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ENVIRONMENT, KNOWLEDGE AND CHANGE : A CASE STUDY OF PEASANT
FARMING IN MARIDI DISTRICT, SOUTHERN SUDAN

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Thesis submitted in accordance with the requirements of the
degree of Doctor of Philosophy in the Faculty of
Social Sciences, University of Durham

Department of Geography

March 1985



-1 MAY 1985

DECLARATION

The material presented in this thesis
has not been submitted either wholly or
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Signed: Candidate:.....*Alfredo*.....

Supervisor:.....*By Stang*.....

TO MY LATE DEAR MOTHER
AND FATHER

.....

ABSTRACTENVIRONMENT, KNOWLEDGE AND CHANGE : A CASE STUDY OF PEASANT FARMING
IN MARIDI DISTRICT, SOUTHERN SUDAN

This is a case study of peasant farming in Maridi District, Western Equatoria Province, Southern Sudan. The object is to explore the impact and inter-relationship of economic, environmental and ecological factors on the changes that have occurred in 'traditional' farming in the study area. Special attention is paid to internal as well as external forces leading to changes, and peasant farmers' own understanding of the change processes, as well as the externally-induced explanations of change. It is hypothesised that agricultural development in Third World countries cannot be fully appraised without an understanding of the farming knowledge and attitudes of farmers whom it is supposed to benefit.

Some basic concepts are reviewed and the hypotheses and methods of data collection and problems encountered are presented. A background survey of the nature of the physical and human environments in which farmers base their decisions is provided. The spatial organisation and nature of 'traditional' agricultural changes and their importance to households' sustenance is noted. Farmers' environmental and agricultural knowledge, and some of the hazards and pressures of agricultural change from the farmers' viewpoint, and how they interpret and respond to these constraints are outlined. The socio-economic characteristics of farmers and the current farming activities and the nature of change taking place, including farmers' involvement in a cash economy, are examined. Emphasis is laid on the adaptive rationality of existing modes of production and the importance of the web of social and economic networks surrounding the individual farmer and influencing his activities. Changes in the pattern of 'traditional' agriculture in an historical and regional perspective are elucidated. A discussion of the existing patterns and

processes of agricultural change, and the diffusion of innovations through the formal and informal channels, and farmers' attitudes and response demonstrating their rationality is shown.

In a broad analysis of farmers' world-view, the individual's attitude to farming is studied including the extent of his farming knowledge, his degree of interest in this activity, his needs and problems, land-use trends, and desired changes. A case study of coffee as a cash crop innovation and its socio-economic impact on 'traditional' land-use systems now and in the future is considered. A brief concluding section summarises research findings and some of the practical and theoretical implications for policy consideration.

This study mainly concludes that only by identifying farmers' management strategies, circumstances and their analysis of problems on their own behalf can a development programme and research be formulated which has technologies appropriate to them.

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TABLE OF CONVERSIONUnits of Area

1 Feddan	=	1.038 acres
	=	0.420 hectares

Units of Money

1 Sudanese Pound £S1.000	=	£Stg. 0.65
(100 Piastres (P.T.) or 1,000 ^m /ms)	=	\$ U.S.0.78
(Official Bank of Sudan Currency exchange rates, January 1985)		

Units of Weight

1 Metric ton (1,000 kg.)	=	2,240 lb.
1 Rotl (weight)	=	0.99 lb.
1 Kantar	=	99.05 lb.

ABBREVIATIONS

ACROSS	African Committee for the Rehabilitation of Southern Sudan
CBD	Central Business District
CHW	Community Health Worker
CMS	Church Mission Society
EPAPC	Equatoria ~~Province~~ Agricultural Production Corporation
EPB	Equatoria ~~Projects~~ Board
GMT	German Medical Team
IBBA RC	Ibba Rural Council
ITCZ	Inter-Tropical Convergence Zone
ITD	Inter-Tropical Discontinuity
ITK	Indigenous Technical Knowledge
MARIDI RC	Maridi Rural Council
OFAR	Off-Farm Adaptive Research
PDU	Project Development Unit
PHCU	Primary Health Care Unit
SPSS	Statistical Package for Social Sciences
SSSMS	Social Statistics and Social Monitoring Survey
SSU	Sudan Socialist Union
TBA	Traditional Birth Attendant
VM	Village Midwife

CHAPTER ONE

INTRODUCTION AND CONCEPTUAL CONSIDERATIONS

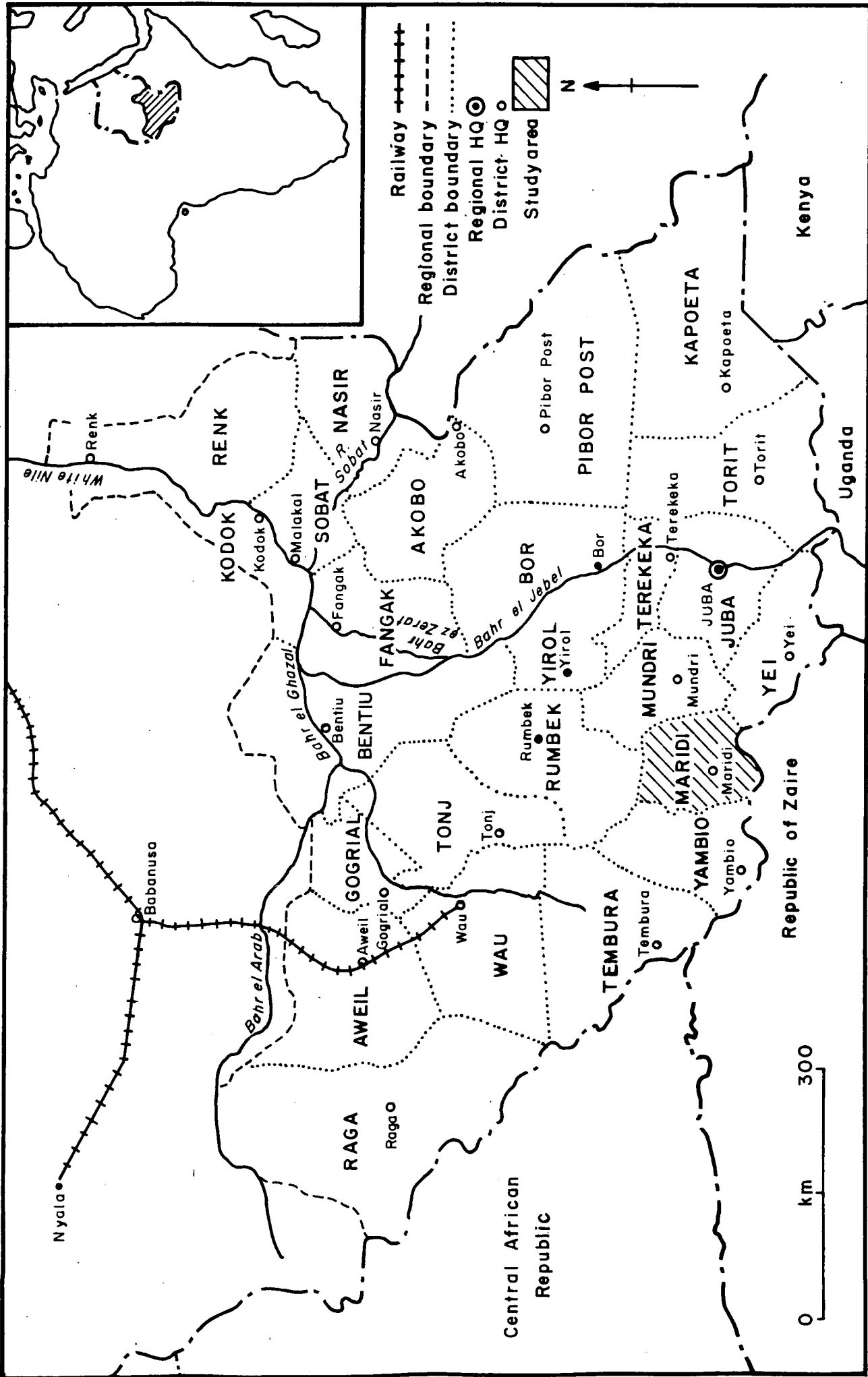
1.1 Introduction And The Objective Of The Study

The present study examines the working of 'traditional' agricultural systems and the changes taking place in Maridi District, Western Equatoria Province, Southern Sudan (Fig . 1.1). The objective of this research is a systematic investigation of peasant farmers' attitudes to the agricultural environment and development opportunities. Small-scale farmers in Maridi District have been chosen for this study for reasons stated in Chapter 2.

The basic working hypothesis of this study is that the ordinary peasant farmers explore their environment in a systematic way much as scientists would, and that their attitudes to agricultural change and development opportunities are rational. A response which, in most cases, differs from that expected by development agencies such as the Agricultural Department and the Project Development Unit (PDU). The regional dynamics of agricultural change will be reviewed in terms of the diffusion of innovations. In the study area, there are two main forces working together influencing the type and direction of change. The first force is the unplanned diffusion of minor techniques and services by peasant farmers mainly through the informal channels. The second force is brought about by attempts made by change agencies to popularise new methods and techniques in the field of agriculture or by the diffusion of infrastructural facilities and other efforts. In this context, equal emphasis will be concentrated on internal as well as external factors leading to change. Thus, of changes which have taken place some have been intended and expected by development agencies while others have been spontaneous and not been anticipated.



Fig.1.1 LOCATION OF STUDY AREA IN THE SOUTHERN SUDAN



In the study area as a whole, no studies were made to evaluate and assess the degree of rural response to the popularisation of the new techniques. This is an attempt to demonstrate the effectiveness of the methods employed. To carry out this assessment, the farm setting and the social setting of selected peasant farmers were investigated. Thus, special emphasis is laid on the interrelationship between economic and ecological variables in farm management and on the current agricultural changes and innovations which have been experienced by peasant farmers. Both the material factors contributing to change and to the ideas, images and attitudes of farmers caught up in this process of change will also be considered.

Although the changes which have been experienced by peasant farmers in this specific geographical area are not enough to assess national developmental programmes, they do indicate the community-family-individual level changes associated with these efforts in the study area. In fact, the national aggregate figures indicating poverty and prosperity of individuals and household acquire 'flesh and blood' in the context of a specific community. We therefore start our acquaintance with Maridi District community by placing it in national perspective. It is believed that there is value sometimes, however, in looking at a situation from a wide perspective.

It is postulated that agricultural development in Third World countries cannot be appraised without a proper understanding of the farming knowledge as well as economic and cultural attitudes of those small-scale farmers whom it is supposed to benefit. In this respect, the factors which have moulded the contemporary individual's approach to farming must also be appreciated. The general theme of this thesis centres on the analysis of the physical and human factors which interplay in forming the norms of a society's response to and capacity for change and hence

influence the mode of its development and progress. Analysing the way peasant farmers perceive and react to their physical environment and to the ecological problems associated with agricultural change will, it is hoped, provide results which may be of practical value in the field of agricultural extension. Thus, the sole objective of this study is to reveal some of the physical and social conditions in the study area that ought to be the focal starting point of development policy formulation and its implementation. Consequently, the specific objectives of this study in Maridi District are:

- (1) To identify farm constraints and problems which would hinder increasing output of food crops, cash crops and livestock, and to identify the processes of agricultural change such as the diffusion of innovations;
- (2) To identify different enterprise patterns by gaining appropriate knowledge about the crops grown, environment resource use and farmers' production techniques. That is to explore to what extent specific programmes and measures and directives apparently struck the peasant farmers as being economic from the 'enterprise' viewpoint;
- (3) To provide information which relates to farmers' circumstances, values, attitudes, systems of belief, and their perception of the physical and socio-economic environments for the existing research agencies;
- (4) To identify implications for Government policies relating to small-scale farmers, and to offer alternative lines of analysis that are argued essential for effective rural and agricultural development planning in the future;
- (5) To identify specific research questions or problems which can be addressed in future research directed to solve them.

In this context, it is necessary to obtain knowledge and the understanding of the farmers' circumstances, constraints and problems. Thus, it is important to collect specific facts about 'what', 'how' and 'why' the peasant farmer does what he does, which is a way termed by several scientists (e.g. Wolf, 1966; Gould, 1963; Kay, 1969; Simons, 1957) among others, as either 'rational' or 'irrational' behaviour, 'economic' or 'uneconomic' and so on. Only by identifying existing management strategies and resources behind them can a development programme and research be formulated which has technologies appropriate to peasant farmers. These aspects are of relevance for the future rural transformation at the village and farm level.

Having provided the introduction and purpose of the study in this chapter, the rest of the sections here will concentrate on firstly, outlining some theoretical conceptions of the 'traditional' farming systems; secondly, a review of innovations and the structure of social institutions, community norms and the attitudes of farmers which impede or accelerate change; and finally, some of the theoretical debates relating to the nature and processes of development or underdevelopment existing paradigms and their conventional approaches will be reviewed. Some attempt will be made to examine the conceptual basis of rural development planning and the assumptions underpinning 'interventionist' approaches to rural development and the understanding of social change such approaches themselves generate. A brief examination of some of the key issues involved in agricultural development planning (as part of the package of actions designed to bring about economic development) in the specific context of Southern Sudan is the main objective of this chapter. Thus, overall, the aim of this chapter is to locate the present study within the corpus of knowledge concerning processes of economic development and social change and also to outline how the specific

material presented later in this thesis illuminates some of the theoretical issues involved in the analysis and discussion.

1.2 Better Understanding Of The 'Traditional' Farming Systems

Agriculture is the dominant sector in the Sudanese economy in general and the Southern Sudan in particular, and is likely to remain so for several decades. At present, it contributes 38% to GDP, it constitutes over 95% of exports and contributes directly and indirectly over 50% of Government revenues; and it provides income and employment for the majority of the population (ILO, 1976). Hence, in the Sudan as in most Third World countries, the majority of the rural population is engaged in, or dependent on some form of 'traditional' farming; some estimates put the figure at ten million persons of which perhaps 500,000 families are in the Southern Sudan (ILO, 1976:35).

The Southern Region is an area remote from the international market. From Juba any produce for export must travel 1427 km by river; 381 km by rail to reach Khartoum and a further 738 km by rail to reach Port Sudan. This means that any feasible cash crop for the world market would have to be of very high value. This is in marked contrast to the Northern Sudan where there is a very high emphasis on export crops (e.g. in the Gezira spearhead zone). The basis of this development was laid during the Anglo-Egyptian Condominium period (1896-1955). During this time, the single largest factor that transformed the Sudan economy from one almost entirely of a subsistence type, was thus the establishment of long-staple cotton on the large-scale Gezira Irrigation Scheme in 1925. This scheme has been a major factor in the colonial agricultural planning policies and continues to be central in subsequent post-Independence State intervention in economic and agricultural development strategies and agrarian change.

Until 1946, however, the Anglo-Egyptian Condominium administration

sought to develop the Southern Sudan 'along its own lines', building up a series of self-contained tribal units based upon indigenous customs and organisation (Oduho and Deng, 1963; Roden, 1974). This involved almost complete separation from the predominantly Islamic Northern Sudan, and thus the economic development of the Southern Sudan tailed behind its counterpart and, there was no great unity at Independence (1956). The Southern Region has further receded backward compared with the North as a result of the seventeen-year Civil War (1955-1972). However, little economic development was undertaken in the South prior to independence. The main project was the Zande Cotton Scheme begun in 1946 with the intention of stimulating cash cropping and the growth of simple manufacturing spinning and weaving industry at Nzara (Ferguson, 1954; De Schlippe, 1956; Reining, 1966; Roden, 1974) as outlined in Chapter 9. It is significant to note that failure to undertake a critical reassessment of the colonial agricultural planning approaches by the newer generation of politicians and bureaucrats in the Sudan partly explains the lack of consistent success in efforts at developing the 'traditional' agricultural sector vital to the livelihoods of inhabitants in general. At several points in this thesis this argument is elaborated to establish that agricultural planning requires more than a 'technical' approach. Thus, agricultural change processes have important social and political dimensions which remain 'under-analysed' within a technocratic framework.

Remoteness is the greatest obstacle to developing cash crops in the Southern Region, but this does not preclude any development. The major resources of the South are land and manpower, and external inputs are equally difficult to obtain as cash crops are to export. Hence, any development or improvement of the 'traditional' agricultural sector must primarily depend on food production and import-substitution strategies.

In the study area, food crops grown for consumption constitute the most important segment of the total agricultural production, yet very little has been done (e.g. De Schlippe, 1956) by way of research into the geography of their cultivation. Even today the nature of the crop enterprise patterns and their ecological distribution, their varieties, qualities, methods of production and the factors affecting peasant farmers' behaviour, images, attitudes and perceptions and choice of crops, their socio-economic and utility characteristics are not yet precisely understood. This study highlights some of these aspects.

Studies of the 'traditional' agricultural sectors of Third World countries in general, and Africa in particular, have been attempted by several scientists (e.g. Allan, 1965; Oyenuga, 1967; Miracle, 1967; Collinson, 1972; Phillips, 1959, 1961; Floyd, 1972, 1969; Ruthenberg, 1980; Webster and Wilson, 1966; Wrigley, 1966). Case studies done by McMaster (1962a), Morgan (1957, 1959), Porter (1965), Knight (1974), De Schllipe (1956), Richards (1939) and Trapnell and Clothier (1937) among others, have been especially valuable in demonstrating the characteristics and nature of 'traditional' farming systems. But many of these scholarly studies have mainly been undertaken by 'outside' observers (Chambers, 1979, 1983) or by the Africans having a Western training and outlook. Thus, evidence suggests that there has often been a lack of understanding on the part of Western-trained experts of the true character of 'traditional' food production systems, particularly of the complexity of decision-making processes which govern the use and manipulation of the basic factors of production. Consequently, attempts at improving or transforming 'traditional' farming systems are not often backed up with sound knowledge of what already exists. Some work done so far (e.g. Wickizer, 1960) has failed to account for the multiplicity of factors influencing land use due to a preoccupation with standard economic principles. Even more serious is the tendency to relegate

the small-scale farmer to the background; often his viewpoint is not sought or even neglected in decision-making procedures affecting his well-being. In addition, undue emphasis is also laid on the introduction of alien cash crops with the aim of high output as opposed to indigenous food crop annuals and perennial tree crops ideally adapted to the local environments (Okigbo, 1975 : 15-16; Coursey, 1967 : vii, 1976 : 1, 1976 : 29).

Coursey (1976 : vii) advanced three reasons for the long period of neglect of indigenous agricultural systems by research scientists:

- (a) Some felt that as the crops (e.g. yams, sweet potato, cassava) grown were essentially 'inferior foods for inferior peoples,' they were not worthy of research efforts (e.g. Uchendu, 1970 : 160-168);
- (b) Western-oriented and Western-trained agricultural scientists claimed that some indigenous staples were difficult to study. It was argued that the 'production of cultivars' many of which are yet unclassified and of highly localised distribution, created a problem of ensuring comparability of results (Biebuyck, 1963);
- (c) Above all, methods of cultivation and the complexities of habitats and land-use techniques deeply rooted in indigenous thought and culture - as Floyd (1972 : 7) correctly puts it "the essence of rural Africa, if there is one, is diversity, not similarity", all appeared strange to 'outsiders' and Western-trained agricultural scientists (e.g. Hutchinson, 1972; Uchendu, 1970), some of whom wished to see the systems of production changed without even understanding their function.

Even the regional texts on African geography produced over the last two decades have tended to feature broad, and occasionally misleading

generalisations of environmental factors and land use patterns on the continent (Floyd, 1972). Consequently, these studies have often failed to portray the kaleidoscopic variety of agricultural techniques and related socio-economic 'life-styles'. The so-called problems, notwithstanding "research in food crops" has become a vital issue in recent years (Okigbo, 1975 :18, Winch, 1976 :4; Flinn, 1976 :1; FAO, 1973, Idisogie, 1971 :17-24) among others.

Studies of food production and decision-making processes undertaken in recent years at farm and village levels, however, have shown that although peasant farmers are aware of the possibilities for increasing crop yields, the quest for security, in terms of their domestic food requirements for the immediate farm family or the local populace, is often their basic concern; and therefore they may show some reluctance to take risks which might involve deviation from long-established and well-tested methods of production (e.g. Elliot, 1969). These studies have also revealed that food production systems in Third World countries are invariably related in an intricate way to many other features of the societies in which they function. Indeed "even when the new production techniques are proven to be profitable, the farmer may be slow to adopt... any innovation requiring cash outlay, for risks are reluctantly taken by people living close to the level of starvation" (Millikan and Hapgood, 1967 : 32).

In this context, any attempt to induce change in such systems should thus be based on a thorough understanding of existing socio-economic structures (Clayton, 1968; Hill, 1970; Hunter, 1969, 1970; Knight, 1971, 1974; Lipton, 1968a 1968b; Belshaw, 1979; Olukosi, 1976; Norman, 1969, 1973, 1974; Wharton, 1969, 1971; Fogg, 1971). However, if the productivity of 'traditional' agricultural systems is to be improved through the latter approach, there is a basic need for the acquisition of information

on the various factors shaping food production systems in particular localities, so that appropriate innovations may be matched with specific situations.

Indeed, the gap between those charged with the responsibility of planning the agricultural economy of the peasant farmers needs to be narrowed through research aimed at understanding the problems of increasing food production as understood by the farmers themselves. It is increasingly becoming clear that most development agencies in the Sudan in general and Southern Sudan in particular (e.g. Project Development Unit - PDU), today are prisoners of alien development models which are to a lesser extent related to the agricultural needs of small-scale farmers.

Freitag (1963) provides a catalogue of the failures which have littered the African agricultural development landscape. Baldwin (1957), in reporting on the failure of the Niger Agricultural Project, puts it more succinctly by acknowledging the surprising and fatal ignorance in which the scheme was planned and implemented. Chambers (1979, 1983) Collinson (1972), McMeekan (1964), Norman (1973,a), Briggs (1978,1984) and Richards (1978) among others, have critically commented on attempts made by development agencies and Western-trained scientists to establish new technologies and methods in the African agricultural landscape without adequate attempts to comprehend the merits of the existing farming systems. Clearly, development in the rural sector has to be more than simply a technocratic process, planned and implemented impersonally by what have been called 'rural tourists' - i.e. planners and administrators having only limited contact with those for whom they are planning.

In the study area, there is rarely adequate knowledge for developing the 'traditional' sector, so very often the line of least resistance is

taken and other schemes are put forward. This situation, to be understood generally, must be seen in historical context and national terms as is recognised by the ILO (1976 : 38) that:

"historically, agricultural research in the Sudan developed in response to the need for technology appropriate for irrigated cash-crop farming and its results have predominantly benefited the modern subsector, ... small number of research stations are operating in the West and South; even such seemingly simple technological advances as improved crop varieties and better seeds may not be readily available in the new environments."

One of the main objectives of this study is to give the peasant farmer a chance to express his viewpoint by looking at the farming behaviour. This is essential in order to comprehend fully the farming environment so that introduced innovations which are expected to bring positive change are effective. This study indicates one way in which indigenous technical knowledge (ITK) complementing scientific knowledge in farming may be documented and likely to be available for use by development agencies.

In this context, ILO (1976:39) stated that "extension officers are not effective unless relevant technology exists which they can extend; nor can their recommendations be carried out until the supply and distribution of requisites such as improved seeds have been organised and until there is a market" (my emphasis). This is particularly the case when it is familiar food crops and varieties that are being developed. As the President of the Southern Regional Government stressed in his speech to the House in 1978 when outlining Government policy that "the main objective of economic development is the improvement of the living conditions of every member of society." Thus, it is important that a development project can relate to every member of society.

Therefore, food production is the top priority of the Agricultural Ministry particularly in the light of recent food shortages experienced

in Juba and other main centres in the Southern Sudan. This situation is further worsened by the increasing number of refugees from neighbouring countries such as Zaire, Uganda and Ethiopia. The need for concentration on food is clearly stressed in the Minister's statement to the House in 1976 that:

"my ministry still places the highest priority on increased food production ... that rapid progress in agriculture, with maximum benefit reaching many small-scale farmers can gradually generate enough resources to establish and maintain other social services. Hence, production of food for regional self-sufficiency is the core of our agricultural development policy and strategy and ... which can collectively stimulate economic and social development through increased production and better distribution of benefits to the rural masses of people, and to assist them to produce their own food and thus become self-reliant" (my emphasis).

It will be demonstrated in this thesis that peasant farmers have the capacity to respond positively to changes and the introduction of new techniques and practices introduced by the public and private agencies (Chapter 10). However, they will hardly respond other than negatively to incorrectly timed introductions which, evaluated according to their own priorities they find illogical (e.g. Chapter 10).

As a result of long experience through trial and error and observation over generations of soil, natural vegetation, climatic aspects and other hazards and as indicated at various stages of this thesis, the peasant farmers have learned in large measure to adopt their methods of cultivation and pattern of cropping (e.g. crop combination) and land use (e.g. Chapter 8) and the ability to find and grow the right types of crop varieties for various micro-climatic and socio-ecological zonal conditions. In addition, farmers' management strategies such as the maintenance of soil fertility, the making of ridges and mounds to concentrate around the plant the more fertile top soil and facilitate proper drainage, the improvement of crops (e.g. locust and more drought-resistant) and the combating of diseases affecting them (see Chapter 7)

and other practices - all have been shown to be rational (risk avoidance or minimisation) as far as the existing environmental conditions are concerned. These management strategies are undertaken by peasant farmers to secure first priority of food and shelter requirements for the family members, as well as leisure, whereas surplus is sold to obtain cash used for fulfilling social obligations (e.g. taxes, school fees etc.), and to acquire those consumer and manufactured goods outside the farm. Additionally, the profits obtained by farmers from non-farm occupations (Chapter 4) are used to supplement farm income. Thus, peasant farmers' priorities are to some extent in conflict with the basic assumption of planners whose major aim is placed on the importance of cash income; and to structure agricultural policy to provide cheap food for towns but may not achieve the desired advantages for the farmers themselves.

The introduction of cash crops into the study area by public and private agencies as a way of commercialising 'traditional' farming has had other effects (see Chapter 11). The planting of perennial cash crops or the investment of part of the income from the sale of annual crops in better housing, for example, have more or less made farmers more attached to their dwellings and land, and less inclined to move elsewhere as they formerly did when the fertility of the soil was observed to decline in a given locality. Farmers growing cash crops (e.g. coffee) have also been encouraged to clear their available cultivable fertile lands of stumps and roots more thoroughly; and to plant the cash crops in pure stand, often in widely-spaced rows and to weed them more thoroughly; and to follow other new cultural operations than they did their food crops. However, change in agricultural activities directly affects attitudes to land.

In this connection, technical change is likely to disturb the

'traditional' patterns of farm management, in particular the organisation of labour input mainly based on informal co-operatives and social networks, as well as the fulfilment of social obligations or leisure. The introduced cash crops have not fitted well into the customary, locally adapted sequence of cropping. Hence, there has been a conflict between the labour demands on cash and food crops. It will be noted in Chapter 11 that the specialisation of some farmers in growing coffee is likely to bring about shortage of available cultivable fertile land as well as labour bottlenecks on food crops. This situation is also likely to lead to a fall in food production vital for family subsistence and probably high dependence on hired labour and market economy particularly as more and more children are going to school and taking clerical jobs in the urban centres. In addition, the introduction of new seed varieties (exotic) is generally as a graft on a system of production which remains otherwise unaltered. Also it is noteworthy that development agencies take into consideration the qualities of the exotic crop varieties which are only additions to the many 'traditional' types that farmers demonstrate invaluable knowledge in regard to their utility characteristics, preferences, tastes, cooking and keeping qualities, poundability and generally their growth characteristics (see Chapter 6).

To carry out the objective of preserving farmers' ethnoscience, a holistic approach to analysing 'traditional' farming is therefore important rather than the purely economic approach adopted by many scientists (e.g. Boserup, 1965; Clark and Haswell, 1964; Lisenmeyer, 1974; Norman, 1972; Spencer, 1972; Young, 1968). Economic variables alone are insufficient to explain not only land use patterns, but also the whole spectrum of farming behaviour. Porter (1965) came to the same conclusion with the Pokot and Wakamba of Kenya. Luning (1967), looking at choices open to farmers in northern Nigeria, concluded that a wide variety of factors, many of them unrelated to economics, influence

farm management behaviour. This same conclusion was reached by Briggs (1984), Collinson (1972) and Knight (1974). Writers (e.g. Barker, 1977, 1978; Richards, 1977 a,b, 1978; Simon, 1955, 1956, 1957; Warren, 1975) among others, have stressed that the role of culture, tradition and beliefs, goals and aspirations, individual personality, differences and preferences, political and social conditions are as potent as economic and spatial variables involved in farming behaviour. These non-economic variables define what is meant by 'economic' variables in the various communities concerned. They shape the 'image' of an individual and his community, and consequently affect the decision-making process. Thus it will be demonstrated in this thesis that the farmers themselves know most about their total environment and their own priorities.

1.3 Innovations And The Structure Of Social Institutions, Community Norms And The Attitudes Of Farmers

In any environment, farming communities innovate in order to survive. Innovativeness was required when societies first established control over their immediate habitats and they are still required to adjust to the changes which periodically affect every environment, however stable they may outwardly appear (Richards, 1977b). But some societies are more innovative than others, and some environments are also more variable and unpredictable than others. Innovativeness is elevated to a virtue, while inventiveness becomes one of the supreme principles of life, glorified because it is essential to survival. On the other hand, new ideas and new approaches may be actively discouraged or repressed in order not to offend the gods who regulate the functions of society and environment. Sometimes the innovative and conservative principles may be given explicit and equal emphasis. Horton (1962), has demonstrated this in the case of Kalabari where the uncertainties of the Niger Delta environment, social innovations and 'traditional' values of kinship all find a place in the

symbolism of the religious thought.

This section outlines briefly some of the social and cultural variables which are likely to accelerate or impede the adoption or diffusion of innovations among peasant farmers. These institutions and attitudes have been considered to be relevant to the understanding of the kind of agricultural changes in the study area.

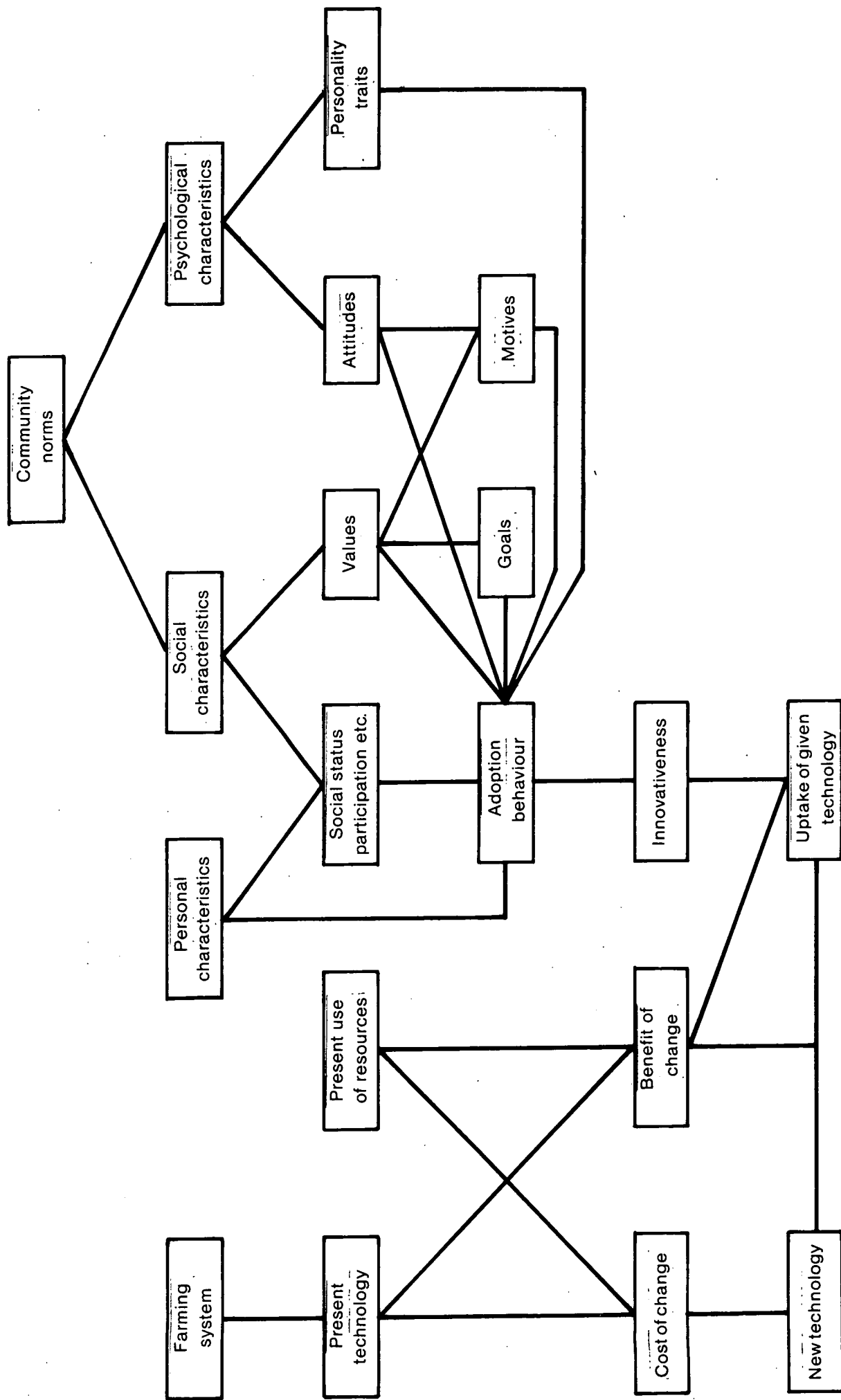
1.3.1 Some factors affecting the adoption of technical change

The attractiveness of an innovation depends upon the costs and benefits of adoption as perceived by peasant farmers in the light of their production objectives. In general, the cost of an action or change can be defined as the benefit forgone through the diversion of resources from the next-best alternatives. Often, however, the estimation of these losses is highly complex and bedevilled by risk and uncertainty. A technical change may require the movement of a range of existing resources from present directions of use, the consequences of which may be unknown or only dimly perceived. Similarly, the benefits may be subject to considerable risk and uncertainty. Many of the changes may involve social costs and benefits which are not accommodated by simple price considerations. The farmer's point of view of the cost-benefit assessment of change depends upon his objectives. Thus, those farmers who aim to maximise longer-run expected profits usually evaluate a change differently from those who try to minimise future losses. Fig. 1.2 illustrates the complexity of factors influencing adoption of innovations. Hence, there are three main factor groups influencing the adoption of agricultural innovations (Jones, 1967) and these are outlined as follows:

(1) Technical system

For there to exist a ready demand for a new technology, it must have, in the farmer's understanding perspective, a potentially significant effect in alleviating a constraint and improving the benefit to be derived

Fig. 1.2 FACTORS AFFECTING THE UPTAKE OF TECHNOLOGY BY FARMERS



Source : Adopted and modified from Jones, G.E. (1967). The Adoption and Diffusion of Agricultural Practices, Journal of Agricultural Economics and Rural Sociology, Abstract 9, No. 3, p. 16

from the productive system (Cohen, 1957; Bradfield, 1966). The closeness of the new innovation to techniques currently in use appears important for two main reasons. Firstly, these technologies which have proved successful in the past can easily be understood as productive factors and more confidently evaluated by farmers in their decision-making processes. Secondly, they are also more likely to be readily integrated with the present system (see Chapter 10). However, absolute profitability also seems a major factor. Thus, variations in actual degree of yield, profitability and risk, peasants' subjective view of profitability and risk, their crop characteristics and preferences, perceptions, priorities and their degree of accessibility to increased factor inputs may explain divergent responses to innovation, adoption and change (e.g. see Chapters 6 and 10). Furthermore, as new husbandry practices are adopted, the farmer increasingly loses control over his own environment. Thus, while the extension staff are concerned frequently with yield variations about the regional average, the peasant farmers are more concerned with the local fluctuations that may be larger than the regional variation (Doyle, 1974). Hence, the fact that farmers know little about crop variation in yield is likely to be an important deterrent to innovation adoption.

Griliches (1958, 1960, 1962) showed the spread of hybrid sorghum in the U.S.A and Panse et al. (1966) and Hayami and Ruttan (1971) the use of fertiliser in India and Japan respectively to be a function of absolute profitability. On the other hand, failure of adoption implies some incompatibility or unsuitability of the system. Okai (undated) studying implements' use in Uganda found major technical faults in seeding equipment which retarded their adoption. Other technologies may present peak operational problems such as the untimely distribution of toria hoes and other inputs by the Agricultural Department officers in the study area to which peasant farmers have other obligations to fulfil and unaccustomed to untimeliness

of operation are often not easily adopted (e.g. Chapter 8). The introduction of cotton during the Anglo-Egyptian Condominium administration (Chapter 9) has met with little success because of the need for high labour peaks at picking time and timely planting, and because of inefficient marketing system and fluctuation and irregular price paid to the farmer.

Thus, farmer's conception of resources, risks and his priorities and social obligations as well as rationality must be borne in mind when introducing new technology. Wilkinson (1973) and Good (1970) emphasised that the fact that the African farmer attaches a relatively higher weight to non-material goals does not by itself make him irrational, but it shows that he has a different hierarchy of values and priorities. It is not the lack of motivation but the lack of opportunities and inadequacy of information that distinguishes him from the 'organisational man', a term often given to the European in Africa (Apthorpe, 1970).

(2) Social institutions and community norms and the attitudes of farmers

Economic growth and change is dependent on the extent of economic motivation of the community; the desire to improve, experiment and seize opportunities (Lewis, 1955). This depends on the levels of aspirations and relative valuations of effort and material goods which vary considerably between groups. For example, people living in dark huts without electricity supply have little use for electrical appliances or similar goods.

One of the approaches to agricultural innovation is to examine the ways in which the structure of social institutions and farmers' attitudes may accelerate or impede change. The 'traditional' innate conservation of value systems and customs are often held responsible for the failures in the attempts to develop 'traditional' farming systems according to the 'Western' lines. Thus, the persistence of certain social and cultural

traditions may seriously hamper the adoption of new technology or increased efficiency in agricultural production (Arnon, 1981). However, care must be taken not to credit too much to the socio-cultural variables, for the modification or removal of institutions which inhibit or assist change does not necessarily accelerate innovation. Conversely, an innovation may find its way round supposed institutional obstacles, for example, cocoa cultivation in Ghana (Hill, 1963). That an innovation that opens up new economic opportunities is likely to lead to the modification of social values in favour of its adoption (Hill, 1970; Doyle, 1974; De Wilde, 1967; Khalifa and Simpson, 1973; Lawson, 1968; Lipton, 1968a; Stevenson, 1968).

In the context of the above review of the institutional variables, the extended family and 'communal' land tenure have been observed in the study area as likely obstacles to innovation to be explained at micro-level. It is outlined in Chapter 8 that pressure of 'traditional' responsibilities was brought on to the head of the household of an extended family who had to share his profits among relatives. Thus, payment of children's school fees, dowries, expenditure on taxes, funerals and wedding feasts are some of the ways in which farm profits are expended, and little capital is therefore available at certain cultivation periods. Consequently, some of the new farm inputs (e.g. toria hoes) distributed to farmers by the extension staff cannot be purchased. However, despite these problems of capital repression and innovativeness, innovation appears to take place precisely because of a farmer's desire to attain or maintain power and prestige with higher family labour input, through disbursing wealth in this way. These 'traditional' forms of co-operation and mutual help have frequently been considered as evidence that the introduction of modern forms of co-operation would be easy because they are in tune with existing cultural patterns (Arnon, 1981).

Considering 'communal' land tenure is the fact that certainly agricultural innovation is inhibited because the farmer has only usufructary rights in family or community land (Udo, 1982). Contemporary land use developments such as the expansion of forest reserves and forest plantations, air strip construction and other Government projects in the study area may be strongly resisted in a community where it is held that the land belongs not to the individual (especially 'outsiders') but to the 'living, the dead and the yet unborn' (see Chapter 4). However, there is fear existing among farmers that these projects have taken over the available cultivable relatively fertile areas thus reducing the 'traditional' agricultural practices mainly based upon land rotation where fields are periodically abandoned to bush-fallow after decline in soil fertility.

In the study area, tree-crops (e.g. coffee, citrus fruit etc.) especially among the Azande in Ibba RC may present special problems. Fieldwork observation showed instances of coffee and citrus fruit trees which have been abandoned unattended in the deserted homesteads due to occurrence of misfortunes such as the death of a wife or household head. However, some individuals have found ways of reconciling tree-crop innovations to land tenure practices although social pressures may consistently discourage innovation. Thus, beliefs, habits, attitudes and images have been held to influence innovative behaviour of individuals, and hence the diffusion of innovation when viewed from the micro-spatial point of view (Richards, 1977).

(3) Personal characteristics/situational variables

In any given social and agricultural system, the rate of uptake of innovation and the rate of change will depend on personal characteristics and aspirations, the development of personal needs and the realisation that these can be satisfied by available means of change. Thus, research

into the circumstances governing the adoption of technological innovations and the nature of entrepreneurial innovativeness (e.g. Rogers, 1962), has produced a stereotype of the kind of person who is in the forefront of agricultural change. He has acquired some cosmopolitan attitudes, uses new farming ideas and less influenced by 'traditional' and social institutions in his judgement and decision making. Thus, he may have a relatively better equipped home, larger farm size than average, and his production is mainly geared for market. He may act as an agent contact of extension officers because he is an opinion leader whose influence through inter-personal contacts channel is important for the rest of the community.

The decision processes involved in assessing new alternative actions by farmers are likely to be in terms of general knowledge and aspirations - a process of 'satisficing' rather than necessarily 'maximising' (Simon, 1957; Westmark, 1961). Decision theory (Found, 1971) provides a number of useful notions in this context. The distinction drawn between decision making under risk, where the decision maker takes a chance knowing the odds, and decision making under conditions of uncertainty, where not enough is known even to begin to assess the chances of success - is a case in point.

Farmers generally know their problems or hazards associated with their established farming systems and operations, but they may not be able to calculate these risks for exotic crops, which may consequently be rejected. Also concepts from the Theory of Games (Gould, 1968) are useful in the distinction between minimising the likelihood of maximum failure (minimax) and maximising outright gains. Farmers in the study area thus aim at minimax strategy, and the combination of crops in one field as well as the adoption of drought or pest-resistant crops might be justified by market conditions in normal years and, therefore, can be comprehended in these terms. Thus, Simon's (1957) concept of 'satisficing' decision

making is similar to farmers' minimax criteria.

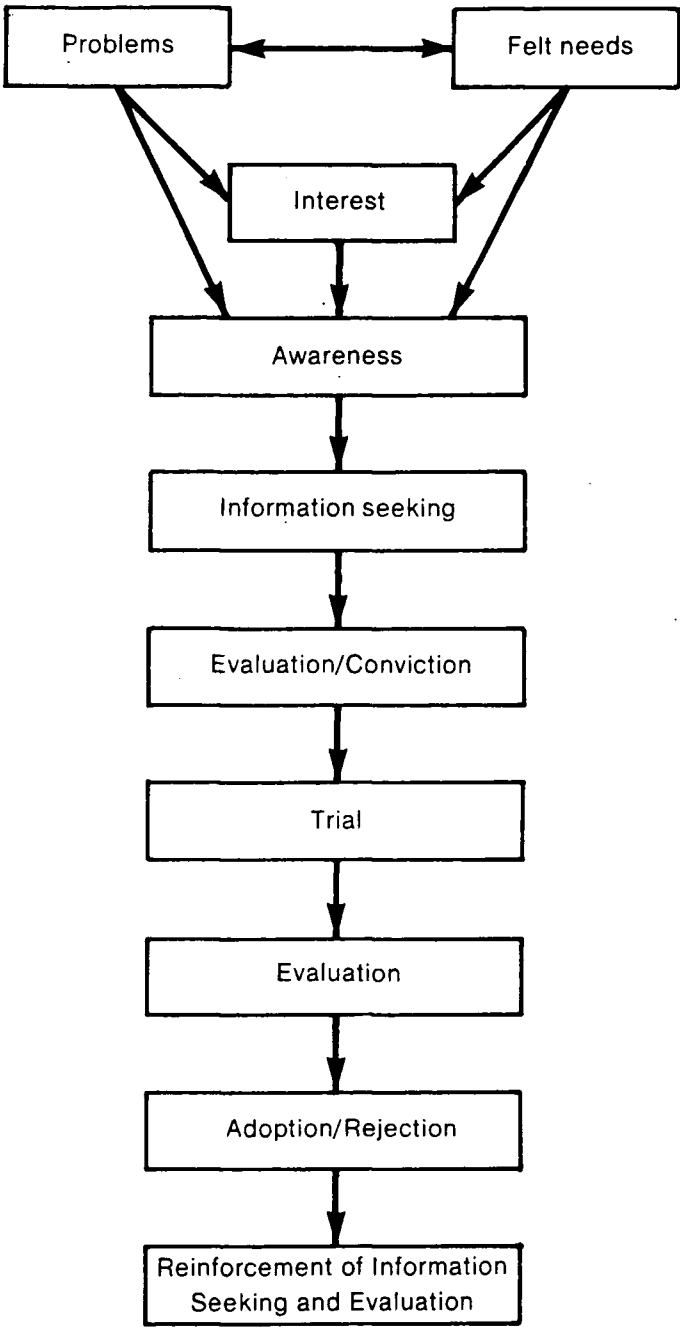
The willingness and ability to investigate innovations as possible means of achieving aspirations will thus vary among individual farmers. The early adopters of innovations are likely to be those with greater physical accessibility and psychological and social ability to grasp the value of new technique and practice and bear the risk of experiment. This observation is the basis of the so-called 'two-step follow' model of innovation diffusion (Rogers, 1962) whereby new ideas are derived from say, the extension or mass media to a small (elites) of innovative leaders in a community. These leaders will have friends, many of whom are also innovators. If the new technology is inappropriate, only few farmers are likely to reach the evaluation and trial stages before rejection (Fig. 1.3). If the innovation is a success, other farmers are encouraged to learn from this experience and are likely to try the idea thus leading to the spread of innovation.

The model of 'two-step follow', however, is to be treated with caution. This is due to the fact that although a farming elite is present in even the most socially homogenous and apparently classless societies (Hill, 1968, 1970), it is more commonly a group of privileged farmers mainly interested in satisfying their own needs rather than those of the society (Richards, 1977). Hence, one of the ironies of the so-called 'Green Revolution' has been the disproportionate benefit by wealthy farmers (King, 1973).

1.4 Some Theoretical Concepts Of Development And Agricultural Change

There has been a marked interest in the analysis of the social structures of Third World countries since the period of the Second World War. This interest has tended to focus on macro-level models capable of accounting for the development process as it occurred in Western capitalist social formations and, more importantly, predicting the

Fig. 1.3 REPRESENTATION OF THE STAGES OF THE DECISION
PROCESS IN THE ADOPTION OF INNOVATIONS



Source : Modified and Adopted from Jones, G.E. (1967) *The Adoption and Diffusion of Agricultural Practices*, Journal of Agricultural Economics and Rural Sociology, Abstract 9, No. 3, p. 9

trajectory of development for the countries of the Third World under the assumption that they would follow a broadly similar path. It has also been assumed by many scientists that Third World countries would replicate most aspects of the Western European experience regardless of socio-cultural and opportunity differences between the two areas and eras. Both Marxist and non-Marxist scholars surprisingly have widely assumed that the conceptual frameworks developed to explain the transition from feudalism to capitalism in Europe could be used as a basis for understanding Third World development processes. However, a number of Third World-based academic and development practitioners have more recently started to criticise these assumptions (e.g. Frank, 1969; Mabogunje, 1980).

Modernisation (or diffusion of innovation) theory takes its starting point the notion that developing societies are characterised by 'economic dualism' - i.e. the co-existence of two sectors within a single economy (e.g. Smith, 1972; King, 1979). The most widely accepted formulation of the 'dual economy' theory views the existence of dualism as a 'natural' stage in the 'modernisation' process. Granted some slight differences in emphasis from one modernisation theorist to the other, the underlying assumption in the conception of dual economy is that the two sectors have developed with separate and largely independent structures each with its own history and dynamics. Thus, modernisation, according to Riddell (1970 : 44) is the 'process whereby 'traditional' institutions, methods and patterns of life are adopted to or replaced by new modern forms."

One implication of modernisation theory is that the 'traditional' sector is outside the limits of the exchange economy and hence outside the wider world economy. Development is therefore primarily a process of adaptation to change diffused from outside the 'traditional' sector. The World Bank essentially shares this view of development and consequently Bank-supported programmes (e.g. the Project Development Unit - PDU in

Southern Sudan) of change are designed explicitly to achieve integration of isolated rural societies into the market economy.

Several factors are used to distinguish the 'modern' and 'traditional' sectors in Sudanese agriculture : the 'traditional' sector is characterised by small-scale rainfed (or 'traditional' irrigation) and unmechanised. Generally, a 'modern' sector is one that is highly dynamic and flexible with respect to the products it markets, it is increasingly productive and its farming technology and efficiency are relatively improved; while the 'traditional' sector has indigenous techniques and with mainly subsistence-production orientation.

In this context, an attempt to close the gap between the socio-economic and cultural structures that are characteristic of 'traditional' and 'modern' sectors, led to the emergence of a rural development strategy aimed specifically towards the reduction of inequalities in income and opportunities, and access to social services and the alleviation of poverty. Thus, rural development has been defined as being concerned with the improvement of the living standards of the low-income population living in rural areas on a self-sustaining basis, through transforming the socio-spatial structures of their productive activities (Mabogunje, 1980; Lele, 1975). Hence, rural development encompasses and transcends agricultural development. These writers view rural development approaches (e.g. Lele, 1975) as part of a new technocratic ideology based on the assumption that production in the 'traditional', inefficient agrarian sector of African countries can be made more efficient by simply adopting 'modernisation' packages in a top-to-bottom' manner. Some of the problems arising from the latter conception of rural development strategies initiated by the Agricultural Department or PDU and other projects are mainly outlined in Chapter 10.

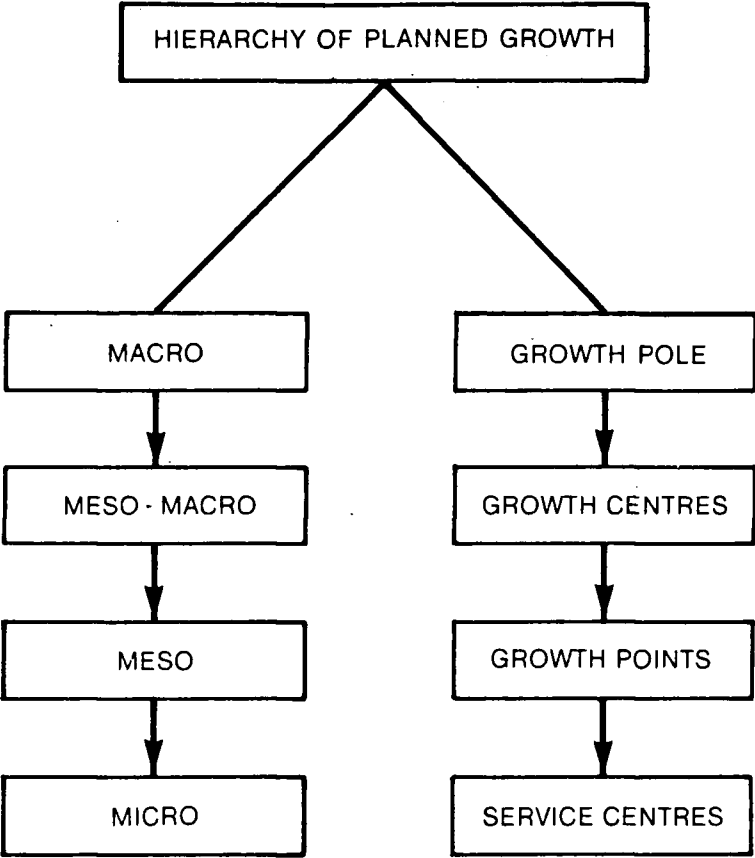
As noted by Mabogunje (1980 : 100) that "rural development programmes cannot be evaluated in terms of whether the stated objectives are achieved or not but whether such objectives are appropriate in the context of many African countries. This point is taken up in some detail again in Chapter 10 to demonstrate farmers' viewpoint and PDU appropriateness.

Regional 'growth pole' analysis is an outgrowth of modernisation theory that is of particular interest to geographers (see Berry, 1967; Gauthier, 1971; Moustead, 1974; Mabogunje, 1971; Darkoh, 1973, 1978) among others. According to this framework, Perroux's (1950,1955) original notion of 'growth pole' (Poles de croissance) has been modified to a theory in which economic development is polarised at specific geographical locations. Such locations tend to be large urban centres where industrial development is concentrated. Granted rapid rates of growth at such agglomerations, it is argued that sufficient potential energy is developed for innovation to diffuse outwards from the 'core' to the 'peripheral' areas. It is suggested in most growth pole analysis of development that the intensity of the impact of the forces of change (generated in the core areas) follows a distance-decay spatial pattern (Fig.1:4) or through a hierarchy and bringing the benefits of urban life to the smaller centres and surrounding areas. Adequate infrastructural development, it is argued would ensure that all parts - even the most isolated communities - eventually experience snowball effects of the benefits of change.

In the terms of this typology, therefore, spatial inequalities become positive characteristics of the regional framework in which social change occurs. In fact, such inequalities provide the basis for the diffusion of modernisation. Both Myrdal (1957) and Hirschman (1958) argue that development is necessarily geographically unbalanced.

In this respect, and in the fields of agriculture, all the major

Fig. 1.4 GROWTH AND DEVELOPMENT



Source : Lado, C. (1979), Unpublished M.A. Dissertation,
Geography Department, University of Khartoum, Sudan , p. 167

agricultural settlement schemes in Africa were the result of the belief in 'growth pole' models for economic development and change. In the Sudan, the Gezira Scheme and perhaps the Zande Cotton Scheme (which had an impact in the study area) and other projects could be cited best examples of 'growth pole' models. This development strategy had been laid down since the Anglo-Egyptian Condominium administration and subsequently followed by post-Independence administrators. Thus, Roden (1974) noted that the Sudan had become a classic illustration of the models of regional inequality outlined by Myrdal (1957) and Hirschman (1958). However, growth pole analysis tends to emphasise, in Darkoh's (1978) phrase, 'a place prosperity approach' as opposed to a 'people prosperity approach' to economic development. Thus, the theory is incapable of suggesting a mechanism for reaching the 'poorest of the poor' in the development process.

Having reviewed some of the concepts on models of economic development and rural change, an attempt is also made to examine some of the attributes that may be important for the improvement or transformation of 'traditional' farming systems.

The nature and rate of agricultural change depends on social and economic environment and in turn they affect the social and economic relations in the society (Bunting, 1970). This is because the farmers are part of the total society. They operate at two levels; in a national context and in the local situation. This implies that there are internal and external factors influencing production incentives. According to Mosher (1969), for the 'traditional' agriculture to be dynamic, it needs a 'progressive rural structure' that provides the necessary links and channels through which innovations and incentives can flow easily. Studies showed that information flows through different channels such as institutional infrastructure for example, towns and nodes of growth that diffuse information to the urban dwellers; secondly, through the direct

word of mouth or face-to-face contacts. Thus, the investigation of the main elements of that structure (see Chapter 10) is essential for the study of change in the rural areas.

A new consensus seems to have emerged and that an effective economic development and agricultural change, particularly during the early stages, critically depends on the achievement of rapid technical change (i.e. new husbandry techniques, better tools, better or improved seed varieties, introduction of new cash crops, the adoption of some practices or cultural operations) (Hayami and Ruttan, 1971; Schultz, 1964; Mellor, 1966) among others. In Chapter 10 an attempt is made to examine the impact of the benefits of development and technical change in 'traditional' farming. Boserup (1965 : 23) emphasised the importance of technology that "it was natural to view agricultural change as determined by a process of gradual change to better and better tools, whereby output ... in food production was increased and part of the population made available for non-agricultural activities."

One implication of Boserup's (1965) hypothesis is that there is a relationship between population increase and agricultural change in all 'traditional' societies, since population pressure makes it necessary to use less suitable land for increasing crop yields through the use of labour-intensive technology. But this hypothesis is apt to mislead because it ignores the fact that the kind of agricultural tool needed in a given context depends upon the system of land use; some technical changes can only materialise if the land use system is modified at the same time, and some changes can only occur if accompanied by the introduction of new technology. The intensive methods of production give higher yields per unit of land at the expense of lower yields per unit of labour (Clark and Haswell, 1964; Netting, 1968). Besides Boserup (1965) scientists (e.g. White and Gleave, 1969) also argue on similar grounds.

It has been noted at various stages in this thesis that there is no scarcity of land but rather of labour and available cultivable relatively fertile lands especially near the main centres of settlements. When land is in plentiful supply, rotational bush-fallowing maximised the farmers' returns per man-day, and consequently is the rational economic behaviour. In the study area, one of the additional relationships which occur between population growth and distribution and agricultural change is that between population pressure and soil-vegetation resources. It is noted in this study that a major problem for farmers in parts of the study area is Striga hermonthica (witchweed pest) infestation, which is a result of prolonged sorghum cultivation. Thus, population growth leading to overcultivation reduces soil fertility and causes soil erosion and invasion by weeds and pests, and sometimes rendering land useless for farming for an indefinite period.

The complex pressures that result from the interaction between farmers and urban centres is also recognised as a significant factor which has a major impact on rural areas. The development strategy followed by many of the Third World countries with emphasis on social development (e.g. education, health) in particular has the unintended effect of aggravating problems in the rural areas and accelerating the collapse of 'traditional' rural structures. For example, the type of education being offered to rural children is essentially oriented to urban employment which leads to dissatisfaction with the existing rural socio-economic structures. The result has been an out-migration of youth usually those with primary education from rural areas to the urban centres, thus diminishing the number of hands available for food production, especially when technological changes do not compensate for labour loss. A common future in the study area is seasonal shortage of farm labour for some families (see Chapter 7) and the higher age of the farming population.

This seasonal migration, however, leads the youth to broaden their horizons (the 'mental maps' of Gould and White (1971)) through the medium of travel. Consequently, this leads them to the accumulation of new tastes, desires, experiences, knowledge and different frame of reference and outlook; contributing to the introduction of new socio-economic structures into the rural areas when the youth return.

Some scholars (e.g. Winter, 1955; Hunter, 1967; Reining, 1966; Miracle, 1967) also analyse agricultural change through taxes. Significant to note is that a major impetus for change is farmers' need for cash to fulfil socio-economic obligations (e.g. payment of taxes, school fees and for manufactured products outside farm) and this can be created also by imposing taxes.

1.5 The Organisation Of The Study

This thesis consists of twelve chapters. Following the First Introductory and Conceptual Framework chapter, Chapter 2 outlines the research hypotheses and methods employed in the elicitation of data and some survey problems. A geographical investigation of the physical and human environmental characteristics is shown in Chapters 3 and 4 respectively, and Chapter 5 describes some aspects of the 'traditional' farming systems. A systematic analysis of farmers' agricultural and environmental knowledge, and their identification of their problems and management strategies devised to cope with these constraints is presented in Chapters 6 and 7. Chapter 8 deals with the socio-economic characteristics of farmers and the current farming systems and the role of markets. Early formal efforts made to transform the 'traditional' agricultural systems in an historical perspective as well as the current formal and informal or spontaneous agents of change, farmers' general attitudes and response towards innovation and change, and some of

the trends in farming and land use strategies are examined and quantitatively assessed in Chapters 9 and 10 respectively. Some preliminary remarks on coffee as a cash crop development and its impact on the 'traditional' land use systems are made and shown in Chapter 11. In the last Chapter 12, an attempt is made to summarise the main findings highlighted in the previous chapters and to draw specific conclusions emerging from the study and the relevance or implications of research to rural development planning and policy consideration.

CHAPTER TWO

RESEARCH HYPOTHESES, JUSTIFICATION AND RESEARCH METHODOLOGY

The aim of this chapter is to highlight the hypotheses of the study and review some of the techniques of sampling and methods employed in the collection of data and associated problems encountered and presented in this thesis.

2.1 Hypotheses Of The Study

Initially, this study was not carried out according to the normal hypothesis-testing strategy, because one cannot frame hypotheses usefully until one has access to a great deal of information about the system under investigation.

As a compromise, from the commencement of this research, instead of constructing hypotheses, a series of 'starting questions' to guide the evolution of the field research strategies were formulated. While these were in most cases not specific enough to be called 'hypotheses' (in that few postulated formal relationships between variables), nevertheless they did serve to translate the broad objectives of the study into a form which would yield specific research hypotheses as familiarity with the socio-economic and cultural conditions of the study area were gained. The initial questions were as follows:

(1) What kind of knowledge underlies farmers' attitudes to their environment and to changing circumstances in regard to diffusion of innovations in particular?

(2) How do farmers and public officials interact? Which agricultural services are most often utilised by peasant farmers and how is agricultural information communicated; and to what extent is it subject to filtering and distortion in the communication process? What useful

and effective sources of information of new ideas and advice do peasant farmers use to solve their problems?

(3) How do farmers adopt decisions especially those of the non-routine nature involved in adaptation to change or adopting innovations? In the acquisition of agricultural knowledge do farmers rely more on personal or impersonal sources, and which are these sources?

(4) How have the historical events in the Southern Sudan in general and the study area in particular affected the 'traditional' agricultural systems? Has the Zande Cotton Scheme any impact on farming systems in the study area and what are the consequences of the 17-year Civil War? Have the public (e.g. Department of Agriculture) and private (e.g. PDU) agencies assisted in communicating what kind of new agricultural techniques and practices to the peasant farmers at large within the community?

(5) What are the consequences in the introduction and incorporation of coffee growing (as a cash economy) into the 'traditional' farming systems in the study area and in particular the implications for the food crop sector?

Before field research was begun there was insufficient information to list research hypotheses in precise detail. Nevertheless, some broad working hypotheses to attain the objectives of the study outlined in Chapter 1 can be stated briefly and argued or elaborated in the main body of the thesis. The hypotheses are:

(1) That farmers tend to adapt their farming to changing circumstances provided the change is satisfying in terms of additional benefits involved. Their failure to adopt recommended innovations by the change agencies in certain circumstances, may be due not to lack of understanding of their consequences for their own situation but to a lack of coincidence of their priorities with the perceived consequences of the recommended new ideas and technology;

(2) That farmers in Maridi Rural Council (Maridi RC) (see Fig . 2.1) have relatively larger farms than those in Ibba Rural Council (Ibba RC), and that these differences are due to the size and use of family and hired labour input. That farm size also varies according to the differences in the socio-ecological zones delineated;

(3) That farmers' agricultural management strategies are mainly based on the following:

- (a) Their knowledge and perception of the physical environment in regard to the utilisation of soils, vegetation, climate and ecological processes involved and the behaviour of these over years of usage,
- (b) Their intimate knowledge of growth, food taste and preference factors or value and utility characteristics of their crops,
- (c) The seasonality of production, household food and cash requirements,
- (d) The amount of inputs which farmers are able to muster;

(4) That the introduction of coffee as a cash crop and its impact on the 'traditional' farming systems is likely to lead to the relative decrease of food crop production in the study area;

(5) That peasant farmers would tend to cite informal sources of information more frequently for those practices associated with well-established farm operations such as labour input as well as experience gained through out-migration, while the formal change agents are also more important for practices which represent more recent innovations particularly technical inputs which are considered as provisions from the outside.

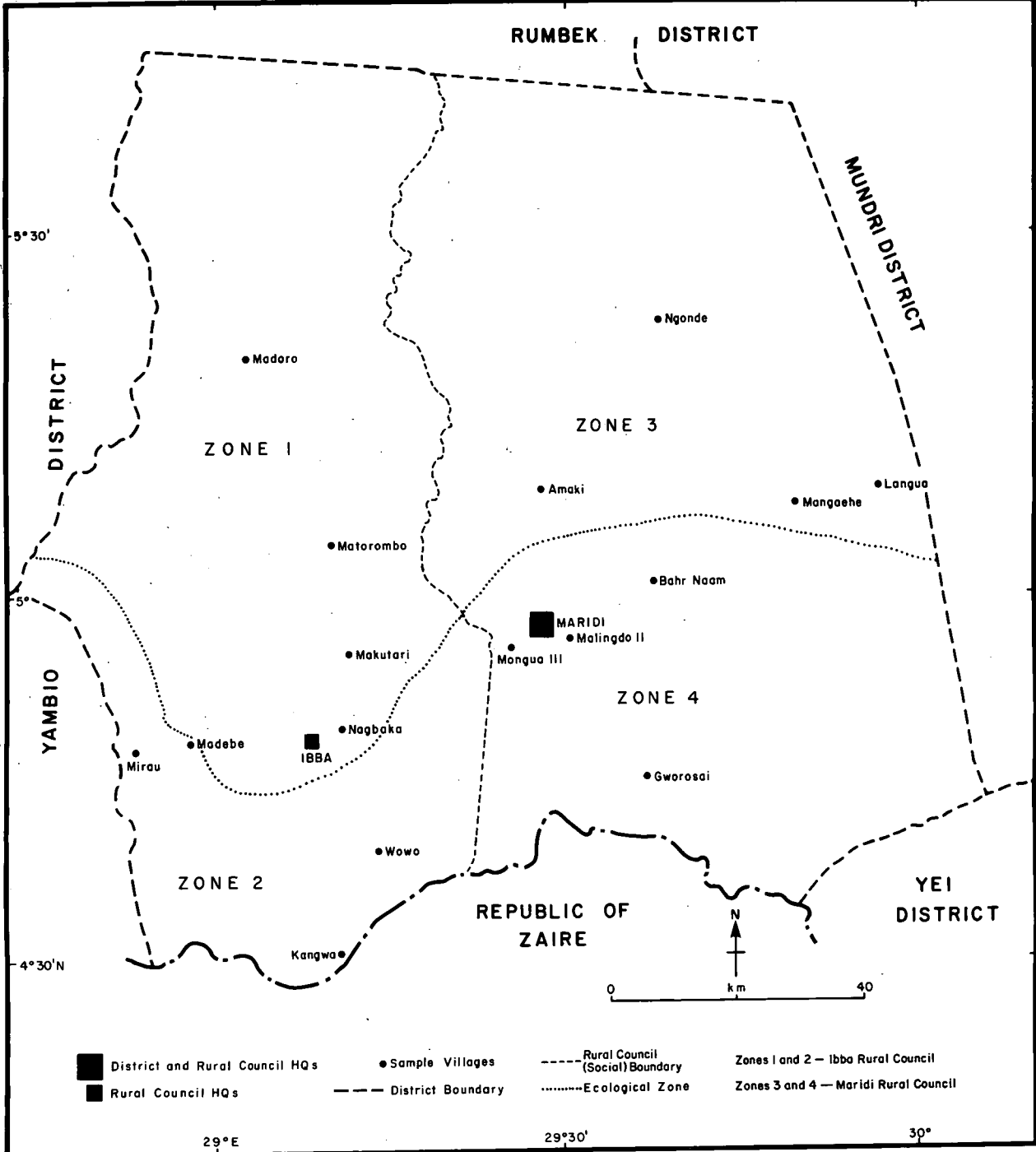
2.2 Research Strategy And Justification/Choosing The Research Site

The choice of Maridi District was made because it had been little studied by comparison with other areas (e.g. Yei District) and the PDU were interested in the data that would result and kindly offered assistance. The study area lies between latitudes $4^{\circ}30'$ and $5^{\circ}45'N$ and between longitudes $28^{\circ}30'$ and $30^{\circ}05'E$ in Western Equatoria Province (see Fig. 2.1). Established as a full district consisting of Maridi Rural Council (Maridi RC) in the east and Ibba Rural Council (Ibba RC) in the west - in 1973, with a total area of about 12,800 square km and an estimated population of 31,908 people (Social Statistics and Social Monitoring Survey - SSSMS, 1982). It is bordered in the north by Rumbek District, in the east by Mundri District, in the south by the Republic of Zaire and in the west by Yambio District.

One of the requirements of this study was that the area under investigation be one that had been the focus of planned agricultural changes so that adequate background information could easily be gained, and a proper understanding or assessment of the impact of formal change agencies engaged in improving the 'traditional' farming systems (as contrasted with spontaneous agricultural change agents) and farmers' viewpoint on their environment and priorities about change could be obtained.

The study area had also since the Anglo-Egyptian Condominium administration and during the post-Independence Governments been one of the 'Agricultural Development Districts' (the boundaries of the development district coincide with the administration boundaries) based on cotton growing. In fact, the study area includes part of the most promising agricultural zone - the Ironstone Plateau in the South-West, and more especially the stretch between Tembura and Yei Districts known as the 'Green Belt' in the centre and west of Equatoria Province. According to Tothill (1941) this

Fig.2.1 LOCATION OF SAMPLE VILLAGES IN THE STUDY AREA



Source: Landsat Images and Sudan Meteorological Department

was the 'Agricultural Cinderella' of the Sudan, while Sawyer (1919) described it as the "home of the industrious agricultural tribes" who had been the subject of some of Gessi's and Emin's economic experiments to create an exchange economy based on the growth of cotton during the Turkish period (c.1878-1883) in the Sudan. Following the 1972 Addis Ababa Accord which ended the seventeen-year Civil War between the Northern and Southern peoples of the country, priority in development has been focused on the rehabilitation of the 'traditional' agricultural sector. Consequently, the Agricultural Department and the Project Development Unit (PDU - a World Bank /IBRD financed Project - are involved in the improvement of small-scale farming with emphasis on the introduction of improved seed varieties (exotic) and development of coffee to raise the standard of living of peasant farmers.

In the study area, there have been no attempts made, as noted earlier, to examine the nature and extent of the working of 'traditional' agricultural systems in detail. However, several articles and reports (e.g. Catford, 1953) mostly dealing with cotton growing have been written. But a wider literature and data published on some of the local peoples are basically anthropological in nature (e.g. Evans-Pritchard, 1937; De Schlippe, 1956; Culwick, 1950; Reining, 1966; Baxter and Butt, 1953; Tucker, 1948).

In this context, it is claimed that this study may perhaps be a contribution intended to explain the nature and processes of 'traditional' farming systems of the study area. The aim is to explore the interaction between man and his environment, how he manipulates and uses it and the impact of planned and unplanned agricultural changes within it. The study area is particularly attractive as a focal area of this research because it provides an intriguing blend of cultural diversity, concomitant agricultural potentials varying according to the socio-ecological zones as

well as different degrees of accessibility and remoteness from the centres of infrastructural services and agricultural innovations.

Finally, the study area also contained a variety of ecological and environmental terrain features. These include rugged mountains in the southern part and which slope northwards into relatively extensive plains and bushes with some scattered hills (jebels : Arabic). It is also subject to rainfall variability with annual totals ranging from 1500 mm in the extreme south to about 1000 mm in the north thus producing a variety of ecosystems associated with different vegetation, soils and a wider range of crops and fauna. This variety of features makes Maridi District a particularly suitable subject for study.

2.3 Choosing The Sampling Frame And Sample Size

Before a survey commences it is important for one to decide on the sample size. As outlined in Chapter 4, Maridi Rural Council (Maridi RC) is mainly inhabited by the Moru and other non-Moru tribes, while Ibba RC by the Azande and other minor tribes. The study area was therefore stratified into four hypothetical socio-ecological zones (based on groups of farmers of similar agro-climatic and socio-economic, ecological and tribal circumstances) or strata. The four zones were therefore delineated as shown in Fig. 2.1. Thus, the identification of such zones was based on available or existing information such as Landsat imagery interpretations, climatic records and social reports. Such zones are expected to have different types of constraints and problems due to different key factors.

Zone 1 Semi-dry and lies in the Ironstone Plateau and mainly inhabited by the Azande;

Zone 2 Relatively wet, lying in the 'Green Belt' also inhabited by the Azande;

Zone 3 Semi-dry, lying in the Ironstone Plateau and mainly inhabited by the Moru and other non-Moru tribes;

Zone 4 Relatively wet, lies in the 'Green Belt' again mainly inhabited by the Moru and non-Moru tribes.

The social and physical distinction between the semi-dry Ironstone Plateau zones and relatively wet zones of the 'Green Belt' is elaborated in Chapter 3.

The unit of interest in this study are the household heads who make decisions about farming operations and management strategies. The Department of Social Statistics and Social Monitoring Survey (SSSMS) of the Regional Ministry of Finance and Economic Planning had recently conducted a survey to determine the total population of each village and the number of chiefs, sub-chiefs and their respective households (see Appendix 8A,B and Chapter 4) in the study area. Therefore, a list of villages and chiefs and their sub-chiefs as well as the number of households was obtained and arranged according to the respective zones delineated. Then two stage sampling was carried out in each zone by first selecting eight headmen (sub-villages) from the list of all headmen in each zone on a random basis by assigning a consecutive number to each headman and then using random number tables to indicate the chosen headmen; and secondly, selecting randomly four heads of household under each selected headman. This procedure ensures that each member of the sample population has the same probability of being selected. Thus, thirty-two households were selected from each of the four zones making a total of 128.

However, with greater social or tribal heterogeneity in Maridi RC and in order to have a reasonable representation of views and ideas on socio-economic environments, it was considered necessary to increase the number of headmen (sub-villages or sample sites) from eight to twelve in each of the two zones. Thus, 64 households were interviewed in Ibba RC (zones 1 and 2) and 96 households in Maridi RC (zones 3 and 4) making a total of 160 sample farmers for the study area (see Appendix 3).

The selected headmen and their sub-villages by zones are shown in Appendix 2, while the sample size for each of the zones and their proportions for the total number of households for each sample site is depicted in Table 2.1.

It is worthwhile noting that in the study area, it is common to find small villages with fewer than ten households and this made it difficult to get the eight or twelve sample farmers from each site. In such cases, where no large village could be found, a number of small settlements or homesteads were combined. The only precaution taken was to ensure that all the settlements (or homesteads) that were combined fell under the same chief, sub-chief or headman. Thus, the sample was fairly representative of the geographic distribution of households in the study area. When considering representativeness, certain socio-economic characteristics are probably more important than location. The problem of over-representation of untypical villages arises in which only a small number are sampled. However, in this study the villages are not in any way unique compared with other villages in the same relative location. Also, the lack of capital and labour when hand farming techniques or methods are practised, means that the potential variations in resource and enterprise combinations are very limited in the study area. This considerably simplifies the problem of selecting both representative villages and farmers.

2.4 Recruiting And Training Enumerators

The PDU and the Agricultural Department generously provided three enumerators for this survey. These staff were invaluable as they had a wider knowledge and experience on the study area in regard to the cultures, agricultural practices and some were able to master more than one dialect. They had also been involved in similar surveys and hence a shorter time was spent on training them. During the training of the enumerators, they were instructed to avoid having pre-determined views and ideas in their minds about the responses they would expect from peasant farmers or

Table 2.1 : The Survey Sample size in Maridi District

Households	Zone 1	Zone 2	Zone 3	Zone 4	District
Households in the sample	32	32	48	48	160
Households in selected sub-villages	481	647	356	487	1971
Sample as % of households in selected sub-villages	6.7%	4.9%	13.5%	9.9%	8.1%
Total households in zone	1898	2441	1415	3889	9643
Sample as % of total households in zone	1.7%	1.3%	3.4%	1.2%	1.7%

Source: Data compiled and derived from the Social Statistics and Social Monitoring Survey (SSSMS) Juba, 1982.

making the answers fit their own preconceptions. They were also briefed on the aims and objectives of the study and were however encouraged to express their own opinions about the wording and sentence structure of the questionnaire (see Appendix 1). After having gone through the questionnaire together with the enumerators and necessary modifications made, the problem of administering it (which was written and typed in English) was considered. Thus, part of the terminology (see Appendix 4) used was fully explained to the enumerators. The questionnaire was then pre-tested on randomly selected thirty farmers but not included in the sample. This procedure provided the opportunity to test the enumerators and assess their competence and hence gained practice and confidence with the farmers themselves. Finally, based on these experiences, final revisions were made in the questionnaire and was then typed for duplication.

2.5 Questionnaire Administration And Regular Interviews By Enumerators

Maridi headquarters was the base of fieldwork operations for the researcher and supporting staff. The dates for interviewing the sample peasant farmers were set two to three weeks in advance. Various respective Government officials, chiefs and their subordinates in the study area were therefore notified of the survey team's programme. Owing to the fact that the enumerators were trained in a short space of time, and although they gained experience from previous surveys prior to this research, each enumerator was nevertheless allocated only one interview during the first two days, thereafter it was two interviews per day. Each questionnaire lasted from about one hour and forty-five minutes to two hours for the first two days to complete filling, and thereafter one and half hours to one hour during the rest of the questionnaire schedule.

In this connection, no major problems were encountered during the administration of the questionnaire, but several of the lessons learned

include the following:

(1) Attempts were made not to miss the day on the schedule on which farmers expected to be interviewed and to avoid farmers' shyness and disappointment;

(2) Back tracking to save fuel was minimised and constant checks were made while enumerators were conducting interviews and problems that arose in several circumstances got adequate attention while still in the field;

(3) Once an enumerator had completed his draft interviews, it was necessary again to check and re-check the questionnaires. This procedure enhanced the quality of the data elicitation.

2.6 Eliciting And Maintaining Farmers' Co-operation And Data Quality Control

The nature of this research plan needed a great deal of farmers' co-operation. No one sample farmer dropped out intentionally although several of the farmers needed special conviction or attention before accepting interview and to allow enumerators to take down notes on the most sensitive types of data, particularly those of income, number of children and other socio-economic aspects that were investigated through the questionnaire. The extent of farmers' sociability (although to a limited extent due to the existence of some of the 'traditional' beliefs, values, and superstitious practices e.g. witchcraft or 'evil eye', the belief of impending bad luck and misfortune especially among the Azande) could be judged by the recalling of most of their social and economic activities and manipulation of the physical environment; by providing full information and details of their age, educational, occupational and residential history and mobility; and being willing to take a test on their agricultural knowledge, development priorities and other attitudinal questions were immensely invaluable.

However, several techniques were utilised in this survey to ensure

data reliability and some checks, as noted in the preceding section, were built directly into the questionnaires and a great deal of care was taken at various stages to maintain the highest possible degree of accuracy in the data. It was possible also to follow unexpected leads at all times, continually adopting the framework of reference and the questions that were asked. This proved extremely invaluable in acquiring unexpected information. The information and data gathered from the study area were comprehensive and the internal coherence would probably not have been obvious to either the enumerators or to the peasant farmers. Part of the questionnaire required personal observations about the farmers' farm, the functions of land and farm residence including buildings and materials and methods of construction; the household equipment used, the dress of the family members and their health, the luxury and consumer goods available and so forth.

In this context, despite the strategies adopted by enumerators to ensure data reliability provided through the formal and informal interviews, it is perhaps important to pose the questions: To what extent do farmers' statements reflect what they actually do? How does one ensure that farmers are telling the truth? In fact, it is quite difficult to some extent to provide precise answers to such questions. However, within the limitations of resources and time usual in this kind of study, the results or data are believed to be reliable. But inevitably, information relating to age, farm size and other estimates, is to be treated with caution, especially where not independently corroborated by other evidence or data sources; since, with the best will in the world, peasant farmers' 'recall' powers are finite. Additionally, some respondents have strong reasons for not disclosing relevant personal quantitative data. While the potential benefits of the information collected from farmers as a whole might be mentioned, the main objectives of the survey to help direct academic

research work were fully emphasised and as strictly confidential. Each farmer was made to understand that no special consideration would be given as a result of participation in the survey and that those selected were on a lottery or ballot basis.

2.7 Procedures And Methods Of Data Collection And Some Survey Problems

This section outlines the different techniques employed to collect information as well as some of the constraints that were encountered in this study. Effort was made to adopt a multi-method approach in order to minimise data inconsistency. This is in response to Barker's (1978:1) warning that "the data collection process is part of a social contract between a researcher and local people, and the onus is on the former to ensure that his techniques are appropriate to the cultural context in which they are to be used, and are tailored to the abilities and requirements of the community in which he works."

Fieldwork for this study was conducted over a period of five months commencing from May 1982 to September 1982. This period was purposely chosen so as to coincide with the peak of agricultural operations and to enable a clear insight of the nature and processes of the farming systems to be gained by the enumerators. Additionally, this period is conducive to surveys of this kind because the weather is cool, but there were some limitations and constraints encountered which will be noted later in this discussion. The general paucity of information necessitated the development of a lengthy methodology of data collection.

The bulk of the basic empirical data presented in this thesis were obtained from the sample survey through the deployment of questionnaires, consisting of structured and unstructured questions which covered socio-economic aspects in regard to details of the head of household; for example, the demographic composition of the household, the nature of

'traditional' agricultural systems including landholding and management strategies, and cropping patterns as well as the perception of agricultural problems and environment; farmers' contact with the outside environment and diffusion of innovations and response to change agencies. Also, some general attitudinal test questions on farmers' response to change and innovation were included. It was hoped that the use of local personnel might help to overcome the problems of language and suspicion of the questionnaire and to cope with the time and resources constraints. Thus, a questionnaire approach has much to recommend it provided as Whyte (1977) suggests that it can also be reinforced by observation and participation.

The researcher was present at most interviews, adding to or supplementing the standard questionnaire by asking additional questions (e.g. questions on knowledge of soils) that arose from the prevailing circumstances of each individual case. In practically all cases the full co-operation of the respondents could be obtained. The response to the questionnaires was generally good (about 80%) although several suspicious farmers required conviction that the survey had nothing to do with poll-tax or campaigning for the local parliamentary elections conducted at that period. When given suitable assurances sample farmers collaborated fully with the enumerators. However, several farmers excluded from the ballot system of selection expressed disappointment at not being included in the questioning. At times, there was interference in the interview from some of the curious on-lookers such as neighbours, family members and so on who tried to help supplying answers to certain questions. In such situations, married household heads (husband and wife) were allowed to co-operate in providing some socio-economic details of the household and farm management.

Although the questionnaire was the major tool of data elicitation, other methods were also used. Information on some of the food and cash

crops grown as well as livestock was sought from the agricultural extension officers (overseers) in their respective areas through the use of a pilot questionnaire (Appendix 14). Each field staff was basically asked to provide a map of his area, marking in villages, roads, tribal differences including approximate boundary of his area. Three sheets of tracing paper were overlaid on the map - each one for food crop, cash crop and livestock and poultry patterns.

One possible way of eliciting community environmental knowledge and uncovering its structural integrity led to the use of Triads Test (repertory grid) approach in which food tastes, preferences and value characteristics of some crop varieties were elicited. The details of this technique are highlighted in Chapter 6. In fact, the results of this technique, however, uncovered information or points that would almost certainly have been missed in a conventional interview schedule.

In order to compare with the primary data collected over that period, formal records were examined. These include published and unpublished documents (e.g. confidential files) and library materials in various Government departments and institutions to enable comparisons to be made between the situation in the study area and similar areas elsewhere. The most valuable source of recent secondary data utilised in this study, as noted earlier, was that on population and total number of households of the study area which have been collected by the Social Statistics and Social Monitoring Survey (SSSMS). Archival materials of the Agricultural Department and PDU too provided invaluable data from which an overall impression of the socio-economic and production systems in the study area could be built.

Other survey methods were also utilised by way of supplementation. Respected leaders or elders and men of repute were either purposely chosen or consulted upon the recommendation of other knowledgeable people in the

study area. Historical data and information relating to agricultural hazards and climatic events as well as other socio-economic aspects of life were collected in this way. Despite the efforts to consult a wide spectrum of elderly informants, time and resources constraints limited consultation of those recommended.

In surveying the sample farmers throughout the study area, much socio-economic data were observed that cannot be presented statistically. Informal interviews and discussions (most valuable) with some selected farmers resulted to the assembly of case studies or histories and emergent farming systems which can be sensed but were not fully documented because they were less anticipated in advance. These individual case studies (see Appendix 5) demonstrate various aspects of contemporary life in relation to the past rural communities and data which are not quantified in this study.

Personal or direct participant observation and informal and semi-informal discussions with farmers were invaluable techniques of data elicitation that relate to knowledge on soils, vegetation and the characteristics of farming systems and crop production. Thus, enumerators' observations yielded much information and their sentiments and impressions and detailed notes on the general pattern of life in the study area were recorded. Sometimes enumerators participated with farmers in some of the farm operations. Working alongside the farmer in the field, listening to what is being said and experiencing and observing what the farmer experiences and does appears to provide real possibilities not only of uncovering what the farmer knows and thinks about his environment but also providing some clue as to how the components of that thought and knowledge are structured.

It is perhaps important to state some of the problems that were encountered during the fieldwork survey in addition to those noted earlier

in this chapter. The research was not all that pleasant due to untold difficulties during data elicitation and thus a brief mention should be made of the specific problems noted below:

(1) There was almost partial or total lack of the base data. This is because the 17-year Civil War resulted in destruction or stagnation of the social and economic development activities as well as the loss or disorganisation of archival and public records. Most of these documents have either been burnt or eaten by white ants, and what is available is often uncatalogued and in a poor state, inconsistent and not very reliable; and in most cases only exist for the last few years. This problem meant that several sources of data had to be consulted and information pieced together (e.g. base map of the study area) as well as the deployment of a long questionnaire for the elicitation of empirical data.

(2) There was also the problem of the translation of questions from English into the various existing local dialects spoken as well as the lingua franca - 'Juba Arabic'. The questionnaire, because of the usual problems of time and resources, was not translated in a typewritten form into the local dialects. Additionally the multiplicity of the dialects spoken in the study area made it impossible to solve this problem. Although the questionnaire was typed in English and only readable by the enumerators, rarely, if ever, was English used to conduct interviews in the field. However, the competence, knowledge and experience as well as mastery of several dialects by the enumerators employed minimised this constraint. Although the standards and qualities of the enumerators improved from pre-survey to the actual sample survey, constant checks and re-checks proved invaluable in errors minimisation of the completed questionnaires.

(3) Gaining the co-operation of several sample farmers for the interview was a long painstaking problem encountered. It was almost impossible at some stages to convince respondents that the survey research

had nothing to do with Government or taxation purposes but was explained to them as purely for academic use. In addition, most farmers had the impression that the research team members were politiking or campaigning to contest in the local parliamentary elections which incidentally coincided with the timing of this survey. On the other hand, for those respondents who were most willing and co-operated in answering the questionnaire sometimes tried to impress by exaggerating their hardships and shortcomings in anticipation that the research team might ameliorate their plight and help them for assistance from the Government. Thus, an enormous amount of friendship and cordiality was established between research team and respondents.

(4) The fourth problem encountered was related to poor accessibility (most roads often little more than mud tracks) especially in the rainy season, consequently contacts with sample farmers proved insuperable. Farmers' homes or farms were, in most cases, not negotiable by vehicle due to the scattered nature of settlements or homesteads and away from the main roads. On locating farmers for interview, a few respondents reluctantly accepted to be questioned due to the fact that their agricultural operations were suspended for a prolonged discussion. This sometimes led several farmers to advance quick and false responses mainly to get rid of the enumerators. In fact, one enumerator had noticeable inconsistencies in the answers to certain questions that the data for one of the respondents in a certain sample village had to be discarded and substituted by another. This was a major drawback. Additionally, there was also the constraint of fuel supply and lack of spare parts for the landrover used in the survey.

(5) Enquiry into farmers' income, number of children, livestock in possession and into some of the socio-economic data which were felt by some respondents to be too personal and confidential posed constraints on data elicitation. Briefly, there was suspicion by respondents due to cultural taboos.

In spite of some of the above-mentioned problems, information was not totally refused and violence threatened only on a limited number of occasions. It was more likely that certain data were secretly withheld or false answers supplied. Whilst such problems and those noted in the text were, of course, inevitable in the research survey of this nature, care, courtesy and co-operation were maintained to elicit relatively reliable data from the sample farmers.

2.8 Methods Of Data Processes And Analytic Framework

The empirical data presented in this thesis were elicited through the use of a questionnaire as the main tool and which consists of structured and unstructured questions. With the field part of the survey completed, the processing of material begins. The data contained in the questionnaire were therefore arranged and assigned the variables' code numbers. Thus, all the statements or responses to various questions were organised and grouped together according to the respective variables which were assigned numerical values and transferred to an 80-column code sheet system from a Master Code Book. The coded data in the 80-column code sheet were then entered into a disk file in Durham University Computer Unit for further analysis and using the Statistical Package for Social Sciences (SPSS). The results of the questionnaire were then analysed and presented in tables of frequencies of the variables involved and numbers and percentages calculated. Because of the nature of the data mainly based on estimates and size of sample, the application of sophisticated statistical analyses and techniques were avoided. At various stages hand tabulation and calculation of percentages by the use of electronic calculators was attempted.

Having presented the hypotheses, procedures or methods of sampling and data collection and some of the associated problems met in this study, the next two chapters therefore outline the main elements of physical and human environments in the study area.

CHAPTER THREE

THE PHYSICAL ENVIRONMENT OF THE STUDY AREA

In the preceding chapter the study hypotheses and the methods of data collection were outlined and the limitations encountered have been pointed out. This chapter attempts to describe briefly the physical environmental features in relation to the physiography, drainage and geological structure, climate and its associated aspects, vegetation and soils; the understanding of which allows a clear picture of the resources and their constraints to emerge. The analyses of these physical aspects will mainly be focused on the Western or scientific thinking although peasant farmers' viewpoint is noted wherever possible. It is important to note that an objective description by experts of the physical environment in which farming takes place may not be as important as that perceived by the farmers themselves. This is because the physical features such as soils, climate and vegetation play a crucial role in crop production, and farmers' success in utilising these resources for crop growth depends on a vital understanding of their occurrence and characteristics.

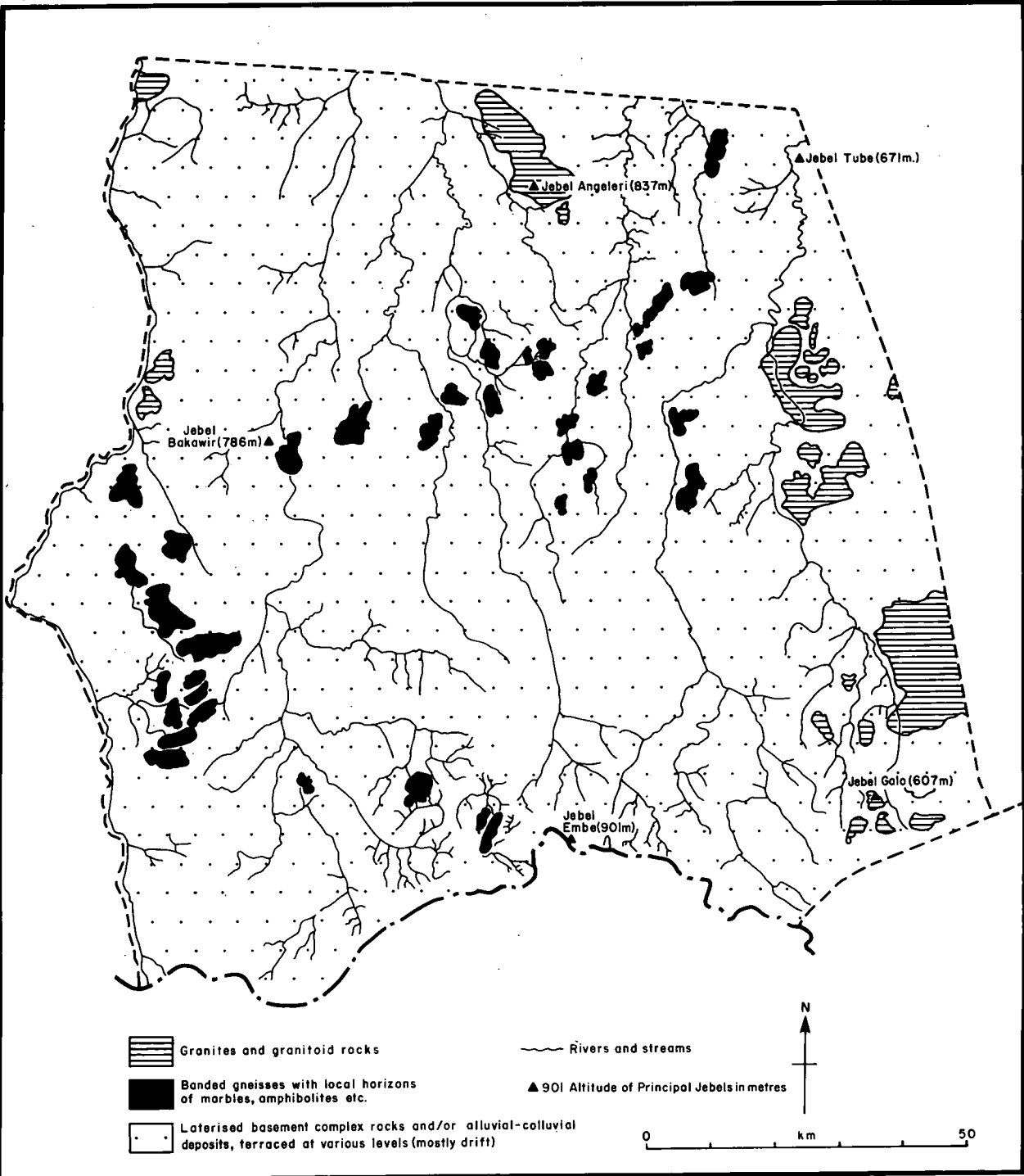
The major problem worth noting in this respect is the lack of specialised data. In some cases, for example, geology and pedology, personal investigation to make up for such deficiencies in knowledge was difficult; the limited existing data had to be used directly and indirectly as indicators of probability. In other instances, as when dealing with the soils of the study area, much depended on personal observations and informal interviews of some of the Agricultural Department and PDU staff. As for the rest of the physical data, use was made of the meagre basic data in conjunction with other literature sources, various thematic maps, landsat images, observations which sometimes meant a certain amount of extrapolation and generalisations.

3.1 Physiography, Drainage, Water Supply And Geological Structure

The complexity of the landscapes of Maridi District is a key to an assessment of 'traditional' agriculture and its development potential. The study area lies on the northern slope of the Nile-Zaire Water Divide and between altitudes of approximately 600 and 900 metres. There are a few granitic outcrops at the surface and even some low rounded hills rise a bare 100 m above the neighbouring countryside. However, there are several mountain ranges or jebels (Arabic) which are evenly spread all over the study area. In the south and along the Sudan-Zaire border are found numerous jebels of which the dominant features being Jebel Embe (901m). In the south-east is Jebel Galo (607m), in the north are Jebel Angeleri (837m) and Jebel Tube (671m) and in the west is Jebel Bakawir (786m) (see Fig.3.1). Besides these physical features, the landscape gently slopes from the south to the rather expansive plains in the north. Slopes are normally less than 2% but steeper near rock outcrops and incised streamlines. There are numerous rivers and streams draining away from the south to the north with parallel watersheds (see Fig.3.2). Some of these rivers and streams are perennial and in most places there is sufficient water supply throughout the dry season. The Na'am, Olo, Maridi, Ibba, Sue and Tiggi rivers flow all the year round, but most of the streams flowing into the above-mentioned rivers dry up in the dry season. Over most of the study area water supply is wholly dependent on annual rainfall, groundwater (hand-dug wells and bore-hole wells), the rivers and seasonal streams. Considering the study area in general, the three main sources of domestic water supplies are:

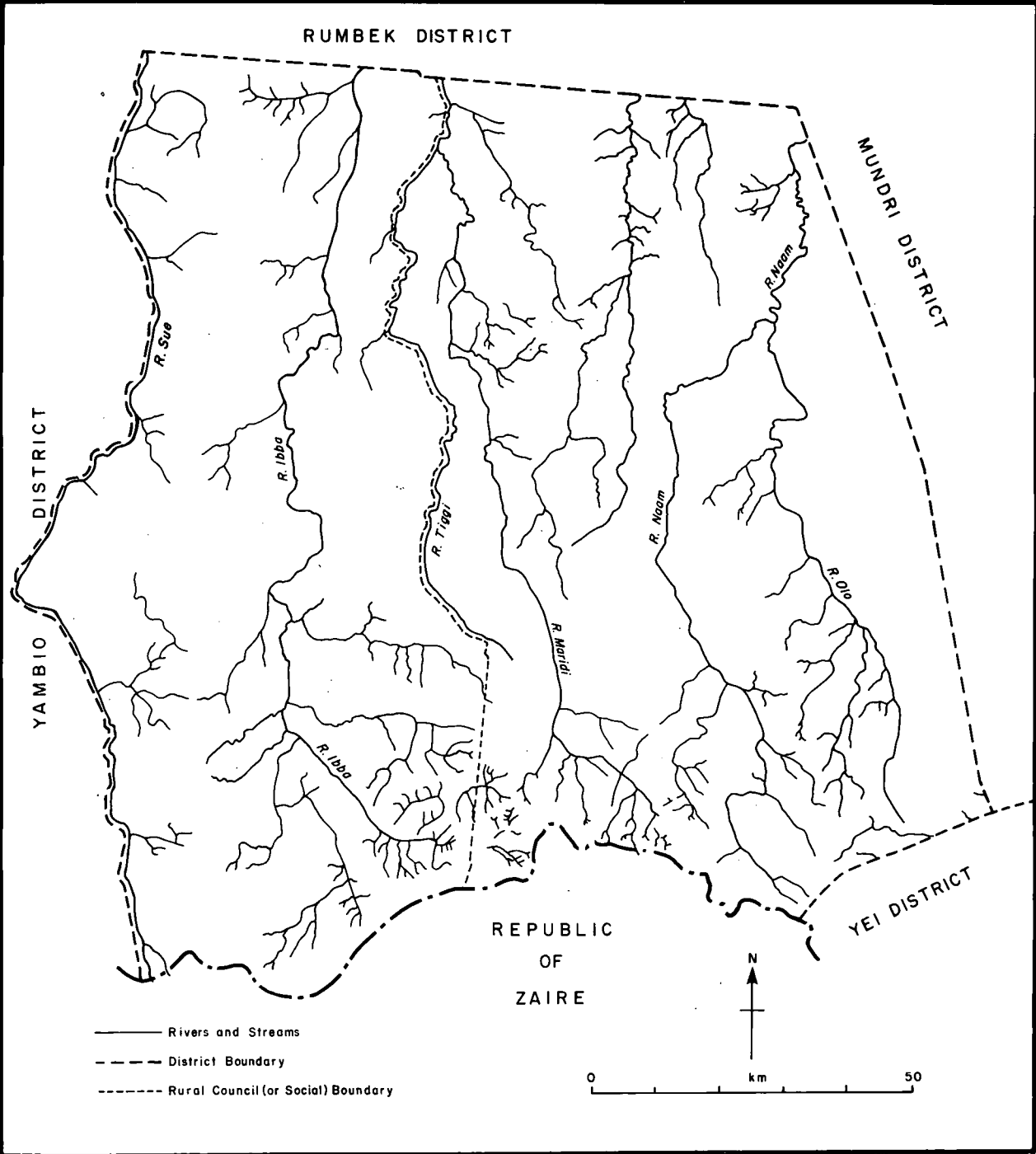
1) Rivers: Six main rivers drain the study area. These are mainly perennial and include Na'am, Ibba, Sue, Olo, Maridi and Tiggi rivers. Some of these rivers sometimes dry up to form stagnant pools in the dry season (November to March). In limited areas perennial water supply coincides with available cultivable fertile soils and cultivation of

Fig. 3-1 GEOLOGY OF THE STUDY AREA



Source : Mefit, S. P. A. Sheet II, Regional Development Plan 1977 and Landsat Images

Fig. 3-2 THE MAIN DRAINAGE SYSTEMS IN THE STUDY AREA



Source: Sudan Survey Department and Landsat Images

innumerable crops is possible by hand irrigation. Several farmers reported rivers as being more important in the dry season particularly in Gworosai, Matorombo, Bahr Na'am, Mongua III and Mangaehe areas. In the wet season (usually April to October) nearby streams tend to be a major source of water especially in those areas where wells are more distant.

2) Hand-dug wells : These are common especially in the northern part of the study area and mainly concentrated along stream beds. They are a major source of water during the dry and wet seasons. But during the dry season most of these wells dry up though some may contain contaminated water. These are a health hazard and are a source of guinea worm and dysentery disorders.

3) Bore-hole wells : In order to alleviate water shortages in the study area, ACROSS (African Committee for the Rehabilitation of Southern Sudan) a Christian Development Agency serving on behalf of International Church Service bodies, together with the Department of Rural Water Supplies drilled several wells and pools are also a source of water during the rainy season.

In this regard, water supply is a major problem in the study area. Most farmers reported that in most areas people had to walk between 5km and 10km to fetch water during the dry season, though several of them reported 13km to 19km respectively; whilst in the rainy season water supply is usually found within 2km or less. Piped water only exists in few Government residential areas in Maridi District headquarters.

Some 5% of the rain falling upon most rivers runs off especially immediately after storms, so the flow of the draining streams is most erratic. Over most of the study area the overall availability of ground-water has not been assessed. However ACROSS in 1972 has found water

at between 40 m and 80 m depth in some of their drilled boreholes. Sometimes iron-colloid content has been high, making filtration necessary. Hand-dug wells are found near streamlines especially north of Maridi headquarters.

The geological structure is the most important of all physical factors that influence the stage upon which other physical forces play their respective roles. Maridi District is part of the Ironstone Plateau and Central Hills Ecological Zones; more than 80% is covered by laterite soils over the basement complex metamorphic rocks (Fig.3.1). The formation and characteristics of the basement complex have been outlined elsewhere (Barbour, 1961; Whiteman, 1971). However, the character of the rocks is varied. Graphitic gneiss is recorded along the Sue River Valley and in the west and south of Maridi headquarters (Southern Development Investigation Team, 1954). Among the rocks so far classed as basement complex, there is a group of syenite intrusives. These carry aegyrine (with riebeckite or another soda amphibole in some), a feldspathoid and strongly parthitic feldspar.

In the northern part of the study area, small, flat-topped jebels or hills of various basement complex rocks are capped with horizontal cakes of ironstone. These jebels, as noted earlier, protrude above a plain of very low relief covered by a lateritic ferruginous deposit generally of soft, unconsolidated, red clay. The lateritic ironstone-capping jebels north of Maridi-Yambio road are considered to belong to 'older laterite' probably of mid-Tertiary Age, and the lower laterite sheet being a much younger deposit (Barbour, 1961).

3.2 Climate

The study area lies between equatorial and tropical climates in a characteristic medium length (eight to nine humid months) rainy season climatic zone. There are marked spatial variations with respect

to the amount of rainfall received, its duration and reliability - a feature common in individual countries in Africa. A particular consideration is focused on the climate of the study area because of its relationship with agricultural potential.

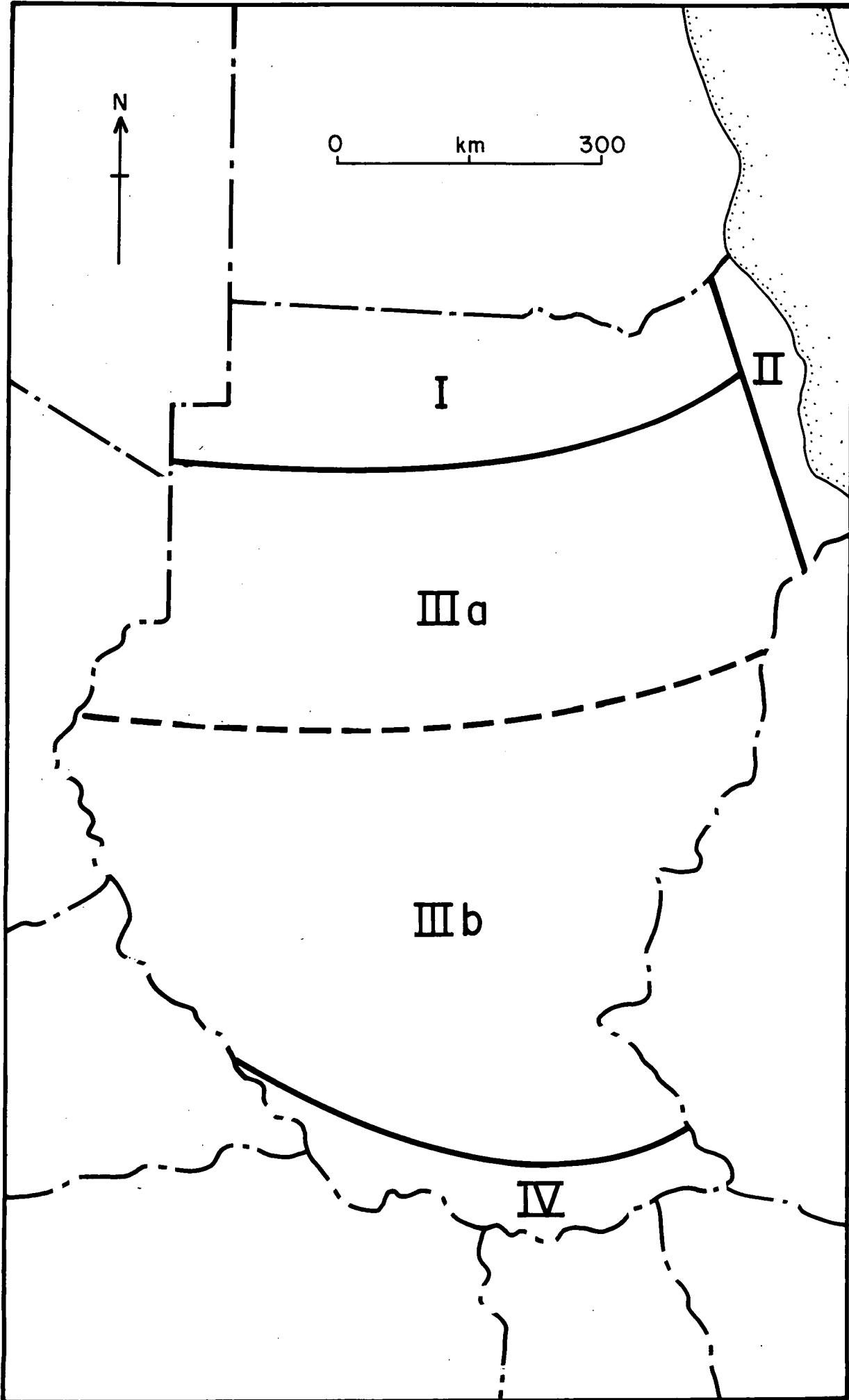
In the study area, meteorological data can be obtained from two organisations, namely, the General Meteorological Department and the PDU which produce annual reports but with no critical analysis in regard to agriculture. On the other hand, most of the meteorological data were either lost during the 17-year Civil Strife (1955-1972) or some stations were operating incorrectly.

3.2.1 Rainfall, temperature and winds

In an agricultural country like the Sudan in general and the study area in particular, rainfall is by far the most important single climatic factor influencing agricultural potential. It helps to determine the types of crops which can be planted and the 'traditional' calendar of farm operations.

The whole of the Sudan is tropical and because of the notable absence of relief, it becomes a problem to divide the country into climatic regions. However, the most widely employed classifications of climate of the Sudan are that provided by Köppen (1931) and Thornthwaite (1948) which are in fact vaguely drawn. According to Köppen's (1931) classification, the southern one-third of the Sudan (in which is located Maridi District) is described as tropical and the equatorial rainy area with 1500 mm rainfall, and with a winter dry season in which isothermal conditions are experienced, and with a little difference in temperature between the hottest and coolest month. Barbour (1961) also devised his own climatic divisions of the Sudan in which he defined four climatic regions, one of which is subdivided into two parts (Fig. 3.3). Thus, the study area mainly lies within region IV.

Fig. 3.3 BARBOUR'S CLIMATIC CLASSIFICATIONS OF THE SUDAN



Source : K.M. Barbour (1961), *The Republic of the Sudan*, University of London Press Ltd. P.39

Barbour identified an almost dry season of three months, when the north wind blows, but cooler temperatures are experienced during the long rainy season. In the Southern Sudan in general and the study area in particular, the climate is affected by the apparent movement of the overhead sun whose effect has a direct control over the distribution of pressure over the whole of the country. The convergence of the humid south-westerly and dry north-easterly winds greatly affect the areal extent and duration of rainfall. The humid south-westerly winds reach the Sudan towards the end of March and by April at most they normally dominate a large part of the study area. These winds continue their journey northwards at the expense of the dry north-easterly winds which are forced to retreat gradually in the face of the advancing south-westerly winds.

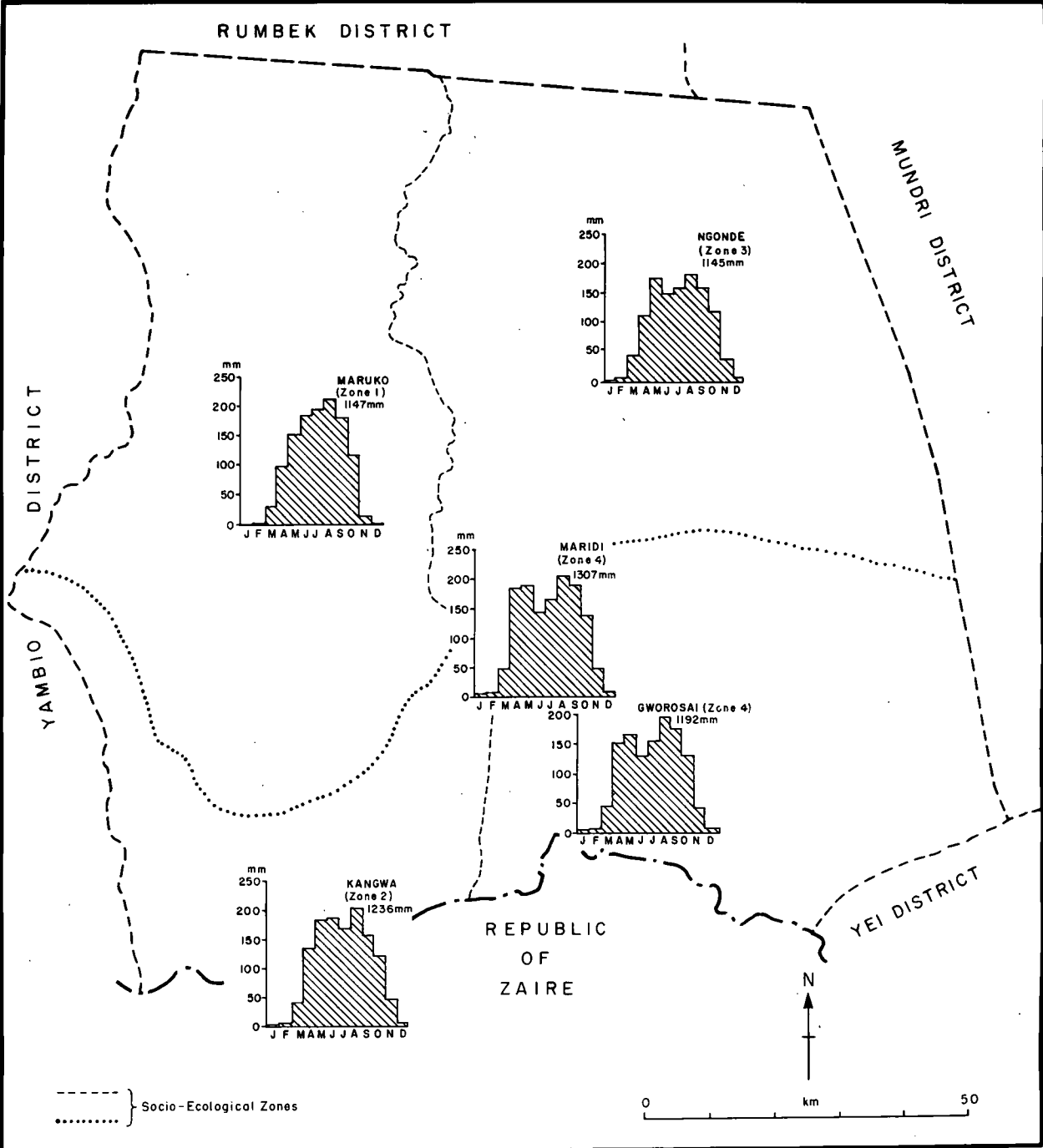
The period taken by the humid south-westerly winds to extend northward over the Sudan is only six months approximately, while their southward retreat is only three months. Throughout this period they tend to meet the dry north-easterly winds along a 'transitional zone' known as the Inter-Tropical Discontinuity (I.T.D.) which is the most significant belt for weather controls over the Sudan and other similar countries. The term 'Inter-Tropical Discontinuity' is preferred over the more common Inter-Tropical Convergence Zone - I.T.C.Z. (Gregory, 1965; Anyadike, 1977) as it is a quasi-stationary moisture boundary. As a result of this movement, the distribution of the mean annual precipitation over the study area tends to follow a fairly simple pattern in which the total amounts decrease northward. Over the study area, the mean annual rainfall generally may exceed 1,500 mm in the southern section, while along the northern part it is about 1000 mm. Also the land configuration has a critical influence on the climate and consequently on agricultural potential. It was noted in this

discussion that the study area slopes from the south down into a rather expansive plain with a few dotted rocky outcrops. Consequently, in the southern part altitude mitigates high temperatures and rates of evaporation.

The physical climatic characteristics of the socio-ecological zones delineated in this study (see Chapter 2) are that in zone 1 and 3 mean annual rainfall is generally 1000 - 1200 mm. They both have dry spells in their growing season in 3 years out of 10. There is also a higher incidence of rainfall failure than other zones. In zones 2 and 4 mean annual rainfall is 1300 - 1500 mm. These zones have relatively reliable rainfall. The effective rainy season (to be noted later in this discussion and according to farmers' definition) for farming operations normally begins in late March or early April, ending about November in zones 2 and 4. Thus, rains start sometimes some days or weeks earlier than in zones 1 and 3. Hence, this rainfall difference has an impact on the cropping strategy in the study area.

The mean annual rainfall ranges from 1236 mm in the Kangwa area in the south to 1145 mm in Ngonde area in the north. This same pattern of rainfall variation is also observed in Amaki, Gworosai and Maridi (see Fig.3.4) and Appendix 6). In this context, farmers have to adjust their agricultural calendar operations to the variability, intensity and effectiveness of rainfall. The annual variability of rainfall in the study area is also illustrated by data for Maridi (see Fig. 3.5 A and B) for the period 1940-1982. While Fig. 3.6 shows the number of years and frequency of rainfall classes for the same period. It is clear from this figure that the annual total rainfall ranging from 1300 mm to 1499 mm was received for about eight to nine times in the study area. Less than 1000 mm was only received once in the above-mentioned period.

Fig 3-4 THE SEASONALITY AND MEAN ANNUAL RAINFALL (in mm) FOR SOME SELECTED STATIONS IN THE STUDY AREA, 1941-70



Source: Data obtained from Sudan Meteorological Department Khartoum and Maridi

Fig. 3-5(A) 9-YEAR RUNNING MEANS OF RAINFALL (in mm) FOR MARIDI 1940-82

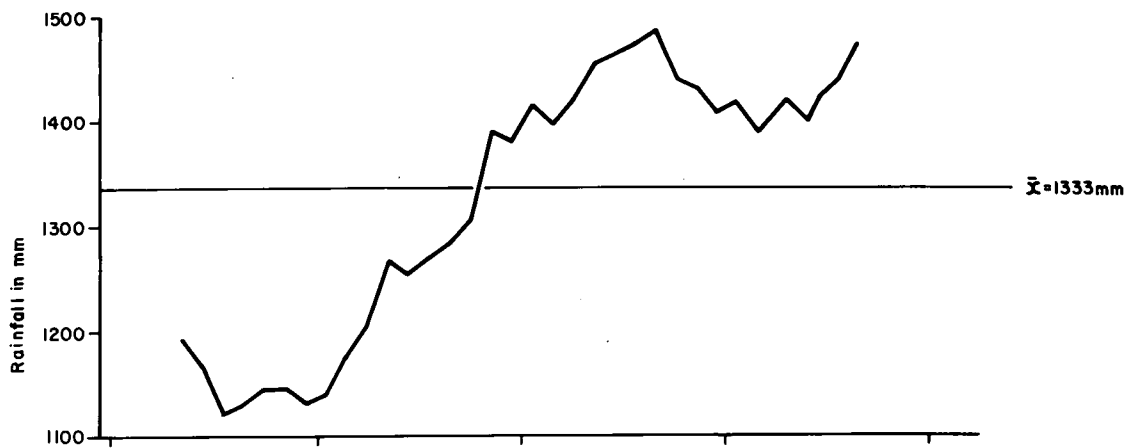
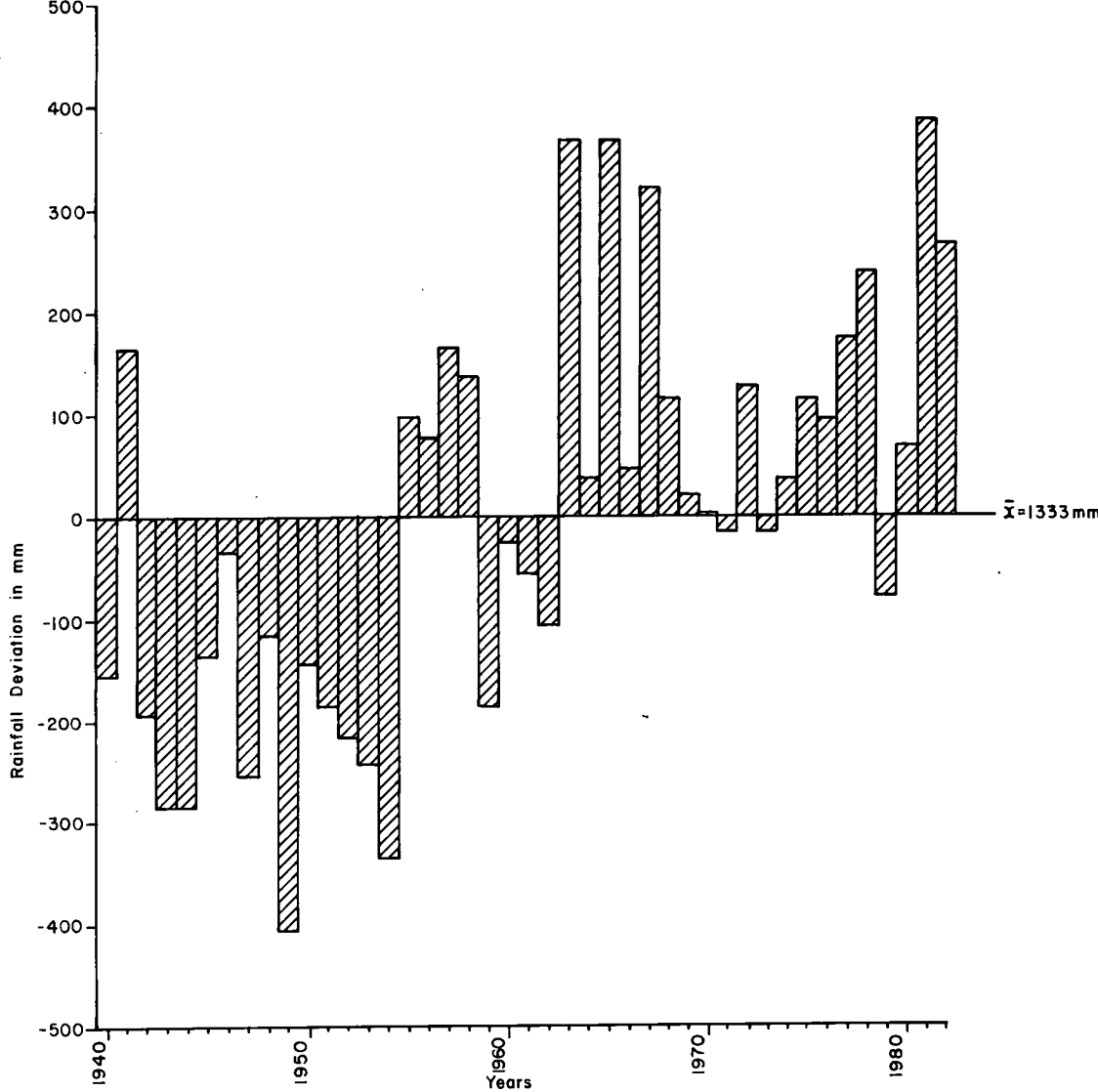


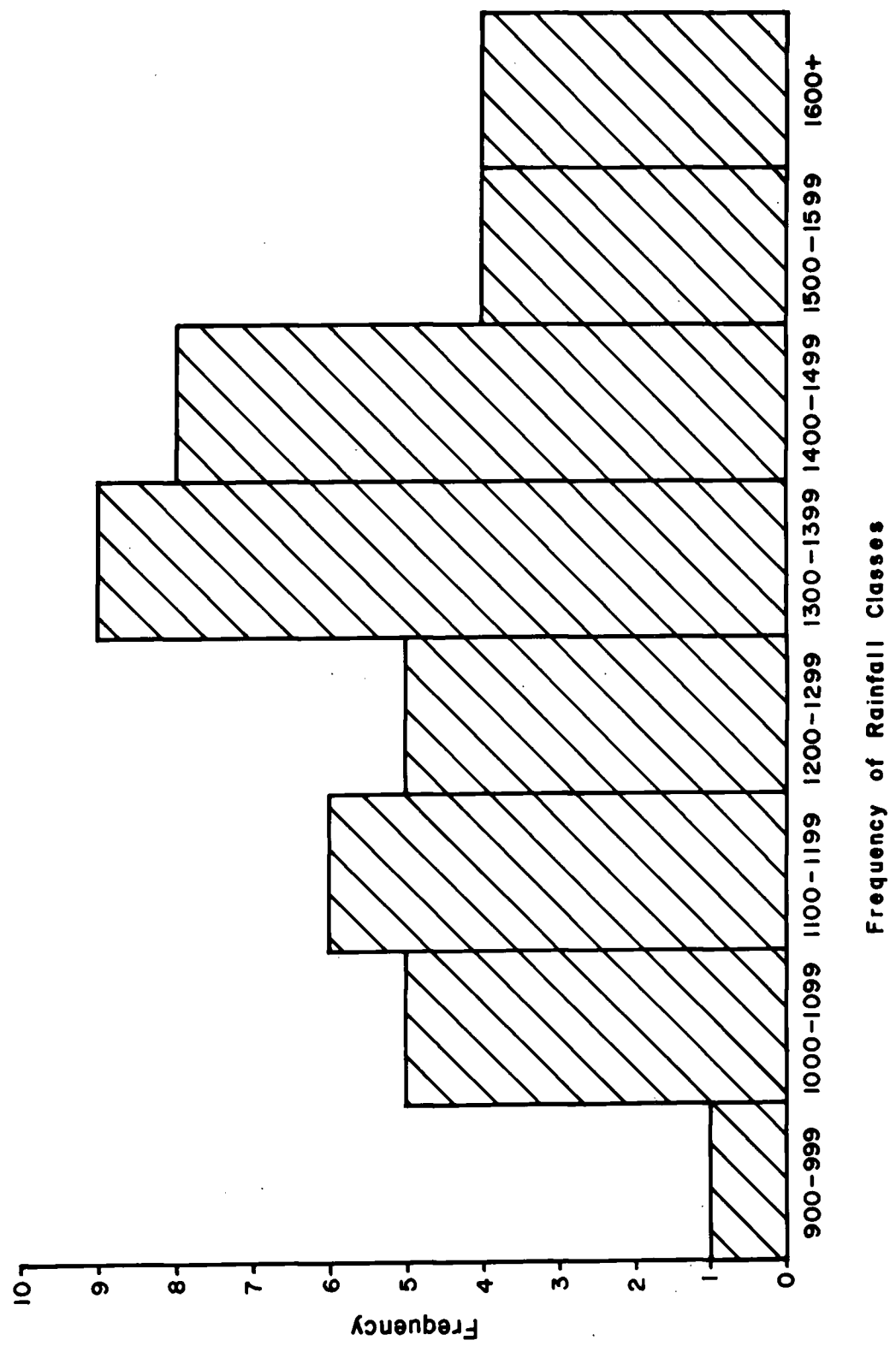
Fig. 3-5(B) ANNUAL RAINFALL (in mm) VARIABILITY AND DEVIATIONS FROM THE MEAN IN MARIDI 1940-82



N.B. Standard deviation (S.D.) = 99.1
Coefficient of Variation = 7.5%

Source: Data compiled from Sudan Meteorological Departments, Khartoum and Maridi

Fig. 3.6 FREQUENCY OF ANNUAL RAINFALL TOTALS AT MARIDI, 1940-82



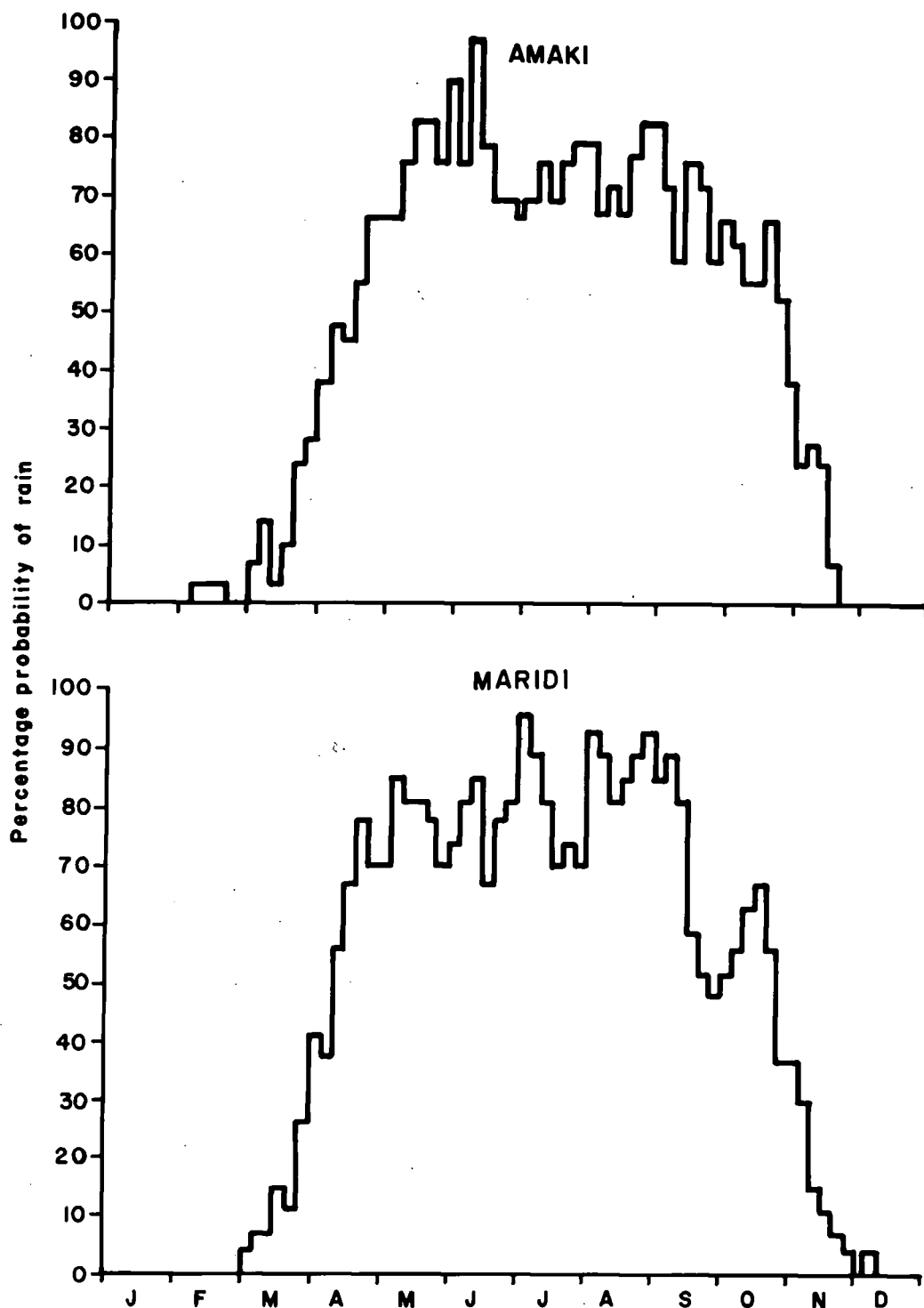
Source: Data compiled from Sudan Meteorological Departments, Khartoum and Maridi

It is worthwhile noting that histograms showing mean monthly rainfall distribution only indicate an overall pattern for that period. However, detail for Maridi Town shows great variation between years and decades. As such means of rainfall have little value. However, one feature is the great variability both within duration and the areal extent of a rain shower. The areal extent of precipitation, in particular, exhibits a pattern usual to tropical areas - namely, the sporadic nature and clear-cut boundaries of the rain shower extent. It was observed during the field survey that while a locality may get a heavy shower, an area a few metres away may stay not only dry and rainless but even sunny. Thus, rain tends to fall in localised storms rather than in a generalised downpour, and so may be unevenly distributed in quite a small area. This fact has been erroneously adduced by several peasant farmers as one of the reasons of the local practice of looking for fields at some distance in preference to using lands near the homesteads. Sometimes, however, particular rain formation conditions may have a wide and complete influence over the whole region or at least a considerable part of it. The annual fluctuation of the amount of precipitation and the variability of the distribution pattern of rainfall within each rainy season, however, leads farmers to the difficulty of predictability concerning the crop situation. So what most peasant farmers do is to clear, till and sow several widely separated plots, and some weeks later, decide which parts have received enough rain to make them promising.

A study of short-term rain patterns in the study area using the rainy pentad (five-day period) system of analysis has been attempted by the PDU in 1980, and covering Maridi and Amaki stations (see Fig.3.7). These stations cover 27 and 29 years of the recorded rainfall respectively. At Maridi about 85% of the total rainfall is indicated as being effective;⁽¹⁾ at Amaki it is 80%. The first effective rainfall, adequate for starting

(1) 'Effective' was being defined as when farmers have fully started their agricultural operations.

**Fig 3-7 PROBABILITY OF RAINFALL (in mm) BY PENTAD FOR
SELECTED STATIONS IN THE STUDY AREA**



	<u>Maridi</u>	<u>Amaki</u>
Average total effective rainfall	1038 mm	939 mm
Average start of first effective rains	8th April	14th April
Average end of effective rains	1st November	24th October
Net season length	208 days	204 days
Range 2 seasons in 3	195 - 230 days	185 - 235 days
Season quality	76 %	71 %
Rainfall reliability	30 pentad	28 pentad
Season length reliability index	81 % (reliable)	78 % (reliable)

Source : Project Development Unit, 1980 File No. PDU / RMANR. 3. I. Maridi

land preparation usually falls in both localities in the first week of April and the effective rains can be expected to end in the last week of October - giving a net rainy season of 200-210 days on average. In one year out of six the net season length will be less than 185 days at Amaki and less than 195 days at Maridi; one year in six will be **more** than 235 days and 230 days respectively. Thus, the season length at Amaki is a little less reliable than at Maridi, but it is not significantly so.

Timing of precipitation, as noted earlier in this discussion, from the agricultural viewpoint is very important for peasant farmers; there is a certain threshold that rainfall must exceed before fields can be ploughed. This threshold is greater in the rainy season than in the dry season. Sometimes the farmers have to rely entirely on anticipation. For example, if the rain does not come in sufficient amount either in March or April, farmers will plough and sow their fields with the hope that rain will fall in May. If it fails to come in May or early June at most, then it is too late and, therefore, efforts have been wasted. As the amount and incidence of rainfall varies between years and between areas, and as different varieties of the same crop are affected to differing degrees by a given rainfall pattern, there is little agreement by peasant farmers as to whether their area or district experienced drought and famine when they were interviewed (Q.1,a, General Questions). The exception was 1979 which was commonly held to be a drought year, but this level of response may have been because it was a recent event. However, historical events such as the complete failure of rainfall (drought?) were generally known by older tribal leaders in the study area, many of whom deliberately committed years of serious drought to memory. They were able to recall in some detail the social and economic hardships arising therefrom. In fact two farmers in Bah-Na'am (Zone 4 : Maridi RC) mentioned serious droughts

in 1931 and 1932 (Fig.3.5B shows that since that period till 1955 rainfall has been received below the expected mean) which were also the years when a plague of locusts led to a serious famine that most farmers resorted to gathering and harvesting of wild roots of trees (e.g. tizee, kendra : Moru), wild yams (kanyokope : Moru); grasses (loyabe, (Eragrostis chloromelas) and molola (Digitaria caesia) : Moru) were also collected, threshed and flour made from them.

In the administration of the questionnaire farmers were asked (Q.3, General Questions) whether they had any idea of the causes of rain. This was a very interesting but difficult question to answer. Several farmers before advancing their responses were observed to scan the horizon (probably in an attempt to recall) and at the usual direction from where most of the winds blowing causing rain normally are expected - mainly the south-westerly winds. About 38.5% of the sample farmers indirectly advanced scientific explanations of the causes of rain, out of whom 30% said escaping smoke into the atmosphere and which is the result of burning grasses and bushes, the consistency and strength of flowing cold air and wind direction; the morning and evening temperature; thunder; black skies or the structure and position or height of thick and black clouds (cumulus); heat eddies; and evaporation or moisture and water from land surfaces, are some of the relevant responses provided. 8.5% of the responses mainly relate to alluded 'rain-makers' (a 'traditional' cause and explanation). Of the remaining 61.5% of the farmers, 31.5% said 'rain is sent by God' who is in fact the source of all things. The remaining proportion of farmers answered the question negatively.

The 'traditional' explanation of rainfall is that smoke from burning bush and forest land 'condenses' on the roof of the sky to fall as rain. Douglas (1972) reports the same notion for the Lele people of Central African Republic. This is by no means a bad theory since in

fact it is quite likely that condensation nuclei from bush-burning help trigger showers in the late dry season (Lee, 1974). Perhaps the real significance of this explanation relates to farmers' concern for the 'timeliness' of their agricultural activities and, hence, they see burning as a way of controlling the rainfall. A point to note is that there are various 'traditional' explanations of rainfall which are still practised in the study area although these are now tending to decrease as a result of the urban influences impinging on the rural areas.

Analysis of the questionnaire (Q.3,b General Questions) revealed that farmers were able to distinguish the different types of rain with some bases of classifications. However, the description of rainfall intensity does not go beyond categorisation. For instance, 'heavy rain' (mai-tutu-he : Zande, welo : Moru, obo : Avukaya, agilifasu : Mundu, g wilitiri : Baka) lasting for about one to two hours ~~fastly~~ sweeps the burnt rubbish and grass from the agricultural fields made ready for sowing of crops. These rains, which may last for some time, are said to be associated with the occurrence of the species of termites or mushrooms as well as by the appearance of millipedes and certain birds and insects thus indicating the start of the agricultural season. They are also said to be dangerous to crops such as sorghum (especially those varieties with long stalks and drooping head grains), maize, cassava as their stalks are broken down or bent, thus several flowering crops are destroyed before reaching maturation stage. Additionally, these rains also stop farmers for longer hours from field operations and hence some wild animals take this chance of attacking crops.

'Light rains' are reported to be efficient in terms of soil moistening and for healthy growth of crops. Several vernacular names exist (e.g. mikomiko-mai : Zande, oze : Moru, muzenziini : Baka, sukude : Mundu, ozelogi : Avukaya). However, peasant farmers were not

able to distinguish between 'light rain' and 'showers' as both are generally said to be good for most crops and do not seriously stop work on the farm. It is worth mentioning that, in estimating the amount of 'effective rainfall' good enough for various crops, peasant farmers essentially use subjective and qualitative assessments. This is because they have no means of recording the actual amount of rainfall in quantitative terms of reference. But the size of raindrops, the duration of the storm, the size of the run-off channels and when earth surface hollows or depressions and ditches are filled up with rain water, are some of the methods used to describe the intensity and effectiveness and types of rainfall.

The mean maximum temperatures in the study area generally range between a high of 37.0°C in March and 30.0°C in July and August - the coldest months, Mean minima for the periods are 25.0°C and 19.5°C respectively. However, the mean average temperature for each month for Maridi for the period 1978-1982 is shown in Fig. 3.8. It is clearly shown that January and February have higher average temperature in contrast to June and July with lower average temperature during the period.⁽¹⁾

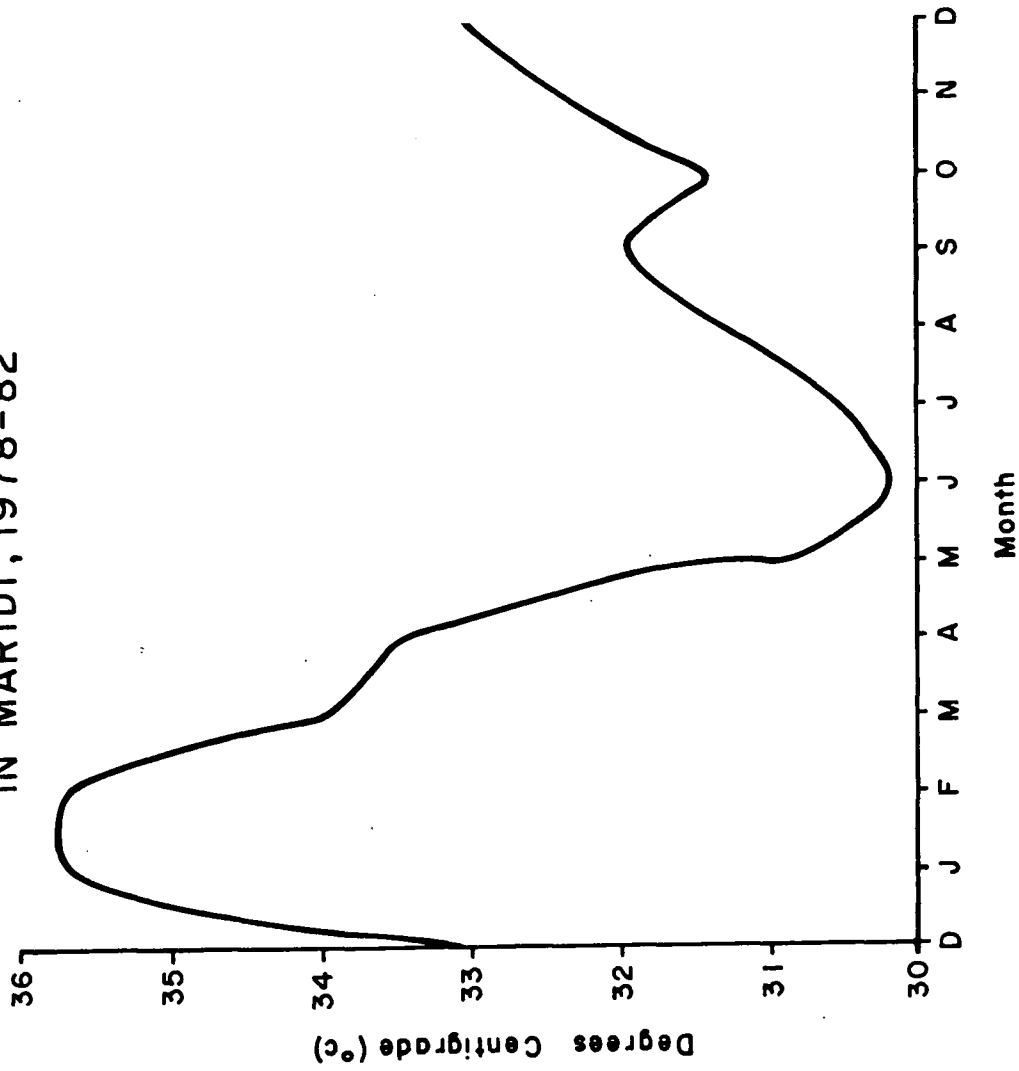
3.3 Soils

The study of soils is important in agriculture as well as in many other physical and cultural aspects. The characteristics of soils, their mineral content and their structural qualities have direct and conspicuous (positive or negative) influences on agriculture.

Few studies on soils in the Sudan have been attempted (De Schlippe, 1956; Barbour, 1961; Lebon, 1965; Whiteman, 1971), and were

(1) Sample tests suggested that the coefficient of variation was greater in the cooler and wetter months (June-Oct) but the sample was too small to be statistically valid.

Fig. 3.8 THE MEAN MONTHLY TEMPERATURES(in °C)
IN MARIDI, 1978-82



Source: Data derived from Appendix 7

mainly confined to areas of agricultural potential and water resources. In the study area, unpublished works on agricultural soils have been conducted by some Agricultural Department staff during the Anglo-Egyptian Condominium period, but most of these works were mainly in sketchy and general form (e.g. Willimot, 1956). This section outlines the general characteristics of soils in the study area. The peasant farmers' understanding of soils in regard to their use, environmental characteristics such as colour, fertility, texture and so on are issues to be taken up and highlighted in Chapter 6. The review of soils of the study area in this discussion is mainly based on personal observations, informal discussions with experienced agricultural staff as well as published and unpublished literature available in Government offices.

According to the findings of the Southern Development Investigation Team (1954) the soils of the study area fall within broad classifications - namely soils of the Ironstone Plateau (Zones 1 and 3) covering the northern half of the study area; soils of the 'Green Belt' (Zones 2 and 4) covering the southern section of the study area. Further details of the soils of the study area are generally outlined elsewhere (Southern Development Investigation Team, 1954). Field survey observations indicate that in Zones 1 and 3 (Ironstone Plateau), the soils are a mixture of deep and shallow, brown, medium and fine-textured, well-drained soils, and with pisolithic or vesicular ironstone gravels (zakarambia : Zande); some areas of red soils and some hill outcrops. High incidence of safaias⁽¹⁾ (munga : Zande). In Zones 2 and 4, the soils are mostly deep red, brown medium to fine-textured, well-drained soils with pisolithic or vesicular ironstone on basement complex rocks with hill outcrops in many places. Thus, the fine chocolate brown or reddish brown loams are mainly found in Zones 2 and 4 (Green Belt) where they have been found to be the most fertile soils. There is a close relationship between

(1) Safaias are treeless and distinctive grass areas with mushroom-shaped termite mounds, and are mainly landforms resulting from the presence of massive ironstone.

climate or more specifically rainfall with soils in the study area. An estimate of the existing land resources and hazardous soils of the study area has been attempted in 1979 by the Department of Agriculture (see Table 3.1).

3.4 Natural Vegetation And Ecotypes

The vegetation of Maridi area (synonymous with the study area) has generally been described by McCall (1950) quoted ^{by} Catford (1953), as high-grass woodland; and within this there is a large number of different plant associations including, in the south, gallery forest formations of lofty trees lining ravines and stream beds. The natural vegetation thins out to the northward as the fringe of the Ironstone Plateau is approached. Two broad vegetation zones are distinguished in the study area. These are mainly woodland savanna recently derived from moist rainforest in the south, and deciduous woodland in the north. In general, apart from the larger forest trees and bushes, the land carries a stand of grass and undergrowth reaching a height of at least five metres by the end of the rains. However, there are numerous indigenous species of grasses, herbs and trees which occur in distinctive ecological associations which provide a good indication of the soil type and prevailing state of fertility (the prevalence of heavy bushes makes clearing for cultivation with 'traditional' implements an arduous task).

In this regard, within the broad classification of natural vegetation in the study, several ecotypes of vegetation in the four hypothetical socio-ecological zones delineated can be observed. These include :

(a) Moist forest transitional to woodland savanna mainly in Zones 2 and 4. This is characterised by secondary forest recently derived from equatorial rainforests in the south. The most common tree species are

Table 3.1 : An estimate of the existing land resources and hazardous soils in the study area, 1979

<u>ARABLE LAND</u>	Km ²	Percentage
With no serious soil hazards	5,789	45.2
With moderately serious soil hazards	4,950	38.7
Forest reserves	365	2.9
<u>NON-ARABLE AND MARGINAL LAND</u>		
Wet lands and natural woodland (including Southern Sudan National Park)	807	6.3
With serious soil hazard	889	6.9
TOTAL AREA	12,800	100.0

SOURCE: Department of Agriculture, Maridi, File Number RMANR/5.6.K. 1979.

Khaya grandifoliola, Chlorophora excelsa, Canarium schweinfurchii,
Ceiba pentandra, Erythrophleum guineense and Mitragyne stipulosa,
Butyrospermum, Entada.

(b) Woodland savanna (Miombo) found mainly in Zones 1 and 3. This is characterised by dense and long grass cover and includes Albizzia, Combretum, Acacia, Khaya senegalensis and Anogeissus schimperi tree species.

(c) Woodland savanna transitional to tree/bush savanna (cultivation savanna). Found mainly in Zones 1, 3 and 4. This consists of woodland with long grass cover characterised by Hyparrhenia sp., Terminalia sp., Acacia Seyal and Khaya.

(d) Woodland savanna and tree/bush savanna association mainly in Zones 1 and 3. Also characterised by Terminalia sp., Vetiveria sp. and Balamites sp. tree species and grasses.

(e) Semi-deciduous moist forest is mainly confined to Zones 2 and 4 and some areas of Zones 1 and 3. Comprises of a very dense secondary rainforest transitional to miombo woodland, with medium long grass cover. Tree species include Acacia spp., Vuba, Albizzia, Entada, Erythrophleum.

The distribution of tree species and grasses are however determined by the availability of moisture and the nature of the soil at different locations. Additionally, the type of agriculture practised in the study area and which involves large clearing of forests by the use of fire (see Chapter 5) exercises considerable influence on the development of woodland species. However, under the Anglo-Egyptian Condominium administration, burning was introduced as a matter of policy and thus fire is the major factor preventing the full development of woodland vegetation. Severe destruction of the natural vegetation is, however, avoided by the commonly practised and adopted policy of the deliberate firing of the grass growth shortly after the rains have stopped.

Recently, early burning with a fire-break path has been introduced as a matter of Government policy.

In the study area, farmers' practice of deliberate firing of forest or bush for wild game on individual or group hunts as well as felling and burning of trees for firewood and charcoal especially during the dry season, has been in conflict with Government afforestation and forest preservation policies (see Chapter 10,A). This practice, although an old one, however, has been accelerated by more people returning to their villages and other centres after the **end** of the Civil War. In fact local building materials such as poles and grass are becoming more expensive especially in the urban and relatively larger villages which also pose a high demand for consumption of firewood and charcoal. It is worth noting that grass and building poles in the relatively densely populated parts have acquired an enhanced value. Field observation reveals that several farmers themselves have preserved certain forest areas where grass and building poles could easily be obtained. Consequently, some farmers have adopted Government afforestation policies as outlined in Chapter 10,A. Thus, the conservation of forest and laws aimed at the protection of natural resources (e.g. wild game), and regulation of forest-cutting and Government encouragement of afforestation programmes have made farmers more aware of the importance of these resources and land potentials in the study area. However, the vernacular botany of peasant farmers and their utilisation and management of forest resources and so on are issues that are dealt with in Chapter 6.

The problem that is associated with the natural vegetation or forests is that of tse-tse fly (carrying trypanosomes) causing sleeping sickness in man and livestock especially in the southern half of the study area where the forests are relatively much more dense than the northern counterpart. However, some few attempts have been made by the

Government in the way of eradication of tse-tse flies. These efforts involved the encouragement of farmers to live near the main roads and health centres. But this issue is a constraint on the development of livestock in the study area.

3.5 Ecological Zones And Their Economic Features

Zoning and the sample stratification strategy adopted in this study (see Chapter 2) based on physical and cultural distinctions produces the four hypothetical socio-ecological zones. The opportunities and limitations of the environment combine in each zone to yield a certain agricultural potential.

3.5.1 Zones 1 and 3

These zones are sometimes broadly classified as the 'Ironstone Plateau'. The physical features of these zones have been outlined earlier in this discussion while the cultural aspects are dealt with in Chapter 4. However, it is worth mentioning that the lateritic soils are more or less poor; rainfall ranges from 1000-1200 mm per year and which is rather unreliably distributed; a dispersed population living generally in small communities; a limited network of roads and the presence of tse-tse fly (carrying trypanosomes) which under the current management strategies restricts livestock from the enormous range of resources. Agriculture is the main economy practised by all the tribal groupings (see Chapter 4). There is relatively larger livestock numbers and many poultry are kept as compared to Zones 2 and 4.

Hunting and gathering as well as seeking of off-farm employment and seasonal labour migration to main centres and public and private schemes supplement farming especially during the dry season. Because of the unpredictability and variability of rainfall farmers have several plots scattered in different sites. The main crops are cassava, groundnuts, sesame, millets (see Chapter 5). Cassava seems to appear to have grown

in importance in recent years. Oilseeds such as sesame, groundnuts, pulses and vegetables contribute a high protein component of the diet.

The natural conditions of these zones, however, tend to more or less restrict crop development alternatives when compared to Zones 2 and 4. For example, some of the most promising cash crops such as coffee are hardly grown in most parts and considering the present rainfed circumstances. But these zones present an option of widespread increases in income from livestock. Hence, a realistic development strategy would build systematically on the farming and livestock systems at present being employed. Encouragement of more drought-tolerant cash crops such as cotton, sesame and so on is called for; and an expansion of opportunities for non-agricultural sources of income (e.g. bee-keeping which is already of some importance) could be induced.

3.5.2 Zones 2 and 4

These zones are classified as the 'Green Belt', with a higher and relatively better distributed annual rainfall which ranges from 1300-1500 mm; they have relatively more fertile soils as compared to Zones 1 and 3. Population is more or less living in nucleated or elongated settlements. There is virtually little livestock especially cattle because of trypanosomes although a few goats and sheep are kept. A wide range of crops is grown and these include sorghum, maize, rice, millets, groundnuts, sesame and cassava have also become of importance in recent years - all constitute important food and cash crops. The non-food crops for cash are mainly coffee and tobacco. Improved varieties of food crops such as sorghum, groundnuts and so on and which are developed in West, East and Central Africa have been widely diffused into these zones through cultural and trading contacts mainly at the borders. As compared to Zones 1 and 3, relatively a larger number of people have migrated into the neighbouring countries especially during

the Civil War in the Southern Sudan because of their nearness and ease of travel.

But there are two main difficulties faced by peasant farmers in these zones. These are related to the poorly developed state of marketing services, except along the main roads in easy reach to Juba, Maridi and Yei centres and for very high value crops such as coffee in recent years. Additionally, producer prices are depressed by poor marketing services and the incentive to generate surpluses is reduced.

An attempt has been made to outline briefly some of the physical features of the study area. The focus of analysis was mainly on the scientific thinking although farmers' viewpoint was noted at appropriate stages. Some of the problems and farm constraints in relation to development potentials for various socio-ecological zones were also noted. The next chapter therefore focuses its attention on some of the salient aspects of the human environment in regard to the physical set-up.

4.1 Ethnology And Historical Background

The population of the study area is culturally and linguistically heterogenous. Fig. 4.1 shows the generalised distribution of the tribal groups. Because of the heterogeneity of the study area it is necessary to state that these cultural tribal groupings have a complexity of norms, values, attitudes which should be taken into consideration as these are relevant to agriculture and the question of adoption of innovations and the exploitation and management of environmental land resources.

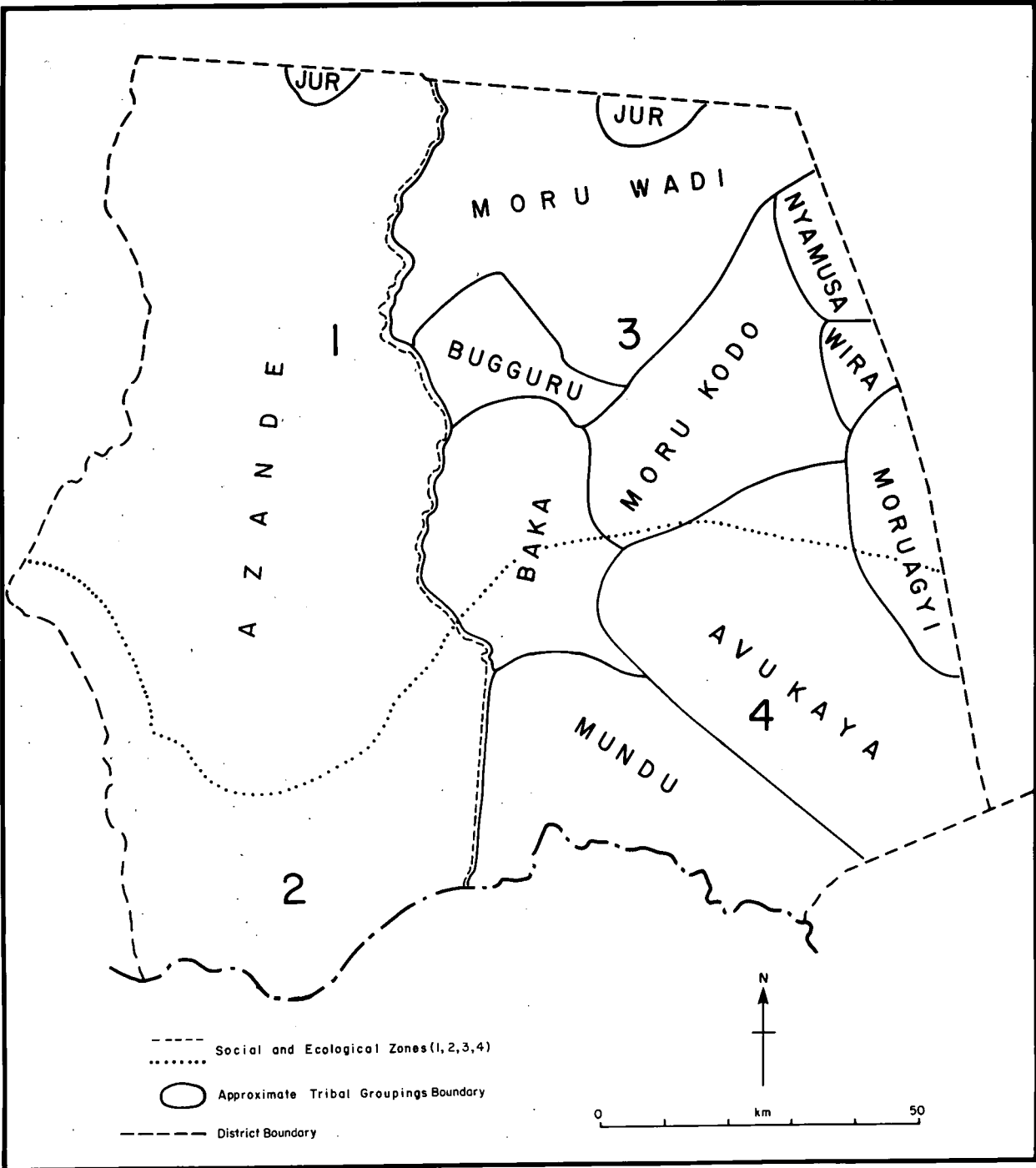
Generally speaking, the peoples of the study area are of Western Sudanean or Sudanic group (Tucker, 1940). The Sudanic-speaking group based on linguistic classification falls into the following most important tribal groupings:-

- 1) Ndogo-sere, mainly comprising the Mundu tribe (Zone 4);
- 2) Moru-Madi, comprising the Moru tribes of which Morokodo (Zone 3), Moru Wa'di, Moru Agyi (Zones 3 and 4), Nyamusa (Zone 3) as well as the Avukaya tribe (Zones 3 and 4);
- 3) Bongo-Baka-Bagirmi or Mittu, consisting of the Baka, Bugguru, the Mittu (Jur) and Wira tribes (Zones 3 and 4);
- 4) The Azande,⁽¹⁾ (Zones 1 and 2) mainly consisting of typical Sudanic or Western Sudanean tribe who invaded the study area and adjacent areas in the 19th century coming from the west or south.

Whatever doubts there may be as to the prehistorical racial purity or mixture of these people, there is little doubt about their ancestry and tribal affinities. Nearly every single family belongs to a particular clan and every clan belongs to a particular tribe, the name of a tribe usually refers to a long past ancestor. While tribes and, less rigorously, clans are associated with particular territories, in every chiefdom in the study area there is a mixture of tribes. Thus, it is very difficult to

(1) Zande or Azande : Either singular or plural.

Fig. 4-1 THE GENERALISED DISTRIBUTION OF THE MAIN TRIBAL GROUPS IN THE STUDY AREA



Source: Fieldwork

draw specific tribal boundaries and differentiate sub-tribes and tribal clans, which is a problem generally recognised throughout Africa (Hance, 1970).

With a population composed of such numerous tribes, it is not worth giving a detailed analysis of the cultural aspects, rather a brief and generalised synopsis of the tribal life of some of the dominant tribes is provided to serve the purpose. Roughly it appears that the original organisation within the tribal groupings was based on a loose confederation of independent clans, often in mutual enmity, under their own clan or family heads (Tucker, 1940). The main tribes in the study area are the Zande, Baka, Avukaya, Mundu, Moru and sub-tribes of Morokodo and Moru Wa'di (see Fig.4.1). Prior to European contact, African history must by its very nature be largely a matter of hypotheses constructed of legends and comparisons of physical types, languages and culture traits. Considerable research, however, has been devoted to plotting movements of the various waves of Sudanic-speaking tribes (Baxter and Butt, 1953). Several historians therefore have provided admirable summaries which succinctly note the key movements essential for an understanding of the present as illustrated by the following brief notes.

4.1.1 The Azande

The dominant tribes in the study area vary spatially (Fig.4.1). The Zande tribe dwell and dominate mainly the Nile-Zaire Water-Divide in the southern section of the study area (Zone 2) and stretching northwards to include Zone 1. All these areas form Ibba RC. The Azande are an agglomeration of invading Sudanic and indigenous tribes of different origins, languages and cultures who, during the last two centuries, have been moulded into a more or less common social pattern by the military and political domination of the Ambomu conquerors

from the south - possibly from Zaire - formerly Belgian Congo (Baxter and Butt, 1953). Under the leadership of the Avungara ruling clan, some of the non-Zande peoples (e.g. Abbugguru) have been completely absorbed and lost their distinct identity; their tribal names have degenerated to clans so that they now consider themselves as Azande.

The Azande of the study area are, therefore, the remnants of the last invasion before that of the Europeans. Perhaps as long as 200 or 300 years ago a chiefly clan, the Avungara emerged among these people to hold sway with unquestioned authority (Baxter and Butt, 1953). Until the establishment of the Anglo-Egyptian Condominium rule the Zande were supreme potentates often exerting their powers with extreme brutality. Their political authority was pyramidal in organisation and consisted of a king, chief and his subordinates (Catford, 1953). Political status primarily depended on birth, while economic and social statuses largely depended on political control. However, the pattern of authority between king and chief in a large kingdom was not strictly formalised. The size of a chiefdom was, however, limited by the criterion of administrative efficiency (Baxter and Butt, 1953).

The social status of women is always low and they can hardly succeed to a chiefdom (there are now changes in that a woman-chief was found in Nagbaka, Zone 1 : Ibba RC), and all succession and inheritance is patrilineal. Traditionally, there was no formal system of land tenure (see section 4.5); the right to work land depended on customary possession and use. There was relatively plenty of land for cultivation and the chief had no real control over it although nominally all land belonged to him (Baxter and Butt, 1953). Chiefs also never had any ritual responsibility for their land, and therefore, had no ritual claims upon it; but a chief might order rain-making ceremonies to be performed (Evans-Pritchard, 1936). The economic success of individual families depended on how much land they were willing and capable to clear

and work. A man had no rights to a piece of land unless he was actually farming it.

4.1.2 The Moru, Avukaya, Baka and Mundu

All that is known of their history about which they are extremely vague is that they originally came from somewhere to the south and south-east. They have been pushed around by larger and more powerful tribes, till the slave raiders of the Mahdiya period found them taking refuge from the Zande in the hills (Tucker, 1940). These hills (jebels) are mostly to the west of River Olo, north and south of Maridi-Mundri road as well as the isolated Jebel Angeleri some distance to the extreme north of Maridi RC. Thus, the slavers finding it difficult to distinguish these hills dubbed them jebels which had been adopted by these tribes (Juba Archive, 1946).

There is probably less known or written about these tribes than any in Africa. Little remains of the tribal history prior to the middle of the 19th century. However, Tucker (1940) suggested that ancestors of the Moru and Avukaya tribes migrated from Lake Albert (now Lake Mobutu Sese Seko) to the study area in the 17th century but were subsequently split by pressure from the Makaraka tribe - now inhabiting the northern part of Yei District in the south-east. Thus, the Avukaya remain south-east of the study area and the Moru migrated to their present position. In the 19th century, the Azande under the Avungara chiefs began invading from the west and attracted to the study area by the cattle herds of the Moru. In fact, Felkin (1883-4:340) reported that "cattle formed the main wealth of the tribe and that the average number possessed by an individual varied from thirty to forty." He noted that the major battle between the Moru and the Azande took place in 1826 on O'do Hill, near Lanyi (Mundri District in the east of the study area), where in fact a thousand Moru were slaughtered (Felkin, 1883-1884).

As a result of this continual raiding the cattle population was greatly reduced. In the study area only a few cattle exist among the Moru and other tribal groupings, mainly in Langua, Ngonde, Mangaehe (Zone 3) and Maruko (Zone 1) areas in the northern section bordering Rumbek District in the north.

Among the Moru as in all other tribal groups, chiefs able to produce a genealogy going farther back than four generations rarely exist. However, rain-makers in the past had greater political power and elders, whose authority the present chiefs endeavour to minimise, probably formerly had more important executive functions. Disputes, if not settled were formerly brought before some individuals of repute or 'case-men' (vureba) or ta-opa'ba (word-tellers). Exogamous patrilineal clans exist but these clans do not constitute any larger system and have a tendency to split. The economic success of individuals (especially among the Moru and non-Moru tribes in Zones 3 and 4 : Maridi RC) depends on how much land can be cultivated and the size of the household. An organised 'traditional' land-use system (see Chapter 5) existed (and still exists) in some remote areas of the Moru and non-Moru tribes in Maridi RC.

Superimposed upon this overview is the localised presence of other tribes such as the Madi, Belanda, Zairian refugees and Government civil servants inhabiting especially the main centres and agricultural schemes in the study area. As noted earlier, with the complexity of these tribal groups, there is expected a differential rate of response to adoption of innovations in the study area.

4.2 Population Growth And Distribution

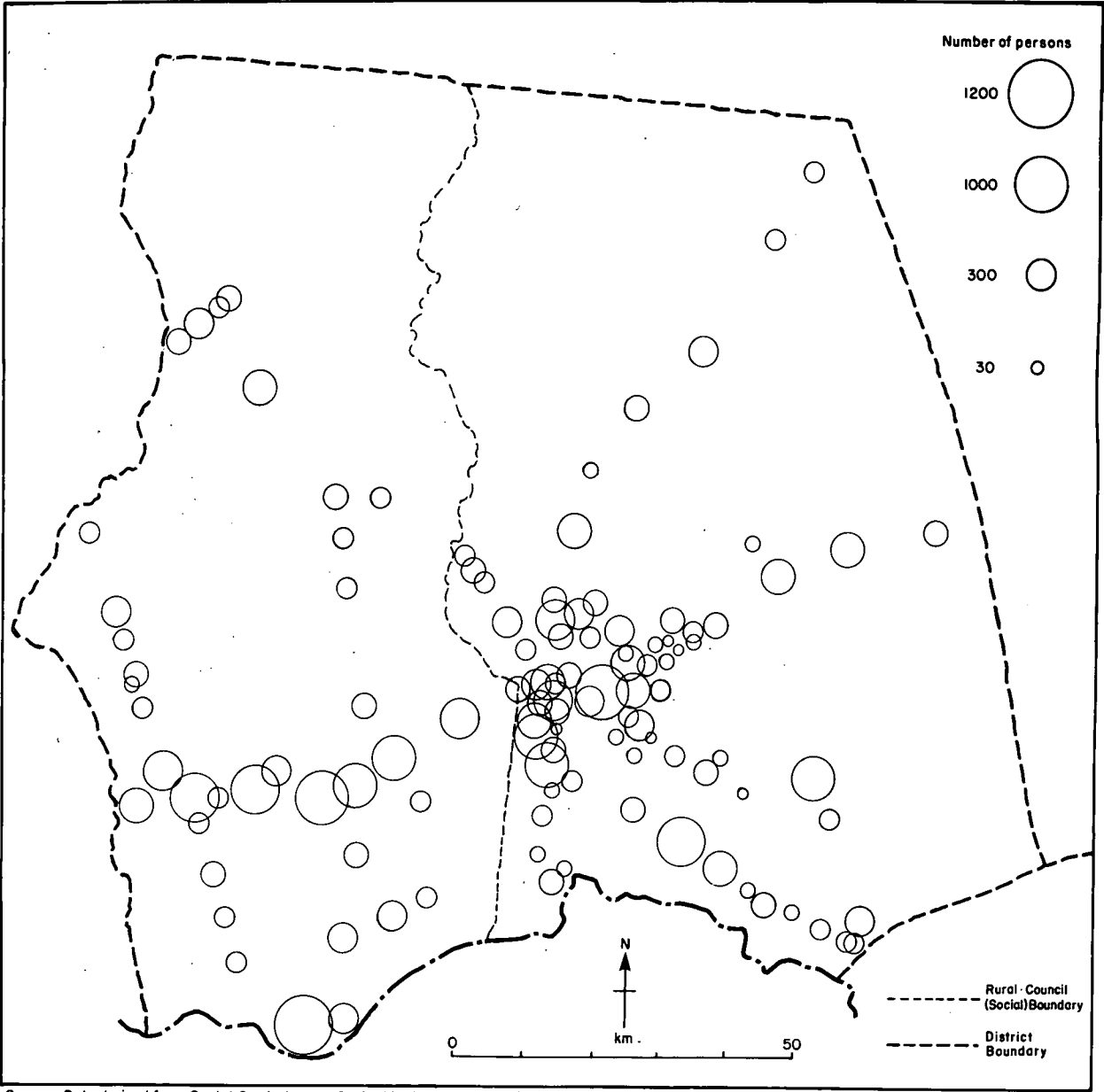
The population of the study area based on estimates of the Social Statistics and Social Monitoring Survey (SSSMS, (1982) of the Regional Ministry of Finance and Economic Planning is about 31,908. The 1973 Population Census estimated the population of Maridi District as 86,473

and Mills (1977) estimated the population as 88,361, but all the 1973 and 1977 population statistics included Mundri District which by then was considered as part of the study area.

Calculation based on the District Commissioner's reports at Maridi District headquarters showed that the population was 26,500 in 1973 based on 1982 boundaries. Taking the 1982 and 1973 Commissioner's office records it is observed that there has been an increase of 5,408 people despite a high death toll in 1976 due to the outbreak of Lassa (Marburg or Green Monkey) fever. Thus, the change of population was 17%. It is likely that this high rise in population growth is due to the large influx of refugees and returnees from the bush and neighbouring countries when peace prevailed in the Southern Sudan.

A study of Fig.4.2 shows the generalised pattern of population distribution in the study area. It is clearly evident that some areas are sparsely populated while others are relatively densely inhabited. However, the largest centres of population in Ibba RC are Ibba, 4,136, Madebe, 3,721 and Nabanga, 2,069. While in Maridi RC the largest population centres are Mboroko, 3,846, Amaki, 2,779, Mambe, 2,710, Maridi headquarters alone has a population of 1,583. However, Fig. 4.3 shows the general breakdown of the population in each of the four zones in the study area (see also Appendix 8A,B). It is clear from this figure that zone 4 has by far the highest proportion of population. Generally, the farming population is mainly confined along the main roads and in areas of water supply (see Chapter 3) and in centres of infrastructural services. It is mostly scattered at a sparse or medium density throughout areas of natural woodland and available fertile cultivable areas. Both extended families and clan-based settlements are found. However, although the siting of settlements and population distribution is within reasonable reach of water supplies, other forces such as schools, health centres and so on

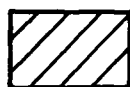
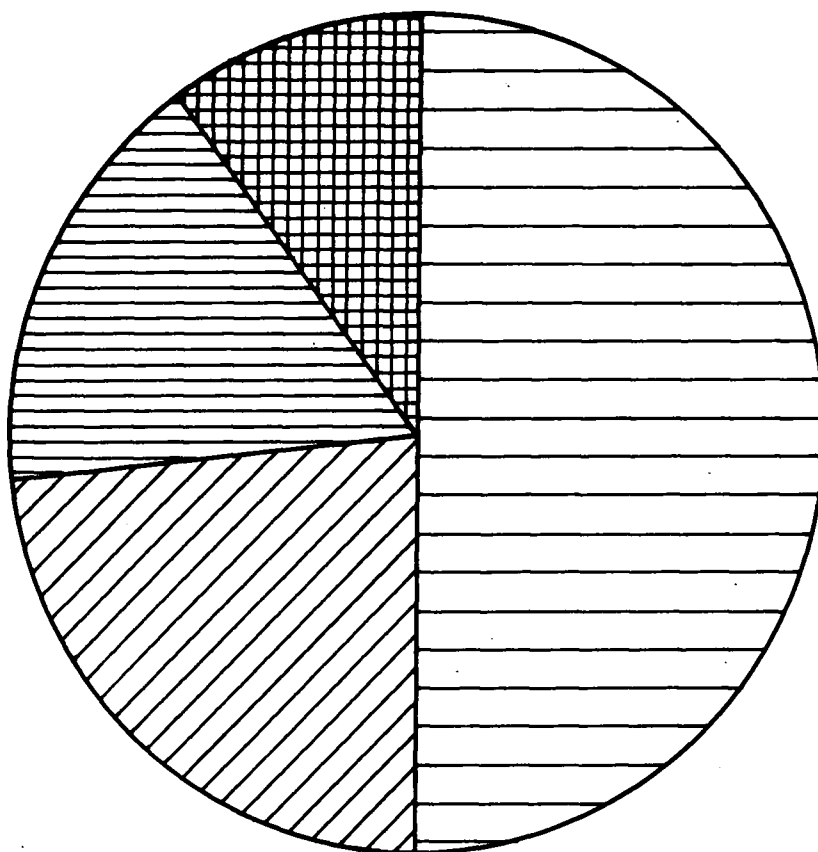
Fig.4-2 THE GENERAL DISTRIBUTION OF POPULATION BY SETTLEMENT IN THE STUDY AREA



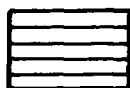
Source: Data derived from Social Statistics and Social Monitoring Survey (SSSMS), 1982 Juba

Fig. 4.3

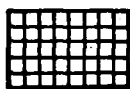
THE DISTRIBUTION OF POPULATION ACCORDING TO THE SOCIO-ECOLOGICAL ZONES IN THE STUDY AREA



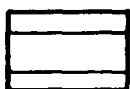
Zone 1 (IBBA RC) 23%



Zone 2 (IBBA RC) 17%



Zone 3 (MARIDI RC) 10%



Zone 4 (MARIDI RC) 50%

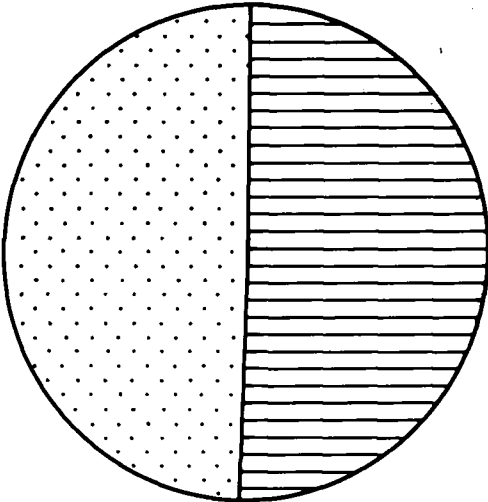
are increasingly attracting population along roads and hence proximity to fertile land is becoming a secondary consideration. More important is the incorporation of coffee into the 'traditional' land-use which, too, has influenced the population distribution and it relatively helps to stabilise population movements and settlements especially in the main centres as more attention is needed for coffee plantations. But there are still vast areas of land resources either unexploited or even unexploitable without large-scale investments in drainage and provision of water supplies.

Fig. 4.4 shows the general breakdown of the proportion of males and females according to the four hypothetical socio-ecological zones delineated in this study (Chapter 2). It appears very clearly from this figure that there are relatively more females than males especially in Zone 4. Generally, fieldwork observation indicates that men are known to be absent from their villages for a considerable period, either in paid employment in the main centres or in public and private schemes, or in off-farm self-employment (e.g. hunting, fishing and so on).

According to population statistics obtained by the Social Statistics and Social Monitoring Survey - SSSMS(1982) the average household size in Maridi RC (Zones 3 and 4) is about 3.6 people while that of Ibba RC (Zones 1 and 2) is estimated at 2.9 people. A discussion of household composition and structure for the respondents is presented in Chapter 8. The mean age of the population is low, with a median age of about 15.5 years (SSSMS, 1982). An indication of present population growth based on birth and death rates is appropriate at this point in the thesis, but there were no viable statistics for the study area. However, the 1955-56 Census showed that Maridi area (synonymous with the study area) had a population growth of about 2.3% per annum, but since then few comments can be made in that it has probably risen quite substantially.

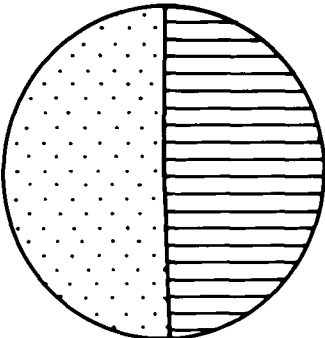
Fig. 4·4 THE GENERAL DISTRIBUTION OF FEMALES AND MALES
ACCORDING TO THE SOCIO-ECOLOGICAL ZONES IN THE STUDY AREA

ZONE 1



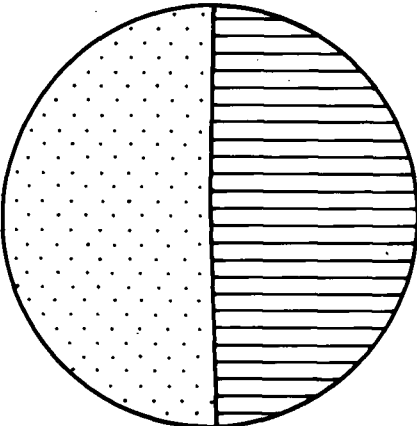
Total= 7 3 4 2

ZONE 3



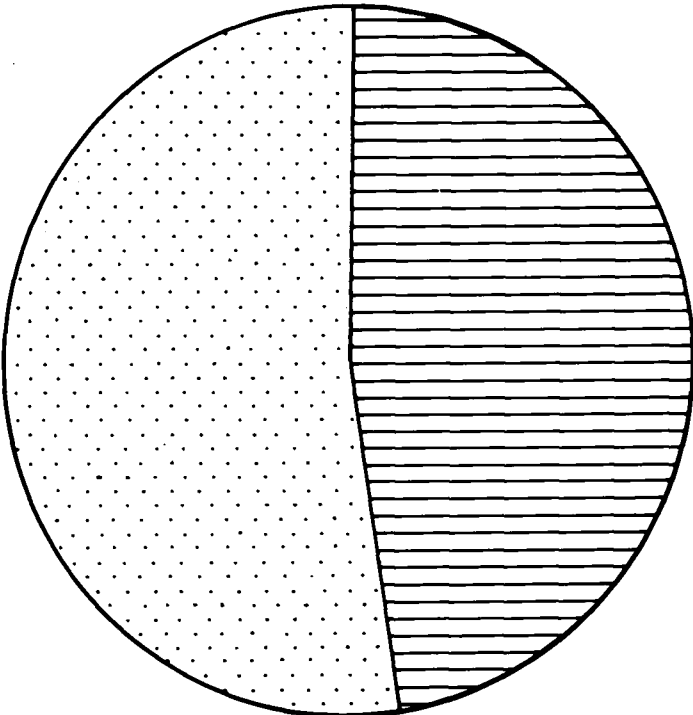
Total=3090

ZONE 2

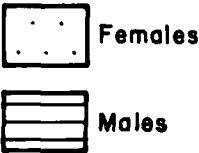


Total=5416

ZONE 4



Total=16060



The rate of growth in the Sudan as a whole was estimated at 2.8% for the period between 1963 and 1970 (Clarke, 1975b). The average number of births per woman is 6.1; there is a high mortality with an estimated 12% dying within the first year of life expectancy (Sudan Population Census, 1955-6). Life expectancy is increasing (about 39 years) and the death rate is decreasing and is likely to decline further before it stabilises.

In the absence of vital statistics, it is difficult to be precise, but informal discussions with health officials point to a rise in the specific fertility rate - that is, more children born to mothers due to the relative improvement of health facilities and better nutritional foods which have led to increases in fertility. Several respondents and local elders informally noted that the marriage age is now lower as compared to thirty years ago, when girls remained unmarried until they reached twenty years old or even longer; that it is considered as exceptional for marriage to be delayed later than sixteen to seventeen years of age.

4.3 Settlement Characteristics And Patterns

This section briefly outlines some of the settlement characteristics and patterns in the study area and identifies the physical and human factors that influence settlement pattern prior to some of the recent changes associated with it. Settlement means land occupance in two interrelated aspects. First, the type, form and arrangement of dwelling as individual houses or as whole villages and other groupings. Secondly, the type of land utilisation inasmuch as it affects settlements.

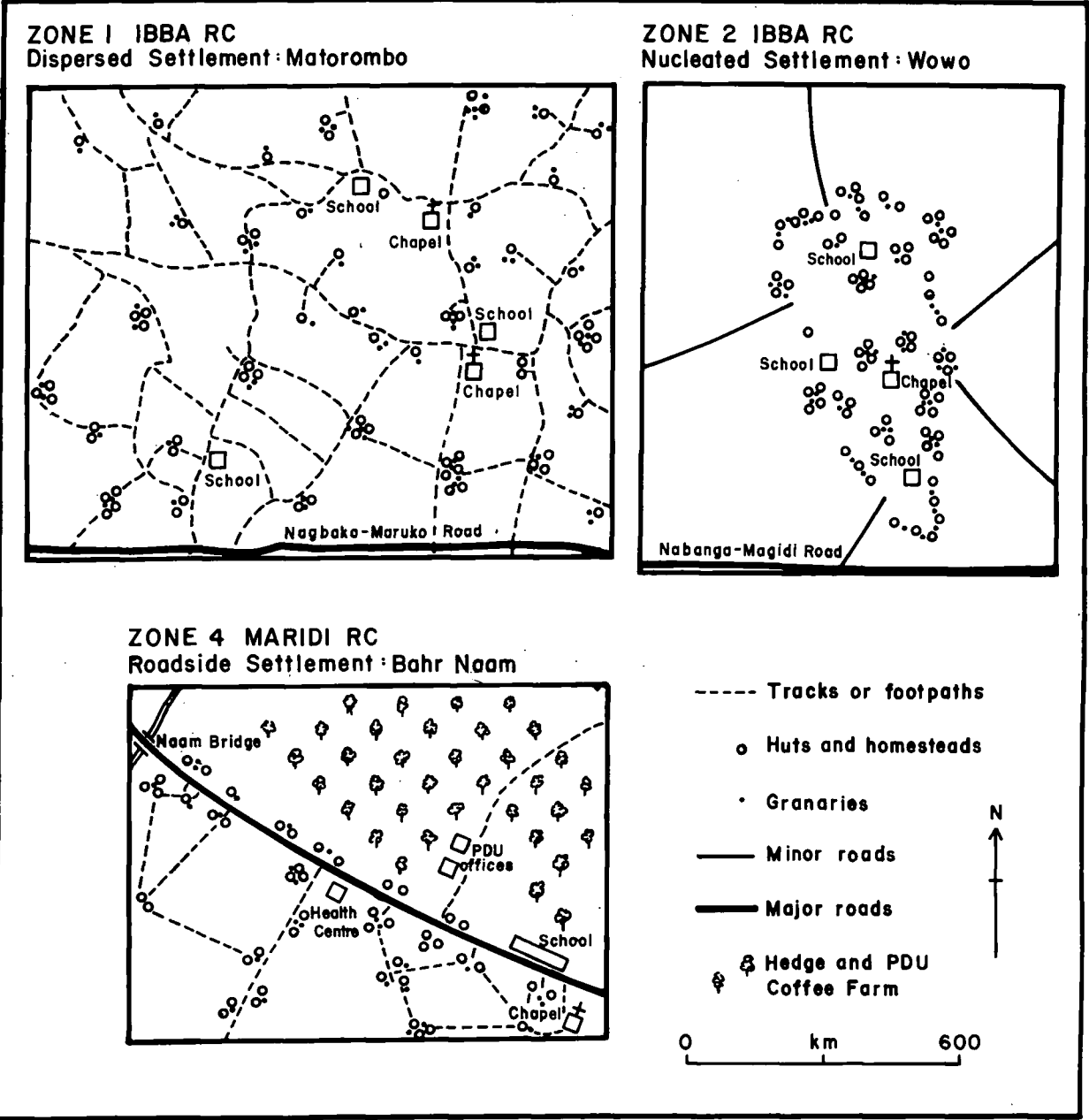
In the study area, the main characteristic of settlement is that it is subsistence orientated based on a farming peasantry and a tribal system of social organisation. The most conspicuous feature of settlement in the study area is that the density in any specific area depends, among other factors, on the availability of water supplies for both humans

and livestock and that farming on permanent available cultivable fertile land is only possible within tribal boundaries. This appears to be a refinement of man-resources density, without necessarily implying any rational or optimal pattern. The evolution of settlement pattern, population growth and changes in farm management practices are closely interrelated aspects.

Farmers generally have two types of settlement in the study area. One is constructed temporarily on a cultivation season in a farm far from home. This is necessary in order to facilitate the protection of crops from wild animals and other pests until the crops are harvested when the farmers will return to another, semi-permanent, base with water supply during the dry season.

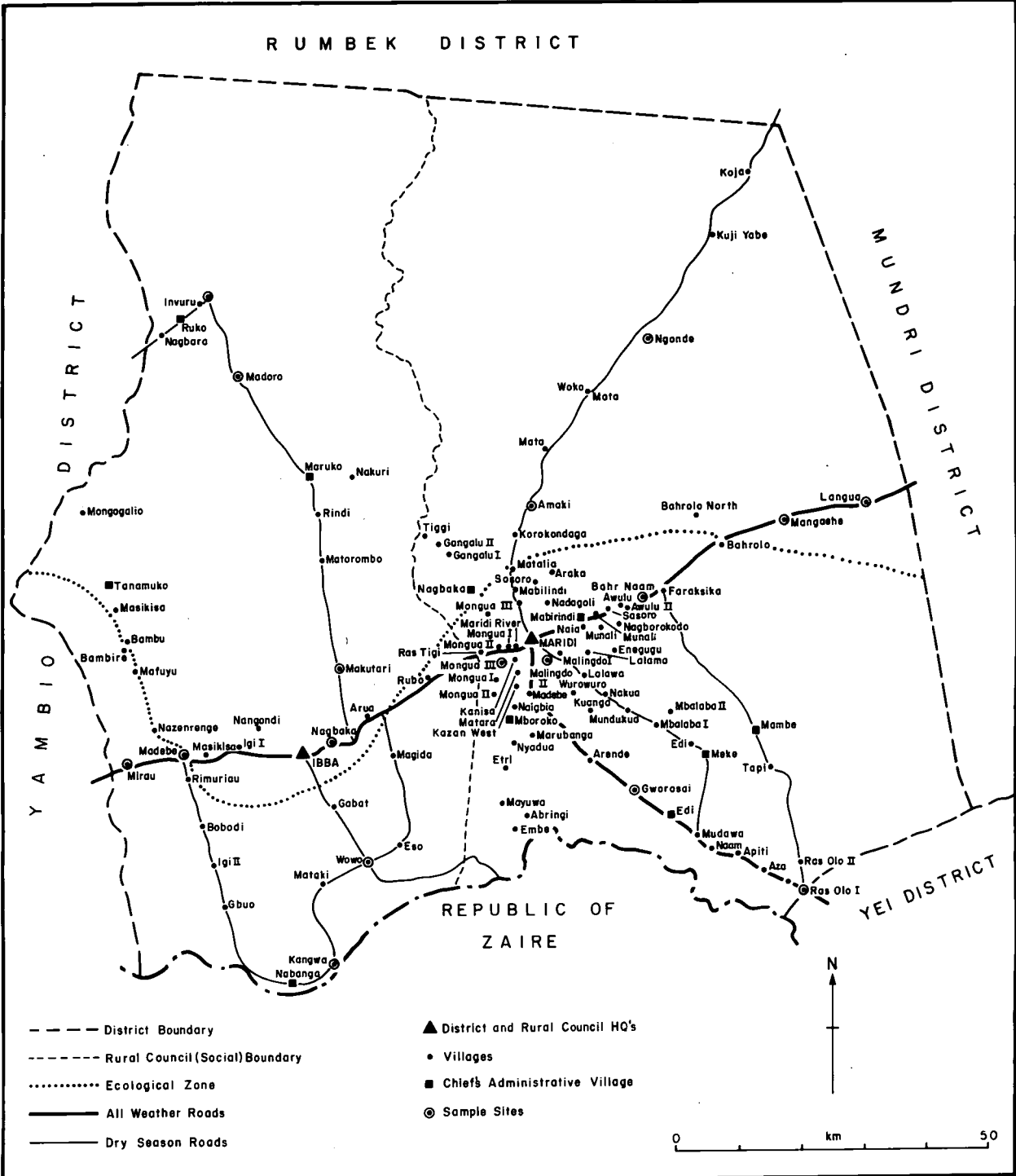
In general, three types of settlement pattern (Fig. 4.5) can be identified : Linear or roadside (e.g. Bahr Na'am : Zone 4), in which roads such as Juba-Maridi-Yambio, Yei-Maridi, Maridi-Rumbek, Ibba-Nabanga and Ibba-Inivuru and other mudtrack seasonal roads and along rivers and streams all have attracted or influenced settlements of this type. These transport routes have further attracted or influenced settlements of this type. These transport routes have further created centres of economic activity engaged in trading such as the 'bush shops', market centres, cafes and food and tea shops, The second type of settlements is the nucleated one (e.g. Maridi headquarters, Ibba, Wowo). This settlement pattern is governed by the availability of other infrastructural facilities such as schools, health centres as well as other social factors for instance, settlements constructed around chiefs' administrative villages. The third type of settlements is the dispersed one - where dwellings or huts are sited in areas of 'good' agricultural land, water sources and so on. The generalised distribution of settlements and roads is depicted in Fig.4.6..

Fig.4-5 SOME TYPICAL EXAMPLES OF SETTLEMENT PATTERNS



Source: Fieldwork

Fig.4-6 THE DISTRIBUTION OF SETTLEMENTS AND ROADS IN THE STUDY AREA



Source : Social Statistics and Social Monitoring Survey (SSSM), Juba and Sudan Survey Department

Among the Azande in Ibba RC (Zones 1 and 2) as discussed elsewhere (e.g. De Schlippe, 1956, Reining, 1966), settlement sites are governed not exclusively by agricultural considerations but also upon such events as the death of wife or failure of crops. Fieldwork observations showed that some settlements have been abandoned by male household heads due to the death of wives. These abandoned settlement sites sometimes have standing huts surrounded by some tree crops such as coffee, mangoes, citrus fruits and so on and may be attractive as habitual centres for baboons. A typical homestead of the Zande (kporo) is composed according to the members living within it and its variations in pattern can be directly linked to variations in the composition and structure of household. Several dwellings or huts each with specific function are the characteristic of a typical settlement pattern. Usually, there are two 'traditional' types of houses - one built of wattle-and-daub (gbuguru) and thatched-overhanging roof with a round wall structure, open verandah surrounding it. This can probably last for several years when they can be maintained by putting up new building materials (e.g. thatching grass) or by the construction and addition of new huts near the old. The second type of house (nandurugia) is a round one, constructed of spear grass, and used as a kitchen but does not last long. Few houses (huts) have wall openings (windows) and this is related to the belief that night witches may have the chance to 'evil eye' or bewitch the owners through these windows.

On the other hand, among the Moru and non-Moru tribal groups in Maridi RC (Zones 3 and 4), the 'traditional' house types are similar in structure and layout. The dwellings are constructed principally of round thatched cottages or huts (tukls : Arabic). Temporary shelters are also generally thatched, as they can be built and dismantled quickly. A typical homestead consists of ten or more huts depending on the size of household. Most tukls have windows and doors made of packing-case wood. Several

huts are oblong in plan which might have been derived from the missionaries who settled in the study area, or from the Government or neighbouring countries such as Uganda, Central African Republic and Zaire. This housetype is more spacious, walls are made of unbaked mud bricks, thatched grass roofs, and some types have flattened-out petrol tins or zinc sheets. But the adoption of oblong form of house does not necessarily mean any change of building materials, though it certainly facilitated the use of a wider range of materials and techniques. However, generally the daub remains the most common wall material whether the plan is circular or rectangular, while the thatch is the most common roofing material.

Generally, extended families and clan-based settlements are a common norm. However, the role of the village as a uniting factor binding all individuals into one coherent entity is now being weakened. The establishment of urban institutions and infrastructural services such as schools, markets, health centres and transport leading to rural-urban links, all have relatively weakened the village importance as a centre of social and communal need. The weakening bonds of the village are evident in the weakening authoritative power of the tribal chiefs. Informal discussions with several tribal leaders in the study area indicate that the youth were migrating to towns in the escape of payment of poll-tax; that some individuals were directing their criminal cases to be solved by Government authorities in the main centres. Thus, individuals no longer wholly depend on village opinion and the elders are not free to exert their sanctions as in the past. However, this is not a denial or dissolution of village authority but merely points to the main trends and ties shifting from the village authorities to those in the towns.

The above discussion therefore shows that physical and human factors do play a significant role in fashioning the settlement characteristics and pattern in the study area. The availability of cultivable

fertile land, water supplies, infrastructural services and the character of physical landscape all play a major role in influencing the pattern and type of settlement.

4.4 Transport And Communications

The influence of transport routes on settlement pattern in the study area has been noted in section 4.3 of this chapter (Fig.4.6). Generally, transport and communications have a vital role to play in the process of socio-economic development. Whilst subsistence farming is practically independent of transport systems, an efficient marketing system is essential for commercialised farming.

As shown in Fig. 4.6 the main provincial roads (all weather surface throughout their length) are from Juba and Yei. The remaining roads provide a reasonable network but are seasonal and all require improvement and some upgrading as well. The network of the minor roads that once existed fell into disuse during the civil disturbances and presently most are impassable for most part of the year. The majority of these roads are often not more than narrow mudtracks and with poorly constructed bridges of temporary cut tree trunks laid across rivers and streams which often slide or are swept away by running water. Additionally, fuel shortages and lack of spare parts and inaccessibility of most parts of the study area due to lack of proper feeder roads are other constraints.

In this context, informal discussions with several farmers revealed that there is always difficulty of transport especially during the period June to September when heavy rains occasionally render remote villages inaccessible in addition to the general lack of transport. Vehicles are very limited and as a result farmers heavily rely on headloading. However, bicycles are used for large purchases in the study area and are becoming the most common form of transport. Bicycles are also flexible

to the nature of small, meandering lanes. Several chiefs reported and emphasised the badness of roads which prevent them marketing much of their agricultural produce for more than three months. In Makutari (Zone 1) one chief noted that heat prevented long journeys on foot during January and February and that the market centre was very far. It is interesting to note that most chiefs in the study area because of the Agricultural Policy (see Chapter 10,A), generally discourage the movement of farmers during the cultivation period especially from April to June (the peak of agricultural operations). But it is not easy to control movement of individuals.

The nature of most of the roads also makes it difficult for vehicles to reach areas where there exist surplus crops : It costs about £S5-10 to travel in a 'suk' lorry⁽¹⁾ from Maridi to Juba depending on whether in front 'seat or 'back' seat. Shopkeepers along the main roads get their supplies (e.g. salt, soap, oil) from the lorry-owning traders. However, some of these commodities filter into the hinterland through small itinerant travelling traders with bicycles. Conversely, these traders purchase bulk surplus crops from farmers and transport them to the main centres in and outside the study area.

Communications (air and wire) are generally poor. There is a small airstrip in the south-west of Maridi headquarters occasionally used by foreign agencies' light aircraft and military helicopters. There is virtually no telephone system. However, the PDU and Wildlife Department offices have wireless telegraphic network linking the study area with the outside world. There is only one post office in the centre of Maridi headquarters.

To sum up, it has been noted that most roads in the study area had fallen into disrepair during the Civil War and are generally impassable in the middle of the rainy seasons. Upgrading and maintenance

(1) It is the Sudanese equivalent of the West African 'mammy-wagon'.

of the seasonal roads and the construction of feeder ones especially in surplus production areas is a prerequisite for the socio-economic development of the study area. The improvement of transport is likely to cause reduction in the high price of food in the 'hungry-gap periods'.

4.5 Land Tenure

The literature on the relationship between social and economic characteristics and land tenure has been widely discussed elsewhere (e.g. Boserup, 1965, Biebuyck, 1963; Yudelman, 1964; O'Connor, 1966; Makings, 1967; Gershenberg, 1971). Within rural communities, land tenure arrangements have long been recognised to play a fundamental role in development process (Goddard, 1972), while Barraclough (1969:21-4) stresses the importance of land tenure to "the success or failure of the 'Green Revolution' in developing countries."

There are several definitions of the term 'land tenure'. However, in this study we adopt the definition which considers land tenure as "the fabric of rights and obligations which comprise the tripartite relationship between man, land and society" (Udo, 1982:49). It is this definition that best reflects the often-quoted statement of a Nigerian 'traditional' ruler (the Elesi of Odogbolu), who while appearing before the West African Lands Committee set up by the British Colonial Government submitted as follows : "I conceive land to belong to a vast family of which many are dead, few are living and countless members are still unborn" (quoted in Jones, 1949:309).

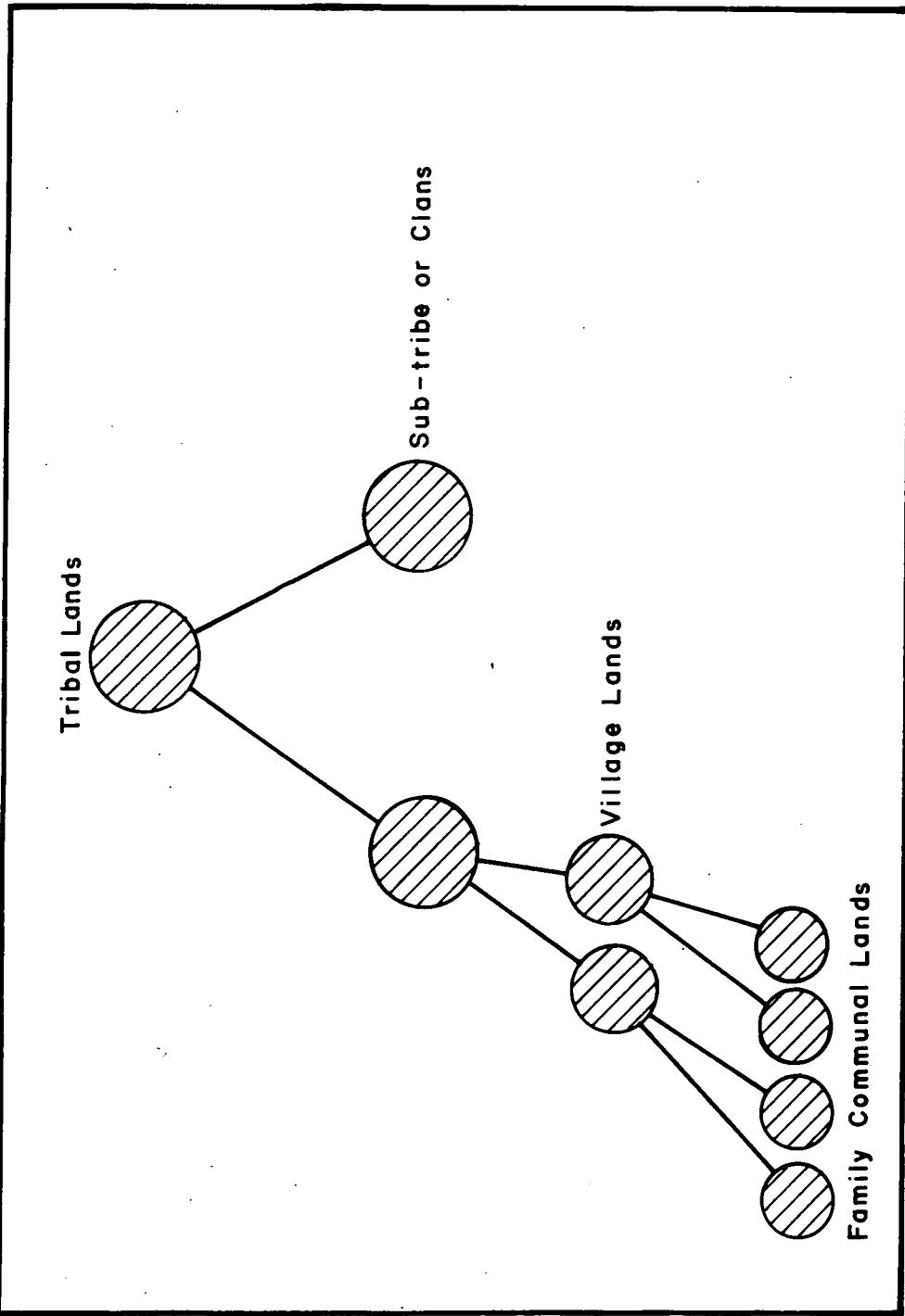
In the study area, as indeed elsewhere, land belongs to the Government but authority over it is exercised by local chiefs from whom permission to settle or cultivate must be sought, but no rent is charged for its use. Hence, a deliberate policy of discouraging private ownership of land is pursued. According to these traditions, there are in fact four levels

of land ownership (Fig. 4.7). Firstly, at the communal scale, generally each tribe has been allotted a given land in which each member of the tribe has the right to its use. Secondly, within the tribal level, there is the sub-tribe or clan ownership where different sectors and sub-sectors occupy a certain area with known boundaries. Thirdly, there is the clan area which is divided among the various villages; and, finally, in the village lands, each person has private family communal occupance.

In this respect, all the tribal groups in the study area have land available to all its members, and the right of individuals to land use derives from having a membership of the community. Under this arrangement, each member is entitled to as much land as requested for cultivation for the purpose of sustaining the family. Thus, one could clear land with the critical proviso that no others held rights over it. In general, after land had been cleared, a continuous right is held by the first user even if it is under bush or idle. But land ownership is not absolute and cannot be disposed of and outright sale is prohibited although this situation is much more complex.

In the study area, there were reported cases of land dispute in Gworosai (Zone 4), Kangwa and Wowo (Zone 2) where some of the tribal or clan lands had been occupied by some of the Zairian refugees. Informal discussions with several tribal leaders revealed the importance and emphasis of inheritance through claiming land traditionally worked by the family or clan. But in 1970 the Government passed an act and declared all lands as 'Government Lands', hence a conflict arose between farmers' concept of the use of land and Government concept of the land use. Since land is held by the clan and the chief representing that clan when he grants permission leads to the concept of inheritance which is relatively becoming an important issue in the main centres. In other villages in the study area, trees planted or claimed by use belong to families even

Fig. 4.7 A GENERALISED PATTERN OF LAND OWNERSHIP IN THE STUDY AREA



Source : Adapted and Modified from Lado, C. (1979), Unpublished M.A. Thesis,
Department of Geography, University of Khartoum, Sudan P.286

though the land around them may have reverted to bush. In fact, the normal movements of clansmen in search of better soil or water resources is usually with a specific area to which the people affected have a well-defined mental map and historical claims as being the land of their ancestors.

In Kangwa (Zone 2) area, the chief emphasised that 'outsiders' would not be allowed to open up projects as there was a general resentment when Government officials tried to resettle some of the Zairian refugees in Nabanga and Kangwa (Zone 2). In the past, a migrant who wished to settle in the study area simply asked the land 'owner' for a plot of land for use. Present, settlement and usufruct rights, as noted earlier, can only be obtained from prominent clan leaders and family heads; once allowed the settler becomes a full member of the community as is the case in Nabanga, Kangwa (Zone 2), Ngonde (Zone 3), Madoro (Zone 1) where some individuals from Zaire, the Jur, the Dinka from Rumbek District and the Belanda from Wau (Bahr El Ghazal Province) have been more or less integrated into the tribal or clan lands although with a high degree of reservation.

Although family and group ownership of land is still prevalent in the study area, the system mainly exists in relatively sparsely settled rural areas where cultivable fertile land is abundant. But in some areas already relatively densely settled, there is an increasing trend towards individual working of discrete plots especially with the success and incorporation of coffee growing and other tree crops as well as the involvement of farmers in exchange economy.

There are, however, two main exceptions to the acquisition of land as outlined above. Firstly, in the main centres such as Ibba and Maridi headquarters, land inside an eight-kilometre radius mainly comes under the responsibility of the Rural Council authorities who allocate land

into 20-metre square plots. These plots fall into four categories according to the location and the kind of development intended. Usually, it is men who get more plots although a few women also are granted plots after when applications are supported with claims to originate from the study area. However, the need to provide accommodation for their family members is the usual stated motive. Individuals pay some little money for this, but there are also indirect charges in the form of social service tax. Secondly, some areas are regarded by farmers as sacred (e.g. tombs, rocky outcrops, old trees, groves and ponds) and, today in spite of the changes which have affected the society and economy, it is still considered an abominable act to destroy, or even cultivate or sell a piece of land in which one's parents or grandparents were buried. But such sacred places are usually small in size and this restriction is only important to the construction of roads, airstrips and so on where 'outsiders' may unwittingly offend a local population by failure to take such beliefs into account. It is interesting to note that informal discussions with some tribal leaders in the study area indicated that the failure of rains to fall especially in recent years (e.g. 1979) was believed to be because of the removal of stones from sacred places and clearance of bush around Maridi headquarters in the construction of the present airstrip.

This section has outlined the 'traditional' and 'modern' concepts of land use and land tenure. Given the present state of relatively low population densities in most tracts of land in the study area, land acquisition is not seen as a serious constraint (although much of it is uncultivable or poor) and the need for more stringent control through more formal tenurial arrangements is not appropriate at the present time. However, other factors such as access to water supplies and availability of infrastructural services and so on, may act as a major

constraint to some of the available cultivable fertile land. Although the study area is characterised by local population density and of shifting/bush fallow agriculture, the land use situation is changing. There is a tendency to nucleate and for the Government policy of establishing some agricultural and forestry projects to favour such a move, and the more classical situation is likely to emerge in which as Stryker (1976) succinctly noted that an increase in the population will lead to an increase in the amount of labour and a decrease in the amount of land used per person despite the availability of free land further afield. Thus, shifting modes are more or less becoming unsuitable especially around the main centres and with the incorporation of tree crops into the land use pattern.

4.6 Religion And The Family Life

The tribal groups in the study area, as indeed in other similar parts of Africa, profess 'traditional' religions, Islam and Christianity. In general, Christianity is the dominant religion introduced by European missionaries even before the Anglo-Egyptian Condominium administration. Table 4.1 shows the proportion of sample farmers according to the existing religions. It is clearly shown in the table that a high proportion of the farmers in Zones 1 and 2 (65.6%; 53.1%) (Ibba RC) belong to the Roman Catholic faith. This was the result of early missionary work of the Verona Fathers; while a high percentage of the respondents in Maridi RC (Zones 3 (58.3%) and 4 (66.7%)) belong to the Protestant churches as a consequence of intensified activities of the Church Mission Society (CMS) in these zones. A small proportion of the respondents (13.1%) however, profess Islam which had been diffused into Maridi District during the slave raids period even before the establishment of colonial administration and also after the missionaries have penetrated into the whole of Western Equatoria Province. However, it is worth noting that the small proportions

Table 4.1 : Number and percentage of farmers reporting membership in different religions in the study area

Sample Area Religion	Zone 1 (N = 32)		Zone 2 (N = 32)		Zone 3 (N = 48)		Zone 4 (N = 48)		DISTRICT (N = 160)	
	No	%	No	%	No	%	No	%	No	%
Protestant	2	6.3	4	12.5	28	58.3	32	66.7	66	41.3
Roman Catholic	21	65.6	17	53.1	12	25.0	8	16.7	58	36.3
Islam	7	22.0	5	15.6	5	10.4	4	8.3	21	13.1
Traditional African	2	6.3	6	18.8	3	6.3	4	8.3	15	9.4
TOTAL	32	100.2	32	100.0	48	100.0	48	100.0	160	100.1

Source: Questionnaire Analysis

Sample: 160 farmers interviewed in Maridi District

N.B. Percentage more than 100 because of rounding

(9.4%) of respondents professing 'traditional' African religions and beliefs in the study area as depicted in the table, is deceptive. As in many other countries, many Christians and Muslims still believe in, and consult the priests and spirits of unknown origin (e.g. atoro or atolo : Zande) and ancestors to whom prayer and sacrifices are offered before most social, economic and political activities are fulfilled.

The tribal groups in the study area also have confidence in 'traditional' medicines used for ritual or magical effect. Thus, a number of folk remedies using herbs, roots, bark or leaves of specific trees are utilised. But the influences of urban institutions have relatively reduced the intensity and use of supernatural beliefs and practices in the rural areas. In Ngonde (Zone 3) a group of elders reported that decreasing crop yields and land fertility in recent years is the result of neglect of performance of rain-making ceremonies.

It is worth mentioning that in the study area, the existence of certain supernatural and 'traditional' religious beliefs among both Roman Catholic and Protestant churches have been influenced by spiritual churches founded by indigenous African Christians such as in neighbouring Central African Republic and Zaire. These spiritual churches have become so influential that the Roman Catholic and Protestant churches have had to modify their style of worship by the introduction of African drumming and dancing (e.g. marching and preaching the gospel to people along the roads and public places in the case of 'Morokole' movement - mainly Protestant Christians), to avoid losing more members. This is probably due to the influence of the programme of evangelism under the name 'New Life For All'. This meant that every effort had to be made to mobilise every Christian for the task of evangelism.

A discussion of the household composition and structure of the sample farmers will be an issue to be taken up and outlined in Chapter 8.

However, about 75% of the sample farmers practice polygamy since the number of wives a man has, determines and reflects the social status, farm size and farm labour. Marriage in the study area involves the payment of a dowry by the bridegroom to the bride's family. However, its nature varies between tribe and clan, and on the social status of the couple marrying. Generally, it involves bestowing money, livestock and poultry, honey, hoes, arrows to varying degrees. Additionally, among the Moru, Baka and Avukaya tribes, a man may sometimes pay a fine because he did not perhaps seek the parents' permission before approaching the desired girl, or because he impregnated her before he became an eligible suitor. Most families are patrilineal and the husband is usually the head of the household and controls most of the farming decisions although the wife occasionally participates in these matters (see Chapter 8).

4.7 Some Small-Scale Economic Activities/Off-Farm Occupations

Although farming is the mainstay from which most income is generated in the study area, not all respondents are full-time farmers. Some are engaged in other off-farm occupations which supplement the diet, or as part of the annual rhythm of activities. Some of these off-farm activities are recent because of the need for more incomes in a monetary economy to obtain commodities and services outside the farm. Non-farm activities, as a component of life in the slack period, have been largely neglected by agricultural economists. However, Heyer (1965), Pudsey (1966) and Richards (1939) emphasised their vital importance in maintaining the social and cultural environment in which farming takes place.

In this study off-farm occupations were defined as those that are performed off the holding and when a farmer is either employed on his neighbour's or Government farm, or he is self-employed in those

activities off the farm (see Appendix 4). Information on off-farm occupations of sample farmers was obtained through the questionnaire (Q.4a - 4e, Q.6e - 6i, Q.7b - 7c, Q.7e - 7f). However, informal discussions with respondents, chiefs and their subordinates also yielded invaluable information on the general pattern and characteristics of the non-farm activities. But there were some constraints encountered in seeking this vital information from some respondents. There was a fear and suspicion of tax purposes or anticipation of being provided a job by the research team or Government. It is also likely that certain information was withheld by the respondents as some of the off-farm occupations are carried out simultaneously throughout the farm calendar year. However, in the study area the majority of the off-farm occupations are mainly undertaken during the dry season.

The main off-farm occupations in the study area include : Beer-making, fishing, handicrafts, hunting, honey gathering, the making of farm tools and carpentry, shea butter (lulu) gathering, trading, waged or Government employment. Beer-making is performed throughout the year in the study area. No distinction was made between honey gathering from the wild sources and locally-made hives. However, the former takes place in the dry season while the latter is carried on throughout the year as time permits. Whilst the gathering of firewood for sale especially in the main centres or larger villages, the making of charcoal for home use and sale was hardly reported. This occupation is mainly considered inferior and performed by some of the Zairian refugees residing in the study area. However, these activities are visibly widespread as one travels along the main transport routes during the dry season and not necessarily confined to the Zairian refugees. It is worth mentioning that the gathering of firewood and making of charcoal are activities that encourage the tremendous depletion of forests especially along the

main communication routes and centres and larger villages. Further details of the above-mentioned off-farm occupations are presented in the following paragraphs.

1) Beer-making

There are different types of beer which include : sweet beer (kpete : Arabic) from maize and finger millet; distilled alcoholic beverages (aragi : Arabic) from sorghum and cassava; local beers including konyimoru (Moru) from sesame and duma (Moru) from dura and honey. These types of beer and beverages are mainly brewed by women especially during the dry season. Beer-making is also performed during the cultivation season (especially in April to September) and beer during this period has an important role to play as it is used for the payment of working beer-parties involved in farming operations. In Zone 3 (Maridi RC) some men were also reported to be engaged in beer-making such as duma (honey beer) and kukya (Moru)-dura and honey beer.

Beer-making, however, as part of the informal sector, is becoming one of the most important off-farm activities and a source of income for the majority of families in the study area. But Muslims and certain religious groups such as the 'Morokole' Protestant sect (common especially among the Moru) in Zones 3 and 4 (Maridi RC) do not perform this occupation. This may act as an obstacle to socio-economic progress and capital formation inhibited. The introduction of Islamic Law in 1983 banning beer and alcoholic consumption in the whole of the country may lead to serious socio-economic and political repercussions particularly among the African, Christian Southern Sudanese.

2) Handicrafts

The making of handicrafts is generally a dry season activity usually performed by females in the study area. Mats for domestic use

and sale are made from palm-oil leaves and some river reeds. Baskets are made from sorghum stalks and are used for carrying grain or flour after harvest or food processing. In most villages some women are involved in making clay pots (see Chapter 6) which are used for cooking or storing water, groundnuts, other pulses and seeds. Both pots and baskets are primarily for use in the household but some are sold, especially during the dry season. Men also make animal skins into drums and for covering harps, seats in chairs; wooden chairs, bows, tables and so on for home use and sometimes for sale.

3) Agricultural tools

The making of farm tools by blacksmiths is undoubtedly declining as a craft. It is reported that Western manufactured goods such as spearheads, hoe blades (torias), axes, knives and forked jembes and so on which could often be purchased from the nearby local shops might have contributed to its decline. Also that local smelting of iron is declining due to the shortage of scrap iron. Farm tools (hoes) made are : The kye'bo (Moru), gita (Zande); the long handle hoe (kuku : Moru, nyoro : Zande) axes (kpinga : Zande, kolóngwa or balata : Moru). It is interesting to note that although toria hoes are increasingly becoming popular in the study area, several farmers including extension staff still continue to use the 'traditional' hoes such as the kye'bo. It is reported that certain farming operations are best performed with them, and that farmers are safer from snakes with the long handle hoes particularly the kye'bo.

4) Fishing

In the study area, fishing generally takes place at the beginning and end of the rains. This is the period when river levels are low and fish are concentrated in pools and some migrate up and down the rivers. In the vicinity of the main rivers such as Na'am, Tiggi, Maridi, Ibba and Olo, fishing continues throughout the year. Several

'traditional' methods of fishing are employed ; spearing with a multi-barbed spear for large fish such as Nile Perch (Lates niloticus) (or Nok; Arabic); hooks and lines; basket-work traps or bed-sheet size piece of cloth and poisoning. Spearing, hooks and lines and basket-work trap methods are usually carried out by men and boys, while poisoning (some of the poisonous plants used will be noted in Chapter 6) involves both men and women.

The most important types of fish include : Tapala (Hererotis niloticus), Longwe (Clarias anguillaris lazera), Kongere (Bagrus bayad) and Gbere (Tilapia spp) (or Khadim miri or Bulti : Arabic). When a surplus of fish are caught, they are preserved either by smoking or sun-drying. The larger fish are usually smoked, and the smaller species sun-dried. Fishing is increasingly becoming a major source of income and supplement the diet especially in the main centres and villages. Recent attempts made by the Fisheries Department to regulate fishing have been a failure as this activity is difficult to control. Unfortunately, data relating to annual catches, size, distribution and consumption are lacking.

5) Hunting

This is one of the most important social and economic activities in the study area and which is performed during the dry season. Groups of men armed with spears, bows and arrows organise large hunting of gazelle, waterbuck and antelope. Some people such as the army, police pensioners and ex-'Anyanya' guerillas in possession of firearms occasionally practise poaching of the 'big game'. Poaching is therefore practised. Hunters normally fire the bush which facilitates the drive of game towards waiting hunters. The Regional Government in Southern Sudan has issued laws against poaching especially of restricted 'big game' (e.g. giraffes, elephants, rhinoceros). But these laws are

difficult to observe in the more remote rural areas and villages. The establishment of the Southern National Park covering some parts of Zones 1 and 3 in the north, is the outcome of these laws (see Fig.10.1).

Single or small groups of men and boys may organise hunting of bush rats, duiker, dikdik, although sometimes girls and women participate. Spears, bows and arrows, snares and nets may be used. Bush meat, an important source of protein is either eaten fresh when cooked or dried over a fire. Surplus meat is usually sold locally to neighbours and friends and rarely outside this circle for fear of Wildlife Conservation Department officers. In fact in Maruko (Zone 1), the research team wanted to purchase some bush meat from some farmers but were denied this commodity for fear of being reported to the Wildlife staff.

6) Honey and shea butter (lulu) gathering

As mentioned earlier, honey gathering takes two forms in the study area namely, honey hunting and bee-keeping. With the former, the hunter or group of hunters search, during the dry season, for wild colonies of bees, kill the colonies by smoking and retrieve the honey and brood comb and the wax comb is usually thrown away. The brood comb is considered as a delicacy. With the latter, the bee-keeper provides a hive or hives for the wild colonies of bees. The hives are usually woven using a bamboo framework plastered with mud, although log and bark hives, as well as flattened-out and carved petrol tins wrapped with grass and plastered with mud are also known. The design of these hives does not facilitate honey extraction and often the brood comb is destroyed when honey is extracted. Honey is both a useful dietary supplement, for example, when used to make tamiya (bean cake) and an important off-farm source of income to farmers. Honey is sold in the form of duma (honey beer) or konyimoru (sesame and honey beer) after the fermentation of these seeds. In the past the by-product of honey, beeswax, had a ready

market in Juba for onward transport to Khartoum. Honey trading is, therefore, increasingly becoming an important source of income in the study area where large quantities of tins, jerry-cans are stored and sold by itinerant traders in the main centres.

Lulu, the fruit of the 'shea butter' tree (Butyrospermum sp), is gathered mainly from April, May and into June especially in Zones 1 and 3. Females collect the fallen fruits (there is a taboo about picking the fruit from the trees) which are eaten. From the nuts inside, the fruit oil is extracted after having sun-dried and roasted the nuts. The oil is much valued as a substitute for groundnut and sesame. Females also use the oil for smearing their bodies ('traditional' cosmetics). Some oil is sold locally. Other fruits, vegetables and some insects are gathered such as tamarind, palm, mallow, wild roots, mushrooms and termites. However, utilisation of the local flora will be described further in Chapter 6.

Besides the off-farm activities generally outlined above, farmers were specifically asked to indicate whether they had other jobs besides agriculture (Q.4a). Farmers' replies are therefore presented in Table 4.2 as zonal and district estimates. Overall the sample, about 76% of the respondents reported off-farm occupations. It is clear that the majority of them supplement their farm income from off-farm activities and especially in Zones 3 and 4 (Maridi RC) as compared to Zones 1 and 2 (Ibba RC). Self-employed off-farm occupations such as hunting, fishing, gathering, handicrafts, carpentry, weaving, beer-making and so on seem to be dominant occupations among the majority of the respondents. However, wage labour in Government and PDU projects appears to be the fourth most important in that order. These paid occupations include gardeners, cleaners and so on. It is worthwhile noting that a general breakdown of the zones shows that higher proportions of the sample farmers in

Table 4.2 : Number and percentage of farmers reporting off-farm occupations and sources of income in the study area

Sample Area Off-farm occupations	Zone 1 (N = 32)		Zone 2 (N = 32)		Zone 3 (N = 48)		Zone 4 (N = 48)		DISTRICT (N=160)	
	No.	%	No.	%	No.	%	No.	%	No.	%
Blacksmithing/Making Tools	3	9.4	2	6.3	3	6.3	1	2.0	9	5.6
Handicrafts/Carpentry, Weaving	5	15.6	3	9.4	10	20.8	7	14.6	25	15.6
Hunting/Fishing/Honey and lulu gathering etc.	15	47.0	6	18.8	26	54.2	20	41.7	67	41.9
Trading, smuggling and shop-keeping & retailing (1)	1	3.1	3	9.4	2	4.2	-	-	6	3.8
Wage earners in Government and PDU employments	1	3.1	2	6.3	5	10.4	11	22.9	19	11.9
Tailoring/Bicycle repairs/Housebuilding (2)	1	3.1	1	3.1	-	-	2	4.2	4	2.5
Firewood and charcoal (3)	-	-	2	6.3	1	2.0	1	2.0	4	2.5
Beer making/Foodstuffs making and marketing	2	6.3	3	9.4	9	18.8	6	12.5	20	12.5
Others (4)	2	6.3	3	9.4	2	4.2	1	2.0	8	5.0
Average Number of off-farm Income Generating per farmer (5)	0.94		0.78		1.21		1.02		1.01	

Source : Questionnaire Analysis

Sample : 160 Farmers interviewed in Maridi District

N.B. Percentages are more or less than 100 because of multiple response and rounding

(1) There were some farmers who were actually engaged in trading and smuggling of goods between neighbouring Zaire and the area. Such goods include Zairian beer makasi and skol, coffee etc. But this information was hidden in Zone 4.

(2) Most of the tailoring, bicycle repairs and housebuilding (Government) are concentrated along Juba-Maridi, Maridi-Yambio, Maridi-Yei roads.

(3) Firewood and charcoal are made and sold throughout the area. (4) Others category includes working as a chiefs guard and headmanship.

N.B. Lack of reporting of any of the off-farm occupations does not mean, however, absence of these activities in the delineated zones in the study area.

Zones 1 (Ibba RC) and 3 (Maridi RC) are engaged in off-farm occupations as a source of income in contrast to Zones 2 (Ibba RC) and 4 (Maridi RC). There is no direct explanation for this anomaly. But it is likely that the average number of off-farm income generating occupations is greater in Zones 1 and 3 than in Zones 2 and 4 is because of their adverse environmental and ecological conditions to farming as these zones are relatively drier than Zones 2 and 4.

To assess the involvement of some of the respondents' members of the household in some of the off-farm occupations, male farmers were therefore asked to state if their wives had any non-agricultural occupations (Q. 6e-6f). Farmers' responses are shown in Table 4.3. It is evident from the table that overall the sample, while there are zonal variations, more than 59% of the farmers' wives are engaged in beer-making and distilling alcoholic beverages and selling foodstuffs; 36% handicrafts making and weaving. A higher proportion of the respondents' wives engaged in these occupations are in Zones 3 and 4 as compared to Zones 1 and 2. However, data regarding the involvement of wives in off-farm occupations in the study area must be treated with caution. These data are believed to be underestimated because most male respondents normally conceive of some females' off-farm activities as normal routine obligations.

To conclude this section, the foregoing discussion has shown that there are many off-farm occupations in the study area. However, two off-farm activities are particularly important - honey production (including beer-brewing) and fishing. It appears that they are not labour demanding. Because of the monetisation of the economy and rising aspirations, the variability of crop yields in more or less an unpredictable environment, efforts to increase family income are often through off-farm occupations. Taking part in the non-agricultural sector of the local

Table 4.3 : Number and percentage of wives of respondents⁽¹⁾ engaged in off-farm occupations in the study area

Sample Area Non-Agric. Occupations	Zone 1 (N = 32)		Zone 2 (N = 32)		Zone 3 (N = 48)		Zone 4 (N = 48)		DISTRICT (N=160)	
	No.	%	No.	%	No.	%	No.	%	No.	%
Blacksmithing/Pottery*	1	3.1	-	-	-	-	3	6.3	4	2.5
Handicrafts/Weaving	5	15.6	7	22.0	25	52.1	20	41.7	57	35.6
Hunting/Fishing/Honey, wild fruit, etc. & lulu gathering	1	3.1	-	-	1	2.1	1	2.1	3	1.9
Beer-brewing and distilling/foodstuffs processing/firewood & water collection	12	37.5	18	56.3	30	62.5	35	73.0	95	59.4
Mean number of response/farmer	0.59		0.78		1.25		1.23		1.00	
Mean number of non-farm income generating activities per wife										

Source: Questionnaire Analysis

Sample: 160 farmers interviewed in Maridi District

Percentages are more or less than 100 because farmers supplied more than one response

* Lack of reporting of any of these activities does not imply absence of the off-farm activities

(1) For those farmers who have more than one wife several of these women perform some off-farm activities.

economy means intensified contact with areas outside. This facilitates the flow of new ideas in agriculture and creates dependency links between the local, national and wider economic systems.

4.8 Education Facilities

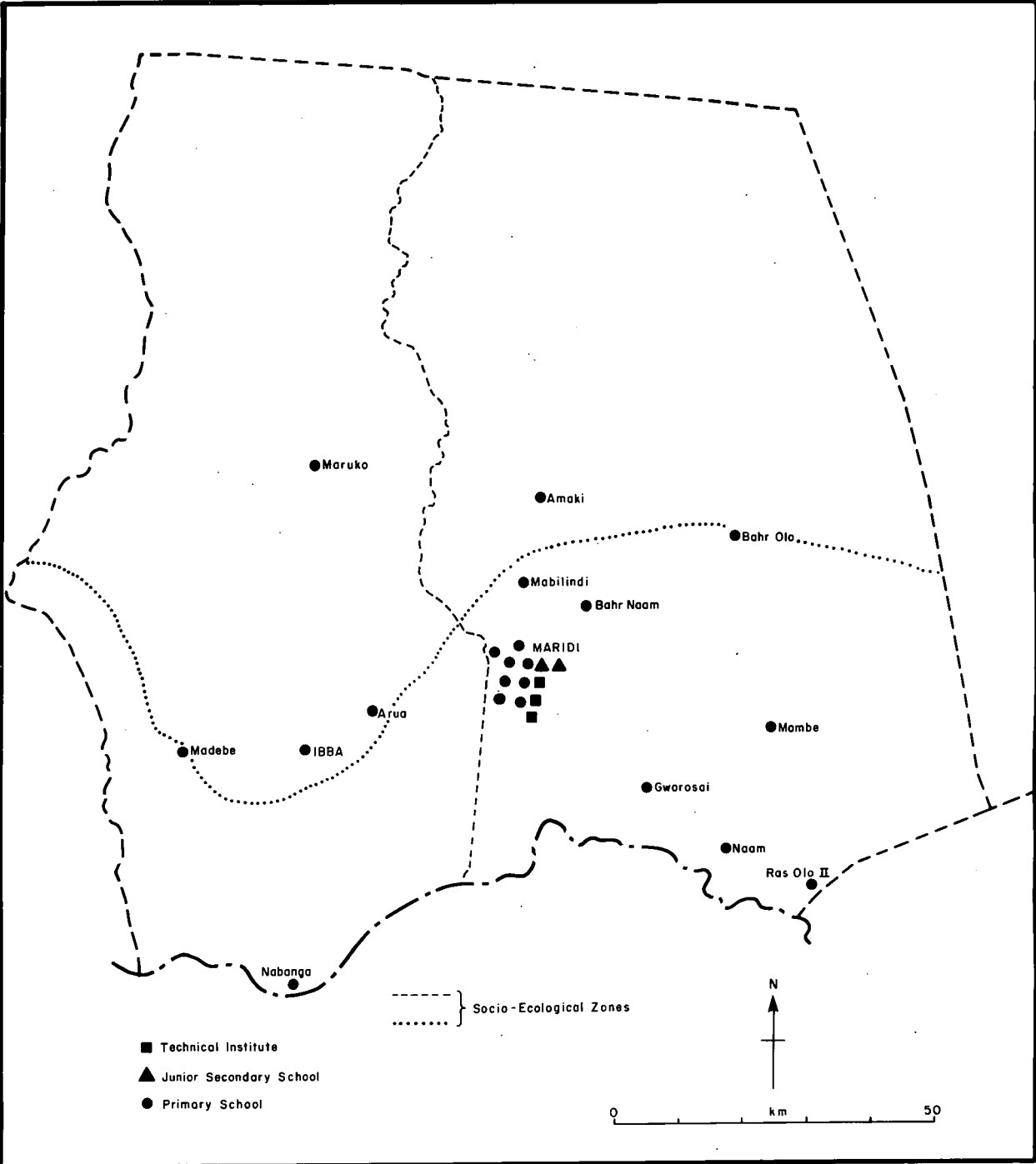
The introduction of education into the study area is traceable to early activities of the Christian European Missionaries. Members of the Verona Fathers and Church Mission Society (CMS) were active in providing 'bush' schools. In fact, the pattern of primary and post primary (junior) schools can be attributed to the operations of missionaries (Reining, 1966; Albino, 1970). The development, structure and organisational details of the education facilities have been fully documented elsewhere (Sanderson and Sanderson, 1982; Reining, 1966) and need not concern us here.

The emphasis in education was primarily religious instruction with some reading, writing and arithmetic. However, after Sudan's Independence (1956), the Government assumed some control of the educational system and thus converted most of the 'bush' schools formerly administered by the missionaries into full primary schools of grade four. In 1967, there were only 9 primary schools, 1 in Ibba RC and 8 in Maridi RC. This number rose to 21 schools in 1981, 5 in Ibba RC and 16 primary schools of grade six in Maridi RC. Presently, there are only 2 junior secondary schools (located in Maridi RC), 2 technical institutions also all in Maridi RC. Fig. 4.8 shows the distribution of the education facilities in the study area. A third technical institute is planned for teaching rural or vocational education and to encourage rural education curricula relevant to farming. This is intended to induce students to go back to farming in the rural areas.

The introduction of the payment for children's schooling in all educational levels in the Southern Sudan in general and the study area



Fig. 4-8 THE DISTRIBUTION OF EDUCATION FACILITIES IN THE STUDY AREA



Source: Fieldwork and Data obtained from the Social Statistics and Social Monitoring Survey (SSSMS), 1982 Juba

in particular more or less required farmers to cultivate crops for the market economy. Thus, agriculture was stimulated by these fees. Hence, provision of school fees for one's children is itself a significant impetus to generation of cash income (Knight, 1974). The informal agricultural and vocational education that rural youths received from their parents is gradually being lost as a result of the gaining of formal education and the diffusion and adoption of new ideas and urban institutions and values. Thus, the majority of these youths who have acquired at least primary education do not return to the farm, but instead head for the main centres and into other occupations in the belief that it is retrogressive to return to the farm after a school certificate. Modern education became a 'passport' to the 'modern' life and the only way to escape poverty and hopelessness in the rural areas.

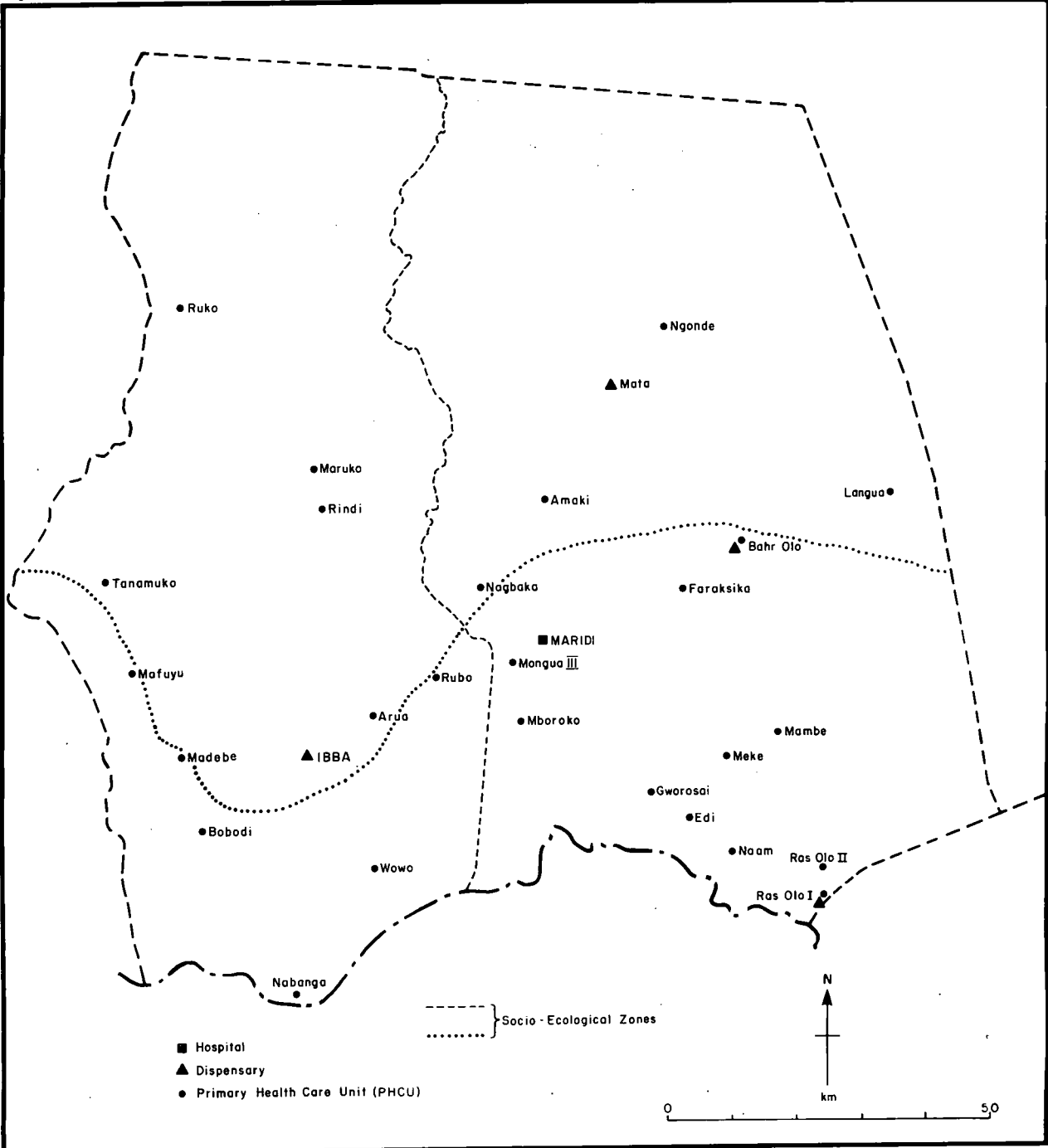
In this context, in many schools in the study area there is in fact little in the school curricula that is relevant to farming.

4.9 Medical And Health Facilities

Fig.4.9 shows the location of existing health facilities in the study area. There is only one civil hospital in Maridi headquarters, with four wards, each with approximately 50 beds. It is staffed by one Sudanese medical doctor, a German medical doctor, a volunteer of the German Medical Team (GMT), his wife - a nursing sister, two medical assistants and a few nurses who treat between them nearly 5,000 out-patients a month on average, as well as the resident patients. Generally, the hospital lacks even the basic drugs, a proper theatre with x-ray equipment, maternity ward and stores and is understaffed despite the services rendered by the GMT volunteers. There had been frequent strikes by the nurses because they had worked for months without receiving their pay.

There are 22 primary health care units (PHCU), 9 in Ibba RC and 12 in Maridi RC and each has a nurse. There are 4 dispensaries, 1 in

Fig. 4-9 THE LOCATION OF EXISTING HEALTH FACILITIES IN THE STUDY AREA



Source : Fieldwork and Data derived from Social Statistics and Social Monitoring Survey (SSSMS), 1982, Juba

Ibba RC and 3 in Maridi RC and all are staffed by ACROSS nurses. The aim of the ACROSS-supported health care programme is to undertake in-service training of community health workers (CHW) and village midwives (VM) as well as the establishment of clinics at all dispensaries and PHCU. But this is just at an early stage. Training is also to be undertaken of 'traditional' birth attendants (TBA) in hygiene and nutrition. They render services for no pay and are specialists who treat children suffering from lugbara teeth (those teeth which develop in children's gums earlier than the normal ones - believed to cause high fever and diarrhoea).

Drugs for the various categories of health centres are supplied from Juba and transported by vehicle to Yambio through Maridi headquarters (without being unloaded) and brought back again to Maridi headquarters after administrative procedures are completed. Drugs are received irregularly and often in short supply as some find their way out of stores and sold in 'black' market transactions. Recently, a pharmacy had been established in Maridi headquarters and sells drugs to patients at high prices thus rendering many people unable to purchase due to lack of sufficient cash. Consequently, 'traditional' medicines and methods of healing are resorted to by most people. It is worth noting that although many people in the study area continue to follow 'traditional' practices with respect to health and possess a wide knowledge on the curative properties of particular plants, they have no difficulty in using Western medicine as an additional strategy when it is available. For example, injections are seen as particularly efficacious, so the demand for medical facilities is one of the people's priorities in the study area (see for example Chapter 10).

In the administration of the questionnaire, sample farmers were asked to state if they and members of their families had had illness or

complaints over the past twelve months (Q.53a - 53b and Q.54a). Also additional information was informally sought from respondents in regard to the months in which these diseases were most prevalent, as a means of gaining an insight into the adverse implications which ill-health has on farm labour productivity. Very limited data were obtained from the various health centres available in the study area as outlined above.

Table 4.4 shows farmers' responses. Of the total sample, about 66.3% of the respondents and some of their household members reported complaints, illnesses and diseases. It is evidently clear from the table that the average number of occurrences of some of these complaints and diseases is higher in Zones 2 and 4 with sleeping sickness occurring most, dysentric disorders, diarrhoea and other internal parasites ranking second in that order. As these are mainly forest zones recently derived from the tropical rain forests, it is therefore not surprising that these diseases and complaints are prevalent. The incidence of many of the diseases coincide with the busiest months of agricultural operations. For example, bronchitis occurs most from May through August; malaria, from May through October, dysentric disorders and internal parasites, from April through September and so on. In fact, several of the diseases such as malaria, filaria and sleeping sickness have extremely debilitating effects, while other chronic parasitic infections such as bilharzia and guinea worms are prevalent throughout the study area with similar effects on farmers' performance. The inadequate supply of 'modern' preventive medicines is a major constraint although this issue is minimised through the use of 'traditional' medicines and methods of treatment. Additionally, the susceptibility to many of the debilitating diseases is exacerbated by inadequate nutrition which sometimes occurs from April to June - a 'hungry gap period'. Furthermore, the distances most farmers travel (most villages are located more than 10 km (6 miles) from the nearest health

Table 4.4

Number and percentage of farmers (1) reporting the incidence of some complaints, illnesses and diseases in the study area

Complaints, diseases and illness	Sample Area		Zone 1 (N = 32)		Zone 2 (N = 32)		Zone 3 (N = 48)		Zone 4 (N = 48)		DISTRICT (N = 160)	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Bronchitis	1	3.1	2	6.3	2	4.2	5	10.4	10	6.3		
Malaria/Headache and fevers*	-	-	-	-	-	-	-	-	2	4.2	2	1.3
Dysentric disorders/Diarrhoea/ Indigestion Bilharzia/ guinea worms	3	9.4	4	12.5	11	22.9	15	31.3	33	20.6		
Filaria/chicken pox/injuries	5	15.4	4	12.5	6	12.5	7	14.6	22	13.8		
Tropical ulcers/Heart trouble/ Leprosy*	-	-	2	6.3	-	-	1	2.1	3	1.9		
Sleeping sickness	2	6.3	17	53.1	13	27.1	18	37.5	50	31.3		
Mental illness	4	12.5	2	6.3	4	8.3	2	4.2	12	1.6		
Rheumatism*	-	-	2	6.3	4	8.3	7	14.6	13	8.1		
Cough/Vomiting*	1	3.1	-	-	-	-	2	4.2	3	1.9		
Jaundice*	-	-	1	3.1	1	2.1	-	-	2	1.3		
Toothache/backache, chest pain/sinusitis	-	-	-	-	1	2.1	-	-	1	0.6		
Bewitched/ Evil eye*	1	3.1	-	-	1	2.1	1	2.1	3	1.9		
Average number of complaints, diseases etc.	0.53		1.06		0.89		1.25		1.00			

Source: Questionnaire analysis

Sample: 160 farmers interviewed in Maridi District

* Absence of a figures does not mean absence of these complaints, illnesses or diseases. Some of the complaints were mere descriptions but corroborated or supported by discussions with health authorities.

(1) The data presented in this table refer to the respondents and some members of their households.

facility) to some of the health centres for treatment has a direct effect on labour availability and performance. However, this aspect will be further noted in Chapter 8 to demonstrate the impact of these diseases and other complaints on farm labour performance and its availability in the study area. Health and nutrition education are vital to improve the rural health problem. Although recent attempts have been made to establish a Home Extension Unit of the Agricultural Department to cater for this purpose, it is as yet in its infancy.

4.10 Co-operatives

There are two kinds of co-operatives in the study area, formal and 'modern' : Co-operatives introduced by Government, and informal co-operatives or 'traditional' institutions and social-networks that have been in existence for long among the peasant farmers. A brief note on the informal co-operatives should first be made and finally some few words on the 'modern' co-operatives.

In a community that is aware of labour bottlenecks on individual farms especially during the busiest or peak of agricultural operations, farmers usually manage to overcome labour shortage by the employment of working parties obligated by 'traditional' institutions involving an element of reciprocity (see Chapter 8). In the study area, there is an element of mutual benefit and co-operation among farmers. For example, the 'traditional' ovu-losi (Moru) and woro-buda (Zande) working parties are important in farming for both clearing, hoeing and weeding. In the study area, the co-operation amongst women who brew and distil beer and alcoholic beverages, in that the waste produce of one stage is used to initiate an earlier stage, is another instance. However, women do not take this co-operation to its logical limits and co-ordinate their brewing so there are no gluts on some days and shortfalls on others. But there may be reasons for this, grain going 'off' and thus having to be used before it is wasted; members of the family feeling like a

drinking session; a space of time available in an otherwise busy period.

In the study area there were reported instances of successful 'self-help projects which were invariably the product of the energy, co-operation and enthusiasm of a small group of people without the support of some of their neighbours. For instance, in Mambe (Zone 4 : Maridi RC), a sub-chief between 1973-1976 was reported by some local leaders to have constructed a feeder road, about 13 km long only with the assistance of his extended family. Later, in 1978-1980 again they built a dispensary. Other villagers were reported to have refused to co-operate though they benefit from these farsighted facilities, the road and the health centre.

In the Sudan, 'self-help' is encouraged by the only one political party, the Sudan Socialist Union (SSU) and the Socialist ideology of the State precludes the support of individualistic entrepreneurs. On the basis of this policy, attempts have been made jointly by the Ministries of Agriculture and Natural Resources and that of Co-operatives and Rural Development to promote the establishment of consumer and production co-operatives. The aim was to provide trading facilities in the basic commodities such as sugar, salt, oil, soap and so on. Measures to prevent further practise of the smuggling of coffee and 'black marketeering' by itinerant travelling merchants especially along the Sudan-Zaire border led to the formation of some co-operative societies at Bahr Olo (Zone 4), Mongua II and III (Zone 4), Nagbaka (Zone 1), Bahr Na'am (Zone 4), Nabanga (Zone 2) and Maridi town (Zone 4). But these co-operatives have not been effective for several factors. Firstly, besides their infancy and lack of transport, the principles of these institutions have not yet been fully understood by most farmers. Secondly, the growth of the co-operative movement has been slowed by the inevitable constraint of creating necessary working capital from the limited savings

of farmer members whose main target is for food supply for family sustenance. Thirdly, suspicions of corruption, embezzlement and dishonesty and the persistence of some individualistic attitudes are some of the constraints. Also, the co-operatives are seen as a resource in the political arena and clan-based members seek to control them and often with negative attitude on their administration and effectiveness.

To conclude, this chapter has briefly discussed some of the aspects of human geography of the study area and the relationship with the physical environment. The interaction between infrastructural services and agriculture has been considered at various stages in the discussion. Transport and communications can be improved but justification is usually based on additional output which requires more exertion which cannot be achieved without the incentives which communications may bring. Periods of intense labour activity in the study area usually coincide with periods of high incidence of diseases. Thus, improved health facilities along with the improvement of supply of medicines are bound to have an impact on labour productivity and availability. Land in the study area is not limited in the strict sense of the term but there is competition for more fertile lands or that near good water supplies or infrastructural services. Thus, improvements of the 'traditional' farming systems must be concurrent with improvements in infrastructure development if many of the farmers' constraints are to be overcome. Additionally, attempts made by farmers to increase farm income and supplement dietary pattern is through the diversification of the economy and their involvement in some of the off-farm occupations. The discussion in this chapter takes a more general form rather than a more definitive coverage and is based on a series of observations into the problems as they affect peasant farmers. The nature of 'traditional' agricultural systems in the study area in which land management systems produce conditions favourable or antithetical to change is next examined.

CHAPTER FIVE

AN OUTLINE OF 'TRADITIONAL' AGRICULTURAL SYSTEMS IN THE STUDY AREA

"The aim of Agricultural Geography should be the interpretation and analysis of actual patterns or spatial organisation of agricultural phenomena" (Pred, 1967:10)".

Introduction

This chapter deals with understanding the current agricultural practices and land use patterns as a means of exploiting the physical environment by the peasant farmers. The crops grown and management of livestock and poultry are the main focus of attention. Consideration is also given to the farm calendar, local or current land use and agricultural changes and management systems focusing upon the way in which land management systems have produced conditions favourable or antithetical to agricultural change.

In this context, Sauer (1941:10) pointed out more than four decades ago that seeing the land with the "eyes of its former inhabitants" is one of the most rewarding ways to penetrate a culture removed in time and space from one's own. This view is therefore important in understanding agricultural change in the study area. On the other hand, Porter (1969:261) stated that "the environment must be put in a mode that is meaningful to the mind of the man who interacts with it." Thus, the propensity of a society to accept change is based in part upon perceived images of local and regional resources" (Larimore, 1969:279).

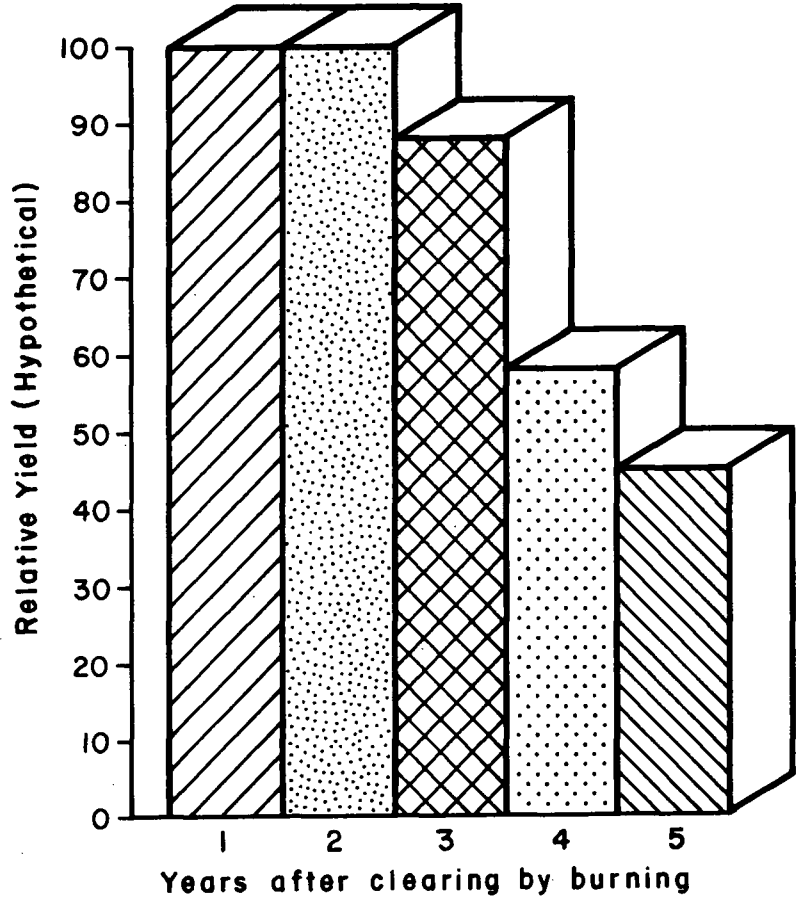
5.1 The Rationale And The Physical Basis Of Shifting Agriculture Land Use

In order to comprehend the working of the 'traditional' farming systems in the study area, it is necessary to consider briefly the tropical ecosystem and shifting cultivation. Nye and Greenland (1965) emphasised that in high rainfall regions with high rates of leaching, storage of

nutrients takes place in the vegetation rather than the soil. But once the rich vegetation has been cleared, soil is generally of low nutrient status. This does not necessarily mean that tropical soils are unproductive (Vine, 1954), but they have to be managed carefully if farming is to succeed.

In the study area peasant farmers intercept the productivity of the forest ecosystem through rotational bush-fallowing or land rotation. High forest or scrub is cleared by felling a chosen area with the help of an axe or machete. The biggest trees and others providing an economic return (e.g. palm oil, tamarind, shea butter) are often left standing. The cut wood, which may be supplemented by brushwood collected from neighbouring areas, is assembled into large heaps, allowed to dry, and burned at the end of the dry season. Immediately after the first rains commence in the rainy season, the sowing or planting of crops takes place on the cleared soil which has been 'fertilised' by mineral ash from the burned vegetation (see Section 5.1.1). As a result of the large net loss of nutrients from the site, cleared plots can only be used for a short time. One or two years is the minimum period in which the farm might be utilised depending on soil and other physical characteristics. In this survey, informal discussions with farmers revealed that progressive weed infestation and more or less declining yield (see Fig.5.1) are often the chief signals for plots to be abandoned after two or three years of utilisation and a new virgin land is selected (see Chapter 6). The natural vegetation cover left in situ re-establishes itself over a long period of about 20-25 years to allow the build-up of nutrient reserves (humus) in the soil (e.g. Nye and Greenland, 1965). Because of partial clearance of forest, bush regrows quickly and in about 4-5 years, a farm may attain an unrecognisable thicket tangle. Sometimes cassava crop may be left in the ground for a number of years (the invasion of bush-fallow by cassava is increasingly becoming an important feature in

**Fig.5-1 REDUCTION IN YIELDS WITH CONTINUOUS CROPPING
UNDER THE SYSTEM OF SHIFTING AGRICULTURE:
AN EXAMPLE OF COTTON, SOUTHERN SUDAN**



Source: Ruthenberg H., (1980) p. 47

the study area) to act as a famine reserve.

Farmers in the study area tend to clear new cultivable lands each year because in practice even where yields of two years' use can be obtained from a plot, it is best to ring changes in terms of crops planted. Within the context of a single planting, cycle crops will be mixed together in a staggered sequence so that some will be germinating as others come to maturity. Through crop management practices, the farmer can supply his basic wants and generate a reasonable food supply without having to let the bush-fallow run its full course. Finck (1973) and Gourou (1961) stressed that it has sometimes been tacitly assumed that the emergence of mature secondary forest should be the mark of optimum or 'ideal' agricultural usage under shifting cultivation; but that in practice an acceptable degree of ecological stability seems to be achieved by a fallow period of between five and ten years.

In accessible fertile areas, the vegetation is being replaced by the growing of coffee and citrus fruit trees (e.g. lemons, oranges, oil palm). The five to ten years' fallow period is short enough to allow the farmer to maintain an idea of the location of his former plots and this encourages a sense of family or individual ownership of land (not in the strict sense of the term) as opposed to more general notion of territoriality encountered in communities with abundant land. The problem is that a shift is required in attitudes to resource management. Under stable rotational bush-fallowing, soil and climatic resources are more or less given and it is the vegetation - initial forest, crops, weeds and forest regrowth - which is the focus of the farmer's management strategies. This is particularly so in regard to the physical characteristics of soils with relatively uniform structure.

The practice of, and underlying reasons for, bush-fallowing or shifting cultivation, its operation, advantages and disadvantages have

been extensively documented (e.g. De Schlippe, 1956; FAO, 1957, Morgan, 1969; McMaster, 1962; Morgan and Moss, 1970; Benneh, 1974; Prothero, 1972; Richards, 1977; Barke and O'Hare, 1984). But many writers have pointed to the extensive and wasteful nature of this system (Spate, 1945; Courtney, 1980; Barke and O'Hare, 1984; FAO, 1957). Others (e.g. Barke and O'Hare, 1984; Clark and Haswell, 1964; Netting, 1968; Benneh, 1974) have argued that the system allows for higher yields per unit of labour or worker-hour with relatively little effort needed to produce the desired harvest in a characteristic crop diversity and each crop takes its own particular requirements from the soil; the cultivator, by mimicking the diversity of the natural vegetation, causes a more balanced depletion of the soil nutrients, while the intermixture of crops discourages the rapid spread of diseases. In ecological terms, shifting cultivation causes the least change in the natural ecosystem. Thus, the system of multicropping simulates the original vegetation while exhibiting basic properties in common with all other systems such as structure, function, equilibrium and change (Stoddart, 1965; Emery, 1969).

In this context, when farmers were specifically asked to state how they know when to cultivate a piece of bush (Q.23a); several farmers' responses centred on the state of the vegetation, for instance, when there exist certain trees (e.g. kurgu, karanya, maza, ori, kifu : Moru) and tall elephant grass which is greenish in colour (e.g. dodu, tiya, 'doru : Moru); when 'saplings had trunks as thick as a man's arm' the cultivation could take place. Informal interviews with the sample farmers also showed that over 90% of them practise shifting cultivation system. It is emphasised here that careful consideration of the system reveals that there is a sound reasoning on the part of the farmers. Some of their reasons include : The flexibility of the system which allows moving to another farm plot if adverse environmental or ecological circumstances occur (e.g. pest damage and weeds or unanticipated poor

soil performance). Additionally, farmers' practice of bush-fallowing enables them to maintain, as noted earlier, high yields without chemical fertilisers' since a new plot is cropped every year and most tropical soils according to Benneh (1974) and Oyenuga (1967) are known to give very good yields in the first two years of cultivation.

In this connection, permanent cultivation would involve (if at all available) a major investment in fertilisers, pesticides and herbicides and small farmers do not have the capital. Other reasons invoked the chance to spread risks by having farm plots in different micro-climatic zones or ecological niches. Flinn, Jellema and Robinson (1974), Knight and Wilcox (1976) emphasised that the system allows for flexibility on the part of the farmers who otherwise have little control over the physical environmental forces, and illustrates why it is unlikely to be willingly abandoned or extensively transformed in the foreseeable future until all its latent potentials have been exhausted, population pressure on land becomes too great or better alternatives such as infrastructural services are developed as they are utilised by the peasant farmers. A fuller discussion of the environmental and agricultural knowledge of the sample farmers will be the theme of Chapter 6.

5.1.1 The soil under shifting agriculture

The techniques of farming pursued by 'traditional' subsistence farmers are the heritage of centuries of adaptation and adjustments by which peoples with a common store of attitudes, objectives and technical skills (culture) adjust to the realities of the physical environment. They reflect a hard-won core of empirically-derived knowledge concerning soil and crop capabilities within the familiar milieu of the homeland as outlined in the foregoing discussion.

In the study area, as noted earlier, shifting cultivation is

mainly practised. The majority of peasant farmers prefer village life and the land close to a village settlement or in the vicinity of the homestead (e.g. turudu : Moru) may be intensively used. The repeated clearance and burning of scrub or forest particularly those near a village, lowers the quality of the natural tree growth and reduces the fertility of the land. Fertility, however, would be more and more lastingly reduced if a plot were exhausted and shifting cultivation is wisely practised by farmers in the study area. Thus, the shifting cultivator makes the best possible use of the existing soil resources with the means available to him. Farmers' practice of having all refuse and manure concentrated on turudu or homestead gardens, such as the peelings from sweet potatoes, cassava and residues from groundnuts shelling, oil palm bunches, husks from maize cobs and sorghum, human waste and so on relatively increase soil fertility.

'Traditional' agriculture therefore involves careful management by farmers in the study area. Before the onset of the first rains in either late February or early March, the area to be cleared is selected and bush is cut so as to allow sufficient time for the tree leaves and branches to enrich the soil and become dry enough to burn. Burning and clearing follow and the cleared land has to be ignited by a person with some knowledge of wind direction and its changes. A large quantity of firewood is also burned as a means of providing warmth during cold periods especially when guarding crops from wild and destructive animals. It also provides ample source of cooking fuel. To illustrate further some of the characteristics of shifting cultivation and land use, the 'traditional' land use patterns as practised by the Moru and non-Moru tribes in Zones 3 and 4 (Maridi RC) is discussed below. This will exemplify some of the current management strategies of the land potentials in the study area.

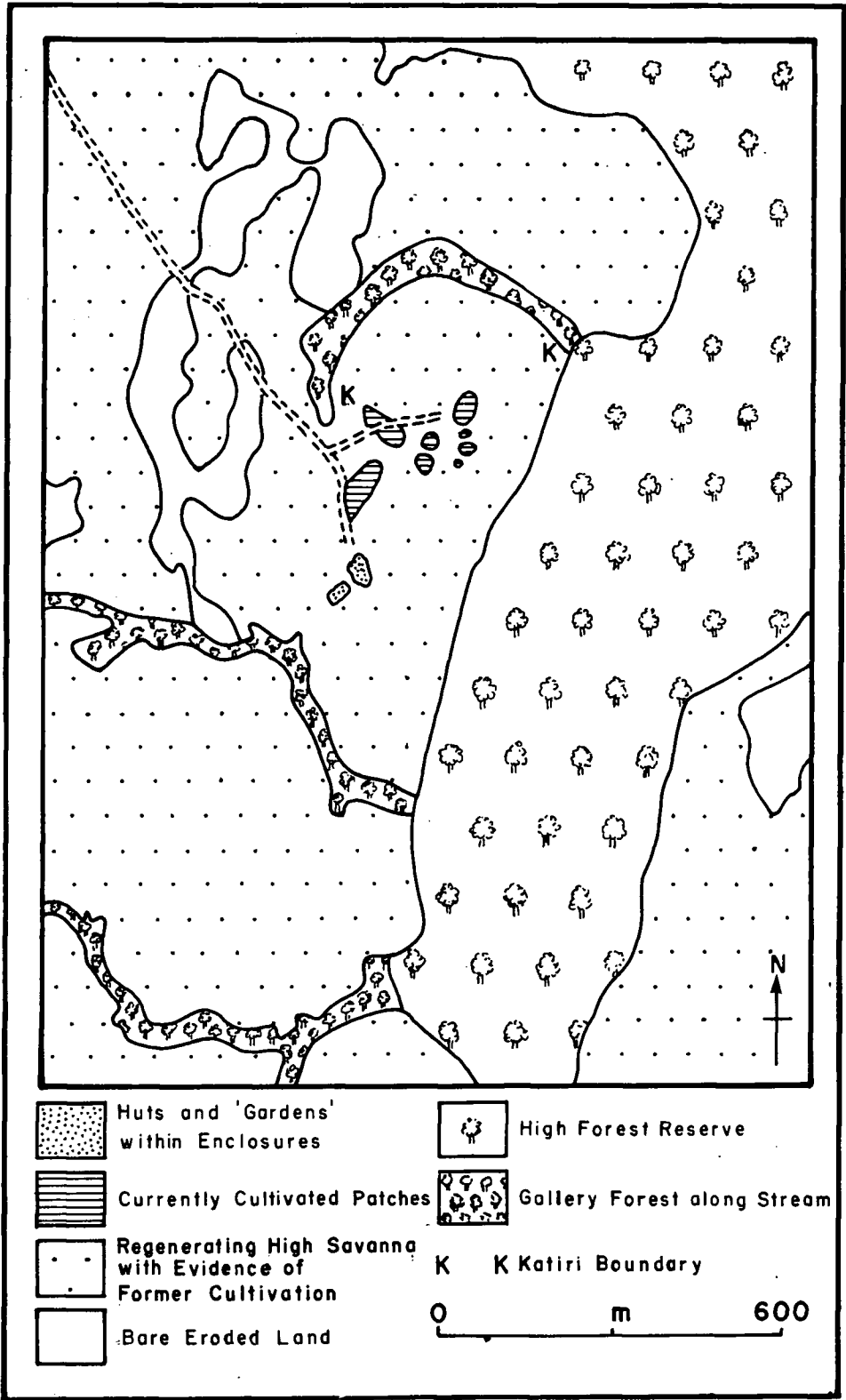
5.2 The Katiri Farming System : An Improved 'Traditional' Land Use?

In this section an attempt is made to describe briefly a system of cultivation practised in Maridi RC (Zones 3 and 4) known as katiri among the Moru. This is the next stage in the evolution of agriculture after shifting cultivation. Usually, in recurrent cultivation systems more than one class of land is cultivated with 'home fields' and 'fields far' from the homesteads. Some of the physical factors governing katiri and the merits and demerits will be outlined. The data for this section were obtained through informal discussions with farmers, local leaders and information supplied by one of the enumerators (Francis Wereson) who is a Moru and supplemented by secondary sources.

Among the non-Moru tribes in Maridi RC such as the Jur, Nyamusa and the Wira, the katiri system is not practised. Catford (1951) has briefly outlined the system elsewhere. Among the Avukaya (akin to the Moru) as well as the Baka and the Mundu tribes, a modified form of the system is followed, by whom it is known as disiyaka and gamuta respectively. In the process of discussion of the katiri system, Moru terms will be used. The difference in the system as practised by the Baka and Mundu is a result of their tendency to grow sorghum (*dura*) in pure stands and not intermixed with sesame.

The katiri is a roughly circular cultivation with a radius of approximately 200 to 400 metres and divided among 6 to 8 closely-related families of the same clan (see Fig.5.2). Katiri refers to the feature chosen as the centre of this cultivation such as a termite mound or a large tree. The virgin area (lowa) is first selected and the vegetation fired. Then the senior member of the clan mounts the mound or tree and divides the full circle according to the hoe strength of the clan. This division is dependent upon the total numbers of adult women, whether wives, widows, sisters or daughters or even mothers of the heads of

Fig.5-2 SHIFTING CULTIVATION AND THE KATIRI SYSTEM IN THE STUDY AREA



Source : Adapted from Lebon, J.H.G. (1965) P.143

household. The various duties of cultivation are, by custom, strictly differentiated between the sexes. At the division of the katiri, each woman is allocated a portion of land to which she confines her efforts. Each head of a household controls one or a number of segments according to the women in his family; he also undertakes the heavy clearing and sowing operations.

The full circle in the katiri may be divided into 10 or 12 segments. If there are more adult women than this in the clan, a second katiri is opened elsewhere. The spread of the individual segments is chosen with the aim that each should be carried outwards to the same direction or distance from the centre. There is also a strict adherence to straight paths (kiswe) between the segments. When the land has been cleared and cultivation reached its limit for the season, a hedge (aga) is built of brushwood and thorns around the extent of the circle of katiri. The system is cultivated for two to three seasons during which period the land is not redivided. It is then abandoned for five to seven years, sometimes longer, when the same clan will usually return to the site of a former katiri. After this time traces of the earlier cultivation would have disappeared and the composition of the clan would have changed thus leading to a new division of the system. The clan will usually possess two katiri cultivations in use : One on recently opened fertile or virgin land (lowa) and the other (tirika) in its second year after lowa. Occasionally, they may also have katiri land (moa) in its third year. The system also relates to the crop associations of which three 'field-types' are important as follows:

(1) Nyarango field-type : Named after its most important local sorghum variety. It is planted later in the season which fits with the need to clear the land and spread labour requirements. This association consists of nyarango, finger millet (kyifo 'desi), beans (koso) and sometimes

sesame (kanyu) and bulrush millet (kaza). The land is not burnt, but is hoed and sown direct into the trash in July to August. After germination, the trash is collected and the trees cut or killed. It is said that if the trash is left after the land is cultivated the grasshoppers eat the rubbish and therefore do not attack the emerging seedlings. The area is weeded by women. Harvest is spread - sorghum in January, millet and beans in December and sesame in February.

(2) Tirika field-type : This is planted into the land which was planted with nyarango the previous year and sometimes into land which was reasonably clear at the beginning of the season. The association consists of kanyu, two sorghum varieties namely, deri and moro as well as kyifo 'desi, kaza, koso which are planted early in the season in May or June. This 'field-type' may be continued for a third year (moa) or left after the second year if the fertility is poor, or put to cassava fallow.

(3) Bari field-type : This is planted later as an extension of nyarango and it takes its name from the bari sorghum variety (a variety of the Bari tribe in Juba District) probably diffused into the study area through cultural contacts. This variety is a quick-maturing but does not do well with heavy rain. The association consists of bari, a finger millet variety (kyifo dringuru), koso. Harvesting takes place mainly from January.

Having outlined the nature and characteristics of the katiri system, an outline of the factors governing the system are now noted.

5.2.1 Factors underlying the katiri system

From fieldwork observation supplemented by informal discussions with sample farmers, local elders, some of the factors governing the system are identified.

(1) Natural factors : In the study area, about 10% of the sample farmers

were encountered practising the katiri system. They live in isolated huts and away from the main villages and roads. There is plenty of material providing brushwood and thorn to form a hedge (aga). The variability of rainfall in time and space (see Chapter 3) is countered by cropping associations such that if conditions are unsuitable for one crop, others will fully develop. It also has advantages in checking weed growth. Wild animals are plentiful so the hedge (aga) around the system affords protection from wild animals and other pests.

(2) Social and historical factors : Although there are modified versions of katiri system among the non-Moru and two sample farmers practising it were encountered in Gworosai (Zone 4), the system is virtually confined to the Moru. Family and clan loyalty is a feature of the Moru and the katiri system maintains this social structure. Secondly, the system is predominant in areas of low population density where actual land (rather than available cultivable fertile land) is plentiful. However, the system seems to be dying out near the main villages and centres where population pressure on the available cultivable fertile land is relatively increasing. Thirdly, the Moru by nature are independent and the ownership of each segment is distinct and when co-operation or assistance is requested, it is sought equally from within and without the system. Fourthly, it has been indicated that the Moru were traditionally cattle-owners in the eighteenth century (Felkin, 1883-84 quoted in Catford, 1951), but that constant raiding by neighbouring tribes (e.g. the Dinka and Azande) depleted cattle numbers so much so that only a few cattle are now found in some isolated areas (especially in Zone 3). Therefore, the fence (aga) around the perimeter may have evolved not only as a protection against wild animals but also against livestock. Finally, among the Moru, hunting and gathering are only some of the many off-farm occupations (Chapter 4) which in some cases take precedence over farming activities.

(3) Institutional and economic factors : Considering the distance of the radius (about 200-400m) of each katiri circle, and that each clan requires two to three systems at any one time, a vast area of land is therefore required. With the increasing of population around the main urban and suburban and larger villages, the katiri system is gradually being pushed out to the more inaccessible areas. This implies that infrastructural services such as education, health, transport and improved water supplies and so on are usually inaccessible. Additionally, access to major urban markets becomes difficult but this could be a factor in maintaining the status quo within the katiri system.

The advantages and disadvantages of the katiri system can be summarised as follows:

Advantages

- (a) Protection against wild animals which is generally a major problem facing farmers in the study area;
- (b) Facilitates agricultural extension through group participation thus minimising time and transport;
- (c) Maintains clan and family loyalty where tribal loyalties are not strong;
- (d) Adapted to the environment where land is plentiful;
- (e) Cropping association allows security and insurance against the variability of environmental or ecological phenomena (e.g. rainfall).

Disadvantages

- (a) In certain circumstances soil erosion is encouraged because comparatively large clearings are made;
- (b) Soil exhaustion is encouraged where there is not a sufficiently long soil regeneration period;

- (c) The scattered and medium population distribution inherent in the system leads to administrative problems and provision of infrastructural services especially during the rainy seasons.

In the light of the description of katiri system, it may be suggested here that in those areas where the system still exists, any policy for agricultural change and modification of the system must probably be guided by close work study of the structure and functioning of the system. This calls upon further research or indepth study of the katiri system of agricultural land use in the study area.

5.3 The Crops Grown And Livestock In The Study Area

Before starting the discussion of farming practices, it is necessary to state briefly the relative importance and general characteristics of the crops grown in the study area. Farmers have a variety of crops which are either indigenous or have early been acquired through cultural, tribal, migrational and trade contacts with the neighbouring peoples. Some crops or crop varieties have also been introduced into the study area either by early European missionaries or more recently by the Government and PDU agencies. Staple grains (cereals), roots, oil, legumes, fruits, vegetables, condiments and other crops are mainly grown for food and some are offered for sale to meet cash requirements. There is also poultry and a little livestock. Recognising that food production within the community is not solely for self-consumption, but that peasant farmers are integrated within the market economy, this sphere of research focuses upon food products that are offered for sale and the use to which the available cash is placed.

The discussion in this section centres on the major characteristics of some of the most important food and cash crops grown in the study area as summarised in Appendix 9 showing the scientific, common and vernacular names of crops. However, specific crop utility functions and value

characteristics and farmers' perceptions, food preferences and tastes of some selected crops and crop varieties are discussed further in Chapter 6.

The picture which emerges is the dominance of food crops reflecting the subsistence priority of farmers in the study area, with few specific cash crops and livestock. Whilst a wide variety of food crops are grown, there is a relatively homogeneous pattern throughout the study area. Cash crops (in its strict sense) are very limited and are mainly specific to certain areas. For example, coffee is mainly suited to the relatively wetter areas (e.g. Zones 2 and 4) and tobacco to riverine soils. Cattle are limited in numbers and only found in isolated pockets - mainly in Zones 1 and 3 around Amaki, Ngonde, Maruko and Madoro areas. Sheep and goats being comparatively more resistant to trypanosomiasis, have a wider distribution but are more prevalent in Langua, Mangaehe, and Ngonde areas (Zone 3) and mainly in the eastern areas of Zone 3 (Maridi RC). Some poultry is kept by most households throughout the study area mainly as a so-called 'backyard subsistence enterprise'.

5.3.1 Food crops and varieties

Generally speaking, the same food crops are grown throughout the four zones comprising the study area. The most important of these are sorghum, sesame, cassava, groundnuts, maize, finger millet, bulrush millet, beans, cowpeas, green gram, sweet potatoes, bambara nut, egg plant, okra, yam etc. The crops mainly grown around the homestead include sweet potatoes, yams, egg plant and okra, while the other crops are grown on a field scale away from the homestead.

The main food crops, some of their varieties and other food crops as perceived by the sample farmers, as well as information provided by the agricultural extension staff (overseers) in their respective extension areas (delineated zones) are provided in Table 5.1. The method of

Table 5.1 The main food crops grown and some varieties and other food crops in each agricultural extension staff area in the study area

Zone	Extension Area	Main food crops grown in order of importance	Varieties of Crops	Other Food Crops Grown
1	Ibba-Arud	1. Sorghum 2. Sesame 3. Finger Millet 4. Groundnut 5. Cassava 6. Bulrush Millet	Mangbagu, Lali, RBri, 9DX7/11, Serena Bungere, Bura, Nzungbo, Yagoza, Bosere Ngindo Wand, Boombiso, Baarima, Banga, Meduara Abazomangi, Abambura, Abizo, Agabu, Zuguzugu Pusitara, Mbiri, Karangba, Mavanda, Babua	Hyptis, Cowpea, Sweet potatoes Eggplant, Bambara nut, Mango Citrus fruits, Beans, Maize
	Maruko	1. Finger Millet 2. Sesame 3. Groundnut 4. Cassava 5. Sorghum 6. Bulrush Millet	Bambiso, Baarima wana, Maduara, Ngindo Miregbie, Baamuamu, Basere, Yagoza Abizo, Agabu, Zuguzugu, Makaraka, Cheang Nziritigo, Tigboyo, Bakango, Babua Mbirika, Ndala, Nyarango, Mabior, 9DX7/11, Serena	Cowpea, Green gram, Sweet potato Mango, Beans, Okra, Pumpkin Maize, Eggplant, Tomato, Kpagu
2	Nabanga	1. Finger Millet 2. Sorghum 3. Sesame 4. Cassava 5. Groundnut 6. Maize	Bambikondo, Bazagbara, Pusimoru, Bamoru Viva, Lalongoro, Ndala, Mbiri, Mabior, Serena Basere, Bangalia, Yagoza, Bura, Bungere Bakongo, Gbazamangi, Tigbogo, Mbiri Abambura, Makulu Red, Makaraka, Iba, Abizo, Awande-azande, Mani Pintar Bangbaya, Bisende, Badari, Nabandai, Kaima	Beans, Pumpkin, Sweet potato, Mango Banana, Pineapple, Guava Green gram, Bulrush Millet, Okra Hyptis, Yam, Sugar cane, Bambara nut, Yam (coco), Eggplant, Yam, Gourds (Kpagu)
3	Amaki	1. Sorghum 2. Groundnut 3. Cassava 4. Sesame 5. Maize 6. Finger Millet	Nyarango, Ndala, Deri, Bari, Mabior, Moro, Serena Iba, Kuku, Makulu Red, Atizo, Makaraka Movondo (sweet), Karangba (Bitter) White and Black Katumani, Western Yellow, Local varieties (unspecified) Red variety	Bulrush Millet (Kaza), Sweet potato, Beans White/Black and white), Pumpkin, Okra Mango, Eggplant, Tomato
4	Ras-Olo I	1. Groundnut 2. Cassava 3. Sorghum 4. Maize 5. Finger Millet 6. Sesame	Makaraka, Atizo, Kuku, Zande-awande, Mani, Matindi, Mani Pintar Karangba (Bitter), Movondo (Sweet) Gbazamangi (Bitter) Ndalla, Deri, Nyarango, Bari, Mabior Serena, 9DX 7/11 Madaraka, Katumani, Western Yellow, American Maize Kyifo (White) Red Bungere, Red (Kiru) White, Bosere, Miregbie	Beans (Koso), Bulunga, Yam, Sweet potato (Red) Bananas, Pineapple, Mango, Citrus fruit, Bulrush Millet, Bambara nut, Sugar cane Hyptis, Okra, Pumpkin
	Edi	1. Sorghum 2. Cassava 3. Groundnut 4. Maize 5. Finger Millet 6. Bulrush Millet	Mangbagu, Lali, Serena, Mbiri, Ndala Karangba (Bitter), Movondo (Sweet), Gbanda Ziraa Atizo, Iba, Matindi, Makulu Red, Mani Pintar Western Yellow, Katumani, Sekeremende Maduara, Ngindo, Baarima, Bambiso	Sesame, Sweet potato, Okra, Pumpkin Citrus fruits, Beans, Bambara nut Eggplant
	Maridi-Kuanga	1. Sorghum 2. Cassava 3. Sesame 4. Groundnut 5. Maize 6. Finger Millet	Moro (Nyandok), Deri, Ndala, Lali, Serena, Nyarango Pusitara, Mbiri, Karangba, Gbazamangi (Bitter) Turudugwa, Basere, Bungere, Turubungura Yagoza Iba, Makulu Red, Atizo, Abambura, Abizo, Makaraka Badali, Bisende, Kaima, Nabandai, Katumani Kyifo, Red, Pusimoru, Ngindo, Banga	Hyptis, Beans, Sweet potato, Green gram, Pumpkin, Okra, Mango, Citrus, Banana, Pineapple, Guava
	Bahr-Olo	1. Groundnut 2. Sorghum 3. Maize 4. Cassava 5. Finger Millet 6. Beans	Iba, Makara, Atizo, Abazomangi, Abizo Serena, Ndala, Nyarango, Deri, Moro, Bari 9 DX/11 Western Yellow, American Maize, Sekeremende, Bangaya Movondo (Sweet), Bakongo, Mbiri, Gbanda Ziraa Kaza, Kyifo (White), Red, Ngindo, Banga Titingwa, Koso	Sesame (Kawari, Kyiriko), Sweet potato, Yam, Pumpkin, Okra, Citrus, Mango, Pigeon peas, Green gram, Tomato, Bulrush Millet

Source: Fieldwork Data

interviewing the extension staff was by providing each one with a simple form (see Appendix 14). Each interviewee was then required to draw a map of his extension area and marking in villages, roads, tribal differences and approximate boundary of his area. Superimposed on this map were three sheets of tracing paper, and on each sheet, food crop patterns and an overview of the enterprise patterns on a district basis were indicated. It was initially planned to present food crop patterns in each extension area on a map. However, the picture which emerges from the analysis of the food crops is that similar food crops are grown throughout the study area so that a tabular format (Table 5.1) serves the purpose. A major problem in identification of varieties has been the different vernacular names for the same variety and the widely different spellings. An attempt has been made to standardise the names for the major food crops into Zande, Moru and Arabic (the same crop names are generally used by the Baka, Mundu and Avukaya). A more sophisticated taxonomic study to establish true varietal differences certainly deserves further research. Some of the general characteristics of the important food crops and varieties are outlined below.

(1) Sorghum

Sorghum is the staple cereal and there are many local cultivars with different keeping qualities, tastes and colours. The most widely grown varieties among the Moru and non-Moru are nyarango, moro, ndala, deri, mabior, beri and bari, though nyarango - a long season variety or any other long season variety for that matter are seldom found in the Jur, Nyamusa and Wira areas (Zone 3) as well as around Ngonde and Kuji Yabe (Zone 3). It is also found in other parts of Zone 1, for example, around Madoro. Among the Zande, yunde (sorghum) varieties include : mangbagu, lali, r̄bri - known to produce high yields. These varieties are especially grown in Matorombo, Madoro, Makutari, Nagbaka (Zone 1) areas as well as in Wowo,

Kangwa and other areas in Zone 2. The various varieties have particular attributes which complement each other and they play an important role in the various crop associations. Farmers select a combination of varieties and by sowing successively through the cultivation season, contrive to spread labour and water requirements over the maximum time and to minimize the chances of total crop failure through periods of rainfall failure. Some of the PDU's exotic varieties such as 9Dx7/11 and Serena were mentioned by the extension staff and farmers as commonly found in their areas.

Among all the tribal groupings in the study area, there are different uses of sorghum. It is ground to flour and cooked into thick porridge or mash (bakinde : Zande, linya : Moru, asida : Arabic) and eaten with sauce; it is also made into a type of thin unleavened bread also eaten with sauce; brewed into beer and aragi. Young sorghum stalks (e.g. gbunguru : Moru) are often chewed by people for its sweetness and especially by children guarding the unharvested crops and working in the field. Sorghum has great drought resistance and needs less water in the growing season. It has a very great adaptability to moisture conditions and a variable periodism. Some stalks of sorghum are used as reeds for making baskets and other food containers and for processing the crops in the courtyard and field. Some sorghum varieties are high yielders, early yielders and good storers and therefore fulfil the subsistence requirements of the farmers.

(2) Bulrush millet

This is the cereal of poor, sandy, semi-arid areas in some parts of Darfur, Kordofan and Bahr El Ghazal Provinces of the Sudan, which according to De Schlippe (1956) are also the areas of its origin from where it has been diffused into the study area. It is used for flour in food and for beer preparation. Bulrush millet (ngiria : Zande, kaza : Moru) is susceptible to bird attack and some diseases, but stores

well on its head. It rarely enters the market.

(3) Finger millet

The extension staff appeared to have little knowledge of the varieties of the crop. However, several sample farmers were able to identify different varieties. Among the Moru and non-Moru in Maridi RC (Zones 3 and 4), there are two main varieties (kyifo 'desi, kyifo dringuru : Moru); while bakude (Zande) variety is the most important of all the 'traditional' cereals among the Azande. Other varieties such as drodrowa, nyandengo and arize (Moru) were mentioned in Zone 3 and wana (Zande) in Zone 1. When the crop is harvested by women using small knives, it is dried on stalk. It is hulled, winnowed, ground and cooked with water to form a thick mash and eaten with sauce, relish or stew of cooked herbs, beans and/or meat and eaten as a common dish. Local beers and alcoholic beverages are made from the crop. Women are experts in its preparation which constitutes one of the sources of income. Some 'traditional' food containers are also made from peeled stalks. The different varieties of the crop in the study area mostly store very well as the grains are too small for insect penetration.

(4) Maize

Maize is an annual grass of American origin usually said to have been brought to Africa by the Portuguese (Miracle, 1965). However, there is some suggestion that its introduction to Africa may have been pre-Columbian (Carter, 1968; Jeffreys, 1953, 1954, 1967). De Schlippe (1956) mentioned that the crop may have occurred together with other introductions on the Nile-Zaire (Nile-Congo) watershed. Thus, the crop must have been diffused into the study area from Zaire probably through cultural and migrational contacts. It is considered by different tribal groups as a 'traditional' crop. There are several varieties in

in the study area. Among the Moru maize (dabali) varieties include turu'dudri or ingudri, toromo and badali. Turu'dudri or ingudri is a field type, while the toromo and dabali are grown near the homestead. There are many varieties but all have the same cultivation. In general, the PDU have introduced Katumani and Western Yellow exotic varieties that are quick-maturing.

Maize requires higher fertility so is planted down the slope from the house where household waste (including chicken manure) is washed down by rain and so is particularly fertile. The human waste also contributes significantly. Perhaps this is a serious consideration when propagating and talking of farmers in rural areas to use pit latrines. The crop is susceptible to damage from several diseases and pests. Maize can be eaten green, roasted or boiled on cob. Children sometimes chew maize stalks. It can also be sun-dried and ground into flour for thick porridge, or can be baked into a 'traditional' bread (mbata : Avukaya). Local beers are made from maize and is mostly harvested and processed by women.

It can be stored with its hanging leaves tied either under granaries, shelters or on to other specially-constructed wooden shelters and well protected from rain. It is a main food crop but also surplus is offered for sale. Maize is not a crop that can easily be expanded as the limiting factor is the fertility of the soil which can only be maintained near the homestead. Several plantings may be made, sometimes in association with sorghum, but it is usually a pure stand cultivated continuously on the same land.

(5) Rice

It is an upland type of rice and a very early introduction from Zaire probably due to trading, migrational and cultural contacts in the 19th century. It is an important staple and cash crop especially

grown in Zones 2 and 4. The crop requires good soil with good water-holding capacity and even distribution of soil and air moistures.

Store pests attack hulled rice but paddy can be kept in good condition for at least two seasons. It is liable to bird attack. Rice is becoming an important staple crop.

(6) Cassava

Cassava (gbanda : Moru, Avukaya, Mundu, Zande) is a crop that is becoming of importance. All told, that following a serious famine in 1932 caused by a plague of locusts and drought in Maridi and Mundri Districts, the district commissioner of the time introduced cassava as a famine crop (Bowili, Personal Communication). Initially, whilst the people were coerced into planting the crop, not much was consumed, but later it became widely accepted and is thus planted in a variety of ways. It may be planted as a fallow after sorghum, into groundnuts, or as hedges around the farm plots. In the study area, there are a number of clones, ranging from sweet which can be boiled direct to the bitter which is usually fermented, sun-dried and ground into flour and made into a thick mash (asida) either used alone or mixed with dura flour. It can also be used as an alcoholic spirit (aragi) from fermenting dura and cassava flour and then distilling. Sweet varieties can be boiled and baked to be eaten as a snack, either alone or with groundnut or sesame paste. Leaves can be eaten, after chopping or pounding and cooked with wild Jews Mallow thus providing valuable nutrients.

Several varieties of the crop were noted. Among the Zande (Zones 1 and 2) some varieties include : Ghazamange (bitter variety), mbiri (bitter), pusitara (sweet), karangba (bitter), mavanda (semi-bitter). While among the Moru and non-Moru some of the varieties include : Movondo, karangwa, gbazamangi, being the most popular. In

Zone 3 (Ngonde) ziraa variety was mentioned. Farmers in the study area generally plant sweet cassava varieties near their homesteads because they are easily attacked and most liked by baboons. The bitter clones are said to be not liked by baboons and so are usually planted further away from the homesteads though some are attacked by hungry baboons regardless (see Chapter 7).

It is reported that an improved labour-saving method of cassava preparation which renders it unnecessary to soak the roots and ferment in streams or water ponds to remove the poisonous bitter liquid chemical was introduced by Dr. J.G. Myers (quoted in Southern Sudan Development Investigation Team, 1954). Unfortunately, the method was not accepted as apparently the people have a liking for the flavour. An improved method of cassava grating exists, and this is simply a one-side pierced empty petrol tin used by women in most households.

(7) Sweet potato

The crop known as bangbe (Zande) and mondovo (Moru, literally meaning the place of the sweet potatoes) is grown in the same plot for several times. Sweet potatoes are usually planted on mounds by burying the weeds in the centre of the mound. This gives good humus and the vines smother the weeds in their denser cover. It is harvested like cassava when need arises. Several varieties are planted and only identifiable on the basis of their leaf shape and colour of their tubers and period of growth. It is less tolerant to drought than cassava and requires well-prepared heaps or mounds. It is grown as a food and cash crop. It can be eaten boiled, baked or fried, often as a snack and sometimes with groundnut, sesame paste or honey. The leaves are sometimes eaten as a vegetable in the relish.

(8) Yams

De Schlippe (1956) mentioned Central sub-equatorial Africa as the likely area from where it may have been introduced into the study area. Yams are planted near homesteads and on a ridge. Like sweet potatoes, yams are vegetatively propagated and are a good foodstuff. There are several varieties including the climbing variety (gbara-ngua : Zande). Several wild yams occur and are gathered by men and women alike and especially by hunting groups. The crop is particularly dominant in Zones 2 and 4.

(9) Oil palm

The crop (mbiro : Zande) must have been diffused into the tribal communities through the Guinean belt (De Schlippe, 1956). The crop is collected and oil is extracted from it. Households usually plant oil palms near the homesteads and in outlying fields from compounds. They are sometimes interplanted with other field crops. If oil palms are planted in a straight line or path, then they indicate the boundary of neighbouring fields. Harvesting of oil palm is a difficult task. The use of bamboo pole lengthened by the addition of one metre sections and at the end of the pole is attached a small sickle, is the most common method. By applying the sickle blade to the base of a bunch of the palm oil fruits and pulling, the bunch falls to the ground. But it is said that this method is difficult as the pole cannot be tilted vertically as a precaution against the sickle falling off and hitting the harvester. It also causes strain on eyes and neck. Sometimes harvesting of the fruit is by climbing the tree with difficulty as it is thorny and this occasionally leads to gatherers falling and being killed or injured.

Women are experts in processing and crushing oil palm into oil, and know which constitutes the sweetest edible oil among others. They

also use the oil as an ointment on their bodies and hair to produce shiny and soft complexion of skin and hair.

(10) Sesame

The extension staff and farmers usually identified the variety by its colour, namely white, for example, turubungwa:Moru, bungere:Zande; red (kira:Moru, nzungbo:Zande). These varieties are widely grown in the study area although other varieties such as those found among the Moru and non-Moru (e.g. tovou kuku, kawari, kyiriko and badi were reported mainly in Zone 3. Among the Zande, varieties such as yagoza, bang-balia, basere, miregbie were also mentioned to be dominant in Zone 1 in particular. The crop is grown on low nutrient soil, but it is subject to attack by leaf-spot diseases. It is harvested by women whose expertise is widely known. At harvest, the pods shatter easily when dried. Women hull and husk it by pounding or beating. Usually, the harvested sesame is tied on a wooden-constructed stand (duro:Moru) where they are sun-dried. After processing, the seeds are well stored in special 'traditional' containers such as clay pots and gourds which are sealed off at their mouths with clay-mud mixed with sheep or goats' dung. This is to protect it from pests and diseases.

In the study area, sesame is generally used to make a paste for flavouring the relish and other foods, the seeds being dry-roasted and then ground, to make oil for cooking; to brew beer (konyimoru, literally meaning 'beer of the Moru') when fermented with sugar or honey. It is also used for making tamia (Arabic), a mixture of honey and sesame, eaten as a snack between meals and especially by children. In the study area, hyptis is grown fairly widely in association with or even replacing sesame and it has similar uses and growth characteristics as sesame. But it is said to be hard to grind and, therefore, is used to test the working capacity and talents of newly-married wives.

(11) Groundnut

It is one of the most important food and cash crops in the study area. As it is an American crop introduced to East Africa through West Africa by the Portuguese (Knight, 1974), the crop was probably introduced into the study area from Central Africa and spread from tribe to tribe (e.g. Iba variety, from Zande to Moru) through cultural contacts. There are several local varieties, for example, among the Zande, groundnuts (awande) varieties include : ambambura, abizo, zuguzugu, amadamu, abiranga, boroawande etc. which are widely grown in Zones 1 and 2. Among the Moru, for instance, groundnut (s̄r̄m̄ndi) varieties include : Iba, makaraka, atizo, matindi etc. which are widely grown in Zones 3 and 4. Recently, the PDU introduced improved or exotic varieties (Makulu Red and Mani Pintar, quick-maturing varieties) formerly grown and introduced from Zambia. These exotic varieties are increasingly grown in Zone 4 in particular, although they were also reported in Zones 1, 2 and 3. These varieties are often sold because of their high oil content not palatable to local taste. Groundnut is mostly eaten as paste, having being dry-roasted; skins removed and ground; used to flavour the relish of meat, fish, beans and vegetables in particular.

(12) Earth nut/Bambara groundnut

The crop has similar physical characteristics as groundnut. It stores well in the soil as cassava. It must have been diffused into the study area through cultural contacts with neighbouring peoples.

(13) Common beans

These include cowpeas (abapu:Zande, koso:Moru) and green gram or mung bean (abakpa:Zande, duduru:Moru). There are several varieties identified in the study area of which the white with black eye and red (kidney) beans are common. Cowpeas are sown together with groundnuts

and grain crops. Common beans are eaten as a relish by boiling alone or with whole sorghum and sesame or groundnut paste added after cooking. Sometimes the peas are dry-roasted, roughly ground, winnowed and boiled and also eaten as a snack especially for children and those who remain at homesteads during the cultivation season. The leaves are also cooked as part of vegetables. There are several identified varieties of cowpeas and green grams. These are often localised and reflects the cultural contacts many people had with neighbouring countries. Extension staff reported that many of the beans have spread to the other tribal groups who often look to the Moru for sources of planting seeds.

(14) Oil-seed cucurbits

In the study area there are several oil-seed cucurbits used for various purposes, oil seeds, vegetables, calabashes, gourds and sponges. Different varieties of the same species may be used for different purposes, and different species may be used for one and the same purpose. Besides the other uses, oil extracted from the various oil seeds is used in sauce and a skin cosmetic and for hair dressing. De Schlippe (1956) provides a list of some of the oil-seed cucurbits among the Azande.

(15) Fruits and vegetables

Several fruity vegetables and fruits are dominant in the study area. These include: Temeleka (Moru), agyiri (Gynadiopses gynanda), gurdern (Jews Mallow), okra (Hibiscus esculenlus), dodo (Amaranthus spp) and rigila (Portulaca oleraca). These are usually eaten as a sauce or relish with thick mash.

Of the fruits, bananas, pineapples, mangoes, pawpaw among others are dominant. Bananas are planted in-between rows of coffee trees to act as wind breaks. There are many varieties of gourds, native tomatoes, cucumber, lettuce, cabbages, pumpkins, roselle, etc. which are usually

planted with some cereal crops. Some varieties of vegetables are probably the result of introductions into the study area by early European missionaries. Several leaves of a great variety of wild growing economic trees (e.g. tamarind) are sometimes gathered, cooked and eaten especially in the hungry gap periods. Many crops such as roselle, chillies (red or hot pepper) are self-sown but allowed to grow and picked by several households for their own use and offered for sale. As these crops form a very important part of the farm family diet, any agricultural extension programme should recognise their importance in the 'traditional' farming systems.

5.3.2 Farmers' and agricultural extension staff perceptions on the importance and decrease of some crops in the study area

In the administration of the questionnaire farmers were asked to list the crops in order of importance (Q.11,a), and also their main food crops (Q.15). The crops were then grouped under broad headings and farmers' responses were calculated and presented as percentages in Table 5.2. From the sample, while there are zonal variations on farmers' perception of the importance of some of their crops, it is clearly evident from the table that a larger proportion (91-100%) of farmers' responses were centred on sorghum, groundnuts and cassava. It appears that cropping associations and inter-cropping practices are more important than environmental conditions. Fruits such as pawpaw, banana and the various types of citrus form an important dietary supplement especially in the relatively wetter zones (Zones 2 and 4); whilst mangoes are to be found throughout the study area - reflecting their widespread distribution in the 1930's and 1940's by the European missionaries and agricultural staff.

Agricultural extension staff were also informally asked to indicate which crops and varieties were becoming more important and which ones were decreasing and the reasons why. The sorghum varieties of nyarango, mangbagu, ndala, moro etc. were widely reported to be

Table 5.2 Estimated percentages of farmers in each zone reporting different crops as "important"

Zone	Class	Under 10%	10-20%	21-30%	31-40%	41-50%	51-60%	61-70%	71-80%	81-90%	91-100%
1 (N=32)	Cereals							Milletts	Maize		Sorghum
	Relishes	Beans Pigeon peas, Bam- bara nut					Hyptis Green Gram			Cow pea	Sesame Ground- nuts
	Root Crops					Yam					Cassava
	Vegetables*	Tomato			Green leaf veg.		S.potato				Pumpkins
	Fruits	Banana Pawpaw Mango									
	Cash Crops	Coffee Cotton			Tobacco						
	Others										
2 (N=32)	Cereals	Rice							Maize F.Millet		Sorghum
	Relishes	P.pea G.gram	Hyptis			Cowpea	Sesame				Groundnut
	Root Crops			Coco yam			S.potato				Cassava
	Vegetables*		G.leaf Veg.	Tomato				Pumpkin	Okra		
	Fruits		P.apple Oranges Lime	Pawpaw Mango	Banana						
	Cash crops	Cotton, Teak Coffee Guava S.cane									
	Others										
3 (N=48)	Cereals					F.and bulrush M.				Maize	Sorghum
	Relishes	Beans P.pea Yam	Hyptis G.gram		Cowpeas					Sesame	Ground- nuts
	Root Crops					S.potato				Cassava	
	Vegetables		Tomato G.leaf Veg.					Okra Pumpkin			
	Fruits	Guava Orange	Pawpaw Lemon Mango Coffee		Banana						
	Cash crops	Cotton Teak		Tobacco							
	Others										
4 (N=48)	Cereals		Rice						Maize	Bulrush & F.mil- lets	Sorghum
	Relishes	Hyptis G.gram	P.pea					Cowpea	Sesame	Ground- nut	
	Root Crops						Yam Okra	S.potato		Pumpkin	Cassava
	Vegetables*	Egg plant	Tomato G.leaf Veg.								
	Fruits	Guava			Orange Lemon	Mango	P.apple		Banana	Pawpaw	
	Cash crops	Cotton	C.Fruits Coffee				Tobacco				
	Others				S.cane						

Source: Questionnaire Analysis, 160 Farmers interviewed in Maridi District

* Green Vegetables are under-represented because such crops in the study area are usually considered as women's domain.

N.B. 1) Farmers' perception of crop importance is not necessarily correlated with crop area. This is because crops such as maize and vegetables may be very important as these mature quickly and hence are eaten during hungry gap periods by households but are of limited area due to adverse environmental circumstances.

2) A feature of Zone 1 is the relative prominence of cowpeas grown by more than 80% of the households interviewed, and Hyptis and green gram, grown by over 50% of farmers. Sesame, a crop moderately resistant to drought, although an important crop in the study area, appears to be prominent in this zone.

3) Zones 2 and 4 seem to be similar in the crops grown. The increasing importance of fruit both for home consumption and for sale and of sugar cane grown in small quantities is evident from the table. Also, crops associated with high rainfall areas in the south and along Maridi-Yambio road, Maridi-Mundri roads such as rice and coffee are given a greater choice of cropping pattern to the farmer.

increasing throughout the study area. Deri, was also mentioned as increasing in Zone 3 (Amaki, Ngonde, Kuji Yabe) and mabior, mbirika in Zone 1 (Madoro, Matorombo and Maruko) for their storage ability, resistance to drought and yield of quantity and quality. Ndala, was reported as increasing in Zone 2 (Nabanga, Kangwa and Wowo areas) and Zone 4 (Gworosai, Edi and Ras Olo areas) for yield of quantity and quality. In Zones 2 and 4, cassava was reported to be increasing because of its good storage ability in the ground and grown as a fallow crop planted after the various sorghums and groundnuts. Sesame was reported as increasing in Zones 1 and 3 because of its palatability and its various uses - oil, paste and in bread. Finger millet was reported as popular in Zones 1 and 2 due to several socio-economic and cultural reasons. Groundnuts were generally reported to be prominent throughout the study area because PDU exotic varieties (Makulu Red and Mani Pintar) were being grown by several farmers.

However, there is less agreement on those crops and varieties which are diminishing in general importance with the exception of sweet potatoes which were generally mentioned as being abandoned in most parts of the study area because of its poor storage qualities and susceptibility to worm damage. Although not specifically mentioned, it is likely that the sweet potatoes are being replaced by cassava, especially the bitter varieties which store well in the ground; can be made into flour and local beers; requires less work than sweet potatoes which usually require higher labour input and are grown in mounds rather than on flat areas as does cassava. In Zone 2 (Wowo, Kangwa and Nabanga areas) snails were reported to be discouraging the growing of some crops such as beans, sesame and finger millet.

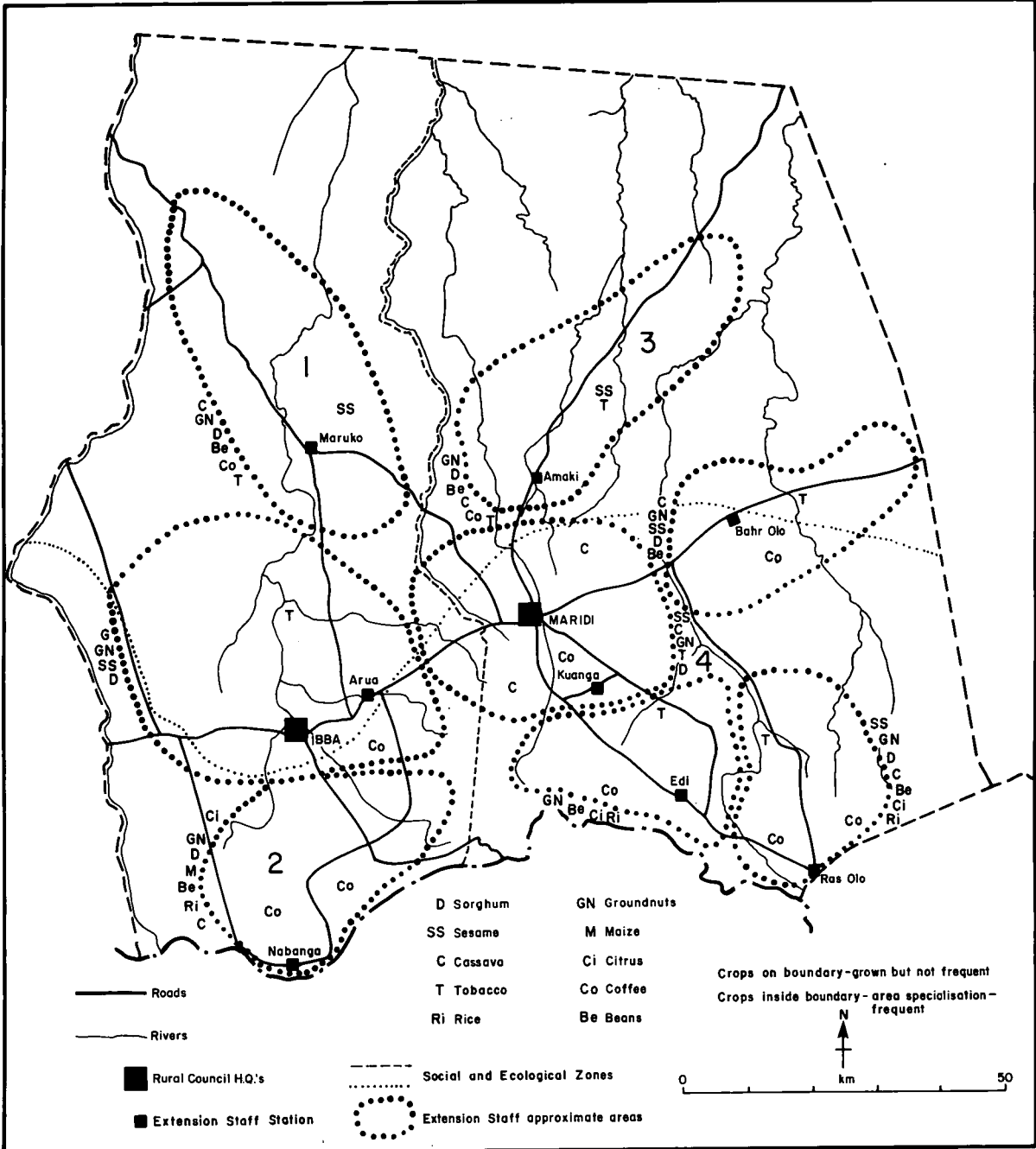
5.3.3 Cash crops

During the Anglo-Egyptian Condominium period, attempts were made to encourage the local people to grow cotton as a cash crop (see Chapter 9) but little success was achieved. Farmers had and are still holding a negative attitude to growing the crop. One sub-chief in Gworosai (Zone 4) and informal discussions with several farmers revealed that cotton seeds were often not distributed at the right time by the EPAPC. Additionally, picked cotton was often not collected by the agricultural staff who entirely control its marketing.

In the study area, purely cash crops are of limited importance although robusta coffee growing is increasingly becoming popular (see Chapter 11) and tobacco is grown both for domestic use and sale, particularly in the riverine areas. Cash crops are therefore loosely defined and include crops usually sold by farmers in each extension area or the local markets in the main centres and villages. The information on the cash crops grown in the study area therefore relates to the availability of surplus food crops that are offered for sale as shown in Fig. 5.3. No information was gained as to the actual quantities sold but it was generally reported to involve only small quantities.

During the administration of the questionnaire, farmers were specifically asked to state the most important cash crops of commercial importance (i.e. crops that bring in more money when offered for sale (Q.13). The responses of the farmers are summarised in Table 5.3. The ranking of the cash crops was determined by the number of frequencies and percentage of the farmers mentioning the importance of these crops in various zones. Thus, this does not take account of the ranking by farmers. This question was meant to elicit indirectly farmers' perceptions on those crops primarily grown for sale and those food crops increasingly becoming important for cash income.

Fig. 5-3 THE MAIN CASH CROPS GROWN IN AREAS OF THE AGRICULTURAL EXTENSION STAFF (OVERSEERS) IN THE STUDY AREA



Source : Fieldwork Data

Table 5.3 : Farmers' responses on their crops of commercial importance in the study area

Crop	Sample area		Zone 1 (N=32)		Zone 2 (N=32)		Zone 3 (N=48)		Zone 4 (N=48)		District (N=160)	
	No.	% R.O.	No.	% R.O.	No.	% R.O.	No.	% R.O.	No.	% R.O.	No.	% R.O.
Sorghum	12	37.5	3	31.3	6	95.8	1	72.9	3	64.4	2	
Maize	12	37.5	3	43.8	4	35.4	4	43.8	6	40.0	6	
Milletts (Finger & Bulrush)	9	28.1	5	37.5	5	6.3	10	4.2	12	16.3	11	
Sesame	10	31.3	4	59.4	3	29.2	7	52.1	5	42.5	5	
Groundnuts	20	62.5	2	90.6	2	62.5	2	81.3	2	73.8	1	
Cassava	24	75.0	1	93.8	1	50.0	3	41.7	7	61.3	3	
Pineapple/Citrus fruits	1	3.1	9	6.3	11	8.3	9	33.3	8	14.4	10	
Coffee	4	12.5	7	31.3	6	50.0	3	87.5	1	50.0	4	
Tobacco	1	3.1	9	9.4	10	31.3	6	43.8	6	25.0	9	
Beans	8	25.0	6	12.5	9	33.3	5	41.7	7	30.0	7	
Rice	2	6.3	8	25.0	7	4.2	11	68.8	4	28.1	8	
Vegetables	1	3.1	9	9.4	10	6.3	10	20.8	9	10.6	12	
Sweet Potato	4	12.5	7	15.6	8	16.6	8	20.8	9	16.9	10	
Cotton	1	3.1	9	6.3	11	8.3	9	18.8	10	10.0	13	
Others	1	3.1	9	3.1	12	6.3	10	10.4	11	6.3	14	

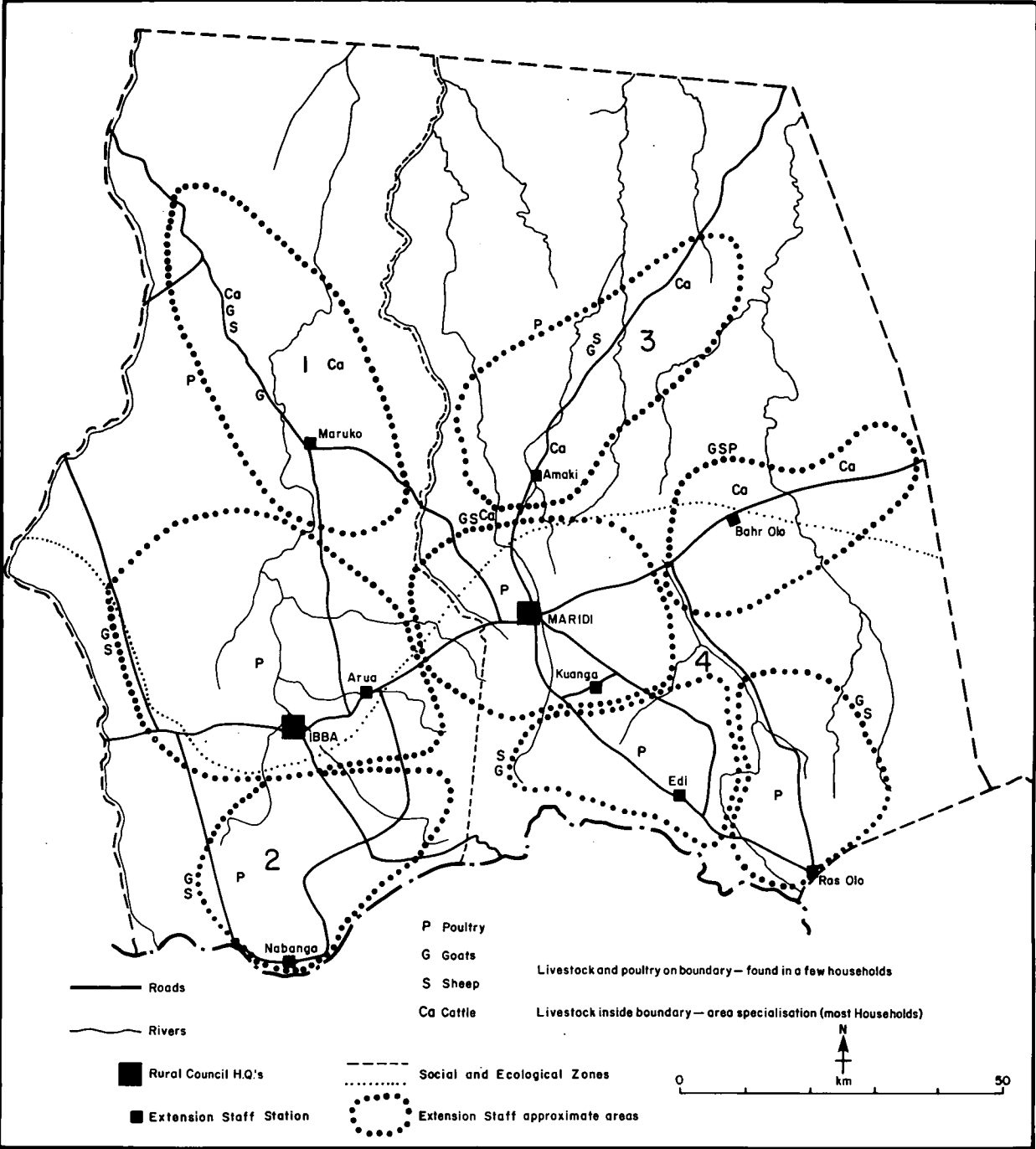
Source: Questionnaire Analysis
 160 Farmers interviewed in Maridi District
 Percentages more than 100 because of multiple responses

From the sample, while there are zonal variations, it appears from Table 5.3 that groundnuts, sorghum, cassava, coffee and sesame in that order are increasingly becoming of commercial importance, though the total volume of trade is likely to be small and limited. Cassava appears to be valued most in Zones 1 and 2 (Ibba RC); sorghum (Zone 3), coffee (Zone 4) - in Maridi RC; groundnuts are, however, important cash crops in the study area. However, it seems that those crops which are most important as a source of income are also those which are important for household consumption, giving credence to the commonly-held view that traded crops are merely surplus food crops. This probable serves the function of evening out surplus and shortfalls at a comparatively local level. No data, as noted above, exist on the quantities of crops traded or which are sold outside the study area.

5.3.4 Livestock and poultry

The agricultural extension staff were also requested in the enterprise pattern zoning pilot inquiry (Appendix 14) to indicate the livestock and poultry distribution in their respective areas. Fig.5.4 summarises this information. However, in this survey farmers were asked to indicate the kind and number of poultry and livestock that are kept (Q.39-Q.40), and their responses are shown in Table 5.4. It is clear from the table that poultry (mainly chickens, ducks, pigeons etc.) are the most widespread and followed by sheep and goats. Cattle, sheep and goats are mainly confined to Zones 1 and 3. The over-riding factor determining the distribution of livestock is the increasing presence of tse-tse fly (mainly Glossina morsitans and G. palpalis) particularly in Zones 2 and 4. Most households keep a few chickens of indigenous breeds, small and less productive than the exotic breeds introduced into the study area by ACROSS. Chickens are mainly kept for sale when cash is needed, though eggs are often consumed (mainly

Fig 5-4 THE GENERAL DISTRIBUTION OF LIVESTOCK AND POULTRY IN THE AREAS OF THE AGRICULTURAL EXTENSION STAFF (OVERSEERS) IN THE STUDY AREA



Source : Fieldwork Data

Table 5.4 : Number and percentage of farmers owning livestock and poultry in the study area

Sample area Livestock and poultry	Zone 1 (N=32)		Zone 2 (N=32)		Zone 3 (N=48)		Zone 4 (N=48)		District (N=160)	
	No.	%	No.	%	No.	%	No.	%	No.	%
Cattle	5	15.6	-	-	10	20.8	-	-	15	9.4
Sheep	18	56.3	2	6.3	26	54.2	6	12.5	52	32.5
Goats	14	43.8	1	3.1	22	45.8	2	4.2	39	24.4
Poultry	28	87.5	30	93.8	45	93.8	43	89.6	146	91.3
Average number of livestock and poultry owners/Zone	2.03		1.03		2.15		1.06		1.58	

Source: Questionnaire Analysis

Percentages more than 100 because of multiple response

160 Farmers interviewed in Maridi District

by children) during the dry season when chicks have little chance of survival because of predatory birds. They are also used for entertaining guests, feasts, divination and sacrifices. In fact poultry are mainly kept by most households as a 'backyard subsistence enterprise'.

Cattle are restricted specifically to the northern part of the study area - mainly around Madoro (Zone 1), Amaki, Ngonde, Langua and Mangaehe areas (Zone 3). Most of the cattle are of the Nilotic type originated mainly from the Dinka and Jur tribes of Rumbek District in the north perhaps through cultural, trading and marriage contacts and arrangements. The sheep and goats are more or less resistant to trypanosomiasis. Both of these also are of the Nilotic type, small and of little commercial value. Sheep and goats are kept for marriages (dowries), sacrifices, feeding visitors and are sometimes sold for cash. Milk contributes a very small portion to the diet of the people.

Although an attempt was made to elicit data pertaining to the exact numbers of cattle, sheep and goats, the data presented in Table 5.4 should be treated with caution. Farmers did not divulge most of the information because of the confidentiality of the issue as there was suspicion and fear of taxation and other social reasons (e.g. bewitching or 'evil eye'). Despite the fact that realistic livestock data were not available, a full glance at some grazing livestock revealed that the number possessed in each of the delineated zones in the study area varied. Cattle numbers per household were quite small, an average of five to ten, whilst for sheep and goats, the average numbers per household were between eight and twelve.

Informal discussions with farmers and the extension staff regarding the livestock and poultry enterprise patterns in the study area revealed some interesting points worth noting. It was reported

that chickens were increasing in most areas. The reason being not only because they can easily be sold for cash but they also provide a valuable source of meat and eggs (but eggs are usually kept for hatching except during the dry season). It was also reported that chickens were decreasing in certain areas, especially in Mangaehe and Langua (Zone 3) because of the problem with ticks. Goats were said to be increasing around Ngonde and Amaki (Zone 3) areas because of their vital role in marriage dowry rights among some of the tribal groups such as the Morokodo and Wa'di tribes as well as for sale in periods of food shortage. The money is used for purchasing other manufactured consumer commodities in the nearby 'bush' shops and for acquiring seed crop varieties which are lacking for cultivation especially when the farming calendar commences.

5.4 Farm Calendar And Farming Methods And Operations

This section examines some technical aspects of farming methods and operations and associated relationships with the physical environment, in particular the farm calendar in the study area. However, it is not possible because of space and time to provide a detailed analysis of the great array of the farmers' activities and crops grown throughout the year, nor to make a comprehensive study of farming methods and their impact upon productivity.

The principal primary source material presented in this section is related to : Firstly, personal field observation and impressions as well as informal discussions with farmers and some local leaders in the study area and which had been recorded whenever possible. Secondly, one of the enumerators (Francis Wereson) elicited much more data from the farmers (mainly the Moru in Maridi RC), and he himself being from the same tribal group added invaluable comments. Thirdly, the list of crops grown in the study area throughout the cultivation season for the

delineated zones in this study have been obtained from the survey conducted by the Social Statistics and Social Monitoring Survey (SSSMS, 1982). However, this list was supplemented by fieldwork data.

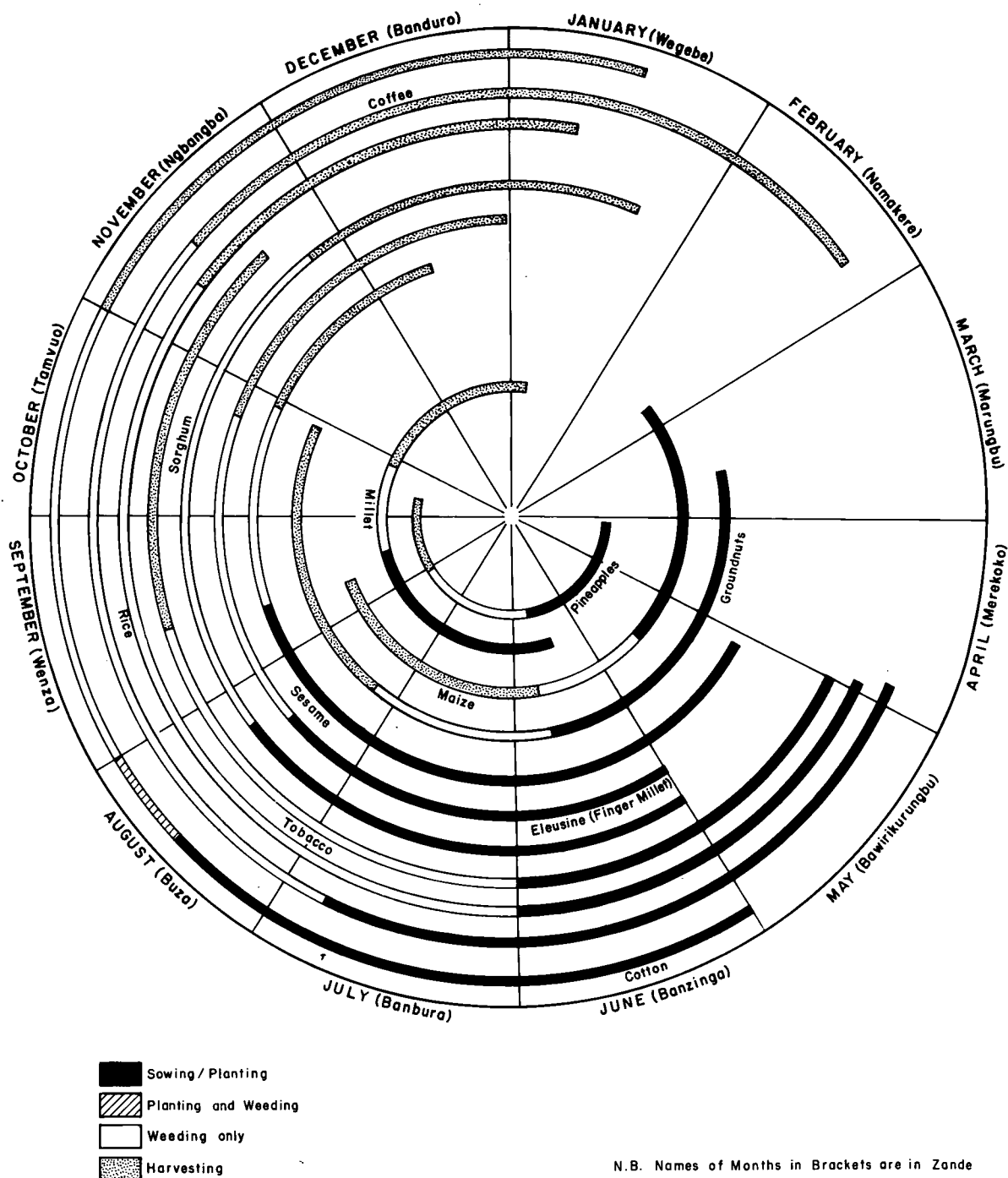
Only three principal operations - hoeing/planting or sowing, weeding and harvesting are recognised in the study area (see Fig. 5.5) although there are other activities which are carried out simultaneously with the farming operations. The crop calendar excludes cassava which is often interplanted with groundnuts or when the demand for labour slackens. It can also be harvested at any time of the year when need arises.

In the study area there are two main agricultural seasons, the rainy season and dry season. The rainy season usually commences in either late March or April and continues until October or early November although, as noted in Chapter 3, there are slight zonal variations. As many different crop varieties are grown, the cultivation season is full of activities and other secondary occupations for both men and women. The dry season which generally starts in late November or December is the period for the general preparation of new farm fields involving the cutting down or ring-barking unwanted trees, clearing and burning of large areas of woodland and bush that are available on fertile cultivable land.

Generally, farmers in the study area recognise twelve months in a year. Among the Zande the farming calendar and operations as practised in Zones 1 and 2 (Ibba RC) have been fully discussed elsewhere (De Schlippe, 1956) and need not much concern us here although a note will be taken into consideration wherever possible. Among the Moru, for example, six sub-seasons are recognised as follows:

- 1) Duru, is the time when the first light rains washing away the trash usually begin in about late March;
- 2) Taii, the first part of the rains, often in April to July;

Fig.5.5 A GENERALISED FARM CALENDAR OF THE MAIN CROPS GROWN IN THE STUDY AREA



Source : Fieldwork [Cf: Blaikie, P.M. (1971) p. 17]

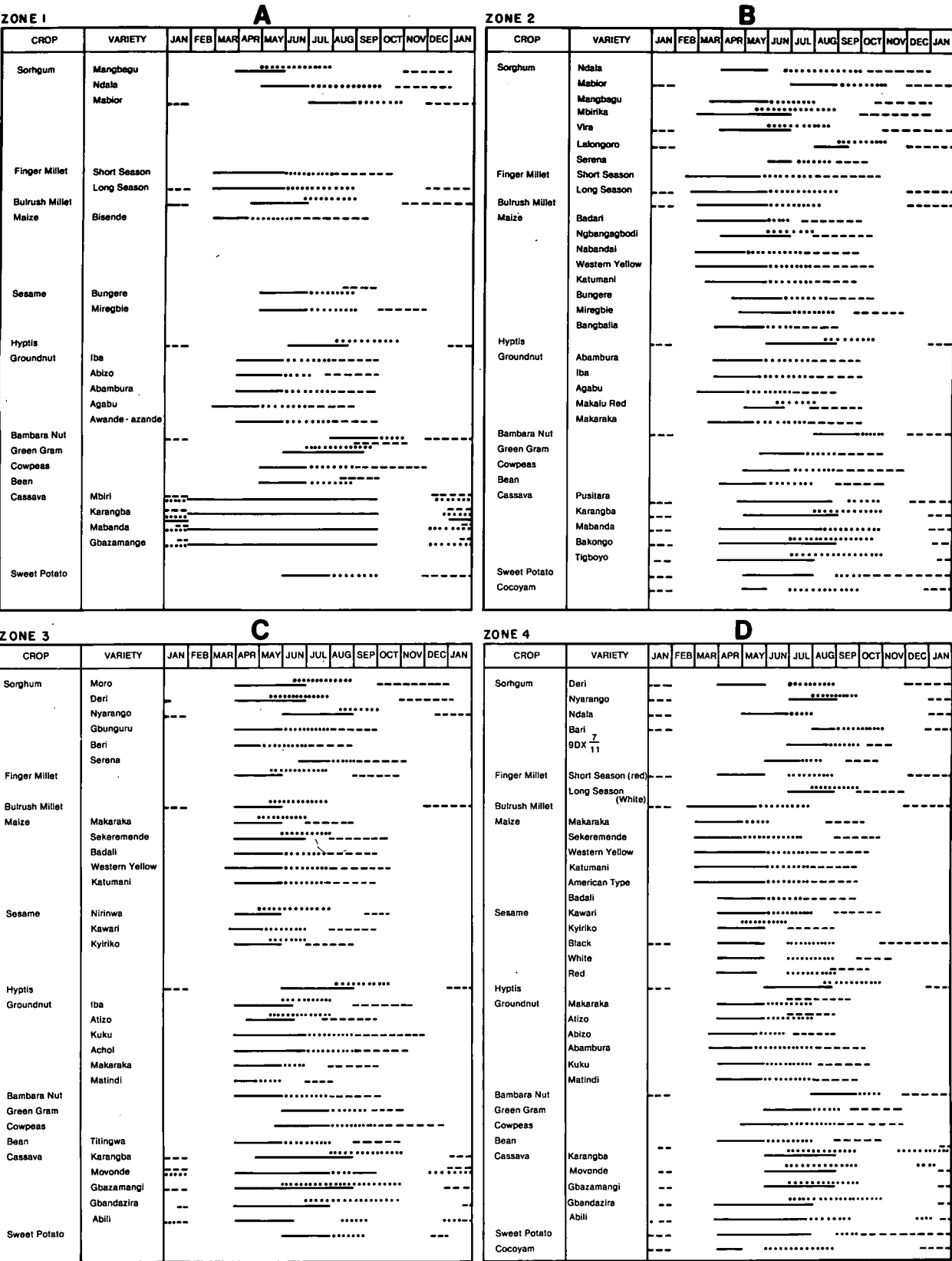
- 3) Jaliya, the second part of the rains and the first harvest,
July to October;
- 4) Leme, the period of variable winds at the beginning of the dry season;
- 5) Meri, is the dry season, December to late February or early March;
- 6) Agulupe, is the height of the dry season when everything is dried
up and when the dry north-easterly winds blow into the study area.
The intensity of the dry season with the north-easterly winds is
particularly worth noting. It severely restricts the growing of
perennial crops and if they survive are again severely set back
each season.

On the basis of the classification of these sub-seasons, the Moru only recognize three main seasons, duru, jaliya and meri as the most important in timing their farming operations and (as do other tribal groups) they use lunar months or moon phases rather than months of the Western World calendar.

In more detail, the cropping calendars for each zone in the study area have been summarised as shown in Fig. 5.6 A,B,C,D. It is clearly observed that there is little fundamental difference between the zones other than the early preparations of the land. In Zone 1, land preparation for groundnuts (makaraka) starts in March; in Zone 2 preparation is underway in mid-March for some sorghum and maize varieties as well as for groundnut variety (iba), in Zone 3 preparation for groundnuts commences in early March; and in Zone 4 preparation is underway in early March for some maize varieties. However, the cropping calendars oversimplify the complexity of the farming systems.

In the study area, the majority of crops grown are in various associations which are traditionally specific to a particular type of land. Among the Zande in Zones 1 and 2 (Ibba RC) De Schlippe (1956) has fully described the cropping associations which will be briefly

Fig. 5-6 CROPPING CALENDAR BY ZONE IN THE STUDY AREA



noted later in this discussion. However, for the purposes of the study, crop associations typical among the Moru and the non-Moru tribal groups in Maridi RC are described in more specific detail using Moru terms. It is to be remembered that in the study area the tilling (hoeing) of land varies according to specific crop requirement and time of the cycle, and as such this operation is treated together with sowing/planting in general. This operation is performed simultaneously with other farm activities and separated at most by a day or more and some crops such as beans, hyptis, sesame, sorghum and so on are even sown or broadcast while tilling the land.

Among the Moru, five different land classifications of which some have been noted in section 5.2 are identified as follows:

- 1) Moga : land before it has been cleared, with dense bush or woodland trees;
- 2) Lowa : recently cleared land with less dense bush;
- 3) Tirika : second year land;
- 4) Moa : third and subsequent years' land;
- 5) Turu'du : land in the immediate vicinity of the homestead.

These classifications of land are outlined in the following section.

5.4.1 Clearing, hoeing and sowing

(1) Moga land : Clearance of dense bush or woodland takes place in November and December. Some large trees may be ring-barked and left to dry or die slowly. In March, the cut trees and shrubs are then burnt. No preparatory cultivations are required. This land is usually sown with groundnuts and maize in crooked lines, the seed being dibbled in and covered with the toria hoe which permits deeper cultivation than the 'traditional' long-handled hoe (kye'bo).

(2) Lowa land : This land is selected in December and a fire belt is demarcated around the field and burned. The field itself is usually burnt in June. As soon as the grass regrowth appears, the association of sorghum (nyarango), finger millet and/or beans, sesame and bulrush millet are broadcast. This is followed by a light hoeing with the kye'bo to cover the seeds and destroy the weeds and grasses that have regrown or germinated. As previously mentioned, these operations (hoeing and sowing) are rolled into one. If the land is not ready in time for the nyarango association, the bari (sorghum) association with finger millet and/or beans follows in August and September and followed by a light tilling with the kye'bo. The bari variety is reported to be a quick-maturing one and susceptible to heavy rain.

(3) Tirika land : No preparatory operations are needed for the second year land which, therefore, facilitates early sowing. The long-term deri/moro (sorghum varieties) association with sesame, beans and/or bulrush millet are broadcast into the trash and covered by a shallow hoeing with the kye'bo. It is said that if these crops' land is dug deep, then the crops are buried too deep and therefore difficult to grow or appear out of the ground.

(4) Moa land : This is the land which in the previous year was tirika land but is treated exactly in the same way and put down to nyarango association. Depending on the inherent fertility, moa land may be used for four or five years. But when its fertility declines, it may be planted with cassava or cassava/groundnuts intercropped in April and May. The latter is an increasingly widespread practice in Zones 3 and 4 (Maridi RC).

(5) Turu'du land : This is the land around the homesteads and reported fertile as it is enhanced by addition and disposal of household

waste, chicken, sheep and goats as well as peelings of sweet potatoes and cassava and by-products of other crops. Also human waste is added (the common practice of squatting in the vicinity of homesteads especially in the rainy season and at night times as pit latrines rarely exist in most rural areas). Into this land are planted maize and vegetable crops in April and May. Sometimes the sweet variety of sorghum (kika : Moru, rarawiya : Avukaya) is interplanted with maize. Sweet potatoes are also planted in this land and runners are sown into mounds in May and June.

In this connection, by way of simplification of the above discussion, a typical crop association and calendar for a farm family in Maridi RC is portrayed in Fig. 5.7 including other subsidiary activities. However, more specific details of the crop sequences or combinations in a particular farm plot are issues to be outlined in Chapter 8.

For the purpose of bringing out any differences in the crop calendar and crop associations as well as land classifications among the Moru and Azande, it is worth-while briefly reviewing the practices of the Zande as described in greater detail by De Schlippe (1956).

Among the Azande, the cultivation season starts as soon as the rains break in either March or April and the first crops to be sown are groundnuts and maize. Groundnut-sowing may continue until the end of June, while maize-sowing can continue into July and August. However, some farmers may start to broadcast eleusine (finger millet) in July, but August is the main month for this work. Part of November and December are the main grain-harvesting months, after which farmers are mainly involved in off-farm occupations and the time of fulfilling social obligations. This existence is followed until another

FAMILY IN THE STUDY AREA

[illegible]

Source: Fieldwork Data

cultivation season starts generally in March or April. The above is an outline of the farmers' main activities during the year and no mention has been made of the times of sowing and harvesting the numerous minor crops but Fig. 5.6 A-D serves the purpose.

Once a cultivation has been opened up, crop succession or association is practised on it until such time as it is left to rest under a long grass and bush fallow. New land (ngasu) in the first half of the rains is cleared and sown with groundnuts. When a farmer has sown as large an area of groundnuts as he requires he continues clearing land, i.e. cutting down the smaller trees and ring-barking or burning the bases of the larger ones, leaving the grass lying on the ground, when the time of eleusine-sowing commences. The grass and brushwood are then burnt in situ. According to Zande farmers, this burn is considered a vital one and that without it the eleusine crop does not yield well. Afterwards, any unburnt remains are raked up and burned in heaps and eleusine is broadcast. The area of the earlier-sown groundnuts is broadcast with eleusine after the harvesting of the groundnuts. In addition, crops such as cow-peas, beans and Bambara earthnut are sometimes sown.

In the second year of cultivation (fute) if the first year's plot appears 'good', eleusine may be broadcast on it again, although not usually as a pure stand. Sesame may be intercropped with it, with a little maize and possibly sorghum. If a mixture of eleusine and sesame is sown, cassava may be planted through it to grow up during the third year, when eleusine or sesame may again be scattered under it. Some farmers sometimes plant cotton into the third year plot. However, as an alternative the second year plot might be planted with kpagu (Lagenaria spp), or cow-peas (Vigna spp), or sweet potatoes sown under it. Apart from a farmer's main plots, there are always

homestead plots which are usually sown with various crops such as maize, groundnuts, kpagu, beans, cassava, sweet potatoes and other food crops and vegetables similar to the practices of the Moru. When it is deemed unprofitable to cultivate a plot again (whether this decision is reached on account of infertility or by reason of its being full of weeds such as rekondo (Commelina spp) after two, three or four years, it is allowed to revert to bush for several years.

Throughout the study area men are generally involved in the hard agricultural operations such as land clearing and hoeing although women occasionally participate. Men usually set off for work early in the morning at very first light, about 5 a.m. especially when work is in the far fields away from the homesteads. However, some do not bother to do so until eight or nine o'clock in the morning. In the fields, refreshments commonly brought from the village by women of the household in the mid-day are usually consumed at the edge of the field and under the shade of a tree. The consumption of white stuff beer (kpete : Arabic) or sometimes dura and honey beer (kukya:Moru) is the sine quo non during hoeing of the land, and its provision is normally expected by men in the field whatever relationship with the holder. The food most usually accompanying it is thick maize or sorghum porridge (thick mash). Sometimes a few snacks of roasted groundnuts, maize, cassava or sweet potatoes are provided. Breaks of an hour or so are vital during which work is temporarily suspended (see Chapter 8).

In this respect, hoeing, as noted earlier, may involve sowing of some seed crops. The seeds (commonly, beans, sesame, sorghum, hyptis etc.) being broadcast a strip at a time by a person holding it in a fold of his piece of cloth or in a container. Other crops such as groundnuts, maize, sweet potatoes among others are usually planted in crooked rows.

5.4.2 Weeding

After clearing or tilling and sowing operations at the start of the cultivation season, there is a hiatus until it is judged by individual farmers that it is time to begin weeding operation. This task is the most labour-demanding and time-consuming tedious event in the farm calendar. If a crop has been row-planted, weeding can greatly be accelerated by the use of a toria hoe which can be used efficiently especially for weeding coffee. Although the farmer is relatively efficient between the rows, hand-weeding is still necessary close to and between the individual crops planted or sown in a haphazard pattern. In the study area in general, weeding of early-sown crops usually commences at the end of May or early June. One weeding (e.g. for sorghum) is normally considered sufficient although occasionally two (e.g. for groundnuts) or three or four (e.g. for cassava) may be performed. However, coffee demands much thorough continuous weeding for so many times even when the crop reaches maturity stage after four to five years at least. Cassava usually is weeded at least three times and where it is interplanted with groundnuts, the weeding therefore coincides with groundnut harvesting. Weeding continues sometimes until October when late-sown sorghums are weeded.

Weeding is usually carried out by women in a kneeling position and using a smaller-headed hoe of the same shape as the kye'bo (Moru) but on the end of short-branched stick. Nearly every household owns at least one or two kye'bo or gita (Zande) which is the principal tool for hand weeding. However, some women use their bare hands in which case they usually kneel on their knees on the ground to work.

The 'traditional' division of labour between the sexes, with women generally responsible for weeding and men for land clearance, hoeing or hunting is, to some extent, gradually breaking down. The increasingly growing importance of coffee and other cash crops as well as some of the

important food crops offered for sale has interested men themselves in weeding of these crops. Additionally, the involvement of women in beer-brewing and the distilling of alcoholic liquors for sale and their participation in other off-farm occupations (see Chapter 4) leads to the variability of farm operations between the sexes. Thus, there are only few operations closed to either men or women. Overall, the proportion of male to female labour in weeding in the study area is approximately one to four. The progress of most weeders across the field is usually ragged although several farmers may weed in straight lines. The pulled-out weeds are generally left stacked in the fields and some are raked along a field path or at the edge of fields. Some damage to crops under weeding by the use of hoe blades is unavoidable although maximum care is taken to heap a little earth around stems of some crops such as maize, sorghum, sesame among others. This practice further assists these crops to stand more or less firm against wind. Sometimes weeding overlaps with cultivation/ planting which finishes, for example, once the nyarango and bari sorghum associations are planted in September; with harvesting which starts with the early-planted maize, groundnuts and sorghum in July as among the Moru.

5.4.3 Harvesting, threshing and storage

Generally, apart from some efforts made against birds and other pests, farmers in the study area take little attention to their weeded crops until harvest time. Harvesting is often a diffuse operation particularly in the case of maize, cassava among others as these crops may be collected from time to time when needed. Other crops such as groundnuts, beans, sorghum etc. require much concentrated efforts to harvest in which case members of the households may work together for most days or a working party is organised. Harvesting period in the study area generally stretches from July and extends until the end of January as different crops mature at different times. Even from the same

plot, harvesting may continue for several months as with, for example, deri/moro, finger millet, sesame and beans crop association. However, in Zone 4 (Maridi RC), for instance, where maize is grown on a larger scale no early-season sorghum is reported, hence, during November there is a lull in harvesting operations.

Sorghum is harvested by cutting just below the heads with a small knife (iri:Moru) or sickle which are then carried in bundles or in sacks to the drying tables near the homestead and behind the huts and often with noticeable number of chickens and pigeons benefiting. Some preliminary sorting may take place at the side of the field. The heads which have been attacked or eaten by birds and have no grains remaining are then separated. The threshing of sorghum is a vigorous task, the heads being beaten on the ground with straight sticks or a piece of stone. The short season varieties are usually consumed soon after harvest and have generally poor storage qualities. Among the Moru and Zande, for example, the long season varieties particularly deri and nyarango which have excellent storage characteristics, are stored in a large woven basket placed on a raised platform (kiro:Moru, bumo:Zande). The smoke generated by cooking (usually done underneath) helps to protect the grain. The sorghum variety (bari:Moru), groundnuts and beans are harvested and stored in a tightly woven bundle of soft grass (lesi motori:Moru) which can either be placed in kiro or mounted on a post. Beans and peas in the study area are generally gathered into baskets or sacks in the fields and brought back to the homestead and placed under the sun to dry before threshing. This is usually done with a stick or a piece of stone on the ground, followed by an interminable process of sorting whether for sale or consumption. This processing takes much of the women's time especially when the beans or peas are scattered a handful at a time on a piece of sacking and the bad ones are individually picked out.

Sesame is harvested by cutting the lower stem with a small knife (iri: Moru) and carried to stands (niendere:Zande,duro:Moru) on which the sesame heads are dried and then subsequently threshed by turning the bundles' heads and lightly beating them with a small stick often over a woven tray and then stored. Surplus maize which has become too hard to be eaten raw while in the field at harvesting period is usually stored in the cob and hung from a branch of a tree or in kiro or rafters of the hut. The threshing of maize takes place in the homestead compound and on the ground with a stick after which the cob may be rolled in the hands so that the kernels fall off.

Several methods of crop processing after storage exist in the study area but lack of space here limits their discussion in detail. However, the 'traditional' method of using two grinding stones (mbia-moru and wiri-mbia:Zane, kuni and kuna:Moru), for example, of sorghum, maize, hyptis, sesame, finger millet, bulrush millet, groundnuts etc. is still common in the study area. However, there are several well-to-do households around Maridi headquarters who now send their maize and sorghum for grinding in the only mill existing. The 'traditional' method of processing is an arduous process in which a woman places a handful of grain, for example, on a large stone whose top is smoothed and hollowed. She then grinds it with a smoother elliptical stone. The smoothness of both stones ensures that a fine flour can be obtained although the work is slow and tiring. The task becomes rhythmic with the singing of songs by females undertaking the work, especially of grain grinding.

All these operations are usually carried out with care and precision. For example, during the harvesting period farmers in the study area, as in other similar areas, generally have to select and store seed and varieties for the next farming calendar. Virtually, most of them retain their own seeds mainly being stored in the ear (e.g. grains) and are generally

hung from the rafters of the house where smoke affords protection against insect and other pests' damage. For example, maize in which the smaller kernels at either end of the cob are removed and the best ones are left on the cob for storage or heaped on the house in one corner. Only a small proportion of the total requirement of seeds is purchased or acquired from a neighbour or friend with a surplus. Sometimes some households experience a shortage of seeds during the planting period because of the problems of storage and damage from insects, diseases and rats.

In this respect, it is suggested here that there should be made some improvements in the 'traditional' grain or seed storage to minimise losses. The usual 'traditional' methods of grain storage outlined above, for example, can relatively be efficient though many of the techniques require much work, skill and are time-consuming. Hence in practice, the methods may sometimes be neglected at the expense of grain damage.

In sum, in the foregoing discussion an attempt was made to examine the 'traditional' agricultural systems and in particular land use management as practised by farmers in the study area. In the process of discussion it was noted that there is some rationality of the land use pattern and that cropping associations and intercropping practices determine cropping patterns. The crops grown (food and cash) are keyed to cycle of the rainfall regime and farmers' perceptions or their social and economic characteristics are very vital that some management strategies, operations and caring of them in order to achieve sufficient food supply are also important and developed. Some few remarks were also noted at various stages on farmers' and agricultural extension staff perceptions on the importance of some crops grown as well as the problems that affect livestock and crop production. In fact, these agricultural conditions should be fully understood in the context

of the relationship and complexity between physical and human environments as a background to the assessment of land management practices and their rationale as a basis of planning.

The following chapter therefore examines farmers' knowledge on the management of their environment and agricultural systems in the study area.

CHAPTER SIX

AGRICULTURAL AND ENVIRONMENTAL KNOWLEDGE OF THE PEASANT FARMERS IN THE STUDY AREA

Introduction

This chapter briefly examines some aspects of environmental knowledge of the peasant farmers and its utilisation in agricultural methods in the study area. This discussion is mainly centred on farmers' evaluation of agricultural soil potentials and fertility and the associated crop types including other important uses of soils. Farmers' perceptions and attitudes on some crop varieties (both 'traditional' and exotic) and their tastes, preferences and utility characteristics will also be outlined. It is also important to note the botanical expertise (ethnobotany) of the peasant farmers particularly in relation to some useful plants or trees. Additionally, some few remarks on farmers' knowledge on health and nutrition will also be examined. It is assumed that a proper understanding of the 'traditional' farming systems in the study area must be grounded in an appreciation of the full spectrum of farmers' technical knowledge of their environment.

6.1 Agricultural Soils And Farmers' Knowledge

Generally in the Southern Sudan, agricultural data are still highly limited such that the soil qualities and limitations to crop growing are relatively unknown. In fact, there have been few articles published on the soils of the Southern Region (e.g. Tothill, 1948; Lebon, 1965). The soil survey of the Sudan generally operates from Wad Medani, the administrative headquarters of the Gezira Scheme in the Northern Sudan, and presently there are relatively few local soil surveyors in the Southern Region. Thus, to fill these gaps by trial plots and conventional methods will take several years, to advise without this information is to court

disaster. One source of data which could possibly help is the elicitation of the knowledge on the soils of the local farmers. In their study of the 'Utility of the Nigerian Peasant Farmer's knowledge in the Monitoring of Agricultural Resources,' Barker et al. (1977) found that the farmer was capable of observing his environment and its limitations to crop growing with precision and care. It is reasonable to assume that farmers in the study area are no different and can also, to some extent, provide relatively reliable agricultural and environmental information. In this context, the 'traditional' methods of the farmer should be seen not as obstacles to development but rather as the expression of trial and error testing of the environment which has been carried on for relatively many years. Thus, like all sources of data, the farmer's knowledge must be elicited, documented and analysed in an appropriate manner if it is to be of any concrete use. Knowledge of soils obtained in this way should be set against the background of existing knowledge and used to fill the gaps in that knowledge.

The object of this section is to:

- a) Establish the farmers' knowledge of their soils;
- b) Establish how they evaluate their soils in terms of their agricultural potential; and,
- c) Find out what methods the farmers use to maintain soil fertility on the land.

In order to fulfil these objectives, two principal areas of primary source material are drawn upon in this section in particular and the chapter in general. The first is personal observation and insights recorded whenever possible. In the questionnaire survey some aspects of farmers' knowledge of their soils and evaluation of the agricultural potential were investigated (Q.22,b - Q.22e). However, fieldwork experience showed that it was essential to provide additional informal guiding

questions as follows:

- a) why does the local farmer think a particular soil is 'good' or valuable;
- b) why does it give 'good' crops;
- c) how does a farmer select the 'good' land;
- d) when and why does he select the 'good' land;
- e) what is it 'good' for and how far does it extend;
- f) why is it better than the rest of the land;
- g) which other types of soils are 'good' and for which crops.

In this respect, as a great deal of information could be gained from the farmers' actions, it was thought essential to interview the farmer on his farm. This allowed the farmer to indicate or point out relevant features which he felt could not be described accurately. For example, soil colour and texture and 'good' soil could be brought or the depth to which a hoe penetrates are demonstrated. In nearly all cases, the farmer was interviewed individually, as groups usually tend to argue and thus he cannot express himself adequately. This gives idiosyncratic rather than consensus opinion but at least the farmer was able to develop his own ideas and insight. However, it would be more interesting to examine which parts of the knowledge are shared between the farmers, and to what extent they discuss their problems and seek solutions. Group interviews would be more appropriate in this context but it was unfortunately beyond the scope of this study.

Elicitation of farmers' knowledge of their soils in such a heterogenous community was not that easy, for linguistic problems were encountered. However, although the enumerators, to some extent, were able to communicate in several languages of the tribal groups in the study area, the data presented here should therefore be treated with

caution as there is likely to be a variable loss of information on the translation of farmers' responses. There would also appear to be a conscious filtering by the interpreters beyond the structural needs of the languages concerned. This is a problem that is likely to occur when someone tries to 'sift out the relevant points' especially when the translator sets his/her own interpretation while searching for a correct translation. Another problem related to farmers' knowledge on soils was that no soil samples were collected from their plots and subjected to laboratory analyses so that the farmers' ideas on soils may be expressed in terms of their physical and chemical characteristics. This would be possible to establish a relative soil fertility index and the identification of the factors that underlie farmers' distinction of 'good', 'bad' and 'exhausted' or 'tired' land, for example, organic matter, nitrogen, pH etc. This factor was not considered in this survey due to limited resource and time constraints.

In the following notes and due to the diversity of the tribal languages or dialects spoken in the study area, Moru and Zande vernacular names of soils are used wherever possible. In general, most farmers have vernacular names differentiated from the point of view of suitability for their various crops. Unless soil variations directly influence the crops which can be grown and also unless the earth is of use for special purposes such as making pots, plastering houses and the like, farmers seldom make a clear soil distinction. The system of distinguishing and describing soil types is not sophisticated, nor was it found to be unanimous. The change from a shifting cultivation to one of 'bush fallowing' (recurrent cultivation system) or annual cropping or permanent tree farming (e.g. coffee) removes an important dimension for the exercise of knowledge about soil types. It is true that some farmers may have two or more fields with differing soils, but consideration is more often

given to questions of microclimate and of bird and animal damage. For example, sorghum is mainly grown away from rivers or streams wherever possible, as this is where birds are known to be numerous. Only if two or more fields are similar with regard to these parameters is soil type likely to affect the choice of crop.

In the study area, farmers' vernacular names for soils and their descriptions mostly relate to colour and the names are really an indirect function of the amount of organic matter in the surface soil or the amount of the burnt ash thus indicating their relative fertility. Generally, peasant farmers have vernacular names for black, white, red, clayey, sandy, gravelly and brown (red?) soils. Thus, in this survey, it became quite clear that a wide variety of names for soils were mentioned for the different soils due to the widely spoken tribal languages and the differences between groups within tribes. In effect, there are a number of words used for describing the different kinds of soil or important soil properties. Among the Moru, for example, each soil word describes a different soil property such as gyini (any kind of soil), singo (sandy soil), igyi (clayey soil) or ini-amba, kago or yayi (gravelly soil), uni (black soil), odogo (hard soil when dry), onje (white soil), turu or rodø (soil found by a river). These names can be linked as follows: singo-gyini-uni (black sandy soil), singo-onje (white sandy soil), kago-igyi (gravels mixed with clayey soil) and so on. The words are linked together to form descriptive phrases, or are used single just to describe one aspect of the soil.

Some of the more commonly used vernacular names for soils in the study area are depicted in Table 6.1. However, other soil descriptions also include : light soil, strong soil, healthy soil ('good' or relatively fertile soil), firm soil, stony soil, reddish earth, bare and hard infertile soil. The latter more superficial soil descriptions were most often named

Table 6.1 : Farmers' classification of the main soils and their suitability for some crops grown in the study area

<u>VERNACULAR NAME</u>	<u>COMMON DESCRIPTION</u>	<u>PREDOMINANT CROPS AND OTHER USE</u>
Gyini-uni (Moru) Bisende (Zande)	Black soil	Sorghum, groundnuts, millets, sweet potatoes, other crops such as beans, green gram, coffee, rice, sesame, pigeon pea, fruit trees.
Singwa (Moru) Nguma (Zande)	Sandy soil	Cassava, beans, groundnuts, millets, maize, sorghum.
Singwa-gyini-uni (Moru) Bisende-nguma (Zande)	Black sandy soil	Some cassava, groundnuts, sorghums, maize, cowpeas, finger millet, coffee.
Gyini-igyi or Ini-Amba (Moru) Mbundu-sende (Zande)	Clayey soil	Cassava, sweet potatoes, cotton, tobacco, sesame, used for making pots, smoking pipes, plastering house walls.
Turu or Rodo (Moru) Pavury-di (Zande)	Soil found by a river	Tobacco, vegetables, rice, maize, s. potatoes, chillies.
Gyini-kago or Yayi (Moru) Mbia-sende (Zande)	Soil mixed with iron-stone gravels	Groundnuts, cassava, sesame.
Singwa-kago (Moru) Nguma-mbia (Zande)	Sand mixed with iron-stone gravels	Groundnuts, sweet potatoes, sorghum
Gyini-uni and kago (Moru) Bisende-mbia (Zande)	Black soil mixed with ironstone gravels	Sorghum, maize, millets, cotton, cassava.
Gyini-kahi (Moru)	Red Soils (1)	Cotton, bambara, groundnuts, cowpeas.
Zamba-sende (Zande)		Cassava, tobacco, sorghums, maize, millets, sesame.
Kago-igyi (Moru) Mbundu-mbia (Zande)	Clayey soil mixed with ironstone gravels	Sweet potatoes, tobacco, cotton, cassava, sesame, cotton.
Odogo (Moru) Kpakpangbere, or Kpengbele (Zande)	Hard soil when dry	Cowpeas, sorghums, cotton, grams, sesame, maize.
Singwa-onje (Moru) Nguma-ngume (Zande)	White sandy soil	Cassava, groundnuts, beans, sesame, sorghum.

Source: Questionnaire Analysis and Informal interviews with farmers

(1) Farmers could also refer to red soils as 'yellow' or 'brown' soils

by females although males, to some degree, also have this classification of soils. Additionally, several farmers were able to identify termitaria (kakure : Zande) soils as well as soils of derelict homestead (bate : Zande) which are both suitable for the growing of tobacco, maize, vegetables, sorghum, gourds, grams etc. They are reported to be less favourable for groundnuts and useless for bambara nuts and sweet potatoes. The clayey and termitarium soils are said to be useful for making pots and smoking pipes as well as for plastering walls of huts or tukls. However, 'superficial' distinction of soil types according to colour may be meaningful as Carrol (1967:2) notes:

"Colour is the most obvious characteristic of soils. Of itself, it is of minor importance, but it often serves as an indicator of other soil conditions that are extremely important ... For example, black or dark brown soils on well drained sites of valleys are associated with adequate supplies of basic cations and nitrate supplies higher than found in lighter-coloured soils."

In this connection, a crude grading of soils' agricultural productivity may be identified according to both texture and colour classifications (see Table 6.1). Hence farmers usually select soils with a 'good' fertility status wherever possible. Informal discussions with farmers indicate that from their long experience, they generally recognise gyini-uni/bisende as the best soils for farming, followed by the singwa/nguma soils, and gyini-kahi/zamba-sende soils, whereas singo-onje/nguma-ngume soils are less preferred unless for special crops such as groundnuts or cassava and to a lesser extent, sorghum, maize, millets, beans and sweet potatoes. Several farmers also noted that sandy soils produce 'good' crop yields in years of adequate rainfall especially groundnuts which are easily picked or harvested. Similarly, loose sandy soils are desired for cassava, beans and sweet potatoes but these, farmers often qualified their statements concerning rain that 'it is 'good' soil if the rains come on time', thus implying problems of rainfall reliability (drought?). Farmers also

acknowledged that gravelly soils that are lateritic in origin are usually avoided. On the other hand, they also believe that the blacker the soil, the more fertile it is, whatever the crop. This may be related to the organic matter in the soil. But Ahn (1970) found out that this was not the case in West Africa. Additionally, the clay in the black soil serves to retain the moisture in the soil and 'stays soft longer' as several farmers asserted, and to support the tall plants (e.g. sorghum) even though only shallow roots form.

It is essential to note that most farmers emphasised the paramount importance of water in regard to soils such that in certain circumstances, a 'good' land was simply that with a relatively good water supply. In this context, farmers generally tend to overlook the properties of the soil per se. The farmers' concept of a 'good' land is that which reliably produces crops nearly every season rather than that producing a larger crop but only when conditions are favourable. This reflects the strict limits under which farming in the study area is practised. There are generally no rules requiring particular crops only to be grown in certain soils and there can be no discrimination in planting when a farmer's field has a variety of soil types. Informal discussions with farmers also revealed that they know, for the first time, that a 'good' farm land exists in a particular location through a combination of chance, deliberate problem-solving search and the functioning of social and cultural relationships. About 60% of the farmers in the sample found their farm plots by deliberate search, taking some days out to walk round to identify alternative 'good' farm land. About 20% were told of a 'good' farm land by their friends and relatives who encouraged such farmers to cultivate their farm plots near them. Nearly all sample farmers sited their 'good' farm plots near those of their parents who brought them up so that farm advice and help can be sought easily and until they

are able to stand on their own. About 20% of the farmers found their 'good' farm lands while not looking for it but when they were hunting, gathering of fruits and termites and house-building poles as well as travelling to a distant farmer's farm to fulfil a communal labour of the informal co-operatives and social networks.

The question that is posed here is that 'how does the peasant farmer establish the quality of his land'? It has been mentioned in Chapter 5 that farmers in the study area would usually select specific areas to take advantage of certain soils rather than a response to population pressure on land, and that they are capable of recognising certain species of trees, grasses and soil colours as indicators of relative fertility. However, individual variations which further cross-check and reinforce general indicators also abound depending on the experience of the farmer. Thus, experience and oral tradition direct farmers to the soils that are relatively most fertile, easy to cultivate, or best suitable to particular crops; the concept of the catena, however, did not escape them (Moultapa, 1973). Informal interviews also showed that about 80% of the farmers reported the state of the vegetation as the most obvious indicator of soil quality, and that an area with dense 'healthy' vegetation (i.e. trees and grasses) is selected, cleared and burned before the sowing of crops in the following cultivation season. Areas with tall grasses rather than land having short grasses with a dense ground cover are usually avoided. But areas with a tall stand of spear grass (Imperata cylindrica or bingba:Zande) are favoured as farmers feel the land to be fertile especially when there is also a lush green grass than land where the grasses are yellowish with such weeds as furukpe, rekondo, ngamu, Zande (*Commelina* spp?) indicating relatively dry 'bad' or poor soil. Among the Moru, for example, tree species such as kurgu (*Combretum schimperi*), karanya (*Acacia seyal*), maza (*Acacia spirocarpa*),

ori (Albizzia harveyi) and kinju (Khaya grandifoliola) etc are used as indicators of relatively 'good' soils (especially gyini-uni), singwa-gyini-uni, gyini-igyi or ini-amba, turu or rodo and other useful soils. The Moru also identify grasses such as dodu (Hyparrhenia sp.), tiya (Imperata cylindrica), amain (Vetiveria nigritana) and doru (Sorghum arundinaceum) as some of the indicators of a 'good' farm land.

Informal discussions with farmers therefore yielded much more qualitative data on the selection of a 'good' farm land in the study area. After burning a piece of land, areas that have the thickest mat of ash and charcoal are clear indicators for that land to be utilised by farmers. Many scientists, however, underestimate farmers' concern about the soil itself once they are impressed by the vegetation. But more than 70% of the sample farmers said that they actually examined the soil before finally deciding on its quality. Thus, soil texture, colour, depth and water retaining capacity are the major attributes considered. Many farmers reported that lands with loose gravels at the surface are usually not cultivated, and they dip their cutlasses about 30cm deep into the ground either to detect the presence of ironstone gravels or to examine the tap roots of fallen trees for soil profile. In fact, about 10% of the farmers claimed that if the previous year's crop yield was 'good' they are encouraged to continue utilising the land for at least another time. However, more than 60% of the respondents said that the presence of nyawura (Zande) (Striga hermonthica), which farmers claimed is the result of the increased seasons of growth of sorghums on the same land, discourages them from planting crops particularly sorghum. Ten farmers in Gworosai (Zone 4) mentioned 'slope of land' as a determinant of soil quality. About 30% of the farmers acknowledged having examined earth mounds to identify what lies beneath the surface; and 13% of the farmers, incidentally all above

forty years of age, also tasted soil to reinforce other indicators, and they acknowledged to be able to distinguish between levels of soil fertility because they tasted differently. By walking through the land and coming back to examine the footmarks to determine not only soil characteristics but also fix boundaries of soil types even when very small variations are involved was one method as pointed out by about 5% of the farmers. Two farmers in Amaki (Zone 3) mentioned a method for finding a 'good' land by looking in the morning and if there is fresh grass which is cold and damp, then it is used. On the other hand, if there is a problem with pests then farmers tend to dismiss the land without considering its soil quality. However, in certain cases, it is only the main crop that is not grown, a secondary crop being grown in its place. So far this has been found for foxes, termites and domestic animals.

An understanding of the indigenous knowledge such as this could probably lead to a different pattern of extension teaching for these areas. Any uncertainty is taken care of by using strategies which could eliminate or reduce the impact of errors made at this stage.

It is also important at this stage to outline how farmers in the study area adopt land management strategies in order to improve soil fertility on their fields. Many farmers do not have a vernacular name for the word 'soil fertility', but they generally do have, for example, names for first or second year field types (see Chapter 5) and this really means land at its most fertile stage. Thus, the crop rotation generally gives an idea of soil fertility though there is no fixed rotation here as farmers usually crop a plot until the yield starts to fall or when it is invaded by weeds. More than 80% of the farmers realise that there are certain land management techniques that can be used to help maintain reasonable crop yields. Some of these strategies of land use include:

- a) Keeping green grass on the top soil and allowing it to decay there. This relatively increases the organic matter of the top soil;
- b) Deep hoeing breaks up grass roots and aerates the soil and turning the top soil under;
- c) Burning grass and brushwood in the field and sometimes piling unburnt remains or raked up and burnt in rows and round heaps for planting of seeds;
- d) Leaving the grass to dry and accumulate for two years on the land before burning;
- e) Using a bush fallow (usually 3-4 years) to allow regeneration of natural fertility of the soil;
- f) Farmers' responses to low soil fertility levels may be to plant crops such as cassava and sorghum that can tolerate these levels of fertility;
- g) Growing legumes as a sole or an intercrop;
- h) Throwing household refuse near the homestead garden (turudu:Moru)
- i) Following a flexible rotation (see Chapter 5) for disease control as much as for fertility maintenance;
- j) Land preparation before the rains in order that the advantages of early time of planting are used - i.e. the benefits of the first nitrogen flush in the season.

In addition to the above land-use management strategies and maintenance of soil fertility, mulching is generally a common practice especially for sorghum, coffee, cassava and other grains. The trash is left upon the surface to be burned at the beginning of the rains as this is reported to aid soil fertility. Also manuring is to some extent used especially for crops grown on turudu land. In fact, one farmer in

Ngonde (Zone 3) kept his three cattle on his fields in the dry season so that they were manured for the rainy season. Another in Madoro (Zone 1) simply burned off the manure deposited by his sheep and goats to keep away flies. Another farmer in Makutari (Zone 1) also used chicken manure for a maize plot. In fact, informal discussions with the local chiefs in the study area showed that there was a considerable unintended use of livestock manure in farm plots when the animals were left to browse or feed on the stalks of grains especially after harvests. While they fed on they deposited manure which consequently improved soil fertility and crop yields. But now this practice has declined as most farmers lost most of their cattle through inter-tribal cattle raids.

Obviously, some of the above-mentioned strategies undertaken by peasant farmers are invaluable and sound indigenous technical knowledge (ITK) which could possibly be a starting point for aiding the small farmer through the extension of agricultural services and diffusion of innovations. It appears that the extension of chemical fertilisers is rarely accepted by farmers at least for the current farming circumstances. From the limited notes in this section, the farmers in the study area have, however, shown some aspects of knowledge on soil conditions and its relation to crop production. They have also demonstrated knowledge of environmental limitations and methods to accommodate these problems into their farming systems. However, some of the farm problems and management strategies to minimise environmental constraints is the major theme of Chapter 7. Further studies will have to establish the limitations and reliability of this knowledge. Farmers' classification of their soils is based upon much simpler criteria than the Western one. Although the detailed Western nomenclature is valuable in those areas where a detailed plan for the optimal exploitation of villages agricultural resources can be drawn up and implemented, it is not of great relevance to the decision-making

procedures of the ordinary peasant farmer with several plots in different ecological settings. While these observations give an indication of the local farmers' perception of soil potential, they do not, however, in themselves indicate any sure method of improving crop production. This work is intended as an exploratory rather than a problem-oriented study and hence serves to indicate possibilities rather than answer questions. Thus, the knowledge of peasant farmers' agricultural soil classification is essential so as to improve technical changes introduced by 'outsiders' and which do not conflict with the 'traditional' farming practices.

6.2 Domestic Use Of Soils

In the study area the domestic use of soils is mainly carried out by some expert women who generally look for types of material of only marginal use in agriculture. These include black soil found by the river (deep alluvium deposits left after a receding river or stream), reddish earth, sloppy wet mud which squelches between the toes, drier mud which sticks to the feet and clayey earth. These soil types, together with others, are mainly utilised by women for making household equipment including pots, food containers, smoking pipes, as well as for plastering house walls, rat proofing on the legs and floors of the food stores (granaries) and beehives etc. Conscientious housewives know perfectly the locations of the various soil types which may be collected several kilometres away from the homesteads. In the study area, several depressions may be observed in most of the rural areas where these soil types have been excavated. One fascinating fact is the method of preparation of the soils for various uses. For example, the plastering of walls, beehives, granaries and house floors etc. usually involves the mixing of the earth with water and livestock waste matter especially in Zones 1 (Ibba RC) and 3 (Maridi RC) where comparatively more livestock

is kept. Other housewives mix these soils with waste matter from distilled alcohol which is to some extent used as a cementing material for walls and house floors. Informal interviews of some knowledgeable women revealed that this practice has been diffused and adopted from the neighbouring countries such as Uganda and Zaire. Additionally, some school children in most of the rural areas provided enormous information on the use of some soil types. In fact, they were able to describe some of the marginal soil types and to locate them particularly around the schools' immediate environments. They know them quite well when they usually accompany their mothers to collect these soil types from their respective sites. Also, because of the shortage of basic school equipment, teachers have tended to teach children fine and applied arts through the use of clayey soils which forms an invaluable knowledge on crafts and school curricula and development. This is a realm of environmental knowledge exploitation in which women, however, generally remain experts. Some women claimed that pots made from the above-mentioned soils keep their drinking water as cool as that stored in fridges in the urban centres. These local pots are also useful for fermenting and distilling local alcoholic beverages and are 'good' storers of seed crops (when pots are plastered or sealed at their mouths with a particular soil or clay) kept for the next cultivation season.

6.3 The Exploitation Of The Local Flora

It has already been pointed out in section 6.1 that an important aspect of farmers' vegetation knowledge is its identification of likely cropping potential of various soil types. The vegetation canopy and the presence or absence of particular species are used to 'read' the potential performance of soil under cropping. Farmers' experience also demonstrates that crops are matched to some particular forms in the natural vegetation by a process of drawing analogies. For example, in a vegetation association

where wild yams are numerous, farmers usually dig up the tubers to assess their performance. This helps determine whether an area will subsequently be planted with cassava or sweet potatoes. Such plant indicators of a 'good' farm land are invaluable in a farming system where non-quantitative assessment is the method of identifying a 'good agricultural land.

In the study area, tree and plant species provide one of the richest veins of ethnoscience and peasant farmers make use of these in their environment. The notes provided in this section indicate the sophistication of farmers' botany. This botanical expertise of farmers particularly lies in regard to those collected useful plants. Virtually everybody in the village seems to know and is able to list the names of most trees, plants and wild vegetables. In an area such as the one under investigation where farming is supplemented with off-farm employment activities such as hunting and gathering, it is not surprising that farmers exploit the flora surrounding the village. Informal interviews with several females and males showed that about 70% of the housewives of respondents and others as well as about 80% of the farmers were able to mention some few trees and vegetables. Additionally, farmers could identify several trees from their fruits, correctly described characteristics of rooting systems and general growth characteristics (e.g. herb, shrub, climber) and parts of the plants that are useful (e.g. bark, roots, fruits, pods, seeds, beans, leaves, branches etc).

From the limited information provided through informal interviews, it was possible to provide a general taxonomy of some examples of trees and plants used in the study area (see Table 6.2). For example, fruits of some trees which are edible, where twigs can be used as chewing stick (toothbrush), and which plants or trees provide good materials for fibres for making ropes, twines and fishing nets, house-building poles, weaving of mats, baskets, hats and beds, slates and chairs. Handles for

Table 6.2 : Some examples of trees and plants used by farmers in the study area

BOTANICAL OR COMMON NAME TREES/ PLANTS	VERNACULAR NAME	USE
Butyrospermum - Shea Butter nitoticum	Lulu (Moru) Kpakari (Zande)	Oil is extracted from inside lulu and used for cooking Oil used as a cosmetic on the skin Fruit itself is eaten as a snack Fruit eaten as a snack Fruit eaten as a snack
Vitex cuneata Vitex madiensis Tamarind - Tamarindus indica	Ngunge (Zande) Birikitambiri (Zande) Titi (Moru) Abanza (Zande)	Juice is extracted from seed and used to flavour porridge (edible fruits) Walking sticks made from roots Provides good shade; medicine from its bark Fruit eaten as a snack
Anona senegalensis Borassus Palm Borassus aethiopium Landolphia florida	Bagara (Zande) Lina (Moru) Ndavu (Zande)	Fibrous flesh of the fruit eaten as snack The seed after germination in the fruit eaten as a snack Fruit eaten as a snack Fruit eaten as a snack Roots are used as fish poison
Parinari curatellifolia Canarium schweinfurthii Lasiosiphon kraussianus Parkia filicoidea Huggea virosa Landolphia owariensis Corchorus olitorius	Bandani (Zande) Banga or Mbiri (Zande) Buru (Moru) Abongba (Zande) Babalab (Moru) Warawarakpa (Zande) Melukhiya (Moru)	Fruit eaten as a snack Fruit eaten as a snack The bark is extracted and used as fish poison Fruit eaten as a snack Leaves and tender roots of young plants are used for making thick soup Ropes and strings are extracted from stems Fruit eaten as a snack Edible fruit Children shell the seeds to enjoy eating the oily inner part of the seed Fruit eaten as a snack Roots are used to extract a liquid yellowish in colour. Treatment of headaches, malaria, Stomach-ache: drink decoction of roots Medicine for cough or colds from bark Fruit eaten as a snack Pods are used as fish poison Leaves hung up in fields and on buildings believed to induce sickness in those who would steal, destroy or damage by witchcraft crops or other property Shrub leaves and branches are crushed and used as fish poison Medicine from its bark. Bark is also used as tea. It is used for treating yellow jaundice and for traditional childbirth removal Bears edible fruits and leaves. String from bark. Harbours bees, therefore honey and wax. Medicine from its bark Fruit eaten as a snack Used for making beds and slates for use in village schools It is milky and used to keep flies away from wounds Leaves hung up in fields and on buildings to induce sickness in those who would steal destroy or damage by witchcraft crops or other property Used for medicinal properties Drink decoction of plants Edible fruit as a snack Provides good shade. Good hardwood for building poles, axe and hoe handles A plant grown around the farm to keep pests by its smell and poison Seeds, leaves and branches used as fish poison Fruit eaten as a snack Edible fruit as a snack Roots and beans are used as fish poison Roots, bark and fruit used as fish poison Oil is extracted from the seeds and used for cooking after boiling and reboiling (edible fruit) Fruit eaten as a snack Bark of the tree used as a fish poison and medicine from its bark; Tree trunk is used to carve or hollow into drums
Grewia mollis Ziziphus spinachristi	Kpoyo (Zande) Nabaq (Moru)	
Borassus flabellifer Cinchona	Akua (Zande) Kina (Moru)	
Treculia africana Prosopis africana B. Thoningii	Fusa (Zande) Zangare (Moru) Kaw (Zande)	
Tephrosia vogelii	Dawa na Samaki (Moru)	
Albizia sp.	?	
Adansonia digitata	Gangolei (Moru)	
Caloncoba schweinfurthii Euphorbia candelabrum	Kuna (Zande) Suruq (Moru)	
Bauhinia reticulata	Dakpa (Zande)	
Ipomoea hederacea	Lina (Moru)	
Carissa edulis Acacia sp.	Rindikiwe (Zande) Tita (Moru)	
Cactus	Oja (Moru)	
Mundulea sericea Syzygium spp Eicus spp Neorantaneria pseudopachyrhizos Balanites aegyptica	Jier (Moru) Bambisa (Zande) Vuruma (Zande) Jekoro (Moru) Heglig (Arabic) Lalok (Moru)	
?	Nundora (Zande)	
Khaya grandifolia	Kei (Moru) Bogu (Zande)	

Table continues

<u>BOTANICAL OR COMMON NAME</u> <u>TREES / PLANTS</u>	<u>VERNACULAR NAME</u>	<u>USE</u>
Paullinia pinnata	Kenda (Moru)	Seeds and roots are used as fish poison Apply sap for wounds and sores Roots used as fish poison
Adenium obesum (Desert rose)	Sim Ahmar (Arabic)	Aromatic herb; medicine ; drink infusion of roots used as a corrective against sterility in dates and women
Ruta tuberculata Forsk	Ladra (Moru)	The black-hearted woods are used as gateposts, fencing the homesteads compounds, walking sticks, sticks for beating the drum, woods for animal traps
Dalbergia melanoxylon	Babanus (Arabic) Babanusa (Moru)	Fruit used as a fish poison Fruit used as fish poison
Lachnosiphonium niloticum	Kuliyi (Moru)	Fruit eaten as a snack
Gardenia lutea	M'Begge (Zande) Dupiti (Moru) Ngo'ku (Moru)	Grown near to the ancestral spirits' shrine, are pounded in a mortar, the pulp thinned with water and sprinkled by means of a little funnel of leaves over objects to be protected. As a result of this the fingers of the thieves are believed to swell like bulbs
Anacardium occidentale (cashew nuts)	Lagba (Moru)	
Cassia sp	Ranga (Zande)	
Pancratium sp. or Bulb		
<u>VEGETABLES GATHERED</u>		
Wild Jews Mallow - Corchorusolitorius	Nbere (Moru)	Eaten as a relish and often with groundnut or sesame paste
Hibiscus sabdariffa	Namba (Zande)	Eaten as a relish
Gynadiopses gynanda	Agyiri (Moru)	Eaten as a relish and often with groundnut or sesame paste
Hibiscus cannabinus	Zigbi (Zande)	Eaten as a relish with sesame paste
Amaranthus spp.	Dodo (Moru) Kpedepede (Zande)	Eaten as a relish and often with groundnut or sesame paste
Corchorus olitorius	Morambida (Zande)	Eaten as a relish with groundnut paste
Portulaca oleraca	Rigilo (Moru) Seresere (Zande)	Eaten as a relish and often with groundnut or sesame paste
Wild Roots	Tizea and Kandra (Moru) Sure (Zande)	The former is like a yam but very bitter and requires wetting before eating The latter is sweet
Cynanchum	Mololo (Moru)	Eaten as a relish with groundnut or sesame paste after boiling and reboiling and water poured away
Solanum aerthiopicum	Nzua (Zande)	Eaten as a relish with groundnut or sesame paste after boiling and re- boiling and water poured away
Lettuce	Mala (Moru)	Eaten as a relish with groundnut or sesame paste
Celosia spp	Mbadabu (Zande)	Eaten as a relish with meat and groundnut paste
Cucurbita spp	Taza or Luraka (Moru) Boko (Zande)	Eaten after boiling and reboiling usually with 'lulu' oil
Rorippa nudiuscula	Temelaka (Moru)	Eaten as a relish with groundnut or sesame paste or with 'lulu' oil

Source: Farmers' reports (Informal interviews) and Field Notes from visits to farms and data extracted from A.G. McCall (1950), A Note on the Agriculture of the Azande, Ministry of Agriculture, Sudan Government, Bulletin No.2. p.12.

hoes, axes and cutlasses as well as walking sticks etc. have to be cut or carved out from branches or roots of particular trees. Plants used in indigenous medicine for the treatment of ailments such as stomach ache, backaches, headache, fever, cough, sores and ulcers or wounds, menstrual bleeding and abortion, fish poisons etc. are identified and known to most people especially those farmers above forty years old.

In the study area, although herbal medicine is declining especially in the main centres and larger villages, it is still generally used particularly by older families in the remote rural areas. In fact, it is generally used in conjunction with the 'modern' drugs if the condition were at all very serious. Thus, a number of herbal medicines could still be seen being offered for sale in Maridi and Ibba towns' markets. Some of these medicinal plants are either applied outside the body, taken through the mouth either whole or powder and dried before use, or powder of the plant dispersed in water or extracted whole or powder of the plant moistened in hot or cold water and filtered before use. "A certain amount of 'sympathetic magic' may be involved in these medicines" (Morgan, 1981:101). Some plants are also used in most villages to keep away mosquitoes; others are burned as pesticides and some are planted around the homestead compounds to prevent snakes from entering houses. Some village elders are also experts in complicated usage for healing and charming and other specialised functions and therefore are consulted by ordinary farmers who usually seek their advice and help.

Another aspect of vernacular botany in the study area is primarily feminine skill. Although women are increasingly cultivating Western and 'traditional' vegetables (e.g. cabbage, okra etc) they also continue to gather a wide range of wild fruits and vegetables from the fields and the countryside. They are able to identify specific locations (e.g. woods, rivers, valley heads, hills) and periods of collection of these fruits

and wild vegetables especially during the hungry gaps. The processing of some of the wild products for consumption is thus very tedious or tiring. In fact, many are subjected to rigorous boiling and re-boiling before they are eaten.

Due to the usual constraints of resources and time much of the data upon which this section is based cannot in fact be adequately presented. A study of the ways in which farmers in general and women in particular differentiate the appearance and characteristics of trees and plants including wild vegetables and fruits would prove most useful or rewarding. This calls for further investigation and proper identification of the various species of the local flora. However, this section has hopefully shown farmers' relationship with their environmental resources and therefore an important ethnobotanical expertise is developed which generally contributes to the subsistence economy of the peasant farmers in the study area.

6.4 Crop Types And Farmers' Crop Preferences And Tastes

In Chapter 5, a brief account was made on the subsistence nature of the farming systems whereby the household provides much of its food requirements throughout the farm calendar. Adequate and varied food types are always sought while relative lack of sufficient storage facilities compels the household to seek a continuous supply of fresh food. Preferred crop tastes and the nutritional value (dietary patterns and preferences) and the reliability of supply determine not just the types of crops grown but also the different varieties of each crop. It has also been noted in Chapter 5 that farmers in the study area recognise many varieties of their main 'traditional' crops. But the list of crop varieties noted earlier cannot be precise because research on the classification of crops, as on the other aspects of vernacular farming, has been inadequate.

Additionally, farmers were also not unanimous in their naming of the different varieties or their definition of crop variety characteristics. Moreover, although certain broad favourites may be identified, individual farmer's preferences naturally vary depending on local circumstances and personal tastes. But perhaps the most important factor determining the actual variety in a specific plot, when seed from a previous harvest is not consumed, is the range of seeds available at the cultivation season, which may or may not include the types the farmer needs. The many crop varieties grown by farmers are generally determined by their growth and utility characteristics such as quick and late maturing and keeping and cooking qualities.

To demonstrate farmers' crop utility considerations, a technique similar to a repertory grid was employed in this survey study. A repertory grid is a research tool used in investigating the way people evaluate the elements of their socio-economic or physical environment. The detailed analysis of the technique and its background in personal construct theory has been fully documented elsewhere (e.g. Kelly, 1955; Bannister and Mair, 1968; Hudson, 1974; Townsend, 1976, 1977; Floyd, 1977; Pocock and Hudson, 1978). The technique is designed to study the perceived world of an individual with a minimum of interviewer-interference, therefore, we may now be ready to utilise grid technique in the study of Third World problems (Townsend, 1977). This technique assumes that people express their perception of objects, things or situations in bi-polar constructs such as 'good/bad', 'light/darkness', 'long/short', 'wet/dry', 'clean/dirty', or 'high/low' etc. The classification into these bi-polar terms can be analysed to uncover the underlying attitude or perception of a given situation. Although many of these will be held in common by most humanity, the constructs pertaining to any individual will be personal to him in their relative significance and their organisation, and particularly in their application (Townsend, 1977).

In this study the grid type technique was therefore utilised in eliciting information on twelve varieties of sorghum ('traditional' and exotic), seven groundnut varieties ('traditional' and exotic) and six cassava varieties, purposely selected and used in the pre-testing of questionnaire, and which are widely grown in the study area. The procedure followed in the elicitation was to assign respective numbers to the crop varieties (elements) and written, each on a small piece of card. Three cards were then presented to the respondent who was asked to pick randomly and thus the crop varieties corresponding to the assigned numbers on cards identified. Then each farmer was asked in what way two of the three (e.g. sorghum crop varieties) are similar (construct of similarity); and they were also requested to categorise the remaining nine (in the case of sorghum), four (in the case of groundnuts) and three (in the case of cassava) into these two constructs. The three cards were then replaced and another random selection of three more cards was made. This same procedure was repeated until all the constructs (responses) a farmer could remember were in fact exhausted.

The use of this technique provides a very useful way of eliciting information and interesting insights into farmers' perception of the utility functions of their crop varieties under consideration, and without imposing the views of the interviewers since all constructs are supplied by the respondents. The flexibility of repertory grid technique implies that it has no fixed format or content as it is not concerned with relating the construct patterning elicited to any established normative data. But it aims only at exposing the construct patterning of an individual (Bannister and Mair, 1968; Bannister and Fransella, 1977). As such, much is left to the inventiveness of the researcher with regard to the problem in hand (Barker, 1977).

Most farmers were co-operative and actively or fully participated

in the triad sorting test exercise and which attracted several on-lookers. It also provided the context of very useful follow-up discussion. However, the problem with this type of exercise is that it is time-consuming and cumbersome. Additionally, a few farmers were suspicious of the research team that they were using the survey as a cover-up for something else. Their main argument was that the enumerators are familiar with the crops and have been eating them since their childhood. So they saw no point of asking them to identify similarities and dissimilarities of the crops in question. However, they were later fully convinced of the purpose of the study after a careful explanation.

Constructs of similarity and dissimilarity for the crop varieties under consideration were spelt out. For sorghum varieties farmers' constructs were mainly centred on the growing period, the botany, the qualities, the position in rotation years and the uses made of these varieties and other features. The constructs advanced by farmers for sorghum varieties included : Quick-maturing/late-maturing, white colour/red or yellow; subrounded/flattened, closed/open, good or sweet taste/poor or bitter taste, good storage/bad storage, resistant to smut or head moulds/ not resistant to smut or head moulds, bird resistant/ not resistant, drought resistant/ not resistant or susceptible, cash crop/food crop, can be grown twice/grown only once; good for eating or boiled whole grains/not good, makes good beer/does not etc. Crop characteristics of groundnuts and cassava varieties were also identified on the basis of growth and other qualities and uses.

In this context, Table 6.3 demonstrates a list of the sorghum varieties corresponding to each of the principal growth and utility characteristics as farmers' constructs for the elements under consideration, with the best or worst varieties starred. It is clear from this table that in determining which crop varieties to grow and how many of each to plant,

Table 6.3 Some Characteristics of main sorghum crop varieties and farmers' participation in a repertory grid type exercise in the study area

Farmer's Construct	Crop Variety											SERENA (EXOTIC) (-) 90X7/11 (EXOTIC) (-)
	BARI (2)	BAUARI (3)	BERI (3)	DERI (1)	GBUNGURU (3)	MBIRIKA (3)	MABIOR (2)	NDALA (1)	NYARANGO (1)	MORO (1)		
Planting month	August/Sept.	April	April	April	April	July	July	July	July	April	April/August	
Harvesting month	December/Jan.	September/Oct.	July	December	December	December	December	December/Jan.	December/Jan.	November	August/December	
Maturation period	Quick (5 mths)	Late (6-7 mths)	Quick (4-5 mths)	Late (8-9 mths)	Late (8-9 mths)	Late (6 months)	Late (6 months)	Late (6-7 mths)	Late (67 mths)	Late (8 months)	Quick (5 months)	
Grain colour	White	Red	Red	White	Red	White	White	Reddish, yellow	White, yellow, red	Off-white, grey	Red	
Grain shape	Very small, Sub-rounded	Sub-rounded	Flattened to Sub-rounded	Sub-rounded	Sub-rounded	Sub-rounded	Sub-rounded	Flattened to Sub-rounded	Subounded	Flattened	Subounded	
Panicle type	Goose-necked open heads	Closed	Open or close small	Closed	Open big heads	Closed	Closed	Open big heads	Open	Open	Closed	
Height of grain stalk	Short	Short	Short	Long	Long/Tall robust pithy	Short	Short	Long	Long	Long	Short	
Grain taste	Poor/Bad	Good/Sweet	Good/Sweet	Good/Sweet	Poor/Bad	Good/Sweet	Good/Sweet	Poor/Bad	Poor/Bad	Poor/Bad	Good/Sweet	
Storage ability	Good	Good	Good	Poor	Poor	Good	Good	Poor	Good	Good	Good	
Resistance to fruit or head moulds	Poor with late rains	Poor if much rain at flowering	Poor if much rain at flowering	Poor with late rains	Resistant/Good	Resistant/Good	Resistant/Good	Poor if much rain at flowering	Poor with late rains	Resistant/Good	Poor with late rains	
Bird resistance	Poor	Poor	Poor	Good	Fair	Poor	Good	Good	Poor	Good	Poor	
Drought resistance	Good	Good	Good	Good	Good	Poor	Poor	Poor	Good	Good	Good	
Wind resistance	Good	Good	Good	Poor	Poor	Poor	Poor	Poor	Good	Poor	Good	
Disease damage	Susceptible	Susceptible	Withstands	Withstands	Susceptible	Withstands	Withstands	Susceptible	Withstands	Susceptible	Susceptible	
Pounding Process	Easy	Easy	Difficult/Hard	Difficult/Hard	Easy	Difficult/Hard	Difficult/Hard	Easy	Easy	Easy	Difficult/Hard	
Many enemies including humans	Good	Poor	Poor	Poor	Good	Poor	Poor	Good	Good	Good	Poor	
Yields potential, producing quantities	High/Good	High/Good	High/Good	Low/Bad	Low/Bad	Low/Bad	High/Good	High/Good	High/Good	Low/Bad	Low/Bad	
Preferably grown in black soil	Good	-	Good	Good	-	Good	Good	Good	-	Good	-	
Old/New introductions from outside the study area (origin)	Bari Tribe	-	-	-	-	-	A man from Dinka Tribe known as Mabior	-	-	-	Project Development Unit (PDU)	
Cash Crop	Attracts good prices	-	Attracts good prices	Sells well	Attracts good prices	-	-	Sells well	Attracts good prices	-	-	
Porridge (Asida) in Arabic (or pan-cake) Linye, in Moru, Bakinde in Zande	Good	Good	Good	Good	Good	Good	Bad	Bad	Good	Good	Good	
Boiled or roasted whole grains (bulila, in Moru)	Bad	Good	Good	Good	Bad	Good	Good	Bad	Bad	Good	Good	
Making beer (marrissa or waragi in Arabic)	Good	Good	Good	Good	Good	Good	-	Good	Good	-	Good	
Can be eaten raw in a milky stage	-	Good	Good	Good	-	-	-	Good	Good	Good	Bad	
Stalks chewing condition	Sour	Sweet	Sweet	Sweet juicy	Sour	-	Sour	Sweet	Sweet	Sweet	Sour	
Position in rotation (Years)	(1)(2)(3)	(-)	(1)	(2)(3)	(-)	(2)(3)	(-)	(1)(2)	(1)(2)(3)	(1)(2)(3)	(-)	

Source: Informal interviews and Farmers participation in a Repertory Grid Type Exercise in Maridi District

(1) Dominant variety (2) Common variety (3) Minor variety (-) Unidentified

farmers usually take into consideration their utility characteristics. For instance, some varieties are mainly good for boiling or roasting whole grains thus providing a mid-day snack on the farm throughout the year. Other varieties are quick-maturing and thus fulfil household food needs especially in the hungry gap periods when most crops have been sown. On the other hand, the quick-maturing crop varieties are usually grown in small quantities because they are comparatively poor storers and cannot be kept for long in the soil. Additionally, some varieties may provide the utility characteristics but are susceptible to adverse environmental or ecological conditions. All these crop characteristics have an important role to play in shaping the decision of farmers as to what varieties to grow and, therefore, each farmer tries to plant at least a range of varieties which contains each of the useful features. However, as shown in Table 6.3 some crop varieties may combine more than one utility features. Farmers' constructs (responses) on crops and varieties are particularly important and relevant as an indication of the precision with which farmers differentiate their crop varieties and types.

Many of the comments (constructs) made by farmers on the classifications of groundnuts and cassava are briefly summarised in Tables 6.4(A) and 6.4(B). These tables reflect similar crop features of the sorghum varieties as shown in Table 6.3. Thus, different crops and varieties grown at different rates, for different periods, have various uses, vary in taste and are of varying reliability. In this regard, farmers combine several strategies and therefore seek to balance as many relevant factors as possible, reflecting consumption needs and tastes, dietary preferences, soil and vegetation as well as climatic conditions within the context of the farm technology available. Hence, it is possible to discern that farmers are primarily concerned with stability of food supply and the degree of diversification is rational to cope with the adverse

Table 6.4 (A) : Some comments on main groundnut crop varieties grown and farmers' participation in a repertory grid type exercise in the study area

CROP VARIETY	FARMERS' COMMENTS	CROP VARIETY	FARMERS' COMMENTS
Atizo	- It is grown from April to May - It is harvested in August - Dominant variety - Its stalks grow together (bunch) - Seed size is small - It is pink in seed colour - It has two seeds in a pod - It tastes good/sweet and can be roasted or boiled - Poor drought-resistant - Originally grown by a chief known as Atizo - Produces a greater number of pods per stalk-good yielder - Many can be eaten or raw (fresh) - It needs quick harvest to avoid seed rooting - It sells good - Quick maturing variety and grown on sandy soils	Kuku	- Good taste - Makes sweet paste mixed with honey - Planted in April - Harvested in August - Quick maturing variety - Minor variety - Mainly for food - Its stalks are small and grow together (bunch) - Small seed size - Seed colour is pink/lb - It has two seeds in a pod - Poor drought-resistant - Mainly grown near homesteads - Planted on black soils - Its paste makes sweet cassava leaves and vegetable soups - Many can be consumed fresh, especially by children - Good snack
Iba	- Originally planted in Ibba where it derives its name - It is planted from April to May - Its stalks when growing lie stretched on ground (Prostrate) - Harvested from August to September - Its seed size is medium - Its colour of seed is pink/lb - Three seeds in a pod - It is a very good drought-resistant - Quick-maturing variety - Good market - It has a good or sweet taste - Difficult to weed without pulling out young pods from ground - It is a good yielder and grown on <u>singwa</u> soils (sandy soils)	Tambura (Zande)	- Introduced by a Zande chief known as Tembura - Planted in April - Harvested in August - Quick-maturing variety - It has a prostrate habit of growth - Very good taste - Does not withstand drought and disease - Grown on black and sandy soils - Two seeds in a pod - Pink/lb colour - Seed size is large - Makes good roast pea-nut - Easily unearthed by foxes when freshly planted - It is usually a man's favourite - Sells well - A minor variety - Its stalks are good sheep and goat fodder - Produces excellent potash after burning
Makaraka (Zande)	- It is a dominant variety - Azande grew it first - Planted from March to April - It has a bunch shape when growing - Harvested in August - Has both red and white seed colour - It has a medium seed size - Three to four seeds in a pod - It has a very sweet taste - It is a good drought resistant - Most liked by people - Small area planted but more yields - Easy to harvest - Grown on <u>singwa-gyini uni</u> (Black sandy soil) - Matures late - It fetches more money - The Zande probably borrowed it from Makaraka tribe living in Yei District	Nyeing'wa	- It is a minor variety - Good yielder - It has a prostrate growth characteristics - Planted on sandy soils - Planted in April - Harvested in July - Quick-maturing varieties - Relieves hunger in critical periods - Most is eaten while in field - Medium seed size - Seed colour is pink/lb - There are two seeds in a pod - To prevent seed rooting it must be harvested as soon as it matures - Not bad taste - Few can be eaten when fresh unless roasted or boiled - Does not attract market
Makulu Red (Exotic)	- It is a minor variety - Seed colour is red - It is a poor drought resistant - Taste is poor/not sweet - Not a good yielder - Planted in April - Harvested August - It matures quickly - Medium seed size - Semi-bunch stalks when growing - Does not attract good prices - Two seeds in a pod - Easy weeding - Provides good ash for potash and salt - Project Development Unit (PDU) introduced it - It was first seen and grown in Zambia - It is preferably grown in sandy soils		

Source : Informal interviews and farmers' participation in a Repertory Grid type exercise in Maridi District.

environmental conditions and uncertainty and problems of risk. These factors help determine farmer's decisions concerning resource allocation to different crop types and varieties in regard to land and labour.

It is worth mentioning that informal interviews with male respondents revealed that their housewives are knowledgeable about seed qualities especially in regard to food processing and cooking characteristics, and in some cases these women advise them on what amounts of crop varieties to grow. This points to the consultation of women by extension staff to determine whether project inputs are well-designed from their point of view. Cole et al. (1974) in the findings of one of their studies of visual perception test on rice plants in rural Liberia lend support to the above remark; stating that women rather than men were the experts and that extension agents had focused their attention on the wrong sex.

6.5 Farm Family Diet

In recent years, there has been a great deal of controversy concerning the inadequacies of the diet of rural farm families in the Third World countries and the effects upon health, work output, personal aspirations and various other relevant matters (Clark, 1970; Elliot, 1970; Schofield, 1979). However, Clark (1970) warns of the difficulties in interpretation of studies of the nutritional requirements of populations being markedly influenced by body weight, ambient temperatures, rate of activity and amount of work done and probably other factors too. Vitamins and protein requirements are even more disputed and variables such as age of the individual and quality of the protein are important.

The object of this section is, therefore, to outline in general what farmers in the study area actually do with their farm produce in terms of meeting family requirements. Dietary customs and etiquette, as

noted in section 6.4, generally govern preparation and ingestion of food. They also influence the crop types and varieties grown and which consequently determine the rate at which farmers are willing to accept introduction of new crops and varieties. The data that are presented in this section were mainly gained through informal interviews of the sample farmers and others as well as several of the extension staff in the study area. While visiting farm families throughout the study area, the major food items (including those hunted or gathered) were recorded and are presented in Table 6.5. Typical food items consumed each month and some of the health, agricultural and environmental hazards as well as nutritional deficiencies are shown in Table 6.6. The information presented in this table was not quantified but it gives a general picture of the diet of the farmers in the study area.

It is clear from Table 6.6 that farmers generally have one meal a day during the cultivation season, a period characterised by peak of farming operations. The shortage of food and the impact of debilitating diseases at this time generally reduce the physical energy and labour inputs and efforts of most farmers. Farmers in the study area, as in other similar parts of the world, generally do not have fixed or specific meal times as those set down in the Western countries. They often do not take breakfast before going to farm especially when they have to walk a considerable distance from the homesteads and when farm work is at its peak. Usually, snacks including dry roasted or boiled groundnuts, maize, cassava, sweet potatoes, bean cakes, thin porridge (madida: Arabic) serve the purpose and are consumed while in the field. Also mid-day meals may be taken any time between noon and late afternoon and again snacks of different foodstuffs noted above are taken; occasionally food and beer are also consumed especially in the case of informal labour of co-operatives and social networks (see Chapter 8). Children and older people remaining at home may eat rice, beans or roasted sweet potatoes, cassava etc.

Table 6.5 : Ways in which the main home-grown foods and those hunted or gathered are prepared for household consumption and their nutritional uses

<u>ITEM OR CROP</u>	<u>USES</u>
Sorghum (Dura)	- <u>Linya</u> (in Moru), Bakinde (in Zande), a thick porridge or mash which is eaten with sauce (<u>mullah</u> in Arabic) - <u>Kisra</u> (adopted Arabic name in the area), pan-cake, a type of thin unleavened bread that is eaten with sauce - <u>Madida</u> (in Arabic), a porridge which is eaten as a snack flavoured with sesame or groundnut paste, lemon, honey, tamarind and sugar - <u>Balila</u> (local Arabic name adopted), boiled whole grain (<u>dura</u>), flavoured with sesame or groundnuts and eaten as a meal or snack - <u>Marrissa</u> (in Arabic), means beer, either white (<u>abiyat</u>) beer, or <u>kpete</u>, a sweet beer with finger millet or bulrush millet - Local alcohol (<u>waragi</u>, in Arabic), an alcoholic spirit made from fermenting <u>dura</u> flour and cassava flour and then distilled
Cassava	- <u>Asida</u>, cassava flour (after crushing the dried cassava and ground) can either be used alone or mixed with <u>dura</u> flour, boiled with water to form thick mash and eaten with vegetable relish - <u>Waragi</u>, an alcoholic spirit made from fermenting <u>dura</u> flour and cassava flour and then distilling - Sweet varieties can be boiled and baked to be eaten as a snack, either alone or with groundnut or sesame paste - Very young leaves can be eaten, rich in protein but needing special treatment and after grinding and cooking with condiments to form a soup used to accompany main dishes; sometimes leaves are eaten with Jews Mallow
Finger Millet	- Porridge (<u>Madida</u>) - <u>Marrissa abiyat</u> or <u>kpete</u>
Bulrush Millet	- <u>Asida</u>, when mixed with cassava flour - Making beer and alcohol - Thin porridge (<u>madida</u>)
Maize	- Eaten green, roasted or boiled on the cob (most common use), a yellow maize (Western Yellow) is said to be sweeter when eaten roasted or boiled but it is hard to grind - <u>Asida</u>, when pounded into flour - Sweet beer - Dry grain for snacks - Dry grains soaked and ground wet, the paste is mixed with boiling water to form a thick paste and eaten like <u>asida</u> as a snack; but more usually, is wrapped in leaves, covered and allowed to cool and harden and eaten with vegetable soup; can be stored for about a week in this form
Sweet potatoes	- Eaten boiled, baked or fried, often as a snack and sometimes with groundnut or sesame paste - Leaves are eaten as a vegetable in the relish or <u>mullah</u>, a white-skinned, white-fleshed floury textured very sweet variety is preferred
Groundnuts	- Mostly eaten as paste, having been dry-roasted, skins removed and ground, and used to flavour the relish of meat, fish, beans or vegetables, a dry, non-oily groundnut in many seed pods is preferred
Beans and peas	- Eaten as a relish by boiling alone or with whole <u>dura</u> and sesame or groundnut paste added after cooking - Sometimes peas can be dry-roasted, roughly ground, winnowed and boiled
Sesame	- To make a paste for flavouring the relish and other foods, the seed being dry-roasted and then ground - To make oil for cooking - To brew beer (<u>konyimoru</u>, common name in the area), 'moru' actually refers to the Moru tribe who are well-known as good brewers and favour the drink; it is fermented with sugar or honey - To make <u>tamiya</u>, a mixture of honey and sesame, eaten as a snack between meals, especially by children
Rice	- Boiled white and eaten with pepper soup-tomato puree and onions and salt, palm oil, fish/meat, cooked with all condiments added while preparing
Pumpkin	- Leaves are eaten as a relish, either boiled alone or with groundnut or sesame paste - Flowers are eaten as a snack after boiling, sometimes with groundnut or sesame paste
All vegetables	- Are cooked into soup to accompany staples, also combined with common set of basic condiments; namely fish and/or meat, salt, palm oil, beans and pepper; they are added at specific points during the process of cooking depending on the type of vegetable concerned; all vegetables are thoroughly cooked before eating them
Some meat	- Usually dried and smoked and eaten as relish
Fish	- can be eaten fresh after cooking, dried or smoked as relish
Termites (Flying ants)	- Ground into paste after wings have been removed by shaking in a basket, used as a substitute for groundnut or sesame paste
Honey (Hunted or gathered) from beehives	- For flavouring <u>madida</u> - In making beer, <u>konyimoru</u> by fermenting honey and sesame - In making <u>tamiya</u> with sesame and eaten as a snack between meals
All Fruits grown	- Usually eaten as a snack between meals

Source: Participant observation and informal interviews in Maridi District

Table 6.6 : Food consumption, patterns and some problems facing farmers throughout the year

MONTH	DIET	DIFFICULTIES	NUTRITIONAL DEFICIENCIES
January	- Two meals and snacks, <u>asida</u> - <u>dura</u> , finger millet, <u>mullah</u> - game meat, okra, fish - Sauce - sesame and groundnuts	Obtaining water Diarrhoea and coughs in children	Lack of green leaf vegetables in diet
February	- Two meals, <u>asida</u> - <u>dura</u> , finger millet, <u>mullah</u> - game meat, okra, fish - Sauce - sesame and groundnuts	Obtaining water Diarrhoea in children	Lack of green leaf vegetables in diet
March	- Two meals and snacks, <u>asida</u> - <u>dura</u> , millet, <u>mullah</u> - Jews Mallow, beans, meat, fish - sauce - sesame, snacks - sweet cassava	Obtaining water Wooden bridges on roads collapsed due to burning	Some families lack green leaf vegetables especially in Zones 1 and 3 Some families in towns have more or less finished consuming their <u>dura</u>
April	- One meal and snacks, <u>asida</u> - <u>dura</u> , <u>mullah</u> - Jews Mallow, meat - Sauce - sesame and groundnuts snacks - mangoes	Obtaining water Uncertain start of rains especially in Zones 1 and 3 Malaria/fevers in children	Some families in towns finished <u>dura</u> and having to buy
May	- One meal and snacks, <u>asida</u> - <u>dura</u> , <u>mullah</u> - Jews Mallow, temeleka, okra - Sauce - sesame, groundnuts, lulu (shea butter) oil, snacks - sweet cassava and wild fruits	Uncertainties and irregularities of rainfall Malaria in children If <u>dura</u> short, less help from neighbours with land clearance because less food and beer	Families in towns and in some rural areas finished <u>dura</u> and buy from shops and other families
June	- One meal and snacks, <u>asida</u> - <u>dura</u> , <u>mullah</u> - temeleka, Jews - Sauce - sesame, oil, groundnuts snacks - sweet cassava	Irregular rainfall shortage of food to buy from shops	Shortage of <u>dura</u> , sesame, groundnuts Fruits - not enough food
July	- One meal and snacks, <u>asida</u> - <u>dura</u> , <u>mullah</u> - okra, mushrooms termites (flying ants) - Sauce - sesame, oil, groundnuts Snacks - maize	Heavy rains causing bad roads Difficulties in bringing food into the area Shortage of food and consumer goods for sale in shops	Not enough food - <u>dura</u> , sesame groundnuts, meat, fruit, beans, peas
August	- One meal and snacks, <u>asida</u> - <u>dura</u> , finger millet <u>mullah</u> - green leaf vegetables, okra - Sauce - sesame, oil and groundnut Snacks - maize, pumpkin	Heavy rains causing bad roads Difficult to bring food into the area Shortage of food and consumer goods in shops	Not enough food, <u>dura</u> , sesame, meat, beans, peas
September	- One meal and snacks, <u>asida</u> - <u>dura</u> , maize, <u>mullah</u> - green leaf vegetables, okra - Sauce - maize, groundnuts, pumpkin	Situation improves But irregular rainfall	Not enough <u>dura</u> although this supplemented by maize and pumpkin
October	- Two meals and snacks, <u>asida</u> - <u>dura</u> , maize, <u>mullah</u> - green leaf vegetables, okra, beans - Sauce - groundnuts Snacks - sweet potato, groundnuts, pumpkin	-	-
November	- Two meals and snacks, <u>asida</u> - <u>dura</u> , <u>mullah</u> , green leaf vegetables, okra, beans and peas - Sauce - groundnuts, sesame snacks - sweet potato	Heavy bird and wild animal damage to sorghum (<u>dura</u>) and other crops especially when the majority of crops have been harvested	-
December	- Two meals and snacks, <u>asida</u> - <u>dura</u> , <u>mullah</u> - okra, Jews Mallow, game meat - Sauce - sesame, groundnut - Snacks - sweet potato	Diarrhoea and coughs in children Bird and animal damage to <u>dura</u> and pearl millet	

Source : Informal interviews and observation in Maridi District

However, after farm work which may end at 6 p.m. and when the farmers return home, a common bowl meal, typical of any one or two meals taken in the course of the period (see Table 6.6) may be consumed. The meals taken generally consist of one course while fruits and snacks are taken at random (probably acting as a dessert in the 'modern' world), distinct from meal times.

Fieldwork observation showed that in many farm families, the amount of animal protein, as well as eggs was frequently small. For example, eggs are generally not for consumption but hatching and reproduction of more chicks. Sheep and goats, as well as cattle, are rarely slaughtered for consumption or for sale (see Chapter 5). Occasionally, bush meat provides protein. Milk from sheep and goats was given to younger children when available in plenty. Oranges, mangoes and other fruits gathered were also eaten in several farm families. Therefore, hunting and gathering are crucial factors for maintaining this dietary balance in a situation in which rain, drought, soil infertility and wildlife scavengers combine to play havoc with agricultural production. These few remarks on dietary patterns of farmers show that though not ideal, it seemed the farm family diet was not, however, seriously lacking either in quality or quantity, especially in contrast to many similar tropical communities where daily diets of white rice and cassava are rarely supplemented by any meat or fish protein, pulses, green vegetables or fruit. Nevertheless, it is thought possible that during the later part of the dry season and early cultivation or rainy season, food supplies among some farm families may have been inadequate. Thus, malnourishment tends to be seasonal particularly at the beginning of the rains and is localised, with young or sick children suffering the most. The situation is further aggravated by the practice of a family eating together, sharing from a common bowl. Usually, people eat with their right hands and it is impolite to push one's hand in close to another person; but there is no norm of rotation.

Hence, the faster one eats the more one gets satisfied and many children are generally slow eaters. Additionally, children with measles are not fed meat, fish, chicken or eggs (nor are they washed for fourteen days, or carried anywhere) for fear they will die. So they are deprived of protein at a critical time. Culwick (1950) in her study of a 'Dietary Survey among the Zande of south-west Sudan' concluded that the diet of the Zande was low in energy and protein especially in April and May when the demand for labour input was at its highest and deficient in vitamin A and Riboflavin in the dry season, during January - March. Informal discussions with the local nurses and the medical doctor in Maridi headquarters generally showed that diet was not a major cause of ill-health among several farm families in the study area. However, it is thought likely that a richer diet would help to counteract the debilitating effect of internal parasites.

6.6 Some Aspects Of Farmers' Knowledge On Health And Nutrition

Farmers' knowledge on health and their awareness of the presence of some of the debilitating diseases and other complaints and their effects on farm labour input in the study area had already been outlined in Chapter 4. It has been briefly mentioned that many of the illnesses among farm families were of seasonal occurrence and that the rainy season was the time when the health of the households was at its weakest. Diseases such as bronchitis, rheumatism etc. and the effects of internal parasites were all considerably more prevalent and severe during the peak of the cultivation season.

The questionnaire survey investigated aspects of farmers' knowledge on health and nutrition. Specifically they were requested to advance any explanations why medical doctors advise people not to walk barefoot (Q.58,a), and to list the kinds of foodstuffs that are considered nutritionally the most valuable (Q.59).

Concerning the health query, overall the sample, about 35% of the farmers advanced positive responses and therefore are aware and know the risks of diseases and other parasites such as worms, jiggers (tukutuku : Moru) etc which enter the body through the soles of the feet when walking on damp ground and then through the gut thus causing diarrhoea, anaemia and debility. While 65% of the farmers responded negatively. Some of the reasons advanced by the positive proportion of farmers were mainly centred on protection of feet from sharp thorny brushwood, scorpions and snakes. However, in every case, most farmers asserted that it was quite impossible to avoid going barefoot anyway in the rainy season as any boot was invariably left behind in the mud as it is difficult to perform farm work with boots on. Several farmers were seen wearing cheap, Wellington-type rubber boots that are laced together. The large proportion (65%) of the negative block of farmers indicate that general hygiene had probably received little attention in the study area.

Food items considered nutritionally valuable by farmers are listed by rank order in Table 6.7. Overall the sample, while there are zonal differences in the farmers' responses, it is clear from this table that the most popular single item among a wide variety of the foodstuffs is meat and/or fish with 61.9% of the farmers mentioning this item. Also there are higher proportions of farmers in Zones 1 and 2 (Ibba RC) with 56.3% and 59.4% of the farmers naming meat and/or fish respectively. While in Zones 3 and 4 (Maridi RC) about 6.7% and 7.3% of the farmers mentioned starch crops respectively. In the study area, meat is the rarest and the most expensive food item especially among the Azande (mainly in Zones 1 and 2). This is because few livestock are kept especially in Zone 2. There is general belief that the Zande are very interested in meat (poso:Zande)

Table 6.7 : Number and percentage of farmers' reponses on some food items considered nutritionally most valuable in the study area

Sample area		Zone 1 (N=32)		Zone 2 (N=32)		Zone 3 (N=48)		Zone 4 (N=48)		District (N=160)						
Food item		No.	% R.O.	No.	% R.O.	No.	% R.O.	No.	% R.O.	No.	% R.O.					
Meat and/or fish Starch crops Cassava leaves/palm oil Vegetables Beans Fruits Eggs Others		18	56.3	1	19	59.4	1	30	62.5	2	32	66.7	3	99	61.9	1
		16	50.0	2	14	43.8	4	32	66.7	1	35	72.9	1	97	60.9	2
		9	28.1	5	15	46.9	3	25	52.1	4	28	58.3	4	77	48.1	4
		10	31.3	4	9	28.1	7	22	45.8	5	27	56.3	5	66	42.5	5
		7	21.9	6	11	34.4	5	21	43.8	6	20	41.7	6	59	36.9	6
		9	28.1	5	10	31.3	6	17	35.4	7	19	39.6	7	55	34.4	7
		10	31.3	4	9	28.1	7	15	31.3	8	17	35.4	8	51	31.9	8
		13	40.6	3	16	50.0	2	26	54.2	3	33	68.8	2	88	55.0	3
Mean		2.88		3.22		3.92		4.40		3.71						

Source: Questionnaire Analysis.

160 Farmers interviewed in Maridi District

Farmers were able to advance more than one response and these categories are not mutually exclusive.

R.O. Rank Order

consumption and so are believed to be eating even the meat of many of the reptiles and amphibia (e.g. frogs) except baboons' meat. On the other hand, among the Moru and other tribes the higher proportions of farmers in Zones 3 and 4 (Maridi RC) naming starch crops is probably because of the fact that most Moru consume a lot of sweet beer (konyimoru:Moru) made from sesame and mixed with either honey or sugar. This suggests that food preference is also influenced by culture rather than ecology. The low position of eggs in the study area is because most farmers rarely consume them as they are generally kept for hatching and reproduction of more chicks as noted in section 6.5. Fruits are generally considered as snacks. Cassava leaves, which are nutritionally rich in protein, are consumed by most farm families, but relatively rich or well-to-do households do not eat much for reasons of social status - it is generally considered 'poor man's food'. However, food taboos differ between tribes and also between clans.

In general, due to the existence of social and economic values placed on the livestock in the study area, slaughtering of animals such as cattle, sheep and goats is rare (see Chapter 5). Hunting of small wild game is therefore the major way of obtaining supplemental food supply (bush meat), although there is a basic conflict between the interests of small farmers and those of the Wildlife Conservation Department (see Chapter 4). Despite the lack of nutrition education programmes, farmers are generally aware of the nutritious foodstuffs though not on scientific level of understanding in relation to the proteins and vitamins or body weight parameters, but on the basis of food tastes, preferences and healthiness of an individual usually judged by the putting on of body weight or fatness.

The foregoing remarks on farmers' knowledge on health and nutrition are indicative rather than conclusive. There is a need to establish

a system of monitoring of nutritional status and changes in food preferences, tastes and farmers' attitudes (different crop qualities are required for different uses).

Summary

This chapter has generally examined some factors relating to the achievements of peasant farmers in the improvement of their agricultural systems, their competent use of environmental resources as well as their deep knowledge of the underlying processes involved in their production systems. Farmers' decision making involves activities that are aimed at satisfying goals, as Herskovits (1964:512) puts it succinctly "men wish to make their activities efficient rather than wasteful". Thus, they consciously strive to make the most efficient use of resources available to them for the achievement of goals which motivate them into action. It must be recognised that the farm management strategies adopted by farmers are rational, valid and productive and, therefore, they could probably be valuable participants with Government in development planning institutions. Since they have lived (and still are living) in the rural areas all their lives, these ethnoscientists can articulate environmental processes. Thus, their advice, contribution and knowledge of the environment (e.g. vegetation, soils, climate) are useful attributes especially in reconnaissance surveys in relation to historical aspects, crop assessment and utility characteristics as well as household food consumption patterns, preferences and tastes and socio-economic priorities of the rural people particularly where development projects are to be sited and implemented.

In this context, farmers' knowledge of the environment is based mainly on the underlying ecological processes and social and economic issues (proximal and distal) which affect their management of agricultural production. Only by proclaiming farmers' indigenous technical knowledge (ITK) in regard to their agricultural and environmental strategies as 'wasteful'

or 'primitive' and therefore unproductive, can change agencies and research institutions maintain their privilege status to determine what the peasant farmers need and, hence, to direct research along their own line of thinking. This discussion leads to the examination of another rich area of farmers' agricultural and environmental knowledge in regard to their identification and perception of problems and the adoption of some management strategies designed to cope with these constraints. These elements are important to the understanding of the underlying process in farmers' decision-making procedures which are the object of the next chapter.

CHAPTER SEVEN

FARMERS' IDENTIFICATION OF AGRICULTURAL AND ENVIRONMENTAL PROBLEMS AND SOME MANAGEMENT STRATEGIES IN THE STUDY AREA

Introduction

In the previous chapter it has been demonstrated that farmers have expert knowledge of various aspects of agriculture and the environment; some are excellent indigenous soil scientists, entomologists, botanists, nutritionists etc., and some are rational in decision-making procedures. Environmental resources play a crucial role in crop production and hence farmers' success in utilising them for growth of crops is strongly influenced by their understanding of their occurrence and characteristics. Thus, an objective analysis by Western World scientists of the physical environmental phenomena in which farming takes place may not be as important as that perceived and analysed by the peasant farmers themselves.

In the study area, many of the problems experienced by farmers, as will be outlined later in this discussion, arise out of the uncertainties, the timing and severity of which cannot fully be predicted. However, the probabilities of certain hazards (e.g. pest attack) occurring over a period of time can be calculated from experiences (see Chapter 3). These uncertainties, their perception and farmers' management strategies adopted or designed to cope with them are important to an understanding of the underlying processes involved in decision-making procedures.

However, most development agencies and extension projects generally do not understand what farmers perceive their agricultural and environmental constraints to be. In an attempt to plan for farmers, these agencies have, in the words of Johnny (1979:126) "assumed the role of 'development doctors'; they 'diagnose' the illness of the 'traditional' farmers, 'prescribe' and 'administer' the 'antidotes'. Their diagnosis, however,

is based on preconceived notions of what their patients' problems are." The so-called experts, after the most perfunctory contact with farmers, presume to know and interpret a reality whose complexity is even now only partially grasped by farmers who have spent all their lives attempting to comprehend it. It is worth noting that disruptions in the smooth functioning of productive factors are frequent and often unpredictable. Thus, it is often postulated that farming takes place in social, cultural, economic and physical environments which must be stable to a reasonable extent for the combination of productive factors to operate successfully.

The object of this chapter is therefore to outline that, contrary to the normative economics, real-life situations are never completely stable. The identification of production problems which are encountered by farmers and how they perceive them must be taken into consideration. In this context, farming problems, the way decision-makers (farmers) perceive them and trends in the farming environment, are important components in the information-kit especially for on-farm adaptive research (OFAR) necessary for those agencies interested in sustained efforts to bring about meaningful improvement or development of small farming. Thus, the argument here is that it is the peasant farmers who are capable of identifying their own constraints and problems and determine the priorities in terms of finding solutions. The discussion in this chapter is mainly centred on farmers' perception of their agricultural and environmental problems, and how they cope with them in the study area. It is argued that any meaningful understanding, explanation and evaluation of the farmers' decision-making procedures require a sound knowledge of the farmers' physical, social and economic environments.

In the previous chapters, farmers' agricultural and environmental

problems have, directly or indirectly, been referred to and it is pertinent at this juncture to state briefly some of them. Natural hazards (e.g.drought) have been noted in Chapter 3; debilitating diseases and complaints affecting farmers' labour input have been mentioned in Chapter 4; there are also some socio-economic and cultural problems (e.g. social customs relating to sick visiting, burying the dead etc.) exerting influence on the use and availability of farm labour force as well as capital equipment and lack of money to acquire new inputs of the extension staff as will be noted in Chapter 8. Additionally, a note was made on the importance of off-farm occupations which to some extent compete with farm operations (Chapter 4). Generally, in the study area the natural hazards are drought, too much rain (at the critical state of plants' growth), pests and diseases. Farmers are therefore aware of some of these hazards and have wisely evolved management strategies, built into enterprise patterns and husbandry practices to mitigate the effects of these hazards. For instance, intercropping is widely practised throughout the study area and; which is partly a device or an insurance technique to ensure that some yield may be obtained from the expended cultivation efforts (see Chapter 8). Thus, the adoption of such 'fail-safe' production strategies indicates rationale in the current agricultural circumstances and farmers demonstrate considerable skills in manipulating the available crops and varieties to secure their objective of guaranteed food supply.

The approach adopted in identifying agricultural and environmental problems in this study was through the administration of questionnaire survey in which farmers were requested to state and interpret their problems and enquiring about sources of advice and help when these constraints are encountered. Additionally, informal discussions with farmers and especially tribal leaders yielded much invaluable information on the prevailing hazards, outlined in the sections which follow.

7.1 An Analysis Of Farmers' Perceived And Reported Agricultural And Environmental Problems

A list of some perceived and reported farming and environmental problems was obtained through the questionnaire survey (Q.26a; Q.27 a,c; Q.60 a,b; Q.61; Q. 62, a,b; see Appendix 1). Table 7.1 summarises these problems in order of frequency of occurrence. It is clear from this table that overall the sample, while there are zonal variations in the farmers' responses, the most important problems as ranked in order of severity or frequency include : crop pests and attack by wild animals, birds and insects (81.9%), poor or erratic rainfall (73.8%), poor marketing and transport or lack of village amenities (50.6%), limited available cultivable and relatively fertile land or poor soil (48.1%) and competition from off-farm activities (38.8%) in that order. Old age and the need to marry more wives and more children (6.3%) and theft or larceny (3.8%) were the least commonly cited problems in the study area. On the zonal basis as clearly depicted in Table 7.1, in Zones 2 (Ibba RC) and 4 (Maridi RC) the three most commonly mentioned problems by farmers in order of severity include crop pests, poor or erratic rainfall, and poor marketing and transport. While in Zones 1 (Ibba RC) and 3(Maridi RC) poor or erratic rainfall, crop pests and limited available and relatively fertile land or poor soil were frequently mentioned farm constraints. Zones 1 and 3 are relatively drier than Zones 2 and 4 so that it is not surprising that farmers' concern was mainly centred on the adequacy of rainfall.

In general, farmers were able to distinguish between those agricultural and environmental problems which reduce farm size (e.g. shortage or lack of labour, old age and the need for larger family, poor health, lack of seedlings or seeds, restricted available land as well as competition from off-farm occupations) and those constraints which reduce crop yields (e.g. poor or erratic rainfall, pests in

Table 7.1 : Number and percentage of farmers' responses on some of their perceived agricultural and environmental problems in the study area

Sample area		Zone 1 (N=32)		Zone 2 (N=32)		Zone 3 (N=48)		Zone 4 (N=48)		District (N=160)						
Problem		No.	% R.O.	No.	% R.O.	No.	% R.O.	No.	% R.O.	No.	% R.O.					
Crop pests/wild animals, birds, insects etc. Poor or erratic rainfall/inadequate or late rainfall/The 'Sun' Poor marketing and transport/No village amenities Limited available cultivable and relatively fertile land/Poor soil Competition from off-farm occupations Shortage or lack of labour Sickness/Personal, social and cultural problems Weeds Lack of money and seasonality of farm inputs Outbreak of fire Lack of insecticide, toria hoes/Administrative arrangements Too much rainfall/Flooding Lack of seedlings/Seeds Crop and livestock diseases Old age/Need for more wives and children Theft/Larceny		27	84.4	2	20	62.5	1	41	85.4	2	43	89.6	1	131	81.9	1
		28	87.5	1	19	59.4	2	43	89.6	1	28	58.3	2	118	73.8	2
		16	50.0	4	15	46.9	3	26	54.2	4	24	50.0	3	81	50.6	3
		18	56.3	3	12	37.5	4	28	58.3	3	19	35.6	4	77	48.1	4
		13	40.6	5	11	34.4	5	21	43.8	5	17	35.4	5	62	38.8	5
		16	50.0	4	12	37.5	4	7	14.6	10	9	18.8	9	44	27.5	6
		10	31.3	6	7	21.9	7	14	29.2	6	12	25.0	6	43	26.9	7
		8	25.0	8	5	15.6	9	13	27.1	7	11	22.9	7	37	23.1	8
		6	18.8	10	9	28.1	6	8	16.7	9	10	20.8	8	33	20.6	9
		8	25.0	8	3	9.4	11	13	27.1	7	6	12.5	11	30	18.8	10
		7	21.9	9	4	12.5	10	11	22.9	8	7	14.6	10	29	18.1	11
		4	12.5	11	6	18.8	8	7	14.6	10	10	20.8	8	27	16.9	12
		9	28.1	7	4	12.5	10	5	10.4	12	3	6.3	14	21	13.1	13
		2	6.3	12	1	3.1	12	6	12.5	11	5	10.4	12	14	8.8	14
		2	6.3	12	1	3.1	12	3	6.3	13	4	8.3	13	10	6.3	15
		1	3.1	13	1	3.1	12	3	6.3	13	1	2.1	15	6	3.8	16
Mean number of responses/farmer		5.47		4.06		5.19		4.35		4.77						

Source : Questionnaire analysis and informal interviews
160 Farmers interviewed in Maridi District

N.B. R.O. = Rank Order. Because of the different number of responses per farmer, the % response is not strictly comparable between the zones.

Farmers were able to provide more than one response with the exception of one farmer in Gworosai (Zone 4:Maridi RC) who did not advance any problem. He said that the farming problems have existed ever since the time of their ancestors and, therefore, are not regarded as problems to be asked about as they are a normal part of farming life.

particular wild animals' attack, outbreak of fire, lack of insecticides and weed damage).

(1) Crop and livestock pests

Farmers were explicit, in contrast to crop and livestock diseases, in naming pests which include wild animals, insects and birds as well as weeds. In the questionnaire, aspects of farmers' knowledge on diseases, pests, birds and insects attacking crops were investigated (Q.26,a). They revealed a detailed knowledge on insect and weed ecology and careful categorisation and assessment of types and severity of damage (cf. Barker et al. 1977). In the study area, the most frequently perceived and reported crop hazards include:

a) Baboons: (waku : Zande) Farmers consistently reported these as the number one pest. Indeed, they are often the major limitation on crop production and yields. They attack all crops but particularly sweet potatoes and sweet cassava, although bitter cassava varieties (karangba and gbazamangi) are less attacked except when baboons are very hungry and there is no option. Farmers were asked to list their particular problems (Q.60, a) and to list them (Q.60,b); when these problems began (Q.61) and whether these problems were reducing (improving) or getting worse (Q.62,a); and finally, they were requested to illustrate how these problems came about (Q.62,b). In general, about 80% of the farmers claimed that baboons damage to crops was getting worse (on the increase) in the study area. Farmers' explanation to this problem was mainly centred on the increase of citrus fruits and mangoes near the homesteads. Most farmers asserted that before the Civil War there were few or no baboons near homesteads but during the Civil Strife many have moved into the deserted settlement compounds and subsequently remained near habitation. This factor is magnified by the relaxation of effort to kill them due to the widespread superstitious belief, especially among the Azande, that

the killers may contract leprosy or may die an unnatural death. The gradual decline of the katiri land use system in which farm fields were located closely to each other has increased vulnerability (see Chapter 5). There is little doubt that action to limit the number of baboons would be highly appreciated by farmers and such observations may form the baseline for extension services.

b) Wild pigs, goats, monkeys, porcupines (aremvo : Zande) moles and others:

Wild pigs (zigba : Zande) and goats were reported by farmers to inflict severe damage to low HCN (hydrogen cyanide) content cassava tubers and the sweet cassavas are therefore usually planted closer to homesteads. Other pests that can cause appreciable localised damage to certain crops in this group were not so consistently mentioned. Monkeys (baringbi : Zande) particularly attack green maize cobs. Elephants were also acknowledged by farmers to be a major problem especially to cassava, sweet potatoes, sorghum etc. But that they only occasionally attack crops because their habitation is relatively far from farms and homesteads.

c) Foxes, jackals and squirrels (badari : Zande): These pests were reported by farmers to be particularly harmful to the groundnut crop in the study area. They mainly attack recently planted seed before its emergence as well as the crop approaches maturity or ripening. The crop therefore requires continuous guarding. This problem is particularly serious in Zones 1 and 3 (relatively drier zones). It has been estimated in other similar areas that the average losses caused by these pests is about 20% (Coulter, Personal Communication). Ten farmers in Amaki and Ngonde (Zone 3 : Maridi RC) areas reported a decreasing acreage of groundnuts due to the above-mentioned pests. That the iba groundnut variety is liked because of its growth characteristics with deep nuts and able to withstand periods of drought when planted early in the cultivation season before foxes have moved away from their dry season

haunts into the agricultural fields. Additionally, rats were noted for attacking nearly all crops, in particular groundnuts in stores and also seeds of cereal crops in the ground.

d) Birds: Damage to grain crops by birds (apare:Zande) such as yellow weaver bird (Quelea queleaethiopica) or Sudan dioch, sparrow bishop or red-billed finch, dove (abungu:Zande) attacking in particular the unprotected sorghum and bulrush millets was widely reported especially in Zones 1, 3, and 4. These pests are harmful especially to highly palatable crop varieties. Birds usually attack as soon as the ripening grains are available in July, August and September months. Guinea fowls (ngenize:Zande) were also noted by several farmers as a pest of groundnuts in particular although they sometimes attack lowlying or bending sorghum grain heads. Birds can also pick planted or broadcast grains such as sorghum, beans (pod and seed) etc. They also attack maize cobs. In general, Majisu and Doggett (1968) estimated that in Africa some 10-20% of the annual sorghum crop is lost to birds.

e) Grasshoppers (anzede:Zande): These were cited by farmers as a major pest of grain crops as well as sesame, especially during early season growth (April and May); also sorghum when the grains are still in a milky state. Several respondents also acknowledged their attack on cassava stalk and leaves, citrus leaves and flowers, coffee leaves and flowers and banana leaves and flowers. It is reported that most damage done to crops by these pests occurs at night time.

f) Termites: Were reported to attack sorghum, maize, sugar canes and cassava stalks as well as stored dry maize grains, beans in pods and seeds in storage. Most farmers especially among the Azande reported that nothing can be done to reduce the impact of termites attacking crops as these constitute a supplemental food delicacy in the study area.

g) Bees: These pests were mentioned by only two farmers in Madoro (Zone 1: Ibba RC) as sometimes attacking sorghum and maize thus turning the leaves from green to yellow or brown or white colour and the plants consequently die.

h) Stalk borers (*Buseola fusca*): Few farmers noted these pests attacking maize and sorghum stems as well as maize cobs.

i) Millipedes: Farmers acknowledged their attack on germinating seeds of various crops and they are also responsible for slight damage done to maturing groundnut crops.

j) Snails (guru guru:Moru) and slugs (tindi:Moru): Most farmers mentioned their severe damage to foliage on cassava, cereals and legumes as well as young growing groundnuts.

On the basis of some of the above-mentioned pests and the damage they inflict to virtually all crops, farmers rationally adopt a strategy of careful selection of crops for mixed cropping and interplanting to protect the building up of single pest types. Although most farmers in the study area were able to identify clearly several pests and accurately describe the different types of damage and could scale the crop yield losses resulting from the various pests, no attempt was made in this survey to obtain estimates in terms of the percentage yield reduction but awaits later research. Richards (1978) has presented evidence suggesting that such estimates are often realistic.

Several farmers mentioned wild cats and birds of prey as predators of poultry (mainly chickens). One tribal leader in Madebe (Zone 2 : Ibba RC) area noted that many sheep and goats used to be kept but that most fell prey to wild animals - presumably members of the cat family; several farmers were therefore discouraged from keeping these livestock. A few farmers, especially in Zones 1 and 3, were able to specify external pests such as ticks etc.

(2) Rainfall

Too much or, more often, too little rain or late rain ('The Sun') as gauged from farmers' responses (Table 7.1) has caused serious problems for most villages in the study area. It has already been noted that erratic or poor rainfall is the most frequently cited problem by most farmers in Zones 1 (87.5%) and 3 (89.6%) which are relatively drier than Zones 2 and 4. Informal discussions with farmers and tribal leaders revealed that in about four of the last ten years, the amount and incidence of rainfall varied between years and areas; but as different varieties of the same crop are affected to differing degrees by a given rainfall pattern, there is little agreement among several respondents as to which of these years were. However, most elderly tribal leaders agreed upon the year 1932 as a drought one although 1979 was also commonly held by most respondents as a drought year (Chapter 3) perhaps due to its proximity.

In the study area it is commonly believed that both the length of the rainy season and the total quantity of rainfall has gradually decreased (see Fig.3.5) over the last ten or fifteen years (overall deteriorating climate), thus resulting in particular early or late season varieties of crops becoming of less significance. There was also farmers' indication in a change of the busiest months from April and May to May and June due to the later commencement of rains. About 28.1% (9 farmers) in Zone 1 (Ibba RC) acknowledged that moderate or late rain was the main reason they did not plant some sorghum varieties in the year prior to this survey.

On the other hand, years when rainfall stopped too early to allow crops to mature or continued too long with flooding are some of the common experiences of farmers. It is likely that periods of erratic or poor rainfall will affect one or more crops at the critical stage

of their water requirements which is in fact the farmers' major concern. However, compensatory growth in other crops in making up the associations will lessen the effect. Sorghum is probably affected most by a late commencement or an early finish of the rains.

Only certain crops, in particular cassava and sesame were noted by most farmers as suffering from too much rainfall. Since cassava can tolerate much higher rainfall levels, it is likely that the problem is rather one of temporary waterlogging as the crop is usually planted on flat areas. The problem with sesame would appear to be the timing and intensity of rainfall rather than the total amount; it being reported that heavy rainfall (too long) at the crop flowering stage causes shedding. Other crops like beans and cowpeas were also mentioned by four farmers in Gworosai (Zone 4:Maridi RC) as being affected by too much or concentrated rainfall. The adverse effects of too much rainfall on the time of labour inputs and effectiveness on farm-operations was also noted by several farmers in the study area. They reported that too much rainfall encourages many weeds to grow leading to more weeding and high demands on the available family farm labour. Additionally, the problem of working in waterlogged soils forces most farmers to lose several working hours or even man-days. Also excessive heavy downpours of rain can cause farmers to remain indoors when most wild animals take the advantage of attacking unprotected crops. Fox (1953) and Moody (1970) emphasised such events as leading to the reduction of labour input at critical periods.

(3) Poor marketing and transport systems

In the study area, and as observed in Table 7.1, 50.6% of the farmers' concern was on the problems of transport and marketing systems which are in fact inefficient. These constraints therefore limit the production of surplus crops for cash income. Transport and marketing

problems and their impact on agricultural production in the study area have been outlined in Chapter 4 and some will be noted in Chapter 10,A. It is also noted in Chapter 10,B (Table 10.10) that 42.5% of the farmers' wishes were centred on the improvement of transport systems and roads and marketing (especially for coffee and cotton) by the change agencies. As mentioned in Chapter 1 and elsewhere in this thesis, the unfavourable geographical location of the study area from most internal and external markets is one of the major factors of particular importance which has to some degree affected, and is likely to continue to affect, the socio-economic life of the farmers in general. The general improvement of infrastructural services in relation to farming is a clear priority of the farmers.

(4) Limited available cultivable fertile land

Table 7.1 depicts that 48.1% of the farmers' responses were centred on the restriction of available cultivable and relatively fertile land. It can be gauged from the table that this problem was noted by relatively many farmers in Zones 1 and 3 although several farmers in Zones 2 and 4 were also mainly concerned with this problem. The latter zones are comparatively and ecologically suited to the growing of coffee and other tree crops which are now taking up most of the available cultivable and relatively fertile land. It is worth mentioning that farmers' concern on the above constraint in Zones 1 and 3 is mainly on the rainfall distribution, its variability (which is erratic) and reliability and informal discussions coupled with fieldwork observation confirmed that most farmers' fields are sited in the southern-most areas of these zones with the hope and expectation of sufficient rain.

(5) Competition from off-farm occupations

In Chapter 4 it was indicated that although farmers in the study area have other private off-farm occupations like hunting, collection or

gathering of honey etc. which may take precedence over some agricultural operations, in general, these activities do not seriously compete for the scarce family farm labour input. However, Table 7.1 clearly shows that 38.8% of the farmers' replies referred to PDU and other Government projects such as coffee farms, pineapple and citrus fruit projects, tobacco and forest reserves, road maintenance and building and construction etc. as centres offering off-farm employment opportunities and which consequencely disrupt their farming activities. However, these public employment projects are relatively attractive to wage-labourers and artisans, bricklayers, carpenters etc. who seasonally move to work in them due to their immediate cash wages offered by such employment opportunities.

It is interesting to note that in his study of the farmers' responses to planned agricultural development in Gummuiya area of Central Sudan, Briggs (1978:471) noted that "although farmers did not mind working for three to four months a year on the riverain land, few had the desire to work full-time for the whole year in agriculture; the returns were unable to match those from urban employment." Similarly, Mohamed (1975) emphasised that much of the general dissatisfaction in present-day farming is mainly due to the new, wider range of livelihoods available to the farmer. This problem causes a loss of several man-days of labour force which should have been expended in agriculture.

(6) Shortage or lack of labour

It will be mentioned in Chapter 8 that the very 'traditional' nature of society in the study area generally implies that social institutions have a considerable influence on the utilisation of available family farm labour. As can be clearly observed in Table 7.1, 27.5% of the farmers' replies were on the problem of labour input in the study area. On the zonal scale, 50% (Zone 1), 37.5% (Zone 2), 14.6%

(Zone 3) and 18.8% (Zone 4) of the farmers listed shortage or lack of labour. It is not surprising that larger proportions of farmers in Zones 1 and 2 (Ibba RC) as compared to those in Zones 3 and 4 (Maridi RC) noted labour force as a constraint. It will also be mentioned in Chapter 8 that farmers in Zones 1 and 2 have relatively small households and little attempt is made (especially in Zone 2, coffee growing areas) to use labour of non-relations in contrast to Zones 3 and 4 (Maridi RC). Since family labour is the most significant input in farm production, all factors that therefore affect input of labour such as younger people searching for non-farm employment opportunities and those taking refuge in schools, generally leave most of the agricultural activities to the older farmers who are unable to expend much of the requisite energy on the farm. Additionally, those people who have acquired even the least educational levels are attracted to the main centres where non-farm and clerical occupations are their best option of earning their living.

Interviews confirmed the scarcity of labour for some households in the study area. Several farmers reported that during the 1950's and 60's, children in schools used to spend most of their long vacations with their parents and relations living in rural areas. But now that this trend has changed with the result that many remain in towns; while a few just visit these areas when the period of harvesting of most crops commences so as to reap the fruits of harvest. In addition to the awareness of the general process of 'urban-bias', many farmers indicated that the general cause of family labour-scarcity for some households in the study area is mainly due to the effects of the Civil War. They reported that during the civil disturbances, there was relatively less contact with the towns in the country as most young men joined the guerilla (Anyanya) movement in the bush and in hiding places. Those who remained in the villages used to help their parents farm, but when

peace prevailed after 1972, those who were involved in the Anyanya Movement were then absorbed in the National Armed Forces. About 70% of the young men are believed to have joined the movement. Additionally, those who took refuge in the neighbouring countries were influenced by the life-styles of these places and on their return home went to the towns. In general, there was a massive drain on the labour pool in most of the rural areas of Southern Sudan and farmers in the study area particularly expressed this effect.

(7) Sickness/personal, social and cultural problems

Some of these problems have already been directly or indirectly reviewed in Chapter 4 and some will be noted in Chapter 8. Table 7.1 indicates that while there are zonal variations, 26.9% of the farmers' concern was focused on the above-mentioned category in the study area. In general, sickness due to natural causes, or the fulfilment of social obligations such as funeral attendance, burying the dead, visiting the sick, ritual or wedding ceremonies performance, litigation and waiting on the local chief or diviner, witchcraft or 'evil eye' etc were some of the reported of many existing problems that considerably affect the farmer and his farm size as well as production and crop yields. With small farmers incapacity through illness is likely to mean a smaller crop or no crop at all. Such incapacity, as noted in Chapter 4, in general is most obvious in those diseases which are epidemic during and just after the rains as with malaria and guinea worm disease. The effects of malaria and other tropical diseases on farm labour input have long been generally recognised (e.g. Farmer, 1957).

Several farmers also noted the possibility of physical misfortunes like accidents in regard to the use of farming implements (e.g. hoe, axe), or stepping on a snake, scorpion, or stinging bees and wasps etc. which considerably demobilise a farmer and keep him off-farm for hours,

days or even weeks on end or months if not death (see Chapter 8). Additionally, looking for particular crop varieties from neighbours, or repairing an agricultural equipment etc were acknowledged by a few farmers as some of their personal and social or cultural problems. In fact, the impact of these problems on family labour input has again been succinctly emphasised as in the words of a Gambian woman to Margaret Haswell, "... sometimes you are overcome by weeds through illness or accidents". (Haswell, 1975:44).

(8) Weeds

In the study area, over 23% of the farmers' responses were centred on the problem of weeds. For those crops requiring several weedings (e.g. coffee, cassava) it uses up much of the available labour input. It was mentioned in Chapter 5 that witchweed (Striga hermonthica) or nyawura (Zande), is a major problem around some localities where the growing of sorghum for long periods has taken place particularly around the main centres and relatively larger villages. Several farmers asserted that 'it eats up' most crops particularly sorghum. This troublesome pest emphasised by the Zande proverbs 'weed me quickly and thoroughly', means that it requires prompt weeding to save the crops being overtaken by it.

In this context, this is a clear instance for extension staff, planners and change agencies or 'outsiders' to comprehend and fully appreciate vernacular terminology in particular proverbs, folklore or verandah story tellings etc. if they are to be effective on on-farm adaptive research methodology in communicating with peasant farmers. Elsewhere, it has generally been estimated that over 30% of crop losses occur mainly due to the witchweed pest (Coulter, Personal Communication). Farmers have adopted some strategies involving ecological principles such as crop combination (see Chapter 8) to cover as much ground space with crops as a possible control measure to deny space to weeds.

(9) Lack of money and seasonality of farm inputs

Table 7.7 indicates that 20.6% of the farmers' replies were focused on this category. In Chapter 10, A this aspect will be fully outlined and in effect it is one of the problems which is probably of great significance to the future development and improvement or decline of the smallholder farming in the study area. Generally, explanations for shortage of capital range from inadequate marketing facilities and over-emphasis on subsistence production (De Wilde, 1967), to refusal to invest due to farmers' preference for leisure (Ruthenberg, 1971). In Chapter 8 it will be noted that there is incorrect timing in the dissemination of the extension staff new inputs and not lack of motivation on the part of the farmers. It is pertinent to review that farmers' lack of suitable saving places, the exhaustion of their funds through expenditure on various social and economic obligations coupled with cash shortage problem which derives from the seasonality of the farming operations are some of the constraints in acquiring the new inputs. Nearly 80% of the farmers' crop sales take place mainly during the dry season and hence capital cannot also be re-invested immediately in farming and by the beginning of the cultivation season farmers generally lack money. Farming demands investment when capital is exhausted. The importance of availability of credit and other inputs to small farmers by change agencies at the right time has been noted earlier in this thesis as a strategy to minimise the above-mentioned farm constraints.

(10) Outbreak of fire and theft

Overall the sample, 22.6% of the farmers reported the problems of fire and theft as some of the uncertainties in farming. Sorghum, millets, tree-crops (e.g. coffee) and teak plantations etc. were noted to be the most affected of all the crops grown. Informal interviews with farmers growing coffee showed that fire is the number one 'enemy'

which damages coffee trees that have drawn much labour input for several years before reaching maturity (see Chapter 11). Several farmers said that fire discourages the growing of coffee if not promptly and carefully weeded. The outbreak of fire in the study area generally occurs either through deliberate firing to clear new farm fields, hunts, or accidentally through mishandling of fire, especially by small children. However, a person with bad intentions against someone may also inflict a great damage to crops.

Although all farmers grow their own food crops, there are sometimes others who may steal matured crops (e.g. maize, groundnuts) and citrus fruits especially those planted along roads and lanes. As crops do not ripen at the same time for all farmers, those who planted their crops earlier than others may be a target for this particular pest. In the study area the presence of different types of charms (or 'watch') usually placed on the farm and hung on trees especially along road farms is a strategy designed to cope with this problem. However, the low incidence of theft on farm as can be gauged from Table 7.1 indicates that most farmers are self-sufficient in agriculture.

(11) Lack of insecticide and other inputs and administrative problems

The problems involved in the dissemination of farm innovations to farmers by the extension staff and farmers' response to them will be noted in Chapters 8 and 10 and item 9 of this chapter and hence need no repetition in this context. However, it is important to note that several farmers have cited the local Government administrators as a problem to their farming activities. They state that these officials sometimes disrupt farm work in the process of collecting poll-tax from the various local chiefs in the study area. This would involve farmers' movement to their houses to obtain money from hiding places. Some 18.1% of the farmers' responses were on these problems in the study area.

(12) Crop and livestock diseases

Although 8.8% of the farmers' concern was on crop and livestock diseases (see Table 7.1) in the study area, it is interesting to note that most of the respondents and others were not able to provide specific names of all the crop and animal diseases. Apparently, and very surprising, there are no vernacular names for specific diseases. Among the Moru, for example, there is a general use of the term adrove - meaning 'disease' and refers to specific crops like 'cassava disease', 'groundnut disease', 'sorghum disease' or to livestock or animal disease such as 'goat disease' or 'sheep disease' etc. Most farmers and tribal leaders generally claimed little or no knowledge of diseases despite the very common occurrence of cassava mosaic disease spread by the white fly vector (Bemisia spp).

However, several farmers particularly in Zones 1 (Ibba RC) and 3 (Maridi RC) were, to some extent, able to report either the symptoms or the vectors of livestock diseases and vernacular names like badagu or maru (Moru) as diseases of goats and sheep, in which occurs intense irritation of the skin which is damaged with sores around the mouth, nose and hooves including the loss of hair too. Mention was made in Chapter 5 that trypanosomiasis carried by the tse-tse fly is the major limiting factor to livestock distribution (excluding poultry). In the study area some farmers associated diarrhoea in poultry (chickens) with the flush of vegetation at the beginning of the rainy season rather than a specific disease.

In this regard, although crop and livestock diseases are simply tolerated by farmers as a continuous 'expected' occurrence, it is suggested that assistance from the veterinary staff to study possible livestock and poultry diseases in the study area is essential particularly the increasing problem of tse-tse fly. It may be argued that the

livestock size is relatively small to deserve much attention, but their significance to individual farm families especially in periods of hungry gaps (be it a shortage of food or cash) is vital, to say nothing about the predominance among most farmers of their socio-cultural values and institutions.

Summary

From the foregoing discussion, it appears that farmers in the study area in general are more concerned with physical or environmental problems as can be gauged in Table 7.1 in regard to the frequency or intensity of the farm hazards. In effect, the problems caused by crop pests including wild animals, birds and insects are of great significance especially in Zones 2 and 4 which are relatively wetter with dense forests than Zones 1 and 3 (ecological distinction). The expected dominance of farmers' responses on rainfall uncertainty either erratic or late rain ('The Sun') are clearly the major constraints of farmers in Zones 1 and 3 which are relatively drier. Farmers are also concerned with various social and economic difficulties experienced in the management of agricultural activities. It is evidently shown in Table 7.1 that there is a need for the improvement of marketing and transport systems and other related amenities to farming. Most of the farmers growing coffee especially in Zones 2 and 4 requested the improvement of coffee marketing. It is interesting to note that the problem of competition from off-farm employment opportunities came in the same rank order in the study area. Farmers' concern on the lack of labour is more pronounced in Zones 1 and 2 (Ibba RC) as compared to Zones 3 and 4 (Maridi RC). In Chapter 8 it will be demonstrated that farmers in Zones 3 and 4 have relatively larger families and therefore the use of labour force of non-relations is widespread than in Zones 1 and 2 mainly depending on conjugal labour input.

For points of specific detail, generally insect and bird losses alone are perceived by farmers as less of a problem in the study area. With regard to insect losses alone, certain insects cause direct damage to crops; others are merely vectors and it is possible that such insects are mistakenly thought to be causal agents, thus resulting to the under-reporting of disease in yield reduction. Excessive weed competition is generally not considered a very serious problem and casual fieldwork observations throughout the study area lend support to this contention. In effect, most fields only require weeding once or twice (except coffee and cassava with several weeding) during the growing season. Most farmers acknowledged that unweeded crops, however, lead to the farm 'growing badly' in addition to the inadequacy of rainfall and other environmental factors. However, the problem of Striga hermonthica is prevalent in those localities which are subjected to prolonged cultivation of sorghum varieties. It is worth mentioning that most of the problems outlined above are not in fact current but have ever since existed and therefore are part of the life of the farmers.

The general inference from the above is that moisture conservation techniques are probably of great relevance to Zones 1 (Ibba RC) and 3 (Maridi RC) in particular. In fact, this is a topic which the change agencies and research section of the Agricultural and Natural Resources Ministry and its extension staff might profitably investigate especially through on-farm adaptive research (OFAR). The prevention of damage to crops by wild animals (e.g. the culprits being baboons) particularly grain crops and cassava is more problematic as well as foxes and squirrels which cause much damage to the groundnut crop. Assistance from change agencies in relation to these pests is appreciable.

7.2 Farmers' Control Measures Designed To Reduce The Impact Of Natural Hazards And Crop Failure

Although most peasant farmers have similar agricultural and environmental problems, responses vary due to the simple fact that farmers have different assessments of their difficulties and their severity or frequency. They have different goals and levels of knowledge as well as their aversion to risk. In other countries, soil research surveys and weather records, cheap and readily supplied fertilisers, pesticides, herbicides, mechanisation to reduce labour constraints, social security insurance, legal tenancy contracts, credit facilities and crop insurance to reduce the impact of crop failures - all have been methods used to minimise potential sources of uncertainty. Long-term pricing policies or market agreements also ensure secure and profitable marketing channels. All these factors enable farmers in such environments to take the risk of crop specialisation and monocropping.

In the study area, peasant farmers have virtually none of these facilities; their strategies are thus radically different from farmers in such countries. In this discussion, no attempt is made to describe farmers' management strategies in relation to the classical decision-making theory. This is because apart from strategies long ago built into the 'traditional' farming systems, individual farmers combine a host of mixed strategies to deal with the complex mix of uncertainties which face them. The object of this section is thus to outline management strategies adopted by farmers to reduce the impact of natural hazards and crop failures.

The diversification of crop growing to cope with uncertainty and to achieve stability is the main strategy adopted by farmers in the study area. Other management strategies include shifting of farm plots,

crop planting methods (intercropping), the planting of several varieties of the same crop species and various crop-care processes. In Chapter 8 farmers' reasons for preferring their present systems and their comprehension of the advantage of them indicates an acute awareness on their part of the need to maintain stability through diversity of crops.

7.2.1 Farmers' control measures to reduce the impact of pests and diseases

When farmers were asked about some of their control measures, many expressed the feeling that little could, in fact, be done to counteract the prevailing pests and diseases. It was generally reported that the larger crop pests such as wild animals were chased away or hunted. Hunting of wild and protected animals like elephants, without a licence is prohibited; and licences to kill them are even extremely expensive and most of the peasant farmers do not possess them. So when elephants etc become too much of a menace to crops, farmers either kill them illegally or ask the Wildlife Game Department staff for help. Hence, there exists a basic conflict between the interests of Wildlife Conservation Department officers and those of peasant farmers. Traditionally, farmers rely on wild animals for various products especially bush meat and ivory, but with the virtual ban on illegal hunting by farmers, these sources of supply have largely dried up though some illegal poaching still exists to a limited extent. However, such 'traditional' hunting is probably in harmony with the natural balance. Thus, if wild animals can be controlled in reasonable numbers, they actually contribute to the well-being of the farmers and to the long-term ecological stability of the study area in general.

The other major problem in the study area is related to the severe damage done to crops by mammals, in particular baboons, wild pigs

and monkeys. Several farmers use snares to trap animals such as dikdik, duiker and wild pigs. However, informal interviews with farmers revealed that most of the defence of the crops from predators is now done by human sentries. For instance, the grass around fields in many parts of the study area is coated with ground hot chillies as a protection against monkeys and baboons. While passing through the grass, these animals get the hot chillies on their skin, in particular the buttocks; the hot chillies start to burn their skin and effectively drive them away from the farm fields. On the other hand, groundnut seeds are coated with a sauce of ground chillies (as well as the hard-to-obtain kerosene in some places) before planting. It is acknowledged by several farmers that after tasting a few of the coated seeds with these chemicals, monkeys and baboons are effectively deterred from digging up the rest of the freshly planted groundnut seeds. Some farmers also noted growing hedges of sisal or other thorny species as a strategy of protecting fields from these pests. Additionally, other kinds of herbs are dried and mixed together with ground chillies and burnt in big bowls at some strategic points on the farm producing smells which drive away not only wild animals but even insects and other pests. Among the Moru, the burning of a tree species (kuru kuru) branches and stalks of hyptis are also devices employed to scare animal pests in the study area. Most farmers use other indigenous animal pest control methods such as the setting of tree trunks on fire in particular overnight to produce smoke which wafts over the fields and to keep wild animals and birds away. Assistance from Wildlife Game Department could be rendered to the farmers and advice on animal migration patterns may be useful in this context.

Several farmers noted that snails (guruguru:Moru) and slugs (tindi:Moru) are hand-picked and burnt in heaps; that occasionally thorn barriers were constructed at the field perimeter, or that surrounding

bush was fired. Some farmers have designed some local strategies to remedy livestock diseases. For example, in Mangahe (Zone 3) areas, salt is given to goats suspected of diarrhoea; in Ngonde (Zone 3) a mixture of ground hot chillies and kinju (Moru) or Khaya grandifoliola roots are crushed, soaked in water and given to both chickens and goats. In Langua and Mangahe (Zone 3) areas, ground hot pepper is again dissolved in water and given to chickens and goats. Several farmers acknowledged the use of bark of kuru kuru tree, mixed with water for chickens and goats. For mange in goats, ash is rubbed on to the body skin, while some farmers acknowledged using mahogany bark which is rubbed in too.

On the basis of the above discussion, it is apparent that specific strategies for minimising damage and which are built into the 'traditional' farming systems and which were observed during the course of this survey do exist and are outlined as follows:

a) Planting sweet cassava and sweet potatoes near to the homesteads where they are, to some extent, more secure. As noted earlier in this chapter baboons do not usually prefer the more bitter cassava varieties (except when they are hungry) which are often planted in plots away from the homesteads. Additionally, there exists the deliberate replanting of maize and random clusters of sorghum on the cassava plot (when other crops have been harvested) until harvest time. Thus, by adopting mixed cropping, farmers clearly attempt to spread risks or uncertainties among many crops. According to the words of one farmer in Kangwa (Zone 2) that "if pests damage some crops, or if some crops are bad, some will still be good."

b) Planting kosokara (Moru) or bambara nuts (Voandzeia subterranea) which is less attractive to wild animal pests at the boundary of the groundnut plot; or planting an early, and therefore, highly valued

variety of groundnuts in the middle of a long season variety.

- c) Planting groundnuts early, especially the iba variety to ensure germination before the arrival of foxes.
- d) Close planting of groundnuts in order to minimise, to some extent, the incidence of rosette virus and to deny space to weeds.
- e) Planting cassava tops so as to reduce the incidence of cassava mosaic disease since the virus is mainly concentrated at the base of the stems.
- f) Bird-scaring : This seems to absorb much of farmers' energies and time. While few people (adults or children) make expeditions to the farm fields especially to scare birds, the building of watchtowers from which children can spot and scare birds attacking sorghum as well as the construction of different scarecrows (e.g. white flags, hanging up empty petrol tins) not only against birds but also against monkeys, are common. Although several strategies are undertaken to minimise losses of crops to birds some farmers generally tolerate birds as a nuisance.

7.2.2 Farmers' control measures to reduce the effect of adverse rains and crop failure

Mention has been made earlier in this thesis that the 'traditional' farming methods and operations in the study area are keyed to the rainfall regime (e.g. Chapter 5), especially too little or failure of rain to fall at the required time. Several ritualistic management strategies are adopted to reduce the effects of the above-mentioned hazards and these include:

- a) Among the Moru, for example, the killing of a black chicken or breaking of eggs at sacred places (oriya) are practised;
- b) The shooting of arrows at the known rain tree (kyaleko);
- c) Consultation of the witch-doctor or rain-maker (gbari) who pours water into a special pot (muda) in a sacred place; and

- d) Consultation of the witch doctor who pours water on a sacred place.

The first three strategies usually involve landri, which is the process of detecting the person who has stopped the rain. It is generally believed by most farmers that rain will commence again once the person has been detected. If not, then the culprit would once again be arrested, tied up and finally beaten or tortured until he accepts to release rainfall. The last strategy involves making good some damage that was done to the sacred place - the damage being the reason for stopping the rain.

Other management practices observed during the course of this survey include:

- a) Farmers' practice of mulching of fruit trees (e.g. budded oranges) and coffee in particular, as well as cassava to a lesser extent, especially at the end of the rainy season. Groundnut trash is sometimes incorporated into mulch for cassava;
- b) Sweet potatoes are usually set in mounds or ridges to encourage root formations and to guard against waterlogging; and,
- c) Relatively small plots of various vegetable crops are often grown beside rivers, streams and seasonal hand-dug wells which facilitate watering or irrigation of these crops during the periods of erratic or poor and failure of rains.

On the whole, a careful examination and the detailed analyses of the nature of the 'traditional' farming systems reveals that it is generally orientated towards stability under prevailing circumstances of environmental risks and uncertainties.

In addition to the above-mentioned management strategies, most farmers use storage methods and famine-reserve crops which are designed to meet the shortages experienced during the hungry gaps e.g. cassava etc. One of the problems of the moment is whether it is possible to replace

this insurance element in the 'traditional' farming systems now that market forces have influenced the 'normal surplus' concept (Allan 1965). In the study area the adoption of coffee growing by several farmers may be an outcome of individual farmer's desire to have a further management strategy of insulating himself/herself against similar uncertainties.

In coping with the problems of lack of labour, old age, sickness, lack of seedlings or seeds and other individual farmer's social and cultural constraints, management strategies such as community social institutions, co-operative and reciprocal relationships between household members as well as the use of hired labour etc. - all have been adopted by most farmers in the study area. Since various extended family members and groups come to each other's aid at times of critical farm operations, shortage of food or seeds and other aids between families - all are strategies designed to spread risks. Hill (1963) found similar management strategies among farmers in a Hausa village in Northern Nigeria.

In the study area the involvement of farmers in off-farm occupations and their competition with farm operations is, in fact, a strategy of coping with the uncertainties of peasant farming characterised by a relatively narrow economic base. The keeping of, and farmers' investment on livestock including the raising of poultry mainly as a 'backyard subsistence enterprise' which act both as social and economic values (e.g. dowries, rituals, funerals, need of a large cash etc.) all these indicate strategies designed to cope with farming uncertainties. Although the importance of off-farm employment opportunities have been emphasised (see Chapter 4), it is worth mentioning that farmers' investment in children's education (payment of school fees, equipment etc.) so that they later join clerical and urban job opportunities or opening small retailing businesses etc. all indirectly indicate farmers' awareness

and their concern with the agricultural and environmental uncertainties; this is also in competition with other sectors of the national economy. Farmers' concern with their own problems and the management strategies designed to cope with is, however, not entirely confined to themselves but other sources of help or advice are also sought.

7.3 Peasant Farmers' Sources Of Advice On Their Problems

The above discussion has shown that peasant farmers are capable of designing some management strategies to cope with their agricultural and environmental difficulties. However, farmers do not generally live in complete isolation from the outside world. In Chapter 10,A it will be demonstrated that there are several sources or channels of communication through which they came to know some of the new agricultural techniques and practices. These channels of communication include formal (e.g. Agricultural Department and PDU extension services, etc.) and informal (e.g. fellow or neighbouring farmers, parents and relations, market centres and contacts with the outside environment). In the study area, farmers came into contact with the extension staff mainly through the dissemination of new inputs like the exotic seed varieties and demonstration centres of coffee where the new cultural operations and management techniques take place. Some farmers have also made attempts to visit the extensionists in the office at Maridi headquarters while others through fellow farmers. The object of this section is therefore to outline briefly what use is made by farmers of the public institutions and other informal sources when reporting their problems in regard to their environmental set-up.

The questionnaire survey included some aspects of investigation into farmers' problems. Specifically, farmers were requested to indicate the sources of help or advice to some of their problems discussed in section 7.1 of this chapter. They were also asked if they ever consulted

or sought help or advice from other neighbour farmers when they faced specific agricultural problems (Q.27,b-Q.27,c). The specific aim of these questions was to assess the use made of the formal and informal sources of help or advice by farmers on their particular problems as listed in Table 7.1.

Table 7.2 therefore shows these problems raised in relation to both formal and informal sources from which help or advice is sought by peasant farmers in the study area. It is clearly evident from this table that most of the farmers' problems are raised and help or advice sought from the informal sources with an average response per farmer at 3.3 while it is only 2.1 for the formal sources in the study area. However, because of the different number of responses per farmer, the percentage response is not strictly comparable between zones. Overall the sample, and considering the formal sources referred to for advice or help by farmers when specific problems occur, it is clearly shown in Table 7.2 that the main problems raised by the majority of farmers are those related to crop pests particularly wild animals (56.3%), lack of insecticide and toria hoes and coffee equipment and cultural operations (41.3%), poor markets and transport (36.3%), lack of seedlings/seeds (36.3%) and crop and livestock diseases (24.4%) in that order. Specifically, the extension staff of the Agricultural Department and PDU were consulted on problems of lack of insecticide, toria hoes, coffee equipment and lack of instruction on management of cultural operations on coffee, crop diseases as well as the problem of poor markets and transport particularly for coffee. Also, these extension officers were consulted on difficulties of obtaining the exotic improved seed varieties, as well as the acquisition of coffee and budded orange seedlings. However, EPAPC were consulted by farmers on issues related to the availability of cotton seeds and marketing of cotton produce.

Table 7.2 : Number and percentage of farmers' responses on the formal (1) and informal (2) sources of help or advice on their problems in the study area

Sample area Problem	Zone 1 (N=32)				Zone 2 (N=32)				Zone 3 (N=48)				Zone 4 (N=48)				District (N=160)													
	Formal		Informal		Formal		Informal		Formal		Informal		Formal		Informal		Formal		Informal											
	No.	% R.O.	No.	% R.O.	No.	% R.O.	No.	% R.O.	No.	% R.O.	No.	% R.O.	No.	% R.O.	No.	% R.O.	No.	% R.O.	No.	% R.O.										
Crop pests/Wild animals etc.	18	56.3	1	17	53.1	1	16	50.0	1	19	59.4	1	27	56.3	1	29	60.4	1	28	58.3	1	90	56.3	1	93	58.1	1			
Poor or erratic rainfall/ The 'Sun'	-	-	10	31.3	4	-	-	-	9	28.1	6	-	-	-	16	33.3	3	-	-	14	29.2	5	-	-	-	49	30.6	5		
Poor markets and transport	10	31.3	3	-	-	12	37.5	4	1	3.1	10	17	35.4	2	-	-	19	39.6	4	2	4.2	11	58	36.3	3	3	1.9	12		
Lack of available cultivable fertile land	-	-	2	6.3	9	-	-	-	7	21.9	8	-	-	-	4	8.3	6	-	-	10	20.8	9	-	-	-	23	14.4	9		
Shortage or lack of labour	-	-	13	40.6	2	-	-	-	15	46.9	3	-	-	-	10	20.8	5	-	-	10	20.8	9	-	-	-	48	30.0	6		
Sickness/Personal, social & cultural problems	-	-	7	21.9	7	1	3.1	7	8	25.0	7	1	2.1	6	10	20.8	5	-	-	13	27.1	6	2	1.3	7	41	25.6	7		
Weeds	-	-	4	12.5	8	1	3.1	7	6	18.8	9	-	-	-	14	29.2	4	3	6.3	7	12	25.0	7	4	2.5	6	36	22.5	8	
Lack of insecticide, toria hoes, coffee equipment	11	34.4	2	-	-	14	43.8	2	1	3.1	10	17	35.4	2	1	2.1	7	24	50.0	2	3	6.3	10	66	41.3	2	5	3.1	11	
Too much rainfall/Flooding	-	-	-	-	-	-	-	-	6	18.8	9	-	-	-	-	-	-	-	-	11	22.9	-	-	-	-	17	10.6	10		
Lack of seedlings/Seeds	9	28.1	4	11	34.4	5	13	40.6	3	17	53.1	2	15	31.3	3	16	33.3	3	21	43.8	3	15	31.3	4	58	36.3	3	59	36.9	3
Crop and livestock diseases	6	18.8	5	12	37.5	3	8	25.0	5	14	43.8	4	10	20.8	4	19	39.6	2	15	31.3	5	18	37.5	2	39	24.4	4	63	39.4	2
Others	1	3.1	6	9	28.1	6	2	6.3	6	11	34.4	5	2	4.2	5	14	29.2	11	4	8.3	6	17	35.4	3	9	5.6	5	51	31.9	4
Mean number of responses/farmer	1.75	2.91			2.09	3.88			1.92	3.00			2.44	3.46				2.09	3.31											

Source: Questionnaire analysis

160 Farmers interviewed in Maridi District, R.O. = Rank Order

Farmers were able to advance more than one reply on each category of formal and informal sources

- (1) Formal sources include : Agricultural Department and Project Development Unit (PDU) extension staff, Wildlife Conservation Department, Equatoria Province Agricultural Production Corporation (EPAPC) Veterinary Department and Health authorities
- (2) Informal sources include : Neighbour or fellow farmers, local or tribal chiefs, witchdoctors, rain-makers, parents and relations, God.

Most farmers also consulted the Wildlife Department on the problem of damage by wild animals; while livestock diseases were the constraints that were mainly referred to the Veterinary Department for action.

Considering the informal sources consulted by farmers for help or advice, problems like crop pests and especially wild animals (58.1%), crop and livestock diseases (39.4%), lack of seedlings/seeds (36.9%) and other problems such as social and cultural or personal problems (31.9%) in that order were also the main concerns of the farmers in the study area. Regarding the problem of wild animals, when no or prompt help is forthcoming from the Wildlife Conservation Department staff tribal chiefs and neighbour farmers are consulted. Thus, as noted earlier in this chapter, that because of the existing conflict between Wildlife Conservation policy which is in contrast to farmers' interests, it is not surprising that neighbour farmers particularly co-operate in the protection of their crops and the organisation of group hunts of these predators. Similarly, when no help is forthcoming from the PDU and Veterinary staff, farmers generally resort to informal sources such as the use of the bark of kuru kuru (Moru) tree mixed with water etc. Farmers who lack seedlings/seeds usually borrow from neighbours. Also, other social, cultural and personal problems including sickness are mainly referred to the native doctors and healers including the use of 'traditional' medicines. The consultation of formal and informal sources of help or advice on farmers' agricultural and environmental problems indicates that farmers would always have trust or confidence in those well-established 'traditional' farming systems and management strategies. Thus, some problems are referred to both formal and informal sources.

In this regard, Barker et al. (1977:20) observed that "... the farmer relies on the extension service for that which ^{it} is good at providing (e.g. information relating to cash crop farming and new cultivation

techniques), whereas he falls back on the help or advice of his neighbour and the community at large in matters where a substantial body of 'traditional' wisdom and empirical expertise has accumulated." Therefore, in the study area, problems such as poor markets and transport, lack of insecticides and coffee equipment and new cultural operations, as well as lack of exotic seed varieties and coffee seedlings are mainly the issues referred to formal sources for help or advice. On the other hand, problems such as poor or erratic rain, lack of cultivable fertile land, shortage of labour, too much rain or flooding, socio-cultural and personal difficulties are matters that are generally raised and discussed with the informal sources like the tribal leaders, rain-makers, fellow farmers and, therefore, other 'traditional' management techniques are employed.

On the zonal variation, it appears (see Table 7.2) that most of the farmers' agricultural and environmental problems in Zones 2 and 4 are mainly raised and discussed with the formal sources. These zones have reasonable extension activities on coffee growing. Sample villages such as Mongua III, Malingdo II, Bahr Na'am, Gworosai (Zone 4), for example, have relatively reasonable access to Maridi town where the extension office is located and, hence, farmers are likely to have more contacts with the extension staff.

Conclusion

This section has shown that peasant farmers are active in discussing their problems with both formal and informal sources from whom advice or help is sought. The way farmers explain and express their problems emphasise the competition between pests and humans for food crops. This implies that farmers 'play safe' under risk and uncertainties circumstances. This reflects the so-called 'minimax' approach to peasant farming which is a strategy of minimising maximum potential losses rather than maximising potential gains, common in farming systems where

food production for subsistence is the main concern. Barker et al. (1977) emphasised the above statement that farmers' concern is in eliminating or reducing the impact of pests rather than, for example, improving crop yields through soil fertilisation. These management strategies are by conscious design and not through the evolution of some 'traditional' collective consciousness. This seems to contradict Gould's (1963) view that such adjustments could only represent some long-term processes of trial and error of a 'Social Darwinist' kind.

It is not, however, certain whether these management strategies employed by farmers will continue to exist in the future. This situation is likely to depend on the scale and pace of changing conditions in the larger national economic and institutional environments in which peasant farmers operate them. This may create new aspirations, goals and demands which the system cannot satisfy. In general, the analyses of some of the agricultural and environmental problems and farmers' employment of the management strategies designed to cope with, are indicative and not conclusive. This is an area left for later research. One of the main objectives of this thesis was to identify some of the farm constraints and problems which would hinder the development of 'traditional' agriculture as outlined above. However, it is worth noting that in order to understand fully the problems faced by farmers in the study area calls for the mastering of various tribal languages (dialects) especially useful for on-farm adaptive research if development planners, researchers and policy-makers are likely to tackle the problems of rural development in general, and the improvement or development of 'traditional' farming systems in particular. Additionally, the socio-economic characteristics of the peasant farmers and their management of agricultural potentials and inputs as well as land use systems should be comprehended. This is the theme of discussion of the next chapter.

CHAPTER EIGHT

THE PROFILE OF FARMERS AND THE CURRENT FARMING AND MARKETING SYSTEMS IN THE STUDY AREA

Introduction

The object of this chapter is to outline briefly some of the socio-economic characteristics of the sample farmers and their farming systems. The farming system adopted in any particular area is a reflection of the stage of technological development of the people and their physical environment. There are a wide range of characteristics likely to affect a farmer's managerial ability at this level. Thus, the age, household composition, educational levels achieved, labour inputs and social networks, farming implements, farm sizes and the organisation of cropping systems, marketing and trade, as well as the farmer's contact with the outside environment (mobility patterns) and his perception of it, are some of the likely variables to exert an effect on his activities and his response to efforts in improving his effectiveness as an agricultural producer. Farmers' involvement in a wider regional economy and their relationships with the outside world, either through seasonal or temporary migration, contacts, trade or through social interaction is thus an essential element likely to induce change. However, mobility and change are interconnected in complex ways.

8.1 Age

In the study area most of the farm organisation and decisions are the responsibility of the male household head or, in his absence, of a senior member of the family. The majority of sample farmers, however, did not fully comprehend the concept of 'age' as they do not possess registered birth certificates as defined in the 'modern' world. Rather, seniority as membership of a more or less defined age-group is used. In this survey, respondents were in all cases the heads of households. In some cases,

if the household heads randomly selected were absent for interview, they were therefore substituted by the next senior member of the household; or a new household head in the same locality was selected on recommendation by the headman of the village. However, the constraint of eliciting accurate statistics on ages of the sample farmers was encountered and thus estimates were made to serve the purpose of the study. The distribution histogram for the ages of the sample farmers is shown in Fig.8.1.

As is common among the tribal groups in the study area, when the heads of households were still under 18 years old, they were raised and trained to undertake sex-linked occupations to instil a sense of obligation. But as soon as the youths reach adulthood and after getting married and able to competently manage their own responsibilities, they are allowed to set up their own independent households. In the study area, farmers can sometimes control a recalcitrant son by withholding bridewealth and other socio-economic obligations. Such a measure is ostensibly to ensure that a new household is not set up with inadequate preparation to assume responsibility.

In general, the majority of the sample farmers in the age-group 30-39 have set up their own households a considerable distance away from their parents. It is common to find conflict in some households of farmers who set up their families near their parents. Senior members attempt to keep their juniors as labourers in the household. Several household heads in the age-group 20-29 years continue to live and farm with their parents for the first years of their married life. Thus, husbands and wives may be only partly independent of the larger household.

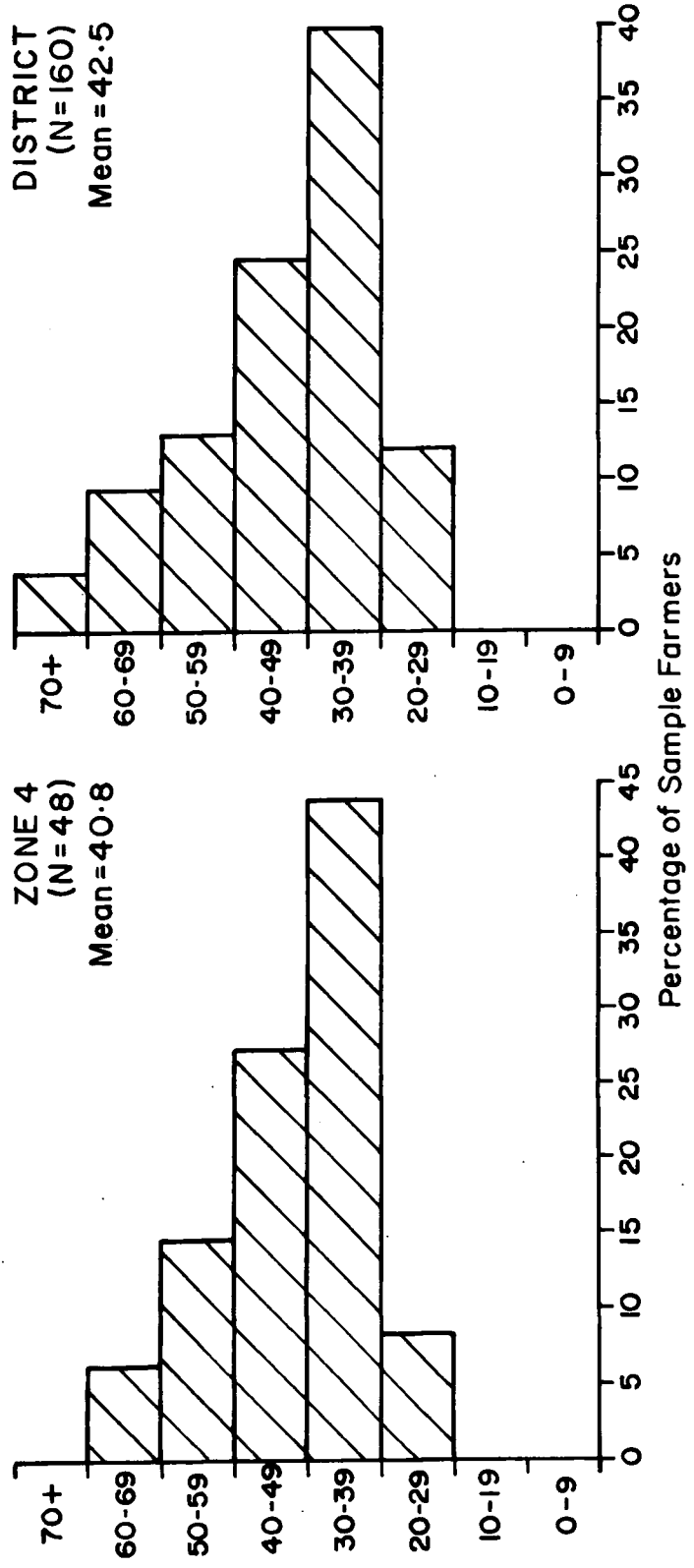
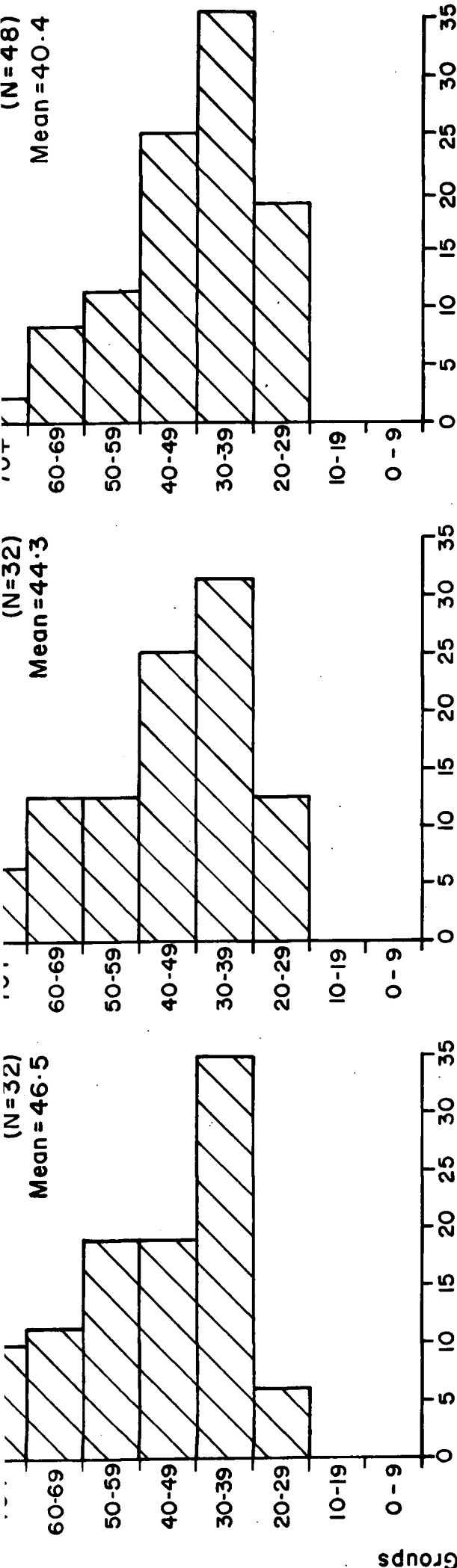


**Fig.8-1 AGE DISTRIBUTION
HISTOGRAMS
OF SAMPLE FARMERS
IN THE STUDY AREA**

*Source:-
Questionnaire Analysis*

8.2 Family/Household Composition And Structure

"Africans measured wealth and power in men rather than in acres; those who exercised power were men-owners rather than land-owners" (Hopkins, 1973:26).

Family formation in the study area can be viewed as a process analogous to that of capital formation in the more 'advanced' capitalist economies (Amin, 1974; Wallerstein, 1974). The basic unit of analysis in this study is the farm household which is the effective decision unit within the homestead. A typical household is composed of : A man and his wife(s), dependents and their children. Several households had other adult persons who are attached as dependents and hence contribute all or part of their labour time to the household's farming activities. These dependents usually include unmarried younger brothers of the household head whose father or mother had died; more distant unmarried male kin of the head; aged relatives (mainly females) of the household head or of his wife(s). Thus, as in most parts of Africa, the household is closely tied to the community at large, hence community-held values and norms in all the tribal groups enormously influence household practice including farm management and resource use. Social obligations such as sons always expecting their fathers to help or contribute to marriage dowries and provision of seed crops, to some extent, determine the status of the person in the society. The ability to feed and support one's immediate and extended family is important for enhancement of the prestige of the farmer. This is the bottom-line of acceptability. De Wilde (1967:22) emphasised that "the inability to produce food sufficient for one's own family and to fulfil eventual obligations to help out kin is still regarded as a source of shame in most parts of Africa." Farmers who fail to assist their sons in 'traditional' obligations are always in difficulty and hence lose their labour force. In effect, farmers with no sons or adult members in the

household usually continue to labour hard as their physical capacity decreases; they always look older at the age of about fifty if they have not died earlier. Such farmers usually grow small amounts of subsistence crops in the 'kitchen gardens' around the homesteads as their ageing does not permit them to walk longer distances to fields further away from their homesteads. Eventually, as the farmer's age increases further, he may end up living with a son(s) for support.

In this context, in addition to feeding of one's family, 'compassion feeding' is also obligatory. Widows, orphans of relatives must also be maintained in the household. 'Traditional' norms and values expect that no one goes hungry, homeless or lonely due to old age. Thus, the residential incorporation of ageing parents into the household of a farmer is a critical aspect of lineal extension in the study area. Additionally, married daughters with their children on extended visits or stay are the responsibility of the household head and especially if some are in the late stages of a first pregnancy, for the children to be born in parents' homes or are nursing a first child. In fact, the interviews showed that a relatively larger family was the main factor in the decisions to increase farm size because of the need to produce enough food surplus and benefiting from the economies of scale. This complicates efforts to assess household size as there are always discrepancies between the sum of the figures provided for the number of wives and children on the one hand, and the household size on the other.

In the study area, households may be divided into two groups, those with one wife and those with two or more wives (Table 8.1). It is clearly shown in the table that family size is relatively larger among the Moru and non-Moru tribal groups in Zones 3 and 4 (Maridi RC) as contrasted with households in Zones 1 and 2 (Ibba RC) whether with one or two or more wives. Thus, the Moru and non-Moru compared to the Azande are more polygamous. These distinctions are mainly due to social (tribal)

Table 8.1 : Household composition and structure (family size) in the study area

Zone Size	Percentage of house- holds with 1 wife	Mean family size	Percentage of house- holds with 2+ wives	Mean family size
1 (N = 32)	46.9	3.0 Adults + 3.2 children	53.1	4.1 Adults + 4.2 children
2 (N = 32)	59.4	2.8 Adults + 2.7 children	40.6	3.0 Adults + 3.2 children
3 (N = 48)	39.6	6.8 Adults + 5.6 children	60.4	5.1 Adults + 8.0 children
4 (N = 48)	41.7	5.3 Adults + 5.0 children	58.3	4.2 Adults + 7.2 children

Source : Questionnaire Analysis
160 farmers interviewed in Maridi District

or cultural characteristics (i.e. Zones 1 and 2 cf. Zones 3 and 4) rather than the ecological or environmental (Zones 1 and 3 - 'Ironstone Plateau' cf. Zones 2 and 4 - 'Green Belt') considerations. However, there is a slightly greater number of polygamous families in the relatively drier Zones 1 and 3 than those households in the relatively wetter Zones 2 and 4 but are less significant than the social difference. As Zones 1 and 3 have relatively larger number of livestock, in particular cattle, there is a tendency among several farmers to acquire more wives through the disbursement of cattle as dowry.

In this respect, the acquisition of more wives is seen by farmers as vital both for meeting the labour requirements of farm work and for the ability of the family to diversify into more lucrative non-farm activities such as trading and beer-brewing. One farmer in Ngonde (Zone 3: Maridi RC) in fact pointed out that wives are a great asset to survival and that with many wives the society respects you in the first instance as a responsible 'big man' due to wives' specialisation in farm and off-farm occupations. It is therefore not surprising among several farmers in the study area to have polygamous families. Thus, the social prestige and wealth are conceived as noted by Hopkins (1973) in terms of the size of a farmer's household. Because 'traditional' farming is still mainly dependent upon human labour, the decision to acquire many wives by several farmers has an economic and social rationality (more children born) as it ensures a certain amount of vital children's labour force at critical periods of the farm calendar. Table 8.2 clearly indicates that higher proportions of farmers with polygamous families especially in Zones 3 and 4 (Maridi RC) reported numbers of children from 5-9 compared to the majority of the sample farmers in Zones 1 and 2 (Ibba RC) with no child. However, it is worth noting that in Madoro (Zone 1) one respondent in the entire sample reported fourteen

Table 8.2 : Number and percentage of farmers reporting the number of children in the study area

Sample area	Number of child- ren	No child No	%	1-4 No	%	5-9 No	%	10-14 No	%	14+ No	%	District No	%
Zone 1 (N = 32)		16	50.0	10	31.3	4	12.5	1	3.1	1	3.1	32	100.0
Zone 2 (N = 32)		20	62.5	9	28.1	2	6.3	1	3.1	-	-	32	100.0
Zone 3 (N = 48)		11	22.9	20	41.7	13	27.1	4	8.3	-	-	48	100.0
Zone 4 (N = 48)		13	27.1	20	41.7	10	20.8	5	10.4	-	-	48	100.0
Total		60	37.5	59	36.9	29	18.1	11	6.9	1	0.6	160	100.0

Source : Questionnaire Analysis
160 farmers interviewed in Maridi District.

children. This is one of the sons of a local chief of the Avungara ruling clan who is married to six wives and has a relatively larger farm size (8 feddans approximately).

The average age of the adults reported by sample farmers was 20.5 years. An adult person in this context was defined as being 18 years according to the definition adopted by Sudan Population Censuses of 1956 and 1973. This is the age when a person is liable to pay poll-tax, eligible to vote in the elections and able to perform a full day's work and the ability to feed one's immediate and extended family members adequately (that is, he/she is socially and economically active). Although most children of the farmers are attending schools at the age of ten, they constitute an additional source of farm labour and different households pursue different strategies in 're-investing' their children in appropriate sectors of the economy. Thus, an alternative to farming is to invest in resources in the education of their children, through which process "wealthier men will seek to ... give them access to the benefits of salaried employment or will seek to establish themselves or their children in trade" (Williams, 1976: 48).

Women in the study area play a major role in farming and other related activities. Farming decisions between husband and wife(s), as noted in Chapter 4, are organised in a well-defined manner and in co-operation. Generally, the husband deals with the control of such farming operations as the heavy task of bush clearance, tilling the land; income generated from the sale of crops and its expenditure (family budget planning); schooling of children; when to plant and what food crops to grow; sale and purchase of seed crops and related tasks. The wife does the lighter operations such as the removal of the hoed grass and scrubs; weeding and harvesting as well as the processing of food crops and the general management of the household affairs. Thus, food processing and the feeding of humans of all ages, firewood collection and

gathering of vegetables, fetching of water, the breeding of babies and so on are a wife's responsibilities. However, although the various duties of cultivation and related occupations are differentiated between the sexes and other members of the household as will be outlined further in the discussion of labour inputs later in this section, it was reported by several farmers in Ngonde (Zone 3) that sometimes after men have cleared the bari (sorghum variety) field-type association (see Chapter 5) they leave the rest of the farming pursuits to the women, and go hunting, fishing and honey gathering. Hence, their absence on hunting parties may occasionally cause the delay of cultivation at the beginning of the rains though the uncertain start often makes it unwise to sow most crops soon after the beginning of the rains.

In the study area, most households had simple and 'traditional' furniture consisting of wooden beds, stools, chairs; while few had cotton and sponge mattresses, iron beds and chairs, leather suitcases, radios, sewing machines; one farmer had a typewriter mainly acquired from the nearby urban centres and through migrational contacts and past employment in East Africa. A large proportion of the households surveyed had bicycles for transporting agricultural produce to market and to facilitate easy movement. Many households had drinking containers consisting of gasoline tins, cans with edges fitted smooth where they had been cut. There was always lending and borrowing of furniture, utensils and sometimes even food, especially when visitors (as it happened in this survey) arrived especially in time of feasts, ceremonious or ritual obligations.

Over 70% of the household heads were born or/and had lived outside the study area. Although such farmers may not have brought large amounts of money with which to capitalise family enterprises they probably had gained more experience of the new ways of earning a

living than their peers or neighbours and thus constitute a potential source of farm innovation as will be examined in Chapter 10,A.

To sum up this section, the object of presenting the above demographic statistics is to assess the nature and characteristics of the peasant farming in the study area. As farming mainly depends on the availability of family labour, the incidence of large families with adult members assisting in farm operations is bound to cause a wider variation on energy expended, farm sizes and the number of farm plots.

8.3 Farmers' Educational Level

Formal education is likely to affect rural-urban migration, the ability and inclination to innovate and accept new farming practices and techniques or the desire to improve the standard of living. In the study area, the educational levels achieved by the farmers are varied as shown in Table 8.3. It is clear from the table that of the total sample 30% of the farmers have no schooling with larger proportions of these in Zone 1 (62.5%), 31.3% (Zone 2) and 20.8% in Zone 3. Zone 3 also has a considerable proportion of the farmers with catechist or pre-school educational levels where a person is to learn christian doctrine and principal aspects of theology so as to enable one to be baptised. This means learning and memorising the Bible and prayers by heart. Also considerable proportions of the farmers especially in Zones 2 and 4 have attained various educational levels such as adult education and agricultural training, village, primary, junior and senior secondary schools. Up to 1971 the educational system comprised village schools (formerly known as 'bush' schools), elementary, intermediate and secondary schooling - village schools with a duration of two years was the level in which emphasis was laid on vernacular learning and a little elementary arithmetic and religion. While each of the three (elementary, intermediate and secondary) of four years duration. However, in 1971 this 2-4-4-4

Table 8.3 : Number and percentage of farmers reporting educational levels achieved in the study area

Educ. level	Zone 1 (N=32)		Zone 2 (N=32)		Zone 3 (N=48)		Zone 4 (N=48)		District (N=160)	
	No	%	No	%	No	%	No	%	No	%
No schooling	20	62.5	10	31.3	10	20.8	8	16.7	48	30.0
Catechist or Christian s.c. Village school	4	12.5	4	12.5	15	31.3	8	16.7	31	19.4
Primary school	4	12.5	6	18.8	4	8.3	6	12.5	20	12.5
Junior sec. school	2	6.3	3	9.4	8	16.7	9	18.8	22	13.7
Senior sec. school	1	3.1	-	-	2	4.2	2	4.2	5	3.1
Adult educ & agric. training	-	-	1	3.1	1	2.1	3	6.3	5	3.1
	1	3.1	8	25.0	8	16.7	12	25.0	29	18.1
Total	32	100.0	32	100.1	48	100.1	48	100.2	160	99.9

Source : Questionnaire Analysis
 160 farmers interviewed in Maridi District
 Percentages more or less than 100 because of rounding

system was replaced by a 6-3-3 system of primary, junior and senior secondary schooling.

In this regard, no clear reasons can be advanced for the differences in the educational levels of farmers for the various zones. However reference to Table 8.3 shows that the Azande (Zones 1 and 2) and other tribes are less educated and have further to go to school than the Moru (Zones 3 and 4) and others. But within each cultural (social) distinction, farmers in the relatively drier zones (1 and 3) appear to be least educated than those in the relatively wetter zones (2 and 4) due to ecological differences. In fact, the main roads such as from Juba to Yambio and Yei to Maridi all have led to the concentration of the investment of such services along them. Thus, the physical location of these services plays a greater role in influencing the distances which most farmers have to walk as well as the amount of time spent travelling to and fro from these places, given that walking on foot is the common form of travelling. This constraint has a direct effect not only on farm labour (especially of farmers' children who have to travel daily from their villages to these centres and back) availability, but also on the number of school attendants. Fieldwork observation showed that about one third of all the sub-villages or settlements under the jurisdiction of the headmen, people have to travel over thirty kilometres to get to the nearest school in Zones 1 and 3, while about half of the sub-villages in Zones 2 and 4 people only have to walk about eight kilometres.

Farmers who send their children to schools lose their farm labour particularly after their second year of their village education when the children have to go to primary or junior schools at the centres and stay with relatives or in boarding schools.

Although religion was the main subject taught in most schools during

the Anglo-Egyptian Condominium period, informal interviews with some farmers and local leaders showed that manual work was also compulsory especially in mission schools and that kept people in contact with their local environment and with emphasis on agricultural work. This was essential in that the pupils had to cultivate their own crops to produce foodstuffs for themselves. On the other hand, Mission schools also emphasised construction and handicrafts especially building and carpentry. Informal discussion with several farmers also revealed that there is at present a breakdown in the educational system in which paper qualifications are an escape route from farming and rural living. This makes the youth receptive to change but the new transitional value system looks down upon agriculture as a vocation. In fact, the amount of education available in the study area has been increasing over the lifetime of the respondents so that the education levels are much higher among the younger generation and vice-versa. Thus, for the entire sample, of the peasant farmers aged 40 years old, 37 (23.1%) recorded no education or just simple religious instruction; whereas of those farmers under 40 years, 78 (48.9%) had some primary or junior education. However, primary and junior educational levels had been received by 45 (28.1%) older farmers in the study area.

In this survey, 9 farmers in the study area had some record documents for farm and trading transactions. About 5% of the farmers occasionally read newspapers, mainly the 'Nile Mirror' which is printed in Juba but sometimes reaches the study area after a couple of weeks if not months due to inefficient distribution and transport.

8.4 The Farmer's Farm

In this study the basic enumeration and tabulation unit is the farm holding, the farm and the household being closely linked. Thus, a 'farm' was defined (see Appendix 4) as all land which is used wholly or

partly for agricultural production and is operated, managed or directed by a person alone or with the assistance of others, without regard to title, legal farm's form, location and size. It also consists not only of land of one or more plots or fields but also capital and labour involved in production, for example, tools and equipment. However, a 'farmer' in this study was defined as the person with the right and responsibility for the management of the farm or holding and may have full economic responsibility over it. Thus, most of the sample farmers fall under this classification.

A farmer's 'field' was defined as a contiguous piece of cultivated land and cultivated as one unit. It may consist of one or several plots carrying one crop or mixture of several crops. A farmer's 'holding' may consist of several fields. On the other hand, a farmer's 'plot' is a piece of land with more or less homogenous cropping. A farmer may have several plots forming one field but with different crops or different fallows. Fallows may last for about ten years or more after which they are utilised again.

There is no concept of the 'field' as a land parcel of standard size and most farmers' fields are also not defined by clear-cut boundaries as in developed countries. Although several farmers have sometimes separate plots for coffee, cotton, tobacco, etc. they may have plots of mixed crops.

8.4.1 Number of farmers' fields/farm plots

In Chapter 4 it was noted that the availability of agricultural land in general is sufficient for the needs of the farm families. However, in this survey, farmers were specifically requested to indicate number of farm plots for various annual crops (Q.8,h) and whether they also had fields cultivated further away from their homesteads (Q.9,a). Their

responses are presented in Table 8.4. About 66% of the holdings in the study area are estimated to be having plots at the homesteads with apparently little variation between the delineated zones.

In this respect, an attempt was also made to gain some knowledge of the walking distance to fields further away from the homesteads (Q.9,b) as well as the time taken to reach there (Q.9,c). However, these questions proved to be difficult to provide precise answers, in that farmers mostly do not know the exact distances and time taken to travel to the various farm plots away from their homesteads. Because of the logistically limited resources and time of the survey, no effort was made to render measurements possible. For several farmers who supplied estimates of distances and time, the reliability of the data is somewhat suspect and were therefore discarded. For different or varying distances and time were reported by several farmers of the same locality and working in the same area where plots or fields are located. But the general fieldwork observation or impression indicates that most of the farmers' farm fields away from the homesteads vary between 1.6 km to 8 km. As noted earlier in this discussion, this does not imply shortage of land as such but rather that farmers usually select specific areas to take advantage of certain soils rather than a response to land pressure.

In this context, it is interesting to note that an important determinant of farm location in the study area is the avoidance of isolation. Most of the farmers' fields are located within shouting distance of at least one other farmer. This is because of the farmers' awareness of more pests and animal damage on crops when these are grown in isolated plots. Other social factors govern the location and number of farm plots. Informal discussions with farmers revealed that farmers' co-operation with each other, for example, in times of danger, emergency or accidents such as fire on the farms, socialisation through hunting in groups, sharing of

Table 8.4 : Number and percentage of farmers with fragmented annual crop holdings in the study area

Number & Location of plots	Sample area		Zone 1 (N=32)		Zone 2 (N=32)		Zone 3 (N=48)		ZONE 4 (N=48)		District (N=160)	
	No	%	No	%	No	%	No	%	No	%	No	%
Number of households with only one plot at the homestead	21	65.6	20	62.5	33	68.7	31	64.6	105	65.5		
Number of households with:												
1 plot away from homestead	2	6.3	6	18.7	3	6.3	7	14.6	18	12.2		
2-4 plots away from homestead	4	12.5	3	9.4	5	10.4	4	8.3	16	10.0		
5+ plots away from homestead	5	15.6	3	9.4	7	14.6	6	12.5	21	13.1		
Total	32	100.0	32	100.0	48	100.0	48	100.0	160	100.0		

Source : Questionnaire Analysis
160 farmers interviewed in Maridi District

farm huts during heavy downpours were some of the frequent responses advanced for farm plots location. Additionally, if a farmer is sick or got delayed at home, other neighbour farmers can offer help and look after his plot thus guarding it against theft and other disasters from pests and especially bird and animal damage. On the other hand, several socio-economic advantages of locating plots near each other such as exchange of information about farm or crop situations, farm problems, new ideas or general chatting with each other were also gained. Thus, in the study area, farmers with two or more plots usually try to minimise risk and uncertainty, and because each plot located in different ecological zones enables the farmer to exploit a broad spectrum of varied environmental characteristics. Studies done elsewhere (e.g. Stevens and Lee, 1979:177) indicate that "the subsistence agriculture with its homogeneity of transport, crops and agricultural techniques should show the effects of distance even more clearly than modern technological agriculture and production techniques." However, space and time do not warrant further discussion of the relationship between crop growing, field location and transport costs as outlined elsewhere (e.g. Chisholm, 1967; Morgan, 1969; Jackson, 1972). However, an examination of more of the reasons underlying the subdivision of small-holdings and its effect on the farming system and especially the time spent commuting from homesteads to distant fields as well as the damage caused by pests and animals deserve further research.

8.4.2 Farm size/size of holding and the geometry of farmers' fields

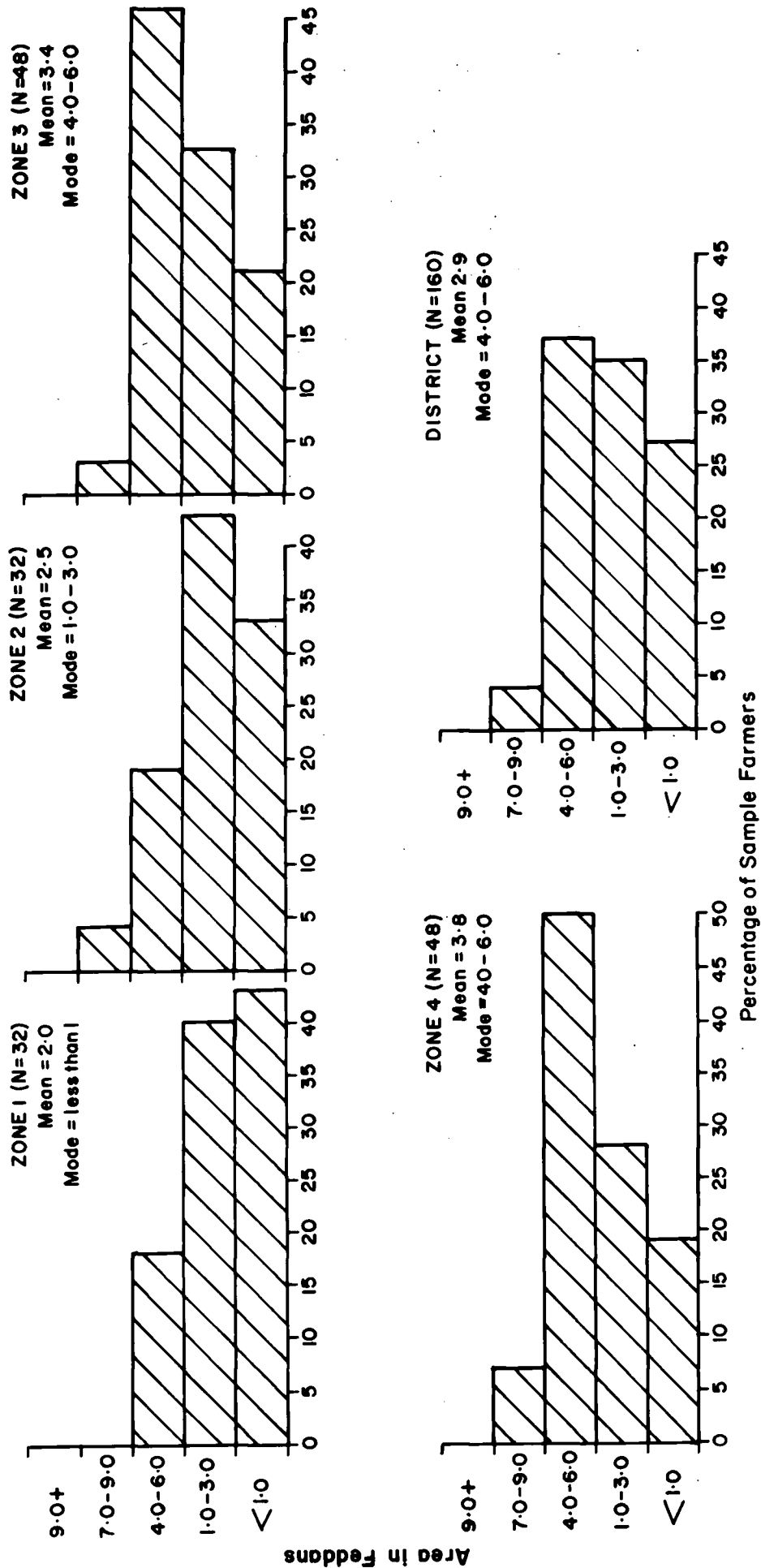
Farm sizes of the sample farmers were not measured due to the limited survey resources and time. However, it cannot be stressed too strongly that the quantitative variations of farming in the study area were so great from individual farmer to another one and from one household to another that averages were virtually meaningless. Additionally, the lack of recent aerial photographs in the study area meant they could not be used for calculating farm sizes as has been performed in some parts of Africa with

similar circumstances (e.g. Goddard, 1972; Norman, 1969).

In the administration of the questionnaire, farmers were asked to state the sizes of their farms in feddans (Q.10,a). In this respect, although several farmers were able to report the sizes of coffee farms as well as cotton which have been measured by the Agricultural Department and PDU staff, a major constraint was encountered as most farmers did not exactly know their farm sizes. However, rough estimates of farmers' farm sizes (in feddans) as has been the case for ages and other variables, were obtained. These estimates (which should be treated with caution) were mainly based on the actual amount of land used for cropping in the period of the survey and taking no consideration of fallow land, area of the homestead and grazing. Although there are some reservations about the accuracy and reliability of the data and estimates which have been made as sketched by eye, they do provide a general order of magnitude to farm sizes as presented in Fig.8.2 (also see Appendix 10). It is clearly shown in the figure that overall the sample data showed that more than 35% of the farmers' holdings range between 4.0 to 6.0 feddans but with higher proportions in Zone 3 (45.8%) and 4 (50%), while only smaller proportions of the farmers with farm sizes in the above category are in Zones 1 (15.6%) and 2 (18.8%). Possible reasons for these differences in farm size (as will be shown later in the discussion of labour inputs) are because of the differences in the size of labour available. However, it is rather surprising and beyond the level of expectation that farm sizes are smaller in Zone 1 which is similar to Zone 3 (relatively drier). It is likely that farm sizes in Zone 1 were underestimated as the Azande are mainly suspicious of outsiders interested in knowing their socio-economic matters due to the high belief in witchcraft and 'evil eye' (see Chapter 2).

In this context, it is generally noted that the area cropped has not significantly changed in the study area (Inspector of Agriculture, Personal communication) in the last thirty years. However, in the

Fig.8.2 FREQUENCY DISTRIBUTION AND PROPORTION OF SIZE HOLDINGS (IN FEDDANS)



Source: Questionnaire Analysis and data derived from Appendix 10

Preliminary Report by the Southern Development Investigation Team (1954), it has been estimated that the area cultivated by the Azande was from three to four feddans per household vis-a-vis four to six feddans for the Moru and non-Moru who have been regarded as enthusiastic cultivators and planted considerably larger areas of crops than any of the neighbouring tribes.

In general, farm size depends on the extent which the farmer is helped by other household members, or by food and beer working parties or hired labour. Farm size also depends on the differences in the environmental conditions and the availability of cultivable fertile land whether relatively drier or wetter, the distance and location of the farm plot from the homestead and time spent on walking.

Fields in the study area generally tend to take parallel and irregular strips or shapes. Some fields also take relatively square or rectangular or even triangular shapes such as those of cotton, coffee etc. Most fields are not bounded by barbed wire as in the Western World but by hedges constructed from thorny bush; by the placement of crops such as cassava, maize, or fruit trees (e.g. palm oil, mangoes) and teak; and by the preservation of some wildy-growing useful trees (e.g. tamarind). All these devices indicate the boundary lines or paths. The practice of making a boundary is for the owner to return to the same piece of land after the fallow period. The preservation of wild economic trees provide useful shades for resting after labouring in the field and where processing such crops as groundnuts can take place and food for the day's work is consumed.

8.4.3 Land use and crop combinations

The majority of the farmers tend to follow arable/fallow sequences sometimes referred to as 'recurrent cultivation' as noted in the discussion of the katiri land use technique in Chapter 5.

In the study area, as mentioned in section 8.4.2 that the first

impression and especially of a foreign researcher, of a typical farm is a mosaic of different plots of crop and crop intermixture and surrounded by a bush. De Schlippe (1956:101-107) has graphically described the reaction of Western World observers to the farming methods of the Zande and that "when one enters a Zande homestead for the first time, the impression is that of chaos...crops, food and household belongings may lie about the courtyard. Worst of all, no fields can be seen and thickets of plants surrounding the homestead seem as patchy and purposeless as any wild vegetation; and that it is impossible to distinguish a crop from a weed."

In this regard, no formal questions dealing with arable/fallow sequences were specifically included in the administration of the questionnaire. However, these aspects were taken into account in informal discussions with several farmers and supplemented by information gained from some tribal leaders, all of which yielded the approximate patterns of land use or arable/fallow sequences in the study area. It was generally reported that the length of a fallow period was typically two to five years in most of the survey villages with the exception of Kangwa (Zone 2: Ibba RC), Amaki (Zone 3:Maridi RC), Gworosai (Zone 4:Maridi RC) and where fallow length was five to ten years. However, these typical fallow periods over-simplify the actual situation. Further discussions with the peasant farmers at individual level revealed that there appears a wide variation in the fallows depending on the different soil types and how quickly natural vegetation regenerates, which to the farmer reflects the intrinsic fertility (see also Chapters 5 and 6). A study of the length of fallow for the different soil types and different vegetation, however, is an area left for further investigation.

The arable sequences or crop combinations and 'field types' which De Schlippe (1956) has used in describing the Zande system of agriculture

(of which Zones 1 and 2 are a part mainly occupied by this tribe) and noted in the discussion of katiri system and farm calendar and operations may provide the framework to comprehend these sequences as summarised in Table 8.5 (see also Fig. 5.7) for convenience. As the Zande arable sequences have been fully discussed by De Schlippe (1956), emphasis is mainly on the Moru and non-Moru sequences as found in Zones 3 and 4 (Maridi RC). Moru terms will, however, be used wherever possible.

In this regard, in nearly all the tribal groups in Zones 3 and 4 with the exception of the Mundu around Gworosai (Zone 4) area and along the Yei-Maridi road, two rotations were noted with minor variations in the constituents of the field type and length of each rotation. In areas such as Langua and Mangaehe (Zone 3), Bahr Naam, Malingdo II and Maridi (Zone 4) the groundnut/cassava rotation followed by sesame/moro/deri association into moga land in the third or fourth year. Rotation one was reported as two years in Bahr Naam (Zone 4), Langua and Mangaehe (Zone 3) areas as three years in Amaki (Zone 3) area, Maridi and Mongua III (Zone 4) areas; as four years in Ngonde (Zone 3) area with sesame/moro/deri association repeated once more. Rotation two was mentioned in the first year land (moga) in some areas around Gworosai (Zone 4) and it is said to be dominant in other unsurveyed villages or settlements for either three or four years. In all cases, cassava is usually planted into the groundnuts in the first weeding and remains in the ground until maturity when it is harvested after a year or so. In Gworosai (Zone 4) area, sorghum variety (moro) was reported to follow groundnuts though sometimes beans with sesame follow in the third year. Finger and bulrush millets, greengram and cowpea are often intermixed with the moro and bean varieties in various mixes. Several farmers, however, sometimes plant groundnuts, maize or cassava in pure stand. Crops planted around the homestead garden (turu'du) include okra, pumpkin, sweet potato, maize, yam and various kinds of vegetables. Different minor pseudorotations and crop associations

Table 8.5 : Field types, year and crop combinations as practised in zones 3 and 4 in the study area

Field type (1)	Year	Main crop associations (2)	Supporting crops
<u>Moga Land</u>	1	Groundnut/cassava or maize	Green grams, beans, bulrush millet, sesame, cowpea
<u>Lowa Land</u>	1	Finger millet, nyarango	Green grams, beans, bulrush millet, sesame, cowpea
<u>Tirika Land</u>	2	Sesame/moro/deri	Beans, bulrush millet, finger millet, okra, few vegetables
<u>Moa Land</u>	3(4,5)	Sesame/moro/deri or groundnuts/cassava (or fallow)	Beans, bulrush millet, finger millet
<u>Turudu Land</u>	Continuous cropping	Maize/pumpkin/okra/sweet potatoes and other crops and vegetables	

Source : Fieldwork data

- (1) These field types were noted in Chapter 5, section 5.4.1.
- (2) These main crop associations were briefly outlined in Chapter 5.

are practised according to the different crop varieties but this aspect was not examined due to usual survey resources and time constraints.

In this context, it is worth noting that in the study area, farmers as elsewhere (Davies, 1964) generally do not fully comprehend 'crop rotation' as a concept understood in 'modern' farming. This is a concept that is in fact a little misleading, perhaps 'pseudorotation' used by De Schlippe and Batwell (1955) is better (Quoted in Davies, 1964:387) to describe Nyangwara system of farming.

In this survey farmers were requested to indicate whether they grow their crops intermixed in one plot or in sole stand (Q.11,b,Q.11,d) and to state the reasons for these practices (Q.11,c,Q.11,e). Farmers' responses are clearly depicted in Tables 8.6 and 8.7 respectively. It is clearly shown in Table 8.6 that in the study area more than 50% of the farmers intercropped their plots as a 'traditional' farming strategy. However, while there are zonal variations in the proportions of farmers stating the above reason, the majority of farmers in the above category and practising their parents' ways of farming are in Zones 1 (Ibba RC) and 3 (Maridi RC). Risk avoidance and security reasons, the need for cash income and supply of food over time, fallow land left under cassava and the problem of weeding crops indicating labour shortage) are the most striking and important reasons that influence intercropping strategy. Thus, farmers' preferences for crop associations are consistent with those reported elsewhere (e.g. Norman 1974; Brokensha et al. 1980; Belshaw, 1979). In fact, with the strategy of producing as many household food requirements as possible from one plot, sole or monoculture would mean that several plots for each of the many varieties of crops have to be made. In 'traditional' farming systems characterised by labour-intensive management strategies such as the ones in the study area, and with a high incidence of pests and diseases, farmers view crop combinations as highly effective and thus harvesting of the different crop varieties at different times

Table 8.6 : Reasons advanced by farmers for preferring crop combinations as opposed to sole cropping in the study area

Reason	Sample area	Zone 1 (N=32)		Zone 2 (N=32)		Zone 3 (N=48)		Zone 4 (N=48)		District (N=160)	
		No.	%	No.	%	No.	%	No.	%	No.	%
Tradition inherited from forefathers		18	56.3	13	40.6	28	58.3	22	45.8	81	50.6
Easy guard from wild animals, birds and other pests		10	31.3	9	28.1	15	31.3	13	27.1	47	29.4
Risk avoidance and security reasons		12	37.5	10	31.3	15	31.3	17	35.4	54	33.8
Shortage of labour/weed only one field for several crops in association		13	40.6	15	46.9	14	29.2	19	39.6	61	38.1
Some crops(e.g.cassava)will remain in fallow		15	46.9	14	43.8	17	35.4	16	33.3	62	38.8
More money/varied supply of food throughout the year		11	34.4	13	40.6	15	31.3	15	31.3	54	33.8
Some crops grow healthier on land with different soils, trees, grasses when grown in association		14	43.8	16	50.0	14	29.2	12	25.0	56	35.0

Source: Questionnaire Analysis
 160 farmers interviewed in Maridi District
 Percentages more than 100 because of multiple responses each farmer supplied as well as rounding

Table 8.7 : Number and percentage of farmers' responses of growing crops separately as opposed to crop associations in the study area

Reason	Sample area		Zone 1 (N=32)		Zone 2 (N=32)		Zone 3 (N=48)		Zone 4 (N=48)		District (N=160)	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Tradition	3	9.4	2	6.3	2	4.2	1	2.1	8	5.0		
Different crops require different soils and different natural vegetation	9	28.1	11	34.4	13	27.1	9	18.8	42	26.3		
Risk avoidance and security reasons/rainfall variability	5	15.6	1	3.1	7	14.6	2	4.2	15	9.4		
Facilitates easy weeding and harvesting	12	37.5	10	31.3	15	31.3	12	25.0	49	30.6		

Source: Questionnaire Analysis
160 Farmers interviewed in Maridi District

throughout the year is the main perceived advantage. Because of the shortage of labour on farm, crop associations are viewed by most farmers as an efficient way of saving labour (e.g. Kassam, 1973; Norton, 1976). Moreover, in intercropping system operations such as clearing, weeding service all the crops at the same time.

On the other hand, Table 8.7 clearly shows farmers' responses for growing crops in sole stand. Overall the sample, while there are zonal variations the majority of the farmers (30.6%) advanced strategic responses centred on easy weeding and harvesting in sole cropping. Since different crops are weeded, mature and harvested at different times, these different farm operations cannot easily be performed due to damage of other weaker crops. While the suitability of different soils and natural vegetation for different particular crops dominates as the second reason with 26.3% of the farmers mentioning; security of crops and risk avoidance and rainfall variability because of adverse environmental conditions comes as the third in that order. In fact, it is worth noting that higher proportions of the farmers in Zones 1 (15.6%) and 3 (14.6%) which are relatively drier as compared to smaller proportions of the farmers in the relatively wetter Zones 2 (3.1%) and 4 (4.2%) said that different lands contain different soils, and vegetation and because of the variability of rainfall with some places receiving sufficient rainfall, others a few kilometres away may be receiving less or even remain dry (see Chapter 3). As such growing crops in different places is the sole strategy. However, it should be noted that farmers' responses as depicted in Table 8.7 must be treated with caution and scrutiny. It is likely that the question relating to sole cropping must have been misunderstood by several farmers, where a farmer may have more than one farm plot in different locations. It is also interesting to note that farmers' responses on the risk avoidance and security of crops in both Tables 8.6 and 8.7 are some reasons for doing the opposite objective. In fact, the field is a microcosm

Similar to ecological niches and natural biological communities as Harris (1971), Wilken (1972) and Herrera and Harwood (1973) noted that a continuous and varied vegetation coverage reduces the impact of large tropical raindrops on the soil, while plant roots hold the top soil firmly together, thus reducing the incidence of erosion.

To conclude this section, it may be said that the first priority of the farmers is for a continuous food supply for families' subsistence and for sale to meet cash requirements. A high level of risk aversion is embodied in the existing cropping pattern and decision strategies as exhibited in the crop combinations and successive plantings and fallowing (see also Chapter 5). Thus, living in an environment with variable precipitation and the depredation of animals, birds, insects and other pests may take heavy and frequent toll of farmer's crops; the peasant farmer minimises the risk of total disaster and labour shortage by successive sowings of various crops over several months and by inter-cropping which ensures that some yield will be obtained from his cultivation efforts. In other words, "the adoption of 'minimax approach' production strategy" (Barker et al., 1977:25), with an emphasis on minimising maximum potential losses rather than maximum potential gains, is very appropriate in the present circumstances.

8.4.4 Capital equipment and farming

In the study area as in similar 'traditional' agricultural systems elsewhere, capital is not a major factor of production. Most of the assets found in a typical holding are made from family labour and these would include huts (tukls:Arabic) and the food stores. Other assets include equipment that is limited to farming tools such as knives, hoes, saws, secateurs, axes and perhaps hunting equipment such as nets, bows and arrows, spears, as well as household assets such as chairs, beds, tables and beehives. There is no improved technology such as ox-ploughing

since livestock numbers are limited due to tse-tse flies presence and they are more important in social institutions. Sheep and goats are also kept for dowry rights. These few livestock, however, are not significant in the farming system, although the farmers benefit from their meat, milk and the depositing of their waste matter on land - thus increasing fertility. Natural vegetation and crop residuals provide the grazing.

In the administration of the questionnaire, farmers were asked to indicate their sources of credit for the improvement of the farm (Q.36) as well as to note the agricultural tools and other aids that are available (Q.41). The aim behind these enquiries was to assess the working capital inputs and their constraints on farming and to gain an insight into the impact of the Agricultural Department and PDU as well as other change agencies' programmes relating to the introduction of new farming techniques and practices. The replies on the farmers' sources of credit are presented in Table 8.8. In the entire sample, it is clearly observed in the table that 50% of the farmers are self-reliant with no sources of credit but with little zonal variations. Relations and acquaintances, neighbours were acknowledged by 29.4% of the farmers as the most important sources of credit, while 20.6% of these reported local shopkeepers or retailers in that order as other sources of loan. When the small farmer in the study area needs a larger capital or other imported consumer goods, Jellaba traders are the potential sources when friends, relatives and neighbours are less able to help especially when the harvest is poor. Usually the local shopkeepers (mainly the Jellaba) overlap with friends and relatives for these are useful sources available and local guarantors of credits.

It is to be noted that the local traders (mainly the Jellaba) exploit the farmers by accumulating agricultural produce during the times of good harvest but later resell to them at exorbitant prices during the hungry gap periods. Sometimes farmers who cannot afford to repay goods

Table 8.8 : The number and proportion of farmers' responses on the sources of credit or loan in the study area

Source	Sample area		Zone 1 (N=32)		Zone 2 (N=32)		Zone 3 (N=48)		Zone 4 (N=48)		District (N=160)	
			No.	%	No.	%	No.	%	No.	%	No.	%
	Relations, neighbours and friends		8	25.0	10	31.3	10	20.8	19	39.6	47	29.4
	Local retailers (Bush, shop-keepers)		9	28.1	5	15.6	11	22.9	8	16.7	33	20.6
	Agriculture Department		-	-	-	-	-	-	-	-	-	-
	Equatoria Province Agric. Production Corporation		-	-	-	-	-	-	-	-	-	-
	Self-Reliance		15	46.9	17	53.1	27	56.3	21	43.7	80	50.0
Total			32	100.0	32	100.0	48	100.0	48	100.0	160	100.0

Source : Questionnaire Analysis
160 Farmers interviewed in Maridi District

or cash loan have to pay in kind and at an unfavourable exchange to the farmers. Hence, there is a general fear of exploitation among the local people - a situation not encouraging the best traders. However, although half of the farmers do take some credits from various sources noted above, half of them are self reliant. As De Wilde (1967:199) observed elsewhere "Africans disposition to save has often been underestimated and that most of the increased cash crop production in East and West Africa has not needed credit, but additional plantings, inputs of plough... have been financed by the farmers themselves."

Regarding the question of the awareness and use of agricultural tools and other aids in the study area about 10% of the farmers (Zone 1), 17% (Zone 2), 13% (Zone 3) and 26% (Zone 4) have heard of the PDU improved seeds; while about 22% (Zone 1) 30% (Zone 2), 34% (Zone 3) and 38% (Zone 4) of the farmers have heard of the Agricultural Department and PDU introduction of the toria hoes, and other coffee implements and technology (see Chapter 10). However, informal discussions with the sample farmers revealed two main difficulties in the acquisition of these capital inputs. These constraints were the lack of sufficient cash and physical availability. A surprising higher proportion of farmers (32%) claimed that they could not purchase the toria hoes because they had insufficient money to buy these inputs. However, the insufficiency of money among peasant farmers should not be over-emphasised as there is doubt about the truthfulness of the 32% of the farmers' responses due to reasons noted elsewhere by De Wilde (1967).

The method employed by the agricultural staff (mainly the PDU) in the past (and to some extent now) in the distribution of toria hoes and improved seeds in the study area was mainly through a mobile team which went around selling these inputs. The major problem with this method is that contact with farmers is limited to very short periods.

Areas further away from the main roads are inaccessible during the rainy season. Additionally, the selling period coincides with the start of the cultivation season which again coincides with the period when the expenditure of resources and capital tends to be high on extended family social obligations such as the fulfilment of funerals; the payment of poll-tax; high expenditure on children's education; expenditure on dowries (bride price), weddings and other socio-economic obligations already mentioned in Chapter 4.

Funerals are probably the greatest drain on resources especially in January and February. Ancestors, and particularly the 'living dead' possess potent powers, and if not properly placated and respected may intervene in people's lives causing death, sickness, famine and misfortune. So several farmers in the study area frequently go into debt to pay, for example, for cement for a tomb, buying not just one bag which costs about £30 to make concrete but five bags so as to make it even more monumental.

January and February are also the months when outgoings or expenditure for farmers incur involving the payment of poll-tax. During the survey period £25 was the poll-tax per household head. In April and May months, Teachers' and Parents' Councils' fees are due for primary and junior secondary school children respectively. School uniform, books, pens, chairs for the children have to be purchased. Thus, education is a major source of voluntary expenditure. In October, examination fees of about £6 during the survey period also have to be paid for final year students at junior secondary schools.

Other social and economic obligations demanding high outgoings are mainly on the payment of dowries (bride price); the purchase of consumer low and high order goods such as salt, oil etc, the purchase of fabric and embroidery thread; medicines are the most usual drains on small profits

and the payment for transporting agricultural produce to distant markets outside the study area. On the other hand, the steel hoes (imported 'jembe' from Italy, UK and Hungary) which are sold in the local shops are expensive and cost from £3 to £6 depending on the size and weight, with farmers having to fit the long wooden handle. But it is worth noting that certain deeper soils in the study area are suited to a bigger and heavier digging toria hoe and the agricultural staff toria hoes were selling for £10-15 in the 'black market' as the supply was spasmodic.

In this context, farmers' high expenditure on the above-mentioned social and economic obligations among others, are the likely ways in which the profits of farming are used up and capital accumulation becomes almost impossible.

It was noted in Chapter 5 that farmers usually retain their own seeds from the previous harvest. However, several farmers reported that they could not buy the improved seeds of the PDU due to lack of money at the time of sale.

In the light of these difficulties, it is clear that these inputs should be made available over longer periods. However, no knowledge was gained as to the amount of money saved by farmers but savings are probably small. There are practical difficulties of money saving among farmers. The only post office is in the centre of Maridi headquarters and there is no bank. The few accounts opened at the post office are mainly those of farmer-traders. In fact, ignorance and fear as well as distance impede its use. Most of the farmers' money from crop sales must, therefore, be invested on agricultural implements, social obligations and livestock ('living bank'). Several farmers hoard their money in small tins, clay pots buried in the ground. However, some farmers use their harvest money as working capital for a dry season craft or trade, for example, beer-brewing thus possibly increasing the

amount at their disposal in the next farming season.

The agricultural innovations being considered for introduction into the study area must also consider road infrastructure, farmers' social and economic priorities and capital savings as important. Thus, current agriculture practices are virtually independent of capital but depend on family labour and a relative abundance of land.

8.5 Labour Inputs And Social Networks

It has been noted (e.g. Chapters 4, 5 and 7) that the most important factor limiting agricultural production is the scarcity of labour; a relatively low population density from about 1 to 8 ^{persons per Sq.}/km² indicating that labour is a major constraint. The very 'traditional' nature of the tribal groupings in the study area also implies that social or cultural values will exert a strong influence on the availability of labour in the household which is dictated by task specialisation. It has also been noted that working parties increase labour input availability at the key period of cultivation with food and beer as the incentives or payment. Also, the 'traditional' role of children in farming is relatively declining as most children now have the opportunity to go to school. The seasonality of the labour input and the importance of the off-farm activities in the overall agricultural system have been outlined (see Chapter 4). It was noted earlier (Chapter 5) that with some farmers certain activities such as hunting and honey gathering may take precedence over some farming operations.

In the study area, family labour input constitutes the most important element in the management of farming and there is full employment during the hoeing and preparation of land, planting, weeding and harvesting operations but there are some labour constraints at the critical periods. On the other hand, during the slack seasons some farmers work in agriculture; while others may move off to urban centres and other schemes

for wage labour and some are engaged in some non-agricultural occupations (Chapter 4) in order to obtain supplementary incomes.

There are two main kinds of farm labour inputs in the study area : Firstly, family labour - the most important; secondly, labour of the informal co-operative institutions based on social networks and inter-relationships. But with the involvement of farmers in a monetary economy and the incorporation of coffee (as one of the main cash crops) into the 'traditional' farming systems, hired labour is relatively emerging as the third important labour input for some enterprising peasant farmers (see Chapters 10,A and 11).

In administering the questionnaire, farmers were requested to provide details of all the persons who usually form the basic labour input on the farm (Q.38,a) and to indicate whether hired labour is used (Q.38,b). Farmers' responses were therefore classified into three groups of labour force as follows:

- 1) Husband and wife(s) only;
- 2) Husband, wife(s) and relatives;
- 3) Husband, wife(s), relatives and others including paid labour.

The analysis is presented in Table 8.9. Considering this table and overall the sample, conjugal labour force accounts for 43.1%, while the extended family labour is 52.6% with only 1.2% non-relatives and paid labour. With regards to the latter category only five persons in Zones 3 and 4 (Maridi RC) were classified as such. Reasons underlying this will be noted later in the discussion.

In Zone 1 (which is mainly inhabited by the Azande and a few other tribes such as the Mittu, Bugguru and Jur), there is a tendency for farmers to work in extended family and conjugal units. 58% of the work force works in conjugal units with 40.5% extended family units. Non-relations and paid labour was not reported in the routine farming activities.

Table 8.9 : Farm labour availability of sample households by categories in the study area

ZONE	CATEGORY 1				CATEGORY 2				CATEGORY 3				TOTALS				TOTALS 3 CAT- EGORIES
	HUSBAND AND WIFE ONLY		HUSBAND, WIFE AND RELATIVES		HUSBAND, WIFE, RELATIVES AND OTHERS		HUSBAND, WIFE, RELATIVES AND OTHERS										
	Head of House- hold	Wife (s)	Head of House- hold	Wife (s)	Relatives	Head of House- hold	Wife (s)	Relatives	Head of House- hold	Wife (s)	Relatives	Others	Head of House- hold	Wife (s)	Relatives	Others	
1	21	26	11	14	7	-	-	-	-	-	32	40	7	-	79		
2	21	23	11	13	4	-	-	-	-	-	32	36	4	-	72		
3	20	26	25	30	21	3	4	1	2	2	48	60	22	2	132		
4	18	22	28	32	20	2	2	1	3	2	48	56	21	3	128		
DISTRICT	80	97	75	89	52	5	6	2	5	5	160	192	54	5	411		

Source : Questionnaire Analysis

160 Farmers interviewed in Maridi District.

50.6% of the labour force comprised of women while 40.5% consisted of men.

In Zone 2 (mainly inhabited by the Zande), 61.1% of the farm work is managed by the conjugal family units, a higher proportion than the other socio-ecological zones. Polygamy is the general norm. Non-relatives and hired labour force was not reported. Females once again comprise 50% of the farm labour with only 44.4% comprising of males working units.

In Zone 3 (mainly inhabited by the Avukaya, Moru, Jur, Morokodo, Baka and other tribes such as Wa'di, Nyamusa) 34.8% of the work force is done by conjugal units, with a higher proportion of 63.6% of the labour force in extended units. Those farmers who do not work with their extended relations are probably solitary men whose wives have left them or relatives have died. The typical family unit (household) is a man living with his wife(s) and children, and his younger brothers and other dependents. It is likely that there is an element of reciprocal labour underlying the typical family unit as it is a tradition to depend on relations for social and economic assistance. About 2% non-relations and hired labour force was reported. This group comprises of friends and other labourers who are only connected through being married to partners who are related. A higher proportion of the work force (45.5%) is performed by females with only 36.4% of the labour input comprised of males.

In Zone 4 (mainly inhabited by Mundu, Moru, Baka and Avukaya), 31.3% of the work force consists of conjugal units, 66.4% (highest proportion) of the labour is extended family units. There is also a willingness to employ non-relations and hired labour units with 2.3% of the work force comprising this category. Females comprise 43.8% of the labour input, while it is only 37.5% of the work performed by males. This zone closely resembles Zone 3 in the willingness to diversify farm labour units especially working mainly in extended units.

In the light of the above discussion of the farm labour profile, it appears that the female labour force is dominant in the study area due to two likely reasons : Firstly, the larger proportions of females in polygamous families (see Chapter 4) and some men may be employed in off-farm occupations; secondly, no attempt was made to have a breakdown of the labour units of relations and non-relations or hired labour into male-female dichotomy. The reporting of certain categories of labour inputs, in particular children, had probably been underestimated including activities such as bird-scaring, collection of the weeded grass and fetching of water etc. which directly or indirectly contribute to farm labour input in the study area.

The average farm labour availability is shown in Table 8.10. It is clearly observed from this table that Zones 3 and 4 (Maridi RC) have slightly higher number of labour input units than Zones 1 and 2 (Ibba RC) thus implying larger areas cultivated per farm as well as farm sizes.

In this survey, farmers were also asked to state the type of work performed by farm labour and the period of the year when work increases (Q.38,a). Generally speaking, the peak periods of April, May, June and July were mentioned by about 95% of the sample farmers as the months of peak labour input but with little zonal variations. In Zone 1, cultivation, planting and weeding operations were acknowledged by all respondents (32) to begin in May. While in Zone 2 the peak periods were reported to begin in April, May, June and July as in Zone 4 when some sorghum crop varieties tend to be planted later after maize and groundnuts. Weeding of these crops takes place in June and often cassava is planted into the groundnuts at this time. In Zone 3, the labour peak was reported by the majority of farmers (47) to be in May and June when early sown crops need weeding and planting continues. Generally the peak periods of all the farming operations are in the months of June, July and August.

Table 8.10 : Average labour availability per farm

Zone	Husband and Wife		Relations	Non-Relations	Total Number per Household
	Head of household	Wife			
1 (N=32)	1	1.25	0.22	-	2.47
2 (N=32)	1	1.13	0.13	-	2.25
3 (N=48)	1	1.25	0.46	0.04	2.75
4 (N=48)	1	1.17	0.44	0.06	2.67
District	1	1.20	0.34	0.03	2.57

Source : Questionnaire Analysis and Data calculated from Table 8.9 of Labour Availability
160 Farmers interviewed in Maridi District

To assess the impact of debilitating illnesses, farmers were asked to state if they had illnesses or complaints and how much of their time was spent off-farm work (Q.53,d). This was a difficult question due to the problem of memory recall in societies where no records are kept. However, rough estimates to safeguard the purpose of the study were made and presented in Table 8.11 although the data should be treated with reservation. It is evident from this table that in total the average number of 'man-weeks' off-farm is more than three weeks. However, farmers in Zones 1 and 2 (Ibba RC) have lost on average more than four to five weeks compared with farmers in Zones 3 and 4 (Maridi RC) with only more than one week. No clear reasons may be advanced to explain these differences, but it is likely that cultural values and beliefs against or less use of modern health and medical facilities may explain these variations.

8.5.1 Family labour

This is the most important type of farm labour input and the composition of the family size has an influence on the size of farm. The relationship between the number of children as part of the family labour input and the size of farm is given in Table 8.12. There is an approximate relationship between farm size and children's family labour in the study area. It is shown in Table 8.12 that there is a tendency of farm families in Zones 3 and 4 (Maridi RC) with polygamous families to have more children and hence larger farms. This is because the type of farming practised is often closely aligned to the size of holding where farms are structured to conform to the optimal degree of self-exploitation of the family labour when hired labour is not used (e.g. Chayanov, 1966; Jackson, 1972).

In this respect, it was mentioned earlier in this chapter that the 'traditional' use of the labour force of children is relatively declining

Table 8.11 : Number and percentage of farmers' time spent off-farm due to complaints and illness

Time/Period	Sample area		Zone 1 (N=32)		Zone 2 (N=32)		Zone 3 (N = 48)		Zone 4 (N = 48)		District (N=160)	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
1 week	5	15.6	3	9.4	13	27.1	11	22.9	32	20.0		
1 - 3	7	21.9	8	25.0	1	2.1	1	2.1	17	10.6		
4 - 6	8	25.0	10	31.3	3	6.3	6	12.5	27	16.9		
7 - 9	8	25.0	4	12.5	3	6.3	-	-	15	9.4		
10 - 12	1	3.1	-	-	-	-	1	2.1	2	1.3		
13 - 15	-	-	-	-	-	-	-	-	-	-		
16 - 18	-	-	-	-	-	-	-	-	-	-		
19 - 21	-	-	1	3.1	-	-	-	-	1	0.6		
21*	-	-	2	6.3	-	-	1	2.1	3	1.9		
Average number of man-weeks (1)	4.19		5.09		1.13		1.56		2.66			

Source : Questionnaire Analysis
 160 Farmers interviewed in Maridi District
 (1) The average number of 'man-weeks' was calculated by multiplying the number of farmers responding in each 'week category' by the average week in that particular class and divided by the number of farmers in each zone respectively.

Table 8.12 : The relationship between number of children and farm size (in feddans)⁽¹⁾ in the study area
Zones 1 and 2 (Ibba RC)

No. of children	Farm size		1		1-3		4-6		7-9		Total	
			No.	%	No.	%	No.	%	No.	%	No.	%
None			17	47.2	15	41.7	3	8.3	1	2.8	36	100.0
	1 - 4		1	14.3	5	71.4	1	14.3	-	-	7	100.0
	5 - 9		7	33.3	7	33.3	7	33.3	-	-	21	99.9
	Total		25	39.1	27	42.2	11	17.2	1	1.6	64	100.1
Zones 3 and 4 (Maridi RC)												
None			8	40.0	2	10.0	10	50.0	-	-	20	100.0
	1 - 4		1	5.0	7	35.0	11	55.0	1	5.0	20	100.0
	5 - 9		9	16.1	19	34.0	25	44.6	3	5.4	56	100.1
	Total		18	18.8	28	29.2	46	47.9	4	4.2	96	100.1
District												
			43	26.9	55	34.4	57	35.6	5	3.1	160	100.0

Source : Questionnaire Analysis
160 Farmers interviewed in Maridi District
Percentages more or less than 100 because of rounding
(1) 1 Feddan = 1.038 acres.

due to their school attendance. But even so farmers still view their labour input as vital especially during the school vacation. Farmers were therefore asked to state the number of children they would wish to have (Q.73,b). Farmers' replies are depicted in Table 8.13. It is clearly shown in this table that there is strongly marked desire for many children because of the 'traditional' objective of more farm labour or in order to send them to school after which family members (especially during old age) may benefit from remittances from urban centres employment opportunities. Thus, any family planning policy therefore has to consider the implications of the social and economic importance of children.

8.5.2 Divisions of labour by age and gender

The divisions of labour by age and gender in this thesis has, directly or indirectly, been noted at various stages (see Chapters 4 and 5). Specifically, in the discussion of the off-farm occupations and farm calendar, it had been indicated that there is specialisation of labour by sex.

In this survey study, no attempt was made to present data in a quantitative context. However, informal interviews yielded much qualitative information. Thus Table 8.14 summarises some of the agricultural and domestic chores as performed by all members of the household. It is clear from the table that most of the domestic duties are shouldered by females although males were mentioned in various zones to be assisting. If a husband has more than one wife he will work for them in their land in turn. Each wife is therefore an independent economic unit, with plots of each field type as well as her own granary and kitchen. The crops harvested from the wife's farm plot are theoretically her own but practically the family's daily food requirements are met by her stores. Although the husband controls the economic decisions of the farm production,

Table 8.13 : The number and proportion of farmers' responses on the number of children they would like to have

Number of children	Sample area		Zone 1 (N=32)		Zone 2 (N=32)		Zone 3 (N=48)		Zone 4 (N=48)		District (N=160)	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
1 - 4	4	12.5	2	6.3	6	12.5	10	20.8	22	13.8		
5 - 9	10	31.3	9	28.1	15	31.3	11	22.9	45	28.1		
10 - 14	15	46.9	12	37.5	19	39.5	13	27.1	59	36.8		
14+	-	-	1	3.1	2	4.2	9	18.8	12	7.5		
Wife/husband ageing/barren	1	3.1	8	25.0	1	2.1	-	-	10	6.3		
As many as God wishes	1	3.1	-	-	4	8.3	4	8.3	9	5.6		
No answer (D.K.)	1	3.1	-	-	1	2.1	1	2.1	3	1.9		
Total	32	100.0	32	100.0	48	100.0	48	100.0	160	100.0		

Source : Questionnaire Analysis
160 Farmers interviewed in Maridi District

Table 8.14 : The general divisions of labour by age and gender in the study area

Sample area	Zone 1	Zone 2	Zone 3	Zone 4
Agricultural operations				
<u>AGRICULTURAL</u>				
Bush clearing	M/B	M/B	M/B	M/B
Seedbed preparation	M/B	M/B(W/G)	M/B(W/G)	M/B
Planting	M/B	M/B(E/G)	M/B(W/G)	M/B
Thinning	W/G(M/B)	W/G(M/B)	W/G(M/G)	W/G
Weeding	W/G(M/B)	W/G	W/G(M)	W/G
Harvesting	M/B/W/G	M/B/W/G	M/B/W/G	M/B/W/G
Cleaning seeds/threshing	W/B	W/G	W/G	W/G
Marketing	M/B/W/G	M/B/W/G	M/B/W/G	M/B/W/G
<u>SOME DOMESTIC CHORES</u>				
Fetching water	W/G(B)	W/G	W/G(B)	W/G
Cooking/making beer	W/G(M)	W/G	W/G/M	W/G/M
Domestic washing ⁽¹⁾	W/G(B)	M/B/W/G	W/G/B/B	M/B/W/G
Cutting grass for tukls (huts)	W/G(M)	W/G(M)	M/B/W/G	W/G(M/B)
Cutting poles for tukls (huts)	M/B(W)	M/B	M/B	M/B
Mudding	M/B/W/G	M/W/G(B)	M/B/W/G	M/B/W/G
Collecting firewood	W/G(M)	W/G(M)	W/G(M)	W/G/M
Grinding foodstuff	W/G	W/G	W/G	W/G

Source: Fieldwork data

(1) It is likely that 'domestic washing' was understood to include hygiene

M = Men B = Boys W = Women G = Girls

Brackets indicate information from one or two respondents only

the wife may sometimes sell crops without her husband's consent (though this probably has not always been so). Generally, if crops are sold by a woman, the husband is usually informed of the income. As shown in Table 8.14 children follow similar sex roles as adults but with females starting at an earlier age than males, about seven years instead of eleven or twelve. This is being affected by attendance at school which is being dominated by males.

However, the rigidity in the sexual division of labour in the study area seems to have relatively declined in the last decade. It is gradually changing especially when the husband or wife is involved in off-farm activities. With the incorporation of coffee (as one of the main cash crops) into the farming systems, there is a change in cropping patterns and the breakdown of the rigid sexual divisions of farm labour; with men now participating in weeding crops particularly coffee, sweet potatoes, sorghum etc.; these are also harvested by men and women and their siblings jointly. But joint activity on an operation does not necessarily imply working alongside each other in the field; in fact, each gender may have one or more specific crop responsibilities.

Labour specialisation is a major constraint in the labour use and availability on the farm holding. It is possible that the rigidity of labour specialisation is more apparent than real. Therefore, this sexual division of labour between husband and wife as well as children is variable, with only a few specialised activities reserved to any one category.

In this context, De Schlippe (1956:139-148) in his study of the 'Zande Farming System', found that labour specialisation did not always conform to the customary rule accepted by the people themselves. He gives two reasons for this : Firstly, the stress of the necessities of the moment gives rise to a number of exceptions; secondly, the people are not aware of the slow social change they are undergoing. Thus, planning

policies and strategies to promote innovations especially in relation to extension work should involve women in general.

8.5.3 Labour of the informal co-operatives and social networks

Family labour was mentioned in section 8.5.1 as the most important input in all the farming operations in the study area. However, it is also being supplemented, although to a gradually decreasing extent, by a system of social networks through the use of the labour of informal co-operatives. It is worth noting that no differentiation was made by farmers on the question (Q.38,b) relating to the use of hired labour as different from the food and beer working parties. The question was mistakenly comprehended by farmers for working food and beer parties although several farmers of course also use hired labour to be outlined shortly after.

In the study area, various kinds of community labour groups exist in which people join on clan or neighbouring basis. Working beer parties include large parties (woro-buda : Zande, ovu-losi ; Moru) in which twenty people or more from surrounding villages assist a particular farmer usually with initial operations such as land or bush clearing, cultivation, planting and weeding; small working parties in which people from the same village or clan assist a farmer in similar operations involving the land around the homestead (pangba : Zande) or 'kitchen gardens'; and reciprocal labour in which the farmer is assisted by members of the extended family and especially brothers of the farmer as well as close neighbour farmers on the understanding that, that farmer will render his labour services at a later stage. Working parties usually only involve one day's work, but others could also be organised later in the year, for example, during the harvest period. It has been noted in Chapters 4 and 5 that food and beer play an important role for the mobilisation of working labour groups. Beer and substantial refreshments of food (e.g. porridge, beans, roasted or boiled groundnuts,

maize and cassava or sweet potatoes) are provided; occasionally, a goat or sheep is slaughtered.

Interesting to note is that the basic function of the working groups is to deploy the labour of the community as efficiently as possible at times of peak demand, when speed is of the essence. Thus, the efficiency of communal labour as compared with individual effort is equally stressed by the participants. As Gulliver (1971:196) succinctly correctly puts it "collective labour, with the encouragement of song, the tapping of sentiments of mutuality and concord, and the short beer drink afterwards, lightens the burden and maintained incentive at a trying time." However, it is worth noting a point of specific detail in order to illustrate one of the demerits of the béer working party in the study area. Field survey revealed a large working party was found in Kangwa (Zone 2) area in which large quantities of beer were served but which later broke up because of the occurrence of a severe group-fighting due to misunderstanding and drunkenness. Additionally, beer parties are sometimes disrupted and inefficient as some participants become lazy and only sit down in the shade of trees most of the working time with their smoking pipes full and with much singing and ululating. Thus, the supply of beer tends to attract more men to this type of working co-operation than generally care for the task.

The beer party laid on by the host is regarded as little more than a neighbourly gesture; the real reward is the entitlement of a regular participant to ask the group to work for him at a later date, thus all participants enjoyed equal rights in this context.

In the study area, a more recently diffused vital feature of farming systems adopted by several farmers is the utilisation of the organised work groups called 'companies' (there is no specific name

for these in either English or the vernaculars). Here, the farmers have to organise themselves in groups of ten to twelve people or even more. Then each farmer would have the 'company' cultivate in his farm once every ten to twelve days for land clearance and tilling operations. In fact, in this survey 5.1% of the farmers in Kangwa (Zone 2) and Gworosai (Zone 4) acknowledged participating in this system. This system was reported to have been diffused into the study area (probably through cultural contacts etc.) from neighbouring East African countries particularly Uganda where it is widely practised by the Madi and Acholi tribes in Eastern Equatoria Province (Torit District). Elsewhere in Africa (e.g. O'Laughlin, 1963; Richards and Sharpe, 1981), these work groups have been widely described as sources of labour for time-constrained farming operations.

In the study area, there are also ad hoc groups collected together for one day's work for someone who is sick, or old and this relationship is articulated by charity; or for someone such as a father or mother-in-law to whom one of the group members is obligated. Furthermore, it has been reported that working parties can also be comprised of both men and women who work alongside each other in the field. This implies that there is flexibility of specialisation by sex, thus supporting De Schlippe's (1956) view that sex specialisation is often overruled by the stress of the necessities of the moment (see section 8.5.2). The rationale of the informal co-operatives and social networks is thus a devise by the farmers to overcome the 'muscle barrier'. This may explain part of the discrepancies between the area cultivated and family size which in turn is also related to the varying quantity and quality of food and beer provided. Households with considerable food surplus and beer will have larger farms and therefore maintain social inequality - a phenomenon widely discussed elsewhere (e.g. Nadel, 1947; Haswell, 1963).

The principle of time-sharing, around which reciprocity between work group members operate deserves later research as these institutions are relevant to the theme of formal co-operatives. However, with the emergence of a cash economy in the study area, these informal co-operative institutions in farming are gradually declining. Thus, communal labour groups become much more sharply defined and the use of hired labour is relatively increasing.

8.5.4 Hired labour

In the study area, informal discussions with farmers and knowledgeable local leaders revealed that before the Civil War there was rarely hired labour in farming. A few people would accept to be employed for cash by others, such as civil servants in the Government who were posted to work in the centres. This was because waged labour in farming was considered as putting the people involved in an inferior social group and they were looked down upon as too lazy to manage their own farms, though they would participate in informal co-operative institutions. It is also reported that local people were more willing to work as temporary labourers in non-farm occupations such as building and construction of schools, roads and other Government projects.

However, during and after the Civil War, a new concept started to develop and the local people took a new trend when they gained experiences of different social environments, new ideas and lifestyles when they took refuge in the neighbouring East African countries. Several people were therefore involved in waged labour occupations especially in public and private coffee schemes. About 25% of the sample farmers, who mostly grow coffee, acknowledged using hired labour for weeding and harvesting operations. However, those who mainly offered themselves for hire are the refugees from Zaire and quite recently from Uganda although a few local people are also involved. But there is a tendency of coffee growers

to hire the refugees because they are known to be hardworking, and with relatively more experience of coffee cultural operations; also that they are relatively cheaper to employ as no other alternative opportunity is open to them.

In effect, the incorporation of coffee as a cash crop into the current farming systems has increased the use of hired labour by some households. As such the ability to hire labour made reciprocal arrangements decreased. Several farmers reported that firstly, hired labour is more efficient both in output and in the control the hirer could exercise over it. Secondly, that food and drink for working parties are becoming expensive (inflation?) and therefore very few are now involved in festive parties, and even close kinsmen and affines who previously would have exchanged labour are now reluctant to do so because of the attraction of non-farm occupations in the centres which are relatively more remunerative. Therefore, because of the pull factors that exist in the urban centres young men between the ages of 20 and 29 were inclining to migrate out of the study area. Consequently, there is a problem for young men who remained in the rural areas to set up exchange partnerships since their peers are away. Thus, it is now necessary to obtain cash to be able to command hired labour instead of making payment in kind. There is even a greater need of money by several farmers who are still engaged in food and beer parties. Because of the variability of rainfall and crop production food is becoming expensive; money is therefore used for buying more foodstuff in order to be able to command available working parties.

Summarising these labour input strategies, conjugal and extended family labour units are more important in the study area as well as the informal co-operative organisations although the latter strategies are gradually decreasing as a result of the emergence of money economy and the trend towards the use of hired labour. Thus, it appears that farmers

are well aware of the labour bottlenecks on individual farms at critical peak periods, and thus through community effort manage to overcome labour shortage on their farms.

8.6 The Role Of Rural Markets And Agriculture In The Study Area

In the study area, 'traditional' farming is not exclusively 'subsistence-oriented' in the sense that all production is for consumption, but a certain proportion of the production may be available for sale in the rural markets. In this study, a 'market' is defined in the sense of market place and is informally acknowledged or an authorised public gathering of buyers and sellers of various commodities at appointed places operating daily or periodically. It is a relatively simple structure which requires little organisation and capital investment. In this section, the main objective is to highlight the importance of markets and how they and transport systems operate to support agricultural specialisation and trade; to outline briefly marketing system as a mechanism of agricultural change and as a means of spreading information about changing economic opportunities at intra- and inter-regional levels.

The role played by rural marketing systems in the economic development and the transformation of the economy of the 'traditional' societies has been widely recognised (e.g. Bohannon and Dalton, 1962; Skinner, 1964; Hodder, 1965; Belshaw, 1965; Berry, 1967; Good, 1970; Bromley, 1971). Rural marketing institutions are crucial modes for integrating the communities into the national economy and culture. Dixon (1974) described the rural marketing system as the most important 'multiplier' of economic development and a network through which information, new ideas and modern techniques can flow into the rural areas. Bartering of agricultural produce is sometimes practised in the study area. For example, food surpluses are bartered for other basic consumer and mass production commodities from

local traders and even for other locally-produced commodities among farmers themselves. In effect, Hodder (1965) suggested that the bartering system was a possible origin of rural markets, but more and more cash transactions have taken its place.

8.6.1 Classification of rural markets in the study area

Academic literature on the development of markets in the Sudan is quite meagre (e.g. Mohamed, 1975; Hamoudi, 1980; Trilsbach, 1983). In the study area, no geographical information exists except that which is anthropological in nature concerned with the Zande markets (Reining, 1962). However, two types of rural market can be identified - the daily and the periodic, although these can further be classified according to size (McKim, 1972) and whether they operate during the day or at night (Hodder, 1961). Both periodic and daily markets are outlined in this section.

For clarity sake, and to help explain the spatial patterns of rural markets in the study area, the framework of a model first identified by Skinner (1964) and modified by McKim (1972) and similar to Trilsbach's (1983) classification is used. Skinner (1964) primarily using the interview techniques identified five classifications of hierarchical levels of rural markets:

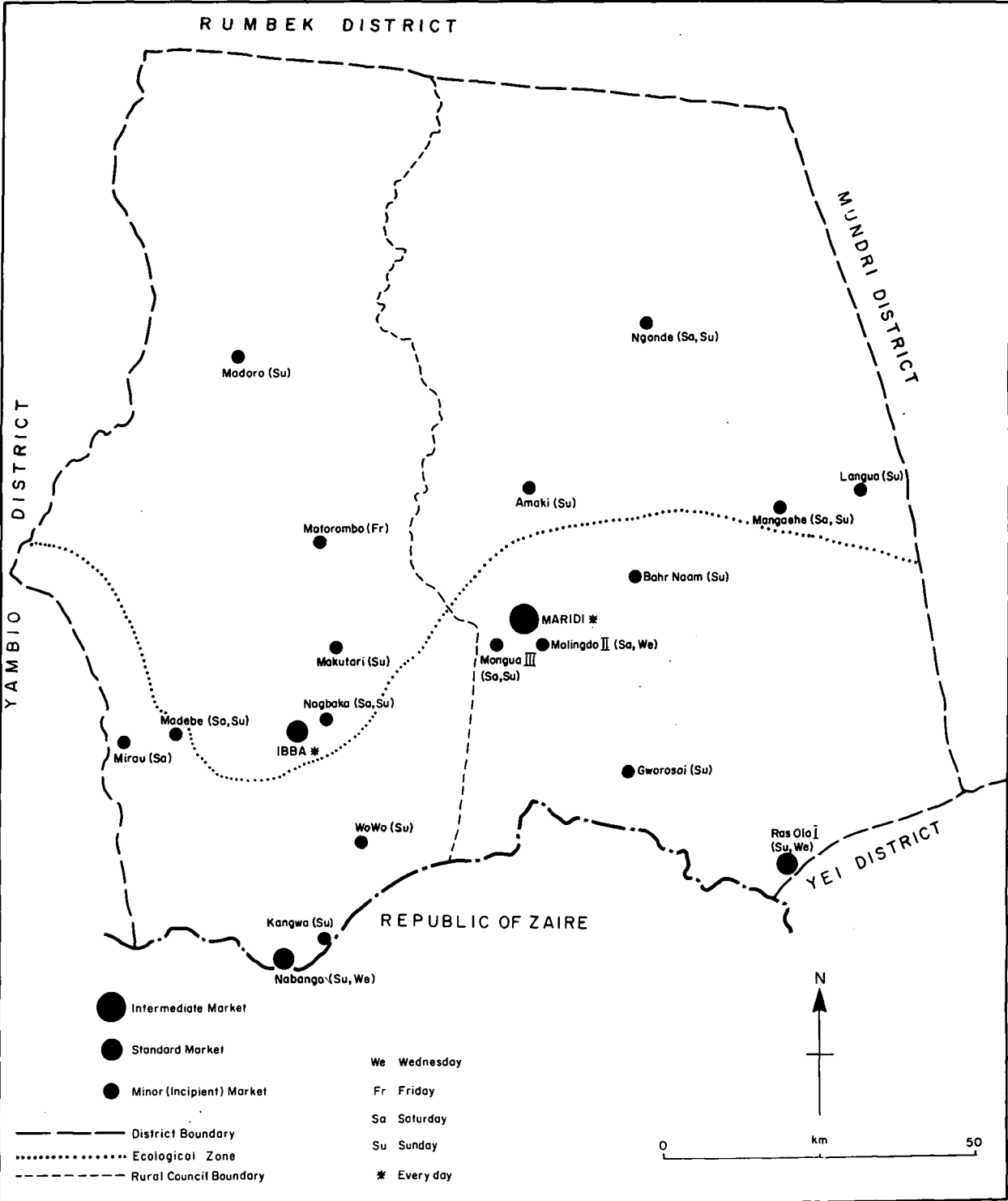
- a) Minor (incipient) or 'green vegetable' markets : are the smallest and specialise in the 'horizontal' exchange of peasant-produced goods which are usually exchanged and bartered between people of neighbouring villages. There are few or no imported goods.
- b) Standard markets : slightly more important than the minor markets. These are characterised as providing for the 'horizontal' exchange of higher order goods within the larger market dependent area. They are also engaged as starting points for the upward flow of agricultural products and craft items into the higher levels of the marketing

hierarchy (Scott, 1972), and also the termination of downward flows of imported items destined for the rural population (McKim, 1972). Although they retain the 'horizontal' functions of the minor markets, they also show some degree of 'vertical' functions.

- c) Intermediate markets : are engaged in both 'vertical' and 'horizontal' flows of higher order goods. These markets are usually located in larger villages and small towns, and often have some trading facilities incorporated within them.
- d) Central markets : are normally situated at strategic sites on the transportation network; they serve a larger market threshold and often have wholesaling and retailing functions.
- e) Regional markets : are above the central markets in the hierarchy; they are associated with the larger central places and are often in urban areas. They usually operate daily and may function in both night and day.

On the basis of the above markets' classification, minor, standard and intermediate markets can be identified. Minor markets are often informally organised within most of the sample villages and have too small a threshold to attract itinerant travelling traders on a periodic basis; there are no official records pertaining to them, while standard and intermediate markets tend to operate predominantly on a periodic basis. Fig. 8.3 shows the spatial and temporal distribution of the periodic markets in the study area. It is observed from the figure that the minor periodic markets are dominant in the study area. They operate mainly on one or two days per week. On the other hand, the standard market at Ibba, Nabanga, Ras Olo I and the intermediate market at Maridi headquarters operate daily. Thus, each sample village has some form of marketing facilities, but the exact extent of operation varies from a few isolated local or 'bush' shops in villages such as Madoro (Zone 1), Kangwa and

Fig 8-3 THE SPATIAL AND TEMPORAL DISTRIBUTION OF PERIODIC MARKETS IN THE STUDY AREA



Source: Fieldwork Data

Wowo (Zone 2), Amaki and Mangaehe (Zone 3) and Mongua III and Bahr Naa'm (Zone 4).

In this context, the spatial distribution or location of markets whether it relates to the distribution of population and settlements (McKim, 1972) or to the degree of mobility of traders and consumers (Hill and Smith, 1972) has been fully discussed elsewhere (e.g. Jackson, 1971; Bromley, 1971; Trilsbach, 1983).

The organisation of the minor markets is quite simple in the study area. Most of them do not have well-defined stalls but are held under convenient tree shades and usually by the roadside and generally chosen by the farmers of each village as central points. These centres are usually located at the same sites where health centres, schools and chapels are located so that farmers from various settlements or scattered huts can visit these institutions by making one single journey. Sunday seems to be the most common marketing day on which most of the agricultural produce is sold mainly in the minor or incipient periodic markets. Thus the majority of agricultural produce not consumed by rural families is disposed through the minor markets. Usually, commodities are sold in small quantities, in heaps, glasses, cups, small tins, bowls, plates and other containers and spread over on mats or open-out sacks laid on the floor. For example, sorghum and eleusine are normally sold in bowls, plates and small tins; groundnuts in small heaps, sesame and cowpea in glasses; cassava flour on plates; sweet potatoes, tomatoes, lemons and oranges in lots and tobacco in compressed bowls. Often the price of agricultural produce varies from market to market due to the absence of the standard units of weights and measures, availability and location or accessibility factors (see Tables 8.15 and 8.16).

On the other hand, the standard and intermediate markets are held in well-defined stalls. But most of the agricultural produce offered for sale at Ibba and Maridi markets are also sold in the same manner as those

Table 8.15 : Some agricultural commodity prices (1981) in four selected markets in the study area

Market Commodity	Maridi LS/Kg	Ibba LS/Kg	Bahr Naam LS/Kg	Nabanga LS/Kg
Dura mixed with B/millet	0.400	0.350	0.300	0.260
Dura mixed with F/millet	0.360	0.300	0.280	0.240
Dura	0.250	0.210	0.210	0.190
Groundnuts	1.120	1.000	0.980	0.800
Sesame	1.500	1.250	1.000	1.150
Cassava flour	0.600	0.500	0.510	0.400
Fresh cassava	0.080	0.050	0.060	0.400
S/potatoes	0.090	0.070	0.070	0.050
Yams	0.160	0.100	0.090	0.080
Cowpeas	0.800	-	-	0.700
Tobacco	10.000	8.000	-	-
Lemon	0.150	0.140	0.150	0.100
Oranges	0.180	0.110	0.100	0.090
Tomato	0.500	0.400	0.400	0.380
Fresh okra	0.900	0.850	0.700	0.590
Dry okra	4.000	3.500	-	2.650
Pawpaw	0.150	0.100	0.090	0.050
Pineapple	0.500	0.380	0.350	0.250
Ash (local lime)	0.350	-	-	-
Mangoes	0.300	0.250	0.180	0.150
Banana	-	0.210	0.200	0.170
Honey beer (dura)	-	-	0.400	-
B/millet	-	0.420	-	-

Source: Maridi Rural Council Headquarters files 76/A/31/1PH, 1981

- A dash indicates that the particular commodity was not on sale during survey period.

Table 8.16 : Average expected farmgate prices (in Sudanese £) of some agricultural commodities in the study area

Sample area Product	Zone 1		Zone 2		Zone 3		Zone 4	
	£S	m/m	£S	m/m	£S	m/m	£S	m/m
Sorghum	0	180	0	290	0	350	0	350
Groundnuts	0	570	0	400	0	640	0	670
Sesame	0	500	0	570	0	450	0	860
Honey	1	200	1	120	1	200	1	200
Cassava flour	0	660	0	280	0	370	0	400
Chillies	5	000	-	-	-	-	-	-
Dry okra	1	250	-	-	2	500	1	250
Finger millet	-	-	-	-	0	530	-	-
Tobacco	-	-	5	000	7	500	5	000
Lemon	-	-	-	-	0	360	-	-
Yam	-	-	-	-	-	-	0	080
Cowpeas	-	-	-	-	-	-	0	400
Green grams	-	-	-	-	-	-	0	360
Oranges	-	-	-	-	-	-	0	160
Bananas	-	-	-	-	-	-	0	210
Tomatoes	-	-	-	-	-	-	0	450
Lulu oil	-	-	-	000	-	-	-	-
Eggs (each)	0	050	-	-	0	050	0	100
Chicken	-	-	0	750	1	250	1	000
Sheep	25	000	-	-	30	000	35	000
Cattle	-	-	-	-	135	000	150	080

N.B. The dash indicates that the particular commodity was not on sale during the survey period.

Source: Data extracted from the calculation of sale prices as reported by the sample farmers.
Each farmer reported what produce he had in heaps, bowls, tins, sacks etc. and then the price expected was calculated. The prices are for the recognised market unit of quantity for each commodity. They are the same for each commodity in each zone.

of the minor markets. A description of the internal structure of the daily markets in Maridi headquarters is illustrated here as an example. In what might be called the Central Business District (CBD) are the meat and vegetable sections and around these sections develop retail shops and stores, most of which are built of permanent materials. Some shops combine the selling of imported goods as well as local produce, and part of the transaction may extend into the open air. Watch-repairers, and tailors utilise shop verandahs as their workshops. Around the retail shops are the restaurants, tea and coffee shops and bicycle-repairers around them. The tea and coffee shops are also made use of as recreational centres. Other socialising centres are located in separate quarters in the nearby residential areas. Other features of the market place are the church and mosque near it. Thus, the organisation of the market into sections is according to the different items sold and specialised functions and enterprises.

Next in order are the women's section specialised in selling foodstuffs, vegetables, beer and other foodstuffs related to food preparation. Very occasionally a man would be seen selling food for the wife or a female relative. On the other hand, meat, craft objects and other items are almost without exception sold by men; because crafts (except pot-making, basket-making) are exclusively in the male province. Almost all the imported goods were sold by men, since the peddlars, hawkers were invariably men who also combine foodstuffs with consumer goods or lower order commodities such as cloth, matches, salt, oil, sugar, tea, onions etc.

The organisation of Maridi headquarters market place (as in Ibba) into sections is an interference from the Town Council Authorities. Thus, each permanent trader is issued with a plot and a trading licence, and each shopkeeper builds his own establishment. Most of the shops are square-roofed and have corrugated zinc and tin roofs. A discussion of the characteristics of the local traders and their role in marketing of farm produce is shown in the following paragraphs.

8.6.2 The role of local traders and marketing of agricultural produce and inanimate goods

The role of local traders and 'bush' shops and marketing in the study area is vital. Generally, the agricultural produce if not sold by farmers through the rural periodic markets discussed above, are disposed through the local traders or 'bush' shops. In this connection, it has often been argued that 'traditional' farmers are 'conservative' and slow to take advantage of market opportunities because of their pre-occupation with survival strategies (De Wilde, 1967). However, considering the first priority to produce food for family sustenance into account, this assertion is more or less inapplicable. What Allan (1965) called the 'normal surplus' by which farmers produce more than they need to ensure food supply in bad years, has been used as a launching pad for cash crop production. As Gleave (1978:9) notes "even ... the marginal surplus has long been traded and intra-community exchange ... of the social system." Thus, surplus produce which used to rot on the farm or was diverted to beer production is now marketed (even in converted liquid form - local beer and its varieties), leading to waste reduction.

In the study area about 90% of the trading establishments or shops particularly in Maridi and Ibba centres are operated by Jellaba traders and the rest by the local people. In effect, as it is common with the other Central African peoples, the Southern Sudanese have little or no trading tradition. Under the separate development policy of the Anglo-Egyptian Condominium administration, the operations of Jellaba traders were limited or restricted; while the Greeks and Syrians were encouraged. However, a few Jellaba managed to penetrate the Southern Sudan and were operating and since Independence up to the present most of the trading activities are controlled by them.

The rural shops operated by the traders in the study area often act as stores for surplus crops such as tobacco, cassava, chillies,

sesame, hides and skins, honey and beeswax, and especially coffee etc. which are purchased in small quantities for relatively low prices when the farmer requires cash for the payment of taxes, children's school fees and to meet the basic needs of manufactured or mass items available in the shops. The rural shops far from the main centres are too small to function independently but nearly all are owned and controlled by those in the main centres and larger villages. The local traders in the remote villages therefore work as agents for those in the main centres on a profit-sharing basis. The crops purchased from the farmers are either re-sold to them by the traders at a later date in the village for a profit of about 50-100% depending on the supply position (especially at the critical drought and hungry gap periods) at the time of sale or transported to Juba whenever a truck is available; hence, this does not permeate to the farmers as they have a 'polyopoly' of the transport system. Table 8.17 shows some of the purchases of crops from farmers by two enterprising farmer-traders who in turn sell them in the main centres or re-sell to the farmers themselves at exotic profits thus creating marketing anomalies.

In this context, generally, the Jellaba traders have also exploited the opportunities for smuggling goods (e.g. coffee, elephant tusks etc.) across provincial and international boundaries (e.g. between Sudan-Zaire, Sudan-Uganda in particular). These opportunities have undoubtedly increased profitability (capital accumulation?), but which have also created shortages (e.g. grain) of these commodities in producing regions. Thus, being absolute masters of the political economy of scarcity, the Jellaba traders can easily manipulate prices at the expense of peasant farmers, hence, establishing their own prices which allow them to make profits. This calls for re-consideration of the lax and inconsistent policy on the part of the Government. The findings of the present study lend support to the observation by Kliet (1980:36) who noted that "prices paid to peasant farmers in Malawi have been well below export

Table 8.17 : Enterprising farmer-traders' cash purchases (in Sudanese f) of some crops in the study area, 1980-81

Month	Crop	Sorghum		Coffee		Groundnuts		Tobacco		Pineapples		Palm oil		Cassava flour		Sweet potatoes		Sesame		Total	
		f S	m/m	f S	m/m	f S	m/m	f S	m/m	f S	m/m	f S	m/m	f S	m/m	f S	m/m	f S	m/m	f S	m/m
July		17	145	92	440	-	-	-	-	18	735	2	960	74	000	3	200	24	500	232	980
August		27	155	89	800	-	-	-	-	71	975	3	200	69	000	20	055	50	670	331	855
September		80	135	83	550	90	000	-	-	82	475	3	440	84	674	2	500	84	640	511	414
October		85	270	85	850	49	775	-	-	93	125	8	200	57	685	9	500	67	240	456	645
November		83	310	87	560	71	000	-	-	86	450	11	550	69	150	8	580	94	320	511	920
December		71	790	78	560	81	005	-	-	62	155	8	700	76	375	-	-	52	158	430	743
January		33	580	66	780	81	000	99	750	76	600	5	300	38	700	11	450	54	975	468	135
February		12	820	34	000	92	900	87	850	81	850	3	150	47	360	11	980	66	530	438	440
March		62	260	28	380	90	500	81	400	61	050	12	940	33	730	-	-	189	875	560	135
April		19	240	91	530	52	500	68	770	-	-	7	400	12	600	-	-	-	-	252	040
May		81	420	-	-	62	000	-	-	19	220	5	000	19	960	12	750	-	-	200	350
June		98	830	93	370	-	-	-	-	10	280	9	800	6	720	15	975	-	-	234	975
Total		672	955	831	820	670	680	337	770	663	915	81	640	589	954	95	990	684	908	4629	632

Source: Fieldwork and data provided by farmer-traders.

parities even if transport charges and marketing costs are taken into consideration."

8.6.3 Types of traders in the study area

Hill and Smith (1972) recognised two main types of traders : Those who traded in local markets only; and those who travelled with the markets on a circuit. The latter category usually travels by lorries and covers a relatively larger area. In this study, a 'trader' is employed generally to mean the entire range of individuals who may be found offering goods for sale in a market place. Traders also include the people who visit the market either to sell items not produced locally and to buy local produce for bulking into larger lots for sale elsewhere.

In the study area, two types of traders can generally be identified : Part-time traders and full-time traders. In this study, no attempt was made to elicit data on the nature and characteristics of full-time traders due to the usual constraints of resources and time. However, in the overall sample four part-time traders were encountered in Madoro (Zone 1), Wowo (Zone 2), Amaki (Zone 3) and Gworosai (Zone 4). Those part-time traders own small shops in which inanimate goods are sold. These include non-perishable locally produced goods like sorghum, cassava flour, millets, okra (ground), chillies, honey, sesame etc. most of which have been purchased from the neighbouring farmers. These shops also offer a limited number of imported items like soap, cloth, oil, cigarettes, matches, sugar, sweets, combs, toothbrushes and other miscellaneous items. Most of these imported items are obtained from traders operating relatively bigger shops in the main centres like Ibba, Maridi and even from outside the study area.

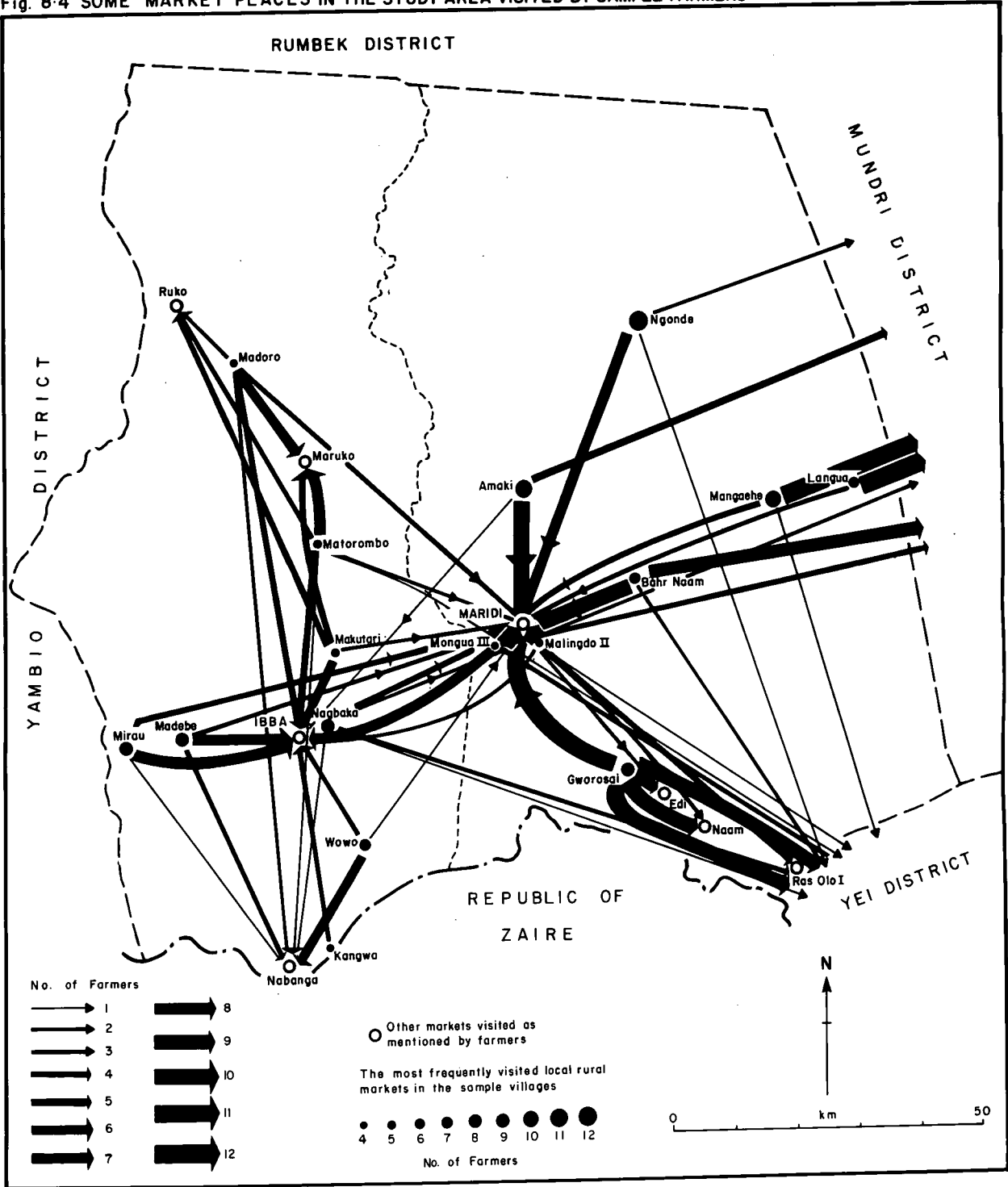
Generally, the full-time traders (mainly in Ibba and Maridi centres) are mainly engaged in selling 'luxury' goods such as electrical equipment, radios, bicycles, watches; and a variety of cooking utensils, hoes, knives, clothes, shoes, sweets, tinned foods, soaps, sugar, tea, coffee, oil etc.

Most of these items are obtained and transported to the study area from wholesalers mainly operating in the regional markets in Juba, Wau, Malakal and Rumbek. Generally, the local traders would probably be emulated as a model of change because they have created rising desires and expectations and thus have carried the newly desirable goods even closer to the farmers in the study area. This is particularly true in that a relatively wide variety of personal and household items such as hoes, axes, bark and cloth (bagadi : Zande) which were locally manufactured are now purchased from the local or 'bush' shops.

8.6.4 Farmers' marketing and mobility patterns

Skinner (1964) and Stine (1962) in their studies of periodic markets have attempted to make detailed analyses of weekly cycles by plotting the daily movement of traders, but in the study area no such pattern exists. The questionnaire survey specifically requested the farmers to indicate the outlets through which their produce was offered for sale (Q.16). Fig. 8.4 demonstrates farmers' responses. It is shown clearly that in the study area 75.6% of the farmers dispose of most of their agricultural produce through other first important ways of marketing. These include : Itinerant travelling traders; travellers passing through the main roads; the 'black market' (magendo) and border trade. The second most important outlets include the local village markets (69.4%). Maridi town market (58.1%) was noted as the third most important outlet. While 34.4% of the farmers acknowledged Ibba town market as the fourth most important outlet in that order (see Appendix 11). Fig. 8.4 clearly shows the extent of farmers' mobility patterns and the frequencies of the markets visited. It appears that the nearer the market the more it is frequently visited by farmers. On the other hand, farmers who are able to hire a truck or lorry to transport their produce to distant markets seem to be a smaller proportion. Farmers living along the main roads (e.g. Yei-Maridi, Mundri-Maridi, and Maridi-Yambio) find it convenient

Fig. 8.4 SOME MARKET PLACES IN THE STUDY AREA VISITED BY SAMPLE FARMERS



Source: Fieldwork Data

to transport their produce to markets in the main centres with relatively high purchasing power and threshold.

In this context, McKim (1972) suggested that the location of markets relates closely to the distribution of population and settlements. But Hill and Smith (1972) argued that an important factor was the degree of mobility of traders and consumers. Hill and Smith (1972) argument seems to lend support to the mobility of the farmers and their marketing patterns considering the point that transport is a constraint in the study area.

A specific point to illustrate the above discussion is that a survey was conducted in 1980 by the PDU in order to ascertain the basic facts about how farmers in the study area actually sold their coffee. The result was that about 20% of the farmers growing coffee transported their coffee to towns of Juba and Yei; 25% mainly sold it in or around their villages and not in the main centres in Maridi and Ibba (Chubb, 1981). Their main finding was that the local hucksters (mainly the Jellaba traders) are the main outlet as they can easily move around the villages in their pick-up trucks. In effect, informal discussions with farmers showed that the sale of the farm produce (especially coffee) to itinerant travelling traders and through the 'black market' (magendo) is the most popular way because it saves time for farming as well as providing relatively 'best' farmgate prices as compared to Government controlled price. This is despite the disadvantages mentioned in section 8.6.2.

In the study area there is also interzonal exchange of farm and non-farm products at the standard and intermediate market centres at Ibba and Maridi headquarters mainly conducted in the dry season. For example, coffee and rice etc. mainly from Zones 2 and 4, bush meat, honey, sheep and goats largely from Zones 1 and 3; the non-agricultural products exchange includes bags, ropes, fishing nets, pottery, leather goods as well as metal tools which are made by specialised villagers.

8.6.5 The problems of eliciting farmers' cash income

The questionnaire survey examined aspects of farmers' cash incomes generated from the sale of crops offered at the market during the previous season prior to the period of the survey (Q.14). There were some difficulties in eliciting data on such a sensitive subject. Even for those farmers who tried to provide such data, their memory lapse was an obstacle. Several farmers could not even remember quite well the exact quantities of the produce sold as most of these are sold in small heaps, glasses, bowls, cups, small tins, buckets etc. as noted in section 8.6.1. Besides the conversion of some crops such as sorghum, millets, cassava, maize into local beers and alcoholic beverages and other crops mainly disposed or sold by women posed a major constraint. It was planned to overcome such constraints by consulting Government records. However, the lack or inconsistencies of Government documents and the variation of prices of most of the crops from zone to zone, their disposal mainly through other unofficial ways (e.g. itinerant travelling traders, 'black market' smuggling) all rendered the impossibility of elicitation of such data with any accuracy. Because of the above-mentioned constraints and the unreliability of the data, farmers' cash incomes were avoided in this study in the hope of improving the quality and quantity of the wide range of other data.

8.6.6 Some marketing problems in the study area

In the study area some of the marketing problems have been noted. It was generally mentioned in Chapter 1 that the scope for the creation of new marketing opportunities is limited by the unfavourable geographical position of the study area with regards to sea and river ports (Port Sudan or Mombasa, Kenya); railway (nearest point is Wau) and the main internal regional markets such as Wau, Rumbek, Malakal and Juba. High transport costs are, therefore, a major constraint limiting export potential of high value, low bulk commodities like coffee, honey, beeswax, fish,

tobacco, chillies, cashew nuts etc. Crops such as sorghum, millets, groundnuts, cassava, sesame etc. constitute a major market potential which could be traded at the internal regional markets as well as important medium-to-low market potential goods in the local markets but there is always a transport difficulty.

In effect, in general, the shortages of foodstuffs in the Southern Sudan reflect not only an inability to produce, but rather a distribution problem. Thus the nature of poor marketing gives little incentive for producing more surplus which in turn is hindered by insufficient storage facilities. On the other hand, Government marketing bodies such as EPAPC which is largely concerned with cotton marketing do exist in the study area but are still finding their way. There is also the strategy of the Commercial Services Branch of the PDU which is planned to handle the marketing of coffee and improved groundnut variety (Makulu Red) and to encourage the formation of pre-cooperative groups of farmers (seen as precursors of co-operative societies) to whom facilities such as farm inputs and credit would be supplied. However, to date, no effort has been made to execute these plans. The poor state of most roads (see Chapter 4) with the exception of the main trunk roads makes it difficult for lorries to reach most areas where there are surplus crops although some are accessible during the dry season. Because of these constraints, transport costs are relatively high and there is a wide price fluctuation.

Informal interviews with farmers showed that the cost of transporting, for example, a sack of sorghum from Madoro (Zone 1) to Ibba market is about fS6 from Ngonde (Zone 3) to Maridi town market is about fS7; from Kangwa (Zone 2) to Ibba market is about fS5; and from Gworosai (Zone 4) to Maridi town market is about fS3. Additionally, the fragmented nature of markets in the study area, leads to the fact that there is little awareness by farmers of market prices. The present lack of market

information is an obstacle to researchers who in general find difficulty in correlating technical research with constantly changing market conditions.

8.6.7 The role of markets and change

In the developing countries, it has been clearly recognised that the social role of rural markets can be as important to those taking part as the economic one (Scott, 1972). In the study area, the evolution of market economy has induced a series of changes which are reflected in agricultural production, the forms of building, the material culture and in the integration of the rural and national economies. The need of cash income and the flow of manufactured imported goods such as cloth, sugar, salt, soap, bicycles etc. have made the rural cultivators aware of the new lifestyles and different frame of reference, urban values and outlook. 'Traditional' farming systems are more or less oriented towards the production for cash. Thus, a situation is created in which the distinction between subsistence farming and cash crop farming becomes blurred. The imposition of poll-tax by the Government, farmers' need of cash for children's school fees and the meeting of some of the socio-economic obligations have accelerated the involvement of farmers into a market economy. This is particularly true with the incorporation of coffee into the current agricultural conditions (see Chapter 11). Alternatively, temporary migratory labour and the involvement of some farmers in off-farm occupations (Chapter 4) become a substitute mode through which socio-economic obligations are met. The utilisation of various marketing channels by farmers and the role of local traders is a response to the growing complexity of the rural market economy.

Markets also play a very significant role in the social life of the farmers in the study area. On many occasions marketing day is a time when friends and relatives meet and socialise among themselves. Thus, most farmers attend markets infrequently to purchase goods for household

consumption (consumers). They may also engage in some selling activity of agricultural produce. Scott (1972), however, observed that women, in particular, visited the markets for social reasons. This was also observable in the study area where women attend markets to gossip and consume large quantities of beer mainly sold during marketing days. Markets are also places where young men go to court young girls as potential wives. Exchange of farm information and discussion of local agricultural problems among farmers also take place in the market places.

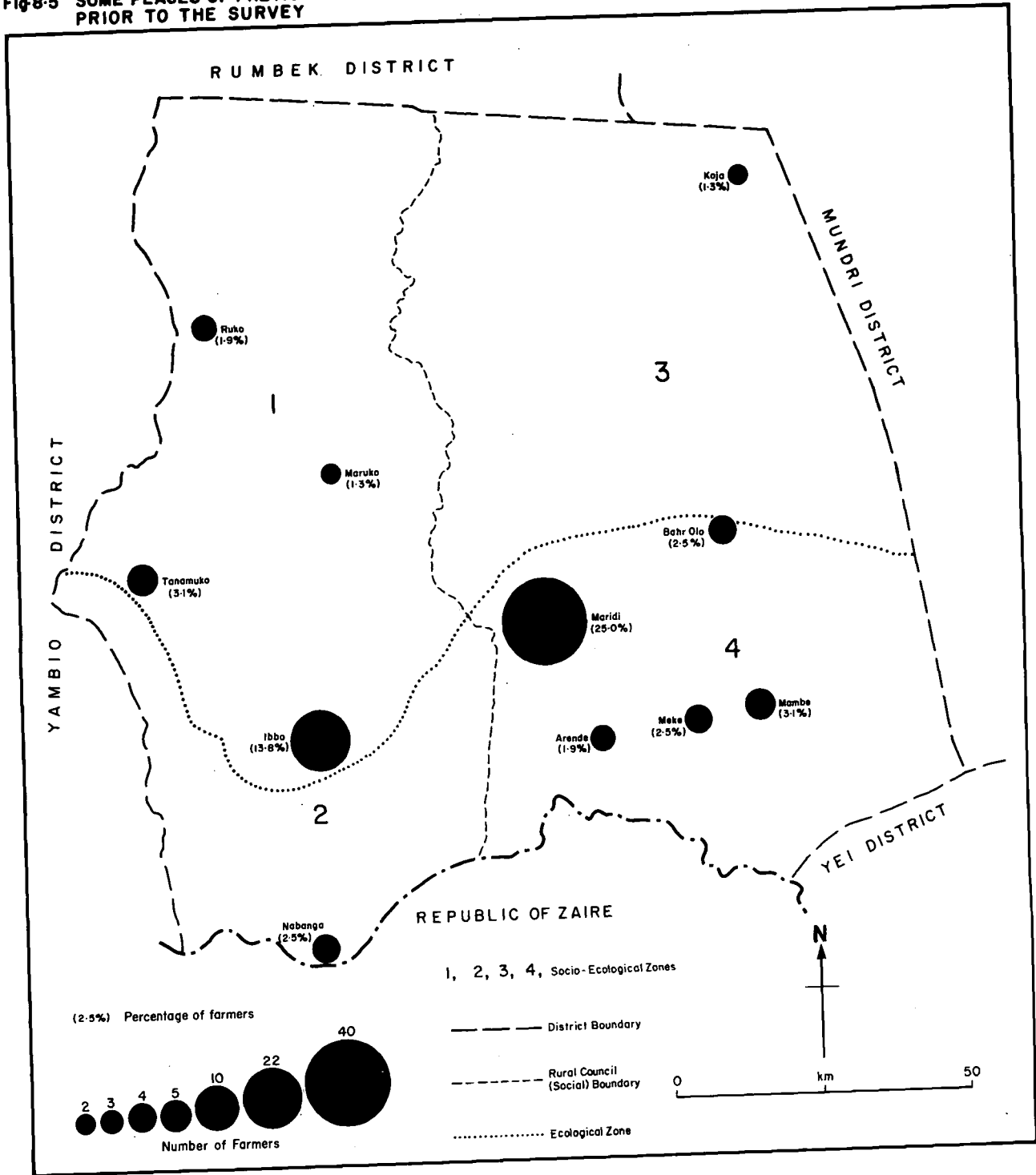
To conclude this section, there is a wide scope to improve local market opportunities in the study area. Secondary schools, prisons, hospitals and dispensaries which are mainly supplied their foodstuffs by the Jellaba traders and contractors (but often face delivery and shortage problems because of transport constraint especially in the rainy seasons), could be potential markets since most of their supplies come from outside the study area. Contracts could also be arranged with the relatively more 'progressive' farmers who live in the vicinity of these centres. To avoid serious marketing bottlenecks in the study area, emphasis on increased food production needs to be gradual and geographically dispersed and commensurate with the simultaneous development of rural markets. The existing ways of marketing could also be improved. It is recommended here that the setting up of small rural stores in areas of food surpluses or the improvement of storage using improved village technology, the improvement of farmers' knowledge of the process of price formation, of the standard of weights and measures and through a market information (intelligence) programmes to enable farmers to become aware of prices prevailing in other markets - all could possibly lead to a gradual elimination of some of the marketing problems facing farmers in the study area. The task of organising an efficient marketing system is admittedly formidable through the improvement of transport, communication and the spatial organisation of other market-related infrastructural services.

and their perceptions, images and attitudes held of some destinations within and without the study area. These movements are generally periodic and seasonal and important to the satisfaction of social and economic requirements of the society. For many, the mobility of a population is a symptom of its dynamism, its persistent process of change (Clarke,1984).

The questionnaire survey investigated farmers' previous residence (Q.64,a) as well as their visits to towns, villages/hamlets (Q.66) within and without the study area that had been made the previous year prior to the survey period. They were also requested to indicate other towns, villages and other settlements that they had made trips to during the previous month (Q.67). In each case, farmers were asked to provide reasons and the frequency of their visits made to various places.

From the sample, 89.5% (143 farmers) of the farmers acknowledged having lived or made visits to various towns and villages during the previous year prior to the survey period within and without the study area. In regard to those farmers who had lived in other towns, villages/hamlets, 58.8% (94 farmers) of the farmers had lived in Maridi and Ibba headquarters, Nabanga, Arende etc. as shown in Fig.8.5. Most of these places are either Agricultural Department and PDU demonstration sites or are centres where there are infrastructural services, or settlements where relatives, friends and in-laws live. 5% (8 farmers) of the farmers had also made visits to some of the familiar or known centres in the neighbouring East African countries (especially Zaire, Central African Republic and Uganda). It is worth noting that during the Civil War, most farmers in the study area migrated involuntarily into the neighbouring countries, acquired more experience of coffee plantation while working in the estates; made mutual relationships and understanding with the neighbours and were generally exposed to different lifestyles at first hand. In fact two farmers in Zone 2 and six in Zone 4 acknowledged having set their own coffee plots as a result of their experience gained

Fig-8-5 SOME PLACES OF PREVIOUS RESIDENCE OF SAMPLE FARMERS DURING THE YEAR PRIOR TO THE SURVEY



Source: Fieldwork Data

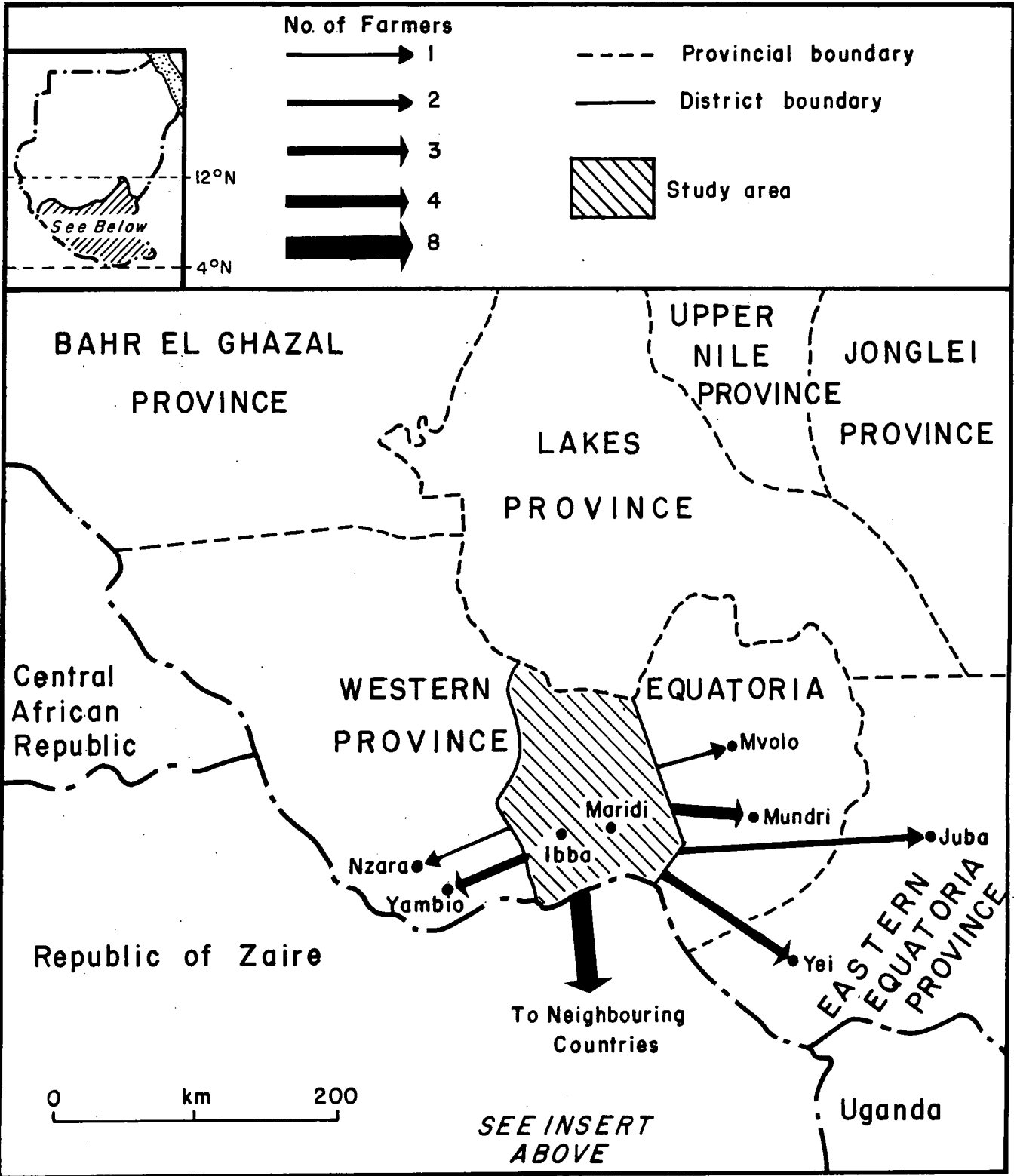
while living and helping friends and neighbours in these foreign countries.

Of the farmers who had made several trips to places outside the study area but within the Sudan, 8.8% (14 farmers) had done so as depicted in Fig.8.6. Thus, farmers who had made such trips are aware of the socio-economic environments in centres such as Yei, Yambio, Juba, Mundri, Mvolo and Nzara. It is likely that where farmers had made no trips to places outside Equatoria Region it was due to their lack of motivation or reasons as well as the problem of accessibility and which usually requires a truck on hire and money. While trips to neighbouring countries particularly across the borders could either be made on bicycles or walking particularly when conducting illegal trade and smuggling.

On the other hand, 16.9% (27 farmers) of the respondents had several visits to various towns, villages/hamlets during the previous month prior to the survey in the study area. Farmers' responses are shown in Fig.8.7. Thus, while farmers are aware of their surrounding settlements because of their easy accessibility bearing in mind that walking is the main mode of travel, they are also aware and therefore had made several trips to the administrative headquarters at Maridi and Ibba as well as Bahr Olo, Bahr Na'am, Nabanga etc. In general, most farmers in the study area had made trips to several places during the previous year to an average of three times, while the average was only once for those who had visited various places during the previous month.

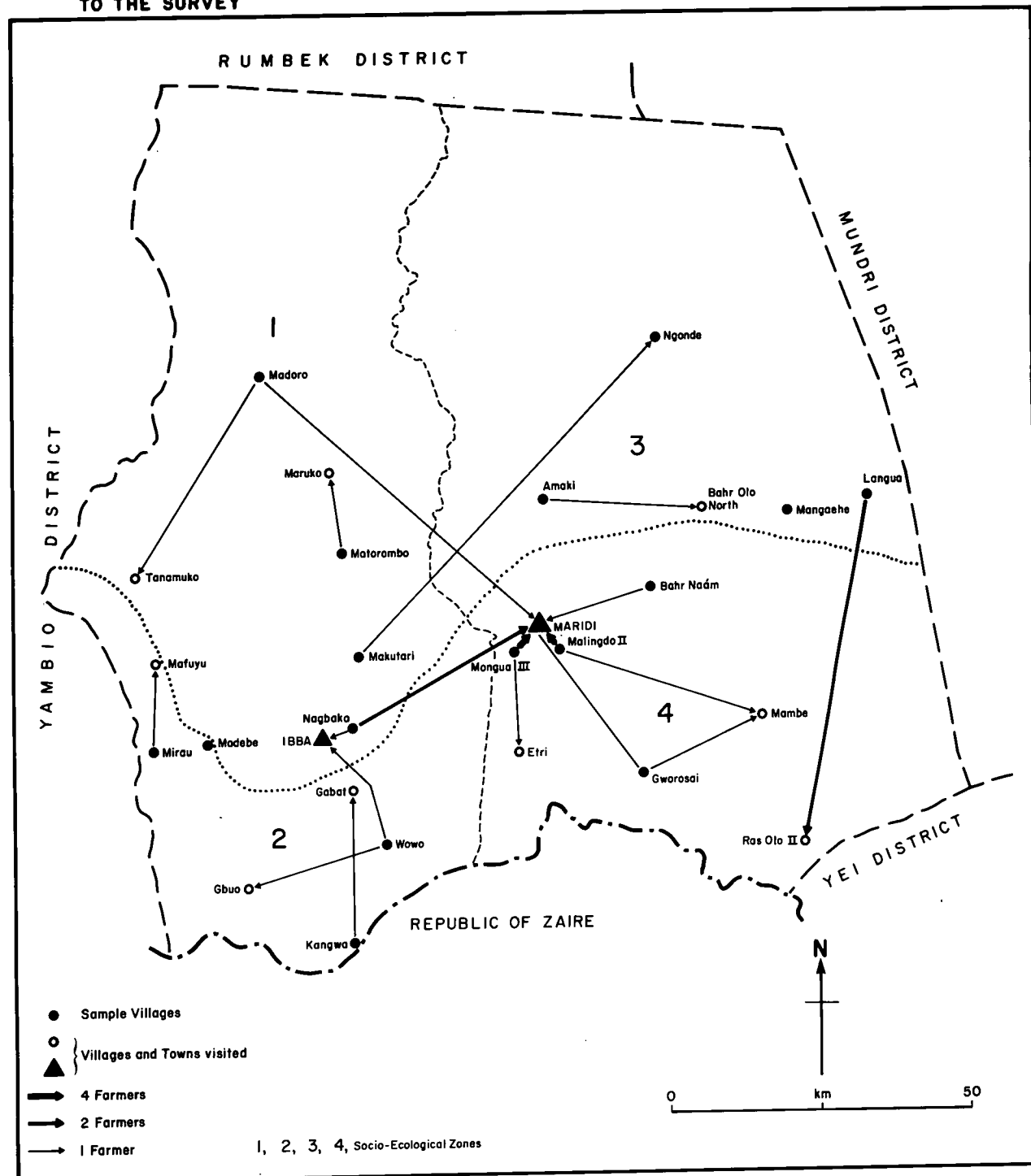
Farmers' reasons or motivations for the various trips made to various places are summarised in Table 8.18. The general picture emerging from this table indicates that visiting children, relations and friends (55.6%), marketing of agricultural produce and purchase of commodities (particularly the manufactured consumer items) unavailable in the villages (51.3%), fulfilment of religious obligations and church activities

Fig-8-6 SOME PLACES OUTSIDE THE STUDY AREA VISITED BY SAMPLE FARMERS DURING THE YEAR PRIOR TO THE SURVEY



Source : Fieldwork Data

Fig 8-7 SETTLEMENTS IN THE STUDY AREA VISITED BY FARMERS DURING THE MONTH PRIOR TO THE SURVEY



Source: Fieldwork Data

Table 8.18 : Number and percentage of farmers' reasons for making various trips to towns, villages/hamlets at any time within and without the study area

Sample area		Zone 1 (N=32)		Zone 2 (N=32)		Zone 3 (N=48)		Zone 4 (N=48)		District (N=160)	
Reason		No.	%	No.	%	No.	%	No.	%	No.	%
To visit children and/or relations and friends		10	31.3	19	59.4	29	60.4	31	64.6	89	55.6
In search of temporary non-agricultural work		11	34.4	10	31.3	17	35.4	19	39.6	57	35.6
To sell farm produce and buy commodities unavailable in the village		17	53.1	18	56.3	20	41.7	27	56.3	82	51.3
To attend funeral and marriage arrangements/ceremonies		4	12.5	8	25.0	11	22.9	18	37.5	41	25.6
For medical treatment		13	40.6	16	50.0	16	33.3	26	54.2	71	44.4
For a religious meeting/church activities/Xmas celebration		17	53.1	12	37.5	25	52.1	19	39.6	73	45.6
To attend a court case/legal reasons		5	15.6	9	28.1	12	25.0	14	29.2	40	25.0
To seek for agricultural advice		14	43.8	11	34.4	13	27.1	15	31.3	53	33.1
Others		5	15.6	11	34.4	13	27.1	24	50.0	53	33.1
Average responses per farmer/per zone		3.00		3.56		3.25		4.02		3.50	

Source: Questionnaire Analysis based on Questions 64,a - 65; 66-67

160 Farmers interviewed in Maridi District

Each farmer was able to give more than one answer as such percentages are more than 100

143 farmers have made various visits to towns, villages/hamlets at any time within and without the study area

N.B. Others' category includes : people to borrow money from, Agricultural Show, social life enjoyable and many fantastic things (sight seeing) to utilise many recreational facilities. Self advancement to learn more things such as carpentry, building construction, bricklaying and bicycle repairing.

17 farmers did not make any trip at any time in the study area.

(45.6%) and visits made due to medical reasons (44.4%) in that order appear to be the most significant reasons advanced by farmers. Reasons for such contacts are important to fulfil the social and economic needs and the efficient day-to-day functioning of society. On the other hand, reasons such as attendance of court cases (25%) and funeral and marriage ceremonies (25.6%) are the least significant concerns of farmers. The low proportions of farmers' considerations of these social obligations probably reflect their infrequent occurrence and most of them can be fulfilled at the village level.

The general picture that emerged from the analysis of farmers' reasons for the various trips made to places, relates to the kind of problem-solving behaviour in the face of changing agricultural circumstances. Additionally, most farmers have seen the 'affluence' and 'allure' of the outside environment which is reinforced by the exchange of letters between them and their friends and relations in the centres. This is coupled with stories of urban lifestyles told by the migrants thus constituting a major source of information.

Informal discussions with farmers revealed that most of the adults who appear to be from the age-group of 20-29 years were involved in spontaneous seasonal and temporary movement to the urban centres in search of non-farm employment fortunes particularly in the dry season, when most villages would appear almost empty of adult males indicating the relative shortage of labour input at critical times of the farm calendar. It was mentioned earlier in this discussion and elsewhere in the thesis that there is a widespread seasonal contact with the outside world particularly with the neighbouring East African countries. Many farmers, especially in Zones 2 (Ibba RC) and 4 (Maridi RC) are involved in smuggling of goods and contact with cultures of the peoples of neighbouring countries is also maintained by means of the rural periodic

markets and trade mainly organised at night times or under the shade of trees at the frontiers.

Farmers' various visits to the outside environment therefore enable them to re-assess their own lifestyles in relation to the other cultures and values. In short, contacts made through travel are an important means of exposing farmers to the changes taking place in other parts of the country and consequently shape their image and perceptions of themselves, their environment, desires and aspirations.

8.7.1 Farmers' knowledge and perception of their towns and villages in the study area

The previous section has examined farmers' mobility patterns and some of their reasons had been noted. To develop this aspect further, the survey investigated farmers' knowledge of the towns and villages in the study area. They were requested to list (in order of importance) five main towns and five main villages (Q.68-Q.69). Additionally, they were informally asked to indicate these towns and villages which were important. Farmers' responses could be readily grouped together as percentages representing image attributes because they were mentioned by many of them. Their replies are therefore depicted in Fig.8.8 as proportional symbols indicating the importance of various towns and villages mentioned by farmers in the study area.

For towns it is clearly evident that Maridi and Ibba headquarters generally stand out as the most commonly known centres which have been visited by most farmers. Also centres such as Nabanga (Zone 2 : Ibba RC), Ras Olo I (Zone 4 : Maridi RC) etc. were generally mentioned as important by a larger proportion of farmers. These towns are either known because of their administrative functions or are centres of infrastructural facilities such as marketing, health and schools, or these are extension staff stations where they have been posted to them, and hence farmers are

RUMBEEK DISTRICT

YAMBIO DISTRICT

MUNDRI DISTRICT

YEI DISTRICT

REPUBLIC OF ZAIRE

1, 2, 3, 4, Socio-Ecological Zones

TOWNS

VILLAGES

Legend:

- District Boundary
- - - Rural Council (Social) Boundary
- Ecological Zone

Percentage of farmers who list the settlements as one of the most important in the study area

The classification of towns and villages by the District Administrators was employed in this study

less than 10%
10-20%
21-30%
31-40%
41-50%
51-60%
61-70%
71-80%
81-90%
91-100%

Source: Fieldwork Data

aware of their social and economic functions when visiting them or even have heard of their importance as border periodic markets and smuggling centres (e.g. Nabanga, Ras Olo I). In fact, it is interesting to note that of those farmers who have not had any visit to any of the towns were able to list them.

For villages, farmers' general comments on their importance were mainly centred on : chiefs' administrative centres; villages where, in the past, their parents and relations or friends lived; places of birth; they may also be rural periodic markets; centres of socialisation and where tribal dances are organised; or these are villages where in-laws live and where farmers' wives have been born and raised. About 20% of the farmers listed some villages as important when they were in hunting expeditions and when they were looking for 'good' agricultural lands with water supply.

Generally, in the study area, certain settlements in effect stand out as central places of attraction : The chapel or church, rural periodic markets, chiefs' administrative villages, health and medical centres or schools. This confirms farmers' reasons shown in Table 8.18 for visiting particular places. A chief's administrative village is generally marked by relatively many large trees both natural and fruit trees; his homestead is usually also distinguished by relatively large number of its buildings including the grain stores and a considerable number of wives, children and adult males helping in farm. In fact, larger villages and other centres are commonly being of the type named after the chief (e.g. Ruko : Zone 1, Mambe : Zone 4 etc). Thus, the chief's village is by far the most significant place in the farmer's mental landscape map in the study area.

Summary

The foregoing chapter has outlined the socio-economic variables of the farmer and his farm in the study area. These variables play a significant role in influencing the nature, pattern and level of farm management strategies. It has been shown that farmers generally set up their own independent households with full responsibility after reaching adulthood and getting married. Sex roles and hard work are taught from childhood to instil a sense of obligation and responsibility. The majority of the farmers in the study area (36.9%) fall in the age-group of 30-39 years. Those from the age of 50 years and above, if they have not died earlier, often look older due to poverty and hard manual work when their physical capacity has relatively declined, and they may only have 'kitchen gardens'. They are economically supported by active younger sons.

Family size is relatively larger in Zones 3 and 4 (Maridi RC) particularly among households with one or more wives, and there are also more polygamous families in the above zones than in Zones 1 and 2 (Ibba RC). The interviews showed that a relatively larger family labour was the most important factor influencing the decisions to increase farm size because of the extra need for food and an increase in the labour input for farming. Farms are comparatively larger in Zones 3 and 4 (Maridi RC) because of the use of larger family units labour as compared to Zones 1 and 2 (Ibba RC). The labour inputs of both adult males, extended families and the number of children helping in farm leads to greater flexibility and the possibility of enlarging the farm size still further, thus benefiting from economies of scale. It was however suspected that cultural factors do affect farmers in the reporting of certain categories of labour particularly children. This is probably due to some supernatural beliefs, values, customs and attitudes.

Labour is the most limiting factor in production. Sexual division of labour in agricultural and domestic usage is relatively strong, although there is some indication that this is gradually decreasing due to the necessities of the moment that introduce some flexibility. With the evolvment of a cash economy, there is a trend of some individual farmers to using hired labour thus relatively decreasing the importance of labour of informal co-operatives and 'traditional' labour institutions in the study area.

The 'traditional' farming systems are virtually independent which consists of simple capital equipment mainly created by family labour; it is relatively small particularly the working capital that depends on 'traditional' sources of credit and friends or local traders. Most seeds are provided from the previous year's crop. The major constraints to farmers' working capital are centred on the high outgoings when fulfilling some of their socio-economic obligations and, therefore, farmers cannot acquire the exotic seed varieties and technology of the formal change agencies because of the distribution problems or unavailability at convenient periods. It has been suggested that improved inputs be available to farmers over a longer period - possibly through local traders, particularly the Jellaba.

Farmers' main priority is the growing of enough food crops for their families and therefore have evolved a 'fail-safe' production strategy involving intercropping and successive plantings amongst others. Given the adverse environmental circumstances in which farmers operate in the study area, this strategy empirically which has evolved over a considerable number of years and with a variety of crops, seems very appropriate.

The marketing system is not well-organised with a little information on crop prices but no standard units of weights and measures. The present system mainly serves a local need, and prices are unpredictable and

fluctuate throughout the year. The very limited trade is however exploited by the Jellaba traders because of the poor bargaining power of individual farmers. This is because transport is unreliable and expensive due to the inadequate number of passable roads throughout the rainy season.

Farmers' involvement in their periodic and seasonal movements and visits made to the outside environment exposed them to different socio-economic lifestyles particularly those of the urban centres or 'modern' world. These contacts with foreign cultures are likely to induce some changes and different outlook among farmers. Additionally, farmers' perceptions and knowledge of their places as well as the physical and cultural landscapes is a function of farmers' utilisation and inter-relationship between them and their environmental set-up.

CHAPTER NINE

EARLY FORMAL ATTEMPTS AT CHANGING 'TRADITIONAL' AGRICULTURE IN THE STUDY AREA

Introduction

The aim of this chapter is briefly to examine in an historical perspective the introduction of some of the cash crops at the regional levels so as to expose some of the early external forces that have, to some extent, influenced peasant farming in the study area. In the debate on colonialism and underdevelopment, it is generally conceded by most historians that the colonial administration brought most of tropical Africa into the world economy; and that "this process conferred at least some benefits on the African population" (Tosh, 1978:1). But economically in the Southern Sudan, the Anglo-Egyptian Condominium administration can be described as "at best a holding operation" (Tosh, 1978:1). This dismal record was the more striking in that the Northern Sudan was regarded as an economic success story, mainly on account of the much-praised Gezira Cotton Scheme as noted in Chapter 1. However, it was this juxtaposition which made general stagnation in the Southern Sudan not just a matter of interest to specialists in the pathology of colonialism, but a politically explosive issue as well. Even today, the imbalance between the economies of the North and South is one of the most serious constraints in the way of a permanent post-war reconciliation.

9.1 Some Sources Of Cash Income And Past Agricultural Development Experiences In The Study Area

The general economic condition of the Southern Sudan in 1898 afforded small grounds for optimism; the available evidence would, however, suggest that the indigenous economies of the Southern Region mostly approximated to small-scale, self-sufficient communities than to the exciting picture of regional trade and African entrepreneurship which has been built up in so many other parts of eastern Africa (Tosh, 1978).

In the agricultural areas, the efforts of Gessi and Emin, as mentioned in Chapter 2, to create an exchange economy based on cotton growing (c.1878-1883) had been very short-lived and of limited scope (Gray and Birmingham, 1970). The violent ivory trade which had flourished in the Southern Sudan until the 1880's was scarcely recognisable as commerce. In 1898, not only were Southern Sudanese largely unfamiliar with regional and long-distance trade (see Chapter 8, section 8.6.2), but they also had very little experience of producing for the market those planned agricultural surpluses which elsewhere in eastern Africa created such a strong predisposition in favour of production for cash during the colonial period (Tosh, 1978).

In the study area few indigenous local industries existed and trade was almost entirely in agricultural produce. Ivory was a sporadic source of wealth although it had recently diminished in significance. The chillie (red hot pepper) spread in from the west, reaching the study area in 1932; and while it had never been seriously planted, it provided a cash income for the minimum of effort in recent years when the market was favourable (Catford, 1953). Beeswax and honey were some of the exportable products which also were a source of income. Coffee and tobacco played little part. Other low-value agricultural produce was exchanged in limited quantities and mainly between the peasant farmers and a relatively small number of wage-earners and Government officials working in medical centres, schools and prisons. Little of the farm produce was ever exported because of the remoteness of the study area from the main market centres and sea ports (see Chapter 1). Human portage also provided limited source of cash income.

Following a serious famine in 1932 caused by a plague of locusts, other efforts had been directed more towards alleviation of famine. Consequently, the District Commissioner, Major Wyld, sought to introduce

cassava varieties as a famine crop throughout the study area (Bowili, Personal Communication). Lorry loads of the planting material of cassava were transported in from further west (probably from Yambio or Tembura where the Azande already grew the crop) and the Government officials took out sets wherever they went. However, there was no extension linked to this effort. The new crop was not popular and several people did not know how to use it. Although it was mainly planted under the influence of local chiefs, not much was eaten even if it later became widely accepted by most farmers (Bowili, Personal Communication); and cassava is now widely planted as a food and cash crop (see Chapter 5). A few groundnut and banana varieties also were introduced.

During the period 1936-1939, there was a disastrous fall in cash crop prices so that many new crops that had been considered for the study area were abandoned and the disastrously bad harvests of 1945-1947 (leading to near famine) further retarded agricultural development (Bowili, Personal Communication). Sorghum became an exceptional source of income, and during the war economy of the early 1940's, it was exploited and became exportable. But it was not felt to be of a long-term value and so was played down in favour of cotton (Catford, 1953). Originally, the poll-tax was tied to sorghum in the early 1920's at 20piastres (p.t.) or a hundred rotls of the crop for each adult male. In fact, a differential extraction rate of sorghum was imposed on the non-cotton growers who were required to sell, through authorised buyers, a relatively larger quantity of the crop than those who had planted a cotton plot of a satisfactory size and standard (Bowili, Personal Communication). However, there are no data available pertaining to the quantities of sorghum collected as tax in the study area. Every agricultural development policy at that time was mainly concerned with finding suitable cash crops so that the potential of food crop economy was played down and the non-agricultural sector was relatively very small.

9.2 The Introduction Of Cotton As A Cash Crop In The Study Area And The Policy Of Social Emergence

No attempt is made to provide an exhaustive account of the policy pursued by the colonial administrators in cotton growing as this has been fully documented elsewhere (e.g. Catford, 1953; Reining, 1966). The objective is to outline briefly, with a few illustrations from past production statistics, the interaction between cotton as an introduced cash crop and the local socio-economic and political environment of peasant farmers in the study area. Success in producing a cash crop is intimately dependent on the relationship between that crop and the established complex of food crops.

Cotton was first introduced to the study area in the 19th century by the Arabs who first introduced the idea of spinning and weaving of cloth (Catford, 1953), arts which barely persist today. The type was possibly a strain of the tree cotton (Gossypium arboreum) or G. barbadense as mentioned by Tothill (1948). Doubtless, the staple was poor but no authentic survival from that time has been traced.

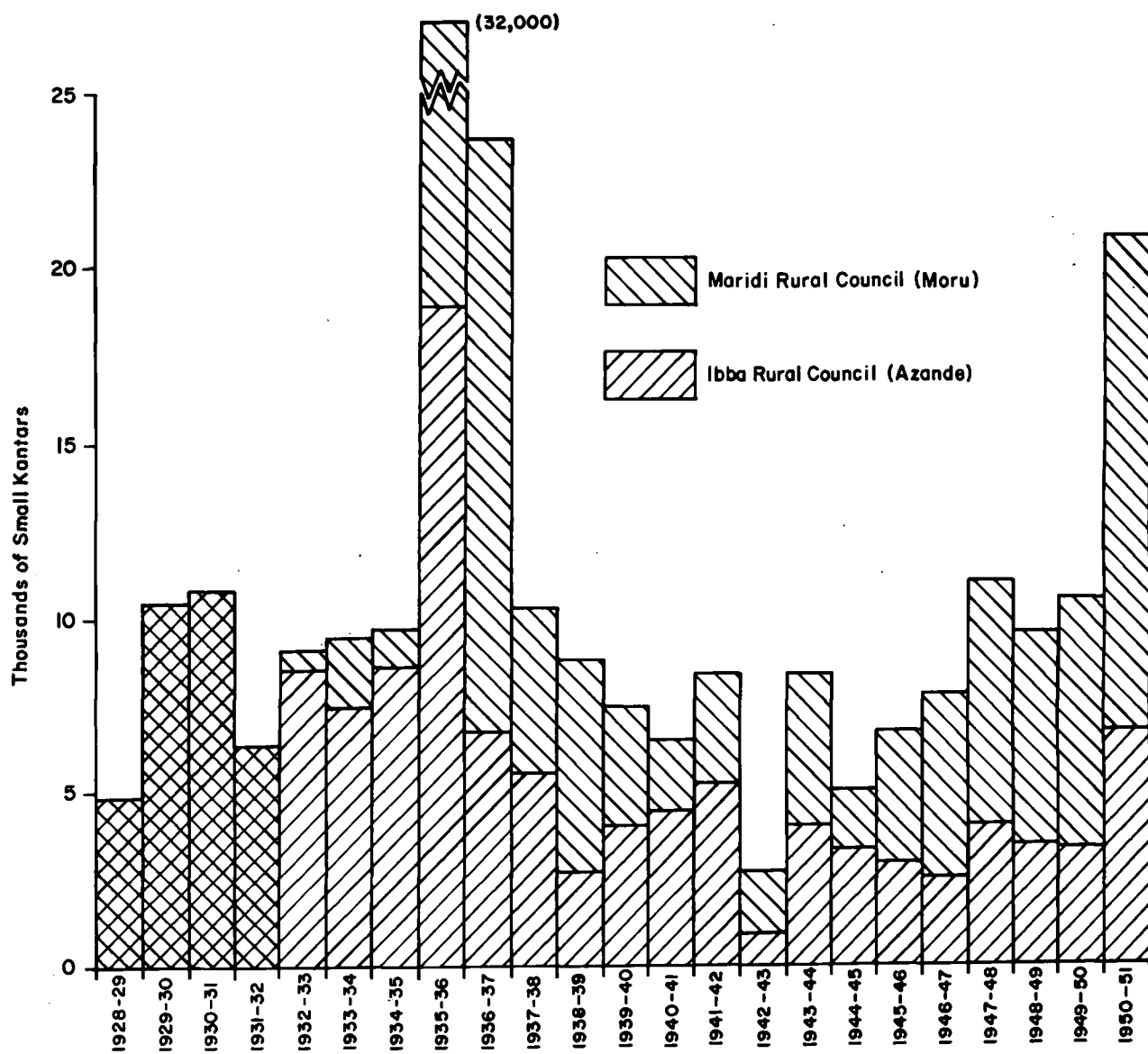
Cotton is one of the major cash crops in the Sudan as a whole, so it is not surprising that initial development policy in the Southern Region in general and the study area in particular was focused on this crop. The crop, a form of American Upland cotton (G. hirsutum), was re-introduced throughout the study area in 1926. From 1928, the colonial administrators saw the success of cotton-growing policy (particularly in Ibba RC: Zones 1 and 2) and, therefore, conducted extensive trials throughout the rest of Zandeland as far west as Tembura which proved to the administrators that the crop was suited to the local environment. Through the policy of social emergence which embodied philanthropic values, the colonial administrators essentially intended to help some isolated 'traditional' societies to integrate socially and economically into the main stream

of the nation. Thus, Tothill (1948) who was very enthusiastic about the policy and based on his earlier proposals of 1939 entitled it "An Experiment in the Social Emergence of Indigenous Races in Remote Regions." This policy, according to Tothill (1948) was specifically meant as the complete social emergence and the social and economic stability of the local people; the introduction of cash crops to enable the farmers to pay their taxes and to purchase those goods required for the participation in the benefits of civilisation, thus becoming literate, financially capable and taking an ever-increasing interest in the management of their own affairs.

In this regard, this policy was soon incorporated into the Zande Scheme which mainly affected Zones 1 and 2 (Ibba RC) while Zones 3 and 4 (Maridi RC) were not. A massive human resettlement scheme of the Azande (Zones 1 and 2) along built roads (in order to control sleeping sickness and facilitate administration and contact between Government agricultural staff and farmers) was carried out, and an end to shifting cultivation practice was planned. Cotton was first planted by farmers through communal labour participation; money incentives being paid to the local chiefs although after two years were withdrawn. Young men (atorobai:Zande) were trained in cotton growing. They were literate in the vernacular and able to keep plot records. To each chief was also posted a junior agriculturalist, literate in English and the vernacular and who co-ordinated the agricultural effort of the chief and collated records. However, in the study area, existing records consulted, as shown in Fig.9.1, mostly refer to the quantity of cotton which has passed through the ginning factory at Nzara in the far west outside the study area.

Tothill's idea was to overcome the crippling obstacle of transport costs by abandoning the emphasis on export crops and instead focusing attention on building up a 'self-sufficient' economy in Zandeland which is different from 'subsistence' economy. Thus, the Azande were to grow a

Fig 9-1 ANNUAL TOTALS OF SEED COTTON PURCHASED IN THE STUDY AREA, 1928 - 50



Source: Cafford J.R. (1953), Sudan Notes and Records, p. 160

number of crops to be processed within Zandeland; the most important, cotton, was to be used for the local manufacture of cheap cloth and the surplus cloth left over for export to other parts of the Sudan which would pay for the few indispensable imports; all other imports were to be cut off by administrative control (Tothill, 1948). In this matter, a textile plant, sugar and an oil mill, and a soap factory were established to form the economic framework of the experiment.

Although the physical qualities of the environment, soil and climate as well as the remoteness were important factors that helped the location of the Zande Scheme, the Scheme departed from Tothill's blueprint. The sealing off of inessential imports was abandoned as impractical; and the unlooked-for boom in world cotton prices (1947-54) led the Equatoria Projects Board to extend cotton acreage far beyond the modest requirement of the textile factory at Nzara. Thus, Tothill's ideas were never fully incorporated. An important point was that the Treasury objected to local self-sufficiency because it would cause a decline of taxes on import of cotton cloth. Furthermore, the forced introduction of cotton together with its strict rules of its growing as well as the ruthless administration exercised especially by the local chiefs outlined elsewhere (Reining, 1966), created a general distrust among the Azande with regard to the objectives of the policy. In fact, the cotton was considered by the Azande as entirely "Government crop" (ga irangbi sunge) rather than a profitable cash crop (McCall, 1950:15). This may reflect the Zande state of mind, who had little or no knowledge of the Scheme's aims or policies. The colonial administrators were acting through a paternal frame of mind; other cultural aspects of the farming management strategies, the exchange system and its values, religion and social organisation did not matter as far as the goals of the Zande Scheme were more important to them.

The policy of direct compulsion in growing cotton was, to some extent, relaxed among the Moru and non-Moru tribal groups in Maridi RC (Zones 3 and 4). Additionally, after 1938, communal practices of growing cotton were abandoned, thus making it more in line with local thinking. However, as compared to the Azande, cotton did not take on among the Moru and non-Moru in Zones 3 and 4. Recent efforts to encourage cotton growing through the schools in Zones 3 and 4 (Maridi RC) were no more popular (Bowili, Personal Communication). The reasons for the differential pursuance of the cotton-growing policy in Ibba RC (Zones 1 and 2) and Maridi RC (Zones 3 and 4) will be noted in the latter discussion of this chapter. From 1938 to 1950 the Moru and non-Moru (Zones 3 and 4) had an area under cotton exceeding 1,000 feddans in seven of the thirteen seasons (the largest being 1,500), while the Zande area (Zones 1 and 2) had exceeded 1,000 feddans in ten and exceeded 2,000 in five (the largest area sown being 3,400 feddans). And, in the same period, the latter region produced a total of 64,700 small kantars of the crop, which was nearly 50% more than the former's production (Catford, 1953).

De Schlippe (1956:250) calculated the annual income per farmer for the whole of the Scheme area at £1.571 (Egyptian pounds) - about \$6 U.S.); of which roughly "one third was spent on tax payment" (Reining, 1966:47).

9.2.1 Cotton marketing

With the introduction of cotton as a cash crop in the study area, there was a need to provide some adequate marketing facilities. When the cotton project was launched in the period 1928-1929, only a single standing market existed in Maridi town. Consequently, because of its inaccessibility to most growers of the crop in remote rural areas, very little was marketed. Because of the need for cash farmers had no option

but had to pack the crop into light baskets and headloaded them to Maridi town. According to Catford (1953) when the cotton price rose in 1932 a chain of rural markets was developed and operated on a periodical basis by the agricultural staff. As can be observed in Table 9.1 such periodic cotton market centres rose from eight to twenty-eight in the period 1932-1950. In 1936, local traders were permitted to purchase cotton at the outside rural periodic cotton markets and to resell it at the textile factory at Nzara. However, most farmers growing the crop were suspicious of the traders' exploitative intentions that most of the cotton was sold to the agricultural staff.

Some more recent data for the acreages and production of cotton for the seasons 1968/69-1975/76 are shown in Table 9.2. The product of this table indicates that the average area as well as the yields of cotton statistics tend to be higher in Zones 3 and 4 (Maridi RC) as compared to Zones 1 and 2, probably due to the relatively higher population.

On the other hand, Table 9.3 shows the comparative exchange prices of cotton and sorghum in relation to poll-tax levied, taking the 1928 price as 100 piastres (p.t.) in the study area. There was a comparative advantage for farmers to grow more sorghum than cotton.

9.2.2 Some remarks on the incorporation of cotton within the 'traditional' farming systems

Zande agricultural practices, as found in Ibba RC (Zones 1 and 2), lent themselves fairly easily to the inclusion of cotton (Catford, 1953). Thus, the Azande were more receptive to cotton growing because of the relative concentration of population following the anti-tse-tse fly campaign and the control measures undertaken as well as the persistence of a comparatively strong authoritarian tribal leadership

Table 9.1 : The numerical data of cotton production in the study area, 1928/29 - 1950/51

Season	Cotton Variety Grown	Price per small kantar (milliemes)		Number of outside markets		Estimated area (feddans)		Seed cotton purchased (small kantars)		Yield per feddan (small kantars)				
		Grade 1	Grade 2	Grade 3	Moru	Zande	Total	Moru	Zande	Total	Moru	Zande	Total	
28-29	P.S.S.	300	300	300			4,500			4,800			110	
29-30	"	400	400	400			2,000			10,400			510	
30-31	"	400	400	400	1		2,200			10,800			490	
31-32	"	150	150	150	-		2,700			6,500			240	
32-33	"	200	200	200	5	3	2,500	500	8,200	500	330	100	290	
33-34	"	200	200	200	5	4	2,500	1,000	7,000	1,800	280	180	250	
34-35	"	250	250	250	6	4	2,400	600	8,300	1,000	350	170	310	
35-36	"				6	6	3,000	3,500	18,600	14,200	620	400	500	
36-37	"				6	6	2,750	3,250	7,100	15,900	260	490	380	
37-38	"				6	6	2,000	3,000	5,500	4,700	270	160	210	
38-39	" *				4	6	700	2,500	2,600	5,500	370	220	250	
39-40	511 D *	280	-	250	4	6	1,100	1,000	4,100	2,700	370	270	320	
40-41	"	280	-	250	4	6	1,200	1,000	4,300	1,700	360	170	270	
41-42	"	320	-	250	7	6	1,100	1,100	5,100	2,500	460	230	350	
42-43	"	320	-	250			700	800	900	1,600	130	200	170	
43-44	"	320	250	180			900	900	4,100	3,500	460	390	420	
44-45	"	375	275	200			500	500	1,600	1,700	320	340	330	
45-46	"	450	350	250			1,000	1,000	3,100	3,100	310	310	310	
46-47	"	500	400	250			500	1,500	1,800	5,100	360	340	350	
47-48	SP 84	700	550	350	12	12	1,200	2,300	3,600	7,400	300	320	310	
48-49	"	800	600	400	11	12	800	2,500	2,600	7,100	330	280	290	
49-50	"	1,000	700	500	12	11	1,000	2,700	2,400	7,900	240	290	280	
50-51	"	1,300	1,000	500	14	14	1,500	3,400	6,500	14,900	430	440	440	
* including a small area of variety 511 C.										Mean		360	310	330

Source: Catford (1953). The introduction of cotton as a cash-crop in the Maridi Area of Equatoria, SNR and Dept. of Agriculture Records, Maridi.

Table 9.2 : Summary of cotton area (in feddans) and yields in the study area, 1968/69 - 1975/76

Rural council and zone	Season	Total area (in feddans)		Total yields (in small kantars)	Average yield (in small kantars feddan)
Ibba 1 and 2	1968/69	267	9.0	914	3.42
	1969/70	385	12.9	1086	2.82
	1970/71	439	14.8	1090	2.48
	1971/72	441	14.8	1084	2.46
	1972/73	355	11.9	1007	2.84
	1973/74	284	9.5	953	3.36
	1974/75	402	13.5	1025	2.55
	1975/76	404	13.6	1029	2.55
Average		372.13		1023.50	2.81
Maridi 3 and 4	1968/69	655	12.7	2452	3.74
	1969/70	675	13.2	2035	3.01
	1970/71	731	14.2	3591	4.91
	1971/72	685	13.3	2100	3.07
	1972/73	556	10.8	1668	3.00
	1973/74	671	13.0	1879	2.80
	1974/75	641	12.4	1708	2.66
	1975/76	538	10.4	1242	2.31
Average		644.00		2084.38	3.19
District	1968/69	922	11.3	3366	7.16
	1969/70	1060	13.1	3121	5.83
	1970/71	1170	14.4	4681	7.39
	1971/72	1126	13.9	3184	5.53
	1972/73	911	11.2	2675	5.84
	1973/74	955	11.7	2832	6.16
	1974/75	1043	12.8	2733	5.21
	1975/76	942	11.6	2271	4.86
Average		1016.13		3107.88	6.00

Source: Data modified and adopted from Equatoria Province Agricultural Production Corporation (EPAPC), Files, Maridi 1977/78
Zones 1 and 2 (Ibba RC) and Zones 3 and 4 (Maridi RC).

Table 9.3 : Comparative exchange prices of cotton and sorghum (dura) in the study area, 1928-50

Year	Cotton price	Sorghum price	Differential in Prices
1928	100	100	-
1929	135	-	-
1931	25	75	50
1940	22	-	-
1944	17	-	-
1948	28	114	86
1949	34	123	89
1950	44	113	69

Source: Catford (1953) The introduction of cotton as a cash crop in the Maridi area of Equatoria, Sudan Notes and Records, Volume 34, Part 2, December 1953, pp.158-163.

structure. On the other hand, among the Moru (Zones 3 and 4), the persistence of individualistic farming attitudes, the organisation and practice of land use system known as katiri (see Chapter 5) and the loosely knit organisation of the Moru into small clans made them less easily coerced into the cotton-growing policy as pursued among the Azande. But the Moru voluntarily continued to grow cotton at their own discretion.

We may make a few remarks on cotton growing and its incorporation into the farming practices in the study area. Firstly, the colonial administration did not take into consideration the working of the tribal structure of the Moru where local power lay among the rain-makers, elders and men of repute. Instead, they appointed chiefs who were regarded by the local people as having no magical power of any kind or 'traditional' right to power. In fact, the Moru looked upon chiefs (who were mainly an administration of the Government) as agents of external authority to be deceived and placated as necessary (Baxter and Butt, 1953). Thus, the creation of the local chiefs among the Moru did not assist the cotton-growing policy with its strict rules. Secondly, no effort was made to resettle the Moru during the tse-tse fly eradication campaign (as it happened among the Azande) which was mainly carried out along main roads as a strategy to supervise easily cotton growing. Thirdly, the Moru unlike the Azande in the 1950's, were often less interested in cash crops such as cotton having few shops and price fluctuations were discouraging. According to Bowili (Personal Communication), the Moru and other tribal groupings in Maridi RC (Zones 3 and 4) pressed for upland rice and coffee but did not succeed as suitable varieties were not available and for the latter the dry season was too severe. The Moru are generally coffee-drinkers and were so very keen to grow the crop that less effort has been made by the local agricultural

extension staff; fruit trees were distributed by the Agricultural Department to all schools, but these innovations seemed to have flourished among the Moru as compared to the conservative attitude of the Azande. Additionally, according to Catford (1953) the colonial administration from the mid 1930's, so far from promoting food production among the Moru, instead imposed price controls on sorghum which had since then been widely grown in the study area. Sorghum, among other food crops was (and still is) to some extent largely produced in Maridi RC which also enjoyed internal local markets and no production problems or crippling transport costs as did cotton.

More crippling than any of these handicaps was the unattractive price offered to the cotton growers (see Table 9.3) owing primarily to the high transport costs. Far from considering what price was needed to attract the growers, the administrators were concerned that too high a price would lead to corruption by "the various luxuries civilisation brings" (Struve, 1925:44-45). In fact, the colonial policies pursued in the introduction of cotton as a cash crop was discouraging to local food production in the study area as has been demonstrated elsewhere (Vail, 1972; Hay, 1972). For example, one of the sharpest conflicts between agricultural staff and peasant farmers in East Africa was centred on the issue of whether cotton or grain should be sown during the first rains when prospects for a good yield were best (Vail, 1972). Thus, a farmer prefers a cash crop which could easily be held back for self-sufficiency if the harvest proved bad and cotton lacks this flexibility. Moreover, it also competes directly with food crops for the scarce labour resources particularly in the busiest months of the farm calendar, when it entails carefully-timed planting, sowing of seeds at regular intervals, periodic thinning, constant weeding and rapid and careful harvesting to avoid spoilage. These labour-demanding cotton operations determine the success or failure of cash cropping.

Among the Azande, although the cotton growing cultural operations were more incorporated into the farming systems and which exposed or accelerated farmers to cash economy enabling them to pay the poll-tax and were able to acquire essential imported consumer goods, the strict cotton-growing regulations imposed on them, the misuse of the administrative powers exercised especially by the 'traditional' chiefs, the fluctuation of cotton prices, the farmers' lack of clear comprehension of the objectives of the cotton project and in particular the 'policy of social emergence', the failure of the colonial administration to understand the rationale of farmers' management strategies of their land potentials and labour needs for both cash and food crops among others, led to the decline of the Zande Scheme especially from 1954 when civil disturbance started to erupt. Apart from the policy of social emergence, there is no mention in the existing literature what the colonial administrators wanted the Azande and other tribes to be.

Informal discussions with farmers, as noted in Chapter 5, showed that cotton is becoming of less significance as a cash crop, while crops such as coffee, sorghum, groundnuts, cassava etc. are becoming important. Table 9.4 shows some cotton statistics for the study area for the seasons 1976/77-1981/82 from which it is clear that there is a decrease in the average yield of cotton per feddan. Also prices for the three cotton grades fluctuated considerably; the average income per farmer was relatively lower. Most farmers growing the crop reported that the product was rarely or never collected, and that seeds are not regularly distributed by the EPAPC. Conversely, the EPAPC staff stated that since the Civil War there has been little sustained demand from most farmers to grow cotton, seed has been issued but a large proportion has not been sown; cotton that was sown was badly planted; and that the existing BARSP 84 variety of cotton often gave poor yields. However, two new varieties (BAR 11/5 and BAR 7/8) have been experimented and have given consistently better yields. Thus, plans are underway to distribute the crop widely.

Table 9.4 : Cotton production and total return per farmer in 1976/77-1981/82

Season Area, production and income	1976/77	1977/78	1978/79	1979/80	1980/81	1981/82
Area (Feddans)	8,850	12,650	17,524	22,649	9,585	22,697
Yields (kantars, 100 rotls)	40,000	47,580	63,724	79,117	35,264	41,276
Average yield per feddan	4.5	3.8	3.7	3.5	3.5	1.8
Percentage Grades 1, 2, 3	58/26/16	62/18/20	67/12/21	59/17/24	64/17/19	29/28/43
Price (P.T.per kantar) Grades 1,2,3	70/55/35	100/70/50	130/100/50	130/100/50	80/60/40	100/70/50
Average payment at markets per farmer	-	-	2.127	2.020	-	0.915
Average total return per cultivator	-	-	2.127	2.020	-	0.915

Source: Equatoria Province Agricultural Production Corporation (EPAPC), File Number EP/1/7, 1982 Maridi.

Because of the annual variability of yields of cotton, cloth manufacture at Nzara textile mill has been badly affected. It has been reported that the factory in 1960 was producing about 40,000 yards of unbleached calico (grays) per week. In 1980, it produced 10,000 yards per week. The main reasons are related to insufficient cotton production and marketing and lack of spare parts for the rehabilitation of the factory machinery and ginning factory after the Civil War that lead to the low cotton production. In 1960, the factory was reported to be efficiently operating with a crop of 30,000 small kantars of seed cotton. However, recently less than half this quantity has been available (EPAPC, 1982).

This section has shown the problems involved in cotton growing. Coffee seems to be taking over as one of the most important cash crops (see Chapter 11). In fact, Reining (1962:541) in his study of 'Zande Markets and Commerce' succinctly emphasised "after several years of apparently successful cotton growing, the Azande in the early 1950's were still in no doubt that given the choice, they would ... rather have grown food crops for the markets." Thus, farmers' response to cotton as a cash crop has been grudging; while in the sphere where they could have achieved most, were frustrated by the lack of market.

9.3 Coffee Growing In An Historical Perspective In The Study Area

Wild coffee was indigenous in the Tropical Rain Forests (a few small patches within the High Rainfall Woodland Savanna) of the Southern Sudan and along the Sudan-Uganda and Sudan-Zaire (on the Nile-Zaire Water Divide) borders (Fauchere 1927; Meyers, 1938; Wellaman, 1961). Coffee cultivation in the Southern Sudan probably dates back to the beginning of the 19th century.

However, none of the above references had ever mentioned the local people's participation in coffee growing at the earliest period of

its introduction as a cash crop. Informal discussions with elders and men of repute (especially Michael Bowili) in the study area showed that it was only the chiefs and their followers who were permitted by the colonial administrators to grow a few coffee trees. Even in this, the area under the crop was restricted by law. The few people allowed to grow coffee did so under the supervision of the local chiefs who carried out the orders of the colonial administrators as they saw fit; that an individual was allowed to plant only one line of coffee trees and thus, the few participants were selected by the local chiefs. The development of coffee and its incorporation into the farming systems took place from 1972 (after the Civil War).

In the 1930's a few systematic attempts towards the growing of coffee, including the establishment of nurseries were made in the whole of Western Equatoria Province in general and in the study area in particular (Bowili, Personal Communication). By 1931, two main nurseries (one in Kwanga south of Maridi town and the other in Ibba town) and some smaller plantations had been started in several unidentified locations in the study area, but proposals for considerable expansion in the work were retarded by retrenchment (Kisanga, Personal Communication). During the period 1936-37, the possibilities of coffee development had again received a particular attention; by that time there were several plantations totalling more than 150 feddans under robusta and a few under arabica (Meyers, 1938). In 1938, the Governor of Equatoria Province estimated 800 feddans of coffee trees in bearing by 1941, and which might be increased by 400 feddans a year. In the 1940's more interest was being put on the development of coffee and in the period 1958-60, EPB (now EPAPC) initiated two commercial plantations of robusta coffee at Ngamunde with 250 feddans on the Yei-Maridi road and Ibba-Arua areas on the Yambio-Maridi road with 12 feddans (Table 9.5).

During the period 1958-60, coffee observation plots were established

Table 9.5 : Establishment of coffee plantations by the Equatoria Province Agricultural Production Corporation (EPAPC) in the study area, 1958, 1960 and 1964, 1976

Plantation and zone	Variety grown	Year started	Proposed area	Area in Feddans during the period	
				1964	1976
Ngamunde (Maridi RC) Zone 4	Robusta	1958	250	250	185 ⁽¹⁾
Ibba-Area (Ibba RC) Zone 1	Robusta	1960	25	12	12
Total			275	262	197
Mean feddan per year			137.50	131.00	98.50

Source: A Feasibility Study for Development of Coffee in East and West Equatoria Provinces Report, 1977.

(1) There has been some damage to coffee plantations due to outbreak of fire and failure to weed the crop

at Maridi headquarters to evaluate the performance of arabica and robusta coffees. Because of the Civil War no systematic records of these plots were kept, as some were inaccessible, while others were burnt. However, informal discussion with the Inspector of Agriculture in the study area showed that robusta coffee was relatively a good yielder with average yields for nearly three years of about 560 kilograms per feddan per year as contrasted with 213 kilograms of arabica coffee. The significance of coffee when compared with cotton was much emphasised by Ferguson (1954) who had predicted that the growing of tree-crops rather than annual crops would be the best form of land use and the planting of high value perennial crops (e.g. coffee, oil palms etc.) would capitalise the local people's farm lands as a much needed asset which cotton could not provide.

With the Independence of the Sudan (1956), more interest was concerted on the development of coffee as a cash crop and lessen cotton. Thus, coffee nurseries, pilot farms and plantations especially at Ngamunde (Maridi RC and Ibba-Arua areas (Ibba RC)) were established by the Agricultural Department. However, with the intensification of the Civil War in the 1960's the coffee development project was halted.

By 1972, peace was in sight and this permitted commercial plantation of the crop. The Agricultural Ministry, through the Extension Department at Maridi, initiated five new coffee plantations (see Table 9.6) located at Kwanga, Mongua III, Bahr Naam, Bahr Olo (Zone 4), and in Nagbaka (Zone 1). The objective of these coffee plantations, which are financed by the Central Government in Khartoum and through the Regional Ministry of Co-operatives and Rural Development, was to offer employment opportunities as a rehabilitation and resettlement programme of the refugees and returnees coming from the bush and neighbouring countries.

Table 9.6 : Coffee plantations newly established in the study area
by the Regional Ministry of Co-operatives and Rural
Development

Plantation scheme and zone	Year of Start of season	Target area in feddans	Area grown in feddans in 1976
Kuanga (Zone 4)	1970/71	200	132
Mongua III (Zone 4)	1971/72	100	40
Nagbaka (Zone 1)	1971/72	100	12
Bahr Olo (Zone 4)	1971/72	100	12
District	Total	600	208
Average feddan per year		120	41.6

Source: A Feasibility Study for Development of Coffee in East and West Equatoria Provinces Report, 1977. Zone 1 (Ibba RC), Zone 4 (Maridi RC).

The ultimate goal was that when coffee plants reached bearing stage, the plantations would be divided among the participants who would then form co-operative societies (see Chapter 4). This was a failure because of crippling management constraints. Some farmers were managing relatively large areas of coffee but because of limited labour available, most of the coffee plants were heavily infested with weeds and bushes.

Another approach undertaken by the Southern Sudan Regional Government to utilise coffee as a pivotal factor in the large-scale rehabilitation and resettlement project of the refugees was the establishment of the PDU in 1972 which is under the Agricultural Ministry. The aims and objectives of the PDU in regard to the improvement of smallholder farming in the study area are outlined in Chapter 10,A.

9.4 Other Colonial Policies

The early years of colonial administration also witnessed the imposition of taxes to raise revenue and hence stimulated participation of the tribal groupings in the market economy. Taxation became a general reason why the local people sold crops such as cotton or involved in wage-earning opportunities which were available in the Government projects such as roads and the construction of buildings as well as agricultural schemes. These off-farm employment opportunities also affected the 'traditional' way of life. Most of the existing periodic rural markets were in fact initially established by the colonial administration as cotton markets. Consequently, these market centres gradually began to influence agriculture since marketing and trade was not wholly on cotton production but also where surplus food crop production was sold. With the availability of European currencies there was an increase in market demand and money was (and still is) needed not only to meet some of the

social and economic obligations such as payment of school fees, taxes, medical services etc. but also to acquire mass manufactured and consumer items such as bicycles, radios, watches, salt, oil, clothing and various tinned foods etc. The market centres were also the main focal points where chapels were established by the missionaries. However, in the 1950's although the market centres were gaining popularity as centres of innovations and exchange of new ideas, it seemed that nearly half of the people living in remote rural areas had rarely traded or visited a Government market place (District Commissioner, Personal Communication).

In the 1930's the colonial administration provided three heavy pneumatic tyred wagons with high wire-mesh sides in an attempt to relieve the cotton producers of the arduous task of a long headloading carry (Catford, 1953). But these later proved difficult and unsuitable. Motorised vehicles (mainly those owned by the Government, missionaries and Jellaba traders or contractors) relatively increased accessibility to outside environment in the 1950's (Southern Development Investigation Team, 1954). Thus the rudimentary road network system was indirectly influencing 'traditional' farming systems. This helped the spread of 'modern' or Western items and urban influences.

9.5 The Role Of Missionaries In Education And Agricultural Change

In Chapter 4 it has been mentioned that the European missionaries (mainly the Verona Fathers and Church Mission Society) in the study area were much more active than the colonial administrators in providing educational facilities. Although the colonial administration made the most direct attempts to improve agriculture in the early 1920's to 1950's, missionaries were also indirect agents of change.

In the early 1920's, there were established two main mission stations of the Verona Fathers and Church Mission Society at Ibba and

Maridi headquarters respectively. These stations had several small ones elsewhere in the study area. In general, a small school or 'catechumenate' was opened immediately after the establishment of a mission station. A 'catechumenate' was the name given for meeting centres where people were taught prayers and the first rudiments in Christian religion in preparation for baptism (Vantini, 1982). Following the medical missionary work of Dr. Kenneth G. Frazer in 1921 particularly among the Moru, a dozen of the children were sent to mission schools to become medical men (Bowili, Personal Communication). And by 1922 there were some sixty boys on the role in Maridi headquarters and no less than twenty-five of them were the sons of chiefs. But there was also a spontaneous response that some twenty children who did not get places at Maridi headquarters were taught, at their own request, to read out of school.

In the mission stations some attempts were also made to implant to the pupils some forms of industrial instruction. It is reported that the Verona Fathers concentrated upon craft training especially in Ibba RC headquarters where a mission workshop was established (Kisanga, Personal Communication). Thus, education meant instruction in some useful technical trade or craft. On the medical work, it has been reported that missionaries were also providing voluntary services at several health centres in the study area, and about three Verona Fathers' Sisters were helping in Maridi Hospital in the 1940's (District Commissioner, Personal Communication). Thus, the 'traditional' mission complex revolving round the church, the hospital and the school provided imaginative and relevant programmes designed for rural people. The missions offered to the local people not only the mundane prospect of self-advancement through literacy, but the possibility of living in an ordered 'alternative society' with its own, perhaps effective, prophylactics against witchcraft and other 'traditional' beliefs, values and sorcery.

As far as the influences on agriculture are concerned, the Church Mission Society and the Verona Fathers missionaries had relatively little effect in the study area. The introduction of new farming techniques and practices as well as crop varieties was certainly not the main objective of missionary religious campaign and expansion in the early years. Thus, Sanderson and Sanderson (1981:40) emphasised that "... nor were the missionaries in the Sudan ever to enjoy the powers and opportunities, or to experience the temptations, which elsewhere in Africa were so often theirs; of becoming landlords, pioneers of cash-crop cultivation, and wealthy and influential rural capitalists." The missionaries were also strictly forbidden to engage in trade. However, besides the industrial instruction some agricultural innovations were indirectly diffused by them. In the 1920's, where mission stations were established, particularly in Maridi and Ibba RC headquarters, the missionaries (especially the Italians) had relatively extensive gardens of citrus fruit trees such as tangerine, oranges, lemons and lime, mangoes, and bananas as well as several vegetables (Kisanga, Personal Communication). Some of the fruit trees can still be seen standing in some of the mission stations particularly in Maridi headquarters. Since missionaries were the pioneers of the introduction of educational facilities in the study area, it is reported that school children (in order to keep them in contact with their own environment) had to cultivate some agricultural field crops around mission schools especially in Ibba, Maridi, Bahr Olo, Nabanga and Maruko (Bowili, Personal Communication). This was a strategy to reduce the financial burden and food supply on the mission schools. In fact, the informal interviewees such as Bowili, Kisanga and the District Commissioner acknowledged having gained some useful industrial/vocational and educational instruction from the missionaries. Thus, several European fruit trees and vegetables found their way onto the 'traditional' farming systems in the study area in the hands of some

mission workers and religious converts. Hence, the clusters of the mission stations may indirectly be regarded as centres of social and agricultural innovations and change.

Education was widely regarded as the key that unlocks the door to 'modernisation'. However, informal discussions with several knowledgeable elders and local leaders revealed that the kind of education inherited from the colonial administrators by post-colonial administrators is excessively literary, giving insufficient encouragement to the pupils to the development of technical skills and to an appreciation of the importance of agriculture. Together with this is an excessive emphasis on the passing of examinations, which leads to an over-valuation of the 'certificate' or 'credential' as against the acquisition of agricultural education and vocational or 'artisan' training.

In summary, agricultural change during the colonial period was limited in scope and area. Apart from the direct introduction of cotton and to some extent several of the crops by the colonial administrators as well as the indirect diffusion of fruit crops by the missionaries, other components of 'traditional' farming in regard to techniques and the organisation of farm and cropping strategy as well as labour division etc. remained more or less unaltered. However, other urban lifestyles and 'modern' aspects were touching the lives of the rural people in the study area. The introduction of motorised vehicles and the opening up of motorable roads facilitated the movement of people, goods and new ideas. The establishment of cotton markets also became some of the focal points for social and economic interaction; the 'traditional' exchange value systems were gradually being replaced by European coinage. Missionaries also introduced some educational and vocational training programmes relevant to the rural environment in the study area. In effect, they were concerned with the 'whole person' rather than only

providing separate services. Thus in the study area, agricultural change has been induced not only due to internal pressures but also to various external influences such as the opening up of markets and commercial activities determined by the socio-economic planning policies of the colonial and post-colonial administrators and aid agencies. It is characteristic of most Third World countries that recently planners and institutions have come to intervene (directly or indirectly) deeply in rural development particularly the improvement or 'modernisation' of 'traditional' farming systems and technology. These are, therefore, some of the issues to be further developed in the next chapter.

CHAPTER TEN

CURRENT AGENTS OF AGRICULTURAL CHANGE AND INNOVATION
IN THE STUDY AREA

SECTION A

Technical Assistance And Agricultural
Change And Innovation

General Introduction

This chapter divides into two sections. The present section outlines some attempts made by the formal agents and in particular the role of the Government and affiliated institutions and the Project Development Unit (PDU) on the improvement of small-holder farming in the study area. A number of specific examples of agricultural innovations in both food and cash crop sectors introduced by the change agents are examined in order to assess the rationality of the farmers' socio-economic decision-making procedures. Thus, the farmer and farm characteristics in regard to innovation adoption including his viewpoint towards it are assessed in this section.

In Section B, a special emphasis is focused on farmers' viewpoint, attitudes, images and perceptions towards their use of the extension services provided by the formal change agencies. A broad regional study of agricultural change and innovation of this kind requires generalisation from individual farmers' viewpoints, images and attitudes. Farmers' desires or aspirations, plans and resource and land use management strategies and trends in farming in the study area will be outlined.

It was mentioned in Chapter 1 that if the agricultural output of the Southern Sudan is to be increased successfully, then it must be the work of small-scale farmers, who constitute the most important segment

of the agricultural sector. This requires some assistance to be made to peasant farmers by the change agencies. Thus, the current policies of the Agricultural Ministry and Natural Resources in the Southern Region are directed towards planning and extension of advisory services and technical guidance to peasant farmers in general including the study area. Because of the existing level of farm technology, any induced change in the farming system is likely to lead to considerable risks unless it is the introduction of improved seed varieties that regularly provide relatively higher yields without either demanding additional inputs, being more susceptible to disease or being less palatable (ILO, 1976).

It has also been noted in Chapter 1 that the Government development policy concentrates on increasing food production. This is important not only to keep pace with the relatively rapid natural population increase as well as more refugees and returnees but also to lessen the dependence on imported food (particularly dura from Northern Sudan) for the urban centres and to relieve famine and malnourishment of peasant farmers themselves. This is particularly necessary as poor communications mean food can rarely be made available by the Government when and where it is needed, as during the food shortages experienced in 1977-79 in Juba and several other towns of the Southern Sudan.

10.1 The Government And Agricultural Extension Services

The object of this section is not to provide a detailed account of all the extension activities in the study area, but firstly, to review briefly some of the early extension efforts made during the Anglo-Egyptian Condominium period; secondly, to outline the general administrative layout today; finally, the impact of some of the agricultural programmes as executed by the Agricultural Department Extension Service Unit.

In the previous chapter, it was mentioned that during the colonial administration period, the extension effort made was mainly on cotton growing. Little effort was given to the development of the food-crop sector. Such compulsory adjustments have placed a strain on the ecological adaptation of the indigenous tribal groupings to their subsistence food supply. It was also noted in Chapter 9 that the management and availability of extension services to cotton growers was mainly the responsibility of the Equatoria Projects Board (EPB) (now known as the Equatoria Province Agricultural Production Corporation (EPAPC)) which was in effect the governing institution of the Zande Scheme. However, the sphere of extension work was of limited scale.

During the Anglo-Egyptian Condominium administration period, the Agricultural Department Extension Office was in Amadi (Mundri District and moved to the present location in Maridi in 1956). In the early 1960's, with American aid, the extension office at Maridi headquarters was expanded (Agricultural Inspector, Personal Communication). This office covered all the study area, mainly concentrating on 4 H clubs in the schools and developing Kuanga Demonstration Farm, about 4.5 km south of Maridi headquarters. The first major efforts of the Agricultural Extension Unit were devoted to increasing agricultural productivity of the small-scale farmers. The objective was to increase farm income and improve the quantity and quality of the family food supply as well as to supply the food needed for the non-agricultural sector. In fact, there is no point in extension projects for increased production if there is no guarantee that the farmer can obtain a reliable and reasonable price for his produce.

In this connection, Bassiouni (1980:6) states further that the objectives of the extension programmes on the district level go beyond the technical improvement of farm practices, to such objectives as

"creating new economic institutions and new social systems that would relatively increase the level of inventiveness and innovation in the existing tribal cultures, values and social institutions."

The Extension Unit of the Agricultural Department has several sections each concerned with specific task. Firstly, there is a Crop Protection Unit which deals with the identification of such problems as animal and insect pests, diseases and rodents as well as the application of suitable control measures through the proper use of chemical insecticide. Secondly, there is the Crop Production Unit dealing with the general agriculture development policy aimed at the improvement of the farming systems through the propagation and experimentation of improved seed varieties of maize (Western Yellow and Katumani), sorghum (9 DX ⁷/11, Serena), groundnuts (Makulu Red, Mani Pintar) etc. Also the promotion of the growing of citrus fruits (e.g. oranges, lemons, tangerine etc.) and planting of coffee, pineapples, tobacco etc. as well as the application of new cultural operations such as planting citrus fruit trees, pineapples, tobacco, coffee etc. in rows with spacing; better seed preparation (tilling the land immediately after harvest to control weeds and in allowing easier and earlier hoeing at the start of rains); early planting and weeding of crops especially cotton and coffee and the use of toria hoes. The third and final section of the Extension Unit is that of Home Economics recently established and headed by a Somali female volunteer. This section deals mainly with increasing the general concept of better farming and development among women in the study area; training them in home economics, nutrition and hygiene and to establish women's organisations. However, it is still in its infancy stage and no headway had so far been made in regard to the above-mentioned programmes.

During the survey period, there were two senior agricultural extension officers with a university and higher institution qualifications

respectively; eight junior agricultural extension officers (overseers), four with post-secondary and secondary education and the rest with junior secondary qualifications. The junior agricultural extension officers generally live in the rural areas at stations in Ibba-Arua (Zone 1 and 2) Maruko (Zone 1), Nabanga (Zone 2), Amaki (Zone 3), Ras Olo I, Edi, Maridi-Kuanga and Bahr Olo areas (Zone 4) (see Chapter 5). These extension staff (each controls one or more chiefdoms) are generally supervised by the two senior extension staff. The overall administrative control or responsibility of all the Extension Units' activities rests upon the Inspector of Agriculture resident at Maridi headquarters and he is directly answerable to the Commissioner of Agriculture at Yambio.

The dissemination and extension of the new agricultural programmes to the farmers by the fieldstaff in the study area is mainly through farm visits and by encouraging farmers to visit demonstration farms at the above-mentioned stations. Also, farmers are sometimes encouraged to visit the Agricultural Extension Unit at Maridi headquarters in case of an urgent need. However, the primary objective of the extension staff is to encourage farmers to actively participate in 'small projects' at the demonstration plots where coffee cultural operations and other new agricultural techniques and practices relevant to other crops are also demonstrated to them. As the local farmers meet the fieldstaff by planting coffee seedlings at the demonstration plot, it is also possible to instruct the farmers on the other recommended practices and techniques in other crops at the same time as they come to collect the seedlings. Hence, the extension policy concentrates its fieldstaff at these points where farmers are expected to be more responsive and where the return on fieldstaff time employed is relatively greatest.

The crux of the extension programme in the study area is the 'annual'

show organised by the fieldstaff at Maridi-Kuanga demonstration when the new programmes are demonstrated to the farmers. Neighbouring farmers are invited through word of mouth. During the survey period, one such meeting had been called but the average attendance (only approximately fifteen farmers turned up) had been very poor. An explanation is likely to be that some farmers did not receive the invitation or that they were disinterested in such programmes bearing in mind that the literacy levels are generally low and the use of mass media (e.g. radio, newspaper) is non-existent. Several attempts are also made to hold similar meetings at the chiefs' administrative villages or sometimes at schools and markets.

Data provided by the Social Statistics and Social Monitoring Survey (SSSMS, 1982) indicate that there are approximately 4,403 farm families in Ibba RC (Zones 1 and 2) and 8,305 farm families in Zones 3 and 4 (Maridi RC); that the approximate ratio of a fieldstaff to farm families in Ibba RC is 1 to 880.6, while in Maridi RC it is 1 to 992.8. It is clear from these data that many farm families in the study area must have not been contacted by the extension staff, considering the general constraints of transport.

To monitor the progress of the extension programmes in the study area, the Inspector of Agriculture also calls for monthly meetings held at Maridi headquarters in which all the extension staff are requested to present trek reports on their activities and shed light on some of the practical constraints encountered in their respective areas and chiefdoms. Informal discussions with several fieldstaff showed that the main recurrent problems often presented for discussion in such meetings include the delays in the payment of monthly salaries for the staff as well as the transport issues.

Generally, the extension staff do not in practice have much to offer the farmers in the study area due to their lack of training and their own inappropriate education, not the least significant reason being lack of transport. Informal discussions with several enterprising peasant farmers showed that several visits had been made to the Agricultural Department Extension Unit at Maridi headquarters in order to seek advice or remedy to some of their problems particularly wild animals such as baboons and other 'big game' as well as to acquire some of the exotic seed varieties, but the extension staff were either not available in the office (had gone to Juba and submerged in political manoeuvring, in the inevitable struggle for power, and in the routine of social obligations and endless meetings) or the seeds were not available.

10.2 The Government And Afforestation Programme

Attempts made by the Anglo-Egyptian Condominium administration led to the institution of laws and prohibitions that restrict the burning and widespread destruction of forests by peasant farmers in the study area (Forestry Department, Unpublished Report). The local chiefs were issued directives to restrict the burning of forests. In fact District Standing Order Number 10 was enacted in 1933 to stop the burning of both ordinary forests as well as valuable teak trees (Tectona grandis sp) for timber. However, this policy has never been rigorously applied and therefore was rescinded in 1951.⁽¹⁾ This is because of the fact that enforcement and proof of guilt of the culprit was (and still is) nearly impossible to obtain.

Because of the importance and value of forest cover in preserving *land against* soil erosion and protecting water catchment areas, and particularly the preservation and creation of teak forests useful for timber in

(1) District Assistant Conservator's File Number FD.M.3.A. 1961, Maridi

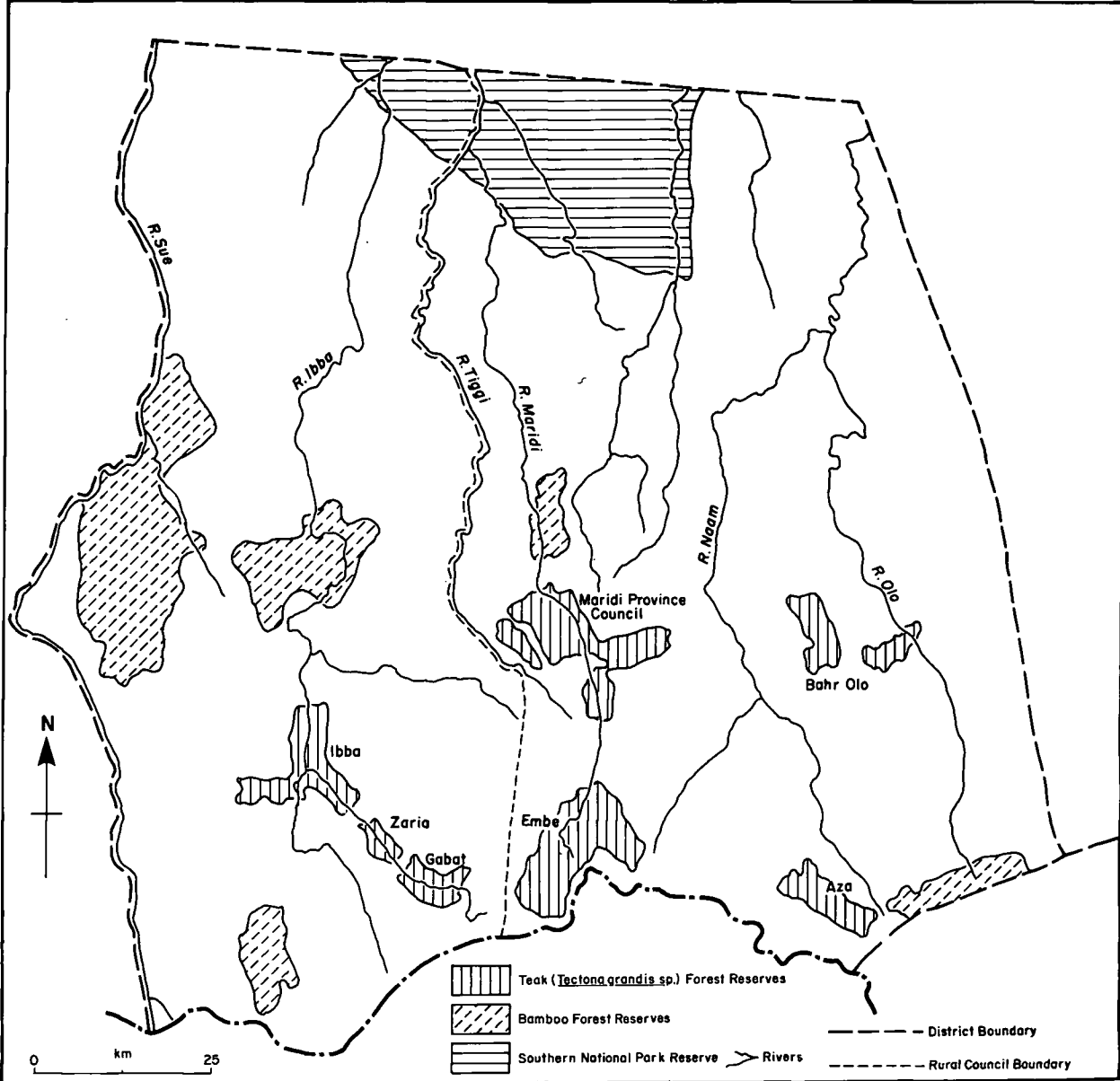
building and construction purposes, the colonial and post-colonial Governments concerted efforts to expand forest reserves. Thus, the Forestry Department in the study area (consisting of Assistant Conservator, two District forest officers, two forest rangers resident in Ibba and Maridi headquarters and a number of forest overseers and labourers) established several teak forest reserves (see Fig.10.1).

In these forest reserves, human intrusion through burning, cutting of teak trees is illegal and limited cutting or felling for timber is the sole responsibility of the Forestry Department. Even so, illegal cutting or theft of these reserves are not uncommon. However, the crux of the afforestation programme in the study area is the regeneration of teak plantations through the propagation of seedlings in nurseries established in forest reserves noted above, by the Forestry Department. These nurseries are used as demonstration sites where farmers are encouraged to attend and be shown the necessary silvicultural operations.

In this survey, 26.9% of the farmers in the overall sample acknowledged planting teak trees. The majority of those adopting this practice are mainly in Zones 2 and 4 which are in fact ecologically more suitable than Zones 1 and 3. Of those planting teak trees, various reasons were advanced such as the need for building and construction poles, as well as for sale; marking of homestead boundaries of grandparents where they had been buried; the marking of farm plots boundary lines; still other plant because these trees are also utilised as wind breaks.

However, there is still widespread burning through the indigenous methods used by several peasant farmers in the process of opening up new agricultural areas common in shifting cultivation (see Chapter 5). Additionally, the dominance of activities as hunting of 'small game' for bush meat and also to keep at bay the wild animals, firewood

Fig.10-1 THE DISTRIBUTION OF FOREST RESERVES IN THE STUDY AREA



Source: Interpretation of Landsat Images Recorded in Jan. 1973, '76 and Dec. 1979 (Mefil S.P.A.)

collection and its burning for charcoal for cooking - all have further encouraged the indiscriminate burning of forests by most farmers in the study area.

The programme of afforestation has not, however, been fully realised simply because it is a long-term project. Informal discussions with farmers revealed some complaints raised about some of their village lands being taken over by Government projects (see Chapter 4). Thus, there is no doubt that some villages and clans lands are gradually being converted into forest reserves and other private and public agricultural projects.

10.3 The Government And Agricultural Policy

After the signing of the Addis Ababa Agreement and with the establishment of the Southern Sudan Regional Government in 1972, sustained Government efforts to improve the 'traditional' farming systems in the study area directly and indirectly took two forms (Agricultural Inspector, Personal Communication). The first and foremost attempt was concerned with the institution of agricultural competitions and staging of crop shows among the peasant farmers. The second plan was to encourage farmers to use toria hoes which are relatively improved (these tools need to be able to deal with a deep weed growth by cutting through the roots of spear grass 10-15 cm below the surface) and more efficient than the 'traditional' ones.

In effect, the main objectives of the first Government policy (Go-Back-To-Land) were to encourage peasant farmers to produce more food for their families' requirements with the surplus for market both within and outside the districts concerned.

In the study area, the agricultural policy was started in the season 1973-74 and Maridi headquarters is the venue for the competitions

and staging of the agricultural shows where farmers from various areas can compare agricultural production statistics.

In this survey, about 40% of the sample farmers had participated in one or more of the agricultural competitions and shows. However, although several farmers acknowledged some limited benefits and incentives from these competitions, informal interviews with them revealed some bureaucratic and organisational problems. These difficulties relate to the transportation of the produce from the rural areas to Maridi headquarters as the agricultural staff do not provide any means of transportation. Secondly, the method employed by the agricultural staff in the evaluation or assessment of size of farms and crop production is not satisfactory. These staff are inclined to favour particular farmers such as the local chiefs and Government officials. Additionally, these staff mostly do not reach several farmers in the remote villages.

The second plan of the Government was the encouragement of the use of toria hoes by the peasant farmers. Realising that the 'traditional' hoes were only used for shallow cultivation (see Chapter 5) and were limiting the expansion of acreage and food production (inefficient within technological limits), a promotional campaign particularly after the Civil War, was launched and farmers were therefore encouraged to use more toria hoes. As a consequence, in the cultivation season 1974-75, about 980 toria hoes were purchased from the Agricultural Department and the PDU in the study area (Agricultural Inspector, Personal Communication).

10.4 The Role Of The Project Development Unit (PDU) In Agricultural Change And Development

In his policy statement to the People's Regional Assembly in 1974, the President of the High Executive Council in the Southern Region stated that his Government would adopt the Six-Year Plan as a strategy to

achieve rapid socio-economic development. The main tenets of this strategy were :

- a) To increase the income and living standards of small farmers;
- b) To attain self-sufficiency in food with adequate supplies to stabilise prices;
- c) To produce sufficient tea, coffee, rice so as to achieve national self-sufficiency, and to increase production of new crops and improved seed varieties;
- d) To increase production of industrial raw materials and encourage development of agro-industries.

In this regard, Government strategy was focused on the rehabilitation of the agricultural schemes which were brought to a standstill during the Civil War as well as the resettlement of refugees and returnees from the neighbouring countries and places of hiding in the bush. As such, the Agricultural Department and the EPAPC embarked on the improvement of their agricultural projects in the study area. These included introducing, multiplying and distributing improved seed varieties as maize, sorghum, groundnuts and the propagation of coffee seedlings and development, pineapple sucklings, and citrus fruits budlings (e.g. Indian Mango). In furtherance of this aim, the Southern Sudan Regional Government in 1972 initiated and established the Project Development Unit (PDU) under the Agricultural Ministry and Natural Resources and financed by the World Bank/IBRD.

The main object of this section is to provide a few comments on the introduction of the PDU as an important component in the improvement and development of small-holder farming systems in the study area. This is related to the fact that the conventional interpretation and planning of environmental resource utilisation in Africa assumes that African

societies are characterised either by "little access to technology" (World Bank, 1975:21) or by 'innovation up to a limited point' (McLoughlin, 1970). Thus, planning approaches based on such a 'modernisation paradigm' (e.g. Roxborough, 1979; Frank, 1969) consequently aim to supply the necessary technology or innovation from 'outside' sources and to promote the process of diffusion of the appropriate 'development hardware'. Hence, the establishment of the PDU would appear to correspond closely to the prescriptions of modernisation theory as mentioned above. The organisation and administrative structure of the PDU, its plans and means of implementation etc. have been fully documented elsewhere (e.g. World Bank, 1979; Robinson, 1979; Chubb, 1981). The main aims and objectives of the PDU which are focused on the smallholder coffee development could be summarised as follows:

- a) To encourage further plantings of robusta coffee by the small-scale farmers through the supply of seedlings from the PDU nurseries. However, with the gradual reduction of PDU nurseries as planned, farmers would produce their own seedlings;
- b) To train and establish an active extension service for coffee which would advise farmers on improved cultural operations (e.g. clean weeding, pruning, mulching, row-planting and spacing, intercropping etc);
- c) To provide coffee growers with hand-operated implements such as secateurs, toria hoes, saws, hulling equipment, insecticide and pesticide chemicals;
- d) To set up mobile buying teams to purchase coffee at the farm-gate or buying centres as an interim strategy in the development of a marketing system;
- e) To bring about economic and social development by providing a more

assured subsistence (particularly in the drought periods) by the introduction of improved seed varieties as sorghum (Serena and 9 DX ⁷/11), maize (Katumani and Western Yellow) and groundnuts (Mani Pintar and Makulu Red).

The thrust of the PDU was to provide assistance to peasant farmers in the relatively lower income groups in an effort to improve their living standards.

10.4.1 The project development unit (PDU) and coffee development programme

It has already been mentioned in Chapter 9 that coffee was known in the study area since the 19th century, but its growing mainly by the local chiefs was of limited extent although several people such as the Moru who are coffee-drinkers pressed for its plantation. Although other varieties (e.g. Exelsa coffee) probably existed in the study area, robusta variety is the most important cash crop.

During the 1978/79 season, the Sudan imported from Zaire and Uganda a total of 8,400 tonnes of clean coffee, the value being \$31.4 million at the average world price. At the same period, smallholder coffee growers in the Southern Sudan contributed an estimated 475-575 tonnes of coffee of which about 21 tonnes were produced by small-scale farmers as registered through PDU sales certificates recorded in the study area (Chubb, 1981). This is the equivalent in value to \$ 1.8-2.1 million, and represents a most useful contribution to the national balance of payments. Therefore, as the demand of coffee in the Sudan in general and Southern Sudan in particular increased, the PDU launched a crash programme for the improvement and development of the crop in the study area through the establishment of coffee nurseries, and the associated extension services in regard to silvicultural operations and management strategies outlined in the paragraphs which follow below.

(1) Coffee nursery development programme

To some extent, the PDU has been successful in meeting one of its original objectives of the propagation and dissemination of coffee seedlings to farmers through the seedbed nurseries set up in Maridi-Kuanga area (Zone 4), Ibba-Arua (Zone 1) Nabanga (Zone 2), Ngamunde and Mabilindi (Zone 4), Bahr Olo area (Zones 3 and 4), Edi and Ras Olo I (Zone 4), Maruko (Zone 1) and Amaki (Zone 3). At the start of the coffee project, seedlings were supplied free to peasant farmers but were of late sold. Table 10.1 shows coffee seedlings sold to the small-scale farmers by the PDU in the study area. This table clearly indicates that there is a greater demand for seedlings in Zones 2 and 4 than in Zones 1 and 3 due to ecological limitations of growth. The larger number of seedlings distributed in Zone 4 reflects the greater number of coffee nursey gardens than in Zones 1, 2 or 3.

(2) Coffee planting programme

The diffusion of coffee growing in the study area is seen by the expansion of acreage (Table 10.2). According to Chubb (1981), coffee was grown in limited areas in the study area, mainly around demonstration and nursery gardens but gradually spread to other areas. It has been estimated that on average, a farmer in the study area has a coffee plot of 0.9 feddans (Chubb, 1981) and there is a general expansion in the crop. Data on income derived from the sale of clean coffee by farmers in general are not available due to the disposal of the crop through unofficial marketing channels as noted in Chapter 8.

(3) Source of coffee seedlings

In the study area, farmers generally obtain their coffee seedlings not only from the PDU nursery gardens but also from EPAPC as well as from their own gardens. Data on sales of seedlings to farmers from the

Table 10.1 : Sales of coffee seedlings from the Project Development Unit (PDU) nursery gardens in the

study area, 1976 - 80

Year	Zone 1	Zone 2	Zone 3	Zone 4	District
1976	385	615	2,000	12,000	15,000
1977	2,000	4,000	3,000	14,000	23,000
1978	285	3,715	6,985	13,015	24,000
1979	1,630	1,870	5,500	20,500	29,500
1980	2,000	4,000	9,000	12,000	27,000
Total	6,300	14,200	26,485	71,515	118,500

Source: Modified and adopted from A.G.Chubb (1981), Smallholder Coffee Development in the Southern Sudan, p.8.

Table 10.2 : Coffee expansion (in feddans) (1) and development in the study area, 1976-82

Year	1976	1977	1978	1979	1980	1981	1982
Acreage (feddans)	180	278	287	407	467	550	685
Number of Growers	245	281	330	532	567	631	727
Acreage/grower	0.735	0.989	0.870	0.765	0.824	0.872	0.942
Tonnes of clean coffee	160	179	189	234	304	467	580
Tonne/grower	1.5	1.6	1.8	2.3	1.9	1.4	1.3

Source: Data derived and modified from Project Development Unit Files RMA/PDU 3.R.J.Maridi, 1982

(1) 1 Feddan = 1.038 acres

PDU sources are of limited value as incomplete records are kept by the other sources. However, during the annual farmer registration in 1979, it has been estimated that about 47%, 26% and 27% of the coffee growers obtained their seedlings from the PDU, farmers' nurseries and EPAPC gardens respectively, but in 1980 the proportions were about 22%, 51% and 18%. Therefore, there is a trend towards farmers becoming self-providing with their own seedlings from their nursery gardens. Farmer nursery gardens supply seedlings to their owners but sometimes can be sold to other neighbour farmers who have not yet established their own nurseries or in case of misfortune from outbreak of fire. Table 10.3 shows farmers' nursery coffee seedlings development for the period from 1979 - 81 which indicates the gradual increase of coffee plants.

(4) Technical aspects and coffee growing

The other technical assistance in the programme of the PDU is concerned with the improvement of small farming in the study area through the extension service activities. These include the eradication of pests and diseases mainly attacking coffee, the training of farmers to use improved cultural practices on coffee such as weeding, pruning, mulching etc. Additionally, the provision and use of hand hulling equipment, secateurs and saws are essential for the development of coffee plantation.

In the light of the extension services of the PDU in the study area, one of the problems that had frequently been mentioned by farmers in this survey and acknowledged by the extension staff is the continual existence of leaf skeletoniser (Leucoprema diheriyi) in coffee nursery gardens. The build-up of this pest is due to several years of experience in raising nursery gardens within a limited area. Coffee growers reported that the attacks by this pest occur throughout the year but intensify during October to December period. Although the disease has, to some extent, been controlled through the application of Malathion

Table 10.3 : Farmer coffee nursery development of seedlings in the study area, 1979-81

Year	Number of Farmer Nurseries	Number of Seedlings
1979	7	10,000
1980	12	11,000
1981	26	28,000
TOTAL	45	48,000

Source: A.G. Chubb (1981), Smallholder Coffee Development in Southern Sudan, p.13.

of unplanned diffusion of innovations, techniques and services through informal channels. Secondly, there is the force which relates to formal attempts to popularise new methods and techniques. An assessment of the degree of farmers' response to the popularising of the new agricultural techniques and ideas is therefore the main object of this section.

However, it is essential to pose a general question : Why do some farmers adopt new techniques and others reject? In fact in answering this question, it is important indeed to know first the attributes of the innovations sponsored for adoption and the channel through which farmers come to know about them.

Studies focused on the diffusion of innovations have been attempted by sociologists and geographers. The sociologists approach the study of innovation diffusion through the investigation of the social barriers and classified the individuals according to the scales of progressiveness or laggardness (e.g. Rogers, 1962; Fliegel, 1968; Bose, 1964). Thus, in investigating innovation diffusion, the sociologists stress four main elements:

- 1) The innovation that is spreading;
- 2) The channels through which it is communicated;
- 3) The time taken;
- 4) The social system.

Geographers on the other hand, have examined it from the spatial point of view by stressing the locational factors in explaining the differences in the rate of adoption from one place to another (Hägerstrand, 1952, 1967; Abler et al., 1972; Blaikie, 1973). The spatial approach, however, recognises the first three elements but in the fourth it stresses on the spatial or physical factors more than the social aspects. In this approach, the key factors are distance from the sources of information and the development of channels of communications in relation to the decay characteristics of information flows.

encouraged to plant their cotton early (from June and before the end of August). The Forestry Department started advocating the establishment of forest reserves of teak plantations or afforestation programme. Through this method, it is hoped to stabilise the 'traditional' land use practices which involve forest burning or destruction common in shifting agriculture. Forest reserves would protect the environment and halt soil erosion. On the other hand, other practices such as thorough weeding, spacing of some crops (e.g. maize, groundnuts, cassava) and thorough hoeing of the land are techniques and practices recommended by the extension staff of the PDU and Agricultural Department, but which are also some of the 'traditional' practices of some farmers, who might have been influenced either by an extension programme or by some other neighbour farmers. The use of hired labour has not been advocated by the extension staff but has either been the habitual practice (e.g. labour of informal co-operatives, see Chapter 8) or urgently to perform tasks at peak farming periods and due to the evolution of money economy in the study area.

Innovation and extension programme do not cover exactly the same ground; some farmers may innovate because of the extension programmes, or they may do so where these are unavailable. Neither is an 'innovative' farmer the same as a 'good' farmer. The latter may have inherited relatively good practices from his parents and had been (or is) following them consistently. An 'innovative farmer' in this study is defined as one who has adopted **four or more** innovations. Based on this definition, 91 farmers (57%) in this study are classified as 'innovators', while 43% (69 farmers) are designated as 'less innovative' or laggards ('traditional').

Farmers' response to innovations and adoption process

Farmers' responses on the adoption of innovations, passing through stages of awareness/knowledge trial and adoption, are depicted in Table 10.5. While there are zonal variations in the relative frequencies of farmers' response, the extent of awareness or knowledge and experiment of the items of innovations is generally high in the study area. The level of adoption is comparatively low. The mean number of relative frequencies of awareness/knowledge and trial of the package of innovations is generally higher in Zones 2 (Ibba RC) and 4 (Maridi RC) as compared with Zones 1 (Ibba RC) and 3 (Maridi RC). This is an environmental or ecological distinction. However, the rate of the 'innovativeness' of a farmer including the interest to innovate as well as the suitability (success) of the innovation is relatively higher in Zones 3 (81.5%) and 4 (76.7%) contrasted with Zones 1 (60.7%) and 2 (62.5%) as depicted in Table 10.5. This is probably due to cultural or administrative differences.

Overall the sample it is shown that the innovations which have been adopted most by farmers include : The use of toria hoes (51.9%), the adoption of 9 DX⁷/11 sorghum variety (48.8%), the establishment of coffee nursery gardens and its growing (45%), the growing of Serena sorghum variety (43.8%) in that order. The exotic crop varieties adopted by the majority of farmers have relative greatest value in simply being additions to the many 'traditional' crops grown, and some farmers have tried and adopted them. Farmers have variation in food crop preferences and tastes of the various varieties. Farmers' strategies of adopting the 9 DX⁷/11 sorghum variety rather than the Serena sorghum are based on the reason that it is 'white' and makes 'good' pan-cake (kisra : Arabic) and beer (kpete:Arabic). In fact, more than

Table 10.5 : Number and percentage of farmers indicating knowledge, trial and adoption of farm innovations in the study area

Sample area and adoption	Zone 1 (N=32)						Zone 2 (N=32)						Zone 3 (N=48)						Zone 4 (N=48)						District (N=160)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
	Knowledge	Trial	Adoption	Knowledge	Trial	Adoption	Knowledge	Trial	Adoption	Knowledge	Trial	Adoption	Knowledge	Trial	Adoption	Knowledge	Trial	Adoption	Knowledge	Trial	Adoption	Knowledge	Trial	Adoption																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
Innovations	No.	%	No.	%	No.	% R.O.	No.	%	No.	%	No.	% R.O.	No.	%	No.	%	No.	%	No.	%	No.	% R.O.	No.	%	No.	% R.O.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
Sereia sorghum	27	84.4	19	59.4	10	32.3	3	29	90.6	21	65.6	11	34.4	4	41	85.4	30	62.5	21	43.8	3	33	68.8	28	58.3	3	141	88.1	103	64.4	70	43.8	4	78	48.8	94	58.8																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
9 DX 7/11 sorghum	25	78.1	17	53.1	15	46.9	1	27	84.4	20	62.5	16	50.0	2	40	83.3	25	52.1	23	47.9	2	43	89.6	26	54.2	21	144	90.0	87	54.4	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	58	36.3	5	5

Source : Questionnaire Analysis
 160 Farmers interviewed in Harid District
 Farmers were able to provide more than one response R.O. = Rank Order
 'Innovativeness' of the Farmer = $\frac{\text{Mean Trial} \times 100\%}{\text{Mean Knowledge}}$
 'Suitability (success)' of the Innovation = $\frac{\text{Mean Adoption} \times 100\%}{\text{Mean Trial}}$

45% of the farmers adopting the 9 DX ⁷/11 sorghum variety asserted in their own words that 'it is generally good for food', the produce can store well for a relatively longer time.' However, some farmers claimed that 'it grows poor with late rains' and 'it is difficult for women to grind'. On the other hand, the Serena variety was described as 'red' (red colour is associated with blood and therefore danger) and does not make 'good' kisra or even thick porridge or beer. Additionally, that when planted in April (as recommended by the extension staff) and harvested in August before most other grain crops, it is most subject to severe bird and disease attack. Thus, farmers' food tastes and crop preferences may have other important socio-economic consequences including the perceived utility functions (see Chapter 6). As such, there is little extension agents can tell farmers about how to evaluate improved seed varieties. This same principle applies to all other introduced inputs to the peasant farmers in the study area by formal change agencies.

It is also interesting to note that there is some association between the adoption of toria hoes and coffee plantation. Informal interviews with farmers showed that the toria hoes are relatively more efficient for deeper digging of soils particularly for coffee plantation. However, they are not completely a novel innovation as some farmers have probably seen them in the neighbouring East African countries. However, several farmers asserted that the method of weeding coffee using toria hoes (as recommended by the extension staff) severely damages the feeder roots at the surface of the soil. In this context, the employment of toria and 'traditional' hoes co-exists side by side. Thus alternative forked jembes and shallow hoes (or kye'bo:Moru, gita:Zande) may be recommended. Indeed the quality of the 'traditional' types of hoes produced by the blacksmithing subsector is good and approaches the limit possible in a dispersed industry (Cobbald and Winter, 1979).

Concerning the other coffee cultural operations, it has been possible to obtain interesting points from the coffee growers in the study area. About 70% of them appreciate the benefits of mulching but that the laying of mulch is too labour-intensive and also encourages white ants. Additionally, there is a high risk of fire especially in the dry season. The adoption of the recommended coffee pruning practices (1 stem for the first three plants with subsequent conversion to four stems as well as the cutting of heads at 1.2m of bearing wood) have been followed by several farmers in the study area.

On the other hand, the innovations that have been least adopted by farmers in the study area include : The use of insecticides and other chemicals (12.5%), adoption of Katumani maize variety (21.9%), coffee equipment such as secateurs, saws, hand-operated hullers (24.4%) in that order. In general, farmers seem to be willing to accept the virtues of the use of insecticides and pesticides for coffee even though they are much more sceptical of their value in regard to the other crops. The principal impediment is a distribution one. This is mainly due to the inefficiency of the transportation systems and farmers' lack of cash when these inputs are needed (see Chapter 8). Perhaps the low proportion of adoption of insecticides is due to the unsatisfactory methods of demonstration of these inputs by extension staff to the farmers. On the other hand, Katumani maize variety has been least adopted because of its newness - just introduced into the study area the year prior to this research. It is interesting to note that some farmers who cannot afford to acquire hand-operated coffee hullers of the PDU have taken to making wooden hullers using local materials (see Chapter 11).

Although the adoption of coffee plantation in the study area involves painstaking cultural operations the economic return is higher than other crops. The incentive to adopt an innovation is thus related

to the marginal return from adoption (Brown,1970) as well as social and utility characteristics (my own emphasis). The expected socio-economic returns (profitability) and farmers' perceived utility functions both influence its adoption and incorporation into the 'traditional' farming systems. This feature is called 'compatibility'. This explains farmers' variation and differences in the rate of innovativeness as indicated in Table 10.5. Some farmers may easily be convinced by extension staff, while others behave in a manner of 'wait and see'. Thus, the degree of farmers' preparedness to accept and differences in response to innovations also depend on personal characteristics, the ability to bear risks, effective communication and sources or agents of innovations (Weeks, 1971).

10.5.2 Channels of communication and the adoption of innovations : Farmers' viewpoint

The process by which diffusion of innovation occurs is the function of appropriate media which informs the potential users of its availability and advocates its acceptance. Studies have shown that information flows through different channels such as institutional infrastructure and the direct word of mouth or face-to-face contacts (Blaikie, 1973; Bose, 1964; Brown, 1970). The first type is represented by the towns and nodes of growth that diffuse information to urban dwellers. The second type caters for the needs of the rural masses. Effective strategies for efficient information flow develop channels that link between the mass media in towns or urban centres and the word of mouth in rural areas. This intermediate channel, in many countries, is occupied by extension staff, change agents, middlemen and formal and informal leaders who diffuse information in a language acceptable and easily understood by the rural people. On the basis of this general framework, this section specifically examines the range of formal and informal channels which farmers themselves acknowledged

as important in leading to the acceptance and adoption of the new farming techniques and practices in the study area. Farmers' attitudes opinions and impressions or their own general assessment of the role of the extension staff and change agencies will be noted in

Section B. Obviously one is unlikely to accept a new idea or practice if its existence and usefulness are unknown.

The questionnaire requested farmers to state the sources of influence of the new farming inputs for the sixteen innovations identified in the study area. Table 10.6 (see also Appendix 12) clearly shows that by far the most important sources of influence are the PDU and the Agricultural Department staff; out-migration and experience gained from the neighbouring countries; friends, relations and immediate family members; neighbours; while other sources of farm innovations cited by farmers include wage labour in Government projects.

Taking the PDU and Agricultural Department extension staff as the first important source of innovation adoption by the majority of farmers, it is clearly shown in Appendix 12 that coffee technological packages and equipment (42.5%), using toria hoes (41.3%), adoption of coffee growing and cultural operations and establishment of coffee nursery gardens (40%) growing exotic seed varieties of sorghum - 9DX⁷/11 (40%) as well as adopting to plant improved groundnut variety - Makulu Red (39.4%) in that order, all have been acknowledged as the most important innovations that had been advocated by the extension staff. Thus, with a limited knowledge of a new technique, some farmers are rational in seeking clarifications by contacting agricultural extension staff. In effect, changes and the introduction of these new inputs are purely seen from the angle of technical aspects and of help from the Government rather than the integrated strategies or well-established 'traditional' agricultural systems which had been practised by farmers

Table 10.6 : Average number of farmers' responses on the sources of influence that led to the adoption of farm innovations in the study area

Source • Zone	Friends, relations, immediate family members	Saw it on neighbours farm/market	PDU and agricul- tural extension staff etc.	Out-migration and experience from neighbouring countries.	Others
1 (N=32)	2.56	2.13	2.81	2.66	1.47
2 (N=32)	2.75	2.19	3.25	3.22	1.94
3 (N=48)	4.15	4.13	5.29	4.27	2.96
4 (N=48)	4.79	4.50	6.25	5.85	3.35
District	3.74	3.44	4.68	4.21	2.58

Source : Questionnaire Analysis and data derived and calculated from Appendix 12

160 Farmers interviewed in Maridi District

N.B. There is an overlap between friends, relations and neighbours.

for generations. The main innovations that have been adopted or diffused through out-migration include adopting toria hoes (43.8%), hired labour (40.6%), coffee growing and the related cultural management strategies (39.4%) and the establishment of coffee nurseries (38.1%).

The experience that was mainly gained from working in the coffee estates in the neighbouring East African countries particularly Zaire, Uganda and Central African Republic is the second most important source. This was made possible when most farmers migrated and lived in these countries particularly during the Civil War coupled with the spontaneous movement and trading contacts made across the borders. Thus, the opportunity to experiment with these innovations and talk with people who have first gained experience is the most important influence of innovations for the newcomers or refugees. It is obvious that migration, culture contact and the spread of new ideas and farm innovations have gradually facilitated the spread and diffusion of farm innovations from one society to another.

Considering friends, relations and immediate family members as the third most important source of innovation adoption cited by farmers (with mean responses per farmer of 3.7) in the study area, using toria hoes (40%), employing hired labour (35.6%), growing Serena sorghum variety (32.5%), planting cotton early (29.4%) and adopting coffee growing and cultural operations (28.1%) in that sequence, are important innovations adopted from friends, relations and immediate family members.

On the other hand, the most important innovations derived from observations of neighbouring farms and market centres include : Planting cotton early (33.1%), using toria hoes (31.3%) and adopting coffee growing and management strategies (25.6%) in that order. The main by-product of informal social relationships at the farm level in the village is the easy diffusion of information. This 'indigenous extension

network' is an important vehicle for transmitting farm information and innovations.

10.6 The Farmer And Farm Characteristics In Relation To Innovation Adoption In The Study Area

Socio-economic, cultural, institutional and structural variables as well as the physical characteristics of farms, all influence innovation adoption by farmers. It is, therefore, the aim of this section to outline some of the variables of the farmer and his farm characteristics in regard to the diffusion and adoption of innovations in the study area. However, it is worth noting that due to the nature or quality of data, mainly based on approximations coupled with the smallness of the sample as well as the usual research constraints of time and resources, nothing at this stage can categorically be subjected to statistical analysis. However, general comments and approximate relationships between variables in question serve the purpose. Thus, a relationship between the farmers' socio-economic and farm features and innovation could be established as depicted in Table 10.7(A) and summarised in Table 10.7(B) (see Also Appendix 13). Table 10.7(A),a indicates that the age of the farmer or household head is generally correlated with innovation, though older farmers may innovate rather less than relatively younger ones. It is clearly apparent from this table that out of the 117 respondents under 50 years old, more than half (53.0%) were 'innovative' (innovative being defined as making four or more innovations especially those related to coffee plantation and management practices as noted in section 10.5.1) as compared with only a quarter (25.6%) of the 43 farmers who were aged 50 years or more. Thus, granted that the samples are small and ages are only estimates, this suggests as one may expect, that the older farmers are less innovative. In fact, farmers who are aged 50 years or more have generally lost much of their physical energy and if not helped by adult family

Table 10.7(A) : The farmer and farm characteristics in relation to the adoption of farm innovations
in the study area

Variable	Total sample & innovation		Number of farmers making 0-3 innovations		Number of farmers making 4+ innovations		Total in sample	
	No.	%	No.	%	No.	%	No.	%
(a) AGE OF FARMER								
20-29	11	57.9	8	42.1	19	100.0		
30-39	31	52.5	28	47.5	59	100.0		
40-49	13	33.3	26	66.7	39	100.0		
50-59	15	68.2	7	31.8	22	100.0		
60-69	11	73.3	4	26.7	15	100.0		
70+	6	-	-	-	-	-		
(b) FAMILY SIZE								
1-7	59	67.8	28	32.2	87	100.0		
8+	28	38.4	45	61.6	73	100.0		
(c) ADULT MALES HELPING HOUSEHOLD HEAD								
1-2	12	70.6	5	29.4	17	100.0		
3-4	30	68.2	14	31.8	44	100.0		
5-6	27	54.0	23	46.0	50	100.0		
7+	18	36.7	31	63.3	49	100.0		
(d) FARM SIZE								
< 1 feddan	33	76.7	10	23.3	43	100.0		
1-3	35	63.6	20	36.4	55	100.0		
4-6	19	33.3	38	66.7	57	100.0		
7-9	-	-	5	-	5	-		
9+	-	-	-	-	-	-		
(e) SECONDARY OCCUPATION								
Not available	7	-	-	-	7	-		
Self employment opportunities	57	61.3	36	38.7	93	100.0		
Government employment/Wage labour/ Trading activities	17	48.6	18	51.4	35	100.0		
Others	6	24.0	19	76.0	25	100.0		
(f) MIGRATION AND MOBILITY EXPERIENCE								
Not available	20	-	-	-	20	-		
Migrated and lived in neighbouring countries	48	51.1	46	48.9	94	100.0		
Temporary/seasonal mobility to other towns	19	41.3	27	58.7	46	100.0		
(g) EDUCATIONAL LEVEL								
Not available	37	77.1	11	22.9	48	100.0		
Catechist/Christian or Missionary school	16	56.6	15	48.4	31	100.0		
Village school	7	35.0	13	65.0	20	100.0		
Primary school	12	54.5	10	45.5	22	100.0		
Junior secondary school	1	20.0	4	80.0	5	100.0		
Senior secondary school	1	20.0	4	80.0	5	100.0		
Others	13	44.8	16	55.2	29	100.0		
(h) TRIBE/CLAN								
Avukaya/Mego	10	66.7	5	33.3	15	100.0		
Baka/Badugo	12	46.2	14	53.8	26	100.0		
Moru/Kenyi	7	28.0	18	72.0	25	100.0		
Mundu/Bokora	6	42.9	8	57.1	14	100.0		
Zande/Avungara	27	64.3	15	35.7	42	100.0		
Other tribes/clans	25	65.8	13	34.2	38	100.0		
(i) SOCIAL STATUS								
Not available	36	66.7	18	33.3	54	100.0		
Local chief/men of repute	10	45.5	12	54.5	22	100.0		
Member in Co-operative society/S.S.U.	23	74.2	8	25.8	31	100.0		
Father worked in Govt.Agric.scheme	7	28.0	18	72.0	25	100.0		
Others	11	39.3	17	60.7	28	100.0		
(j) LOCATION OF FARMER/FARM								
Living in village < 8km* from nearest	26	55.3	21	44.7	47	100.0		
" " > 8km " "market	28	80.0	7	20.0	35	100.0		
" " < 8 km from nearest Demonst.Farm Agric.Offices	7	28.0	18	72.0	25	100.0		
" " > 8km " "	7	77.8	2	22.2	9	100.0		
" " < 8km from nearest main road	7	26.9	19	73.1	26	100.0		
" " > 8 km " "	12	66.7	6	33.3	18	100.0		
Total, each section	87	54.4	73	45.6	160	100.0		

Source: Questionnaire analysis and data derived from Appendix 13
160 Farmers interviewed in Maridi District

* 8 km was considered as the average walking distance per farmer bearing in mind that (except for a few farmers who may travel by bicycles or truck), the majority of the farmers usually walk to the basic infrastructural service facilities in the study area.

Table 10.7 (B) : Zonal summary of the farmer and farm characteristics in relation to the adoption of farm innovations in the study area

Innovation Zone	Number of farmers making 0-3 innovations		Number of farmers making 4+ innovations		Total in Sample	
	No.	%	No.	%	No.	%
1	25	78.1	7	21.9	32	100.0
2	18	56.3	14	43.7	32	100.0
3	25	52.1	23	47.9	48	100.0
4	19	39.6	29	60.4	48	100.0
District Total	87	54.4	73	45.6	160	100.0

Source: Questionnaire Analysis and data calculated from Appendix 13
160 Farmers interviewed in Maridi District.

members, or unable to command a working beer-party or hired labour, generally tend to cultivate small farm plots especially around the homestead compounds. Table 10.7(A),b indicates that 45 out of 73 of the respondents (61.6%) with 8 family members or more helping in farm, are more innovative than the 28 out of 87 farmers (32.2%) with only one or more household members helping. This labour input is strongly reinforced by the 54 out of 99 of the innovative farmers (54.5%) with five or more adult males helping as compared with only 19 out of 61 less innovative farmers (31.3%) with only less than five adult males helping the household head (see Table 10.7(A),c). Thus, generally farmers with relatively larger family labour input supplemented by other adult males are more innovative than their counterparts.

It was noted in Chapter 8 that farm size is, to some extent, related to the amount or size of the available family labour. Table 10.7(A),d, depicts that 43 out of 62 respondents (69.4%) with four and more feddans are innovative compared with 30 out of 98 farmers (30.6%) with less than four farm feddans. This implies that the larger the farm the more innovative is the farmer who is also willing to undergo risks.

Table 10.7(A),e, shows that most farmers (153 out of 160) were found to have several secondary employment opportunities which have been outlined in Chapter 4. However, those farmers who were self-employed in activities such as carpentry and handicrafts, beer-making, fishing and gathering etc. (an adaptation to local resources and to local needs), were found to be less innovative (61.3%) compared with the innovative farmers with retailing activities and engaged in Government occupations or in wage labour (51.4%); or 'others (76%) engaged in unofficial trading or 'black market' or perhaps smuggling of coffee and elephant tusks etc. across borders with the neighbouring East African countries.

Therefore, a farmer who is involved in other secondary employment fortunes has a primary objective of supplementing household needs for cash. He is also likely to lead to change as the combination of farming and off-farm occupations expose him to different environments, new ideas, customs, values and persons alien to the 'traditional' village culture.

Some studies that have attempted to analyse social diffusion of innovations (e.g. Foster, 1967; Brierley, 1974) through travel experience or geographical mobility have concluded that these are factors that are more likely to lead the farmers to innovation adoption and change. Similarly, it is clearly shown in Table 10.7(A),f, that a higher proportion of farmers (58.7%, i.e. 27 out of 46 respondents) who have gained more experience through travel (temporary or seasonal) to other places outside their environment or have migrated and lived in neighbouring countries (48.9%) are more innovative compared with their peers (14.3%, i.e. 20 out of 140 farmers) with no travelling experience. During the Civil War, several farmers have migrated and lived in neighbouring countries and have worked in private and public projects like coffee estates and, therefore, have been exposed to new agricultural techniques and practices as well as different lifestyles and are more innovative than their peers who remained behind. In this context, a goodly proportion (48.9%) of innovation is the result of farmers who have moved in, bringing new ideas and material items with them; and even more important, the will to change.

The product of Table 10.7(A),g, clearly indicates that education is generally correlated with innovation. In fact 80% of the farmers (8 out of 10) with secondary education had higher rates of innovation as compared with only less than half (43.3%) of the 65 out of 150 farmers with no formal or lower educational levels. However, farmers with village education (65%) were comparatively innovative. The evidence of this study lends support to the findings of other studies (e.g. Brierley,

1974) that the more educated farmers tend to have a more receptive attitude and be more enthusiastic about farming. However, caution must be taken because no statistically sound conclusions could be drawn from a cell of this sample size.

In the study area, all the tribal groups innovated as shown in Table 10.7 (A),h. However, the Moru, Mundu and Baka tribes of the Kenyi, Bokoro and Badugo clans respectively showed a somewhat greater propensity to innovate than the average farmer of other tribes/clans. It was mentioned in Chapter 9 that relatively many Moru (most of whom belong to Kenyi dominant clan) compared with other tribes had always been involved in the activities of the Agricultural Department in the 1950's. Several worked as medical staff and were offering their services in places of other tribes. In fact, even today, there is a high pride among the Moru especially to work as medical staff. The Moru, too, were noted to be very keen to grow coffee as they had been (and still are) heavy coffee-drinkers (a crop now mainly encouraged by the extension staff to be grown as a cash crop) in the study area. It is likely that the common experience of travel to work in other places exposed many of the Moru to some social and economic as well as cultural changes during the colonial period.

Table 10.7(A),i, reveals that 35 out of 53 farmers (66%) whose fathers have worked in Government agricultural projects and who are either retired police, army and prison warden officers or senior civil servicemen and ex-members of parliament had higher rates of innovation. About 55% of the farmers who are either local leaders and men of repute or local chiefs also showed higher rates of innovative attitudes. In fact, retired civil service officials who had probably accumulated enough capital are likely to invest more in agriculture and adopt those new techniques and practices and ideas.

Farmers (i.e. 37 out of 51) living in villages less than 8 km from the nearest main roads or demonstration farms and offices of the extension staff showed a higher rate of innovation (72.5%) than those living in settlements more than 8 km from the above infrastructural services (see Table 10.7(A),j). As shown in Table 10.7(B) most of the innovative farmers were not evenly distributed through the sample. They formed a majority in Zones 4(60.4%), while they were lowest in Zone 1 (21.9%).

In summary, this section has outlined, as might be expected, that differences in age, family size and number of adult males helping in farm, farm size, farmers' involvement in secondary occupations, migration and mobility experiences, the membership of particular tribal grouping/clan and social status as well as the location of farm in relation to demonstration farm and extension service centres and main motorised roads, all have generally been observed as relatively good indicators in the adoption of agricultural innovations by farmers in the study area. Other studies done elsewhere (e.g. Tiffen, 1973, 1976; Brierley, 1974) lend support to this observation. However, the few remarks noted in the foregoing section are only indicative of the general trend of farmers' socio-economic features in relation to farming. This is mainly due to the fact that no statistical analysis was attempted to demonstrate the significance because of the sample size and nature of data. To help bridge the gap, a few individual farm case studies portraying the general socio-economic aspects in regard to the innovation adoption as well as the apathy of 'non-innovative' attitudes of farmers were documented (see Appendix 5).

SECTION B

Farmers' General Attitudes And Response Towards Current Formal Agencies Of Agricultural Change And Innovation And Trends In Farming In The Study Area

Introduction

The object of this section is to examine peasant farmers' general attitudes, perceptions, images and their response towards the development programmes and services that are advocated by the formal change agencies particularly the Agricultural Department Extension Unit and the PDU in the study area.

In the Sudan in general, since the colonial times and post-colonial Governments, issues concerning agricultural development had always been focused on 'big projects' (e.g. Gezira Scheme) rather than the 'small projects'. The small farmers, to some degree, were (and still are) not given the chance to determine research focuses and socio-economic development priorities (e.g. El-Arifi, 1978; Stöhr and Taylor, 1981; Floyd, 1977; Chambers, 1983). In fact, the results of small farmers' experimentation, aspirations, needs and discoveries as well as the underlying factors which shape their attitudes to farming and management or production decisions (often overlooked or ignored) are never known to the planners (mainly politicians) interested in aiding the small farmers. As Davies (1980) correctly puts it "... schemes have not been as successful as they might have been because they were developed in isolation, with poor management and with little regard for the aspiration and needs of the local people as they see them" (Quoted in Davies, 1983:7). These are usually done for them by the 'outsiders' with little or no knowledge of the context of peasant farmers' attitudes, images, perceptions and their decision-making procedures. Therefore, the discussion in this section is focused on specific questions primarily dealing with agricultural felt needs and priorities as well as farmers' attitudes

and responses to rural development and land use changes desired in farming including what role small farmers expect the Agricultural Department Extension Service Unit and PDU to play in the study area. It is generally believed that the presentation of the insiders' view (an emic view) on their farming systems is important if they are to be fully comprehended by the 'outsiders' (an etic view); and if innovations which are expected to induce change are to be effective.

10.7 Farmers' Use Of The Agricultural Extension Services

The questionnaire survey examined aspects of farmers' contact with the agricultural extension staff (Q.28); they were then requested to state whether such contacts were either at the agricultural office or at the demonstration sites, or through farm visits made by the fieldstaff (Q.29,a). They were also asked to indicate the number of occasions and frequency of contacts with the fieldstaff (Q.30,a); and to state the reasons for the various contacts made (Q.30,b). Finally, they were asked if they attended extension service lectures (if any) or demonstrations regularly (Q.31). Farmers' responses to these questions are depicted in Table 10.8.

Overall the sample, 66 farmers (41.3%) acknowledged some contacts with the agricultural extension staff in various places and occasions. While there are zonal variations in the mean number of frequency of contacts or occasions made as well as places of contact, the product of Table 10.8 shows that farmers in Zones 3 and 4 (Maridi RC) had made comparatively more contacts with the extension staff for various reasons and in several places than farmers in Ibba RC (Zones 1 and 2). This may be explained by cultural differences in farmers' response to change programmes. On the other hand, farmers in Zones 2 and 4 (relatively wetter zones) have made relatively more contacts with the agricultural staff through farm visits by these staff than farmers in Zones 1 and 3

Table 10.8 : Number and percentage of farmers reporting frequencies and places of contact with the agricultural extension officers in the study area

Zone/district Reasons of contact	Number of times/Occasions			Place of contact		
	1-3	4-6	7-9	Office	Demonstration Farm	Farm visits by agric extension officers
	No. %	No. %	No. %	No. %	No. %	No. %
1(N=32) Establishment of citrus fruit nurseries/To buy improved seed varieties	8 25.0	2 6.3	- -	2 6.3	4 12.5	2 6.3
To ask for agricultural money/loan	6 18.8	- -	1 3.1	1 3.1	- -	- -
To ask for agricultural tools (torias, pangas, axes)	9 28.1	1 3.1	- -	1 3.1	- -	1 3.1
To report and seek solutions to agricultural problems (wild animal attacks)	8 25.0	3 9.4	- -	2 6.3	- -	2 6.3
To seek for technical assistance (new techniques and practices and insecticides)	8 25.0	2 6.3	- -	1 3.1	3 9.4	1 3.1
Average number of occasions and contacts per farmer	1.21	0.25	0.03	0.22	0.22	0.19
2(N=32) Establishment of citrus fruit nurseries/To buy improved seed varieties	10 31.3	4 12.5	- -	4 12.5	6 18.8	7 21.9
To ask for agricultural money loan	7 21.9	- -	- -	1 3.1	- -	- -
To ask for agricultural tools (torias, pangas, axes)	7 21.9	2 6.3	1 3.1	2 6.3	- -	3 9.4
To report and seek solutions to agricultural problems (wild animal attacks)	9 28.1	4 12.5	- -	2 6.3	- -	4 12.5
To seek technical assistance (new techniques and practices and insecticides)	10 31.3	3 9.4	- -	3 9.4	5 15.6	3 9.4
Average number of occasions and contacts per farmer	1.34	0.41	0.03	0.38	0.34	0.53
3(N=48) Establishment of citrus fruit nurseries/To buy improved seed varieties	13 27.1	- -	9 18.8	6 12.5	10 20.8	6 12.5
To ask for agricultural money loan	11 22.9	9 18.8	- -	4 8.3	- -	- -
To ask for agricultural tools (torias, pangas, axes)	18 37.5	4 8.3	2 4.2	3 6.3	- -	3 6.3
To report and seek solutions to agricultural problems (wild animal attacks)	12 25.0	7 14.6	3 6.3	1 2.1	8 16.7	4 8.3
To seek technical assistance (new techniques and practices and insecticides)	14 29.2	6 12.5	4 8.3	3 6.3	11 22.9	5 10.4
Average number of occasions and contacts per farmer	1.42	0.54	0.38	0.35	0.60	0.38
4(N=48) Establishment of citrus fruit nurseries/To buy improved seed varieties	17 35.4	- -	10 20.8	10 20.8	18 37.5	11 22.9
To ask for agricultural money loan	13 27.1	11 22.9	- -	4 8.3	- -	- -
To ask for agricultural tools (torias, pangas, axes)	21 43.8	6 12.5	3 6.3	4 8.3	- -	5 10.4
To report and seek solutions to agricultural problems (wild animal attacks)	14 29.2	9 18.8	2 4.2	3 6.3	12 25.0	7 14.6
To seek technical assistance (new techniques and practices and insecticides)	16 33.3	10 20.8	6 12.5	6 12.5	17 35.4	9 18.8
Average number of occasions and contacts per farmer	1.69	0.75	0.44	0.56	1.00	0.67
District (N=160) Establishment of citrus fruit nurseries/To buy improved seed varieties	48 30.0	6 3.8	19 11.9	22 13.8	38 23.8	26 16.3
To ask for agricultural money loan	37 23.1	20 12.5	1 0.6	10 6.3	- -	- -
To ask for agricultural tools (torias, pangas, axes)	55 34.4	13 8.1	6 3.8	13 8.1	- -	12 7.5
To report and seek solutions to agricultural problems (wild animal attacks)	43 26.9	23 14.4	5 3.1	8 5.0	20 12.5	17 10.6
To seek technical assistance (new techniques and practices and insecticides)	48 30.0	21 13.1	10 6.3	13 8.1	36 22.5	18 11.3
Average number of occasions and contacts per farmer	1.44	0.52	0.26	0.41	0.59	0.46

Source : Questionnaire Analysis

160 Farmers interviewed in Maridi District

66 Farmers in Maridi District acknowledged contacts with agricultural extension staff [20 farmers in Zones 1 and 2 (Ibba RC) and 46 farmers in Zones 3 and 4 Maridi RC]

Percentages more or less than 100 because of farmers' multiple response and rounding.

Some of the farmers' response categories are not mutually exclusive

(relatively drier zones). This may be explained by the ecological variations in which farmers' concern on the latter zones is on the reliability and variability of rainfall and therefore are less inclined to make contacts with the fieldstaff. Also Zones 2 and 4 are relatively more suitable, in ecological terms, to coffee plantation and hence much emphasis of extension services is on them particularly along the Maridi-Yambio, Maridi-Mundri and Maridi-Yei mainroads. However, most farmers in Zones 3 and 4 (Maridi RC) acknowledged contacts with the extension staff more than seven occasions in several places for various reasons. However, several farmers claimed that they did not know where the Agricultural Department Extension Unit office was situated in Maridi headquarters (which is actually in the central public square garden of the town).

Concerning the attendance of demonstration lessons, 6.3% of the peasant farmers reported having attended these lessons conducted in the demonstration farm sites in Nagbaka primary school garden (Zone 1) mainly connected with the planting of an exotic groundnut variety (Makulu Red). This primary school garden also provides foodstuff for the school. Of the farmers who attended these demonstration lessons held in the school garden, most were relatively young (from 20-29 years) and had been migrants to the neighbouring East African countries.

As this is a smallholder farming survey, several farmers were often reluctant to openly express their opinions due to their suspicion of the research team as being Government officials. In fact, several farmers changed their attitudes after lengthy discussions when more confidence was gained.

10.8 Farmers' Opinions Of The Extension Service Unit

In this survey, several farmers evaded the direct question on their opinions of the work of the extension staff by stating that they had had little knowledge or no contact. However, Table 10.9 is the product of the 58.8% (94 farmers) of the farmers' responses for not having made contacts with the fieldstaff. About 24% had no confidence because the officers were reported as not practically applying what they advocate to them. Thus, most farmers who viewed themselves as comparatively more knowledgeable than the fieldstaff deliberately neglect to take them seriously. This aspect is again re-inforced by a still larger proportion (23.8%) of the farmers indicating their inability to comprehend the language used by the extension officers in the dissemination of the new farm practices and techniques. Additionally, peasant farmers regard these fieldstaff as too young and also arrogant and lacking in confidence in farm knowledge (21.3%) and without appreciating or taking farmers' problems more seriously (21.3%) and are also liable to make unkept promises in that order.

In this respect, the result of the training received by the extension officers common in most Third World countries, in fact, misleads these staff to assume the 'primitiveness' of indigenous farming systems. They regard themselves as the vanguards for changing 'traditional' farming systems into 'modern' enterprises. Because of some of the above-mentioned reasons, several farmers refused to consult the fieldstaff.

The above-mentioned few remarks of farmers' opinions on the extensionists therefore call for a modification of the extension strategy on the dissemination of the new farming techniques and practices to peasant farmers. As Floyd (1977:53) succinctly puts it "there is an

Table 10.9 : Number and percentage of farmers' responses for not seeking assistance of the agricultural extension staff in the study area

Reasons	Zone 1 (N=32)		Zone 2 (N=32)		Zone 3 (N=48)		Zone 4 (N=48)		District (N=160)	
Sample area	No.	%	No.	%	No.	%	No.	%	No.	%
They use technical language we cannot comprehend	10	31.3	8	25.0	11	22.9	9	18.8	38	23.8
No confidence in the advice and instruction they give and some do not use it	7	21.9	8	25.0	14	29.2	10	20.8	39	24.4
They are too young, arrogant and inexperienced and lack knowledge, unaccustomed	9	28.1	7	21.9	10	20.8	8	16.7	34	21.3
They do not understand and appreciate our problems. They make unfulfilled promises	6	18.8	8	25.0	9	18.8	11	22.9	34	21.3
They sometimes complain to us about their office problems especially the delay in the payment of their salaries and they occasionally ask us for food to eat	8	25.0	6	18.8	7	14.6	6	12.5	27	16.9
Others	3	9.4	4	12.5	5	10.4	6	12.5	18	11.3
Don't know	2	6.3	1	3.1	3	6.3	2	4.2	8	5.0
Mean number of responses per farming	1.41		1.31		1.23		1.08		1.24	

Source: Questionnaire Analysis
 160 Farmers interviewed in Maridi District
 94 Farmers advanced various reasons for not seeking assistance and their opinions on extensionists.
 Percentages more than 100 because farmers could supply more than one reason or opinion and rounding
 The response categories are not mutually exclusive

art to the spreading of agricultural innovations ... The geographic diffusion of new and tested techniques in farming requires skillful planning on the part of the well-trained and 'people-oriented' extension staff."

The questionnaire survey also investigated farmers' opinions on the role of the Agricultural Extension Service Unit in helping the small-scale farmer (Q.71,a). Table 10.10 provides farmers' responses. It is clearly shown in this table that most of the farmers' suggestions were centred on the interaction between infrastructural services and agricultural resources and their constraints (see Chapter 8). On the ecological zonal basis, it is evident that the mean number of farmers' replies is relatively higher (3.5) in Zones 1 (Ibba RC) and 3 (Maridi RC) implying that there is an urgent need of these basic facilities in the relatively drier areas. Of the sample, most farmers are most worried about the problems of pests particularly baboons as well as snails (45%) provision of boreholes, health centres and improvement of schools especially those destroyed during the Civil War (45%) and the supply of toria hoes and other implements (36.9%) in that order. These are mainly concerned with technical aspects. On the other hand, farmers are least worried about cotton markets (17.5%) which implies the low proportion of those growing the crop; and 18.8% of the farmers' concern was mainly on agricultural money loan indicating their aspiration for its institution since it is not in existence in the study area. However, it is worth mentioning that those farmers who grow both cotton and coffee in particular, as well as other crops, marketing problem is one of their major considerations (see Chapter 8). Only a small proportion of the farmers (15.6%) emphasised the need for exotic seed varieties. This implies that these varieties are just additions to their many 'traditional' varieties;

Table 10.10 : Number and percentage of farmers' suggestions of the ways in which the agricultural extension unit and officers might improve the small farmer in the study area

Suggested activity	Zone 1 (N=32)		Zone 2 (N=32)		Zone 3 (N=48)		Zone 4 (N=48)		District (N=160)	
	No.	% R.O.	No.	% R.O.	No.	% R.O.	No.	% R.O.	No.	% R.O.
Supply better tools (torias, pangas etc.)	8	25.0	7	12	37.5	2	20	41.7	59	36.9
Supply better and improved seed varieties (Serena, 9D x 7/11, Makulu Red etc.)	4	12.5	10	7	21.9	6	8	16.7	25	15.6
Instruction, visits, general techniques of farming / inputs distributed late and no warning	6	18.8	8	4	12.5	8	17	35.4	37	23.1
Remedies for pests (particularly baboons and snails)	16	50.0	3	10	31.3	4	24	50.0	72	45.0
Unify farmers to help themselves and each other (co-operation)	5	15.6	9	8	25.0	5	9	18.8	42	26.3
Better or well-trained agricultural extension staff	9	28.1	6	5	15.6	7	11	22.9	31	19.4
Supply agricultural money loan to farmers/supply local input stores	3	9.4	11	8	25.0	5	7	14.6	30	18.8
Establish coffee and cotton markets	2	6.3	12	7	21.9	6	9	18.8	28	17.5
Improved road accessibility and build bridges	11	34.4	5	8	25.0	5	13	27.1	40	25.0
Supply firearms to eradicate wild animals	13	40.6	4	10	31.3	4	7	14.6	35	21.9
Supply boreholes, health facilities and medicines/ improvement of schools	20	62.5	1	11	34.4	3	23	47.9	72	45.0
Don't know	18	56.3		14	43.8		21	43.8	69	43.1
Mean number of farmers' replies	3.59		3.25		3.46		3.02		3.38	

Source: Questionnaire Analysis
 160 Farmers in Maridi District
 Percentages more than 100 because of farmers' multiple replies advanced and rounding
 Farmers' response categories are not mutually exclusive
 R.O. = Rank Order

or that the improved varieties are already well-disseminated into the current farming environment in the study area. Several farmers also suggested extension and farm visits and instruction (23.1%). However, the 'Don't Knows' category of farmers (43.1%) represents a negative block towards technical assistance matters.

In this context, informal discussions with several farmers indicated that similar surveys as the one under consideration had been carried out and promises in regard to the improvement of their socio-economic life had also been made. So far they had not been fulfilled. As such, peasant farmers have become cynical about such promises. Other farmers' concern was centred on the low frequency of contacts with the change agents. However, it is hoped that with the improvement of infrastructural services, particularly roads and transport, incentives and regular payment of monthly salaries for the extension officers as well as the improvement of the existing difficult conditions in the villages to which extension staff are posted, the situation may induce an improvement in coverage.

In sum, the agricultural extension service in the study area still has limited significance in rural farming landscapes. Extension agents have been responsible for some of the changes taking place; however, a particularly painful constraint to the successful dissemination of the new techniques is the frequent lack of suitable training of the extension staff. This is generally portrayed in Table 10.9 by the farmers' responses for not taking extension programmes more seriously.

Thus, never having heard the results in practice of the new farming techniques they are advocating to farmers, the extensionists themselves may lack faith in the effectiveness of these methods. Therefore, instead of encouraging the spread of new farming methods and ideas, such fieldstaff are more likely to cause harm by inspiring scepticism on the part of the peasant farmers concerning the general

agricultural background of the young, Western-trained fieldstaff. Whether fair or not, it is scepticism which these change agents have to overcome (Floyd, 1977). Thus, the success of future peasant farming and improvement projects may well depend on thorough understanding of indigenous knowledge on physical and human elements and their interrelationships as well as the recognition of perceived development needs and priorities of the rural masses.

10.9 The Role Of The Project Development Unit (PDU) In Rural Development: Farmers' Attitudes And Viewpoint

The previous section of this chapter has examined the role of the PDU in the improvement of peasant farming and individual farmer's awareness or knowledge and response to this change agency have generally been noted. However, the questionnaire survey requested farmers to ascertain whether they received help from the PDU and what specifically had this agency done in their chiefs' areas (Q.71 b,c,e). These questions were specifically meant to assess farmers' awareness of the impact of the PDU at the local and regional levels. Farmers' responses are depicted in Table 10.11. This table shows that in the study area, while there are zonal differences in farmers' replies, most farmers mentioned the provision of improved (exotic) seed varieties (47.5%), establishment of coffee nursery gardens and selling of the seedlings (45.6%), provision of agricultural instruction and advice (36.9%) in that order. While only 13.1% of the farmers indicated 'good' agriculture. Farmers' responses lend support to the argument that agricultural development initiatives would be adopted if inputs are made available.

On the other hand, farmers' general attitudes and viewpoint on those activities which should be avoided or given up by the PDU in the study area were investigated (Q.71f). Table 10.12 indicates farmers' replies with most of them noting that the PDU extension should not favour

Table 10.11 : Number and percentage of farmers' responses indicating the activities of the Project Development Unit (PDU) in the study area

Activities mentioned	Zone 1 (N=32)		Zone 2 (N=32)		Zone 3 (N=48)		Zone 4 (N=48)		District (N=160)	
	No.	%	No.	%	No.	%	No.	%	No.	%
Distribution of pesticides(Thiodian, Malathion)	9	28.1	12	37.5	15	31.3	21	43.8	57	35.6
Agricultural information, instruction and advice	8	25.0	14	43.8	14	29.2	23	47.9	59	36.9
Establishment of coffee nurseries, sell coffee seedlings	10	31.3	21	65.6	16	33.3	26	54.2	73	45.6
Provision of improved seed varieties (sorghum + G/N)	12	37.5	17	53.1	19	39.6	28	58.3	76	47.5
Supply of coffee equipment or tools (secateurs, saws etc.)	5	15.6	10	31.3	10	20.8	18	37.5	43	26.9
'Good' agriculture	2	6.3	5	15.6	5	10.4	9	18.8	21	13.1
Mean number of activities/ responses per farmer	1.44		2.47		1.65		2.60		2.06	

Source : Questionnaire Analysis
160 Farmers interviewed in Maridi District
Percentages more than 100 because farmers provided more than one answer and rounding
Farmers' response categories mentioned are not mutually exclusive

Table 10.12 : Number and percentage of farmers' responses on the activities that the Project Development Unit (PDU) should give up in the study area

Suggested activities	Zone 1 (N=32)		Zone 2 (N=32)		Zone 3 (N=48)		Zone 4 (N=48)		District (N=160)	
	No.	%	No.	%	No.	%	No.	%	No.	%
Should not discourage intercropping with food crops	5	15.6	8	25.0	9	18.8	12	25.0	34	21.3
Not to favour certain farmers and local leaders	7	21.9	11	34.4	12	25.0	15	31.3	45	28.1
Not to delay selling toria hoes and other implements at <u>right</u> times	4	12.5	2	6.3	16	33.3	14	29.2	36	22.5
To stop making unkept promises concerning money loan and other inputs	6	18.8	9	28.1	8	16.7	10	20.8	33	20.6
Not to send to farmers untrained extension staff	3	9.4	6	18.8	10	20.8	13	27.1	32	20.0
Others	1	3.1	2	6.3	2	4.2	3	6.3	8	5.0
Mean	0.81		1.19		1.19		1.40		1.18	

Source: Questionnaire Analysis

160 Farmers interviewed in Maridi District

Farmers were able to offer more than one response

certain categories of the local people particularly the chiefs and Government officials (28.1%). A larger proportion (22.5%) of the farmers emphasised the delay and irregular distribution of PDU new inputs especially the improved toria hoes and coffee implements. This reflects the problems of availability and distribution of new inputs to the farmers as mentioned in Chapter 8. Other requests or suggestions include unkept promises made by some extension staff in regard to agricultural loans.

In this context, some peasant farmers generally expect necessary changes and help to come mainly from the formal agencies (outsiders) particularly the Government, rather than looking at what they can do themselves. Thus, having imbibed 'etic' notions about their farming systems, farmers consider themselves as incapable to contribute significantly anything better because things are being performed differently in the 'modern' life of today. In fact during the survey period, several farmers (especially coffee growers) attempted to use the research team as a medium through which their major problems and in particular their appeal for money loans and other aids could get through to the Government leaders and particularly the Ministry of Agriculture and Natural Resources.

In general, the prosperity and happiness of the peasant farmers find their security in the farming base, and where rural development proposes to strengthen the agricultural environment, farmers react with interest. But where rural development does not incorporate 'traditional' farming management practices and techniques as well as the improvement or provision of basic infrastructural facilities essential for agricultural development, then farmers aspire for these basic facilities from those interested in aiding them. On the other hand, farmers generally respond negatively to those innovations which are not easily accommodated into the 'traditional' farming management practices.

There is much scope for the improvement or refinement of the survey methods applied in this study and the intensification of research as a central contribution to rural development planning. It is important that attitudinal scale studies and farmers' perceptions, viewpoints and the socio-economic development priorities could be promoted by change agencies or administrators in the Sudan and therefore incorporated into the machinery of policy-making and implementation institutions. This may be the root of community development work. Farmers should be partners in the planning procedures, and where opportunities which they consider rational do arise within their means, they are prepared to respond positively but with caution.

10.10 Farmers' General Attitudes Towards Innovation And Change

The questionnaire survey included some attitude scale statements and questions (Q.76-92) to ascertain the extent to which an individual farmer has an interest to innovate. It was generally assumed that those farmers responding positively to the questions or statements (renumbered in Tables 10.13,A,B) (Q.1-3, Q.11) in the innovation scale were generally expressing their willingness to innovate. Thus, if a farmer is not satisfied with the prevailing socio-economic conditions, he is likely to become interested in experimenting with the new ideas and practices and innovates more than his counterpart who is satisfied with his present status quo. Additionally, farmers' negative responses to those statements or questions (Q.7,8 and Q.16,17) which relate to 'traditional' attitude and non-innovation generally indicate the wish to innovate the new agricultural techniques and practices.

In this survey, it was initially planned to test all farmers in the entire sample. But due to experiences gained in the pre-testing of the questionnaire coupled with the logistic time and resource constraints, nearly half of the sample (70 farmers) were interviewed - 35 farmers from

Table 10.13 (A) Number and percentage of farmers' responses on attitudes towards innovation and change according to social distinction in the study area

Statement/Question	Zones 1 and 2(Ibba Rural Council (N=35)				Zones 3 and 4 (Maridi Rural Council(N=35))			
	Total sample agreeing and disagreeing		Respondents agreeing		Total sample agreeing and disagreeing		Respondents agreeing	
	No.	%	No.	%	No.	%	No.	%
(1) Do you want to learn new ways to farm?	28	100.0	19	67.9	7	100.0	30	90.9
(2) If the farm demonstrator gave a talk would you attend?	28	100.0	21	75.0	7	100.0	29	87.9
(3) Becoming a success in life is a matter of hard work, luck has little or nothing to do with it	28	100.0	21	75.0	7	100.0	29	87.5
(11) If your Government would help you establish an 80-feddan farm elsewhere would you move?	27	100.0	20	74.1	8	100.0	28	87.5
Sub-total	111	100.0	81	73.0	29	100.0	116	88.5
(7) A farmer should try to farm the way parents did	30	100.0	10	33.3	5	100.0	18	64.3
(8) The agricultural instructors do not know any more farming than 'traditional' authority	24	100.0	6	25.0	11	100.0	10	66.7
(16) It is too risky to try new farming techniques and practices	32	100.0	18	56.3	3	100.0	20	74.1
(17) This world is run by the few people in power, there is not much the small farmer can do about it	29	100.0	18	62.1	6	100.0	19	76.0
Sub-total	115	100.0	52	45.2	25	100.0	67	70.5
Grand total	226	100.0	133	58.8	54	100.0	183	81.0

Source: Questionnaire Analysis
70 Farmers interviewed in Maridi District
'Innovative' farmers would first answer 'yes' to questions 1,2,3 and 11 and 'no' to questions 7,8, 16 and 17.

Table 10.13 (B) : Number and percentage of farmers' responses on attitudes towards innovation and change according to ecological distinction in the study area

Statement/question	Zones 1 and 3 (Relatively dry zones (N=35))				Zones 2 and 4 (Relatively wet zones (N=35))			
	Total sample agreeing and disagreeing		Respondents agreeing		Total sample agreeing and disagreeing		Respondents agreeing	
	No.	%	No.	%	No.	%	No.	%
(1) Do you want to learn new ways to farm?	27	100.0	20	74.1	34	100.0	29	85.3
(2) If the farm demonstrator gave a talk would you attend?	27	100.0	21	77.8	34	100.0	28	82.4
(3) Becoming a success in life is a matter of hard work, luck has little or nothing to do with it	29	100.0	20	69.0	32	100.0	26	81.3
(11) If your Government would help you establish an 80-feddan farm elsewhere would you move?	34	100.0	29	85.3	35	100.0	19	54.3
Sub-total	117	100.0	90	76.9	135	100.0	102	75.6
(7) A farmer should try to farm the way parents did	26	100.0	13	50.0	29	100.0	18	62.1
(8) The agricultural instructors do not know any more farming than 'traditional' authority	18	100.0	9	50.0	29	100.0	18	62.1
(16) It is too risky to try new farming techniques and practices	29	100.0	16	55.2	30	100.0	22	73.3
(17) This world is run by the few people in power, there is not much the small farmer can do about it	26	100.0	15	57.7	28	100.0	22	78.6
Sub-total	99	100.0	53	53.5	116	100.0	80	60.7
Grand total	216	100.0	143	66.2	251	100.0	182	68.5

Source: Questionnaire Analysis

70 Farmers interviewed in Maridi District
'Innovative' farmers would first answer 'yes' to questions 1,2,3 and 11 and 'no' to questions 7,8,16 and 17.

each of the two rural councils of Ibba and Maridi. Four farmers were therefore selected from each of the 16 sample villages and three more from each of the two relatively nearest sample sites (Nagbaka:Zone 1 and Malingdo II:Zone 4) from Ibba and Maridi headquarters. The selection of the three more farmers from these two sample sites was based on their nearness to these towns where the rate of farmers' contacts with the extension staff and indirect urban influences are expected to be relatively high in the study area.

In designing a scale to assess farmers' attitudes towards innovation in the study area, each farmer selected was requested to respond to each of the statements or questions in terms of one of three alternatives, whether he/she agreed, disagreed, or was undecided about the idea expressed. However, it is worth mentioning that during the questionnaire administration, some questions or remarks associated with some object under consideration and which could be answered positively or negatively by both farmers with 'innovative' or 'traditional' attitudes alike were omitted from the analysis. Farmers' responses were then aggregated and shown on the rural council scale basis (social or cultural basis). That is Zones 1 and 2 (Ibba RC) compared with Zones 3 and 4 (Maridi RC) (see Table 10.13(A), and Zones 1 and 3 as compared with Zones 2 and 4 (an ecological distinction) (see Table 10.13(B)). However, the size of the sample and nature or quality of the data precluded the use of statistical analysis.

Table 10.13(A) clearly shows that 88.5% of the farmers in Zones 3 and 4 (Maridi RC) have expressed the need to innovate and change as compared with 73% of their counterparts in Zones 1 and 2 (Ibba RC). In particular, 90.9% of the farmers in Zones 3 and 4 wanted to learn new agricultural techniques and practices as contrasted with 67.9% of them in Zones 1 and 2. Farmers' greater wish in Zones 3 and 4 to try

the new ideas is also re-inforced by most farmers indicating hard work as the only goal to success in life (87.9%), to attend a demonstration talk (87.9%) and to join a Government agricultural scheme for employment opportunities (87.5%) compared with 75% of the farmers in each of Zones 1 and 2 respectively, and only 74.1% wished to join a Government scheme for wages.

Considering Tables 10.13 (A) and 10.13(B), while there are insignificant ecological differences, surely they suggest differences in farmers' willingness to innovate - mainly due to cultural distinctions rather than ecological variations which are summarised below:

Table 10.13(A) cultural differences: 73.0% cf 88.5%) Larger differences
or 58.8% cf 81.0%) and both going in
same direction.

Table 10.13(B) ecological differences:

76.9% cf 75.6%	) Very small differences) and going in opposite) direction.
or 66.2% cf 68.5%	

There is no direct explanation for this variation but cultural differences are the likely effects on farmers' attitudes towards change and innovation. In fact, Catford (1953) notes that the lives of the tribes especially among the Azande are governed, to a considerable degree, by superstitious beliefs and practices involving various processes of divination and their apathy to change and innovation. However, this is a matter of generalisation since there are individual farmer differences in agricultural practice and systematic experimentation of new farming methods or inputs within the same apathetic community. Farmers' propensity and their attitudes to innovate in the study area may be due to their differential rates of contact with the change agents as well as the degree of urban influences and cultural contacts through migration and trading relationships.

In sum, this section has shown that farmers' attitudes towards innovation and change in the study area are, to some degree, mainly related to cultural differences and rather less to ecological variations.

10.11 Trends In Farming And Land Use Strategies : Farmers' Viewpoint

There is a general consensus held by some scientists concerned with the development of 'traditional' agriculture in the Third World countries that farmers are naive or not innovative; that their farming methods and practices once having developed, have remained unchanged for generations. As such, farming systems may be beautifully adjusted to social requirements and environmental circumstances (e.g. De Schlippe, 1956), but they are outmoded, it is supposed. The evidence often advanced is that farm equipment and operations, management strategies, crop combinations and the farming rhythm seem not to have changed over a long time. In fact, this is part of a set of assumptions which have given rise to the so-called 'appropriate' or rather 'intermediate' technology which is fit for the general socio-economic circumstances of the rural population. The presumption is that the pre-industrial economies are not able to absorb dramatic innovation or to change easily and quickly. The rural people should then be provided with farm equipment innovations that readily 'slot' into the existing socio-economic and institutional structures. 'Small' is said to be beautiful for the small-scale farmers, while 'large' has been the lynch-pin of better productivity, higher crop output and better material standards of living in the industrialised societies.

The application of 'modern' technology in the 'traditional' societies brings about dramatic and substantial changes, but it must be very clearly stated that innovation and changes desired by farmers,

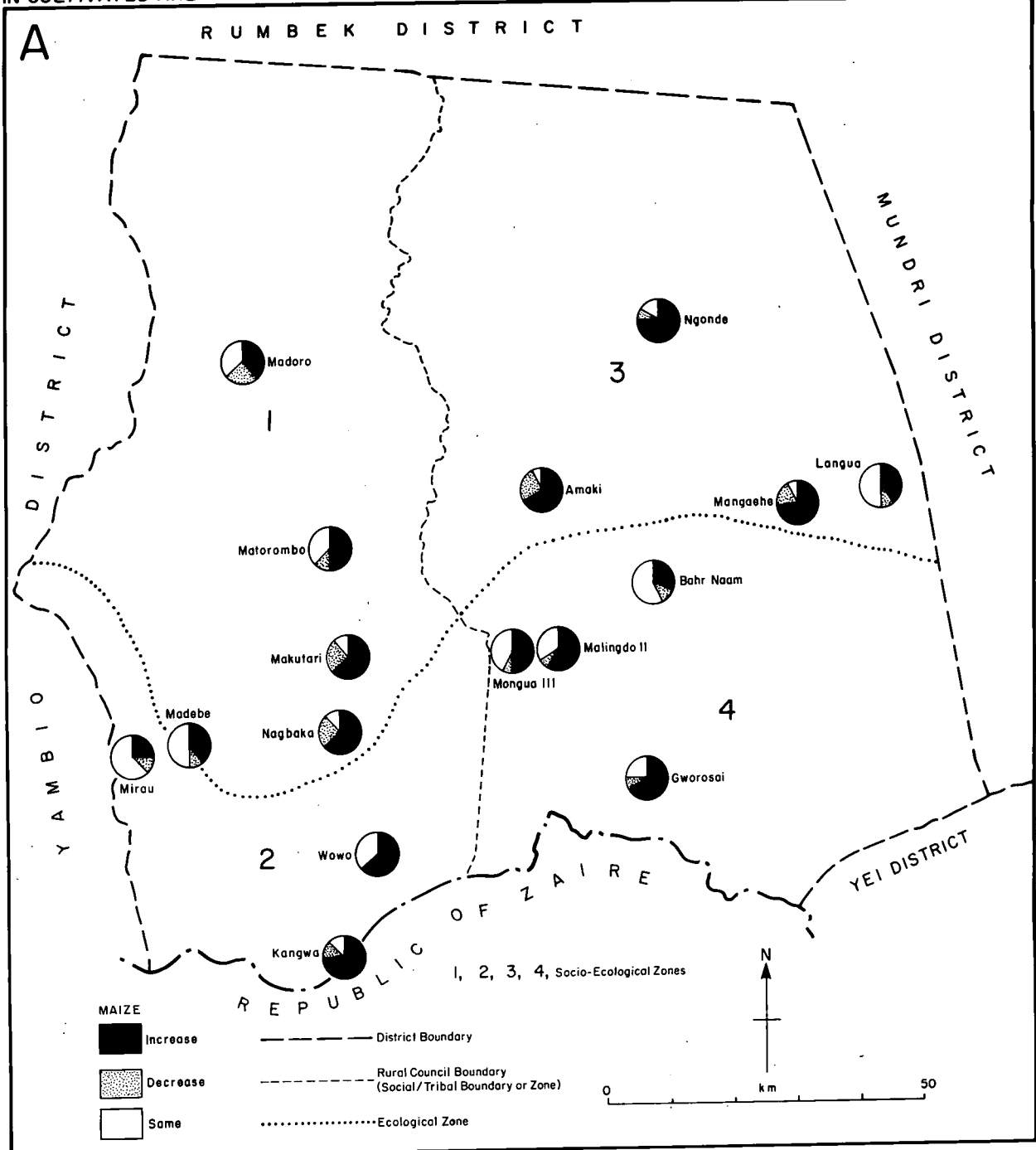
however slow, are normal features of the system (Knight, 1974; 1977; Collinson, 1972; Ruthenberg, 1980). Without a continuous series of experiments, adjustments and modifications, the present farming systems could never have been devised and maintained. In section A of this chapter, it has been demonstrated that the 'traditional' farming is, to some extent, a dynamic economy, and the capability of peasant farmers in the study area to identify agricultural and environmental problems and their management strategies as well as their response to innovations (which are within their means or power) is appreciable. In this context, the limits to change are not determined by farmers' lack of motivation, ignorance or conservation attitudes but by bureaucratic or administrative physical conditions, technical and financial institutions, which by using their own analyses and language of comprehension deprive the peasant farmers of the initiative they have been assumed to lack.

The aim of this section is to provide a brief note on the farmer and his changing land use strategies in the study area. Specifically, farmers' attitudes, perceptions and their evaluation of land use management are brought into the focus of discussion. In Chapter 5, some of the aspects of agricultural land use changes in the study area had been mentioned in the discussion of the katiri system. With increasing population, particularly on available cultivable and relatively fertile land and around the main centres and larger villages, this system of land use is decreasing in significance, and now is confined to areas of relatively low population density and dispersed settlement. Mention was also made in Chapter 5 that some food crops (e.g. sorghum varieties of nyarango, moro, ndala and cassava) were widely reported to be increasing in popularity throughout the study area in general, with special concentration in particular zones due to socio-economic and environmental circumstances. Crops like sweet potatoes were also widely reported to be

diminishing in importance throughout the study area. Some of the related reasons for the increase and decrease in importance of the above-mentioned crops and others have also been noted. However, it is worth mentioning that to construct a picture of agricultural dynamics in the study area without reliable long-term data and aerial photographs is more or less difficult. In fact it is unreasonable to expect peasant farmers to recall precisely and reliably report upon farm sizes where no records for such information are kept.

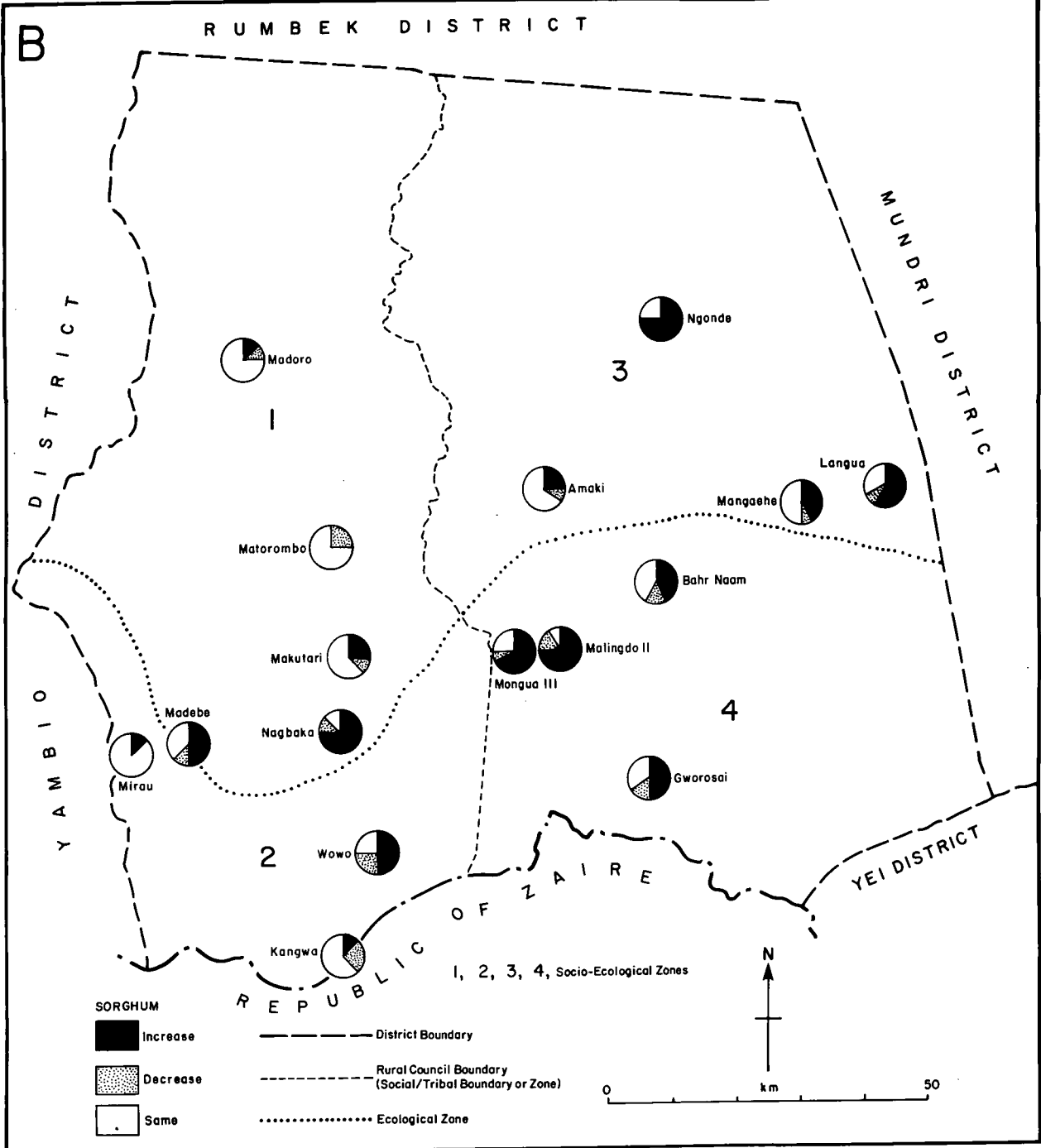
The questionnaire survey therefore looked at some of the general aspects of land use and farmers were requested to indicate whether (in relative terms) their farms during the survey period were any different from those of the previous year prior to this survey (Q.19a,b). They were specifically asked to note particular changes in land use of some of the crops grown and whether their farmholdings were larger (increase), smaller (decrease) or no change (same). Fig.10.2 A-F (and summarised by zones in Fig.10.2 G-I) clearly illustrates farmers' responses (see also Appendix 15, A, B). Of the sample 56.6% of the farmers have increased their areas under maize with high proportions of them in Zones 1 (53.1%) and 3 (64.6%). Areas under cassava have also been expanded by 45.6% of the farmers with the majority of these in Zones 2 (46.9%) and 4 (58.3%). About 44% of the farmers reported a decrease in areas under cotton with most of these in Zones 1 (59.4%) and 2 (59.4%). As cotton is considered by most farmers as a 'Government crop' with its marketing system largely controlled by EPAPC and which have, to some degree, failed to meet the needs of the peasant farmers in terms of secured prices with minimal delays in the transaction, it is not surprising that the crop is decreasing in importance. In fact, there is a high tendency among farmers to grow coffee rather than cotton (see Chapters 9 and 11).

Fig 10·2 (A) to(F): PERCENTAGE OF CROPS IN FIELDS WITH AN INCREASE, DECREASE AND NO CHANGE (SAME) IN CULTIVATED AREAS MEASURED FROM FARMERS' RESPONSES



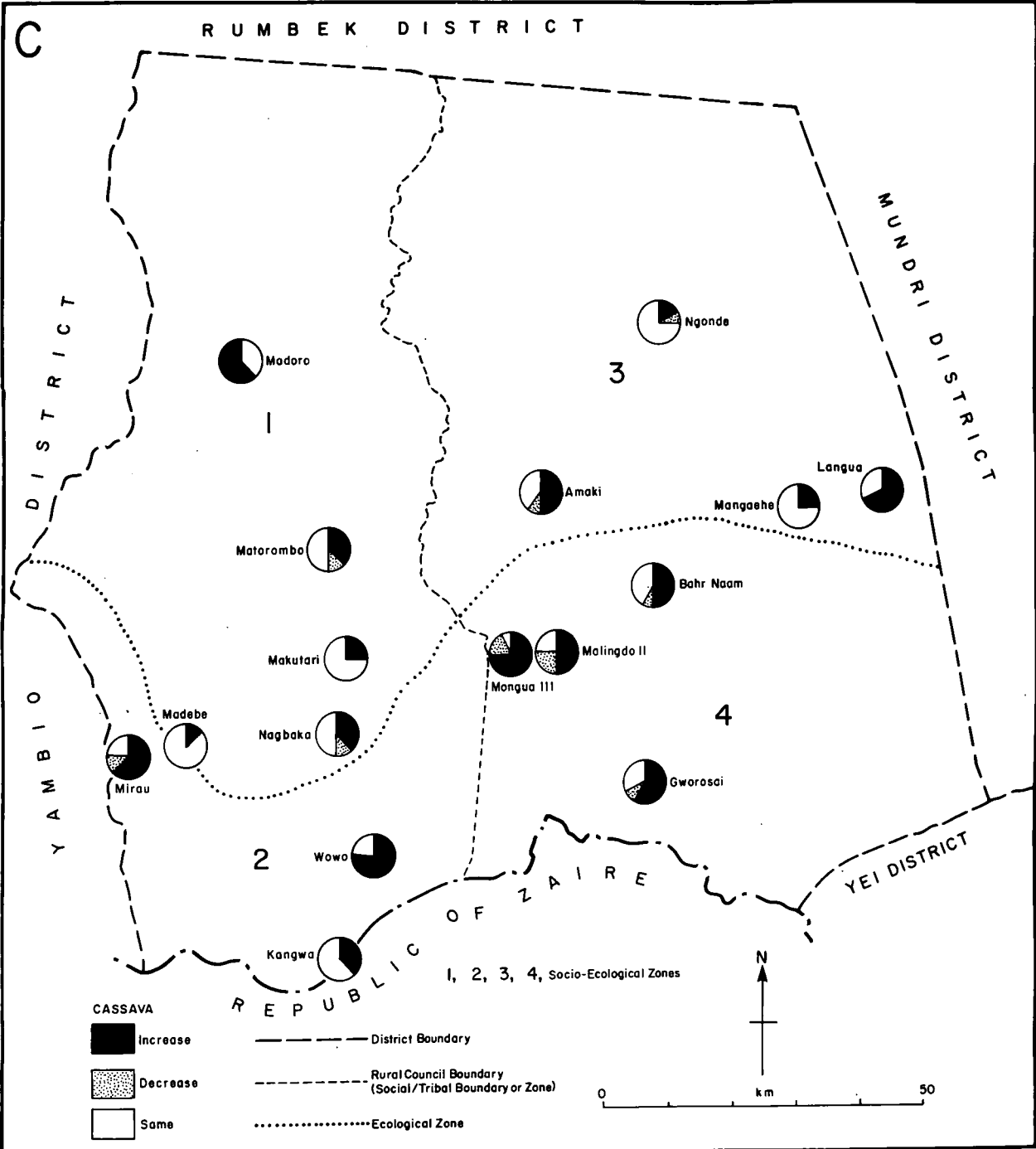
Source: Fieldwork Data

Fig 10-2



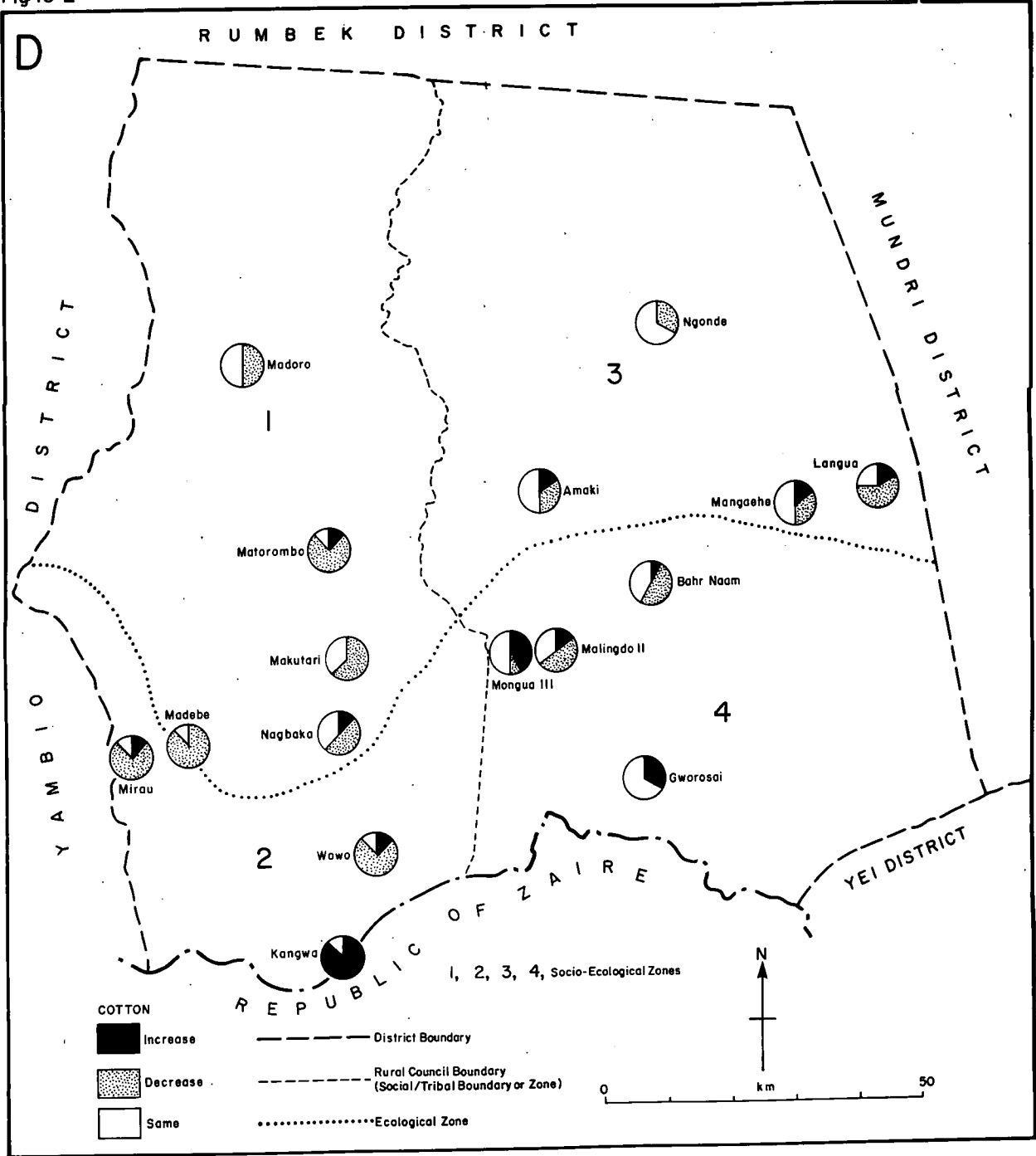
Source: Fieldwork Data

Fig 10.2



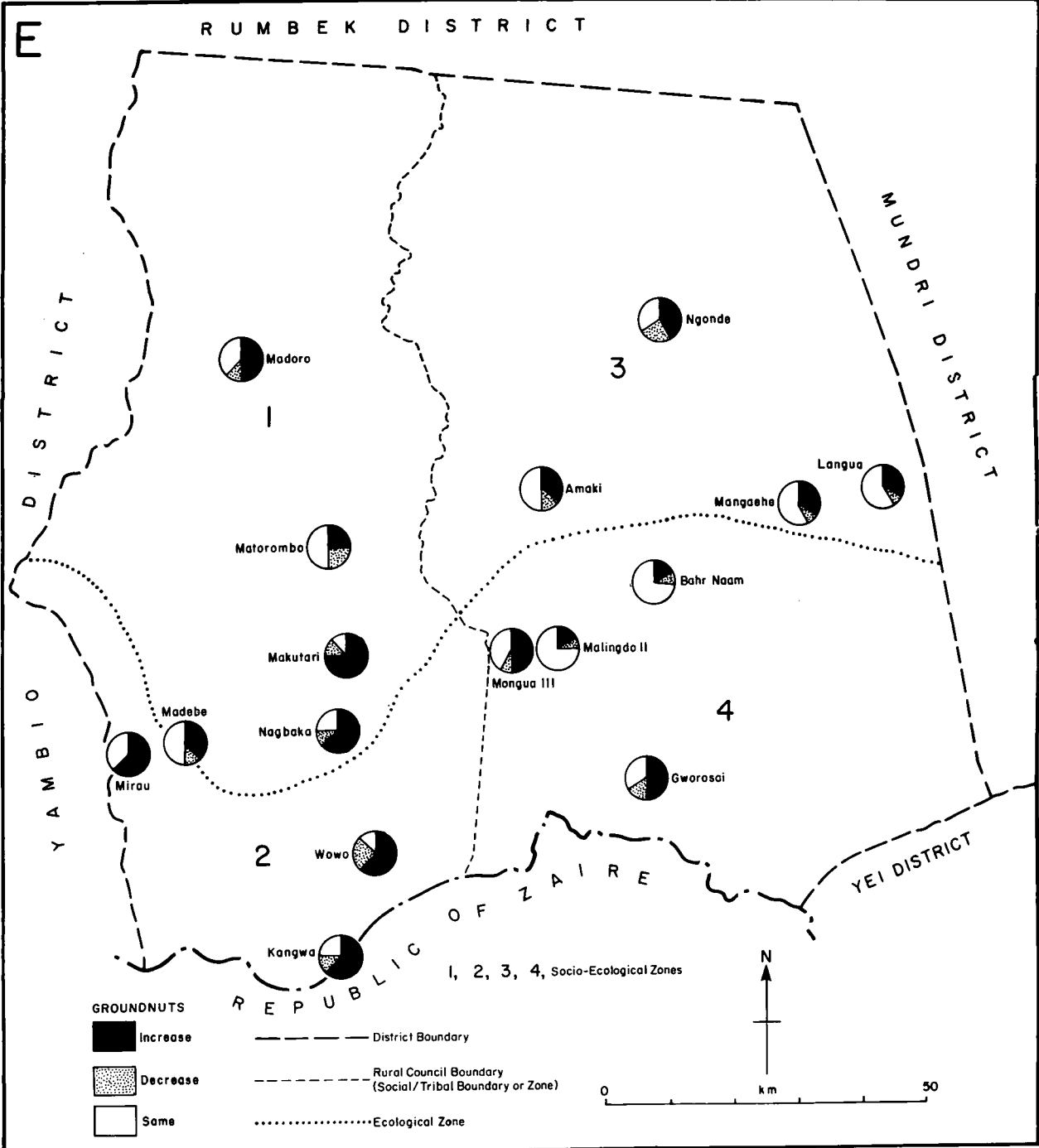
Source: Fieldwork Data

Fig 10-2



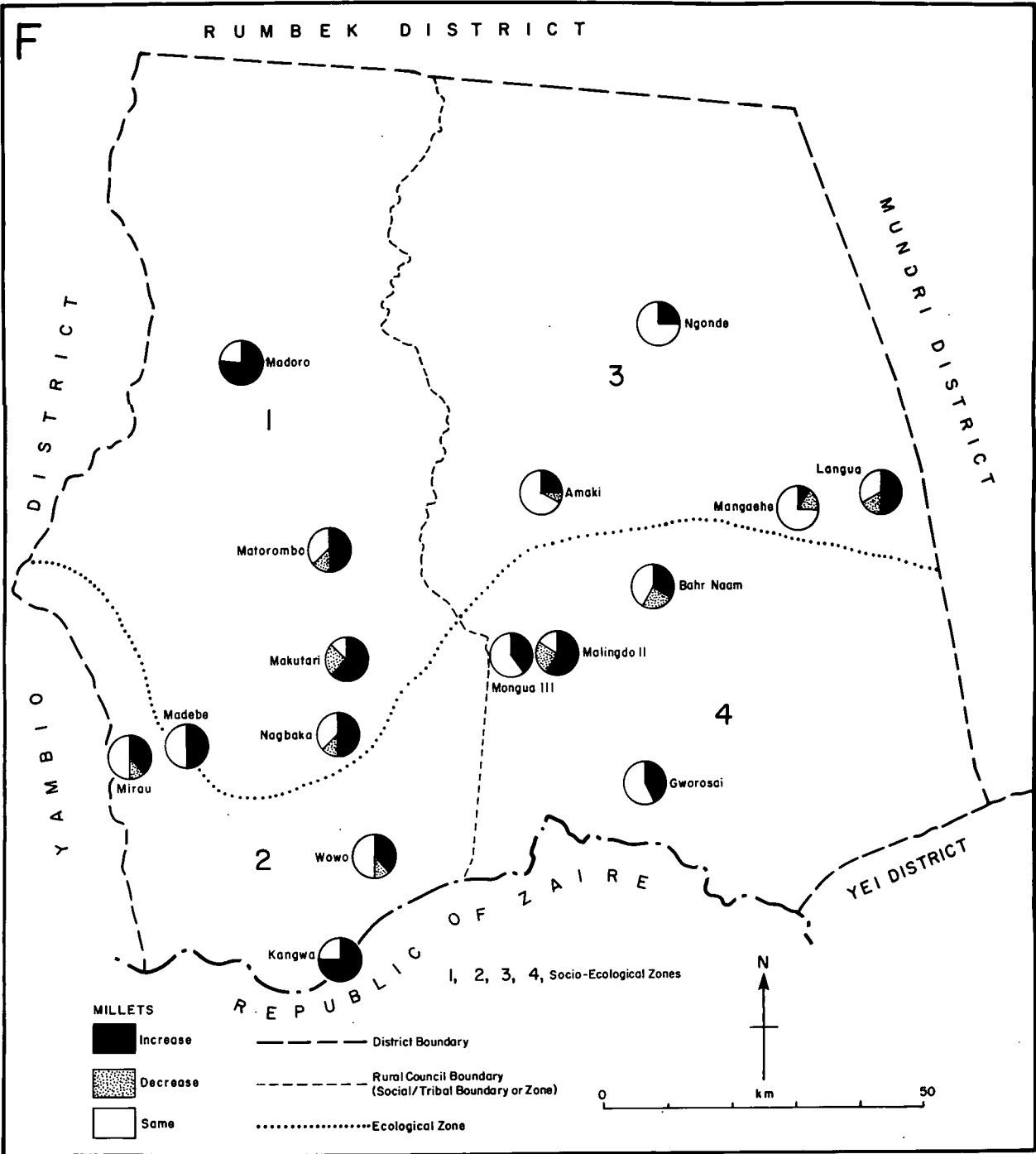
Source: Fieldwork Data

Fig.10-2



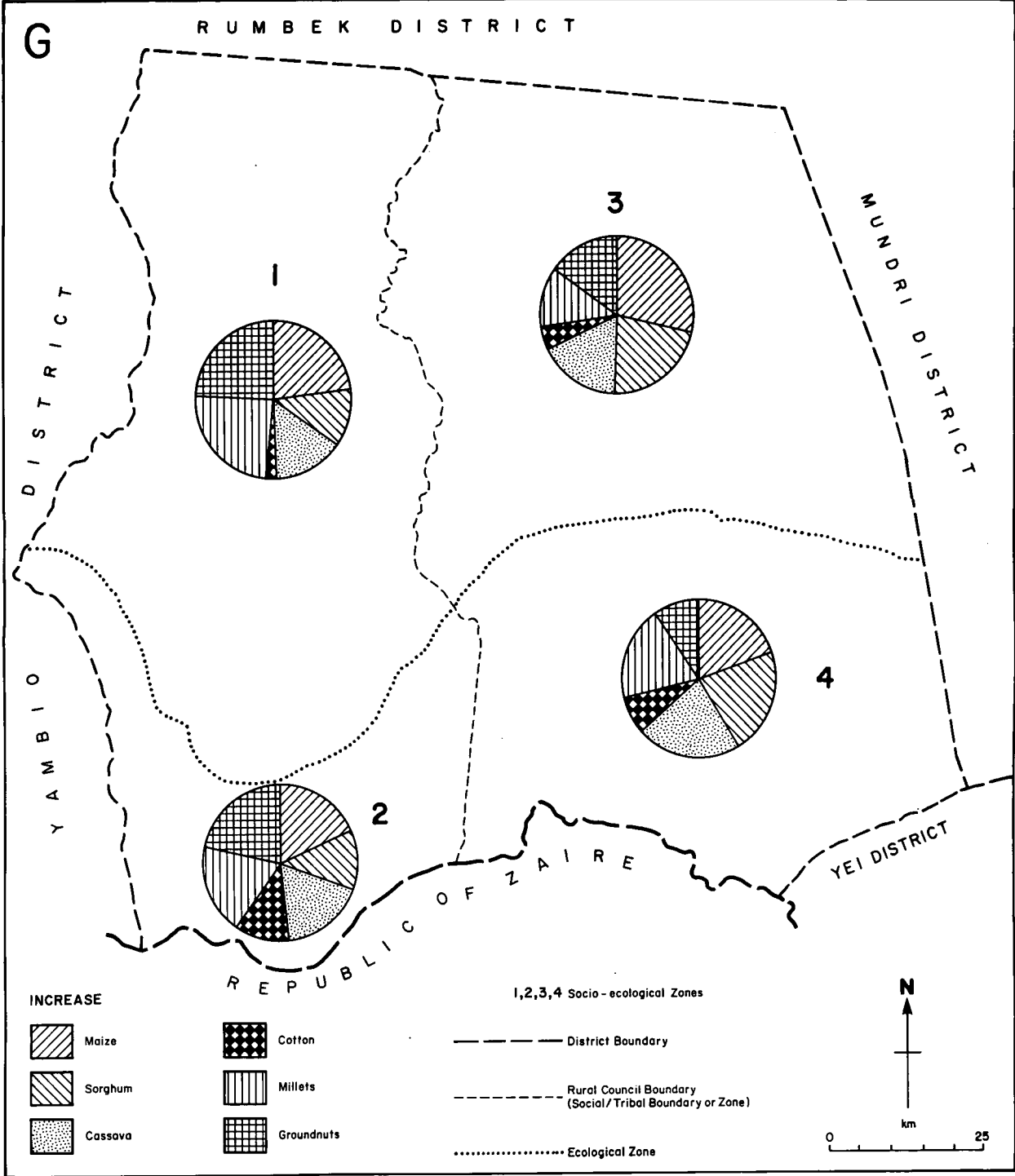
Source: Fieldwork Data

Fig 10-2



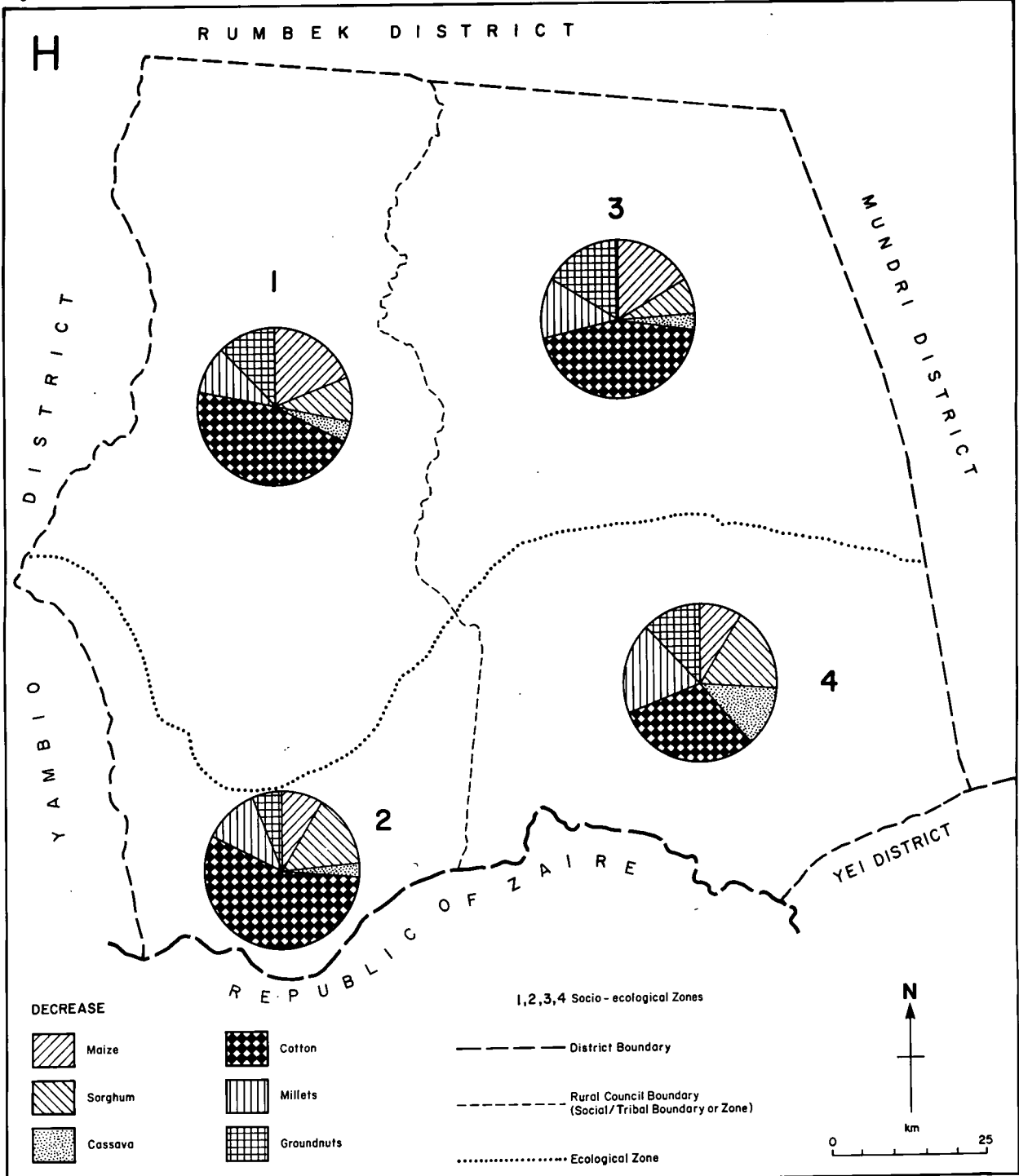
Source: Fieldwork Data

Fig.10-2 (G) to (I) ZONAL SUMMARY OF THE PERCENTAGE OF CROPS IN FIELDS WITH AN INCREASE, DECREASE AND NO CHANGE (SAME) IN CULTIVATED AREAS MEASURED FROM FARMERS RESPONSES



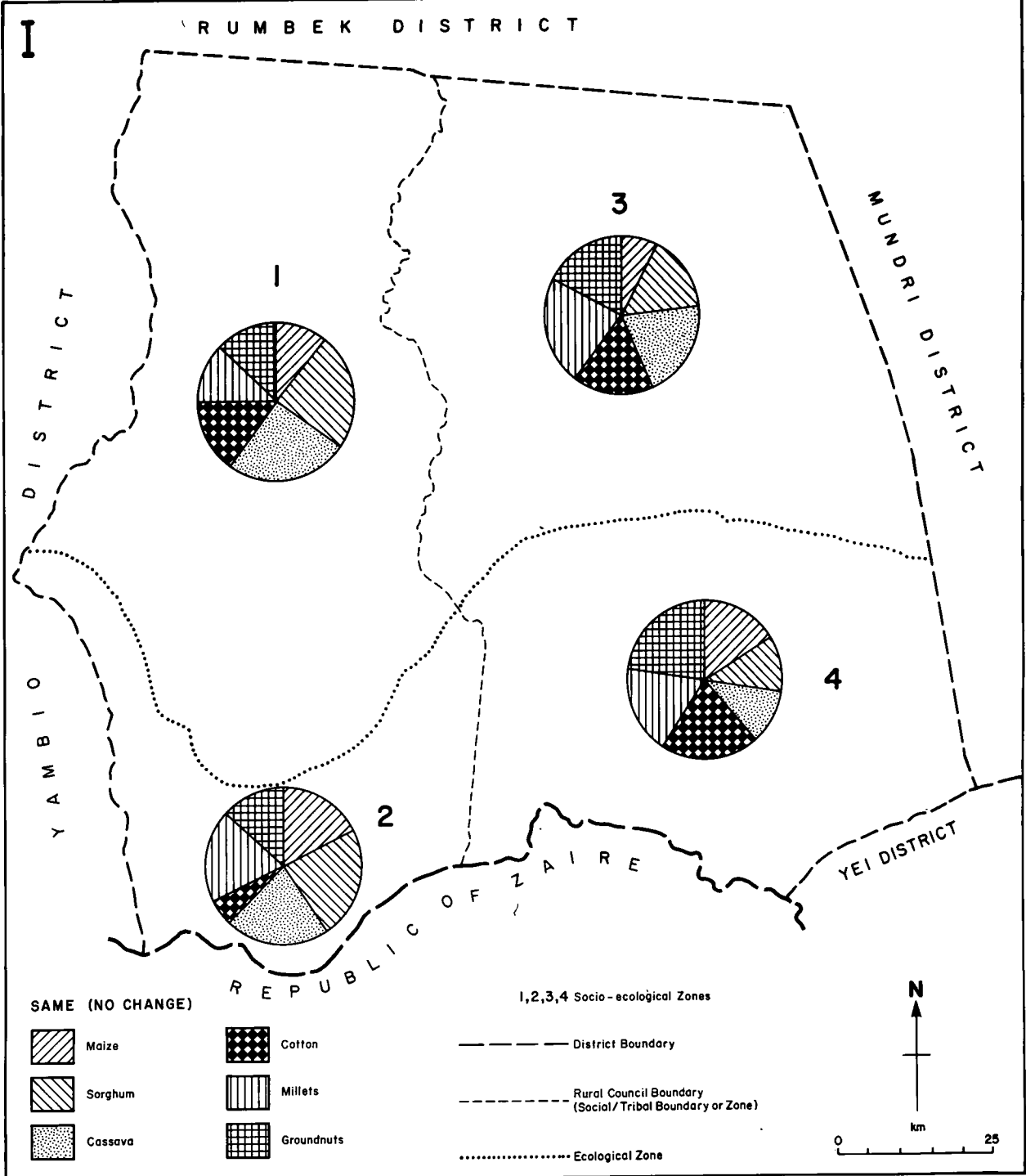
Source: Fieldwork data

Fig 10·2



Source: Fieldwork data

Fig. 10·2



Source: Fieldwork data

Various reasons have been advanced by farmers to explain farm management strategies undertaken to provide some evidence of the types of agricultural opportunities and constraints locally experienced in the study area. Of the farmers with increase of crops, about 60% of these in Zone 3, 75% (Zone 4), 45% (Zone 1) and 55% (Zone 2) made such a move because of a relatively larger family labour input and the need for extra food for sustenance. However, about 50% of the farmers acknowledged the need for more cash to meet social and economic obligations (e.g. Chapter 8) and to acquire other mass consumer manufactured items. 10% of the farmers, however, received some cash from relatives working in the main centres and thus were able to command hired labour. This acts as a relevant 'push' factor for the decision to increase crop areas. About 52% of the farmers, however, cited several reasons for the decrease of crop areas and these include: Lack of seeds, sickness and social obligations, labour supply difficulties, old age and that children were in school; 8% of the farmers reported lack of rain and crops were burnt ('The Sun') or that rains started late among others, as possible explanations. Of the farmers whose farms remained the same (no change), the majority said that their farms are no different from those of their ancestors or parents. However, it is emphasised that the latter response category is likely to defend the sort of 'traditional' farming practices considered by farmers as 'effective'.

During the administration of the questionnaire, farmers were further requested to indicate their contemplated plans and agricultural land use strategies for the 'next year' and their reasons for doing so (Q.63a,b). Farmers' replies are therefore summarised in Tables 10.14(A) and 10.14(B). In the study area, most farmers were able to provide various responses with an average of approximately 6 replies per farmer.

Table 10.14(A) : Trends in farming and farmers' responses on the changes desired in farming for 'next year' in the study area

Sample area		Zone 1 (N=32)		Zone 2 (N=32)		Zone 3 (N=48)		Zone 4 (N=48)		District (N=160)						
Change desired		No.	% R.O.	No.	% R.O.	No.	% R.O.	No.	% R.O.	No.	% R.O.					
Grow more food crops		18	56.3	2	20	62.5	2	31	64.6	1	30	62.5	3	99	61.9	1
Plant more cash crops (especially coffee)		15	46.9	5	19	59.4	3	29	60.4	2	31	64.6	2	94	58.8	3
Expand farm sizes		12	37.5	7	14	43.8	6	28	58.3	3	29	60.4	4	83	51.9	4
Use more hired labour/Beer working parties		10	31.3	9	12	37.5	8	29	60.4	2	32	66.7	1	83	51.9	4
Change the present farm site to a new location		16	50.0	4	11	34.4	9	20	41.7	9	22	45.8	9	69	43.1	7
Reduce cotton farms/Gives up growing cotton		23	71.9	1	21	65.6	1	25	52.1	4	27	56.3	6	96	60.0	2
Experiment to plant exotic sorghum varieties of PDU		11	34.4	8	15	46.9	5	21	43.8	8	26	54.2	7	73	45.6	6
Thorough weeding/Make fire breaks paths around farms		10	31.3	9	13	40.6	7	18	37.5	10	21	43.8	10	62	38.8	10
Use more <u>toria</u> hoes/Coffee implements and insecticide		14	43.8	6	18	56.3	3	22	45.8	7	28	58.3	5	82	51.3	5
Make fence of brushwood around farms/Guard crops from animals		9	28.1	10	10	31.3	10	23	47.9	6	24	50.0	8	66	41.3	9
Plant less sweet potatoes		8	25.0	11	16	50.0	4	24	50.0	5	19	39.6	11	67	41.9	8
Everything depends on God/If rainfall starts on time/ Wait and see		6	18.8	12	4	12.5	11	10	20.8	12	12	25.0	13	32	20.0	12
Don't know		17	53.1	3	11	34.4	9	16	33.3	11	18	37.5	12	62	38.8	11
Mean number of responses/farmer		5.28		5.75		6.17		6.65		6.05						

Source: Questionnaire Analysis
 160 Farmers interviewed in Maridi District
 Farmers were able to provide more than one response and the categories are not mutually exclusive

Table 10.14(B) : Number and percentage of farmers' reasons for proposing particular strategies for the farm 'next year' in the study area

Sample area		Zone 1 (N=32)		Zone 2 (N=32)		Zone 3 (N=48)		Zone 4 (N=48)		District (N=160)						
Reason for desired change		No.	% R.O.	No.	% R.O.	No.	% R.O.	No.	% R.O.	No.	% R.O.					
More food for subsistence and to avoid hunger		11	34.4	5	13	40.6	3	21	43.8	3	23	47.9	4	68	42.5	3
To obtain more cash income especially from coffee		10	31.3	6	12	37.5	4	18	37.5	5	19	39.6	6	59	36.9	7
Expansion of farms brings more food and cash crops		9	28.1	7	10	31.3	6	14	29.2	7	16	33.3	9	49	30.6	9
Hired labour enables cultivation of larger farms/ children are at school		6	18.8	9	6	18.8	9	4	8.3	10	10	20.8	11	26	16.3	12
Present farm site is 'tired'(exhausted) because of poor crops		13	40.6	3	12	37.5	4	19	39.6	4	22	45.8	5	66	41.3	4
Cotton has less market/last year's produce not bought		19	59.4	1	15	46.9	2	22	45.8	2	17	35.4	8	73	45.6	2
Exotic varieties are quick-maturing		8	25.0	8	9	28.1	7	12	25.0	8	19	39.6	6	48	30.0	10
Thorough weeding allows crops to grow healthy		14	43.8	2	13	40.6	3	19	39.6	4	18	37.5	7	64	40.0	6
Torria hoes dig deeper soils/coffee implements are efficient		12	37.5	4	11	34.4	5	18	37.5	5	24	50.0	3	65	40.6	5
More crops could be harvested if properly guarded from animals		10	31.3	6	16	50.0	1	25	52.1	1	28	58.3	1	79	49.4	1
Not enough labour/cassava will be grown		9	28.1	7	7	21.9	8	17	35.4	6	18	37.5	7	51	31.9	8
For 'security and up-keep of children' and family in general		4	12.5	10	3	9.4	11	10	20.8	9	13	27.1	10	30	18.8	11
Because neighbours did same thing		2	6.3	11	5	15.6	10	18	37.5	5	26	54.2	2	51	31.9	8
Average number of reasons/farmer		3.97		4.13		4.52		5.27		4.56						

Source : Questionnaire Analysis R.O. = Rank Order
160 Farmers interviewed in Maridi District
Farmers could advance more than one reply
Some Farmers' response categories are not mutually exclusive

38.8% of the farmers stood as a negative block and did not have any proposed plans for land use changes. It is clearly shown in Table 10.14(A) that the main future concerns of farmers were focused on the need to grow more food crops (61.9%), decrease of cotton growing or abandoning it (60%) and the general expansion of areas for various crops (51.9%) in that order. Again on the zonal considerations, it appears that in Zones 1 and 2 (Ibba RC), the majority of the farmers were concerned with the decrease of cotton growing (and food crops increase) with 71.9% and 65.6% of the respondents falling into this category respectively. On the other hand, in Zones 3 and 4 (Maridi RC) most farmers' interests were focused on the increase of food and cash crops and the use of hired labour with 64.6% and 66.7% of them mentioning these categories respectively. However, a small proportion (20%) of the farmers had less hope for improving their agriculture but would rather 'wait and see' since everything depends on God - the source of all 'good' things in particular, rainfall (see Chapter 3).

Table 10.14(B) depicts some of the farmers' reasons advanced for adopting particular strategies and future plans. A larger proportion of the farmers were concerned with the total loss of crops through animal depredation (49.4%) i.e. minimisation of maximum potential losses; 45.6% of them again had plans to reduce cotton growing because of the marketing constraints as noted earlier in this section. Other reasons advanced by farmers include the need for food surplus for household requirements and cash (42.5%); 41.3% of these planned to change the farm site to another new area due to the loss of soil fertility (in farmers' own words - soil is 'exhausted' or 'tired'). Only 16.3% of them intended to employ paid labour whether in cash or kind.

In sum, this section has shown that farmers' decision-making procedures in relation to the utilisation of available resources are focused on the attainment of particular desired objectives that influence them into action. In the discussion of some of the land use strategies and crop production, it has been noted that farmers have made some changes such as the acreage of areas under food and cash crops. However, those farmers who have relatively increased or proposing to increase food crop areas are in many cases subsistence-motivated. Subsistence elements such as the need for more food and the existence of more mouths to feed, certainly loom as large as the cash-oriented factors, e.g. 'to earn more income' and 'to pay children's education' etc. are some of the farmers' explanations for the adoption of particular strategies. Thus, if this subsistence (or satisficing) thread in the study area is ignored, then it might be difficult to mobilise community support for and interest in some of the broader issues of environmental resource management. In general, socio-economic and environmental factors seem to play a significant role in farmers' decision-making procedures in regard to land use strategies adopted or planned. The next chapter, however, focuses further on the impact of coffee as a cash crop development and its incorporation into the 'traditional' land use systems in the study area.

CHAPTER ELEVEN

SOME ASPECTS OF COFFEE AS A CASH CROP DEVELOPMENT AND ITS IMPACT ON THE 'TRADITIONAL' AGRICULTURAL SYSTEMS IN THE STUDY AREA

Introduction

This short chapter outlines some of the wider issues arising from the introduction of cash crops into the study area and takes coffee as an illustrative example of innovation. The term 'cash crop' is often associated with the colonial penetration of Africa by the Western World. Coffee as a cash crop was generally introduced into the Southern Sudan during the colonial era of the Anglo-Egyptian Sudan (see Chapter 9). But in the study area it only came to be widely grown as one of the leading cash crops from 1972 - the period when peace and stability prevailed after the Civil War. The adoption and wide incorporation of coffee marks the starting stages of the society's transition from reliance on food production to dependence upon a perennial cash crop. This has important effects on the historically existing economy and on society in general. It is hypothesised that as a result of incorporating coffee into the 'traditional' farming systems as a cash crop in the study area, the following impacts are likely to emerge:

- a) Relative scarcity of available cultivable fertile land;
- b) Probable decline in food crop production;
- c) Commercialisation and modernisation of agricultural activities;
- d) Relative increase in rural inequality.

This section derives much of its data from informal interviews and discussions with extension staff, knowledgeable people and coffee growers in the study area. It examines why some of the farmers have started to grow coffee as a cash crop. The use of modern inputs in coffee production and the extent to which these have been applied in other branches of the

economy and its success will be outlined. The relationships in coffee production between farm owners and farm labour (whether family or hired) will be noted as well as the impact of coffee on farmers' income and that of society in general. The possibilities of surplus commodity production which relates to rural development and the development of capitalist relations of production will be assessed generally.

11.1 The Production Of Coffee As A Cash Crop : The Decision To Adopt

Much of the theoretical discussion on why 'traditional' societies adopt a new productive activity have been fully documented. For example, Fisk and Shand (1970) have tended to treat the decision for subsistence societies to adopt a new enterprise as a result of external influence of market forces which they termed as 'incentive factor'. This situation can be applied to the study area in relation to the adoption of coffee plantation. Though this holds true other factors also seem to have played an important role, for example:

- a) Early Government coffee farms established in the study area (see Chapter 9) served as an important source of dissemination of knowledge on the crop farming to the society;
- b) During the Civil War in the Southern Sudan in general and the study area in particular, many people took refuge in the neighbouring East African countries e.g. Zaire, Uganda and Kenya, which are important coffee-growing areas. This may have enabled several of the people to learn some of the cultural and economic attributes of coffee plantation and its management strategies;
- c) After the Addis Ababa Peace Accord in 1972, the PDU within the Regional Ministry of Agriculture and Natural Resources, was actively involved in the establishment of coffee nursery gardens for distribution of seedlings to small farmers in the study area;

d) Since 1972, the Southern Sudan Regional Government Agricultural policy has been giving high priority on coffee growing based on three considerations:

- (i) To find a reliable high unit value cash crop;
- (ii) Diversification of agriculture by lessening the dependence on cotton;
- (iii) To save foreign currency through import-substitution and possible export policies in the long run.

At an individual household decision level, Table 11.1 indicates that the majority of the households in the study area began to plant coffee since 1972. It is clear from the table that while there are zonal variations, in the study area there is an increase in the proportion of farmers (about 15% between the period 1972 and 1982) growing coffee. In this survey, about 80% of the farmers in the study area started growing coffee because it brings in a relatively high cash income; while the remaining proportion advanced various reasons such as because friends or neighbours were planting it; or saw it on PDU and Government projects when wage-labouring there.

11.2 The Production Of Coffee As A Cash Crop : Methods Of Production

Now that a relatively large number of farmers in the study area are beginning to participate in coffee production, what changes in methods of agriculture have resulted from its plantation or production either directly or indirectly?

In the study area, production of coffee is generally cultivated with some 'traditional' implements and methods. In fact land preparation is still carried out by the utilisation of 'traditional' implements such as hoes, axes, etc. except on some of the relatively big coffee plantations of some merchants, enterprising retired civil servants, army, police and other Government officers where the use of 'modern'

Table 11.1 Estimated number of coffee growers by zone in the study area, 1972-82

Zone \ Year	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
1 and some neighbouring areas of Zone 2	6	-	12	14	33	32	64	148	144	201	204
2 (Proper)	11	17	34	33	36	40	-	14	20	31	39
3	22	33	51	56	70	72	85	60	111	116	114
4	68	68	104	107	106	137	181	310	292	283	370
District Total	107	118	201	210	245	281	330	532	567	631	727

Source: Data modified and derived from the Project Development Unit (PDU) Files RMA/PDU 3.R.J.Maridi 1982 and from Equatoria Province Agricultural Production Corporation (EPAPC) File EP/A.3.1, Maridi

N.B. The number of coffee-growers fluctuate probably because of deaths, coffee plantations burned or owners have migrated elsewhere.

inputs (e.g. tractor or bulldozer) may be observed. However, harvesting of coffee is still labour intensive. In regard to coffee processing, 'traditional' methods similar to those used for food crops are also used such as pounding or removing coffee husks on stones. Even so, some of the more prosperous coffee growers and some small producers (about 21% of the coffee growers) have begun to hire the only diesel-power huller in Maridi-Kuanga coffee farm for hulling their coffee.

Although 'traditional' methods of coffee production as practised in subsistence farming tend to persist, nevertheless, modernisation is gradually penetrating the farming systems in the study area. In effect, more than 70% of the coffee growers employ line-planting which is also reflected in the growing of other food crops such as cassava, groundnuts and maize. Those farmers employing line-planting of coffee have probably accepted this innovation taught them by the extension staff, or seen from a neighbour's farm or experience gained from working in coffee estates in the neighbouring countries. Other new agricultural techniques and practices such as the use of insecticides, management strategies of mulching and pruning have also been used by about 60% of the coffee growers in the study area. This is in contrast to some other parts of the world where coffee has been adopted without any change in the production methods. Fisk (1978:38) succinctly puts it correctly for Papua and New Guinea that "it is an adoption without any cultural revolution in the methods of production." Allan (1965:396) again seems to agree with this statement when he emphasised that "the introduction of economic crops to be grown by the African peasant farmers afforded an opportunity of effective and permanent improvement in the standard of living ... without radical change in the methods of agricultural production."

In this context, the situation in the study area tends to indicate that new farm innovations are easily and gradually being adopted by coffee

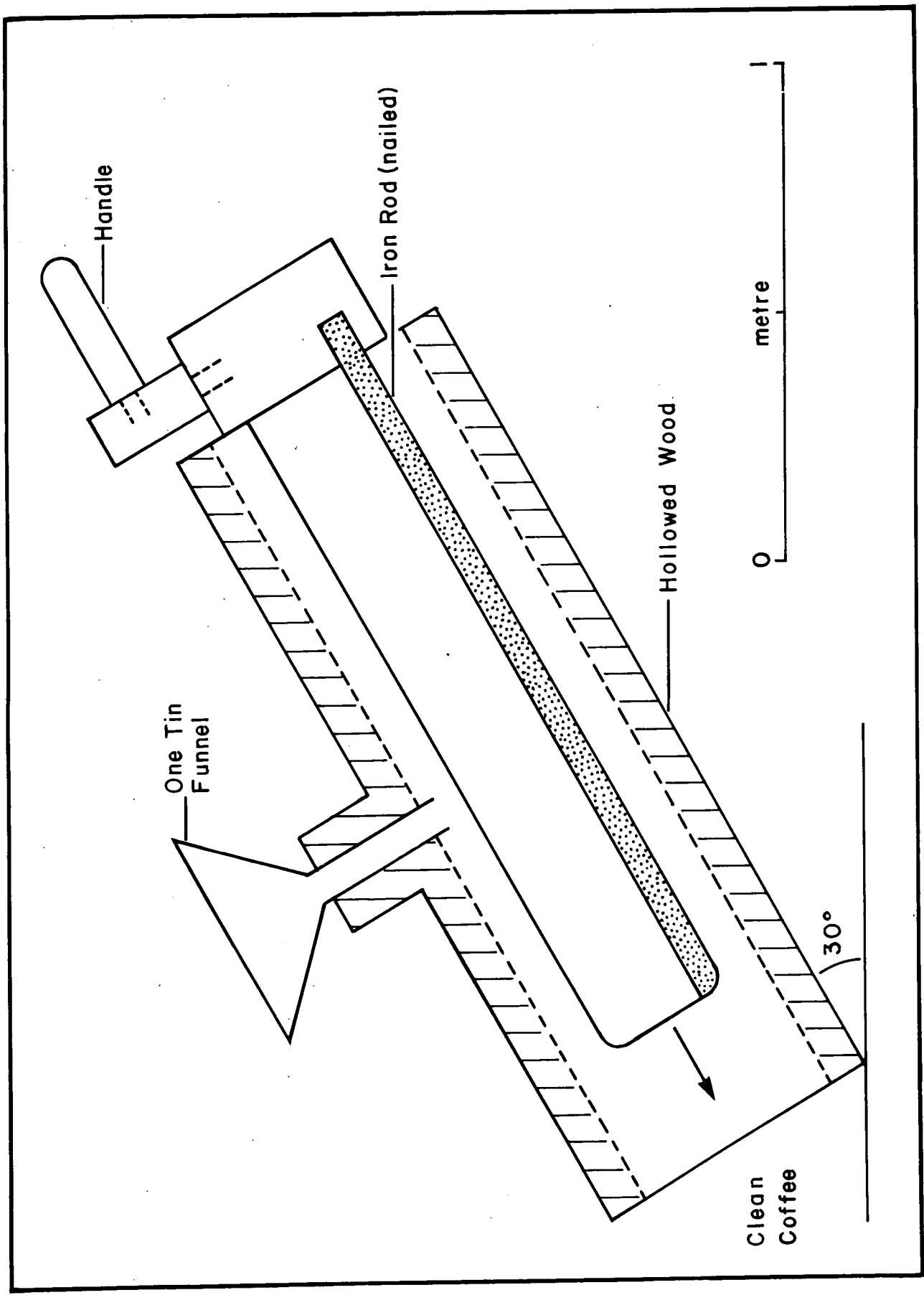
growers. It is interesting to note that in the study area, about 26% of the coffee growers especially in Maridi and Gworosai (Zone 4) areas on Maridi-Yei road, who cannot afford to utilise PDU mechanised hullers (which are not often available) have developed their skills in constructing wooden hullers using local materials (see Fig.11.1). There is no doubt that this is an important piece of indigenous or 'intermediate technology' useful to the development of coffee. Even though its impact cannot be assessed presently because of its infancy stage, its efficiency as compared to mechanised coffee hullers is to some extent limited. However, it is possible that locally-made wooden hullers will prove a valuable investment if advocated or assisted by the policy-makers and those interested in aiding the small farmer in the study area.

Setting aside the fact that coffee production has induced some new ideas on peasant farming in the study area, it is likely that some of the new inputs being used could easily be transferred to food production in the foreseeable future as Uchendu and Anthony (1975:87) note for Kenya coffee growers that:

"Success in expanding production of high value export crops has played a significant role in achieving an efficient 'sequence' of innovations that has made farmers more receptive to innovations and enabled them to adopt later and more expensive ones. Inputs purchased with proceeds of export crops sales are often used for food crops as well, and fertilisers applied to cash crops have a residual effect on food crops."

In this context, in the study area, farmers are willing to apply inputs as fertilisers on their coffee farms when there is a sign of decreasing yields as well as the use of chemical insecticides and pesticides such as Malathon and Thiodian which are also extended to food crops; but they are being hampered in doing so by the irregular distribution constraint or unavailability of such inputs (see Chapter 8). As a result, relatively few farmers are able to have access to insecticides for spraying coffee fields. This is not because farmers

Fig.11.1 A CROSS-SECTION OF A LOCALLY CONSTRUCTED WOODEN COFFEE HULLING MACHINE IN THE STUDY AREA



could not afford to buy them because many are prepared to spend money on insecticides and secateurs if these are available at the right time by the extension staff. Thus, if farmers can realise the benefits of spraying coffee, they can also do so for those food crops being destroyed by pests.

Coffee production is a long-term investment; the first harvest is made after about three or four years and it takes about two more years for the trees to reach their maximum yield. They can have an economic life ranging from twenty to fifty years (World Bank, 1977). This has had some effects on 'traditional' farming management strategies in the study area. Although the intensification of coffee growing is a recent phenomenon, it has shown some effects on farming in general. Coffee has tended to make some farmers abandon their early shifting cultivation practices. In one area there has been a change to permanent farming and settlement since coffee requires closer attention to husbandry practices throughout the year. The fact that coffee growers are becoming permanently stabilised in one location may consequently lead to soil fertility deterioration; so other strategies of maintaining soil fertility through the use of fertilisers will probably be intensified. If fertilisers are not used, there is bound to be a relative decline in soil fertility especially in the more fertile coffee growing areas where population concentrations are high. The relative decline in soil fertility could mean that in the long run food production will decline.

Informal discussions with coffee growers as well as extension staff revealed that about 53% of them hull their coffee by hand, 26% by locally-made wooden hullers and 21% by mechanised huller at Maridi-Kuanga farm on the Maridi-Yei road.

11.3 The Scale And Success Of Coffee Incorporation : Implication For Food Crop Sector

It is difficult at this stage to be precise in stating statistically the scale and success of coffee incorporation in the current farming systems in the study area. This is due to the lack of data due to the usual constraints of time and resources coupled with the sensitivity of such information. However, as shown in Table 11.1 the fact is that during the period since 1972 coffee growing has been expanding as a major source of earning within the economy of the study area. Thus, within the years 1972-82 the number of households that have incorporated coffee has increased relatively by about 835%. Coffee, being a permanent crop, its commercial plantation can only be successful in stable societies. On the other hand, the increasingly growing popularity of cassava as a food crop, has also enabled energy and time to be concentrated on coffee growing. It is likely that many households could become coffee producers if this trend of coffee expansion continues; as the crop is one of the main sources of earning additional income apart from food crops offered for sale especially when the marketing system of the crop is improved or regularised. However, the main dangers to guard against will be over-emphasis on the coffee growing as a cash crop at the expense of ordinary food crops; and the buying up of quantities of food crops by coffee growers and which are not really surplus cash crops to the true requirements of the peasant farmers. Additionally, the agricultural rotation could also be unbalanced and consequently the diet of farmers affected and likely to cause lasting damage.

In this regard, this trend could possibly be checked by a drastic price fall, but the probability of peasant farmers ending coffee incorporation could relatively be very low as Streton et al. (1971:16) observe the situation:

"Producers will continue cultivation as long as receipts cover their variable costs and, given cost structure of the coffee industry, this will occur even at the very low ex-farm prices. This is particularly true of producers in Africa whose out-of-pocket production costs are very low and who have little alternative to shift to other crops."

This situation could also hold true in the study area as indicated by informal discussion with coffee growers in that about 80% or more expected to expand their coffee plots the year after this survey. The most frequent reasons cited by coffee growers for their motives to increase farm sizes were based on the profitability of the crop (70%); and the remaining proportion mentioned that coffee brings in prosperity and better standard of life and welfare, and experience gained from other coffee growing areas such as neighbouring countries as well as neighbouring farmers and friends.

However, in spite of the accelerated trend of coffee expansion, coffee growers have also to produce food crops for their subsistence requirements. Informal discussions with coffee growers showed that coffee cultural operations take much of their labour input and reduce the time available for other crops. But several growers reported that although their food crop production declines as a result of the impact of coffee cultivation, they can still purchase food using the cash income from the sale of coffee. A few coffee growers asserted that coffee occupies most of their relatively fertile farming areas.

In this connection, considering the fact that all that has been outlined above happened within a very short time span, it is likely that in the long run the tendency would seem to indicate the peasant farmers moving towards more reliance on coffee as a cash crop economy in the study area. However, it is essential to note that this situation would occur as food prices, especially prevailing in remote villages, are relatively low. Since there is a constant supply of food, this means

that households intending to specialise on coffee production could comfortably rely for their food requirements on the markets. This situation in turn creates a demand for households only producing food crops. On the other hand, specialisation of households on coffee production could be ruled out as Fisk and Shand (1970:273) argue that "... for 'traditional' farmers are believed to regard dependence upon others for subsistence needs as a somewhat risky venture and tend to discount heavily possible profits for specialisation due to uncertainty."

In the study area, this uncertainty is possible since there exists poor transport systems (especially in the rainy seasons) and communication. This means that heavy reliance on market supplies of food could be precarious for the non-food producers. On the other hand, specialisation on coffee production appears almost impossible in the study area for the obvious fact that food is still essential for cash crop producers especially in the preliminary stages of adopting coffee plantation. A point to note is that, in the initial stages of coffee growing, food sales tend to act as a working capital that provides the producers of the crop with cash income from its sale. While food itself is generally used for mobilising labour (especially labour of the informal co-operatives) on cash crops which are the habitual practice in the study area although there is now a gradual trend towards employment of hired labour.

It is fair to state that although some possibilities exist for coffee production and specialisation by farmers in the study area, its potential future development is likely to depend on the improvements in transportation and communication links as well as the expansion of local and regional markets. In fact, emphasis on the improvement and expansion of coffee by the PDU with a total neglect of the basic infrastructural facilities in particular transport and marketing is open to question. Most of the rural areas in the study area are still characterised by lack

of health facilities, inaccessible road conditions, etc. and in the phrase of the World Bank (1979) 'widespread absolute poverty'. If these infrastructural services are improved, coffee specialisation or expansion is likely to occur considering the relatively sparse populated areas. Consequently, those areas which are relatively suitable for coffee growing could also continue to be utilised for food crops on increasing scale in order to meet the requirements of the cash crop sector. Perhaps it is necessary for the PDU and Agricultural Department staff to modify their policy by the introduction of an integrated rural development strategy which is likely to reduce some of the inevitable farm constraints. It has been mentioned at various stages of this thesis (see Chapters 4 and 8) that there is no scarcity of land but rather relative scarcity of available cultivable fertile land and labour. Therefore, from where will the labour input for the expansion of coffee be obtained? It is likely that food production could decline in the foreseeable future in the study area but at an individual household's level.

11.4 Coffee Production : Farm Owners And Farm Labour

As coffee cultivation intensifies in the study area, one would expect production relationships to change especially with a trend towards the hiring of labour. An important point to note is that the hiring of labour by the households existed in peasant farming in the study area even before the incorporation of coffee as a cash crop as it exists elsewhere in Africa. As noted earlier in Chapter 8 this labour input was mainly based on community interrelationship of 'working parties' and social networks.

a) Owners

In this survey, of the total sample, 70 farmers (43.8%) were growing coffee, with 8 farmers (5%) in Zone 1, 12 farmers (7.5%) in Zone 2,

20 farmers (12.5%) in Zone 3, and 30 farmers (18.8%) in Zone 4. Of the seventy coffee farmers, 51.4% have acknowledged using hired labour on their farms since they started its plantation. Field observation and informal discussions with farmers and extension staff indicate that the use of hired labour is not mainly confined to households with relatively larger coffee farms or income although the amount of labour input employed is, to some extent, governed by the level of one's wealth in the study area. Of the coffee growers employing hired labour (51.4%), 31.4% of them had acknowledged cash payment basis, 12% on kind, usually food and drink. Of the latter category, one farmer in Maruko (Zone 1 : Ibba RC) mentioned salt and seed crops and another in Kangwa (Zone 2: Ibba RC) mentioned soap. 8% of the coffee farmers also paid hired labour in both cash and kind. The terms of labour employment are mainly temporary particularly during the peak periods and about 33% of the coffee farmers reported this method; 10.8% used permanent labour especially in Zone 4 where most of the Uganda refugees willing to offer themselves for waged labour have been resettled.

In this connection, it may appear that for a cash crop producing household, hired labour is becoming important in not only coffee production but also on the food production sector when most of the coffee operations have been performed. Although hired labour is gradually gaining momentum in the study area, most coffee farmers still mainly depend on the family labour input (especially the female labour whose bulk of activities are not touched very much by the hired labour).

Generally, most of the coffee cultural operations such as picking, drying and cleaning are performed by female labour, while hired labour (mainly male) performs such operations as land preparation and tilling, planting, pruning, mulching etc. which are generally regarded as men's agricultural tasks. Male labour input concentrates on coffee as a

cash crop, while female labour works partly in the food crop sector and partly in the cash crop sector. This situation has been acknowledged by Lele (1975) for other parts of tropical Africa as well.

The cultural operations of this crop have increased the length or duration of the farming calendar as well as the intensity of work for family members. By implication, the amount of labour input (man-days) devoted to coffee is likely to increase since coffee husbandry practices are, to some extent, performed throughout the year; while at the same time households are also expected to produce for their sustenance. Therefore, if underemployment exists in subsistence farming, producing coffee as a cash crop could reduce the underemployment. Under subsistence food crop production systems, most households are relatively unemployed or underemployed ('disguised unemployment') in the slack dry season. The notion of 'disguised unemployment' in 'traditional' agriculture, however, is a matter of definition and assumptions made about the institutional forces involved as fully documented elsewhere (e.g. Boserup, 1965; Clark, and Haswell, 1964; Helleiner, 1966; Mbilinyi, 1973; McLoughlin, 1965; Njoko and Karr, 1973). However, because of the increasing work requiring labour input, a household producing coffee as a cash crop as well as food crops may become more dependent on the use of hired labour.

b) Labour force

It has been stated in the above discussion that of the 70 coffee growers in the study area, 51.4% of them have employed at least some labour (whether in kind or cash payment) on their coffee plantations. It has previously been noted that the bulk of the labour force on hire is mainly provided by the Ugandan refugees, since they badly require money to buy food, clothes, medicines etc. However, indigenous community members are also available for hire but to a limited extent.

On the other hand, labour is to some extent becoming apparent among the coffee farm owners themselves. This is due to the fact that cash is usually needed, for example, for purchasing inputs such as coffee seedlings as well as for the payment of hired labour when establishing a coffee farm. Therefore, any member of the community who may be aspiring for a coffee farm could easily hire himself for cash. The demand for food in the study area is relatively very low especially in remote rural areas away from larger villagers and the main centres, since every household at least is relatively self-sufficient. However, for the food crop output to generate enough cash income, it requires efficient transportation to distant market places such as those at Maridi headquarters, or the regional markets, for example, at Juba, Wau or Rumbek and the mere movement of goods to these market centres requires cash. Several of the farmers who offered themselves for hire acknowledged the need to acquire experience and knowledge in coffee growing husbandry practices.

Although some household members offer themselves for hire as yet there is not a class of landless labourers depending only on wages or of farmers who rely solely on hired labour. Since land which is the basic means for farmers is still not limited in the strict sense, farmers are likely to find it possible to continue relying on their own food production, although occasionally offering their labour for cash when needs arise. Although family labour is still the most significant input for the cash crop producers, this aspect is gradually declining especially for the relatively 'big' and enterprising coffee farmers such as Brown Element (currently a Member of Parliament), Michael Bowili (a farmer-trader) and Michael Towil (who held several ministerial posts in the Southern Sudan Regional Government and presently retired to coffee farming) and others who solely depend on the employment of hired

labour. Since several coffee farmers of this calibre are enterprising businessmen, they can in fact afford to bid relatively higher wage rates for labour used. This situation in effect attracts more hired labour force to their coffee establishments. On the other hand, such coffee farmers reported that they could even bring labour from elsewhere outside the study area if local labour for hire is not available since most households are, to some extent, self-sufficient. This implies that a farmer with relatively larger coffee farms and income can generally finance labour more easily than relatively poorer one. However, labour in the study area is likely to continue to be in short supply as long as land remains readily available; but the relatively poorer farmers in the foreseeable future may be available for hire on some of the wealthy or enterprising coffee farmers' estates.

11.5 Coffee Income Or Surplus : Results On The Society

Due to its sensitivity and confidentiality as well as time and resource limitations, no attempt was made to collect data relating to incomes of coffee establishments. We can only make general remarks which are the outcome of informal discussions with coffee farmers and extension officers. It has already been stated in the previous sections that approximately 52% of the coffee farmers invest in coffee farming through the mobilisation of hired labour; about 13% have purchased inputs such as insecticides and pesticides (e.g. Malathon and Thiodian) from the Agricultural Department and PDU offices. 24% of the coffee farmers have also hired or bought from the extension staff implements such as hand hulling machines, secateurs, saws and toria hoes. In Gworosai (Zone 4 : Maridi RC) two farmers reported having purchased from the neighbouring farmers two locally-made wooden hulling machines each costing approximately £25. Interesting to note is the amount of energy and time devoted to the construction of wooden hullers (approximately two months

for the payment of hired labour. One coffee farmer in Bahr Naam (Zone 4:Maridi RC) acknowledged having purchased three cows and a bull (a living bank) for nearly £500 using the income mainly generated from the sale of coffee.

The surplus from coffee also tends to flow to meet social obligations, or what Polanyi et al. (1957:36) calls "pseudo-economics" whereby people show strong preferences for investing in social relationships and in the ceremonial reinforcement of social ties (see Chapter 8). This stems from the fact that ceremonial spending is a vital mechanism in ensuring the reproduction of existing social and political relationships. For example, in the study area, the high bride price (which increased from £200-£300 in 1972 and rose to more than £600 in 1982) has been attributed (especially among the Moru) to the expansion of coffee plantation and the relatively higher incomes generated from the crop. However, there is no evidence or quantifiable data to indicate the differences in investment in marriage or bride price between coffee and non-coffee farmers. While coffee production accrues profits to the small farmers as well as the State which also benefits, the real beneficiaries are the Jellaba merchants and farmer-traders who are the monopoly of the marketing systems and exploit the coffee farmers (see Chapter 8). Since most of these traders mainly come from outside the study area, there is virtually no potential for development due to the fact that most of the capital gained from trading with coffee in particular is generally channeled out by them.

In this context, Griffin (1974:108) argues that "the size and destination of the marketable agricultural surplus are major determinants of the pace and pattern of development." This situation could be improved if coffee processing plants were established in the study area which would also increase the level of income of some of the

coffee and non-coffee farmers by the employment opportunities generated therefrom. Additionally, the Government could entrust institutions such as the Mr. George Haggard Company (which have been involved in coffee production since 1950) to generate other employment opportunities in the study area (Brown Element, Personal Communication); and to carry out the marketing of this crop in full assumption that the State can use the surplus income for investment in rural development programmes. On this basis, however, one can never be sure if the State will fulfil this recommendation. Griffin (1974:123) again emphasised that:

"Massive evidence has accumulated that resources thus transferred have not been used productively. First, a large proportion of the resources thus transferred has supplemented consumption rather than investment, the peasantry has been squeezed in order to raise the standard of living in urban areas rather than accelerate the rate of investment."

It could be argued that in the long run production of coffee could lead to specialisation or division of labour. A household could progress by selling more and more of its product be it coffee or food crops, as the productivity increases as among small farmers in Japan and Taiwan who have moved out of subsistence activities and become commercialised in crop production (Fisk and Shand, 1970). However, this major transformation seems unlikely to occur in the study area. It would require massive transformation of the 'traditional' farming which itself cannot supply the capital required for its own transformation, even by its increasing involvement in cash crop production.

On the basis of the foregoing discussion, coffee incorporation into the subsistence economy is likely to lead to the increase in households incomes. Primary products tend to offer no other real rural development. They aggravate the real underdeveloped nature of the study area.

Conclusions

It is apparent from the discussions of this chapter that some of the findings do not fully accord with the initial hypotheses stated. Firstly, there is no drastic evidence that the introduction of coffee has resulted in land shortages. However, the proposals' validity cannot be left to founder; for it has only been a few years that active participation of some peasant farmers has been witnessed in coffee production. As more and more households tend to grow this cash crop, the problem of scarcity or relatively available cultivable fertile lands could arise especially for coffee. Also, the fact that an increasing number of relatively big coffee investors have begun to emerge and shown personal interests in the study area, makes it likely that such class of people will have the capacity and capital to accumulate more suitable lands which could easily lead to a scramble for land. This latter possibility looks inevitable, since, the current policy of the Government is to encourage increasing private investment in agriculture in particular and the economy at large. ⁽¹⁾

Secondly, although the impact of coffee on the food crop sector tends to be small since food still continues to play an important role in the economy of the study area, a few people will probably rely, sooner or later, on the market for their food supply requirements. Food output, however, could easily decline especially if available cultivable relatively fertile lands continue to be used up and brought under coffee plantation. The possibility is that some households will soon become cash crop producers only, thus becoming, to some extent, more dependent on food supply from the market. But for this to succeed, improvements in rural communication and transportation networks need to be improved so as to facilitate easy access to food from the markets.

(1) For details on Government Policy on this issue, see The Six-Year Plan of Economic and Social Department 1977/78-1982/83, Vol.1, Ministry of National Planning Khartoum, April, 1973 Chapter 10, pp.137-141.

Thirdly, the changes in the methods of farming and new management practices that coffee cultivation has imposed tend to be mainly confined to the cash crop sector, with little application to the food crop sector. Coffee production as well as food crop enterprise, however, still continue to be performed using the 'traditional' implements and methods. However, signs of capitalist production relationships are, to some extent, beginning to emerge as coffee farmers are increasingly becoming more reliant on hired labour. This creates the possibility of the relatively prosperous coffee farmers forming a potential group of capitalist farmers. Thus, as a consequence of the intensification of technical changes, it is expected in the foreseeable future that farmers' new relations of production (termed 'semi-proletarianisation of the poor farmers', Karimu and Richards, 1980) will probably emerge. In this context, even though the World Bank may not want to see itself as not 'involved' in politics, the results of Bank-funded projects yield explicitly political results (Pearse, 1980). However, there is much argument between the 'left' and 'right' as to whether or not such transformation of rural societies from non-capitalist relations of production to a stage of capitalism is not an essential pre-requisite for any form of lasting development. The character of this problem in the overall improvement in the standard of living of a substantial proportion of rural people has been noted briefly in the introduction of cotton as a cash crop during the Anglo-Egyptian Condominium administration (see Chapter 9).

In general, through the incorporation of coffee within the current farming systems, the commoditisation of the rural economy is likely to be complete, and thus allowing the increasing role of money in the agricultural transformation of the study area. Consequently, this induces a decline in 'traditional' values. Because of this, the society

will continue to get more and more involved in the commodity production relationships as a necessary means of earning cash income.

Although relative inequality does exist between coffee and non-coffee farmers, this relationship has not, however, reached to the extent of the emergence of a landless class of peasant farmers. This has been mainly because land in its wider sense is still sufficient though strictly speaking the relative scarcity of cultivable fertile land is an issue.

Not all the sample farmers have taken to growing coffee as a cash crop. However, the incorporation of coffee into the current agricultural management strategies needs encouragement together with the food crop production in the study area. This is important especially if the Government's main objective policy is for it to meet the national demands of 'coffee in cups' and diversification of the 'traditional' farming systems by lessening the dependence on cotton.

CHAPTER TWELVE

SUMMARY AND CONCLUSIONS

"As for knowledge, it will pass away. For our knowledge is imperfect ... Now I know in part; then I shall understand fully, even as I have been fully understood"
(I Corinthians 13, v.8,9,12).

Introduction

In this concluding chapter, it is intended to draw together some of the major findings and important conclusions, brief comments and areas requiring further research which have been fully highlighted at appropriate stages of the preceding chapters.

The analysis starts from the conviction that efforts to develop 'traditional' agriculture in the study area are likely to be successful only if they are:

- a) Suitable to the natural environment. They must be properly adjusted to the existing ecological conditions such as the characteristics of soils and climate, including the range of temperature and rainfall, the pattern and reliability of the rainfall.
- b) Feasible in terms of the availability of all the 'inputs' essential to the achievement of the objectives including labour, machinery, land, water, fertilisers, insecticides and advice to small-scale farmers.
- c) Sufficiently profitable to provide the peasant farmers with rational motivations to rural change.

12.1 Major Findings/Results

This study of peasant farming systems in Maridi District has demonstrated that:

- 1) The 'traditional' farming systems discussed in Chapters 5 and 8 represent a careful and time-tested balance between farmers' perception

of their needs (e.g. household food and cash requirements) and the available physical and human environmental resources. Thus, farmers' main consideration is the provision of enough food for their family members' sustenance, and therefore have evolved a 'fail-safe' production strategy (minimax approach) involving intercropping and successive plantings among others (reference hypotheses 1 and 3c, Chapter 2).

2) Peasant farmers are inheritors and possessors of an invaluable agricultural and environmental knowledge of soils, local flora, climatic elements particularly rainfall, crops, ecological processes, weeds and pests, both of historical and temporal nature. Indigenous technical knowledge (ITK) which exploits the physical environmental resources in relation to their adoption of management strategies and solutions to farm constraints is highly developed. Both aspects have developed into a useful and valid knowledge system - 'folk' or 'ethnoscience' parallel to the formal science though unwritten and unsystematised (see Chapters 3 and 6) (reference hypothesis 3a).

3) Farmers' agricultural management strategies are also mainly based on their intimate knowledge of growth, food tastes, utility and value as well as preference factors, the seasonality of crop production and other characteristics of the 'traditional' and improved (exotic) crops and varieties. Additionally, dietary customs and etiquette generally govern preparation and ingestion of food including their influence on the crop types and varieties grown, and which consequently determine the rate at which farmers are willing to adopt new agricultural practices and technology as well as the amount of inputs they are able to muster. Farmers also possess a rich store of indigenous knowledge on nutrition. In this context, the notion of peasant farmers' 'irrationality' and 'conservatism' is probably due to the lack of understanding of the socio-economic circumstances of farmers by formal

change agencies, or is a device by the latter to enhance and maintain their privileged position where they can 'plan' for and 'dictate' to farmers (see Chapters 6 and 10) (reference hypotheses 3b,d).

4) Peasant farmers are active in identifying and discussing their agricultural and environmental difficulties with both formal and informal sources from whom help or advice is sought. However, farmers would always rely on formal agencies for help or advice on those issues which are considered new and/or technical in nature; whereas help or advice is sought from relations, friends and neighbours or the community at large in matters that are physical in nature (e.g. protection of crops from animal damage and adjustment strategies to rainfall variability and drought) and that have existed for generations where a large body of indigenous technical knowledge (ITK) and wisdom has accumulated (see Chapter 7).

5) Farms are larger in Zones 3 and 4 (Maridi RC) compared with Zones 1 and 2 (Ibba RC). They are probably larger due to cultural reasons, but this is uncertain (see Chapter 8, Fig. 8.2) (reference hypothesis 2).

6) Differences in farm sizes are related to the availability and use of labour. Thus, farm size is related to labour unit. In Zones 1 and 2 this input is mainly restricted to immediate family members (conjugal families), whereas in Zones 3 and 4 immediate family members and other relations and in some cases non-related members are employed. This is believed to be true despite some suspected under-reporting (due to social and cultural values) particularly among the Azande (see Chapter 8, section 8.5) (reference hypothesis 2).

7) Farmers' lack of adoption of some of the agricultural inputs advocated by the change agencies is due to their unavailability or irregular distribution. These inputs tend to be made available at

the beginning of the cultivation season (the start of the rains), but this is also the time when the first priority of the farmers is to meet some of their socio-economic obligations as children's school fees and equipment, poll-tax etc. (see Chapter 8, section 8.4.4). Thus, farmers have their own priorities about the types of inputs they need.

8) Prices of crops offered for sale vary from zone to zone since there are no standard weights and measures and farmers generally lack market information about the prices prevailing in the intermediate or regional markets. However, the Jellaba traders have exploited the opportunities and thus have undoubtedly increased profitability. Thus, being absolute masters of the political economy of scarcity, they can easily manipulate prices at the expense of farmers, to make profits as they have a 'polyopoly' of the transport system and thus creating marketing anomalies especially during the 'hungry gap periods' (see Chapter 8, sections 8.6.1 and 8.6.2).

9) Farmers' degree of mobility and their visits, perceptions, knowledge and experience of other settlements is normally greatest for places within the immediate study area or places in neighbouring East African countries (which were mainly lived in during the Civil War), though a few had visited or lived in other parts of Western Equatoria Province or the rest of the Sudan (see Chapter 8, section 8.7).

10) The Project Development Unit (PDU) and Agricultural Department Extension Staff (formal sources) and the experience gained by farmers through out-migration (informal sources) particularly from neighbouring East African countries (e.g. Zaire, Uganda and Central African Republic) are the two most important sources of influence that have led to the adoption of the innovations as demonstrated in Chapter 10. The use of hired labour (strictly paid in cash) has been adopted concomittantly with the development of coffee as a cash crop; this activity had been

diffused into the study area by several returned-migrant farmers from the neighbouring countries or learned from relations, friends and neighbours (informal sources). On the other hand, other relatively well-established farm management strategies such as deep cultivation and ridging, spacing and thorough weeding of food crops although recommended by the extensionists are also the habitual custom of some farmers mainly influenced by immediate family members, friends and neighbours (reference hypothesis 5).

11) Farmers who have adopted most of the innovations in the study area appear to be defined (as demonstrated in other studies) by some socio-economic and farm characteristics as those with:

- (i) Less than 50 years;
- (ii) Some formal education;
- (iii) Relatively larger farms;
- (iv) Larger family labour units including a number of adult males helping farm;
- (v) Secondary employment opportunities;
- (vi) Migration and mobility experience;
- (vii) Membership of a particular tribal group/clan;
- (viii) The relative location of farm in relation to extension service centres and accessible motorised roads.

It has also been noted in Chapter 10 that there is a device of measuring 'innovativeness' of a farmer and the suitability (or success) of innovations based on the degree of their adoption in the study area. Thus, it has been demonstrated that farmers in Zones 3 and 4 are relatively more innovative than their peers in Zones 1 and 2 - i.e. 'innovativeness' is more a function of culture than ecology. However, due to the quality of data based on estimates and the size of sample, no statistical analysis has been performed to demonstrate the level of significance but a general overview of the situation has been presented.

12) The 'traditional' farming systems highlighted in Chapter 10,B is, to some extent, a dynamic economy. Farmers' attitudes, perceptions and their responses on their land use trends and changes including management strategies showed that there was a net increase of some food crops. For example, the proportion of farmers increasing maize and cassava planting was the larger, and these crops appear to be increasingly becoming important and that farms have relatively increased in size. Also coffee as one of the important cash crops has relatively increased in significance while, conversely, the proportion of farmers decreasing their areas under cotton was even the greater, and the crop is declining in importance. This raises the interesting question of whether cotton is less likely to be planted in the future because of the persistence of its problems. Overall, various socio-economic, environmental and administrative or marketing factors have generally been advanced by farmers as motivating them to adopt a specific land use strategy (see section 10.11). However, subsistence factors such as the need for more food for family sustenance as well as the fulfilment of other socio-economic obligations are as significant as the strictly cash-oriented motivations.

13) Farmers' general attitudes towards innovation adoption and change in the study area as outlined in Chapter 10,B (see section 10.10) are mainly related to cultural differences and rather less to ecological or nurtural variations. The majority of farmers in Zones 3 and 4 (Maridi RC) have generally expressed their desires to innovate and modify their existing farming systems, whereas in Zones 1 and 2 (Ibba RC) mainly inhabited by the Zande, socio-economic life is governed, to a greater extent, by 'traditional' values, beliefs and practices inherent in their land use strategies. However, it has been noted elsewhere in this thesis that caution must be taken and credit should not be put so much on these cultural attributes due to the fact that there are individual

socio-economic variations in the rate of experimentation and adoption of a package of innovations.

14) The introduction of coffee as a cash crop development and its impact on the 'traditional' farming systems in the study area is likely to lead to the relative decrease of fertile arable land, increase in rural inequality and the commoditisation of the rural economy including the relative decline of food crop production. However, it has been observed and noted in Chapter 11 that the above-mentioned remarks are mainly preliminary in nature; for it has only been a decade (1972-82) that active participation of coffee growers has been witnessed in the study area. It is important to note that there is a likely danger of over-emphasis on growing cash crops (e.g. presently, coffee and historically, cotton) compared with food production by development planners (who are frequently politicians) (reference hypothesis 4).

12.2 The Main Constraints On Development Of 'Traditional' Agriculture And The Relevance Of Research To Rural Development Planning And Policy Consideration

This section generally presents the implications of the survey findings for research and the brief notes highlighted here are intended as supplementary (indicative) rather than an alternative (conclusive) to development planning approach. This approach is evolutionary which ultimately encourages peasant farmers to produce relatively more food crops (for cash) through co-operation between them and the Government. However, in spite of the interim character of the empirical data obtained, perhaps some useful recommendations may be put forward in the following paragraphs.

A. Improvements Of Infrastructure And Social Services In The Study Area

The improvement in infrastructure and social services should be emphasised as these are of vital significance not only from the point of view of promoting the well-being of the peasant farmers, but also from

relieving their present constraints on agricultural development. Thus, the viability of the farming sector is clearly dependent on the efficient provision of these basic services among others (see Chapters 3 and 4).

1) Water supplies : The provision and maintenance of easily accessible portable water for the rural population in the study area is considered one of the most important programmes for both improving health and saving labour (particularly of women and children who collect water from long distances away from homesteads). More bore-hole wells are needed and other sources of domestic water supply should be thoroughly investigated.

2) Health and medical facilities : The debilitating effect of chronic illnesses and many of the diseases and sickness outlined in Chapter 4 and which coincide with the rainy season, have been observed to affect farm labour availability and productivity (see also Chapter 8). However, 'primary health care' e.g. health, food production, education, access to safe water, sanitation and medical treatment should be advocated to improve the rural health problem. The introduction of continuous meetings with the extension staff, nutritionists, health and community development workers as well as farmers may be appropriate in the study area. Such meetings have been introduced in Yei District by the PDU with some success. There is also a need to highlight spatial measures in evaluating the provision of health facilities through the frequently used ratios of people-to-doctors, and people-to-facilities (e.g. Thomas, 1982) in order to assess the relative location of people and the facilities. However, Thomas (1982) observed that this does not suggest that the distance/location factor is the most important one in health planning and improving the health of the rural communities, but it is certainly one which has too often been neglected and can readily be established for villagised populations. Thus, it is important to plan health services in

such a way as to stress health education and modest clinics in order to provide the greatest number of people with a minimum of preventive and curative medical care.

3) Roads : In Chapter 4, the problems of road transport and inaccessibility of most parts of the study area particularly in the rainy season have been outlined. Upgrading of the minor roads and the construction of feeder ones, especially in areas of surplus crop production, is a pre-requisite for the improvement of peasant farming systems. Thus, farmers would be encouraged to produce surpluses and traders are also encouraged into these rural areas to purchase the produce; and through improvement in transport to cause food prices to be reduced in the 'hungry gap' periods.

4) Marketing : The problems of marketing and trading operations in the study area have been highlighted in Chapter 8. However, opportunities are limited by its unfavourable geographical location with regards to main internal and international markets; and high transport costs are a major constraint to crops offered for sale especially in the internal regional markets such as Juba, Wau, Malakal etc. Marketing opportunities within the study area should be improved. Hospitals, secondary schools, army, police and prison centres could possibly be potential markets as they are currently supplied food by the Jellaba-trader contractors and which is usually transported into the study area from outside. Consideration should be given to the improvements of the existing rural marketing forms, and there is need to stimulate production (especially for home market) and construct small rural stores in surplus areas, and to improve farmers' knowledge on the standard of weights and measures or pricing policy and information in other distant market centres. This would enable farmers and traders to perform their function of moving goods to areas where they have the greatest utility with greater efficiency.

B. Appropriate Technology

Improved technology has limited extent in the study area.

1) Ox-ploughing : There is a wide scope of employing ox-ploughing particularly in Zones 1 and 3 (see Chapter 4) where it is likely to relieve the seasonal farm labour constraint. Draught-oxen could also be used for transport. However, as tse-tse fly is a constraint to livestock economy (excluding poultry), close supervision is required by the veterinary staff to devise control measures for the spread of trypanosomiasis reducing livestock production. This entails the improvement of veterinary service with a more reliable supply of drugs and better support for its fieldstaff.

2) Hand-operated coffee hullers : It was noted in Chapter 11 that some enterprising coffee growers have devised their skills to making hand-operated wooden coffee hullers in the study area. This 'intermediate or appropriate technology', suitable and adapted to the needs of small-scale farmers should be encouraged by formal change agencies. It is much more likely to achieve the desired increases in output than inappropriate and usually unavailable technology imported from developed countries. Thus, before the use of labour-saving devices must come proficient technical training programmes and relevant educational curricula to be organised by the extension staff for small farmers of the future.

C. Extension Strategy

1) Farmers' knowledge and extension : Agricultural extension staff should have regular contact with small farmers and to monitor and report on farmers' problems, circumstances and practices. This will enable them to comprehend what farmers do and why. Therefore, scientific knowledge should be an addition to farmers' indigenous technical

knowledge (ITK). Feedback from the ITK should enable research and planning to be oriented to the farmers' needs, attitudes, and perceptions of environmental resources being considered locally but relating to the national levels, even if radical changes are not possible. Scientific knowledge that is useful at the level of peasant farmers is knowledge that is adaptable. In this context, it is interesting to note that in the introduction to his book 'Where There Is No Doctor', Werner (1977:W3) points out that "if you can use what is best in modern medicine together with what is best in 'traditional' healing, the combination may be better than either one alone". As such, why cannot agriculture which is dealing with the same rural people do the same as medicine? As stated earlier in this chapter, there is a close parallel to appropriate extension. The two types of knowledge complement each other; and together they may achieve advances which neither could alone. It is thus suggested here that peasant farmers with their invaluable knowledge and identified by extension staff as 'good' ones (model farmers) should be enrolled for training (especially Off-Farm Adoptative Research - OFAR) at Yambio Research Division and the Institute for Agricultural Technicians. This would possibly enable them to exchange their ideas with students and research staff and thus formulate strategies and decisions together in harmony. These farmers once back to their respective areas could be relatively better extensionists and may probably 'trigger growth' in rural areas. Additionally, the extension services of the Agricultural Department and PDU including other related institutions should be put together on sounder basis by integrating them into one unit, perhaps under the Agricultural Department Extension Service Unit in the study area.

2) Existing farming strategies and extension : The 'traditional' farming systems and decision strategies as noted in the crop combinations and successive plantings and the adoption of 'fail-safe' production strategy

should be recognised as valid and productive and small farmers should therefore be considered useful partners in policy-making and implementation institutions of rural development in general, and improvement of peasant farming in particular.

3) Farmers' socio-economic priorities and extension : Peasant farmers have their own priorities about aspects of social and economic development in the study area. Additionally, the importance of values, beliefs, norms, attitudes, concerns and reactions of the farmers to all of their environmental resource utilisation must be taken into account if they are to be induced to adopt a package of innovations advocated by the formal change agencies. Only in this way can we discern the basis from which efforts to innovate must depart, and realise the possible implications that are likely to arise from the whole complex of interrelated aspects affecting the potentialities and the rate of change. Thus, the development of peasant farming systems requires both economic, social and positive political action including inter-disciplinary approach. In short, more attention should be paid by policy-makers to the regular appraisal of popular attitudes to policy, both as it is planned and as it is implemented. This means an environmental approach as a development strategy.

4) Capital and extension : In the study area, the 'traditional' farming systems have little use for capital other than that created by family labour; but with the introduction of improved exotic seeds and technology (e.g. toria hoes, insecticides and other inputs) by formal change agencies, the lack of capital became a limiting factor to their adoption. Improved inputs need to be sold over a longer period, possibly through selected rural shopkeepers (e.g. Jellaba traders), or continuously made available at time when farmers' cash is more available, e.g. after the main harvest. Additionally, more well-trained, well-paid regular and dedicated extension

staff living in the rural areas would be an advantage so that they are familiar with the existing ecosystems and the population of their assigned areas, and the spatial changes which are planned or may be recommended for them, through consultation and participation in development planning.

5) Women and extension : Consideration should be given to female labour in the study area. As labour specialisation by sex is, to some degree, a constraint to labour availability and farm performance, the extension message and demonstration of innovations (often with emphasis on male labour) should also include females.

6) Farming hazards and extension : Drought and depredation by wild animals are the major farming hazards which concern most farmers. Some techniques of moisture conservation such as mulching and ridging among others, are inherent in the 'traditional' farming systems so as to reduce relatively the impact of drought in the study area. These strategies should therefore be promoted by the extension service. As for animal damage, there are 'traditional' measures taken by farmers such as building stockades and trapping and spearing. These should be improved and encouraged although they are labour-demanding and have limited effect. The Wildlife Conservation Department should undertake a study of certain animals' migration patterns throughout the year, and to devise suitable control measures.

7) Off-farm activities and extension : In the study area, two off-farm activities offer potential for further development - honey production and fishing. These are excellent sources of food and income particularly honey. It was noted in Chapter 4 that the design of the 'traditional' beehives does not facilitate the collection of honey without killing the bees and damaging the brood and wax combs. Increased productivity could be ensured by introducing improved designs of beehives (e.g. the box

hives in Oman (Dutton et al., 1982) European straw skep hive and Omdurman multi-chamber fixed comb clay beehives (Paterson, 1978) known since 1932) which would allow removal of honey comb while leaving the brood and wax combs undisturbed (see Appendix 16A,B). Thus, pilot demonstrations of the improved hives could be set up in areas of 'traditional' bee-keeping, and a marketing system and resource should be conducted. On the other hand, a thorough research is a pre-requisite to tapping fish potential. Net fishing could be introduced and the use of fish poisons discouraged.

8) Co-operatives and extension : This study recommends that the introduction of formal or 'modern' forms of co-operatives would be relatively easy if based on the 'traditional' forms of co-operation and social or cultural patterns. The formation of these co-operatives would not only facilitate the involvement of small-scale farmers in the dialogue of planning, but could also serve as a source of incentives which would increase agricultural productivity as well as provide an ideological commitment to local enterprise. Additionally, there would be an economising of scarce resources available under that 'trinity of essentials' - marketing, credit and extension in the study area. The co-operative members would also be used as 'model farmers' to disseminate improved agricultural methods under the supervision of extension agents.

D. Questionnaire Administration And Language

Interviews and society : In conducting interviews, particularly the formal ones in a heterogenous rural community consisting of several tribal groups with a variety of languages (dialects) spoken, there is a need to translate questionnaires into the local languages or else to learn and master them in order to understand the vernacular modes of expression. Additionally, several approaches such as semantic differential and self-anchoring scales, cultural linguistics or folklore and verandah

storytelling aimed at gaining an insight of 'traditional' farming knowledge are recommended.

12.3 Some Areas For Further Investigation

While analysing the survey data, some areas for future studies have been noted in relevant stages in the text. Even so several topics included in this study have been touched upon only sketchily due to the constraints of resources and time. Areas demanding further investigation are identified as follows:

- 1) Farming hazards;
- 2) Changes in farming techniques and inputs;
- 3) Labour-work and indepth study of labour specialisation by sex and working parties and social networks;
- 4) Crop storage methods;
- 5) Crop yields and management assessments and farm budgeting exercises and statistical analysis of repertory grid technique in relation to farmers' perception and choice of crops or decision-making procedures;
- 6) Detailed information on the catches and consumption of fish in regard to seasonality or fishing, main fishing areas, river water levels, weights of catches and consumption;
- 7) Detailed information on the impact of coffee as a cash development on the 'traditional' farming systems;
- 8) Relating scientific identification (e.g. laboratory analysis) of all the soil types, grasses, trees, weeds and pests with farmers' cognitive patterns concerning these environmental features could prove a fascinating research topic of investigation;
- 9) Detailed information on whether the differences in resource use between one tribe and another diffuse from cultural differences in environmental perception or from other aspects of their culture.

12.4 Concluding Remarks

In concluding this thesis, a brief comment which relates to one of the main theoretical problems in the literature on the improvement of 'traditional' farming systems and economic development, is noted here. Basically, this relates to the speculation over the kind of spatial structures expected to be found emerging from the different assumptions of Marxist dependency and western modernisation theory (Brookfield, 1975; Haggett, 1965).

The peasant farmer has two main objectives. First, there is that part of the farm produce for subsistence requirements to which the ecological economics of subsistence farming applies. Secondly, there is that part of the farm which is disposed for cash, which in the capitalist world where micro-economics applies. There is security rather than conflict in this context. Usually, risks are spread by keeping open the option of retreat into self-sufficiency when times are bad. Therefore, it is this fall-back position of the subsistence farmer which explains the supposedly 'unprogressive', 'conservative' or 'irrational' character of the rural areas - the 'idiocy of rural life' of the nineteenth century Marxist thought. This philosophy fails to take into account the socio-economic characteristics of the peasant farming systems and the creativity of the farmers - a need for cash income obtained through the disposal of crops through the opportunities offered by the market. This is Allan's (1965) concept of 'normal surplus' which, as noted in the text, was used as a spring board for production for sale. The peasant farmer, in fact, does quite well to maximise his economic well-being given the actual and perceived constraints under which he operates in a particular environment.

This study has indicated that with the organisation of land use in the interest of cash and export crops (e.g. cotton and coffee), opportunities for improvements in the 'traditional' crop sector may go

by default. With so much research (and development of schemes in isolation with poor management) being tied up with high input and technology and cash-crop thinking, there is little relevant primary research and thus even less secondary that is relevant to local food-crop production. Thus, the introduced cash crops have not been oriented towards the utilisation of indigenous or appropriate technology but instead focused at the often imported Western technology oriented to maximum yields and pure stands of crops. These crops are also not often oriented towards the requirements of the home market but for export. This even leads planners to relegate farmers to an 'irrational' situation where farmers can produce but do not often syphon their crops through the official marketing channels. On the other hand, the improved (exotic) crop varieties disseminated to farmers by the extension staff with growth specifications alongside the 'traditional' fields have not altered the indigenous land use systems except perhaps in their incorporation. In fact, if extra food production is to be seen as a surplus, it must be recognised by development agencies that there are different 'traditional' food crop varieties with various 'utility' or value and growth characteristics which should be taken into account for improvement.

In this context, in order to make numerous small improvements to transform 'traditional' farming systems, there would have to be a deliberate shift in emphasis on the part of the research and extension service towards local food crops and indigenous methods of production, whose value to the community would not be measured in terms of returns at market prices. This would, in effect, mean deliberately sacrificing the advantages of a high degree of regional specialisation in crop production in the interests of safety through diversity at the local level.

Finally, farmers' decision-making procedures involve activities that are aimed at the satisfaction of their own socio-economic goals. Thus, farmers rationally strive to make the most efficient (rather than wasteful) use of their available resources to achieve their goals. It has been noted in the text that the strategies employed by farmers in the study area in the light of available resources and indigenous technical knowledge (ITK) demonstrate resource management efficiency. As such, only by the identification of farmers' management strategies, circumstances and problems can a development programme and research relevant to the small-scale farmers be devised.

APPENDIX 1

AGRICULTURAL QUESTIONNAIRE DESIGN, 1982

MARIDI DISTRICT

WESTERN EQUATORIA PROVINCE

SOUTHERN SUDAN

The purpose of this research is to help Cleophas Lado, of Juba University and currently a research student from Durham University, Geography Department, in his studies of the socio-economic and other aspects of life of the District and their farming. You are respectfully requested to assist in this work by answering all the following questions carefully and correctly. The information will be used only by Mr. Lado and will not be given to any other person but will be treated as strictly confidential.

Thank you.

VILLAGE/SETTLEMENT _____	SAMPLE NUMBER _____
LOCATION _____	NAME OF FARM HOLDER _____
DATE OF INTERVIEW _____	NAME OF INTERVIEWER _____
TRIBE _____ CLAN _____ LINEAGE _____	SEX: MALE _____ FEMALE _____
MARITAL STATUS : MARRIED _____ UNMARRIED _____	DIVORCED/WIDOW _____

1. What is your age _____
2. Where were you born? Village _____
Town _____
- 3 (a) How many children do you have? _____ Male _____ Female _____
- 3 (b) How many do help in farming operations?
 - (i) Ploughing _____
 - (ii) Planting or sowing _____
 - (iii) Weeding, Bird scaring _____
 - (iv) Harvesting _____
- 3 (c) How many go to school _____
- 4 (a) Do you have any other work besides agriculture?
Yes _____ No _____
- 4 (b) If yes, what is it? _____
- 4 (c) If so, what is your principal occupation(s) ? _____

- 4 (d) When did you first do this work? _____
- 4 (e) Did you have any work before you started that work?
- | <u>Work</u> | <u>Year started</u> | <u>Year ended</u> |
|-------------|---------------------|-------------------|
| _____ | _____ | _____ |
| _____ | _____ | _____ |
| _____ | _____ | _____ |
- 5 When did you first have your own farm? _____
- 6 (a) Does your wife/husband have his/her own farm now?
Yes _____ No _____
- 6 (b) If no, did your wife/husband have his/her own farm before marriage,
Yes _____ No _____
- 6 (c) What year did she/he leave farming? _____
- 6 (d) What was the reason(s)? _____
- 6 (e) If more than one wife answer each of the following questions separately for each wife.
- 6 (f) Has your wife/husband any other non-agricultural work?
Yes _____ No _____
- 6 (g) If yes, what is the work? _____
- 6 (h) When did she/he first start this work? _____
- 6 (i) Is the work continuous or seasonal? _____
- 7 (a) Does your father have an agricultural field?
Yes _____ No _____
- 7 (b) Does your father have any other non-agricultural work?
Yes _____ No _____
- 7 (c) If yes, what is the work? _____
- 7 (d) Does your mother have her own farm? Yes _____ No _____
- 7 (e) Does your mother have any other non-agricultural work?
Yes _____ No _____
- 7 (f) If yes, what is the work? _____
- 8 (a) Do you have a corrugated tin and zinc house?
Yes _____ No _____
- 8 (b) If yes, when was it built? _____
- 8 (c) If no, where do you live? _____
- 8 (d) Do you own any other houses now? Yes _____ No _____
- 8 (e) If yes, where are they built? _____
- 8 (f) Of what are they built? _____
- 8 (g) When were they built? _____

8 (h) How many fields (plots) do you have? _____

9 (a) Do you have fields further away from the homesteads?
Yes _____ No _____

9 (b) If yes, how far are they? _____

9 (c) How long does it take to go there? _____

9 (d) Do you have any huts in the further away fields
Yes _____ No _____

9 (e) If yes, are they temporary or permanent? _____

10(a) What is the size of your field(s) in feddans?

Field (1) _____ (2) _____ (3) _____ (4) _____ (5) _____

10(b) How do you know your family land boundary? _____

11(a) What are the main crops grown in your agricultural field or farm (List as many crops as you can) in order of importance

(1) _____ (2) _____ (3) _____ (4) _____ (5) _____ (6) _____ etc.

11(b) Do you grow each crop separately in different plots? Yes _____ No _____

11(c) If yes, why? _____

11(d) If no, which are the crops/sown in a mixture in one plot/field?

11(e) If so why? _____

12(a) Which of the following tree-crops do you plant?

(i) Coffee

(ii) Guava

(iii) Orange

(iv) Tangerine

(v) Palm-tree

(vi) Tea

(vii) Pawpaw

(viii) Lemons

Please name any other tree-crops which you plant

Please name any other type of wild trees which you preserve for their fruit etc.

12(b) How many trees of each of these do you have?

Tree-Crops

Number

(1) _____

(2) _____

(3) _____

(4) _____

(5) _____

(6) _____

- (7) _____
(8) _____
(9) _____
(10) _____

13. If crops are sold in the market, which are the most important cash crops?

(Please name them in the order of importance, the one which brings in most money first, followed by the second, etc.)

- (1) _____
(2) _____
(3) _____
(4) _____
(5) _____
(6) _____
(7) _____
(8) _____
(9) _____
(10) _____

14. How much of your income, in Sudanese pounds, did you obtain from the sale of each during the last season?

Crop:	(1)	Pounds	
	(1)	_____	_____
	(2)	_____	_____
	(3)	_____	_____
	(4)	_____	_____
	(5)	_____	_____

15. What are your major food-crops in order of importance?

- (1) _____
(2) _____
(3) _____
(4) _____
(5) _____

16. To whom or where do you usually sell your:

(i)	Cash crops	People	Market	Organisation
(1)	_____	_____	_____	_____
(2)	_____	_____	_____	_____
(3)	_____	_____	_____	_____
(4)	_____	_____	_____	_____
(5)	_____	_____	_____	_____

(ii) <u>Food Crops</u>	<u>People / Market / Organisation</u>		
(1)			
(2)			
(3)			
(4)			
(5)			

17. When did you start first planting these crops?

<u>Crop</u>	<u>Year</u>
(1)	
(2)	
(3)	
(4)	
(5)	
(6)	
(7)	
(8)	
(9)	
(10)	

18(a) Are there any crops (new) which you planted in the past (up to last year) which you do not plant now? Yes No

If yes, name:

<u>Crop</u>	<u>Year</u>
(1)	
(2)	
(3)	
(4)	
(5)	

18(b) When did you first start planting them? And when did you stop planting them?

<u>Year first planted</u>	<u>Year stopped planting</u>
(1)	
(2)	
(3)	
(4)	
(5)	

Why did you stop planting them?

18(c) By whom, when and where did you see these new crops being planted?

<u>Crop</u>	<u>Year</u>	<u>Place</u>	<u>Person</u>
(1)			
(2)			
(3)			
(4)			
(5)			

18(d) Why did you go there?

19(a) Is the way you farm this year any different from the way you farmed last year? Yes No

19(b) If yes, how has it changed?

- (1) More land cultivated
- (2) More food crops grown
- (3) More cash crops grown
- (4) Less land cultivated
- (5) Land remains the same as before
- (6) Use fertiliser and manure
- (7) Sometimes use tractor for ploughing land
- (8) Use hired labour

If you use hired labour, why?

19(c) Tell me of any cash crops or food crops of which you are growing more or less since last year

<u>Cash Crops</u>	<u>Farm Size Increase</u>	<u>Farm Size Decrease</u>	<u>Same</u>
(1)			
(2)			
(3)			
(4)			
(5)			
<u>Food Crops</u>	<u>Farm Size Increase</u>	<u>Farm Size Decrease</u>	<u>Same</u>
(1)			
(2)			
(3)			
(4)			
(5)			

19(d) If there is any change, why did you change?

20(a) Do you have a record book or diary concerned with seed cost, fertiliser used, hours of labour?

Yes No

20(b) If yes, where did you get the idea to do this? _____

21(a) Do you use fertiliser in farming for your crops?

Yes _____ No _____

21(b) If yes, for which crops and which kind of fertiliser do you use?

<u>Crops</u>	<u>Kind of Fertiliser used</u>
(1) _____	_____
(2) _____	_____
(3) _____	_____
(4) _____	_____
(5) _____	_____

21(c) In what year and from where did you first start using fertiliser?

<u>Year first started using</u>	<u>Where first seen fertiliser being used</u>
_____	_____

21(d) Why did you go there? _____

21(e) Does the Government give you a subsidy for fertiliser use?

Yes _____ No _____

22(a) How do you decide where and why you plant a particular crop?

<u>Where</u>	<u>Crop type ('Traditional' or new variety)</u>	<u>Reason for Planting</u>
(1) _____	_____	_____
(2) _____	_____	_____
(3) _____	_____	_____
(4) _____	_____	_____
(5) _____	_____	_____

22(b) Describe the soil in your land _____

22(c) What other types of soil are there on village land? _____

22(d) Which is the most valuable soil overall on your land _____

22(e) Describe the best conditions for a vegetable garden _____

23(a) How do you decide on the time for sowing/planting, weeding and harvesting of crops?

<u>Crop</u>	<u>Time sowing/planting</u>	<u>Weeding</u>	<u>Harvesting</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

23(b) How many times in the season do you weed each of your crops?

.....

23(c) Who weeds the household fields?

23(d) How would the weeding be done (specify the implements used)?

.....

24. From where do you obtain the seeds or seedlings of your crops?

<u>Seeds/Seedlings</u>	<u>From where/whom collected</u>
(1)	
(2)	
(3)	
(4)	
(5)	

25(a) What are the new crop varieties and agricultural techniques or practices that you have tried and have adopted and in which year?

<u>New crop variety</u>	<u>Year of trial</u>	<u>Year of adoption</u>
(1)		
(2)		
(3)		
(4)		
(5)		

25(b) Where did you first see these new crop varieties and other techniques and practices and why did you try and adopt them?

<u>Where first seen</u>	<u>Reason of adoption</u>
(1)	
(2)	
(3)	
(4)	
(5)	

26(a) What diseases, birds or insects and other hazards attack the following:

- (a) Maize (b) Millets (c) Cassava
 (d) Sesame (e) Cowpea (f) Groundnuts
 (g) Sorghum (h) Other crops

26(b) Have you ever sought advice and discussed your particular farm problems? Yes No

26(c) If yes, from whom do you seek advice?

27(a) What are your major agricultural problems on which you have asked for advice?

And what are the sources of advice and help used for each problem?

<u>Problems</u>	<u>Sources of advice</u>
.....	
.....	
.....	

27(b) Do you ask for advice and help from other neighbour farmers?

Yes _____ No _____

27(c) What other kinds of problems do you ask co-farmers for advice?

(Give two or three examples)

Problems/Advice _____

27(d) Have you found their advice or help useful? Yes _____ No _____

28. Do you have contacts with the agricultural extension workers?

Yes _____ No _____

29(a) If yes, where did you first meet the agricultural extension officers for advice? _____

29(b) Have you found their advice helpful? Yes _____ No _____

30(a) If yes how many times during last year did you visit the agricultural extension officers?

30(b) What are your specific reasons for contacting them? _____

If no contact why (Give your opinion on the work of agricultural extension staff).

31. Do you attend extension service lectures (if any) and/or agricultural demonstrations regularly?

Yes _____ No _____

32(a) Do you listen to agricultural programs (if any) on a radio?

Yes _____ No _____

32(b) If yes, how often? Daily _____ Weekly _____
A month _____ Rarely _____

32(c) If yes, which station broadcasts the agricultural programs which are best to follow? _____

32(d) Do you read newspapers? Yes _____ No _____ If yes, how often?

Daily _____ Weekly _____ A month _____ Rarely _____

33. Are you a member of any village/town organisations?

Yes _____ No _____

34. If yes what are these organisations? _____

35(a) When did you last attend a co-operative society meeting?

35(b) Is there a co-operative garden in this village?

36. If you want a loan to improve your farm, where do you attempt to get it?

37. Do you have any idea of how many hours per day you work on your agricultural land during:-

- (1) Land clearing season _____
 (2) Sowing/planting season _____
 (3) Weeding season _____
 (4) Harvesting season _____

38(a) Try and complete the following table concerning farm labour.

<u>Labour</u>	<u>Type of Work</u>	<u>At what time of year is work heavy</u>
Farmer's children	_____	_____
Farmer's wife(s)	_____	_____
Farmer's brother(s)	_____	_____
Farmer's relatives	_____	_____
Labourers from		
other tribes	_____	_____
E.G. Zaireans	_____	_____
Etc.		

38(b) Do you use hired labour and for which agricultural operations?

Yes _____ No _____

Agricultural operations: _____

39. What poultry do you have and how many?

<u>Poultry/kind</u>	<u>Approximate number</u>
(1) _____	_____
(2) _____	_____
(3) _____	_____
(4) _____	_____
(5) _____	_____

40. What livestock do you keep and how many?

<u>Livestock/kind</u>	<u>Approximate number</u>
(1) _____	_____
(2) _____	_____
(3) _____	_____

41. What are the agricultural tools or other aids that you have use of?

42. What is the approximate distance (in miles) from your farmstead to the (a) main road used by trucks _____ and (b) to the market? _____

43. By what do you transport your agricultural produce to the market?

44. How many markets do you have in your village/town _____

45. How many per week and on which days do you visit your market and for what reasons?

<u>Market days per week</u>	<u>Reason(s) for going to market</u>
(1) _____	_____
(2) _____	_____
(3) _____	_____
(4) _____	_____
(5) _____	_____
(6) _____	_____

46(a) Do you make any handicrafts and furniture?

Yes _____ No _____

46(b) If yes, mention them and reason(s) for making them.

<u>Handicrafts/Furniture</u>	<u>Reasons for making them</u>
(1) _____	_____
(2) _____	_____
(3) _____	_____
(4) _____	_____
(5) _____	_____

47. What is your religion? _____

48. Do you call upon agricultural help/advice from the clergy? Yes _____ No _____

What sort of help/advice? _____

49(a) For how many years have you been to school and which educational level reached? Years _____ Educational level _____

49(b) When did you leave schooling? _____

50(a) Have you received any other training in agriculture? Yes _____ No _____

50(b) If yes, what sort of training and for how long was it?

Training _____ Period _____

51. Do you possess any of the following in your house?

- (1) T.V. _____
- (2) Radio/Cassette _____
- (3) Car _____
- (4) Gas Stove _____
- (5) Refrigerator _____
- (6) Bicycle _____

- (7) Sewing Machine _____
(8) Record Player _____
(9) Others (specify) _____

52. Where do you get your drinking water? _____

53(a) Have you had any illness or complaints over the past 12 months?
Yes _____ No _____

53(b) What were the nature of your complaints or illness?

53(c) If yes, who did you see about it for assistance?

53(d) Because of these illnesses or complaints, how many days/weeks were
you totally off work from farming operations? _____

54(a) Have the members of the family suffered from particular diseases?
Yes _____ No _____

54(b) If yes, what are these diseases? _____

55. Did you have children (and how many) in your marriage with your
present spouse who died in infancy or early childhood and what
was the cause of death? Yes _____ No _____

If yes:

<u>Number of children died</u>	<u>Cause</u>
(1) _____	_____
(2) _____	_____
(3) _____	_____
(4) _____	_____

56. Can you estimate your total annual medical expenditure in
Sudanese pounds? _____

57(a) Have you ever had any member of your family detained in hospital
or health centre? Yes _____ No _____

57(b) If yes, when _____ and kind of sickness

58(a) Do you know why medical doctors advise people not to walk
barefoot? Yes _____ No _____

58(b) If yes, mention the reason _____

59. Which foodstuffs in rank order do you consider nutritionally the most valuable?

- (1) _____
- (2) _____
- (3) _____
- (4) _____
- (5) _____

60(a) Is there any particular problem(s) confronting your farm this year? Yes _____ No _____

60(b) If yes, what are these problems?

- (1) _____
- (2) _____
- (3) _____
- (4) _____
- (5) _____

61. When did these problems begin? _____

62(a) Considering each problem in turn. Are they reducing (improving) or are they getting worse?

- (1) _____
- (2) _____
- (3) _____
- (4) _____

62(b) Can you explain why and/or how these problems came about?

- (1) _____
- (2) _____
- (3) _____
- (4) _____

63(a) Are you contemplating any changes in your farm next year? Yes _____ No _____ Dont' know _____

63(b) If yes, what are these changes? And why?

- (1) _____
- (2) _____
- (3) _____
- (4) _____

Reasons _____

63(c) What is the main way that a small farmer in this area could help himself to get bigger harvest? _____

64(a) Have you ever lived in any other town, village/hamlet than the home village in which you are now living?

Yes _____ No _____

64(b) If yes, for how long? Weeks _____ Months _____ Years _____

65. When, where and why did you live in these places?

When _____

Where _____

Reason(s) for living there _____

66. What towns in the country but outside the District have you visited in about last year and why?

<u>Name of towns</u>	<u>How many times you</u> <u>have been to them</u>	<u>Reasons for</u> <u>going there</u>
(1) _____	_____	_____
(2) _____	_____	_____
(3) _____	_____	_____
(4) _____	_____	_____
(5) _____	_____	_____

67. Which towns, villages and hamlets in this District did you go to last month?

<u>Name of town/village/</u> <u>hamlet</u>	<u>How many times</u> <u>did you go there</u>	<u>Reasons for</u> <u>going there</u>
(1) _____	_____	_____
(2) _____	_____	_____
(3) _____	_____	_____
(4) _____	_____	_____
(5) _____	_____	_____

68. Which are the main towns in order of importance in this District? (Not more than five)

- (1) _____
- (2) _____
- (3) _____
- (4) _____
- (5) _____

69. Can you tell me which are the main villages in this District? (Not more than five)

List of the main villages in this District

- (1) _____
- (2) _____
- (3) _____
- (4) _____
- (5) _____

70. Would you join a collective or land settlement scheme if one were organised in your District?

Yes _____ No _____ Don't know _____

71(a) How do you think the local agricultural (e.g. extensionists) staff could improve your system of farming?

71(b) Does the Project Development Unit help you?

Yes _____ No _____

71(c) If yes, how does it help you ? _____

71(d) If so, what do you suggest of the ways (in order of importance 1-3 ways) of how the agricultural extension staff might help the small farmer? _____

71(e) What has the Project Development Unit done in the area of your chief? _____

71(f) What activities should the Project Development Unit give up? (Explain) _____

72. If you were given a free choice in spending a "gift" of £s.300 Sudanese or if you got bigger coffee harvests, and therefore earned more money, what is the one main way how you would spend it?

73(a) What is your personal aim in life generally?

73(b) How many children do you think probably you would like to have? _____

74. Do you find that the agricultural way of life suits you?
Yes _____ No _____ Don't know _____
75. Would you accept a suitable job in town if you were offered one? Yes _____ No _____

The following general statements and questions relate to your own future plans in life as well as general comments and suggestions. You are required to answer in the following manner: Agree, Disagree or Undecided. You should also bear in mind that your answers would be treated as strictly confidential.

	<u>Agree</u>	<u>Disagree</u>	<u>Undecided</u>
76. Do you want to learn new ways to farm?	_____	_____	_____
77. If the farm demonstrator gave a talk, would you attend?	_____	_____	_____
78. If your Government would help you establish an 80-feddans farm elsewhere, would you move?	_____	_____	_____
79. Would you like to become rich as the capitalists?	_____	_____	_____
80. Becoming a success in life is a matter of hard work, luck has little or nothing to do with it	_____	_____	_____
81. A steady or regular job is good for a person	_____	_____	_____
82. I would like to work for wages away from farm	_____	_____	_____
83. It is a good idea to borrow money	_____	_____	_____
84. I would like a change in my way of life	_____	_____	_____
85. Do you think you will live better in future?	_____	_____	_____
86. I would like to live in the town/city	_____	_____	_____
87. A farmer should try to farm the way his/her parents did	_____	_____	_____
88. The Agricultural Department instructors do not know any more farming than the 'traditional' authority of farmers	_____	_____	_____

	<u>Agree</u>	<u>Disagree</u>	<u>Undecided</u>
89. It is too risky to try new farming techniques and practices			
90. Do you like your sons/daughters to be farmers?			
91. It is better to enjoy today and let tomorrow take care of itself			
92. This world is run by the few people in power, there is not much the small farmer can do about it			

GENERAL QUESTIONS

- 1(a) Did your District experience drought and famine?
Yes No
- 1(b) If yes, when was that?
2. Do you know the consequences of drought?
Yes No
If yes, explain:
.....
.....
- 3(a) Do you have any idea of what causes rain?
Yes No
If yes explain:
- 3(b) How many types of rain (local names) e.g. heavy rain, showers, light rain
- 4(a) Name all the things needed for good farming and high yields. (Name 1-3 in order of importance) and
(a) Can be obtained with some help from other people (specify)
- (b) Can only be obtained with help from other people (specify)
- (c) Cannot be obtained with help of any other (specify)

4(b) What other things make a farm grow badly?

.....
.....
.....
.....

Thank you very much for your co-operation and
information provided.

PERSONAL COMMENTS AND OBSERVATIONS

- (1) General attitude of farmholders to the agricultural questionnaire.
 - (2) The social, economic and standard of living of the farmholder and his condition of the house.
 - (3) Plan showing the general organisation of the holders' farms.
- Etc.....

BY

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APPENDIX 2 The Selected Headmen and their villages/sub-villages by zones in the study area

Zone 1		Zone 2		Zone 3		Zone 4	
Selected Headman	Village/ sub-village	Selected Headman	Village/ sub-village	Selected Headman	Village/ sub-village	Selected Headman	Village/ sub-village
Erisa Daniel	Madoro	Eugumbe Sabuni	Wowo	Yoroma Budri	Ovobamku	Yona Kperenge	Tiggi I
Agustino Kasimiro	Mbagi	Dungasai Kisange	Musari	Kiro Aburasen	Ngarama	Kazima Kangali	Ras Mongua
Paulino Tihimo	Biji	Daniel Ingina	Madebe	James Eri	Langua	Gbakata Beshir	Lower Bahr Na'am
Luka Mvute	Jambakule	Marangu Gunduso	Naguruti	Balebua Adii	Maripo	Taligo Malis	Upper Bahr Na'am
Leben Banza	Danongiro	Kambili Ritasiri	Namatondo	Karabani Tombura	Mariamba	Ezekiya Bandaga	Jebel Anguto
Mukada Dagbamba	Rubo	Mambedi Dingiso	Mataki	Waria Ungasa	Mangani	Mangua Ladu	Matamar
Magimi Gbabie	Nagbudu	Yosito Asere	Naumbage	William Kulu	Dakude Kugi	Chafura Bilali	Manyipuru
Gbangba Furum bara	Manyene	Sebit Siringi	Mirau	Ariga Ndaga	Ngonde	Petero Geleburu	Sosoro

Source: Fieldwork

APPENDIX 3

List of names of sample farmers in the study area

ZONE 1 (IBBA RC)

1. Agustino Takara	2. Alexander Simona
3. Bimo Bangasuk	4. Charles Giza
5. Charles Awad	6. Charles Sebit
7. Eberema Biyatangba	8. Ereminia Kaduma
9. Furuda Abudalla	10. Gimo Torotiri
11. Gisima Babu	12. Keliopa Banza
13. Leben Banza	14. Luka Mvute
15. Maame Bangbua	16. Manoa Nzari
17. Marian Taiyi	18. Michael Arama
19. Nzuwa Sudunka	20. Obede Kobare
21. Oliver Mathew	22. Orange Dami
23. Orange Mandegi	24. Payitira Yore
25. Penesi Arama	26. Petero Nongba
27. Philip Gbarinya	28. Roto Diko
29. Sawegi Nabiri	30. William Senji
31. Yona Tembura	32. Zerfa Saduki

ZONE 2 (IBBA RC)

33. Angelo Madukinya	34. Alfred Jaiza
35. Anisa Mangeanguo	36. Augustino Garangbanadakayo
37. Bariye Frangi	38. Dakpa Mateyo
39. Daniel Ingima	40. Efuyo Azanga
41. Ereneo Kurupari	42. Ereneo Rungara
43. Everest Gaimo	44. Gerasi Khamiso
45. John Fasi	46. Joseph Lazaro
47. Kurayo Mangeanguo	48. Martino Barikoyo
49. Mat:eyo Gaimo	50. Mingere Vumutaramiza
51. Morodoni Philip	52. Oliver Elia
53. Petero Goliyo	54. Rangaime Gumekite
55. Rhasimiro Khamis	56. Sartel Mande
57. Sarume Gbazi	58. Sobit Kandiso
59. Syangbere Kwakpi	60. Suwandi Uruti
61. Valeryo Ngalimo	62. Yakobo Tamana
63. Yonatana Wegedi	64. Zingwa Ngbavua

ZONE 3 (MARIDI RC)

65. Agobo Meke	66. Alfredi Lago
67. Alfred Nziduko	68. Agoro Manzaka
69. Alawa Pamba	70. Alisama Zara
71. Amosa Nagbarago	72. Andrea Kapi
73. Bennet Jima	74. Benjamin Mgwori
75. Beshi Auda	76. Bilal Osugwo
77. Bondi Sitiye	78. Charles Kuradi
79. Daniel Arubamo	80. Dukuambia Kukeyi
81. Elia Gima	82. Elisa Kagu
83. Elisapa Ali	84. Ezekiah Mursali
85. Gersama Kodo	86. Goodwell Hakimo
87. Gone Ngawa	88. James Abdullah
89. James Kali	90. Kali Mula
91. Kiru Aburasen	92. Kwoddu Bingo
93. Lasu Mande	94. Mamur Liba
95. Manase Agobo	96. Masaba Paulo
97. Morris Adigini	98. Morris Bonduwa
99. Paul Kilimanyango	100. Samuel Badi
101. Samuel Bowili	102. Samuel Jima
103. Simona Yakobo	104. Sobit Wani
105. Stephen Mabinza	106. Stephano Lali
107. Stewart Kenyi	108. Yoanne Gala
109. Yairo Atiya	110. Yona Ngumi
111. Yoroma Lelu	112. Yotama Moru

ZONE 4 (MARIDI RC)

113. Andrea Kagume	114. Arubama Beshir
115. Brown Element	116. Biyambu Bambia
117. Buluro Bazuruta	118. Charles Beshir
119. Christopher Kiro	120. Damari Nandegi
121. Elisama Lebene	122. Ezekiah Gambur
123. Gbarango Ndeke	124. Gima Fargalla
125. Gordon Gargalla	126. John Nguwari
127. John Sebit	128. Joseph Ezekiah

129. Jowaba Marasanga	130. Juma Murujani
131. Justin Kalawa	132. Khamisi English
133. Kitabo Ribanda	134. Lucy Mbakima
135. Lino Awasi	136. Mbafuyo Murangi
137. Manga Bullen	138. Marko Gumasi
139. Marko Hakim	140. Michael Bowili
141. Michael Makiri	142. Michael Tiyimali
143. Ngaringa Manganzu	144. Oliver Morjan
145. Philip Ezekiah	146. Richard Basha
147. Richard Juma	148. Samuel Meriwa
149. Sarona Biriza	150. Satina Kparenge
151. Sebit Mande	152. Silvano Dokolo
153. Simon Mbaraza	154. Sitabu Azua
155. Thomas Nganzi	156. Tito Lazarus
157. William Simon	158. Wilson Kirima
159. Yaura Ngabi	160. Zai Beshir

APPENDIX 4

SURVEY TERMS AND A NOTE ON TERMINOLOGY

(1) Farm or holding

The basic enumeration and tabulation unit of this survey is the 'holding' or 'farm' which are used synonymously. In technical terms, it is all land which is used wholly or partly for agricultural production and is operated, managed or directed by one person alone or with the assistance of others, without regard to title, legal form, size or location. The farm may comprise of one or more fields or plots. The fields may be adjacent (side by side) or scattered. As long as the fields are under the control of one farmer they are part of the same technical and economic unit; and, therefore, make up a 'farm' or 'holding'.

(2) Field or block

A continuous piece of cultivated land which may consist of one or several plots carrying one crop or mixture of crops. A farmer's 'holding' may consist of several fields.

(3) Fallow land

Land allowed to rest in order to regain its fertility under natural cover (e.g. bush).

(4) Plot

This is a piece of land with more or less homogeneous cropping pattern. A farmer or 'holder' may have several plots forming one field but with different crops or different fallows. For instance, the sorghum (dura) plot, the groundnut plot, the coffee plot may all form one continuous field; or it may also consist of interplanted crops.

(5) Farmholder

The person who has the right and responsibility for the management of the farm or holding and may have full economic responsibility for it.

(6) Household

A person or group of persons living together under one roof or several roofs within the same compound or homestead area and sharing a community of life by their dependence on a common holding as a source of income and food, which usually (but not necessarily) involves them eating from a 'common pot'.

(7) Head of household

The senior member of the household residing in the household compound. The 'head' of household or 'holder' are the same person in cases where the holder resides with the rest of the household. The head of the household may be a woman (widow) and whose husband has died or is away (absent) for a long period of time.

(8) Household farm labour or family labour

Members of the household who normally work on the farm. This usually includes father, mother, children, relatives and other adult members of conjugal and extended families, who live permanently and may or may not share the meals from the same pot.

(9) Working or beer parties

These organisations or parties usually involve members of a local community and who provide their labour force on co-operative or helping terms especially during peak periods of agricultural operations. These informal co-operative institutions may or may not involve the expectation that the labour force provided will be returned.

(10) Hired labour or non-household labour force

This is labour force provided from outside the household or family and engaged individually in farm operations, either for hire in cash payment or in kind (e.g. a portion of the harvested crops). The payment may be received for a 'day's' work or for a certain job performed.

(11) Agricultural produce

This is the set outcome of products from the growing of arable crops such as sorghum, maize, groundnuts and so on as well as livestock, tree crops (e.g. coffee) and other fruits.

(12) Crop mixture or intercropping

This is a combination of crops planted within the same plot. They are not necessarily planted or harvested at the same time. It may happen that more than one crop are interplanted within another over the course of the year.

(13) Homestead

It is the bush-cleared area of the household or family and includes houses, or huts (tukls: Arabic), kitchen and storage facilities and so on.

(14) Non-agricultural occupations/off-farm activities

These include all non-farm or off the holding activities. For example, a farmer may be employed on his neighbour's farm, or in public or private projects; or the farmer is a part-time bicycle repairer, blacksmith, retailer; or the farmer and wife/husband works as a tailor; or if the children attended school. Other activities may include collecting useful fruits, vegetables and hunting fauna and honey-gathering, beer-making, mat and basket making and other handicrafts and so on.

(15) Ecosystem

Wherever this term is used in this study, it should be explained or interpreted along the lines of Fosberg's (1963) definition as a 'functioning interacting system comprising of one or more living organisms and their effective environment, both physical and biological'; and granted that where man is concerned the 'effective environment' includes social,

economic and cultural attributes. One problem in this interpretation is that despite recent work on economics of environment (Isard, et al., 1972), a single conceptual system linking social and biological phenomena has yet to emerge. This difficulty can partially be explained in that the ecologists concentrate on energy values whereas social scientists employ monetary terms or value-scales to measure and explain the dynamics of the systems under study.

(16) Environment

Wherever the term environment is used in this study, it (unless specifically qualified) refers to the entire effective environment of the peasant farmer including physical, biological and social relationships. A discussion of the specific sub-set of man-environment relationships which are directly involved in the process of agricultural production - thus leading to the use of terms such as farming or agricultural system, man-land interrelationships and farm-management practices.

(17) Environmental perception

The loose use of the term 'perception' by geographers in their attempt to explain spatial behaviour and environmental decision-making (Wood, 1970) gives little or no strict definition of empirical studies of psychologists concerning the relationships between sensations and external stimuli (Allport, 1955). When geographers talk of environmental perception, they generally refer (as employed in this study) to mental constructs, images and concepts which are only explainable to each individual-environmental relationships.

(18) Economic-ecological and social-physical factors

These terms when referred to in this study, mean that these distinctions reflect present weakness of terminology and conceptualisation, but do not imply a fundamental distinction between 'human' and 'physical' factors in the geography of man-environmental relationships.

(19) Peasant

In this study, emphasis is mainly empirical and therefore it should be made clear that, in the absence of suitable substitute terms from those of Marxist theories of revolutionary 'social change' and Western theories of 'modernisation' (Rogers, 1969; Wolf, 1966; Shanin, 1971), peasant and peasant farmer (or farming) are used in a generalised and descriptive manner to cover the situation where farming is more than auto-subsistence production, but less than a fully-commercialised business; is on a small-scale and using restricted amounts of capital and simple technology; and is dominated by kinship-based rights to land and access to labour.

(20) Knowledge

In this study 'knowledge' is used to mean the technical knowledge of newly introduced agricultural ideas of practices and techniques either spontaneously or by the public and private agencies (external or internal) as well as that knowledge possessed by peasant farmers; and with their capabilities for assimilating, adapting and communicating and creating knowledge (a knowledge known as indigenous technical knowledge (ITK)).

(21) Change

This is intended in a neutral sense to cover the 'good', 'bad' and 'indifferent'. And as much as possible 'progress', 'development' and 'modernisation' have been given specific and restricted meanings in this study.

(22) Traditional agriculture

For the purposes of this study, 'traditional' agriculture as defined by Ruthenberg (1971) means food production systems that do not use fossil fuel energy subsidies.

(23) Southern Sudan

This name is synonymously used with 'Southern Region' to mean the same thing. The political and administrative changes of Southern Sudan made in 1983 are not considered.

(24) Maridi District

This name is also used to refer to the 'study area'.

APPENDIX 5

SOME INDIVIDUAL FARM CASE STUDIES IN THE STUDY AREA

This Appendix outlines some case histories (biographies) of a few relatively poor and rich peasant farmers selected from the four hypothetical socio-ecological zones delineated in the study area (see Chapter 2). During the fieldwork survey much was observed or detected that was difficult to analyse statistically. These farm case studies presented here are mainly intended to convey to the reader some of the impressions and the general flavour of events which the researcher and enumerators obtained in the course of farm visits. These case studies illustrate a variety of background characteristics of farmers' lives in rural areas that can be associated with some aspects of success or failure in peasant farming career. In fact, these histories represent the kind of raw material which is probably relevant or essential to innovation studies and which is unavailable in the more structured study (see Chapter 10).

The procedure adopted in the selection of individual farmers for informal interviews was to ask the local chiefs in respective zones to mention or nominate a farmer(s) who has a relatively 'best farm' or 'worst farm'. A 'best farm' in contrast to 'worst farm' was defined as one which is well-managed particularly well-weeded and protected from pests and wild animals, and sufficient labour input, relatively larger farms with many crops grown including the exotic improved varieties as well as the use of new techniques and practices of farm management (see Chapter 10). A 'worst farm' lacks the above-mentioned aspects and is usually owned by farmers who cultivate smaller plots particularly around homestead compounds; they are often seen offering their labour on neighbouring farms for food and beer and talk much about more farm problems and particularly lack of agricultural implements. It was decided to interview three farmers from each zone thus making a total of twelve.

FARMER 'A' : ZONE 1 (IBBA RC)

This farmer is aged 41, born in Wau (Bahr El-Ghazal Province) as was his father. He is a Jur by tribe and is married to two wives. He feeds seven people of whom four help farm. He is a farmer-trader who moved from Wau to live in Maruko to run his retailing business. He managed his business for four months together with his brother in Juba but it was not profitable. He has a relatively larger farm (about fifteen feddans) containing groundnuts, maize, cassava, sorghum, millets and sesame. He has three tin-roofed newly constructed houses as the mud plaster on the outside walls was still fresh. He employs two permanent labourers and pays each fifteen Sudanese pounds per month. He sells various consumer items such as oil, soap, tea, sugar, dried and salted fish, bush meat and clothing. He has a gun and hunts small and big wild animals. He transports from Juba into the village his commodities for sale in larger quantities with his own landrover car. He confidentially acknowledged receiving a gross income from his farm of five hundred Sudanese pounds per month, six hundred and fifty Sudanese pounds from his shop and particularly from the sale of bush meat and from illegal selling of smuggled elephant tusks into Zaire and to Jellaba traders. He noted that although he helps his neighbour farmers by granting them loans in kind from his shop, and payable in kind (crops), there are some farmers who envy and hate him because he is considered as an immigrant. The farmer proudly showed his typewriter and a refrigerator

but admitted that now he does not use the typewriter except when he was keeping accounts for his elder brother; and the refrigerator because there is no electricity. The farmer hopes to progress ahead and intends to purchase a generator to supply light and power to his residence and shop, and a pump to help him irrigate his vegetable plot located in the nearby stream. He generally intends to invest all his extra money into the development of his farm. He admitted having saved part of the farm income in a bank in Juba and hopes to expand his trade and to establish a grinding flour mill in Juba. The farmer acknowledged his awareness of the prevailing price variations or market intelligence of some of the consumer items in some of the market centres and therefore informs his neighbours and friends. This farmer appears to be a prosperous one by combining trading (off-farm occupation) with farming.

FARMER 'B' : ZONE 1 (IBBA RC)

The farmer is aged 39, was born in Madoro as was his father. He is a Zande with a wife and two children. His father is a witchdoctor. The farmer attended a Qoranic school (khalwa) in Juba in 1955 and studied Islam for one year. In 1965 he went to Khartoum where he worked as a houseboy with one of the retired army officers. In 1970, he returned to his village on learning of his mother's death. He started to grow cassava, groundnuts, maize, millets, sesame, beans and sorghum in a small farm plot of one feddan. He sells few of his crops when he needs some cash to purchase some of the consumer commodities unavailable in the village. In 1976, he started to sow Western Yellow maize, Serena sorghum and Makulu Red groundnut exotic varieties. All these varieties did not do well and he therefore abandoned them the year after. He said that he would rather prefer growing the 'traditional' varieties. He has a few young coffee plants interplanted with bananas around his homestead compound consisting of three huts, two granaries and a chicken house. He aspires to grow more food crops of which some would be offered for sale. He also intends to have another wife and produce more children who would help him farm relatively larger plots with more food crops. This would also enhance his reputation or respect in the village community. The farmer noted the problem of poor transport and marketing systems. He always keeps money back from his previous year's harvest for his family's sustenance. This farmer generally aspires to advance socially and economically though with some 'traditional' attitudes reserved.

FARMER 'C' : ZONE 1 (IBBA RC)

This farmer was considered by the local chief as poor by the local standards. Aged 38 and born in Makutari in 1944 and a Zande, he had his left hand cut off during the Civil War in the Southern Region in 1967. He has two wives but no child. They live with his younger brother on the adjoining farm. The farmer's wives virtually manage their small separate farm plots, each with a hut, and they buy some consumer goods from Maruko and Ibba centres. Nevertheless, they continue the man's farm plot as their joint responsibility. However, the farmer only helps to a limited degree in scaring birds and harvesting. Occasionally, the farmer's two sisters come to help the wives on the farm. The farmer's wives brew beer and distil alcoholic beverages which are sold in the local periodic markets particularly on Sundays. The money obtained from the sale of the

drinks is used for purchasing some food items from the centres to supplement the farm produce. The farmer's wives acknowledged that they have seen neighbouring farmers experimenting to sow some of the exotic 9DX7/11 and Serena sorghum varieties the previous year. But that they have not been contacted by the extensionists who, according to them "only visit their friends or places which can only be reached by walking or by bicycle"; and that these officers disregard them as they are females who are generally considered to know nothing about the 'modern' agricultural inputs and development initiatives. The farmer's wives, however, lamented their fate and misfortune of not having produced children who would contribute their labour force to farming or join some of the urban employment opportunities. When interviewed, the senior wife insisted that all 'traditional' social values should not, however, be discarded and that if a person is bewitched, a treatment from the local practitioner should be sought. The farmer and his wives hope that God, who is the source of all things, will help him have children in the future and who would help him farm. This farmer is relatively poor who depends wholly on his wives' efforts considered insignificant by local standards.

FARMER 'D' : ZONE 2 (IBBA RC)

The farmer aged 34, lives in Kangwa but was born in Nabanga, where his father was also born. However, he spent part of his childhood life with a relative in Ibba town. This farmer is a church preacher and very hard-working. Both he and his father hold village titles of chief and sub-chief. He has no formal education; married with five children, of whom two are in primary school. He would have, he admitted, been more prosperous, but for a younger married brother with two children, who became mentally deranged (thought to be suffering from chronic sleeping sickness) some three years ago. The sick brother was taken by the family in succession to Lirangu, Yambio (Yambio District) and Juba for treatment, but to be told each time that he was a hopeless case and difficult to cure. Presently, the farmer's brother wanders aimlessly about the homestead compounds of neighbouring farmers in the village, and unable to talk sensibly or to help out in any way. In desperation, the farmer and some of his family members took the sick brother to 'traditional' medicine and local healers after which the brother was acknowledged to have improved slightly. But that the treatment was too dear - five rams and ten big cocks. Currently, the farmer is struggling very hard to save some money to enable him take his sick brother to Khartoum which he regarded as the last resort. The farmer said that if that fails, "we want God's help to be done speedily; for we have attempted all ways and exerted our efforts by spending all that was possessed." He has five farm plots which contain various crops, and has also a hundred coffee trees which first yielded the year before and gave him a hundred and fifty Sudanese pounds. He admitted that he started to grow coffee because he saw neighbouring farmers securing relatively much income from it. Coffee, as he put it, "is a crop which became commercially more important than cotton." His income is mainly derived from the sale of coffee, sorghum, cassava and millets and other crops. He sometimes hires temporary labour on his coffee farm and pays them mainly in cash. He talked with pride and confidence of his farming management or performance and that his family members did not experience hunger. This farmer appears to be more prosperous and optimistic about the development of his farm. He tends to utilise both the 'traditional' and 'modern' health facilities.

FARMER 'E' : ZONE 2 (IBBA RC)

This farmer is aged 60 and a Zande born in Wowo. He has a relatively large household located in the heart of the bush. The household contained in all six houses and two chicken houses and four grain stores. He has two wives, the first with five adult sons and the second with a small son and two married daughters. The wives help on farm. The farmer has five goats, six sheep and three cattle which are herded by neighbouring farmers. The farmer said that his livestock was herded by his adult sons but now they have migrated to the centres in search of waged job opportunities. But that none of them remits back any money. His wives brew local beers to earn more income. This is supplemented by the sale of firewood and charcoal. The second wife, the most hard-working in comparative terms was reported to have obtained enough income in this way to purchase her own clothes for the previous year's Christmas feasting. The farmer in the past thirty years worked as a cotton purchasing officer in the EPAPC during the Anglo-Egyptian Condominium period, but retired in 1960. He approves of the improved exotic crop varieties introduced by the extension staff but does not appreciate the methods of their dissemination as these varieties are only accessible to few farmers. He reported that there has been an increase in cattle and goat disease in recent years, which he added is due to more livestock being brought into the study area by Dinka cattlemen who mainly slaughter them for sale at the main centres and larger villages. The farmer now depends on a very small plot of food crops and most of the farm operations are mainly performed by his wives as his physical capacity is decreasing due to ageing and hard labour. The farmer seems to innovate but labour is a constraint as well as the methods of dissemination of new inputs.

FARMER 'F' : ZONE 2 (IBBA RC)

He is aged 36, a Zande and born in Madebe. His father is a rain-maker. He feeds five people of whom one helps farm, one is blind. The others are school children. He began to farm independently at the age of 18. He considered himself as a young struggling farmer. He said that in the previous farming season he was sick and the man who helps farm was away for five months and hence lacked labour to grow enough food crops. Consequently, he resorted to labour in neighbouring farms and begged for seeds from them and other friends. In the previous years, the farmer worked as a labourer in the Forestry Department but this ceased in 1965. He has a disabled wife and contributes less to farm labour input. She does not even brew local beers. Although she is a 'traditional' medicinewoman, she is rarely visited by people of the village. The farmer grows few crops. He stopped planting sweet potatoes entirely because of lack of sufficient labour needed for heaping. He plants a small amount of cassava around the homestead compound. He acknowledged to have grown a small plot of cotton the previous year but the product was not purchased by the agricultural staff and therefore he stopped growing the crop. He said that now there is less interest in farming than there was during the time of his ancestors and there is no future in it. He does not think or hope to live better in the future unless he was educated to join clerical jobs in the urban centres. He noted that the world of today is run by the educated and in general people prefer education, office work and city life to farming. Generally, although this farmer tries to improve his farm, he is constrained by labour input problems and lack of efficient marketing systems. He is therefore pessimistic about farming life and is influenced by urban life and better living through involvement in clerical jobs.

FARMER 'G' : ZONE 3 (MARIDI RC)

Aged 45 and a member of the Jur tribe; the farmer was born in Rumbek. He lives in Ngonde where his father also lived. He feeds twelve people including eight children most of whom help farm. He breeds about fifty chickens, five sheep and three goats and manages a farm of about five feddans planted with various food crops. In addition, he has about four feddans of coffee plants and employs three permanent Zairian refugee labourers who are each paid two Sudanese pounds a day. Four of the children are in school and he spends approximately fifty Sudanese pounds for their fees and school equipment. He has a small tea shop located near the coffee farm. He said that he gets about three hundred Sudanese pounds per year gross income from the farm and a hundred Sudanese pounds from his tea shop. The farmer considers himself as one of the most industrious and business-like of farmers in Ngonde village. He uses poultry livestock refuse for manuring the backyard or homestead gardens particularly his vegetables, because according to him "the crops grow green, healthy and strong." He said that it is better to take risks so as to obtain benefits which accrue from being first. He complained of lack of Agricultural and Veterinary Departments' services in the village particularly for the problems of crop and animal pests and diseases. He acknowledged having reported these problems to the extension staff but nothing has been done so far to remedy these constraints. This is a more prosperous and innovative farmer who combines farming with off-farm activity. A hard-working farmer and optimistic to live a better life than his neighbour farmers.

FARMER 'H' : ZONE 3 (MARIDI RC)

This farmer is aged 39, a Moru, born and lives in Amaki. He is the son of a local chief. He has a family of thirteen including three children and two unmarried brothers. He has two wives, and the homestead includes nearly fifteen feddans as a common unit from which the harvest is processed for sale. Each wife maintains additional plots. The farmer keeps five goats and one sheep while the women keep many chickens. The homestead is virtually a 'village', a cluster of mudwalled, thatched houses, one to a wife and each with its own kitchen. The farmer grows various food crops such as millets, beans, sorghum, groundnuts, cassava in small quantities. In 1979, he sold many of his livestock when there was a failure of crops due to lack of rainfall. During that period, his brothers, wives and other household members went to the bush to gather wild fruits as well as firewood and honey for sale in the local market. He admitted that they were very nearly ruined in 1979, "it was a real war," he added. By dint of very hard work each family member was able to obtain about thirty five Sudanese pounds per month from the above-mentioned subsidiary occupations. Now he grows more sorghum, groundnuts, cassava, sesame and other food crops. He tried to grow the PDU exotic crop varieties in 1981 but gave up planting them because they are easily susceptible to bird attack and do not taste good. He aspires to get more income and food for his family sustenance. He said, he now weeds more frequently than in the past, but complained of the problem of witchweed (Striga hermonthica) mainly attacking sorghum. This is generally a relatively 'advanced' or 'innovative' farmer able to work harder by combining off-farm occupations and farming for the livelihood of his family members.

FARMER "I" : ZONE 3 (MARIDI RC)

Born in 1948 in Kuji Yabe, son of an Avukaya farmer who was a hunter and blacksmith. When his father died in 1959, he was still in a primary school. Soon afterwards he left school and went to Juba where he worked as a houseboy for one of the Jellaba traders. He attended evening classes offered by the missionaries and proceeded to a Government junior school. After completion of this level, he could not continue his further studies because of lack of financial support particularly the payment of school fees. Consequently, he opted to work as an untrained teacher, and later as a trainee dresser or hospital dispenser. In 1965, when the Civil War intensified in the Southern Region, he migrated to Uganda where he had Bible studies and learned veterinary education by correspondence. In 1972, when peace prevailed in the Southern Sudan, he came back and settled in Kuji Yabe where his father was buried. He started to grow various food crops after being married subsequently on his return. He now has two children of whom one helps farm. He was offered a job in the Agricultural Department but did not accept the job as the salary was relatively low. In 1977, he purchased five cows from a Dinka cattle owner for four hundred Sudanese pounds. He herds the livestock on harvested farm fields and admitted that the dung deposited by the cows is useful in increasing soil fertility. He provides limited advice to farmers owning livestock, but complained of lack of drugs for animal diseases. In 1981/82 Southern Regional Government parliamentary elections were held and he contested in them and subsequently became a member of parliament. He employs two permanent and some temporary labourers on his farm and herd his livestock. He was a politician for four months but later resigned when confronted by the bitter tribal politics and conflict. He is currently settled in Kuji Yabe but owns three zinc houses in Maridi headquarters which are rented out to some Government officials each for eighty Sudanese pounds per month. He confidentially acknowledged a gross income of nearly four hundred Sudanese pounds from his farm and house rents in one month. He emphasised living on farming is better than being 'pushed around' in Government clerical employment opportunities by the senior administrators. This farmer has generally experienced urban life-styles and values but has focused his interests on farming. He is more prosperous by average local standards in the study area.

FARMER 'J' : ZONE 4 (MARIDI RC)

This farmer is aged 41, a member of the Moru tribe born and lives in Mongua III. He had primary and junior education in Maridi headquarters and joined Yambio Agricultural Institute. Having completed the institute after two years he joined work as an assistant research officer in Yambio Research Division. He migrated to Uganda when the Civil War erupted in the Southern Region. In Uganda, he worked for three years as an assistant shopkeeper with an Indian merchant. Having accumulated some capital, he started though with difficulty to set up a small canteen food shop, a new business in his life-time. While managing his business, he at the same time worked as an agricultural officer in one of the coffee estates in Uganda. "This was comparatively a valuable job because of the farm experience gained," he added. Thus, he divided his working time between the canteen food shop (which he employed an assistant who was paid about one hundred and sixty Ugandan shillings) in the evening and worked in the coffee estate in the morning hours. He married a Luo girl who was also working in the same estate as an extension officer. They now have four children. Since returning to Mongua III in 1972 from Uganda, he has gained travel experience.

The farmer then started his career back in Mongua III by establishing a small coffee plantation of about six feddans. Three of his family members help farm. At first the plantation yielded five sacks of coffee beans from four hundred trees. During the cultivation season of 1978/79, his yield increased by an appreciable ten sacks of coffee beans from one thousand trees. The farmer now employs one permanent labourer and uses 'modern' agricultural techniques and practices in coffee management including mulching, pruning, use of secateurs and locally-made wooden coffee hulling equipment. Soon some of his neighbouring farmers began to copy from him coffee management techniques which were subsequently and gradually diffused. In some cases, the farmer demonstrated to his colleagues the new farm techniques and practices. He acknowledged having helped five neighbouring farmers set up coffee nursery gardens. In 1978/79 season, he received about four hundred Sudanese pounds from the sale of ten sacks of coffee beans produced. Out of this income, seventy Sudanese pounds were expended on clothing for the Christmas celebrations and other consumer items such as sugar, salt, soap; he paid twenty five Sudanese pounds poll-tax, fifty two Sudanese pounds as school and examination fees, fifty three Sudanese pounds as the cost of coffee equipment and other inputs and saved the rest (\$200 for emergency cases such as funerals and hospital treatment). The farmer is therefore ambitious to expand his coffee plantation in the near future. Thus, socio-economic aspirations influenced the farmer to be one of the most enterprising in the study area. The only capital impetus available to him is that generated from coffee which would probably enable him to develop his land through hard work and experimentation. But the only major constraints, the farmer admitted were those associated with transport and marketing of coffee. He mainly sells his coffee to travelling Jellaba traders or sometimes uses a truck or lorry to transport his coffee for sale in centres such as Juba or Yei. This farmer is the most innovative by local standards. The importance of off-farm occupations and farming is much emphasised.

FARMER 'K' : ZONE 4 (MARIDI RC)

The farmer aged 40 is a Baka born in Bahr Naam. His father worked as an agricultural officer until 1956 when he died. He started to farm independently at the age of 18 after being married to a Moru girl. He has five children, one in a primary school. At first he planted cotton, millets, beans, grains and has some sheep, goats and poultry. In 1964, he stopped planting cotton because it was unprofitable. During the Civil War he moved on to live in Maridi headquarters for security reasons where he obtained a driving licence that led him to work as a lorry driver for a Jellaba merchant. He acknowledged having accumulated approximately two thousand Sudanese pounds with which to set up a small retail shop in the town. He sends some money to a brother back at the village to help him manage his coffee plantation by employing hired labour. He previously possessed a few livestock and poultry but the livestock died of diseases and wild cats killed his poultry which he did not bother to replace. Sometimes he goes back home to visit his brother and help in the management of the coffee plantation. The proceeds from the sale of coffee are used to purchase more mass consumer items for re-sale in the shop in the town besides being invested in the farm. Since starting farming, he frequently weeded his crops, mulched, pruned his coffee, practices which he admitted having seen from his father and which have persisted until now. It is a matter of hard work and ambition that enable one to be successful in life. The farmer said very little in precise terms about his gross income but mainly lamented that socio-economic obligations on the extended family members 'pull him down very much'. He has

a hazy opinion about dependence on the farm alone, but that off-farm and farming occupations should be complementary to each other. Now that he is relatively better off than his colleagues highly dependant on farming. He said "when I go home to visit friends and imagine them struggling to survive, I just wondered whether they were mad and how they were coping with the 'modern' living standards of today." It is obvious that the importance of off-farm employment opportunities and farm are again brought out into focus by the ambition and prosperity of this farmer.

FARMER 'L' : ZONE 4 (MARIDI RC)

Aged 33, a member of the Mundu tribe was born in Gworosai village. He has only one feddan mainly managed by his wife. The farmer became disabled after being wounded during the Civil War hence he contributes very little on the management of the farm. The farmer's wife was not, however, well-dressed but wore a torn frock. She was on site working in the nearby fields and sang songs indicating despair and lament of their poverty. The nearby farm plot was interplanted with groundnuts, cassava and beans and the farmer acknowledged a poor harvest because they were not weeded. The woman mainly deals with the day-to-day farming decisions after consultation with her husband. The farmer did not experiment or try to grow the exotic improved crop varieties of the PDU because he heard from several neighbouring farmers that they were not as good as the 'traditional' varieties. He expressed less hope to improve his farm and he doubted whether he will ever live a better life in the future. This farmer lacks labour input and is pessimistic about the prospects for improvements of his farm. He appears to be 'traditional' in his outlook and mental frame of reference and is relatively poor in the study area.

In sum, the individual farm case studies outlined above are therefore intended to convey some of the fieldwork impressions gained through informal interviews and observations during farm visits. The socio-economic trends embodied in the above histories are mainly related to the new agricultural practices and techniques that are diffusing into the 'traditional' farming systems in the study area. Most of the socio-economic features common to most of the case studies concerned the 'traditional' and 'innovative' attitudes of farmers. In particular, the importance of off-farm activities to supplement farm income or farmers struggling to accumulate farm income to open up secondary businesses especially retailing or trading are well-spelt out or portrayed in most of the individual farm case histories, and their relationship to the town as farmers' access to cash within the farming calendar. It is emphasised that these few individual farm case studies are not offered as a 'balanced sample' but to some extent provide some instances of the 'special factors' that are to be found at the individual farm level, and are not brought out by questionnaire summary statistics. They mostly seem to be relatively prosperous or 'advanced' farmers. Gasson (1973:526) succinctly noted that "superficial answers are still meaningful and individual variations in what is thought to be socially and economically acceptable can be highly revealing."

APPENDIX 6 Mean annual rainfall (in mm) for selected stations in the study area, 1941-70

Station	Zone 1 Maruko	Zone 2 Kangwa	Zone 3 Amaki	Zone 3 Ngonde	Zone 4 Maridi	Zone 4 Gworosa
Number of years of record	19	24	20	24	26	20
Altitude in M a.ms.l	430	550	440	450	750	495
MONTH						
January	1	4	3	5	8	7
February	2	5	3	10	9	8
March	30	41	26	47	48	45
April	96	132	112	112	180	150
May	147	180	181	172	185	162
June	180	183	157	147	140	126
July	187	164	195	156	160	151
August	204	199	230	179	200	192
September	173	154	122	157	185	173
October	114	119	81	116	134	129
November	12	47	33	39	49	42
December	1	8	4	5	9	7
Total	1147	1236	1147	1145	1307	1192

Source: Meteorological Department, Maridi

APPENDIX 7 Mean monthly temperatures (in °C) in Maridi, 1978-82

<u>Month</u> <u>Year</u>	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
1978	N.A.	N.A.	N.A.	31.5	30.9	31.0	32.9	33.9	34.4	35.2	35.5	35.1
1979	35.3	35.3	36.5	33.2	30.2	30.0	32.4	33.3	33.8	N.A.	35.1	35.8
1980	38.6	38.4	N.A.	36.6	33.8	33.6	32.5	32.7	34.6	34.4	30.4	31.9
1981	33.7	33.8	31.9	32.8	29.9	28.0	27.7	29.9	28.9	29.2	30.7	32.4
1982	33.2	33.3	33.5	33.2	29.6	28.6	26.9	26.9	28.3	26.8	30.0	30.0
Mean	35.2	35.2	34.0	33.5	30.9	30.2	30.5	31.3	32.0	31.4	32.3	33.0

Source: Project Development Unit, (PDU), Maridi.

APPENDIX 8(A)

The Distribution of Population by Chiefdoms in the study area, 1982

Zone	Name of Chief	Name of village or centre	Estimated Population	Male	Female	% of Fem- ales to Males ($\frac{F}{M} \times 100$)	Number of households	Sample as % of households in selected villages
1	Migido Ramadan (Maruko) ⁽¹⁾	Rindi	120	57	63	111	42	7.0 14.8
1		Maruko	259	139	120	86	83	
1		Nakuri	143	75	68	91	53	
1		Madoro	390	197	193	98	115*(8)	
1		Matorombo	161	83	78	94	54*(8)	
1	Ayobo Ruko (Ruko) ⁽¹⁾	Manzange	210	103	107	104	59	
1		Inivuru	143	76	67	88	49	
1		Nagbara	250	115	135	117	68	
2	Ismail Bagbaro (Tanamuko) ⁽¹⁾	Mafuyu	117	62	55	89	44	
2		Bambira	85	40	45	113	26	
1		Masikisa	146	63	83	132	46	
1		Tanamuko	371	190	181	95	140	
1		Bambu	263	133	130	98	86	
1		Mongogalio	174	88	86	98	60	
1	Yoasa Unga (Ibba) ⁽¹⁾	Ibba and country	1,000	580	420	72	350	3.0
1		Arua	785	391	394	101	263	
1		Nagbaka	712	336	376	112	222*(8)	
2		Rubo	620	326	294	90	214	
2		Gabat	246	140	106	76	78	8.9
2		Wowo	283	135	148	110	90*(8)	
2		Eso	134	67	67	100	35	8.9
1		Makutari	200	103	97	94	90*(8)	
2		Magida	156	73	83	114	47	
2	Faustino Roro (Madebe) ⁽¹⁾	Bobodi	238	115	123	107	80	2.5
2		Madebe	908	439	469	107	321*(8)	
2		Rimuriau	159	82	77	94	56	
1		Nazenrenge	573	277	296	107	204	
1		Masikisia	127	56	71	127	40	5.4
2		Mirau	401	177	224	127	148*(8)	
1		Igi I	973	459	514	112	279	
1		Nagondi	342	167	175	105	138	
2	Gbamani Mabenge (Nabanga) ⁽¹⁾	Kangwa	271	108	163	151	88*(8)	9.1
2		Gbuo	166	75	91	121	62	
2		Igi II	156	72	84	117	65	
2		Mataki	283	152	131	86	95	
2		Nabanga and country	1,193	582	611	105	449	
TOTAL			12,758	6,333	6,425	-	4,339	1.5

* Sample Villages and number of selected household heads in brackets, 64 Households

Zone	Name of Chief	Name of village or centre	Estimated population	Male	Female	% of Females to Males ($\frac{F}{M} \times 100$)	Number of households	Sample as % of households in selected villages
3	James Bakinda (Nagbaka) (1)	Tiggi	163	88	75	85	56	
4		Mongua I	381	193	188	97	120	
4		Ras-Tigi	199	96	103	107	77	
4		Mongua II	350	152	198	130	123	
3		Gangalu II	227	118	109	92	86	
4		Mongua III	225	105	120	114	58	
3		Nagbaka	296	148	148	100	61	
3		Gangalu I	149	68	81	119	40	
4		Maridi River	158	81	77	95	57	
4	Osman Ali (Amaki) (1)	Mabilindi	555	278	277	100	131	
3		Amaki	381	186	195	105	100*(12)	12.0
4		Matalia	227	120	107	89	63	
3		Korokondaga	165	80	85	106	43	
4		Napere	217	114	103	90	52	
3		Mata	100	46	54	117	35	
3		Woko	232	117	115	98	70	
3		Ngonde	284	143	141	99	80*(12)	15.0
3		Kuji Yabe	157	85	72	85	36	
3		Koja	151	74	77	104	37	
4		Sosoro	310	155	155	100	90	
4	Samuel Muragi (Mboroko) (1)	Abringi	105	48	57	119	32	
4		Etri	132	60	72	120	39	
4		Mongua I	501	220	281	128	184	
4		Mongua II	729	343	386	113	187*(12)	6.4
4		Mboroko	667	323	344	107	219	
4		Mayuwa	56	20	36	180	14	
4		Nyadua	105	47	58	123	32	
4		Naigbia	214	100	114	114	72	
4		Mongua III	137	60	77	128	39	
4		Kazan West	43	18	25	139	14	
4		Marubanga	122	46	76	165	35	
4		Matara	246	116	130	112	73	
4		Embe	258	124	134	108	57	
4		Kanisa	531	243	288	119	154	
4	Elia Bingo (Edi) (1)	Mbalaba I	249	114	135	118	76	
4		Arende	223	107	116	108	66	
4		Gworosai	843	400	443	111	209*(12)	5.7
4		Edi	500	246	254	103	140	
4		Naam	196	103	93	90	59	
4		Apiti	94	47	47	100	22	
4		Aza	166	82	84	102	47	
4		Keli	126	60	66	110	38	
4		Ras-Olo I	141	69	72	104	38	
4	Jonathana Mambe (Mambe) (1)	Bahr-Olo	445	218	227	104	110	
4		Mambe	690	323	367	114	173	
3		Mangaehe	520	250	270	108	129*(12)	9.3
3		Langua	208	91	117	129	47*(12)	25.5
4		Bahr-Naam	146	70	76	109	39	
4		Ras-Olo II	288	138	150	109	76	
4		Tapi	165	80	85	106	45	
4		Faraksika	191	90	101	112	45	
3		Bahr-Olo North	57	27	30	111	19	
4	Daud Idris (Meke) (1)	Mundukua	115	50	65	130	29	
4		Nakua	40	19	21	111	16	
4		Lalama	173	80	93	116	34	
4		Mudawa	59	20	39	195	17	
4		Edi	45	25	20	80	17	
4		Mbalaba II	75	35	40	114	22	
4		Kuanga	67	32	35	109	18	
4	Ruben Batali (Bahr-Naam) (1)	Bahr-Naam I	107	50	57	114	30*(12)	40.0
4		Sasoro	55	25	30	120	17	
4		Nagborokodo	69	32	37	116	26	
4		Jikulu	58	27	31	115	17	
4		Munali	88	41	47	115	28	
4		Awulu I	33	15	18	120	8	
4	Solomon Kamia (Maridi Town)	Malingdo I	1,103	491	612	125	209	
4		Maridi Centre	202	86	116	135	37	
4		Malingdo II	278	130	148	114	61*(12)	19.7
4	Tito Maidagba (Mabrindi) (1)	Mborolo	402	191	211	111	118	
4		Wurowuro I	107	49	58	118	38	
4		Wurowuro II	371	177	194	110	120	
4		Mabrindi I	103	49	54	110	31	
4		Mabrindi II	286	138	148	107	77	
4		Awulu II	114	46	68	148	37	
4		Nadagoli	179	86	93	108	48	
4		Araka	244	117	127	109	45	
4		Eneugu	177	85	92	108	46	
4		Lalama	83	39	44	113	26	
4		Munali	116	56	60	107	29	
4		Naia	380	180	200	111	159	
TOTAL			19,150	9,101	10,049		5,304	1.8

Source: Social Statistics and Social Monitoring Survey (SSSMS), Juba, 1982.

(1) Chief's Administrative village or centre

* Sample villages and number of selected household heads in brackets, 96 households. The Sample: 160 Farmers interviewed in Maridi District

N.B. Sometimes villages under one chief may occur in a different or adjacent delineated zone.

APPENDIX 8 (B)

Total population for each chiefdom in the study area, 1982

BBA RURAL COUNCIL (ZONES 1 & 2)

Name of Chief	Estimated Pop.	Males	Females	% of Females to males ($\frac{F}{M} \times 100$)	Number of households
Igido Ramadan	1,073	551	522	95	347
Iyobo Ruko	603	294	309	105	176
Ismail Bagbaro	1,156	576	580	101	402
Isoasa Unga	4,136	2,151	1,985	92	1,389
Ipaustino Roro	3,721	1,772	1,949	110	1,266
Ipbamani Mabenge	2,069	989	1,080	109	757
Total for Rural Council	12,758	6,333	6,425	101	4,339

ARIDI RURAL COUNCIL (ZONES 3 & 4)

Name of Chief	Estimated Pop.	Males	Females	% of Females to males ($\frac{F}{M} \times 100$)	Number of households
James Bakindo	2,148	1,049	1,099	105	678
Osman Ali	2,779	1,398	1,381	99	737
Samuel Muragi	3,846	1,768	2,078	118	1,151
Elia Bingo	2,538	1,228	1,310	107	695
Jonathana Mambe	2,710	1,287	1,423	111	683
Daud Idris	574	261	313	120	153
Ruben Batali	410	190	220	116	126
Solomon Kamia	1,583	707	876	124	307
Tito Maidagba	2,562	1,213	1,349	111	774
Total for Rural Council	19,150	9,101	10,049	110	5,304
District Total	31,908	15,434	16,474	107	9,643

Source: Social Statistics and Social Monitoring Survey (SSMS), Juba, 1982.

APPENDIX 9

An inventory of the main crops grown in the study area

<u>Scientific Name</u>	<u>Common Name</u>	<u>Vernacular Name</u>	<u>Arabic</u>
<u>CEREALS</u>			
Sorghum bicolor	Sorghum	Vunde (Z) Inya (M)	Dura
Zea mays	Maize	Ngbaya (Z) Dabali (M)	Dura Shami or Asharif
Pennisetum typhoides	Bulrush millet	Ngiria (Z) Kaza (M)	Dukhun
Eleusine coranaca	Finger millet	Moru (Z) Kifo (M)	Telebun
Oryza sativa	Rice	Maponga (Z) Ruzu (M)	Uruz
<u>LEGUMES</u>			
Arachis hypogaea	Groundnuts	Awande (Z) Sārāmāndi (M)	Ful
Voandzeia subterranea	Bambara nuts	Baunda (Z) Kosokara (M)	Abu gowi
Cajanus cajan	Pigeon peas	Adugo (Z) Tuga (M)	Bisila
Phaseolus aureus	Green gram or beans	Abakpa (Z) Dudura (M)	Gesharingeik
Vigna unguiculata	Cow-peas	Abapu (Z) Koso (M)	Lubia akhdar
<u>ROOT CROPS</u>			
Manihot esculenta	Cassava	Gbanda (Z) Gbanda (M)	Bafora
Ipomoea batatas	Sweet potato	Abangbe (Z) Mondo (M)	Bambe
Dioscorea spp.	Yam	Gbara (Z) Koro (M)	-
<u>OIL CROPS</u>			
Sesamum indicum	Sesame (Simsim)	Soro or Ngbindia (Z) Kānyu (M)	Simsim
Hyptis spicigera	Hyptis (hard sim sin)	Andoka (Z) Kino (M)	Simsim gowi

Appendix continues

Ctd. 2

<u>Scientific Name</u>	<u>Common Name</u>	<u>Vernacular Name</u>	<u>Arabic</u>
<u>FIBRE CROP</u>			
Gossypium spp	Cotton	Gutun (Z) Kodo (M)	Gotton
<u>FRUITS</u>			
Carica papaya	Paw-paw	Paipai (Z) Pai-pai (M)	Bayibayi
Ananas comosus	Pineapple	Ananasi (Z) Ana-Nasi (M)	Ananas
Psidium guajava	Guava	Guafa (Z) Ngofo (M)	Jowafa
Mangifera indica	Mango	Manga (Z) Manga (M)	Manja
Citrus sinensis	Orange	Orenji (Z) Lamonindiri (M)	Borodokal
Citrus limon	Lemon, lime	Lemon-ria (Z) Lamoni-atra (M)	Lemon-mur
Musa sapientum	Banana	Bu (Z) Bogwo (M)	Mouzi
Lycopersicon esculentum	Tomato	Komandore (Z) Timati (M)	Timatim
Cucumis sativus	Cucumber	Mbuguru (Z) Kurunju (M)	Ajur
<u>VEGETABLES</u>			
Solanum melongena	Egg-plant	Bidingiari (Z) Biringali (M)	Asuwat
Hibiscus esculentus	Okra	Mboyoy (Z) Nbokodo (M)	Bamiya
Cucurbita spp	Pumpkin	Datiro or Boko (Z) Inju (M)	Banjo (Gara)
<u>TREE CROPS</u>			
Coffea robusta	Coffee	Bun (Z)	Bun (Gahawa)
Coffea liberica (excelsa)		Buni (M)	

Ctd.3

<u>Scientific Name</u>	<u>Common Name</u>	<u>Vernacular Name</u>	<u>Arabic</u>
<u>SOME OTHER CROPS</u>			
Nicotiana tabacum	Tobacco	Gbakara (Z) Toba (M)	Tombak
Saccharum officinarum	Sugar cane	Ngasab Sukari(Z) Kyika (M)	Gashab-Sukar
Capsicum spp	Chillies (red pepper)	Riaria (Z) Kitaata (M)	
Hibiscus sabdariffa	Roselle	Naamba (Z) Kerkede (M)	Karkade
Lagenaria siceraria	Gourd	Bainga (Z) Tore (M)	
Elaeis guineensis Jack	Oil Palm	Mbiro (Z) Ndiro (M)	Zerwa
Colocasia antiquorum	Cocoyams (Taro)	Menze (Z) Nkoro (M)	
Lagenaria vulgaris	Oil-Seed cucurbits	Kpagu (Z) Kpago (M)	Koreish Battikh

Source: Fieldwork (see cf: Knight, C.G.(1974) p.86.

Z = Zande

M = Moru

APPENDIX 10 The size distribution of farm holdings (in feddans) in the study area

Farm size	Sample area	Zone 1 (N=32)		Zone 2 (N=32)		Zone 3 (N= 48)		Zone 4 (N=48)		District (N=160)	
		No.	%	No.	%	No.	%	No.	%	No.	%
< 1.0		14	43.8	11	34.4	10	20.8	8	16.7	43	26.9
1.0 - 3.0		13	40.6	14	43.8	15	31.3	13	27.1	55	34.4
4.0 - 6.0		5	15.6	6	18.8	22	45.8	24	50.0	57	35.6
7.0 - 9.0		-	-	1	3.1	1	2.1	3	6.3	5	3.1
9.0+		-	-	-	-	-	-	-	-	-	-
TOTAL		32	100.0	32	100.1	48	100.0	48	100.1	160	100.0

Source : Questionnaire Analysis

160 Farmers interviewed in Maridi District
Percentages more than 100 because of rounding

APPENDIX 11 Number and percentage of farmers reporting market places visited and buyers of food and cash crops in the study area

Markets and buyers	Local village markets	Maridi town market	Ibba town market	Nabanga	Naam	Edi	Maruko	Ruko	Ras-Olo I	Yei	Mundri	Others	Av.No.of Fre- quencies (visits)per market and buyers per zone
Sample area	No. %	No. %	No. %	No. %	No. %	No. %	No. %	No. %	No. %	No. %	No. %	No. %	
ZONE 1 (N=32)													
Nagbaka (N=8)	8 25.0	4 12.5	5 15.6	1 3.1	-	-	-	-	3 9.4	1 3.1	2 6.3	7 21.9	
Makutari (N=8)	5 15.6	2 6.3	6 18.8	-	-	-	4 12.5	4 12.5	-	-	-	5 15.6	
Madoro (N=8)	4 12.5	3 9.4	4 12.5	2 6.3	-	-	7 21.9	2 6.3	-	-	-	7 21.9	
Matorombo (N=8)	5 15.6	2 6.3	5 15.6	1 3.1	-	-	8 25.0	3 9.4	-	1 3.1	-	6 18.8	
TOTAL 32	22 68.7	11 34.5	20 62.5	4 12.5	-	-	19 59.4	9 28.2	3 9.4	2 6.2	2 6.3	25 78.2	9.8
ZONE 2 (N=32)													
Wowo (N=8)	7 21.9	1 3.1	3 9.4	7 21.9	-	-	-	-	-	-	-	8 25.0	
Kangwa (N=8)	4 12.5	-	3 9.4	8 25.0	-	-	-	-	-	2 6.3	-	6 18.8	
Madebe (N=8)	8 25.0	3 9.4	8 25.0	3 9.4	-	-	-	-	-	-	-	3 9.4	
Mirau (N=8)	8 25.0	4 12.5	8 25.0	1 3.1	-	-	-	-	-	-	-	4 12.5	
TOTAL 32	27 84.4	8 25.0	22 68.8	19 59.4	-	-	-	-	-	2 6.3	-	21 65.7	8.3
ZONE 3 (N=48)													
Mangahe (N=12)	10 20.8	4 8.3	-	-	-	-	-	-	-	1 2.1	12 25.0	8 16.7	
Langua (N=12)	6 12.5	3 6.3	-	-	-	-	-	-	-	-	12 25.0	11 22.9	
Amaki (N=12)	11 22.9	10 20.8	1 2.1	-	-	-	-	-	-	-	5 10.4	12 25.0	
Ngonde (N=12)	12 25.0	8 16.7	-	-	-	-	-	-	-	1 2.1	2 4.2	11 22.9	
TOTAL 48	39 81.2	25 52.1	1 2.1	-	-	-	-	-	-	2 4.2	31 64.6	42 87.5	11.7
ZONE 4 (N=48)													
Mongua III (N=12)	4 8.3	12 25.0	8 16.7	-	-	-	-	-	-	3 6.3	4 8.3	10 20.8	
Gworosai (N=12)	8 16.7	11 22.9	2 4.2	-	10 20.8	8 16.7	-	-	9 18.8	9 18.8	-	10 20.8	
Bahr Naam (N=12)	7 14.6	10 20.8	-	-	-	-	-	-	-	2 4.2	9 18.8	7 14.6	
Malingdo II (N=12)	4 8.3	12 25.0	2 4.2	-	2 4.2	2 4.2	-	-	4 8.3	1 2.1	-	6 12.5	
TOTAL 48	23 47.9	49 93.7	12 25.1	-	12 25.0	10 20.9	-	-	13 27.1	15 31.4	13 27.1	33 12.5	15.0
GRAND TOTAL 160	111 69.4	95 58.1	55 34.4	23 14.4	12 7.5	10 6.3	19 11.9	5.6	16 10.0	21 13.1	46 28.8	121 75.6	44.7

Source: Questionnaire Analysis. Sample: 160 Farmers interviewed in Maridi District N.B. Farmers provide more than one response.

APPENDIX 12 Number and proportion of farmers citing sources of influence that led to the adoption of
 ZONE 1 (N = 32) farm innovations in the study area

Innovation	Agent of Change		Friends, relations, immediate family members		Saw it on neighbours farm/market		PDU and agricultural extension staff etc.		Out-migration, experience from neighbour countries		Others	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Serena sorghum	7	21.9	6	18.8	9	28.1	2	6.3	4	12.5		
9DX 7/11 sorghum	6	18.8	4	12.5	8	25.0	2	6.3	2	6.3		
Makulu Red groundnut	11	34.4	3	9.4	5	15.6	1	3.1	1	3.1	1	3.1
Mani Pintar groundnut	5	15.6	7	21.9	4	12.5	3	9.4	4	12.5		
Katamani maize	4	12.5	5	15.6	3	9.4	1	3.1	3	9.4		
Western Yellow	3	9.4	1	3.1	1	3.1	4	12.5	2	6.3		
Coffee nurseries	8	25.0	2	6.3	10	31.3	9	28.1	4	12.5		
Improved citrus seedlings	1	3.1	1	3.1	11	34.4	8	25.0	3	9.4		
Teak plantations	2	6.3	1	3.1	1	3.1	1	3.1	7	21.9		
Changes in cultivation, ridging etc.	4	12.5	4	12.5	6	18.8	7	21.9	1	3.1		
Coffee cultural operations	3	9.4	7	21.9	8	25.0	10	31.3	1	3.1		
Coffee equipment	1	3.1	2	6.3	7	21.9	6	18.8	2	6.3		
Using toria hoes	12	37.5	9	28.1	12	37.5	11	34.4	4	12.5		
Use of insecticide & pesticides	2	6.3	1	3.1	4	12.5	4	12.5	1	3.1		
Planting cotton early	10	31.3	13	40.6	1	3.1	3	9.4	3	9.4		
Using hired labour	3	9.4	2	6.3	-	-	13	40.6	5	15.6		
Mean	2.56		2.13		2.81		2.66		1.47			

Innovation	Agent of Change	Friends, relatives, immediate family members		Saw it on neighbours farm/market		PDU and agricultural extension staff etc.		Out-migration, experience from neighbouring countries		Others	
		No.	%	No.	%	No.	%	No.	%	No.	%
Serena sorghum		8	25.0	7	21.9	10	31.3	4	12.5	3	9.4
9DX 7/11 sorghum		7	21.9	6	18.8	9	28.1	3	9.4	4	12.5
Makulu Red groundnut		4	12.5	4	12.5	7	21.9	2	6.3	5	15.6
Mani Pintar groundnut		1	3.1	3	9.4	4	12.5	1	3.1	7	21.9
Katamani maize		2	6.3	2	6.3	3	9.4	2	6.3	3	9.4
Western Yellow		3	9.4	4	12.5	2	6.3	5	15.6	4	12.5
Coffee nurseries		1	3.1	5	15.6	11	34.4	10	31.3	2	6.3
Improved citrus seedlings		4	12.5	3	9.4	8	25.0	8	25.0	3	9.4
Teak plantations		2	6.3	1	3.1	4	12.5	4	12.5	7	21.9
Changes in cultivation, ridging etc.		6	18.8	2	6.3	6	18.8	7	21.9	3	9.4
Coffee cultural operations		9	28.1	6	18.8	7	21.9	13	40.6	6	18.8
Coffee equipment		7	21.9	4	12.5	9	28.1	9	28.1	5	15.6
Using <u>toria</u> hoes		13	40.6	10	31.3	11	34.4	13	40.6	3	9.4
Use of insecticide & pesticides		1	3.1	2	6.3	6	18.8	4	12.5	4	12.5
Planting cotton early		9	28.1	9	28.1	6	18.8	3	9.4	2	6.3
Using hired labour		11	34.4	2	6.3	1	3.1	15	46.9	1	3.1
Mean		2.75		2.19		3.25		3.22		1.94	

Appendix 12 (Cont.)

ZONE 3(N=48)

Innovation	Agent of Change	Friends, relations, immediate family members		Saw it on neighbours farm/market		PDU and agricultural extension staff etc.		Out-migration, experience from neighbour countries		Others	
		No.	%	No.	%	No.	%	No.	%	No.	%
Serena sorghum		12	25.0	11	22.9	21	43.8	11	22.9	11	22.9
9DX 7/11 sorghum		10	20.8	12	25.0	22	45.8	13	27.1	9	18.8
Makulu Red groundnut		11	22.9	14	29.2	23	47.9	14	29.2	10	20.8
Mani Pintar groundnut		13	27.1	15	31.3	19	39.6	16	33.3	12	25.0
Katamani maize		15	31.3	13	27.1	14	29.2	12	25.0	11	22.9
Western Yellow		12	25.0	11	22.9	10	20.8	11	22.9	9	18.8
Coffee nurseries		14	29.2	13	27.1	21	43.8	19	39.6	8	16.7
Improved citrus seedlings		13	27.1	16	33.3	19	39.6	12	25.0	9	18.8
Teak plantations		10	20.8	9	18.8	10	20.8	8	16.7	10	20.8
Changes in cultivation, ridging etc.		9	18.8	10	20.8	11	22.9	11	22.9	8	16.7
Coffee cultural operations		16	33.3	13	27.1	18	37.5	19	39.6	7	14.6
Coffee equipment		6	12.5	14	29.2	23	47.9	13	27.1	9	18.8
Using toria hoes		18	37.5	15	31.3	17	35.4	21	43.8	10	20.8
Use of insecticide & pesticides		6	12.5	9	18.8	10	20.8	3	6.3	8	16.7
Planting cotton early		13	27.1	14	29.2	14	29.2	4	8.3	6	12.5
Using hired labour		21	43.8	9	18.8	2	4.2	18	37.5	5	10.4
Mean		4.15		4.13		5.29		4.27		2.96	

Appendix 12 (Cont.)

ZONE 4(N=48)

Innovation	Agent of Change	Friends, relations, immediate family members		Saw it on neighbours farm/market		PDU and agricultural extension staff etc.		Out-migration, experience from neighbour countries		Others	
		No.	%	No.	%	No.	%	No.	%	No.	%
Serena sorghum		25	52.1	12	25.0	24	50.0	15	31.3	12	25.0
9DX 7/11 sorghum		11	22.9	13	27.1	25	52.1	15	31.3	8	16.7
Makulu Red groundnut		12	25.0	13	27.1	28	58.3	17	35.4	9	18.8
Mani Pintar groundnut		14	29.2	14	29.2	21	43.8	22	45.8	14	29.2
Katumani maize		16	33.3	17	35.4	15	31.3	18	37.5	13	27.1
Western Yellow		13	27.1	12	25.0	16	33.3	19	39.6	10	20.8
Coffee nurseries		15	31.3	14	29.2	22	45.8	23	47.9	11	22.9
Improved citrus seedlings		12	25.0	15	31.3	21	43.8	23	47.9	10	20.8
Teak plantations		13	27.1	10	20.8	16	33.3	10	20.8	13	27.1
Changes in cultivation, ridging etc.		10	20.8	11	22.9	14	29.2	17	35.4	9	18.8
Coffee cultural operations		17	35.4	15	31.3	19	39.6	21	43.8	6	12.5
Coffee equipment		7	14.6	16	33.3	29	60.4	18	37.5	9	18.8
Using toria hoes		21	43.8	16	33.3	26	54.1	25	52.1	15	31.3
Use of insecticide & pesticides		7	14.6	8	16.7	12	25.0	9	18.8	9	18.8
Planting cotton early		15	31.3	17	35.4	10	20.8	10	20.8	7	14.6
Using hired labour		22	45.8	13	27.1	2	4.2	19	39.6	6	12.5
Mean		4.79		4.50		6.25		5.85		3.35	

Appendix 12 (Cont.)

DISTRICT (N=160)

Agent of Change Innovation	Friends, relations, immediate family members		Saw it on neighbours farm/market		PDU and agricultural extension staff etc.		Out-migration, experience from neighbouring countries		Others	
	No.	%	No.	%	No.	%	No.	%	No.	%
Serena sorghum	52	32.5	35	21.9	64	40.0	32	20.0	30	18.8
9DX 7/11 sorghum	34	21.3	35	21.9	64	40.0	33	20.6	23	14.4
Makulu Red groundnut	38	23.8	34	21.3	63	39.4	34	21.3	25	15.6
Mani Pintar groundnut	33	20.6	39	24.4	48	30.0	42	26.3	37	23.1
Katamani maize	37	23.1	37	23.1	35	21.9	33	20.6	30	18.8
Western Yellow	31	19.4	28	17.5	29	18.1	39	24.4	25	15.6
Coffee nurseries	38	23.8	34	21.3	64	40.0	61	38.1	25	15.6
Improved citrus seedlings	30	18.8	35	21.9	59	36.9	51	31.9	25	15.6
Teak plantations	27	16.9	21	13.1	31	19.4	23	14.4	37	23.1
Changes in cultivation, ridging etc.	29	18.1	27	16.9	37	23.1	42	26.3	21	13.1
Coffee cultural operations	45	28.1	41	25.6	52	32.5	63	39.4	20	12.5
Coffee equipment	21	13.1	36	22.5	68	42.5	46	28.8	25	15.6
Using toria hoes	64	40.0	50	31.3	66	41.3	70	43.8	32	20.0
Use of insecticide & pesticides	16	10.0	20	12.5	32	20.0	20	12.5	22	13.8
Planting cotton early	47	29.4	53	33.1	31	19.4	20	12.5	18	11.3
Using hired labour	57	35.6	26	16.3	5	3.1	65	40.6	17	10.6
Mean	3.74		3.44		4.68		4.21		2.58	

Source: Questionnaire Analysis
160 Farmers interviewed in Maridi District
Respondents were able to list more than one source

APPENDIX 13

The farmer and farm characteristics in relation to the adoption of farm innovations in the study area

Sample area and innovation Variable	ZONE 1 (N=32)				ZONE 2 (N=32)				ZONE 3 (N=48)				ZONE 4 (N=48)				DISTRICT (N=160)			
	Making 0-3 Innovations		Making 4+ Innovations		Making 0-3 Innovations		Making 4+ Innovations		Making 0-3 Innovations		Making 4+ Innovations		Making 0-3 Innovations		Making 4+ Innovations		Making 0-3 Innovations		Making 4+ Innovations	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
(1) Age of Household Head																				
20-29	2	6.3	-	-	2	6.3	2	6.3	6	12.5	3	6.3	1	2.1	3	6.3	11	6.9	8	5.0
30-39	9	28.1	2	6.3	4	12.5	6	18.8	9	18.8	8	16.7	9	18.8	12	25.0	31	19.4	28	17.5
40-49	2	6.3	4	12.5	3	9.4	5	15.6	4	8.3	8	16.7	4	8.3	9	18.8	13	8.1	26	16.3
50-59	5	15.6	1	3.1	3	9.4	1	3.1	3	6.3	2	4.2	4	8.3	3	6.3	15	9.4	7	4.4
60-69	4	12.5	-	-	4	12.5	-	-	2	4.2	2	4.2	1	2.1	2	4.2	11	6.9	4	2.5
70+	3	9.4	-	-	2	6.3	-	-	1	2.1	-	-	-	-	-	-	6	3.8	-	-
(2) Family Size																				
1-7	20	62.5	2	6.3	17	53.1	9	28.1	11	22.9	8	16.7	11	22.9	9	18.8	59	36.9	28	17.5
8+	5	15.6	5	15.6	1	3.1	5	15.6	14	29.2	15	31.3	18	16.7	20	41.7	28	17.5	45	28.1
(3) Adult Males helping Household Head																				
1-2	6	18.8	1	3.1	5	15.6	2	6.3	1	2.1	2	4.2	-	-	-	-	12	7.5	5	3.1
3-4	17	53.1	2	6.3	11	34.4	6	18.8	-	-	4	8.3	2	4.2	2	4.2	80	18.8	14	8.8
5-6	2	6.3	2	6.3	1	3.1	3	9.4	15	31.3	5	10.4	9	18.8	13	27.1	27	16.9	23	14.4
7+	-	-	2	6.3	1	3.1	3	9.4	9	18.8	12	25.0	8	16.7	14	29.2	18	11.3	31	19.4
(4) Farm Size																				
1 Feddan	13	40.6	1	3.1	8	25.0	3	9.4	8	16.7	2	4.2	4	8.3	4	8.3	33	20.6	10	6.3
1-3	12	37.5	1	3.1	10	31.3	4	12.5	8	16.7	7	14.6	5	10.4	8	16.7	35	21.9	20	12.5
4-6	-	-	5	15.6	-	-	6	18.8	9	18.8	13	27.1	10	20.8	14	29.2	19	11.9	38	23.8
7-9	-	-	-	-	-	-	1	3.1	-	-	1	2.1	-	-	3	6.3	-	-	5	3.1
9+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(5) Secondary Employment/ Occupation																				
Not available	1	3.1	-	-	2	6.3	-	-	1	2.1	-	-	3	6.3	-	-	7	4.4	-	-
Self employment/Opportun- business ities	18	56.3	4	12.5	12	37.5	6	18.8	18	37.5	9	18.8	9	18.8	17	35.4	57	35.6	36	22.5
Government employment/ Wages/Trading	6	18.8	1	3.1	2	6.3	4	12.5	4	8.3	6	12.5	5	10.4	7	14.6	17	10.6	18	11.3
Others activities	-	-	2	6.3	2	6.3	4	12.5	2	4.2	8	16.7	2	4.2	5	10.4	6	3.8	19	11.9
(6) Migration and mobility Experience																				
Not available/None	10	31.3	-	-	5	15.6	-	-	4	8.3	-	-	1	2.1	-	-	20	12.5	-	-
Migrated and lived in neigh- bouring countries during 17-year Civil War	13	40.6	5	15.6	10	31.3	9	28.1	13	27.1	14	29.2	12	25.0	18	37.5	48	30.0	46	28.8
Temporary/seasonal migration to other towns	2	6.3	2	6.3	3	9.4	5	15.6	8	16.7	9	18.8	6	12.5	11	23.0	19	11.9	27	16.9
(7) Educational level																				
Not available/None	19	59.4	1	3.1	9	28.1	1	3.1	4	8.3	6	12.5	5	10.4	3	6.3	37	23.1	11	6.9
Catechist/Christian school	3	9.4	1	3.1	-	-	4	12.5	10	20.8	5	10.4	3	6.3	5	10.4	16	10.0	15	9.4
Village school	2	6.3	2	6.3	3	9.4	3	9.4	1	2.1	3	6.3	1	2.1	5	10.4	7	4.4	13	8.1
Primary school	-	-	2	6.3	2	6.3	1	3.1	6	12.5	2	-	4	8.3	5	18.8	12	7.5	10	6.3
Junior secondary school	1	3.1	-	-	-	-	-	-	-	-	2	4.2	-	-	2	4.2	1	0.6	4	2.5
Senior secondary school	-	-	-	-	-	-	1	3.1	1	2.1	-	-	-	-	3	6.3	1	0.6	4	2.5
Others	-	-	1	3.1	4	12.5	4	12.5	3	6.3	5	10.4	6	12.5	6	12.5	13	8.1	16	10.0
(8) Tribe/Clan																				
Avukaya (Mego)	-	-	-	-	1	3.1	-	-	3	6.3	1	2.1	6	12.5	4	8.3	10	6.3	5	3.1
Baka (Badugo)	4	12.5	-	-	-	-	1	3.1	4	8.3	5	10.4	4	8.8	8	16.7	12	7.5	14	8.8
Moru (Kenyi)	-	-	-	-	-	-	2	6.3	3	6.3	8	16.7	4	8.3	8	16.7	7	4.4	18	11.3
Mundu (Bokoro)	-	-	1	3.1	-	-	-	-	3	6.3	3	6.3	3	6.3	4	8.3	6	3.8	8	5.0
Zande (Avungara)	15	46.9	2	6.3	10	31.3	8	25.0	1	2.1	1	2.1	1	2.1	4	8.3	27	16.9	15	9.4
Others (various tribes/ clans)	6	18.8	4	12.5	7	21.9	3	9.4	11	23.0	5	10.4	1	2.1	1	2.1	25	15.6	13	8.1
(9) Social Status																				
Not available/None	19	59.4	1	3.1	7	21.9	3	9.4	8	16.7	8	16.7	2	4.2	6	12.5	36	22.5	18	11.3
Tribal Chief/Village Leadership	-	-	2	6.3	1	3.1	2	6.3	5	10.4	3	6.3	4	8.3	5	18.8	10	6.3	12	7.5
Member in Co-operative Society	3	9.4	1	3.1	7	21.9	2	6.3	6	12.5	2	4.2	7	14.6	3	6.3	23	14.4	8	5.0
Father worked in Agricult- ural Dept.	2	6.3	2	6.3	1	3.1	2	6.3	2	4.2	5	10.4	2	4.2	9	18.8	7	4.4	18	11.3
Others	1	3.1	1	3.1	2	6.3	5	15.6	4	8.3	5	10.4	4	8.3	6	12.5	11	6.9	17	10.6
(10) Location of farm in relation to some infrastructural serv.																				
Living in village < 8 km from nearest market	7	21.9	2	6.3	3	9.4	4	12.5	11	22.9	5	10.4	5	6.3	10	25.0	26	16.3	21	13.1
Living in village > 8 km from nearest market	9	28.1	1	3.1	9	28.1	2	6.3	5	10.4	2	4.2	5	18.8	2	4.2	28	17.5	7	4.4
Living in village < 8 km from nearest Dem. Farm/Ag. Offices	2	6.3	1	3.1	-	-	2	6.3	2	4.2	7	14.6	3	6.3	8	16.7	7	4.4	18	11.3
Living in village > 8 km from nearest De. Farm/Ag. Offices	1	3.1	-	-	2	6.3	-	-	3	6.3	2	4.2	1	2.1	-	-	7	4.4	2	1.3
Living in village < 8 km from nearest main road	2	6.3	2	6.3	1	3.1	5	15.6	2	4.2	4	8.3	2	4.2	8	16.7	7	4.4	19	11.9
Living in village > 8 km from nearest main road	4	12.5	1	3.1	3	9.4	1	3.1	2	4.2	3	6.3	3	6.3	1	2.1	12	7.5	6	3.8
TOTAL each section	25	78.2	7	21.9	18	56.3	14	43.7	25	52.1	23	47.9	19	39.6	29	60.4	87	54.4	73	45.6

Source: Questionnaire Analysis

* 8km was considered as the average walking distance/farmer

160 Farmers interviewed in Maridi District Percentages more than 100 because of rounding 1 feddan = 1.038 acres

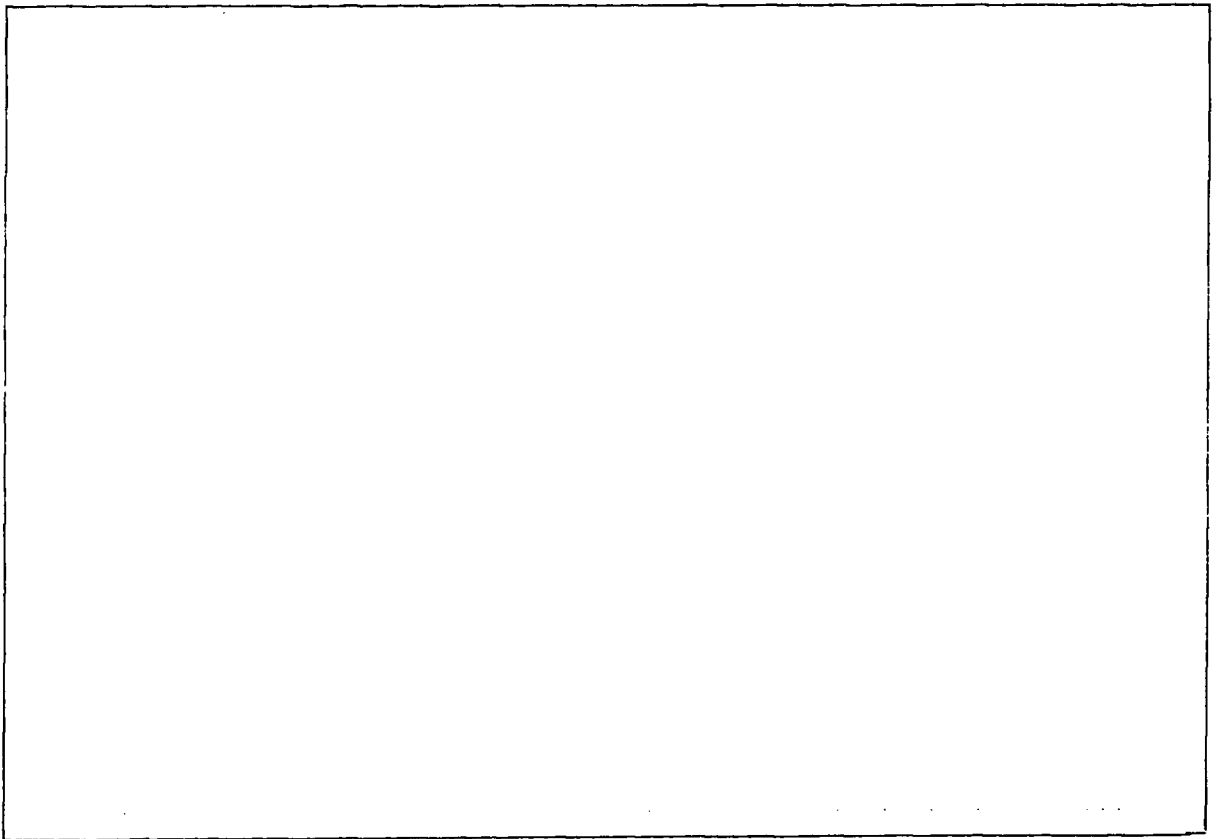
AREA ZONE
ENTERPRISE ZONES

APPENDIX 14

PILOT INQUIRY OF AGRICULTURAL EXTENSION STAFF ABOUT
THE CROP ENTERPRISE PATTERN ZONING IN THE STUDY AREA

NAME OF FIELD STAFF DISTRICT
VILLAGE

Ask the field staff to draw a map of his area marking in villages, roads, tribal differences and boundary of his area. On the three tracing papers attached, include the food and cash crops grown as well as livestock and poultry.



Name of Interviewer

APPENDIX 15(A)

Number and percentage of farmers reporting changes in farm holdings of some food and 'cash' crops in the study area

Farm changes		No. of farmers with changes in maize		No. of farmers with changes in sorghum		No. of farmers with changes in cassava		No. of farmers with changes in cotton		No. of farmers with changes in millets		No. of farmers with changes in groundnuts	
Sample area	(Type of change)	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
ZONE 1(N=32)													
Nagbaka (N=8)	Increase	5	15.6	6	18.8	3	9.4	1	3.1	4	12.5	5	15.6
	Decrease	2	6.3	1	3.1	1	3.1	4	12.5	1	3.1	1	3.1
	(Same size)	1	3.1	1	3.1	4	12.5	3	9.4	3	9.4	2	6.3
Makutari (N=8)	Increase	5	15.6	2	6.3	2	6.3	-	-	5	15.6	6	18.8
	Decrease	2	6.3	1	3.1	-	-	5	15.6	2	6.3	1	3.1
	(Same size)	1	3.1	5	15.6	6	18.8	3	9.4	1	3.1	1	3.1
Madoro (N=8)	Increase	3	9.4	1	3.1	3	9.4	-	-	6	18.8	4	12.5
	Decrease	2	6.3	1	3.1	-	-	4	12.5	-	-	1	3.1
	(Same size)	3	9.4	6	18.8	5	15.6	4	12.5	2	6.3	3	9.4
Matorombo(N=8)	Increase	4	12.5	-	-	3	9.4	1	3.1	4	12.5	2	6.3
	Decrease	1	3.1	2	6.3	1	3.1	6	18.8	1	3.1	2	6.3
	(Same size)	3	9.4	6	18.8	4	12.5	1	3.1	3	9.4	4	12.5
Total 32		32	100.1	32	100.1	32	100.1	32	100.0	32	100.1	32	100.1
ZONE 2(N=32)													
WoWo (N=8)	Increase	5	15.6	4	12.5	6	18.8	1	3.1	3	9.4	5	15.6
	Decrease	-	-	2	6.3	-	-	6	18.8	1	3.1	2	6.3
	(Same size)	3	9.4	2	6.3	2	6.3	1	3.1	4	12.5	1	3.1
Kangwa (N=8)	Increase	6	18.8	1	3.1	3	9.4	7	21.9	6	18.8	5	15.6
	Decrease	1	3.1	2	6.3	-	-	-	-	-	-	1	3.1
	(Same size)	1	3.1	5	15.6	5	15.6	1	3.1	2	6.3	2	6.3
Madebe (N=8)	Increase	3	9.4	4	12.5	1	3.1	-	-	4	12.5	3	9.4
	Decrease	1	3.1	1	3.1	-	-	7	21.9	-	-	1	3.1
	(Same size)	4	12.5	3	9.4	7	21.9	1	3.1	4	12.5	4	12.5
Mirau (N=8)	Increase	2	6.3	1	3.1	5	15.6	1	3.1	3	9.4	5	15.6
	Decrease	1	3.1	-	-	1	3.1	6	18.8	1	3.1	-	-
	(Same size)	5	15.6	7	21.9	2	6.3	1	3.1	4	12.5	3	9.4
Total 32		32	100.0	32	100.1	32	100.1	32	100.0	32	100.1	32	100.0
ZONE 3(N=48)													
Mangahe (N=48)	Increase	9	18.8	5	10.4	3	6.3	2	4.2	1	2.1	4	8.3
	Decrease	2	4.2	1	2.1	-	-	4	8.3	2	4.2	1	2.1
	(Same size)	1	2.1	6	12.5	9	18.8	6	12.5	9	18.8	7	14.6
Langua (N=12)	Increase	5	10.4	7	14.6	8	16.7	2	4.2	6	12.5	4	8.3
	Decrease	1	2.1	1	2.1	-	-	7	14.6	2	4.2	1	2.1
	(Same size)	6	12.5	4	8.3	4	8.3	3	6.3	4	8.3	7	14.6
Amaki (N=12)	Increase	8	16.7	3	6.3	6	12.5	2	4.2	3	6.3	4	8.3
	Decrease	3	6.3	1	2.1	1	2.1	4	8.3	1	2.1	2	4.2
	(Same size)	1	2.1	8	16.7	5	10.4	6	12.5	8	16.7	6	12.5
Ngonde (N=12)	Increase	9	18.8	9	18.8	2	4.2	-	-	3	6.3	5	10.4
	Decrease	1	2.1	-	-	1	2.1	4	8.3	-	-	3	6.3
	(Same size)	2	4.2	3	6.3	9	18.8	8	16.7	9	18.8	4	8.3
Total 48		48	100.3	48	100.2	48	100.2	48	100.1	48	100.3	48	100.0
ZONE 4(N=48)													
Mongua III(N=12)	Increase	6	12.5	8	16.7	9	18.8	4	8.3	5	10.4	6	12.5
	Decrease	1	2.1	1	2.1	2	4.2	1	2.1	-	-	1	2.1
	(Same size)	5	10.4	3	6.3	1	2.1	7	14.6	7	14.6	5	10.4
Gworosai (N=12)	Increase	8	16.7	6	12.5	7	14.6	4	8.3	5	10.4	6	12.5
	Decrease	1	2.1	2	4.2	1	2.1	-	-	-	-	2	4.2
	(Same size)	3	6.3	4	8.3	4	8.3	8	16.7	7	14.6	4	8.3
Bahr Naam (N=12)	Increase	4	8.3	5	10.4	6	12.5	1	2.1	4	8.3	2	4.2
	Decrease	1	2.1	2	4.2	1	2.1	6	12.5	3	6.3	1	2.1
	(Same size)	7	14.6	5	10.4	5	10.4	5	10.4	5	10.4	9	18.8
Malingdo II(N=12)	Increase	7	14.6	9	18.8	6	12.5	2	4.2	7	14.6	2	4.2
	Decrease	1	2.1	2	4.2	3	6.3	6	12.5	3	6.3	1	2.1
	(Same size)	4	8.3	1	2.1	3	6.3	4	8.3	2	4.2	9	18.8
Total 48		48	100.1	48	100.2	48	100.2	48	100.0	48	100.1	48	100.2
District (N=160)	Increase	89	56.6	71	44.4	73	45.6	28	17.5	69	43.1	68	42.5
	Decrease	21	13.1	20	12.5	12	7.5	70	43.8	17	10.6	21	13.1
	(Same size)	50	31.3	69	43.1	75	46.9	62	38.8	74	46.3	71	44.4
Grand Total		160	101.0	160	100.0	160	100.0	160	100.1	160	100.0	160	100.0

Source : Questionnaire Analysis
 160 Farmers interviewed in Maridi District
 N.B. Percentages more than 100 because of rounding.

APPENDIX 15(B) Zonal summary of the number and percentage of farmers reporting changes in farm holdings of some food and cash crops in the study area

Sample area	Farm changes (Type of change)	No. of farmers with changes in maize		No. of farmers with changes in sorghum		No. of farmers with changes in cassava		No. of farmers with changes in cotton		No. of farmers with changes in millets		No. of farmers with changes in groundnuts	
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Zone 1 (N=32)	Increase	17	53.1	9	28.1	11	34.4	2	6.3	19	59.4	17	53.1
	Decrease	7	21.9	5	15.6	2	6.3	19	59.4	4	12.5	5	15.6
	(Same size)	8	25.0	18	56.3	19	59.4	11	34.4	9	28.1	10	31.3
Total		32	100.0	32	100.0	32	100.1	32	100.1	32	100.0	32	100.0
Zone 2 (N=32)	Increase	16	50.0	10	31.3	15	46.9	9	28.1	16	50.0	18	56.3
	Decrease	3	9.4	5	15.6	1	3.1	19	59.4	2	6.3	4	12.5
	(Same size)	13	40.6	17	53.1	16	50.0	4	12.5	14	43.8	10	31.3
Total		32	100.0	32	100.0	32	100.0	32	100.0	32	100.1	32	100.1
Zone 3 (N=48)	Increase	31	64.6	24	50.0	19	39.6	6	12.5	13	27.1	17	35.4
	Decrease	7	14.6	3	6.3	2	4.2	19	39.6	5	10.4	7	14.6
	(Same size)	10	20.8	21	43.8	27	56.3	23	47.9	30	62.5	24	50.0
Total		48	100.0	48	100.1	48	100.1	48	100.0	48	100.0	48	100.0
Zone 4 (N=48)	Increase	25	52.1	28	58.3	28	58.3	11	22.9	21	43.8	16	33.3
	Decrease	4	8.3	7	14.6	7	14.6	13	27.1	6	12.5	5	10.4
	(Same size)	19	39.6	13	27.1	13	27.1	24	50.0	21	43.8	27	56.3
Total		48	100.0	48	100.0	48	100.0	48	100.0	48	100.1	48	100.0

Source : Questionnaire Analysis and Data derived from Appendix 15(A)
 160 Farmers interviewed in Maridi District
 Percentages more than 100 because of rounding

APPENDIX 16(A)

MULTI-CHAMBER FIXED COMB CLAY BEEHIVES

These recommendations are based on the European straw skep hive and the Omdurman hive developed in the Sudan in 1932 as summarised by Paterson (1978).

Structure of the Hive (see Fig.16(B) in this Appendix)

The hive consists of three parts:

- a) The base : On which the rest of the hive will stand. This may either be made of clay, wood or palm leaf mat.
- b) The brood chamber : Is the main part of the hive into which the bees will enter first and where the queen will lay the eggs for brood rearing. The volume of this chamber should be about 40L (2 500 cubic inches). The brood chamber is made in the same manner as a 'traditional' pot, the shape being similar to that shown in the diagram. Note: The top of the brood chamber should be as flat as possible so that the super may be fitted over it. A hole 10cm (4 inches) in diameter is cut in the top of the 'pot'. An entrance for the bees may be cut in the side about 5cm across and 2.5 cm high (2 x 1 inch).
- c) The honey super. : Is like the brood chamber but a little smaller - about half the depth and nearly as wide is the best shape. It does not need an entrance as the bees will come up from the hole in the top of the brood chamber; but there should be a hole 5 cm in diameter (2 inches) in the top of the super. This hole is normally covered as it is only used for blowing smoke into the hive.

Siting the Hive

Clay hives cannot usually be placed directly on the ground because wild animals may disturb them. Neither can they be placed safely in trees because they would be difficult to reach and would break if they fell down. A small platform in low branches might be satisfactory. However, a good way to set up these hives is to make a low stand, similar to stands used for grain stores, but it should be constructed under a large tree so that the hives are shaded from the mid-day sun. Nine or ten clay hives can safely be kept on one big stand. The hives should be kept away from the immediate vicinity of the homestead and livestock and it is a good thing if there are some big bushes around. First the hive bases and brood chambers only are set up, but with the hole in the top covered over with a small piece of wood or broken gourd.

Attracting Bees

The hives should be set up at the same time as 'traditional' hives would be hung, which is normally at the beginning of the swarming season. Anything that is done to attract bees to a 'traditional' hive may be done to a clay hive, e.g. baiting it with beeswax.

Hive Management

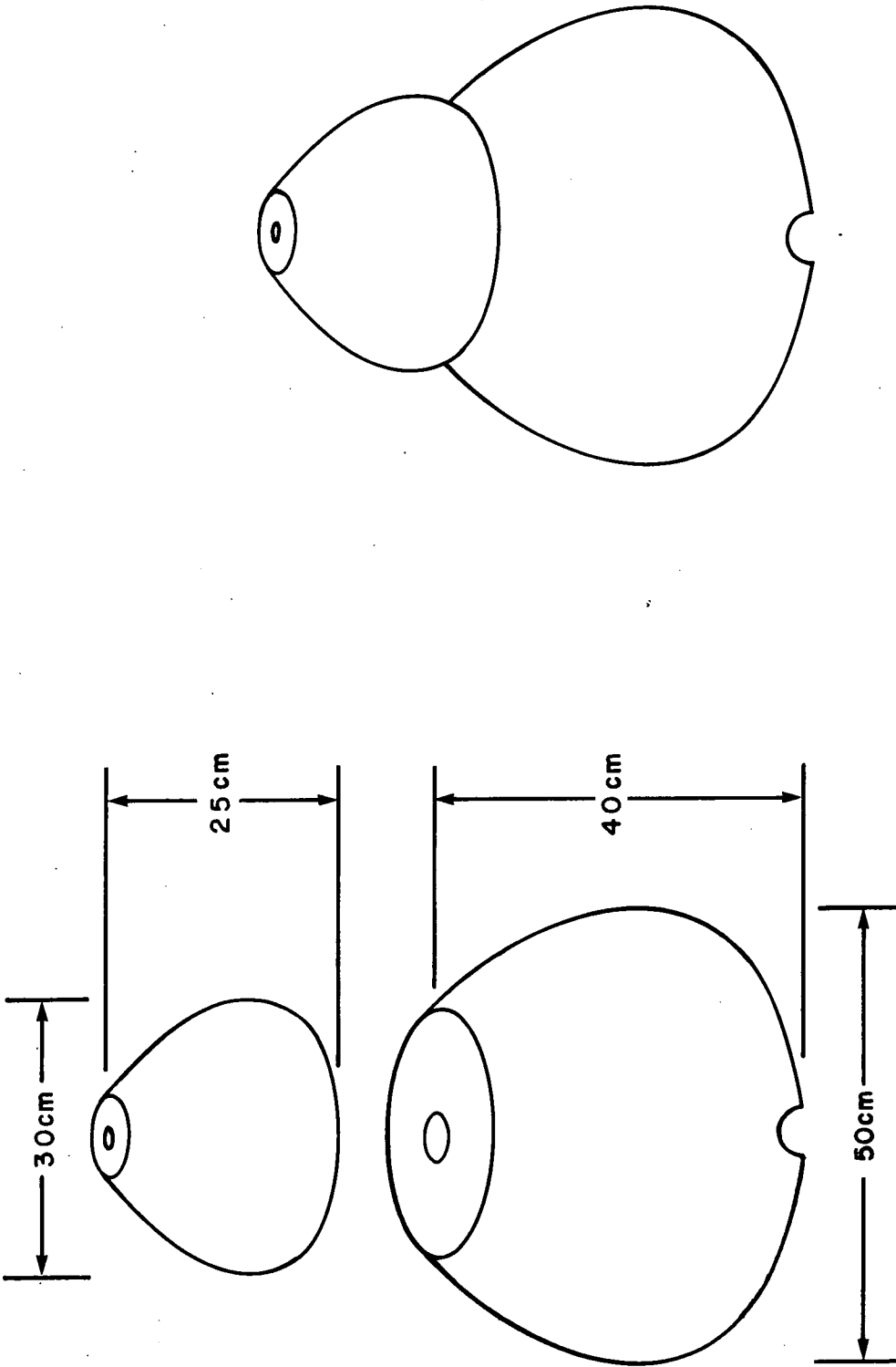
After bees have entered the hive it is left for a few months for the bees to build up and become strong. When the bees are strong and there are many flowers a super must be added by doing as follows:

- a) Approach the hive in the late evening;
- b) Blow smoke all round the hive and in the entrance;
- c) Remove the covering over the hole at the top of the brood chamber;
- d) Place the honey super on top of the brood chamber.

The hive should now be left for several weeks during which time the bees will store honey in the honey super; the time taken for this will depend on floral and weather conditions and the vigour of the particular strain of bee. When the beekeeper believes that the honey is ready to be taken he should do as follows:

- a) Approach the hive in late evening;
- b) Blow smoke all around the hive and in the entrance;
- c) Remove the covering over the hole at the top of the honey super and blow smoke through this hole intermittently for several minutes;
- d) When the bees have gone down into the brood chamber the honey super should carefully be prised up and off;
- e) If the honey is ready for harvesting the beekeeper may either cut the combs out and return the empty super to the hive or he may place a spare super on the hive.

APPENDIX 16(B) CLAY HIVE



Source : Peterson, P.D.(1978), p.30

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