Perception of, and adjustment to, drought hazard by farmers in southern SRI Lanka

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PERCEPTION OF, AND ADJUSTMENT TO, DROUGHT HAZARD BY FARMERS IN SOUTHERN SRI LANKA

by

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ABSTRACT

In Sri Lanka, two thirds of the land mass lies within the Dry Zone where agriculture is the most important economic activity. In this climatic zone, rainfall is highly uncertain, seasonal, and limited to a few months. Consequently, the farmers in the area have to face drought as a natural hazard.

This study focusses on how the farmers in the southern Dry Zone of Sri Lanka perceive drought as a hazard, the adjustments they make to reduce their vulnerability to droughts and how human behaviour affects the growing hazardousness of the study area.

The results of this study show that the farmers in the study area have perceived drought as one of their major problems, and that the vulnerability to this natural phenomenon is growing as a result of the power abuse and environmental mismanagement of those high ranking people responsible. However, the farmers' deeper understanding regarding their living environment (natural and man-made) has enhanced their power to combat the hazardous effects of droughts by way of a variety of adjustments.

Considering and studying the above problems and issues the researcher has come to some conclusions and has put forward some suggestions, the most important of which, lie with changing the self-centered attitudes and activities of the powerful people in the direction of a socially and environmentally more sustainable and wholesome path.

PIDUMA

Dasa masak kusa darā
Noyeka duka vinda darā
Obē ratu lē bindu
Utum kiri bindu kota
Povā mā dadi karapu
Honda naraka kiyadun
Magē Budu Māniyani,

Bata bulatha adu nativa
Mila mudal hinga nativa
Vairayē biya gatiya
Nidahasē ati agaya
Pancha kālema mata iganvū
Magē Budu Piyāneni,

Lova danuma labāgena
Nanasa pādendā ari
Magē ati gurun vana
M.E. Peiris mahatā,
K.V. Sōmapala mahatā,
R. Pascal mahatā,
B. S. Ebeling meneviya,
Āchārinī Y.A.D.S. Wanasinghe,
Mahaduru I.G. Simmons,

Mā priya birinda Sudharma,
Ādaranīya duva Ganguli Kānchanā
Saha
Ādaranīya puthū Ian Kānchana

Magē mē Paryēshana Krutiya
Oba siyalu denā veta,
Hada batin pudami mama.

DEDICATION

To my Buddha like mother
Who kept me in her womb for ten months
With numerous difficulties
Fed me converting red blood into milk
And taught me the virtues of humanity,

To my Buddha like father
Who brought me up giving fewer difficulties
And taught me the adversaries of hate
And the virtues of freedom
From my childhood,

My Gurus who helped me in many ways,
To obtain the knowledge
And allowed me to realize the virtues of wisdom,
Silently, slowly but steadily,
Mr. M. E. Peiris, Mr. K.V. Somapala,
Mr. R. Pascal, Miss B.S. Ebeling,
Dr. Mrs. Y.A.D.S. Wanasinghe,
Professor I.G. Simmons,

Beloved wife Sudharma,
Beloved daughter Ganguli Kānchanā
And
Beloved son Ian Kānchana

I dedicate this thesis
To all of you
With love, affection, honour and respect.

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Chapter I

NATURAL HAZARDS RESEARCH

All matter and phenomena which can be perceived by ordinary human beings in the world are conditioned, relative and interdependent. Though this chapter is on natural hazard research, it is impossible to treat natural hazards as if they were an absolute phenomenon. Such a research could only regard, see and analyse a part of the problem if the researcher considers and treats these hazard events in isolation. The resultant picture would be similar to a picture one sees with one eye. Therefore, the relative and interdependent nature of the hazardousness of any natural extreme event is very important in natural hazard research.

The definition given in the *Dictionary of Human Geography* clearly summarizes what constitutes a natural hazard and describes its different forms.

> "Any risk to people encountered in the physical environment. Environmental hazards can be of short-term duration such as a bolt of lightening, or can form a continuous component, as it is the case of high levels of ultraviolet light in high-altitude areas. Most of the widely recognized hazards earthquakes and severe weather occur naturally in the environment".[1]

On the whole, *'any risk to people encountered in the environment'* indicates that the onset, the time and the place of the occurrence of these phenomena are uncertain. As a result, human victims have no chance to avoid hazards completely. One of the leading natural hazards researchers defined natural hazards as follows:

> "an interaction of people and nature governed by the coexistent state of adjustments in the human use system and the state of nature in the natural events system. Extreme events which exceed the normal capacity of the human system to reflect, absorb, or buffer them are inherent in hazard. An extreme event was taken to be any event in a geophysical system displaying relatively high variance from the mean".[2]

This definition indicates that people make adjustments to cope with nature and that these are carried out without great difficulties under normal environmental conditions. However, extreme deviations of geophysical events do not allow

people to escape without facing hazardous effects. Therefore, where there are extreme geophysical events, there is an unavoidable phenomenon which can be called hazard. White (1974) furthermore described uncertainty in the following terms.

> "Every parameter of the biosphere subject to seasonal, annual, or secular fluctuation constitutes a hazard to man to the extent that his adjustments to the frequency, magnitude, or timing of its extremes are based on imperfect knowledge. Were there perfectly accurate predictions of what would occur and when it would occur in the intricate web of atmospheric, hydraulic, and biological systems, there would be no hazard".[3]

It is clear that some hazards and their damaging effects in time and place can be predicted with considerable accuracy, as, for instance, hurricanes in the USA. This, however, does not change the fact that these hurricanes are hazards, which create numerous problems for the occupants in the area. People who are living in a hazardous area take the risk of not knowing the exact time of the onset of a hazard. Moreover, knowledge of the onset of a hazard in advance only helps to avoid the likely deaths of occupants of the affected area, because they have time to be evacuated.

This still leaves the question why people occupy hazardous areas at all. The answer is, in one way, very simple, if people find areas free from natural hazards, they are, in most cases, still unable to find areas free from man-made hazards. Thus no matter where people live, be it in a developed or underdeveloped country, a capitalist or socialist society, be they rich or poor, there is a risk of hazards anywhere in this world and to varying degrees. In general, as White (1974) points out, human occupance of areas with recurrent natural hazards take place because of superior economic opportunities, lack of satisfying alternative opportunities, short-term time horizons or high ratios of reserves to potential loss. The environmental risk, the growing losses due to extensive use of hazardous areas and the problems which beset people through both natural and man-made hazards have directed scientists' and especially geographers' attention towards hazard studies with the aim of reducing the problems involved.

1.1 Development of Natural Hazards Research

The world is generally hazardous, but is especially so in the industrially developed countries. Here, the need for research on hazards has become very important as a way of reducing or eradicating uneasiness in peoples' minds. Though humankind has suffered and faced losses from natural hazards from time immemorial, little explicit research was done on this problem until 1945 when White first attempted a systematic study of flood hazards within the context of modern hazard research. However, the influence of this pioneering work was negligible until the 1960's. Even before White embarked on this study, flood damage to people and their economy had been identified as a severe hazard in the USA. As a result, the Federal Government legislated the 'Flood Control Act of 1936' with a view to control the floods using modern engineering devices. The USA Government had subsequently spent $4 billion from 1936 to 1961 in order to control floods. However, appraisals of the flood control programmes indicated that the heavy investment in flood control has not decreased the average annual flood damage (Kates 1962). In the meantime, White (1945) was working on his study of flood hazards, trying to prove that systematic research of hazards is more effective than high-cost engineering devices, in reducing damages and losses caused by floods. Indeed, his efforts began to help people living in the hazardous areas after the flood control engineering devices have been appraised and proven to be ineffective. However, his main concern was about rehabilitation and insurance activities aimed at bringing the hazard-damaged area back to normal as soon as possible. Such studies aimed at reducing damages and losses were not only needed in areas prone to flooding, but also ia areas where other types of hazards occurred in the USA. In this way the field of natural hazard research was expanded. In the beginning of this expansion researchers realized the value of a collaborative research paradigm, rather than of a variety of individual paradigms for their research.

By the early 1970s, it was possible to identify several directions in the development of the field of natural hazard research. Until the early 1960s, the main emphasis was on flood hazard, e.g. Burton (1962, 1965); Cook and White (1962); Kates (1962, 1965); Murphy (1958); Renshaw (1961); Roder (1961); White (1945, 1964) and White *et al.* (1958). This research on flood hazard was mainly carried out by geographers working in the Department of Geography at the University

of Chicago. As a result of this heavy concentration of geographers doing hazard research in Chicago, these were collectively referred to as the Chicago Study Group (The Open University 1977). The development of flood hazard research and its influences led to the study of other hazards occurring within as well as outside the USA such as wind hazards (Peyronnin 1962; Simpson and Malkus 1964; Hendrick and Friedman 1966; Hartman *et al.* 1969; Julian and Julian 1969; Islam 1970; Frank and Hussain 1971; Miller 1972); earthquake hazards (Steinbrugge 1968; Kates 1970; Mukerjee 1971; Thomas *at el.* 1971); drought hazards (Saarinen 1966; Heathcote 1969; Berry *et al.* 1971; Brooks 1971; Kates 1972; Mbithi and Wisner 1972); snow hazards (Rooney 1967; Archer 1970); and volcanic hazards (Macdonald and Eaton 1964; Swandon *et al.* 1971).

The already mentioned collaboration during the research process came to be recognized as a great potential benefit. Thus a collaborative research design was suggested in Natural Hazard Research Working Paper No. 16 (White, Kates and Burton 1970). While these suggestions were used as a guideline, researchers were free to change the suggestions according to the problems arising in the specific area under study. Since the researchers tried to follow this collaborative approach, it was possible and helpful to compare their results and findings.

International agencies recognized the importance of natural hazard research. The United Nations Disaster Relief Office was formed in 1972 in order to provide counter-disaster activities to reduce hazard losses. Further, under the UNESCO, the Man and Bio-sphere Programme became concerned with Natural Hazards. Apart from those UN bodies, the Scientific Committee on Problems of the Environment and the Commission of Man and Environment of the International Geographical Union (IGU) are the other main organisations whose programmes include an interest on environmental hazard threats.

Under the auspices of IGU, geographers from different countries gathered at a Meeting in Calgary, Canada in 1972 to review the results of the cross-cultural and multi-hazard research carried out during the early 1970s by the collaborative researchers in Natural Hazard research. Most of the studies presented for the Calgary Meeting were published in *Natural Hazard: Local, National, Global* by White in 1974. This publication covers hazard problems under three general themes: a) localised studies, under which twenty-one case studies were investigated represent-

ing ten different hazards, of which eight were in the Third World and ten in the USA. Almost all the localised studies presented at the Calgary Meeting attempt to test the hypotheses and research methods suggested in 1970 by the leading natural hazard researchers and their associates; b) national reviews which cover Japan, New Zealand, Canada, USA and USSR; and c) global summaries, under which three chapters dealt with tropical cyclones, floods and earthquakes.

The dominance of geographers in natural hazards research was gradually declining as specialists in other fields entered the research field transforming it into an interdisciplinary field of research. Thus psychologists (Simms and Saarinen 1969[4]; Schiff 1971); economists (Lind 1966; Krutilla 1966; Renshaw 1961; Russell 1970); engineers (Cook and White 1962); insurance specialists and community planners directed their attention to complex policy-related problems involving a wide range of extreme geological and atmospheric hazards in a variety of nations (Mitchell 1984).

Researchers started to use models in order to explain more rationally the decision-making process of the people living in hazardous areas (White 1973). In earlier works, using the tradition of economic analysis, it was postulated that the choice made by people living on flood plains was essentially based on economic optimization. Under this approach, it was assumed that individuals living in hazardous places would have relatively complete knowledge of the hazard and its occurrence, would be aware, in some degree, of consequences, and would seek to make adjustments representing an optimal resolution of the costs and benefits from each of the adjustments open to them. The ideal of the completely optimising man was viewed as one rarely seen in action. Therefore, a more explanatory model, namely a model of Subjective Expected Utility replaced the former economic optimization model. Man would seek to optimise, but his judgement would be based on incomplete knowledge and upon his subjective view of the possible consequences. Neither of these two models seemed to explain much of the behaviour observed in the hazardous areas under investigation. To adequately describe behaviour for purposes of predicting responses to changes in public policy required some other kind of model. As a result, experiments started with other models. One of the more appropriate models resulting from these experiments was the model of Bounded Rationality (Mitchell 1984) described by Simon (1956). This model was

proposed, in a general sense, for a variety of resource management decisions, and was developed in a more rigorous fashion by Kates in order to use it for Natural Hazards research (Kates 1970). In this way the development of natural hazards research had expanded by the early 1970s and had lost its heavy concentration on the study of flood hazards to the study of other hazards. The importance of the latter was recognized by international organisations which attracted the interests of specialists in other fields.

1.2 Development from the 1970s onwards

White and his associates carried out their natural hazards research without facing any major criticism up to the early 1970s. However, by this time, it was obvious that in order to solve the hazard problems, neither mere engineering devices nor the technocratic solutions prescribed by White's group helped to reduce the hazardousness of the natural extreme events. The money spent on their research activities was continuously increasing and so was the extent of property losses and the number of human deaths. The consequence of this background and nature made researchers rethink their activities as well as the group of hazard researchers who differed from White's associates (Hewitt 1983). These problems caused harsh criticism of the activities of this convergent type of hazard research, and the research activities became more diverse as a result. Thus 1) novel interpretations, 2) hazard research institutes (for both natural and man-made hazards) and 3) the usage of different terms instead of hazard, came into being with the increasing acceptance of hazard research as an academic field in its own right.

1.2.1 Novel Interpretations

One critical question frequently asked in relation to natural hazards research was whether the hazards under investigation were really natural. The answer to this question was not so difficult. Extreme natural events have existed in the world from time immemorial, but they have emerged as hazards only when human beings occupied the affected areas. I have seen several landslides in the forested hilly areas in the Wet Zone of Sri Lanka where nobody lives or no economic property exists, and nobody, not even government agencies, ever consider these as hazards. However, when a landslide buries a whole village, or a part of it, it is interpreted as a hazard. Therefore, by living knowingly in hazardous areas human beings should

expect to face hazards, but when they face them, they complain. This behaviour is expressed clearly in the Sri Lankan saying: "Inserting a snake inside the dress, one is shouting, I am bitten, I am bitten". This paradox is very common. However, if people would consider the dangers involved in the existing natural extreme events in a prospective settlement, and then decide not to occupy the area, we would have no need for research on natural hazards. Because of people's behaviour, however, some researchers started to question the validity of the knowledge accumulated by White's group. Some were very critical about the size of the problem to which these dominant researchers were contributing through their proposals.

> "Flooding as a hazard has been promoted by policies which have allowed building on flood plains and by systems of insurance to cover flood damage which have, in effect, encouraged people to underestimate the dangers of living in flood-prone environments".[5]

This quotation shows that policies aimed at assisting the occupants of the flood-plains have increased the hazardousness of the floods. Human intervention has aggravated the hazardous effects not only of flooding, but also of other hazards, such as droughts (Lappē and Collins 1982; Hewitt 1983; Schatan and Schatan 1987). Even dominant hazard researchers have realized the growing hazardousness though the number of hazard research has increased (Burton *et al.* 1978).

As a result of this type of criticism, the distinction between natural hazards and man-made hazards has been made very difficult to recognise, and natural hazards research was gradually transformed into hazard research under which researchers started to study technological problems like nuclear transportation and workplace accidents; toxic substances; explosions; airport noise, and global atmospheric pollution, apart from the natural hazards already mentioned. Furthermore, initial work on social hazards such as violence and mental illness also began to appear (Mitchell 1984).

Strong criticism to the activities of White group, especially the collaborative research published in 1974 was put forward by O'Keefe and Wisner (1975) and Waddel (1977). Tory (1979) criticized the White group's other major collective hazard research work published under the title *'Environment as Hazard'* (Burton, Kates and White 1978). The strongest critcisms against the activities of this dominant research group came in 1983 from another group of researchers (Hewitt 1983).

The leader of this group, Hewitt, had been working for White's group at the beginning of his research career. Because he was working with this group, he had the opportunity to assess the researcher's work more objectively. After realizing the weaknesses of their work, Hewitt started to criticize the hazard research of the dominant group, including his previous research (Hewitt 1983). The research activities of White's group, which uses the wealth and the power of the wealthiest industrial nations is strongly criticized by Hewitt's group focussing on its dominance over the natural hazard research field and its powerful influence on the policy makers in many parts of the world.

> "Dominance is evident in the resources allocated, in the number of highly trained personal involved, and the volume of their published works, in the public visibility and acceptance of these works and, perhaps most of all, in the attachment of this view to the more powerful institutions of modern states. In the work of any sub-field or study, the dominant view might be revealed by the literature quoted and emulated".[6]

The dominant research group takes the physical environment as a starting point for the explanation of the social situation. Therefore, the approach is deterministic. As a result, the most important actions suggested to curb the problems of hazardous events are mainly concerned with geophysical monitoring, forecasting, and direct engineering, or land-use planning, in relation to natural agents. The technocratic approach of the dominant view is always superior in relation to other modes of action and knowledge which can be used to combat the hazardousness more effectively. Hewitt's argument goes on that in order to reduce hazardous effects, it is necessary to follow a socio-cultural approach. For him the technocratic approach is also socio-cultural in nature, but with the difference that the technocratic approach is institution-oriented and lacks an ethnocentric view of man and nature.

The researchers of the dominant group collect information in relation to people's responses, water conservation, hazard zoning legislation, and how institutes cope with hazardous events. These interests may be reasonable in themselves and may add information to the geophysical and engineering knowledge. However, this approach being very narrow, loses sight of the main sources of social influence on hazards. As a result, the research of the social scientists served to reinforce the geophysical and technological reductionist dominant view. This perspective on

the natural hazard research carried out by the dominant group has been the most prominent impediment in the attempt to improve the quality and effectiveness of hazard research. Furthermore the above perspective pretends to be 'objective' 'general' and 'vigorous', but these qualities have been achieved through extremely narrow opportunistic interpretations and empirical interests. All these technocratic activities are a disguise for environmental determinism and the language of accidents, serving to hide or neglect both particular metaphysics of enquiry and politics of management (Hewitt 1983). Apart from its use in hazard research, the reliability and validity of the technocratic approach was questioned and rejected as a panacea for all human and, especially, environmental problems (Simmons 1986).

From the above discussion, the amount of hazard research carried out by White's group and its dominance and influence in the field have become clear. Since hazardousness in the world has increased at the same time, one may accept the criticism of Hewitt's group to a certain extent. However, White himself was aware of the growing hazardousness as a result of human influence over land through technology. Furthermore he emphasized two lessons in the process of environmental management to minimize the hazardousness of extreme events; a) conceptual sharing of the skills, experience and research capacity of the family of the nations, b) inability to expect to cope effectively with hazards in the environment by relying solely upon technological solutions (White 1974). On the other hand, if we frankly talk about our research and their number we can generalise that most of the research cannot help to solve the problems in the world. The Third World itself is a laboratory for many researchers, especially for researchers in the First World. However, the living standard of the people in the Third World is gradually deteriorating, especially because of the ignorance of dominant groups and individuals. There are other researchers who are doing research on hazards, but their approach is contrary to White's group, for instance, Hewitt's group, yet hazardousness is growing. It is therefore very clear that domination, whether it is happening in the nature as extreme natural events or in human society in the form of influential groups or individuals, is hazardous for all living beings and there is no way to escape or eradicate this problem by way of mere research.

Another criticism about White's group is its usage of models to explain the human response to natural hazards. The models are incapable of achieving con-

siderable success with regard to explaining the human response to nature, because of the complexity of human behaviour. The complexity of human behaviour is evident on any level of society, be it at the level of the individual, the family or the national level. However, this complexity is unimportant for some researchers. Consequently, they view the human response to nature in a cybernetic form, and thereby simplify the behaviour and human response to nature with the use of models. Not only that, they apply these models in order to explain unlimited complex human responses. Therefore, the model developed by Kates to explain the human responses to natural hazards, and applied by his collegues in hazard research, has limited their ability to make rational and valuable explanations concerning man and hazardous environmental events. Walker (1979) critized this model as manifestly inadequate to explain human behaviour, and claimed that strategic diversions were constructed around it. The philosophers, among others, Popper, also criticized systems used to predict human society. In Popper's view predictions are only possible for systems that are "well isolated, stationary and recurrent", and this does not, and cannot hold of society, where among the major factors determining development are our own decisions about how to respond to our situation (Flew 1979).

While case studies about hazard research in the developed world are abundant (Heathcote 1985), they are relatively rare in the Third World even though its hazardousness in general increases day by day. However, already carried out research can be divided into two groups which represent the White (technocratic) and Hewitt group's (socio-econo-political) approaches respectively. The problems of the White group approach have already been discussed above. As a result, it must be doubted that this approach, which has failed to solve hazard problems in the developed world (where the concept originated, was developed and extensively used), should be more successful when applied to developing countries. The interpretations of the Hewitt group, by contrast, are politico-econo-social, and its solutions are sought in the radical changes within the world market and within the national economies in favour of the deprived majority which is forced to live in the more hazardous areas in the Third World. However, the world market forces continuously impoverish the Third World because it perpetuates technological dependency and unequal exchange. This process is at work in a similar way within poor countries in relation to the poorer and richer classes. In this context, it has

been identified as a process of marginalization. Marginals are those people who have been either forced off the land completely or onto very poor or insufficient land, and who cannot find a permanent job. These comprise the growing class in Asia, Africa, and Latin America. The poor serve the modern industrial groups in underdeveloped countries as cheap casual labours or by producing cheap food for industrial workers. They also have little political power and a poor standard of living. They often live in the most dangerous and unhealthy places (Susman *et al.* 1983) which may erode quickly depriving them of basic nutrition (Simmons 1986). As a consequence of the uneven distribution of resources between the developed and the developing world, and within the latter thus, threaten the quality of the environment in the struggle for survival.

Modernization has been criticized for the growing hazardousness in the Third World. As a result of modernization, people's traditional arrangements are either disrupted or destroyed, alienating people from the land. Under the traditional system, the extended family, the village 'tribe', the reciprocal duties of lords and people absorbed and dealt with problems such as natural hazards (Hewitt 1983). Hewitt therefore suggested that when looking at hazards in the Third World:

> "it is our 'fellows' with whom we are required to cope first, and the earthquake process second".[7]

This argument points to the most important reason for both the cause and the solution of most problems. We must cope first with our fellows, because they are the manufacturers of the world's growing hazardousness. There does not seem a firm basement to criticize modernization on the grounds that it disturbed the nice relationship and reciprocal duties of the lords and serfs in times of feudalism. Feudalism, which has no place for equal human rights, is hazardous even without natural extreme events. On the other hand, prior to the development of modern medical facilities, this planet was more hazardous than at present. This is very clear when we study the world population growth rates and human life expectancy in time and space. However, modernization can also be criticized for the rapid population growth and the thereby created problems in the world, especially in the Third World. As a result of modernization, land has to be used to an ever greater extent in order to cope with the growing amount of mouths to be fed, all this at the expense of the natural environment. Population growth, for instance,

reduces and indeed abolishes the duration of the fallow period and fragments the land holdings. The hunger for land forces people to use marginal lands. As a consequence, soil fertility and productivity are reduced and the hazardousness of the environment enhanced (Harriss and Harriss 1989).

1.2.2 Hazard Research Institutes

The most important natural hazard research institute is the Natural Hazard Research and Applications Information Center at the University of Colorado Boulder, U.S.A. Its goals and activities are in summary: a) to conduct research and provide assistance for public and private hazard interest groups, b) to organize a workshop on natural hazards in every year, giving an opportunity to participate for academics, researchers, public and private organisations which deal with hazards, c) to publish research and other relevant information in the Natural Hazard Research Working Paper series, the Monograph series, a bimonthly newsletter called *The Natural Hazard Observer,* and other publications.

Another important institute is the Hazard Assessment Group at Clark University in the USA. Geographers who worked here to develop natural hazard research turned their attention to technological hazards. Experts in this institute are not only geographers but also pure scientists and physicists, engineers and social scientists, as well as economists, philosophers and environmental scientists. The journals *'Environment'* and *'Risk Analysis'* which are published here help to circulate their research activities to a wider audience.

Focusing on environmental perception and emergency planning, hazards are also studied in the Institute for Environmental Studies at the University of Toronto, Canada. This institute organizes workshops and publishes working papers and other publications. The working group decided to focus its future activities on the interrelationships between environmental hazards and development, the management of pest and pesticides, and the perception of highly valued landscape. Apart from the prominent hazard research institutes, geographers work in small groups or as individuals in several other North American universities.

Outside North America, hazard research is carried out in Europe, Australia, Japan, India, and Africa. The Disaster Research Unit of the University of Bradford initiated hazard research activities in the U.K.. A series of occasional papers were

published, but it is defunct at present. The activities initiated by this institute were continued by the International Disaster Institute in London, which also sponsors the international journal *Disasters*. The Flood Hazard Research Centre established in 1972 at the Middlesex Polytechnic is carrying out its research and furthermore, it has expanded its research activities in foreign countries such as Bangladesh at the present.

Hazard research in Australia has mainly been carried out by geographers who participated in the Work of the International Geographical Union Commission on Man and Environment. They supplied the majority of papers delivered at a nation-wide Hazard Research Symposium in 1976, which were also published in the same year (Heathcote and Thom, 1979).

1.2.3 Usage of different Terms instead of 'Hazard'

With the expansion of the scope of hazard research of geographers, their opportunities to work with other experts also increased. Therefore, cooperative hazard research links were developed with economists, psychologists, sociologists, anthropologists and political scientists from the social sciences. As a result, there is a growing recognition of common interests of hazard researchers with specialists in overlapping fields like emergency planning, stress management, disaster research, risk management, decision theory and human ecology. Along with the common interests boundary disputes between the specific fields emerged and different terms were used instead of the term 'hazard'. At the beginning the term 'natural hazard' was used. With the emergence of man-made hazards the term 'hazard research' came into being. The term 'risk' is now used by Clark University researchers, and its usage was confirmed and circulated with their journal *Risk Analysis*. While American researchers started their research institutes with the term 'hazard', their counter-parts in Britain established their first institute using the term 'disasters'. 'Disaster' is more widely used by sociologists rather than by geographers in the USA. It is often difficult to see clear-cut boundaries between any of these terms. However, research on disasters has emphasized the explanation of social organisational mechanisms whereby human aggregates and individuals adopt and implement policies in order to mitigate the risk imposed by the occurrence of future environmental extremes. This segment of disaster or hazard research is akin to

human ecology in that it seeks explanations for human adjustments to the risk of environmental routine, while hazard research seeks explanations for human adjustment to environmental routine. Hazard research is different from human ecology in that it has traditionally emphasised the importance of adjustment performed by individuals, although the adjustments of larger social units such as organizations and societies have also been studied. Human ecology has emphasized adjustment of large collectives, although the adjustment of smaller social units such as individuals has also been considered (Mileti 1980).

1.3 Theories Relevant to Natural Hazard Adjustments

Though much research has been done on natural hazards, there is still no universal theory acceptable for researchers and practitioners to explain the many different aspects of hazards, and, especially, to develop strategies for coping with those calamities. However, researchers have to accept the centrality of the relationship between the characteristics of natural hazards, i.e. the physical environment and socio-economic activities of the hazardous area, on the one hand, and strategies to cope with the hazards evaluating their past, present and future on the other. However, considering all these aspects O'Riordan has made an effort to fill this hiatus and put forward the following three theories which explain human responses to hazards i.e., 1) the transition thesis, 2) the lessening and worsening analysis, and 3) the vulnerability thesis.

The transition thesis developed by Burton, Kates and White proposes an evolutionary or developmental approach to natural hazards evolving from 'folk' responses through technically and managerially dominated industrial reactions to mixed adjustments involving a variety of technological, behavioural and political measures. The criteria for selection relate to economic viability, social and political acceptance, administrative convenience and environmental suitability. Burton, Kates, and White summarize their perspective that common to almost all models of societal change is a focus on one-direction development, with an explicit or implicit assumption of growing complexity as societies enlarge their scale of action, differentiate their functions and integrate their adjustments to hazard changes. As folk societies mix with industrial societies, the number and importance of their cultural adaptations and incidental adjustments diminishes.

This view emphasizes a development or maturation approach which may be broadly universal. Folk responses have better characteristics such as good cultural adaptation, flexibility, low cost. Industrial reactions lead to the control of hazards and to protection systems including zoning and other structural improvements. The combination of folk and industrial responses can be used to make better policies like pre-disaster planning, insurance, other loss-sharing schemes, and more coordinated post-disaster relief.

The lessening and worsening thesis, tentatively proposed by Kates and his colleagues at Clark University is more a speculation than a thesis. The lessening side emphasizes that improvements in 'mixed' responses as suggested under the transition thesis reduce the impact of a given natural hazard. Therefore, future events of similar magnitude are less damaging to lives and property. For instance, international aid should be so coordinated that it can assist and rehabilitate famine victims more than in the past. On the other hand, the worsening aspect of the analysis suggests that the growing interdependence of world economies could result in more widespread repercussive effects on natural disasters, since hazard-prone economies become more dependent on international aid, and as hazard-created economic damage creates food-shortages or price rises within the international economy.

Though O'Riordan mentions that "these lines of argument are neither mutually exclusive nor sufficiently detailed to be very helpful", the worsening thesis is very clearly based on the assumption that the growing interdependence of world economy operates at the expense of the Third World , especially of the deprived majority of its people. This analysis could be improved by a more critical assessment of the role of post-disaster relief. Unless aid is conspicuously geared to the existing and potentially beneficial coping strategies of local cultures, it could cause even more economic instability and reliance on external economic assistance in the future. This could worsen the state of hazard vulnerability. The common interests of hazard researchers and specialists in overlapping relief and long-term rehabilitation after disasters cannot be separated from the politics and economics of wider developmental processes which may have to be quite specific to a nation or a region.

The 'vulnerability thesis' was first suggested by Wisner, O'Keefe, and Westgate but much more substantially discussed in a volume of essays edited by Hewitt. Their main argument is that increased vulnerability to hazardous events is due at least as much to the acts of humans as to the acts of God. The man-hazard relationship is considered not in terms of a interactive relationship between man and environment, but largely as a man-man relationship where the environment is an independent phenomenon. The claim is that the heaviest sufferers of a natural hazard are people with limited choice about where they can live; who are lacking in money, knowledge, and awareness of disaster relief assistance so that victims do not know what to do in the event of a calamity and cannot protect themselves; and who often must live in inadequate shelters without sufficient nourishment.

According to the vulnerability theory, disaster-proneness is a product of a capitalist economic development which exploits the poor and worsens their condition so that they are deprived and become involuntarily prone to disasters. In addition, forces of capitalist development may force these people to move into areas that were previously uninhabited precisely because of the natural and man-made hazards that exist there. On the other hand, people are simply not able to adapt, or to develop appropriate coping strategies. Vulnerability is essentially associated with poverty and powerlessness which are often linked to ignorance and defencelessness respectively. The solutions that the vulnerability thesis offer to the problems of increasing hazard-proneness lie in part in re-establishing indigenous mechanisms of communal self-reliance so as to ensure that vulnerable people are provided with the basic knowledge about which hazards they face and how they can cope with them. At the same time it encourages the judicious use of Western technology and organisational experiences as and where appropriate. However, more basic problems of economic dependency, power relations, must also be addressed if the 'vulnerability' element of the hazard-proneness is to be reduced. Furthermore, positive aspects of social change, such as improved access to education and strengthening the status of women in society would help, but present tendencies do not hold much scope for optimism in this area (O'Riordan 1986).

1.4 The Necessity of Natural Hazards Research

The rapid growth of the world population, which results in a limitation of space for safe and healthy settlements (World Resources Institute 1988) together with the unfair distribution and usage of modern technological and economic powers helped by politically and economically powerful countries, are threatening the whole world with growing hazardousness.

In this process natural extreme events have increased damage losses and the number of human deaths, while man-made hazards and environmental degradation are threatening the whole world. This is signalling that man-made hazards such as the greenhouse effect with its possible consequence of sea-level changes are much more widespread. The contribution of western knowledge, technology, and political and economic ideologies to change the surface of the earth is remarkable. Many places and living species over the earth's surface consequently experienced severe damages which in some cases are irreparable (e.g. extinction of species and resources) while some take a considerable time to rehabilitate themselves (e.g. forests). Therefore, western countries, which are more responsible for the continuing environmental degradation have given a very high priority and consideration to the creation of a safer world for its future inhabitants. As a result, environmental problems have become an important topic for discussion and consideration among the everyday activities of the public. This is shown by the growth in the number of organizations, trusts and authorities dealing with environmental problems. For instance, in 1987, there were 481 such organizations, trusts and authorities at work on environmental matters within the North-east of England alone (Baker 1987). However, although the hazardousness in Sri Lanka is growing such organizations are fewer than ten.

Within the European Economic Community, the environment ranks as the second most important political problem perceived by the electorate, ahead of inflation and arms control, and second only to unemployment (Pearce, Markandya and Barbier 1988). In the case of Europe, man-made environmental hazardousness has been the most important political problem.

By the end of the 1970s, the world estimated natural hazards losses were $40 billion a year, and three quarters of these consist of floods (40 percent), tropical cyclones (20 percent), and droughts (15 percent). In addition to these property and

income losses, the average annual losses of lives were 250,000 persons (Kates 1979). Occasionally, it may happen that hazards kill as many as 200,000 people as in 1970 in East Pakistan (present Bangladesh). In the United States alone, property losses from climate-related events amount to more than $13 billion a year.

In the developing countries natural hazards are growing in severity and spatial extent. As mentioned at the beginning, natural hazards cannot be discussed as an independent phenomenon. This applies also to other natural factors such as climate or geomorpology. In the past two decades the scientific study of climate has undergone major changes and has reached higher levels of sophistication in relation to the problem addressed. However, it has moved from the simple concern about atmosphere to an analysis of complete systems in which climate is treated as part of the natural ecosystems and the human economy. Policy makers have begun to take note of its findings. How are these changes brought about? Why is there now a greater awareness of climate among professionals and layman alike (Hare and Sewell 1986). We can also find similar ideas elsewhere. It is very clear that it was not only drought or other climatic misfortunes, but the underlying social conditions that had to be studied, since it appeared that the effects of natural catastrophes are often more transformed through social structures and political processes (both within countries and in the world as a whole) than by any other physical cause (Garcia and Escudero 1982). In the aftermath of a disaster, relief and rehabilitation activities are very important from which politics and economics cannot be dissociated. For the Third World Countries, more needs to be known about the ways in which different societies get to grips with all kinds of environmental hazards, the quality of their political and social situation, and the manner in which they evaluate their priorities. Since poverty and hazard cannot be separated, any improvement of coping strategies must involve some transfer of resources from the rich to the poor, and from the powerful to the powerless (O'Riordan 1986).

1.5 Natural Hazard Research in Sri Lanka

As will be shown in chapter two, drought hazards are extensively and frequently damaging Sri Lanka. Written evidence and data to prove the historical occurrences of these hazards are not available until the middle of this century. However, indirect evidence shows that droughts have been damaging the agricul-

tural activities and the life of the people in the Dry Zone from time immemorial. Thus, our Sri Lankan ancestors developed a very complex irrigation system in response to drought hazards. Though there had always been small tanks on the village level in the country, the first major irrigation tank was built during the period A.D. 276 - 303 by King Mahasena. His gigantic reservoir called Minneri exceeds a circumference of 15 miles. After this, large reservoirs have been built in every river in the Dry Zone. Apart from these tanks and reservoirs, huge dams had been built across the rivers to divert the river water for agricultural use, e.g. the Minipe dam built across the largest river, the Mahaweli. With these reservoirs and dam constructions it was necessary to distribute the stored water more efficiently. The consequence was the development of very complex canal systems. Considering all these activities the conclusion can be made that ancient Sri Lankans had a good knowledge about the drought problem and its hazadousness, and that they combatted the droughts by using their observations and studies to finally develop highly effective irrigation systems.

Research activities in the modern context were initiated in Sri Lanka after its occupation by the British imperial power. The British established several research institutes (e.g. for agricultural crops and health), organised data-gathering institutes (e.g. Dept. of Census & Statistics, and Dept of Meteorology) and Universities. A variety of research covering many problems has been done in the country by the researchers of these institutes and elsewhere. Though there are natural hazards, which damage people and the economy, the number of research efforts to study hazards and related problems is limited to a few drought and flood studies.

The pioneering effort to study drought hazard in Sri Lanka was made by Karunanayake (1976) based on a village in the North-central Province of the Dry Zone of Sri Lanka. In his study, he gave attention to a) water deficiency, b) adaptive processes operating within the peasant socio-economic system, and c) the impact of the drought hazard on agricultural modernization. He showed that there is a wide range of available alternatives for the peasants to minimize the impact of drought in the agricultural system, and that cultural adaptations of the peasantry facilitate the flexibility of agricultural systems, but that their production efficiency is static. However, he also emphasized the necessity of modernization in order to

maximize the production with a shift from static to dynamic efficiency. Some of his suggestions were that peasants should be free from risk minimization in order to improve new technology, the water problem should be solved, and insurance policies are a vital need of the peasants.

Maddumabandara (1983) also compiled a study on drought hazard based on several villages in the North Central Province. In this study, he showed how drought affects the farming community, and proposed various suggestions to reduce the hazardousness of the drought, viz., drought relief, insurance, ground water irrigation, rural industries based on exploitation of forest resources and agricultural products, and animal husbandry. Of these, ground water extraction, the usage of forest resources and improvement of animal husbandry have been the main suggestions to reduce the hazadousness of the drought. However, on the whole, all these suggestions seem like tranquillizers in the face of an increasing hazardousness. The ground water extraction and the usage of forest resources, for instance, can be considered as a remedy for drought hazard only if Sri Lankan people in the Dry Zone want to live for the present, in the area with no thought to their children who come after them. Already ground water is being extensively extracted through tube wells in Sri Lanka mainly for domestic purposes. The hazardousness of these tube wells are already very clear for the people living in the Dry Zone. Nobody can drink water of these wells during a drought period, due to its high salinity and alkalinity.

Tennakoon (1986) did his drought hazard research for his Ph.D. under the supervision of one of the leading drought hazard researchers, Heathcote. It is also based on the settlements in the North Central Province. His main objective was the determination of the Dry Zone farmers' perception of and adjustment to the drought hazard. In addition he a) portrayed the environment of the Dry Zone as perceived by scientists, b) determined the spatial and temporal organization of agricultural activities, c) examined how the Dry Zone farmers perceive drought, d) showed briefly how the Dry Zone resource managers at different levels view the adjustments, e) highlighted some agreements and disagreements in the varied perception of and adjustments to drought by scientist, farmers and resource managers, and f) identified the implications of the above agreements and disagreements as his specific research aims. To analyse the adjustments he used the classification of

White's group and Kate's model.

The first flood hazard research was done by Hewapathirane (1977). He did this Ph.D. research under the supervision of White, at the University of Colorado, Boulder. His main objectives were to study a) the national significance of the flood hazard in Sri Lanka, b) the suitability of alternative adjustments to lessen flood damages, and c) the effects of the possible changes in the national policy on flood reduction. Again, this research propagates the technocratic view in order to reduce flood hazard.

Another piece of flood hazard research was done by American geographers, Churchill and Hutchinson (1984). In this study, they explained flood hazard in the municipality of Ratnapura which is the most vulnerable city for floods in the country, and examined existing ideas and attitudes of the floodplain occupants in the context of the flood alleviation programme recently initiated by the government. This city is 4 km^2 in extent with 30,000 inhabitants. Personal interviews with 58 individuals were conducted with an interview similar to the one suggested by White (1974) and fieldwork was conducted with the help of an interpreter within a period of six weeks. Their results suggested that flood victims do not have very many adjustments and the results contradicted Hewapathirana's (1977) flood study results in Ratnapura city, which according to Burton *et al.* (1978), showed that Sri Lankan flood victims apparently had the highest number of adjustments among world natural hazard victims. This research was handicapped by an interpreter who did not know *Sinhalese* language. (Almost everybody who lives in Ratnapura city speaks *Sinhalese.* Therefore, they gave the literal meaning of the *Sinhala* word *gang watura* (they have written it as *gan watura*) for flood as 'one that enters the house' (Churchill and Hutchinson 1984 p. 521.) which is completely wrong. *Gang,* which means 'belongs to river' in *Sinhalese* is used as the adjective of the noun *ganga* or 'river' and *watura* is 'water'. Therefore, *gang watura* means 'bodies of water in the highlands' which are also like rivers. (*Sinhala* is an Indo-European language and therefore, the English word *water,* the German word *wasser* and the *Sinhalese* word *watura* show similarities.) The research also followed the path of the White's group. The danger of this sort of research and fieldwork with a tight time table has been commented by the veteran English geographer on agriculture in Sri Lanka, B.H. Farmer:

"Perhaps, however, the term 'field-work' also needs some definition, since it is apt to mean all things to all men. I assuredly do not mean the 'field-work' undertaken by those globtrotters who merely visit a country, move through it rapidly by car or by train, and talk to its more articulate inhabitants; yet thus does 'field-work' seem to be understood by some.'[8]

In the present study the researcher explains the perception of, and the adjustments to, drought hazard by farmers in southern Sri Lanka, the driest part of the country. Since natural hazards are extreme geo-physical events, the present researcher does not consider it meaningful to follow any established leading research group which seems merely to propagate its own brand of (extreme) ideas. The present researcher, therefore, has tried to follow a 'middle path' which allows him to detach himself from the leading global natural hazards research groups in order to see the problem more clearly. However, in order to establish a research framework he obviously made use of the literature of the above mentioned groups.

... Notes ...

1. R. J. Johnston *et al.* (eds.) (1986), *The Dictionary of Human Geography,* London: Basil Blackwell Ltd.. pp. 133-134.
2. G.F. White, (1974) 'Natural hazards research: concepts, methods, and policy implications', in G.F. White, (ed.), *Natural Hazards Local, National, Global,* New York: Oxford University Press. p. 4.
3. White's (1974) *op cit.* p. 3.
4. Simms collaborated with Saarinen in using Thematic Apperception Tests in 1969, and helped to design a Sentence Completion Test for the collaborative research suggestions in Natural Hazard Research Working Paper No. 16, 1970.
5. R.J. Johnston, *et al.* (1986) (eds.) *op cit.,* p. 134.
6. K. Hewitt (1983), (ed.) *Interpretation of Calamity from the Viewpoint of Human Ecology,* Winchester, Mass.: Allen and Unwin Ltd., p. 4.
7. K. Hewitt, (1983) *op cit.,* p. 26.
8. B.H. Farmer, (1980) Some thoughts on the place of field work in agrarian studies. *Sri Lanka Journal of Agrarian Studies,* 1, (1). pp. 1.

Chapter II

SRI LANKAN DROUGHT HAZARD AND METHODOLOGY OF THE RESEARCH

"It was in the Dry Zone of Sri Lanka that the early settlements arose. These were riverine in character, and rice was the staple crop. The earliest colonists were dependent on the Northeast Monsoon to cultivate a single annual crop of rice. The climate was rigorous if not harsh, the rains seasonal but not reliable. With the expansion of the settlements the great problem was to provide insurance against not infrequent droughts. As a solution to this problem the ancient Sinhalese developed a highly sophisticated irrigation system, in which technological skills of an extraordinary nature were demonstrated".[1]

The above quotation taken from one of the leading Sri Lankan historians clearly summarizes the nature of the historical Sri Lanka. Written historical evidence in Sri Lanka shows that the present area of the Dry Zone was selected and occupied by its first settlers. There is no evidence to prove that the present Dry Zone was free from droughts in any historical period. Therefore, from the inception of Sri Lankan civilization, drought has been a familiar environmental phenomenon and a hazardous experience for its occupants. Floods, on the other hand, form a major hazard in the Wet Zone where the rainfall is high. Apart from these two major hazards, landslides and cyclones create in addition a considerable amount of hazardousness while malaria epidemic, forest fire and sea-erosion remain minor hazards. (A summary of all these hazards in the country (apart from drought) is given in appendix A.) The present study will concentrate on drought hazard in Southern Sri Lanka.

2.1 Drought Hazard in Sri Lanka

The Dry Zone covers about two thirds of the land area in Sri Lanka. For this study, relevant data on drought was available for the period from 1948 to 1987 of which 25 years have been affected by droughts. The number of drought affected administrative districts during this period varies from 1 to 15 (see table 2.1).

Table 2.1 — Occurrence of Drought Hazard in Sri Lanka: 1948-87

Year	1	2	3
1948	8	n/a	1, 112,839
1949	9	n/a	7,177,776
1950	8	n/a	711,411
1951	6	n/a	87,273
1952	6	n/a	265,316
1953	5	n/a	1,954,568
1954	5	n/a	123,050
1955	5	n/a	141,916
1956	6	n/a	14,351,779
1959	7	n/a	2,147,286
1960	3	n/a	43,784
1961	3	n/a	63,435
1965	11	100,000	10,583,194
1968	6	n/a	174,730
1969	6	n/a	176,730
1973	3	2,680	277,613
1975	5	n/a	n/a
1976	5	n/a	n/a
1980	9	128,360	15,874,104
1981	6	186,185	41,680,202
1982	13	328,516	186,786,799
1983	15	410,752	198,528,442
1985	1	6,491	4,262,033
1986	15	536,111	n/a
1987	15	536,111	n/a

Columns: 1 = number of districts affected (the total number of districts at present is 25), 2 = number of families affected and 3 = government expenditure (Rs.) on relief activities.

Source: Unpublished data, Dept. of Social Services, Colombo, Sri Lanka; (n/a = not available).

Furthermore, the data show the growing geographical expansion and frequency of occurrence of droughts during recent years.

The occurrence of drought hazard shows that all the districts, except four districts in the south-western part, have been affected by this hazard between 1948 and 1987. All the districts affected by droughts are mainly located in the Dry Zone (chapter three explains the Dry Zone). Among all the affected districts, Anurad-

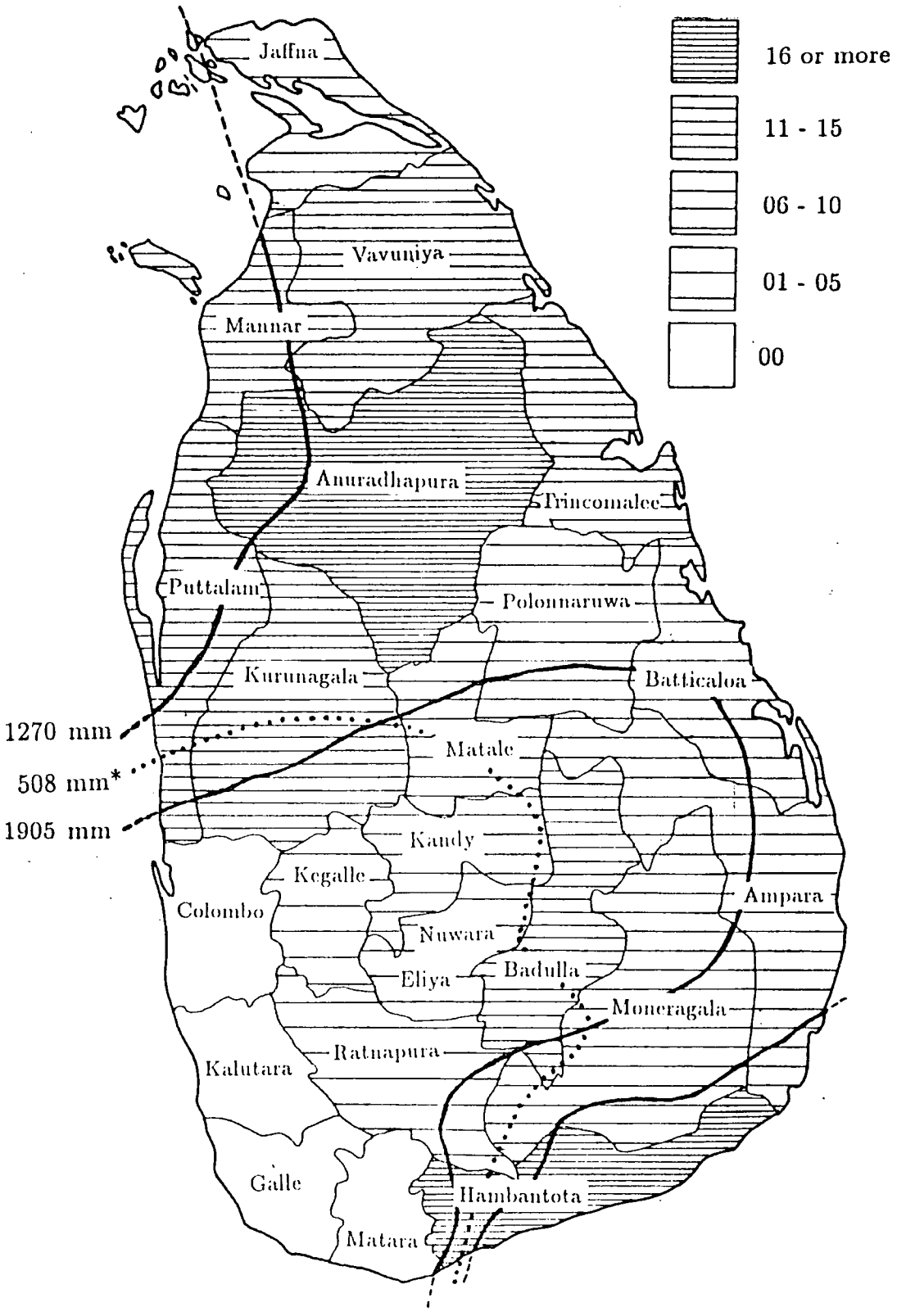
hapura and Hambantota, in which this study is based, were the most vulnerable for drought (table 2.2 and figure 2.1).

Table 2.2 — Distribution of Drought Hazard in Sri Lanka: 1948-87

District	Droughts
Colombo	0
Kalutara	0
Kandy	6
Ratnapura	3
Kegalle	4
Galle	0
Matara	0
Nuwara Eliya	2
Gampaha	0
Matale	10
Badulla	11
Monaragala	7
Trincomalee	11
Batticaloa	8
Puttalam	14
Anuradhapura	20
Kurunegala	11
Hambantota	16
Jaffna	7
Ampara	10
Polonnaruwa	9
Vavuniya	13
Mannar	13
Mullativu	4
Kilinochchi	2
Total	**181**

Source: Unpublished data, Dept. of Social Services, Colombo, Sri Lanka.

Figure 2.1 — The Distribution of the Occurrence of Droughts in Sri Lanka: 1947-87



2.2 Goals of the Study

This thesis contains a study of the second most drought-affected area, but the driest part of the island, Hambantota district in southern Sri Lanka, where thus far no attempt has been made to study drought hazard. It fills the gap of drought hazard research between the north-central province (where research has so far mainly been concentrated) and the southern province in Sri Lanka. The goals of the study are

1. to investigate how farmers in Hambantota perceive drought as a hazard,
2. to understand how the farmers' perception of drought elicits adjustments to redress their difficulties and problems created by droughts, and
3. to see whether there is any relationship between human actions and growing drought hazard.

In order to achieve these goals, it is appropriate to define the terms *'drought hazard'*, *'hazard adjustment'* and *'perception of drought hazard'*, although there are no universally accepted definitions. It is possible to use definitions used by leading hazard researchers. Saarinen (1966) explained that different people and scientists see drought in different ways and therefore, there was little value in trying to give a precise definition on drought. However, among the many definitions on drought hazard, I use the definition of Hewitt and Burton (1971) in this study, viz., "a period in which moisture availability falls below the current requirements of some or all the living communities in an area and below their ability to sustain the deficit without damage, disruption, or excessive costs."[2]

I use White's (1974) definitions of 'hazard adjustment' and 'hazard perception'. Thus by hazard adjustment is meant "a human activity intended to reduce the negative impact of the hazard event" whereas hazard perception is defined as "the individual organization of stimuli relating to an extreme event or a human adjustment".[3] It has to be conceded that the concept of hazard perception has different meanings to different people (Mitchell 1984).

After reading the general literature, and as a result of my acquaintance with drought-affected southern Sri Lanka, the following hypotheses were formed for this thesis, viz., *a). the farmers' perception of drought hazard is a function of*

the magnitude and frequency of droughts they face, the recency and frequency of their personal sufferings from droughts, the way it affects their living environment and economies, and the origin of the farmers and the availability of irrigation water; b). their adjustments to reduce the hazardousness depend on their individual perception of the drought hazard, the variations of aridity and rainfall, the reliability of irrigation water, their socio-economic activities, their perception of alternative activities, their perceived linkages with the people, and the existing social system; and, c). the hazardousness of the drought is growing, and this growth is due to the environmental degradation caused by politico-socio-economic mismanagement rather than droughts themselves.

2.3 Design of the Study

2.3.1 Background of the Researcher

I am a farmer who became an academic. I started agricultural activities helping my father at the age of five. By the age of eight, he gave me a small piece of paddy land (about 1/16 of an acre) to cultivate on my own. After that, almost every year I cultivated annual crops on my own in the paddy fields and in the highlands until I joined the University as a teacher in 1980. Apart from this, I also engaged in activities related to cattle rearing and perennial crops, as my father owns a water buffalo herd as well as rubber and coconut plantations in his small land holdings (see chapter four for explanations about small holdings). I therefore had the opportunity to engage practically as a farmer for 21 years. My home village is situated in Kalutara district, which is the most flood-affected district in the country. My village house is always among the houses submerged in high floods. As a full member of the farming community and as an educated young man I had to participate actively in most of the important social events in my village. This long period of active engagement in a village farming community as a practical farmer has determined my understanding of farmers, and especially of those farmers who live with floods and poverty. On the other hand, my study is based on the driest part in the country. Consequently, drought is the major hazard here (see figure 2.1 and tables in chapter three). Nevertheless, my previous practical life experience as a farmer has sharpened my vision to see and compare the consequences of these natural hazards and the behavioural patterns of the farming communities under

extreme natural events. Thus, I was an ordinary farmer cum student (school and university) in Sri Lanka until 1980. I was a full-time farmer from the last quarter of 1978 to the end of 1979 (see Appendix B for my Agro Identity Card).

The general lack of research on Sri Lanka's environmental problems led me to think of research in this field in my country. As a result, I started to collect information related to environmental matters, and eventually decided to do my higher studies related to natural hazards. There has been much research on agriculture by many local and foreign researchers including English, such as Alexis 1986; Brohier 1934-1935; Chambers 1974; Cook 1950; Farmer 1950, 1952a, 1952b, 1954, 1956, 1957 and 1977; Goldsmith and Hildyard 1984; Harris, B. 1977a and 1977b; Harris, J. 1977a, 1977b and 1977c; Leach 1959, 1962 and 1980; Moor 1980 and Yalman 1967. However, in my university library, there was not a single book directly related to the field of natural hazards. Thus, I started to read and collect necessary literature for this study at Durham only from October 1986 to June 1987 for the first time. Following this period, I went to Sri Lanka for my fieldwork for a period of nine months.

Since the study of natural hazards as an academic research field was developed mainly by geographers and other social scientists in the USA and other English speaking countries, I was heavily influenced by their methodology, and especially, by the main hazard researchers and hazard research institutes in the USA. However, by engaging in these studies I soon realized that research done by these leading experts and their followers were under strong criticism due to their rigid research approach (see chapter one). When I look back on my own university training and research in Sri Lanka and on that of my colleagues who are working in different fields of the social sciences, it is now clear to me that we were, and still are, all uncritically following the positivist approach, without being aware about the problems and limitations it imposes on our analysis and knowledge as social scientists. But when I was an undergraduate, I was taught that this approach constitutes 'the scientific method'. On reflection, my academic upbringing was, therefore, very limiting and partial before I started my research at Durham, and I only later understood that there were other research approaches apart from the one described above and realized that my own taken-for-granted method was that of logical positivism.

The research facilities and the academic environment at Durham University expanded my knowledge beyond the positivist approach and removed my ideological blinkers. Natural hazard researchers who criticized the research of the White group have indicated the limitations of the positivist approach. During my literature survey at Durham, when I went through the research methods used by the leading hazard researchers of the White group, I also learnt that the interview methods of this group were mainly developed from researchers' experience of a variety of North American market societies (White, 1974). Because I am familiar with farming communities in my village area and my field area, I found, however, that it is impossible to use these methods indiscriminately for my own research as they would limit the clarity and power of explanations of any study of a farming community with their own subtle and complex behavioral patterns which had evolved over thousands of years. Consequently, I made a deliberate effort to collect and explore data for this study without rigidly following any one particular research approach.

In summary, I have not only been disciplined as an academic and research geographer in the way indicated above, but I was also a real victim of flood hazards and deprivation as a full member of a farming community. This background and mixture of the two have had a great influence on my academic and research activities. Therefore, this research is a function of the activities and behaviour of a trained researcher conditioned and disciplined in the knowledge and methods of Anglo-American geographers on one hand, and the activities and experience of an educated farmer of a Third World country, for a longer period.

2.3.2 The Origin of the Research Idea

When I sat final year examination for my BA (geography honours) in 1978, I never expected that I would get a first class pass. But, since I achieved such a qualification, I thought that I would have a good chance of higher studies. However, when I applied for all the possible jobs and went for the interviews I was never selected. I tried more than forty times in all. In time some of my villagers assumed that I had failed my university examination and, therefore, could not get a job from the government. When I came to reflect on this I was extremely frustrated about our cruel and revengeful socio-political machinery. According to the existing socio-

political environment in Sri Lanka, academic and extra-curricular activities alone are not enough to be eligible for a job. The most important factors to get a job can be described as the 'boot licking' of ruling politicians and the high-ranking bureaucrats. Alternatively, one must be a relative of these powerful people, to get a job through nepotism. However, by good fortune I was appointed as an assistant lecturer in January 1980. Even though there were politically influential but academically less qualified applicants, my head of Department was strongly committed to justice and gave me a chance. By the time I joined the university, however, my keeness for further studies (it has been one of my wishes after getting a first class pass), my intellectual capacity and mental faculty were paralised. As a new man to the staff, I had to teach 20 hours a week. On top of this, I was assigned to do extra work by some of my colleagues who are senior to me, but in the same rank. Since they were earlier also my teachers, I could not refuse. With this workload I was unable to read other than for my courses.

However, it is necessary to have higher educational qualifications (preferably from an English speaking country according to our norms and values in Sri Lanka) to carry out our academic career in the University. In this pursuit, some preparation is necessary, and I was always interested in the problems related to the environment. At the time, there was no specific course related to environmental problems (even though these are so important) in my department. As a result, even though I did not have the time for extra reading and preparation, I wanted to follow my interest in environmental matters. In doing so, I found the addresses of several institutes which carry out research on environmental matters and problems. Subsequently, I wrote to these institutes and requested them to send me their free publications. (My salary at that time was about £60 which was not even enough for my maintenance in Sri Lanka. If I, therefore, wanted to by a book for even a few ponds, I had to think three times.) Furthermore, I enquired whether there was a possibility for me doing post-graduate studies under the direction of these institutes which are, in many cases, attached to a university. While I was maintaining this procedure, I received three research papers from the East-West Environmental and Policy Institute, Honolulu, in the USA. Among these, one of the articles was entitled "Human ecology research on tropical agroecosystems in southeast Asia" By the time I finished reading this article, the ideas put forward in it brought me back to my earlier village life with its agriculture, floods, environmental risks,

farmers' understanding of their environment, and their variety of efforts in order to maintain their wellbeing and survival in an uncertain environment. Furthermore, this article indicated to me the real potential of exploring and researching man's relationship with the environment. The following paragraph from this article was the key one which showed me the importance of farmers' perception of environmental hazards as a potential field of research to engage in, and which, finally, lead me into this research. (However, I was unable to find the publication of Burton *et al.* mentioned in the quotation in Sri Lanka.)

> "Farmer perception of environmental risk and consequent selection of appropriate production strategies is another important area for human ecological research on information flow. Geographers have developed interesting methodologies for measuring peoples' perception of environmental hazards such as floods and storms (Burton *et al.*, 1978). These approaches might usefully be employed in studying why peasant farmers make decisions as they do, a question receiving a great deal of attention from agricultural economists and economic anthropologists."[4]

2.3.3 Nature of Field Study Area

I selected Hambantota district in southern Sri Lanka as the study area because:

1. It is the driest area in the country (explained in chapter three).
2. So far, no research has been made to study drought hazard in this area.
3. Unlike other drought affected districts in the country, this area is unique in that it has a heterogeneous natural environment. It has all the climatic types which are derived on the basis of rainfall, and 3/4 of the land area is covered by the Dry Zone and the Arid zone (see chapter 3 for details about these zones) while other parts remain in the Wet Zone.

I started field work in June 1987. Before I selected the actual study sites, I wanted to gain a good understanding, knowledge and sufficient information about the farmers living in this area in order to formulate a meaningful questionnaire. Within a few days in the field area, I realized that the political activities in the area were like signals of a volcano which is on the brim of its eruption. Suspicion, fear, anger, and terror were the major characteristics I could sense everywhere. Since field work was critical to my study, I continued. My main worry was not related to

the threat I had to face since I have lived with hunger, deprivation and terror before this study. My main worry was over the uncertainity of ever being able to return to Durham to resume my studies. The volcanic environment blasted on the 28th of July 1987 with the signing of the Indo-Sri Lanka peace treaty. Hambantota became the most violent area in the south where most of the government properties were set fire and destroyed by the opposition political party supporters.[5] From the date the Peace Treaty was signed Hambantota district became the most dangerous of the districts in which the Sinhalese constitute the majority. Frequent free travelling from west to east of the district became dangerous, if not impossible. A new trend was growing of assassinations of leading politicians and corrupt government officers by the guerrillas. They came by motor bicycle and shot their targets with machine guns and disappeared. As a result, people with motor bicycles, like myself at that time, were under a particular threat from the government security forces. Since, Hambantota is a highly rural area, public transport facilities are not satisfactory. Thus, if somebody wants to go by bus, most of his time is wasted on the way. This applied particularly to me which is why I bought a motor bicycle to carry out my fieldwork.

The new trend, mentioned above, jeopardized my life even further. At that time, a young University lecturer, born in Hamabantota district, had already been taken into police custody because of his political beliefs and activities, and disappeared. The latter incident started another wave of assassinations of educated people who had opposing political views. The most vulnerable sector now were people with University affiliations, and especially, university students. Young lecturers and students were highly vulnerable to police and armed forces. As a young university lecturer carrying out my field work I took a very high risk. When I associated with police officers and officers in armed forces, ordinary people suspected me as a government spy, while the government supporters' suspicion was heightened when I was seen living with the farmers. Consequently, I had to abandon my original plan to select study sites according to the various aridity levels (low, medium and high from the west to the east of Hambantota district) with the use of the statistical random sampling procedure. I was forced to confine my study sites to the Hambantota Assistant Government Agent division (AGA) in Hambantota district where I could still find study sites representative of varied characteristics as explained in the next section. The variable character of the study sites allowed

me to explore the farmers' perception of, and adjustments to drought hazards in Hambantota district. As a result, the sampling procedure to select the study sites became purposive, deriving a set which yet represented all the characteristics to examine my hypotheses and to fulfil the goals of this study.

2.3.4 Study Sites

The research clearly required all the selected study sites to experience drought. The analysis of rainfall data in Hambantota district (see chapter 3) shows that more than three quarters of the total land area is affected by seasonal aridity and frequent droughts. The arid and semiarid climatic conditions in the southern province vary from a continuous four months period in the western parts of Hambantota district to eight months in the eastern parts. Apart from a few urban settlements, the composition of the settlements in the Dry Zone region of Hambantota district is dominated by either villages or colonization schemes. However, the size of the villages as well as that of the colonization schemes vary remarkably. Form and function of Dry Zone villages show little variation, although the origin of the villagers may vary. In some villages, migrants are not allowed to settle by the original villagers, so that, all the inhabitants belong to the same lineage; this type of villages is relatively small. In other villages migrants may settle but their number and influence in the village remains very low. In some villages, migrants may outnumber original villagers. A further category of villages comprises those which are solely composed of migrants. All these categories were considered in choosing the study sites.

For the present thesis, study sites were selected among agricultural settlements on the basis of variations in rainfall and aridity, origin of the farmers and their socio-economic activities. All these various characteristics are represented within the Hambantota AGA (Assistant Government Agent's) division. (The country is divided into districts and these are the largest administrative units which are governed by a Government Agent who is a senior civil servant. Districts are then divided into AGA divisions. There are 8 AGA divisions in Hambantota district.) In the Hambantota AGA division, there are 97 villages and four major irrigation schemes or colonization schemes. Even though I considered the safety of my life in determining the study sites, there was no guaranteed safety even in this division,

but, by reducing the travelling distance from one study site to the next, I hoped I could avoid a greater risk. Considering all these factors I finally selected four village settlements and two colonization schemes within the Hambantota AGA division as study sites which represent all the various characteristics mentioned earlier.

The selected villages vary from each other as follows:

1. Arabokka experiences the highest aridity. The moisture index value is -38, while the annual average rainfall is 1060 mm (the nearest rain gauge station is Hambantota). Everybody in this village belongs to the same lineage, no migrants are allowed to settle here. The villagers' main economic activities are cattle rearing, paddy and chena cultivation.

2. Ihalakumbukwewa has few migrants and their influence on the village activities is very low. Chena and paddy cultivation are the most important economic functions in this village. Climatic details can be gauged from the Migahajandura raingauge station as its nearest station (see Migahajandura).

3. Migahajandura is a village where the original villagers are outnumbered by migrants. Again, chena and paddy cultivation are the main income sources. Migahajandura receives higher rainfall than Arabokka. The moisture index value is -28 and rainfall is 1233 mm.

4. Swodagama is a settlement of migrant farmers. It is a new village which developed under the village reawakening-programme of the Sri Lankan government. Villagers here are also heavily dependent on paddy and chena cultivation. The nearest raingauge station is Suriyawewa and the related moisture index values and average annual rainfall data in Suriyawewa are applied to this village too.

In addition to these four villages, two colonization schemes were selected. Such schemes are characterised by more reliable irrigation facilities when compared to the villages. Paddy is grown in the main cultivation seasons of Yala and Maha. The reason for this are the bigger catchment areas of the colonies which have a larger amount of water impounded in their reservoirs. In contrast, most of the village tanks are entirely dried up during the normal annual dry season from June to September. Thus, while the rainfall figures for villages and colonization schemes may be similar, the availability of irrigation water varies strongly between the two

groups of settlements.

Of the selected two colonization schemes, Mahagalwewa is considered as the old colonization. In this colony the ancient tank was renovated in 1953 to start the agricultural activities. Each farming family in this scheme is allotted five acres per farming family. Out of these five acres, three acres belong to the irrigable area to cultivate paddy and two acres to the highland area where farmers have their houses and home gardens. In this particular scheme, there are 93 farming families with 279 acres of irrigated lands and 186 acres of highland. Settlers for this scheme were selected from adjacent villages. The nearest raingauge station to this settlement is Migahajandura and there moisture index and average annual rainfall values are also applicable to this colony.

The second colonization scheme, Suriyawewa, is not a separate colony, but rather a small part of a much bigger colonization scheme. Its main irrigation scheme is the Udawalawa project which was initiated in 1968. The left bank canal of this scheme started to irrigate the Suriyawewa area in 1976. It is thus a relatively new colonization scheme. The Suriyawewa scheme area has been divided into three sub-sections, namely farm, tract 1 and tract 2. The farm was selected as a study site where 101 farming families live on allotted lands of 2.75 acres each. Of the 2.75 acres, 2.5 acres are irrigable and 0.25 acres consist of highland. Most of the farming families are migrants of a diverse origin. Most of them, however, come from various parts of Hambantota district. The moisture index value for this settlement is -21 and the average annual rainfall is 1337 mm. This settlement thus has the highest moisture index value and annual rainfall. Table 2.3 summarises the basic information relevant to all the study sites and the figure 2.2 depicts their locations within Hambantota district.

2.3.5 Background to Data and Information Collection

In order to obtain the necessary data and information for the study I used a variety of sources, namely 1) published and unpublished documents, 2) observer participation method, 3) informal discussions, 4) formal discussions (questionnaires see Appendix C), 5) sentence completion test (Appendix D), 6) continuous recordings of relevant information, and 7) my practical farming experience.

Nine months were spent at Durham in the first stage doing literature survey

Table 2.3 — Background Data for the Study Sites

1	2	3	4	5	6	7
Arabokka	17	12 (= 71%)	88	7.3	62.2	6.6
Ihalakumbukwewa	40	24 (= 60%)	169	7.0	49.0	5.6
Migahajandura	70	45 (= 64%)	306	6.8	48.3	5.4
Swodagama	25	15 (= 60%)	73	4.9	37.8	6.4
Mahagalwewa	93	64 (= 69%)	439	6.9	52.3	4.0
Suriyawewa	101	64 (= 63%)	443	6.9	47.2	5.5
Total	346	224 (= 65%)	1518	6.8	49.3	5.2

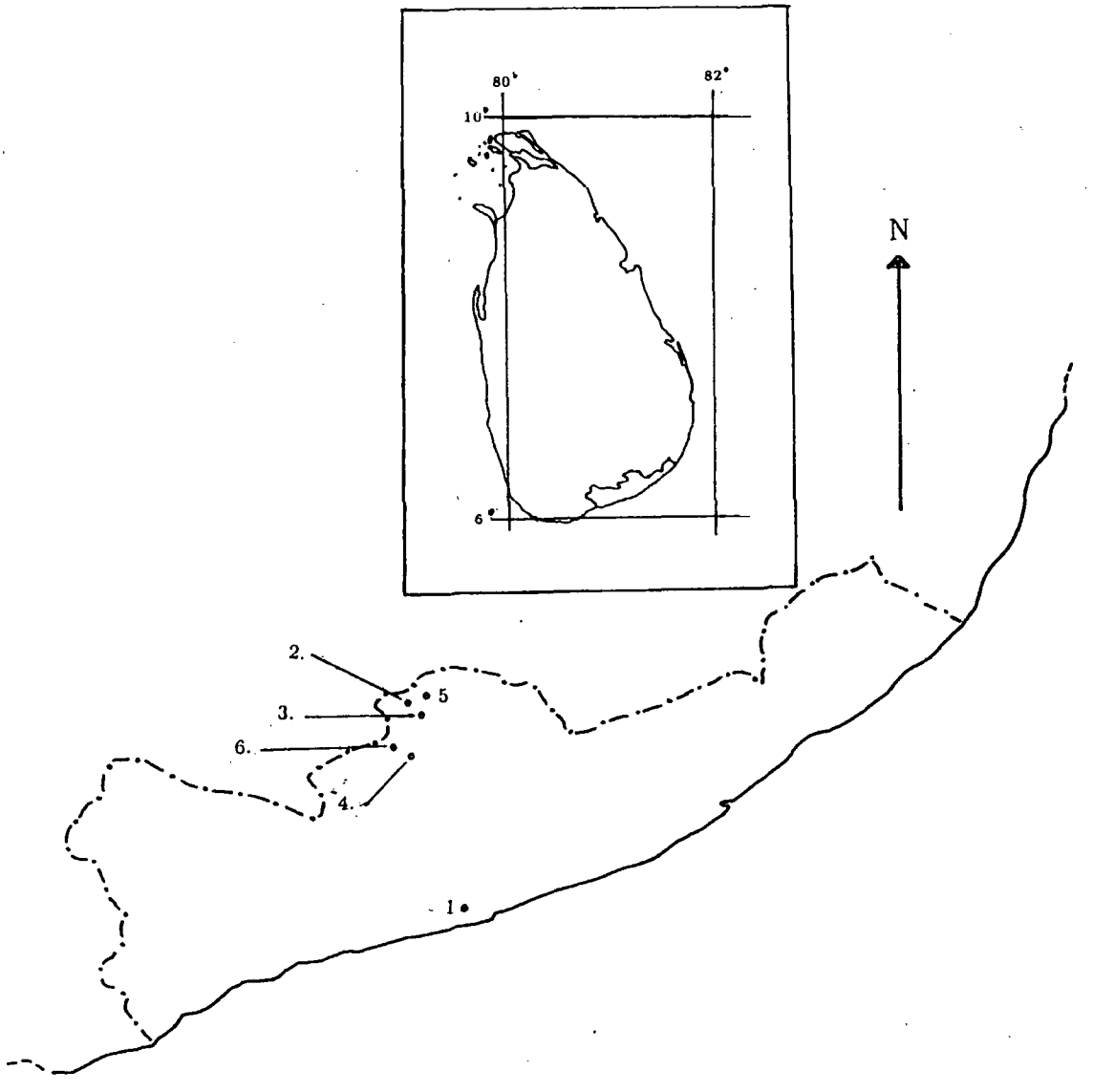
Columns: 1 = name of the study site, 2 = total no. of families, 3 = number of families in the sample, 4 = total population in the sample, 5 = average family size, 6 = average age of the head of the household, and 7 = average level of education of the household head (grades 1 to 12 in the school).

Source: Field data.

to collect background and theoretical information (as already stated in an earlier section), before I started my proper fieldwork. For the next nine months I observed the drought conditions and their affects on the farming communities in southern Sri Lanka doing fieldwork. During the period I carried out my fieldwork, I was changing my place of residence several times in order to spend an appropriate length of time at each study site. My relationship with the farmers was basically that of a participant observer, and I was able to immerse myself into the farming society and could form a healthy relationship with most of the farmers mainly because of my understanding of their way of life. Furthermore, my practical experience helped me to detect any misleading information from the farmers. Knowing this society and its people, I also knew, for instance, that it is impossible to collect reliable data in relation to the income sources of farming families. (In Sri Lanka, most of the researchers and academics underestimate farmers, their perception of outsiders, their code of hospitality and their cultural traits, but the behaviour and attitudes of the researcher towards farmers crucially determine how co-operative farmers are [see last paragraph of section 7.2].)

While observing the field area during the first three months from June 1987, I had a number of opportunities to carry out informal discussions with people from various backgrounds in the area (ordinary farmers, leaders of the farmers, government officers, Buddhist monks, and persons who work for various village level

Figure 2.2 — Location of the Study Sites



1. Arabokka
2. Ihalakumbukwewa
3. Migahajandura
4. Swodagama
5. Mahagalwewa
6. Suriyawewa

organisations). This proved to be invaluable for the construction of the questionnaire (see Appendix C) at the end of this period.

Among the various methods mentioned, the most important for the study is the formal discussions with farmers. For this purpose I selected 70% of the farmers following the statistical random sampling procedure for each study site. In the villages, I obtained the names of the farmers from the cultivation officers. The names of Mahagalwewa farmers were taken from the colonization officer, and the names of the Suriyawewa farmers from the Unit Manager of the Farm in Suriyawewa scheme area of the Udawalawa scheme. (I wrote all of these names on small pieces of paper, rolled them, and randomly selected the 70% of the farmers from each study site.) The reason for selecting such a high percentage of farmers was to gain a high sensitivity from the significant tests. Although, unavoidable problems did not permit me to have discussions with all of the farmers selected in every study site, I still managed to interview 60% or more of the farmers from each settlement. No farmer rejected my formal discussions. I interviewed only the head of the household. I myself conducted all the interviews by way of questionnaire and a sentence completion test. When constructing the questions I considered the possibility of getting different responses for each question. The questionnaire in the appendix C shows the different responses expected. However, I had to abandon one of the most important questions which is used by all hazard researchers throughout the world. That is, if an area is so vulnerable to a particular hazard, why do the victims not leave that area, and if the victims are given another area to go to would they like it. Though this question is crucial, the insertion of this question would have been equivalent to committing suicide according to the situation in the country, for Tamil terrorists were ruthlessly torturing and killing Sinhalese farming and fishing families who lived in the Sinhalese-Tamil boundary areas. Before they became victims, most of them have migrated from southern Sri Lanka to those areas and settled down there. The victims from these atrocities came back to their original villages and told what they had to face, what they saw, and how innocent civilians, not only adults, but also children, pregnant mothers and very old feeble men and women were subjected to Tamil terrorist atrocities and torturings.

Tamil terrorists hoped to provoke the majority Sinhalese to behave in the same way, so that Tamils would get the sympathy from the world by claiming that Tamil

minority people were being subjected to genocide by the majority Sinhalese. With these activities continuing, thousands of Sinhalese people evacuated those areas and propagated information about all atrocities they had to face. Politicians and government officers were preparing to send these poor and helpless Sinhalese people back to the areas where they had lived earlier but evacuated, even though they could not guarantee their security. The National Security minister declared that he was ready to settle two hundred thousand Sinhalese people in northern Sri Lanka as his way to control Tamil terrorist activities. However, nobody knew what would happen and the situation became uncertain and highly unsafe.

Under this regime of extremely animal behaviour and activities of the terrorists and leaders of the country, if I had asked any question in relation to the one mentioned earlier, and if the people misunderstood that I was collecting information in order to make lists of names for sending people back to these problem areas, I would have definitely ended up in the coffin. As it was, when completing my questionnaires, I had to go to the farmers' houses at night because most of them were engaged in agricultural activities during day time in those days. But on these occasions I was checked several times by the government forces who were searching the gurrillas. They suddenly appeared out of the dark, blinding my eyes with their powerful torches while aiming several machine guns at me.

An anarchic environment prevailed. Human killings were started indiscriminately. Among the Sinhalese areas, Hambantota became the number one killing ground. Almost every day, the first news I heard was related to a death of a government officer or politician or a youth suspected as a terrorist. It is possible begin to imagine the degree of terror in the southern province when as many as 30-50,000 died in violence in 1989 (The Guardian 21 April, 1990, p. 8). Most of these victims were from southern province. This environment made it impossible to enter government offices without a special permission. Everybody in an office suspected outsiders, and responsible officers did not give permissions very easily. In order to get a permission one had to go to several places explaining the reasons. Perhaps permission might be given. When I managed to visit an office with permission, the security guards behaviour was appalling, so that, it was very difficult to collect official information.

During my field studies I met a number of teachers whom I had once taught

in my University, in every school of my field area. Without their help, I would not have been able even to find a place to stay, since the people in the district did not trust outsiders as a consequence of the political unrest. Thanks to my former students and university colleagues, I also had the opportunity to extend my relationship to their fellow teachers and students. From my observations, I found that some of the activities and problems (e.g. illegal activities to earn money during the droughts) in relation to the farming communities living under drought conditions could not be discussed directly with the farmers and other affected people. Therefore, I had to implement a method that could be used to collect information related to these activities and problems, as well as other particular aspects of my study. I subsequently explained the problem to my teacher friends and their students and asked them whether they would be able to keep a continuous record in order to cover relevant information, especially those which I was unable to discuss openly with farmers. The task of keeping these records was started in September 1987 in every study site with the aim to continue at least for a year. While I was in the field all went well under my supervision. However, with my departure and under the rising violent environment in the area nobody was able to continue keeping records as I had wished for. However, they were able to report information which mainly related to the farmers' perception of, and adjustments to, the drought hazards, strengthening the value of the information and data collected by myself and enhancing my insight into the problems involved.

Before my departure, I arranged everything in the field area for additional collection of information related to my study. In this pursuit, I gave my motor bicycle, a camera and money to my helpers. But, apart from very little, I did not get the information, even though they wrote saying they had sent photos and slides (film rolls) to me, which I never received. My motor bicycle and camera are still with them.

It is clear in this chapter that drought as a hazard affects many parts of the country. Furthermore, the occurrence of drought is also growing in number and in geographical space. Fieldwork for this study was done in a very difficult and dangerous environment, with a risk for the researcher's life. However, familiarity with the farmers and their behaviour, together with the researcher's life experience as a farmer helped him to finish the field work and this thesis, though deviating

from the traditional path of accepted research. Since this study deals with drought hazard, the behaviour of the rainfall in Sri Lanka to understand the severity of the problem is of utmost necessity, and this aspect is explained in detail in the next chapter.

... Notes ...

1. K.M. de Silva (1977) 'Historical survey' in K.M. de Silva (ed.) *Sri Lanka a Survey,* Honolulu: The University Press of Hawaii. p. 32.
2. K. Hewitt and I. Burton (1971) *The Hazardousness of a Place: A regional Ecology of Damaging Events,* Toronto: University of Toronto, Department of Geography, Research Paper 6. p. 97.
3. G.F. White (ed.) (1974) *Natural Hazards: Local, National, Global.* New York: Oxford University Press. p. 4.
4. A.T. Rambo (1982), *Human ecology research on tropical agroecosystems in southeast Asia,* Honolulu: East-West Center, Reprint No. 39. p. 96.
5. It is important to note here that even in historical times, (apart from western invasions,) all the political movements were initiated in this area when south Indian rulers invaded the northern parts of the country, and they always ended up with the victory of the southern warriors. Still, this mentality seems to be with these southern people. This mentality is also illustrated by the soldier, born in the south, who hit the Indian Prime Minister Rajiv Gandhi at a saluting parade on his way back to India after he had signed the Indo-Sri Lankan Peace treaty in July 1987.

Chapter III

CLIMATIC BACKGROUND TO DROUGHT WITH SPECIAL REFERENCE TO HAMBANTOTA

Sri Lankans are generally taught that Sri Lanka is a paradise and the best country in the world, presumably in order to boost their morale about their country. However, from Sri Lanka's total land area of about 6.5 mil.ha., approximately 4.2 (65%) mil.ha. is regarded as belonging to the Dry Zone. The Wet Zone covers about 1.5 (23%) mil.ha. and the Intermediate Zone constitutes the remaining 0.8 (12%) mil.ha. This means that a vast area of a country whose main economic activity depends on agriculture is affected by aridity and droughts - a paradoxical situation in a paradise.

The location of Sri Lanka within the tropics, its proximity to the Indian subcontinent, its insularity, and the presence of a central mountain mass, are the factors which govern the Sri Lankan climate. The tropical location ensures a high temperature throughout the year, and the maritime effects which are a consequence of its insularity do not allow the creation of thermal extremes characteristic of continental interiors. Mean monthly temperatures in the lowlands vary between 78^o and 70^o f. with little seasonal and moderate diurnal variations. In the central hill country, there is an orographically induced lowering of temperature, where it varies from about 55^o to 70^o f. in the highest parts of the country. For these reasons the temperature does not create seasonal or regional climatic changes in the country. However, there are seasonal and regional climatic variations, and these are governed by the behaviour of rainfall (Peiris, 1977).

3.1 Climatic Zones in Sri Lanka

The annual rainfall in the country varies from 800 mm to 5000 mm. The southwest and the centre receive more than 2000 mm, while the highest amounts reach up to as much as 4000 mm - 5000 mm in very small areas in the southwestern slopes of the central hill country and the Knuckles Range in the northwestern sector of the hill country. Two-thirds of the country, however, receives less than 2000 mm

rainfall per year. The lowest mean annual rainfall of less than 1000 mm is found in the extreme northern, northwestern and southeastern areas (Sirinanda, 1983).

The average annual rainfall has been used to demarcate the climatic zones in Sri Lanka in geography textbooks (Cook, 1951; de Silva, 1954). Based on the variations of annual rainfall the country has been divided into three main climatic zones. The areas which receive more than 1900 mm are considered as the Wet Zone, areas with annual rainfall fall between 1270 mm and 1900 mm comprise the Dry Zone, and areas with less than 1270 mm average annual rainfall remain as the Arid Zone. However, the demarcation of the Dry and the Wet Zone is controversial. One of the main criticisms against the use of the 1900 mm average annual isohyet as the boundary is that it does not adequately demarcate the regions which receive very high rainfall during the southwest monsoon period. Alles (1971) pointed out that some parts well within the Wet Zone according to this division have annual averages over 2540 mm. However, during the southwest monsoon those areas experience less than 250 mm rainfall per annum. He therefore suggests that if any single isohyet is to be used to separate the Dry Zone from the Wet Zone, it should be the 508 mm isohyet during the southwest monsoon. Some hydrologists accept neither of these demarcations, and suggest that it is more reasonable to draw the boundary between the zones along an isoline in which precipitation and potential evaporation are equal (Irrigation Dept., 1966). Another zonal demarcation was made in the late 1950s by the Hunting Cooperation of Canada in collaboration with the Forest Department and the Land Use Division of the Department of Agriculture in Sri Lanka. They defined the Dry and Arid Zones together as the Dry Zone. The Wet Zone they identified is smaller than that of the area with rainfall above 1900 mm isohyet or the subsequently suggested 508 mm isohyet of the southwest monsoon period. They identified a new zone called Intermediate Zone in the transitional region on either side of the 508 mm isohyet Dry Zone - Wet Zone boundary.

Though there are controversies over the demarcation of the Wet Zone and the Dry Zone, there is no controversy about the fact that two-thirds of the country is affected by water shortages for cultivation due to lack of rains. Even in historical times there had been water shortages, and consequently our ancestors developed a well functioning irrigation system in order to encounter the shortage of water (see

figure 3.1). With the help of figure 3.1 and its depicted distribution of ancient tanks and irrigation works for cultivation, it is possible to divide the country into Dry and Wet Zones. Thus, those areas with tanks can generally be used as indicator for the area of the Dry Zone without any argument. These irrigation works show that drought is a recurrent phenomenon in the country from time immemorial.

3.2 Rainfall Seasons

It is better to consider the relative dominance of the causal factors in the analysis of rainfall based on rainy seasons. Considering these causes it is customary to divide Sri Lanka's rainfall year from March to February into the following four major seasons (Thambyapillay 1954; Jayamaha 1955, 1956; Wikkramatileke 1956): 1). March, April: Convectional (vernal intermonsoonal); 2). May - September: Southwest monsoonal; 3). October, November: Convectional-cyclonic-depressional (autumnal intermonsoonal) and 4). December - February: Northeast monsoonal-depressional. Deviating slightly from these months, the same seasons have been used by Farmer (1956 and 1957).

The nature of seasonality, the time of onset, termination and duration of the seasons, are not uniform, not even across the major rainfall zones. The variations of rainfall over time and geographical space are very high. This is proved by the following table (3.1) which shows the average rainfall data and the standard deviations of these averages based on rainy seasons and annual averages. The rain-gauge stations in the table represent a general picture of spatial rainfall variations. Furthermore, figures 3.2 and 3.3 clarify the annual and rainy seasonal variations.

Even though the values of S.D.s (standard deviations) that are relevant to the places in the Wet Zone within the table are high, their deviations are generally lower than those relating to Dry Zone locations when compared to the average rainfall figures. Furthermore, it is clear that the stations in the Wet Zone receive considerable amounts of rain throughout the year.

The rainy seasons have been very important in all kinds of rainfall analyses. However, in order to analyse drought, the most important rainfall must coincide with the agricultural seasons in Sri Lanka, i.e. 1) the *Yala* or Dry Season from April to August and 2) the *Maha* or Wet Season from September to March (Sirinanda, 1983). Farmers who cultivate paddy opt for the collection of their harvest in August

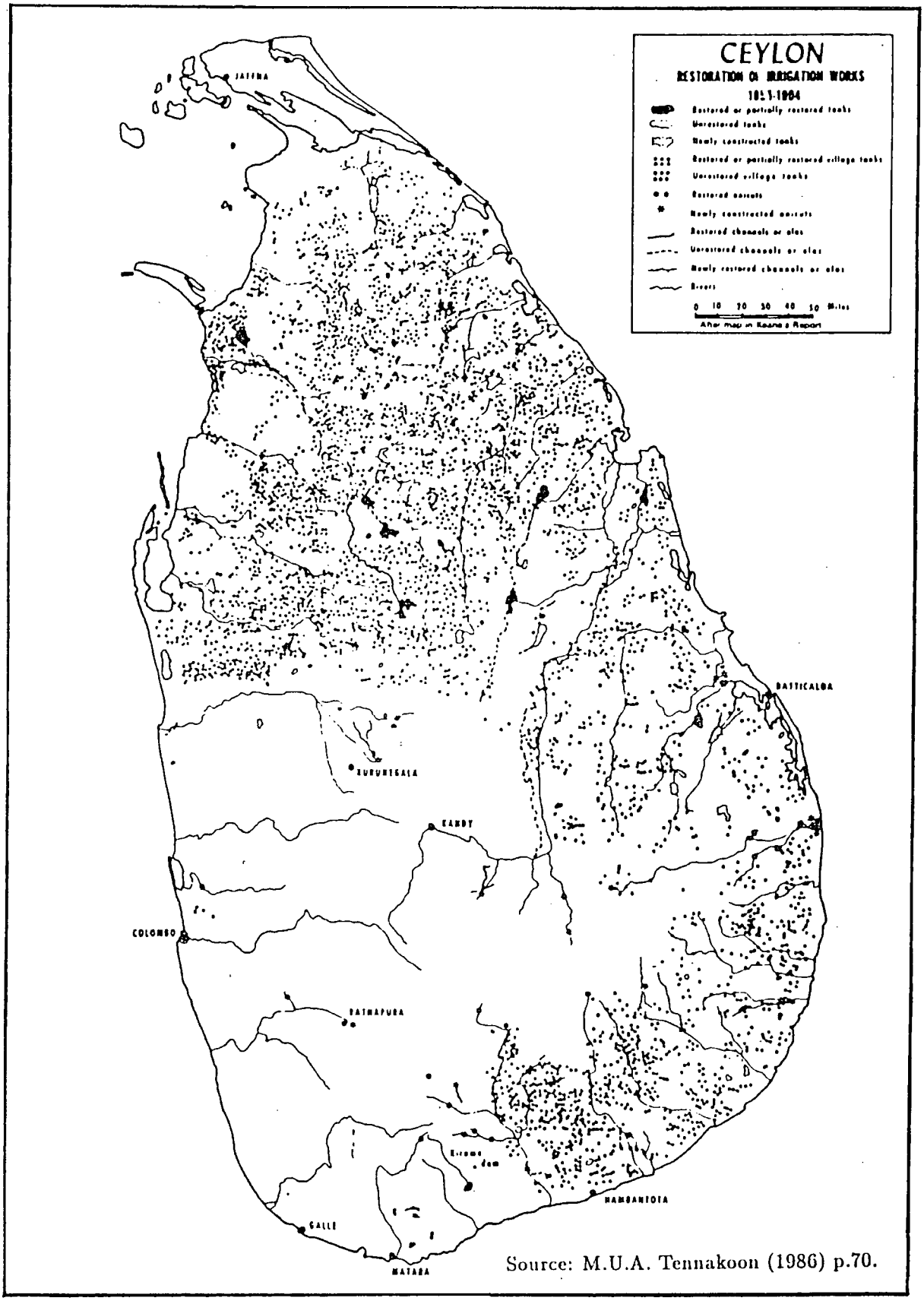


Figure 3.1 — Ancient irrigation schemes restored by the British rulers in The Dry Zone

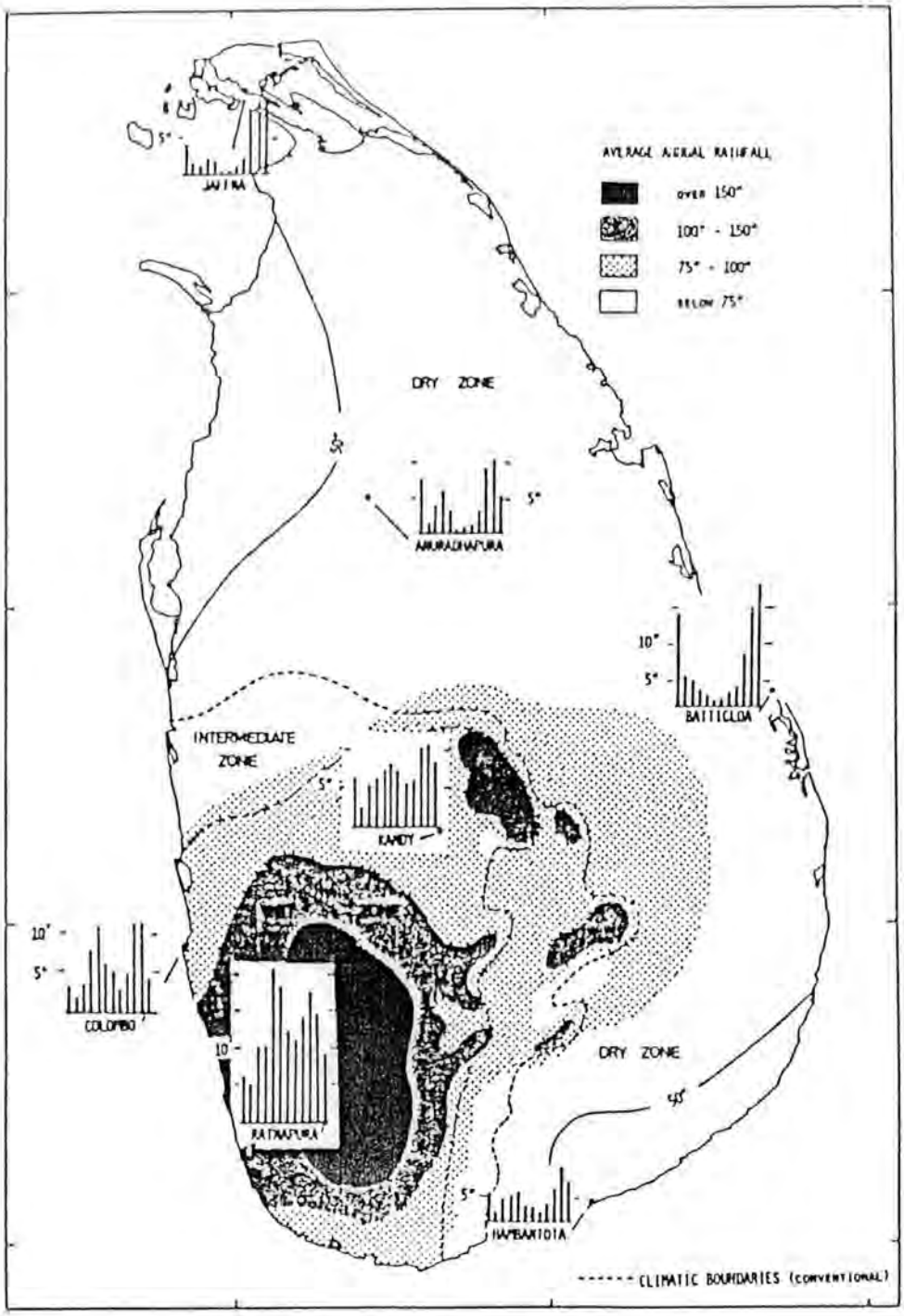
Table 3.1 — Rainfall in Sri Lanka Based on Rainy Seasons

		1			2			3			4			Annual		
Station	Period	mm	%	S.D.	mm	%	S.D.	mm	%	S.D.	mm	%	S.D.	mm	%	S.D.
Ratnapura	1900-87	570	15	175	1916	50	416	826	21	214	512	13	164	3856	100	593
Aninkanda	1900-85	656	18	178	1335	37	408	865	24	269	761	21	242	3645	100	740
Dompe	1930-86	442	15	176	1445	47	436	784	26	248	391	13	194	3037	100	640
Kirama	1901-86	405	17	149	868	36	321	569	24	232	544	23	189	2390	100	574
Kurunagala	1900-87	399	19	154	704	34	197	661	32	215	311	15	155	2081	100	358
Nuwara Eliya	1900-87	215	11	97	919	47	274	442	23	177	374	19	200	1949	100	378
Matale	1902-86	272	14	129	660	34	215	576	30	197	457	24	229	1943	100	485
Ampara Tank	1900-85	183	10	105	323	18	135	465	26	161	831	47	325	1782	100	371
Anuradhapura	1900-87	243	18	102	261	19	136	501	36	159	381	27	212	1386	100	301
Tangalla	1900-87	195	14	108	588	43	214	360	26	134	233	17	114	1376	100	335
Tanamalwila	1900-85	264	21	116	208	16	123	489	38	199	322	25	149	1285	100	327
Jaffna	1900-87	87	7	65	183	15	113	606	48	243	381	30	208	1256	100	327
Hambantota	1900-87	173	16	126	310	29	124	323	30	180	255	24	144	1060	100	278
Puttalam	1900-87	200	19	83	196	19	142	413	39	145	241	23	125	1049	100	250
Yala	1923-87	155	16	94	142	15	86	325	34	129	331	35	156	952	100	225

Columns: 1 = intermonsoonal season from March and April, 2 = south-west monsoonal season from May to September, 3 = intermonsoonal season from October and November, 4 = north-east monsoonal season from December to February and S.D. = Standard Deviations. (Stations in italics are the nearest stations to the study area.)

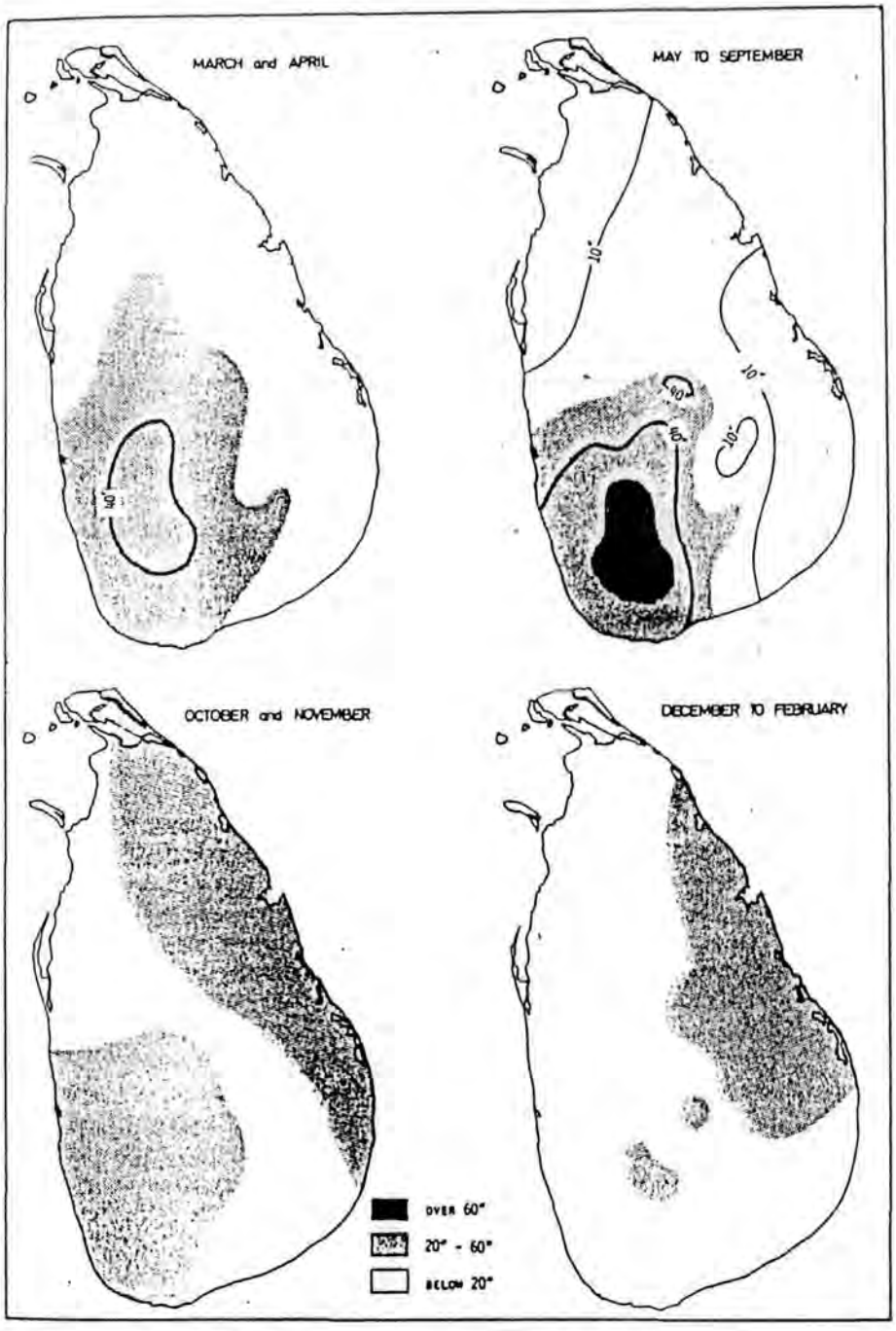
Source: Calculated from rainfall data of the Meteorology Dept., Colombo, Sri Lanka.

during the *Yala* season and in February during the *Maha* season because both of these months are drier than others. For *Chena* cultivators the *Yala* season is limited to only three months, i.e. from the rains in March to May. Farmers in the Dry Zone can cultivate paddy when the water is either supplied by a major irrigation scheme, or when their tanks are full from the March to May rains of the *Yala* season. During the *Maha* season, the whole island gets rains which help farmers to cultivate both paddy and *Chena*. Therefore, the meaning of the word 'Maha', 'the greatest' or 'the main' is very appropriate to explain the *Maha* agricultural season in the Sri Lankan context. With these considerations in mind, and in agreement with farmers' practice, the monthly rainfall distribution can be divided into three agricultural seasons, disregarding the rainfall in February and August.



Source: G. Peiris (1977), p.15.

Figure 3.2 — Annual Rainfall Variations in Sri Lanka



Source: G. Peiris (1977), p.12.

Figure 3.3 — Regional Variations of Rainfall between Rainy Seasons in Sri Lanka

1. *Yala paddy* season: March to July;

2. *Yala chena* season: March to May;

3. *Maha* season: September to January.

The table 3.2 displays average seasonal rainfall data and their standard deviations related to agricultural seasons, and figure 3.4 (excluding the *Yala chena* season) shows the regional variations of rainfall between the *Yala* and the *Maha* seasons. Annual agricultural seasonal rainfall data in stations in table 3.2 were graphed and given in appendix E. These graphs clearly show the seasonal variations over time.

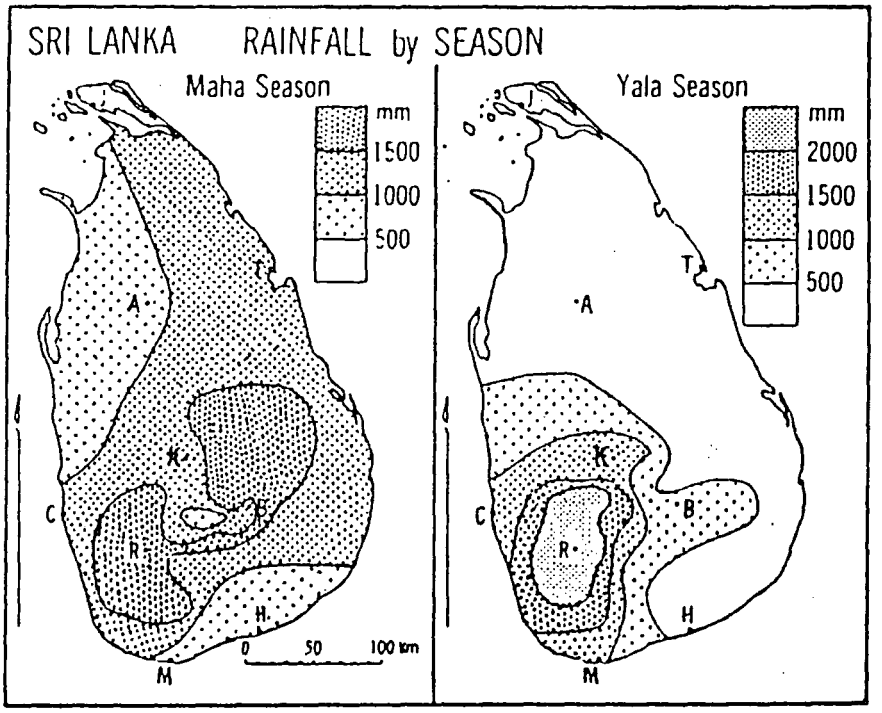
Table 3.2 — Rainfall in Sri Lanka Related to Agricultural Seasons

		Yala Paddy			Yala Chena			Maha			Annual	
Station	Period	mm	%	S.D.	mm	%	S.D.	mm	%	S.D.	mm	S.D.
Ratnapura	1900-87	1811	47	408	1039	27	305	1572	41	269	3856	593
Aninkanda	1900-85	1536	42	328	1020	28	282	1700	47	407	3645	740
Dompe	1930-86	1391	46	342	878	29	301	1333	44	358	3037	640
Kirama	1901-86	974	41	300	632	26	230	1167	49	343	2390	574
Kurunagala	1900-87	867	42	209	587	28	207	1052	51	265	2081	358
Nuwara Eliya	1900-87	807	41	242	376	19	165	920	47	282	1949	378
Matale	1902-86	697	36	216	422	22	178	1090	56	321	1943	485
Ampara Tank	1900-85	344	19	129	263	15	127	1223	69	313	1782	371
Anuradhapura	1900-87	381	27	131	333	24	126	909	66	260	1386	301
Tangalla	1900-87	574	42	197	360	26	165	662	48	194	1376	335
Tanamalwila	1900-85	400	31	155	351	27	143	797	62	265	1285	327
Jaffna	1900-87	176	14	103	138	11	99	1011	80	296	1256	327
Hambantota	1900-87	379	36	166	271	26	154	594	56	227	1060	278
Puttalam	1900-87	340	32	149	291	28	130	655	62	203	1049	250
Yala	1923-87	250	26	111	212	22	109	619	65	195	952	225

Columns: S.D. = Standard Deviations. (Stations in italics are the nearest stations to the study area.

Source: Calculated from rainfall data of the Meteorology Dept., Colombo, Sri Lanka.

The deviations are analogous to the rainy seasonal deviations and also to those of the Wet and Dry Zone division. However, the absolute average rainfall data and their standard deviations do not provide a clear picture for the understanding of



Source: B.L.C. Johnson (1981) p.188.

Figure 3.4 — Regional Variations of Rainfall between Yala and Maha Seasons

the drought phenomenon. In order to obtain a better understanding of drought, the absolute rainfall data relevant to agricultural seasons should be compared with the potential evapotranspirational data (calculated for Sri Lanka by Thornthwaite Associates, and the researcher himself added the monthly data into seasonal data see table 3.3).

Table 3.3 — Rainfall and Potential Evapotranspiration

		Yala paddy		Yala chena		Maha		Annual	
Station	Period	mm	P.E.	mm	P.E.	mm	P.E.	mm	P.E.
Ratnapura	1900-87	1811	753	1039	457	1572	693	3856	1725
Aninkanda	1900-85	1536	753	1020	457	1700	693	3645	1725
Dompe	1930-86	1391	748	878	449	1333	670	3037	1687
Kirama	1901-86	974	751	632	445	1167	673	2390	1701
Kurunagala	1900-87	867	762	587	464	1052	648	2081	1683
Nuwara Eliya	1900-87	807	422	376	245	920	349	1949	917
Matale	1902-86	697	626	422	393	1090	517	1943	1357
Ampara Tank	1900-85	344	792	263	458	1223	650	1782	1713
Anuradhapura	1900-87	381	786	333	464	909	625	1386	1680
Tangalla	1900-87	574	751	360	445	662	673	1376	1701
Tanamalwila	1900-85	400	751	351	445	797	673	1285	1701
Jaffna	1900-87	176	810	138	485	1011	645	1256	1728
Hambantota	1900-87	379	751	271	445	594	673	1060	1701
Puttalam	1900-87	340	776	291	463	655	655	1049	1705
Yala	1923-87	250	751	212	445	619	673	952	1701

Columns: P.E. = Potential Evapotranspiration. (Stations in italics are the nearest stations to the study area.)

Source: Calculated from rainfall data of the Meteorology Dept., Colombo, Sri Lanka.

When the P.E. values are equal or above the rainfall data, there is no water shortage during the season. The stations in the dry zone have a certain deficit of water during both *Yala* seasons. Even though the rainfall in *Maha* season implies no water deficit in general in the country, it is not applicable to Hambantota district where Tangalla, Hambantota and Yala stations remain with water deficits. Since the variations of rainfall is very high, areas with water deficits are generally more vulnerable to drought hazards.

3.3 Drought in Southern Sri Lanka

There are three administrative districts in southern Sri Lanka, but drought is a severe natural hazard only in Hambantota district where this study is carried out. It is situated at the eastern boundary of the southern province. In order to explain the drought phenomenon in this area, the monthly and annual rainfall data from 17 raingauge stations in the district and two stations in the neighbouring districts were used. Hambantota district is unique in Sri Lanka in terms of climatic zones because it is the only district which has very distinctive Wet, Dry and Arid climatic zones. In the western part of the district, it is possible to demarcate a Wet Zone close to its western boundary. Then the Dry Zone starts and its width is increasing as one moves north. The other remaining large part of Hambantota district lies in the Arid Zone. With the help of the rainfall data, mentioned above, it becomes very clear that rainfall in Hambantota district gradually diminishes from west to east (see figure 3.5) and variations of rainfall are very high (see table 3.4 and figure 3.6).

In order to analyse the rainfall behaviour in rainy seasons and in agricultural seasons, the monthly rainfall data from Hambantota district was subdivided in the same way as it was done for the analysis of rainfall behaviour of the whole island according to different seasons. Tables 3.5 and 3.6 give the seasonal average rainfall data while their standard deviations show how high the seasonal variations in Hambantota district are. The data relevant to the rainy seasons show that, apart from the March - April intermonsoonal season, the seasonal variations are not so clearly distinguishable. However, there are very clear distinctions possible in relation to the agricultural seasons. When compared to the *Maha* season, rainfall during the *Yala* seasons is very low. This difference is graphically shown by the graphs which are based on rainfall in agricultural seasons in appendix F.

The monthly, seasonal and annual absolute rainfall data do not show a clear picture about the drought phenomenon because they do not consider the temperature factor. Therefore, it is necessary to use a more meaningful measurement to distinguish the drought incidence clearly. In this direction, potential evapotranspiration which is used to measure the amount of water required by plants is very helpful. The potential evapotranspiration in a place can be calculated using several methods as described by Thornthwaite (1948, 1965), Penman (1948), Walker

Table 3.4 — Monthly and Annual Rainfall in Hambantota District

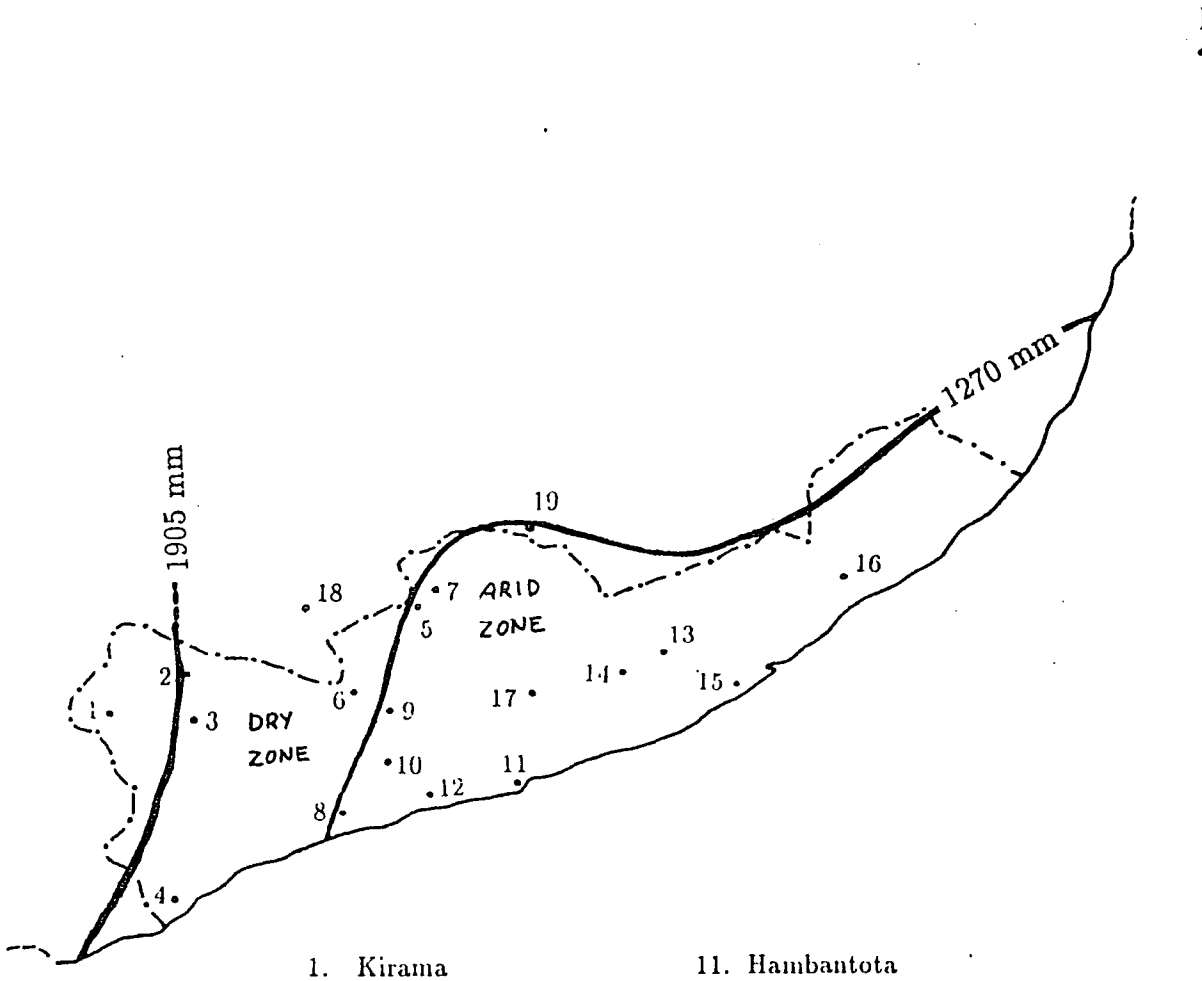
Station	Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Kirama	1901-86	153	127	204	201	227	206	136	118	181	247	322	264	2390
Middeniya	1927-53	95	79	144	167	162	70	45	55	72	191	274	189	1541
Udukiriwila	1900-66	103	69	133	140	150	100	74	62	105	166	220	167	1491
Tangalle	1900-87	75	46	77	118	165	126	89	94	115	168	193	112	1376
Suriyawewa	1965-79	66	49	75	162	100	34	23	43	71	236	259	221	1337
Liyangahatota	1914-65	91	59	129	135	115	47	45	32	53	184	245	166	1294
Migahajandura	1930-72	89	54	120	156	107	37	34	18	40	204	240	141	1233
Bata Ata	1927-87	74	55	72	116	132	75	54	62	81	145	202	131	1199
Ridiyagama	1924-70	82	61	92	118	115	49	42	36	60	147	202	149	1154
Mamadola	1900-87	80	54	77	112	100	53	45	37	67	149	201	130	1105
Hambantota	1900-87	85	46	70	103	98	58	49	41	63	136	186	124	1060
Ambalantota	1922-87	76	46	74	89	112	59	43	45	66	141	176	119	1047
Tissamaharama (Irrigation)	1900-87	104	58	82	97	68	24	25	20	44	153	222	150	1038
Uduwila	1924-87	98	50	82	95	76	25	26	22	58	140	211	134	1016
Palatupana	1933-87	118	76	70	91	60	26	26	21	30	131	190	145	982
Yala	1923-87	120	66	77	78	57	18	20	18	29	125	199	145	952
Bandagiriya	1955-83	46	47	41	93	72	29	26	40	43	141	182	157	917
Embilipitiya Tank	1916-86	94	71	147	171	121	46	44	36	67	197	265	173	1432
Tanamalwila	1900-85	91	60	107	157	87	22	27	27	46	219	270	170	1282

Source: Calculated from rainfall data of the Meteorology Dept., Colombo, Sri Lanka.

(1957) and Papadakis (1965).

In order to identify drought incidence in the district, the *Moisture Index* invented using potential evapotranspiration data by the Thornthwaite Associates (1955) was used considering several reasons. This Moisture Index is described as one of the better readily obtainable measurements of different degrees of aridity for studying drought (Saarinen, 1966). In addition, Thornthwaite Associates has calculated potential evapotranspiration data related to Sri Lanka in several rain-gauge stations. Furthermore, some researchers have got the similar results using both Thornthwaite's and Penman's methods.

Figure 3.5 — Annual Rainfall Variation and Climatic Zones in Hambantota District



1. Kirama
2. Middeniya
3. Udukiriwila
4. Tangalla
5. Suriyawewa
6. Liyangahatota
7. Migahajandura
8. Bata Ata
9. Ridiyagama
10. Mamadola
11. Hambantota
12. Ambalantota
13. Tissamaharama (Irrigation)
14. Uduwila
15. Palatupana
16. Yala
17. Bandagiriya
18. Embilipitiya Tank
19. Tanamalwila

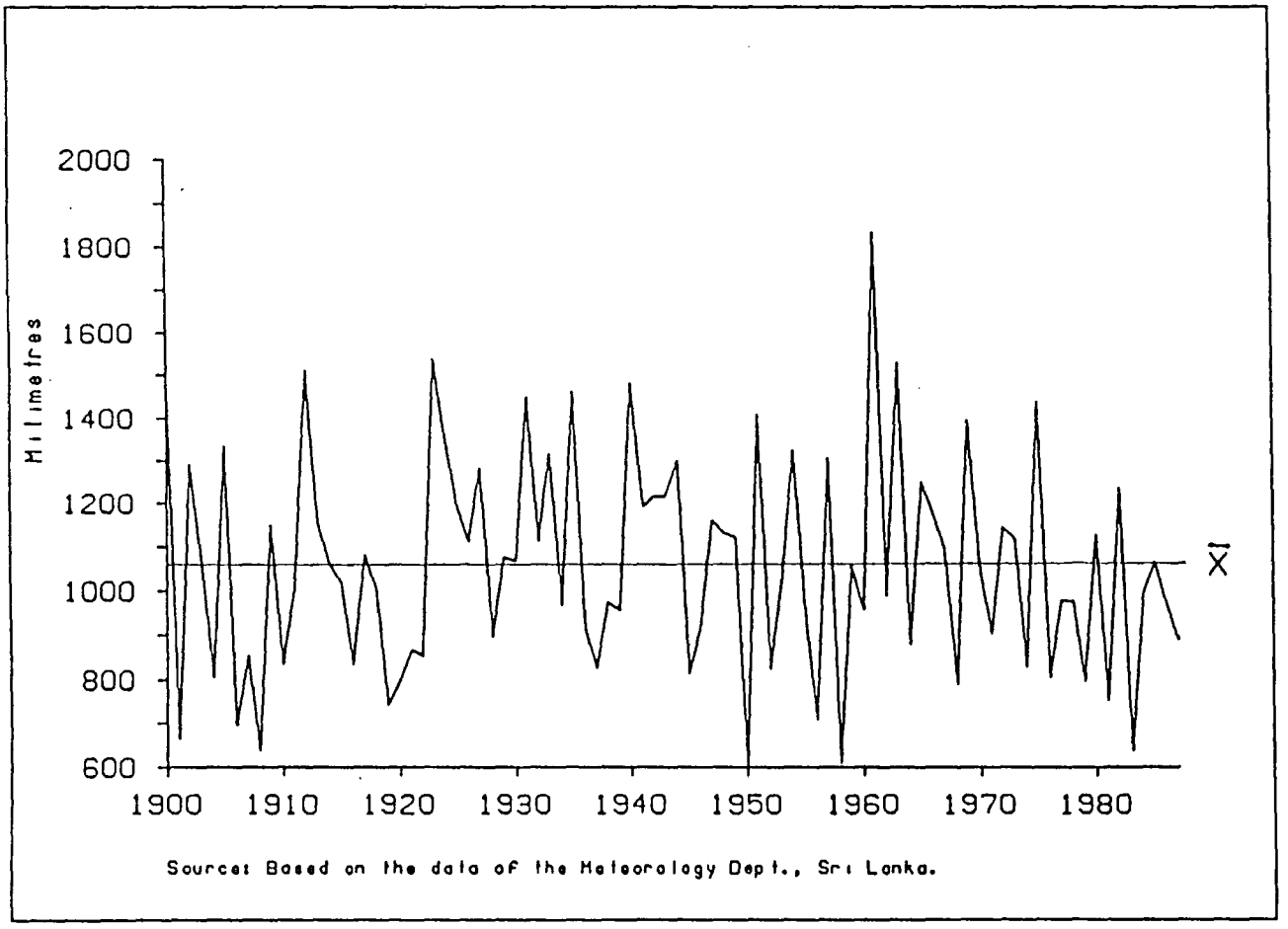


Figure 3.6 — Annual Rainfall Variations in Hambantota Station: 1900-87

Table 3.5 — Rainfall in Hambantota District Based on Rainy Seasons

		1			2			3			4			Annual		
Station	Period	mm	%	S.D	mm	%	S.D	mm	%	S.D	mm	%	S.D	mm	%	S.D
Kirama	1901-86	405	17	149	868	36	321	569	24	232	544	23	189	2390	100	574
Middeniya	1927-53	310	20	127	404	26	183	465	30	158	362	23	117	1541	100	325
Udukiriwila	1900-66	273	18	111	492	33	196	386	26	137	340	23	117	1491	100	323
Tangalla	1900-87	195	14	108	588	43	214	360	26	134	233	17	114	1376	100	335
Suriyawewa	1965-79	238	18	83	271	20	116	494	37	94	335	25	160	1337	100	283
Liyangahatota	1914-65	263	20	115	291	22	134	429	33	165	316	24	131	1294	100	288
Migahajandura	1930-72	276	22	135	236	19	129	444	36	139	283	23	131	1233	100	306
Bata Ata	1927-87	188	16	131	404	34	168	347	30	130	260	22	136	1199	100	312
Ridiyagama	1924-70	210	18	90	303	26	121	349	30	127	292	25	101	1154	100	222
Mamadola	1900-87	190	17	91	302	27	131	350	32	141	264	24	124	1105	100	256
Hambantota	1900-87	173	16	83	310	29	142	323	30	145	255	24	125	1060	100	250
Ambalantota	1922-87	163	16	89	325	31	143	317	30	144	241	23	110	1047	100	255
Tissamaharama (Irrigation)	1900-87	179	17	87	182	18	90	375	36	152	312	30	138	1038	100	249
Uduwila	1924-87	176	17	99	207	20	173	351	35	129	282	28	142	1016	100	280
Palatupana	1933-87	161	16	90	162	16	79	321	33	132	338	34	177	982	100	251
Yala	1923-87	155	16	94	142	15	86	325	34	129	331	35	156	952	100	225
Bandagiriya	1955-83	135	15	88	209	23	108	323	35	189	250	27	162	917	100	336
Embilipitiya Tank	1916-86	319	22	115	314	22	137	462	32	156	338	24	143	1432	100	282
Tanamalwila	1900-85	264	21	115	208	16	137	489	38	156	322	25	143	1282	100	282

Columns: 1 = intermonsoonal season from March and April, 2 = south-west monsoonal season from May to September, 3 = intermonsoonal season from October and November, 4 = north-east monsoonal season from December to February and S.D. = Standard Deviations.

Source: Calculated from rainfall data of the Meteorology Dept., Colombo, Sri Lanka.

> The amount of water required by a crop can be estimated by calculating potential evapo-transpiration (PET). The investigation and evaluation of various methods to estimate PET in the central Sierra has indicated that the ratio between PET calculated using the Thornthwaite and Penman methods, respectively, is quite uniform ...[1]

All that is needed in order to calculate the Index values are the data of mean monthly temperature, the latitude of the station, the monthly precipitation, and the tables and charts calculated by the Thornthwaite Associates (Thornthwaite and

Table 3.6 — Rainfall in Hambantota District Based on Agricultural Seasons

		1			2			3			Annual	
Station	Period	mm	%	S.D.	mm	%	S.D.	mm	%	S.D.	mm	S.D.
Kirama	1901-86	974	41	300	632	26	230	1167	49	343	2390	574
Middeniya	1927-53	588	38	197	473	31	196	820	53	199	1541	325
Udukiriwila	1900-66	598	40	175	423	28	165	762	51	225	1491	323
Tangalla	1900-87	574	42	197	360	26	165	662	48	194	1376	335
Suriyawewa	1965-79	395	30	93	338	25	73	851	58	153	1337	283
Liyangahatota	1914-65	469	36	154	378	29	152	739	57	213	1294	288
Migahajandura	1930-72	453	37	186	383	31	164	714	58	214	1233	306
Bata Ata	1927-87	449	37	197	321	27	175	634	53	201	1199	312
Ridiyagama	1924-70	416	36	138	326	28	139	640	55	176	1154	222
Mamadola	1900-87	388	35	137	290	26	123	626	57	192	1105	256
Hambantota	1900-87	379	36	149	271	26	130	594	56	203	1060	250
Ambalantota	1922-87	378	36	163	275	26	148	578	55	188	1047	255
Tissamaharama (Irrigation)	1900-87	296	29	111	247	24	106	673	65	195	1038	249
Uduwila	1924-87	303	30	143	252	25	132	641	63	205	1016	280
Palatupana	1933-87	272	28	114	220	22	108	613	62	221	982	251
Yala	1923-87	250	26	111	212	22	109	619	65	195	952	225
Bandagiriya	1955-83	262	29	131	207	23	109	568	62	255	917	336
Embilipitiya Tank	1916-86	530	37	158	440	31	144	795	56	215	1432	282
Tanamalwila	1900-85	400	31	155	351	27	143	797	62	265	1282	327

Columns: 1 = agricultural season, Yala, for paddy cultivation from March to July, 2 = agricultural season, Yala, for chena cultivation from March to May 3 = agricultural season, Maha, for both paddy and chena and S.D. = Standard Deviations.

Source: Calculated from data of the Meteorology Dept., Colombo, Sri Lanka.

Mather, 1955). Thornthwaite Associates (1965) calculated the water balance for the Asian countries (excluding the regions of the USSR). They calculated water balance data for 14 stations in Sri Lanka, and Hambantota was one of them. The potential evapotranspiration data from the water balance calculations in a station are necessary to calculate Moisture Index values. There are no significant differences in temperature between the rainfall stations in the district because latitudinal and topographical differences are negligible. Therefore, it is possible

to use the potential evapotranspirational data calculated by the Thornthwaite Associates for Hambantota station without significant errors for calculating the Moisture Index values also for other stations in the district.

Using the precipitation and potential evapotranspiration data, the moisture index values can be calculated as follows.

Moisture Index = Im = 100((P/PE)-1)

P = Precipitation;

PE = Potential evapotranspiration.

If the necessary data are available, the moisture index values can be calculated on a daily, monthly, seasonal or annual basis. Using the Index values Thornthwaite Associates made a classification based on the climatic zones according to aridity and humidity (see table 3.7).

Table 3.7 — Classification for the Climatic Zones

Climatic Type	Climatic Symbol	Moisture Index Values
Perhumid	A	100 and above
Humid	B4	80 - 100
Humid	B3	60 - 80
Humid	B2	40 - 60
Humid	B1	20 - 40
Moist subhumid	C1	0 - 20
Dry Subhumid	C2	-33.3 - 0
Semi-arid	D	-66.7 - 33.3
Arid	E	-100 - 66.7

Source: Thornthwaite Associates 1963, pp. 10-11.

With the help of monthly and annual potential evapotranspiration data calculated by Thornthwaite Associates, the monthly and the annual Moisture Index values were calculated for each raingauge station and the results are given in table 3.8. These values were then converted to the climatic types (see table 3.9).

Tables 3.8 and 3.9 with their data and symbols clarify the fact that there is not a single station in Hambantota district which is free from water deficits

Table 3.8 — Monthly and Annual Moisture Index Values in Hambantota

Station	J	F	M	A	M	J	J	A	S	O	N	D	Annual
Kirama	20	2	43	36	47	36	-12	-21	27	72	140	106	41
Middeniya	-25	-36	1	13	5	-54	-71	-63	-50	33	104	48	-9
Udukiriwila	-19	-44	-7	-5	-3	-34	-52	-59	-27	15	64	30	-12
Tangalle	-41	-63	-46	-20	7	-17	-43	-37	-20	17	44	-13	-19
Suriyawewa	-48	-60	-48	9	-35	-77	-85	-71	-50	64	93	73	-21
Liyangahatota	-28	-52	-10	-9	-27	-69	-71	-79	-63	28	83	30	-24
Migahajandura	-30	-56	-16	5	-31	-75	-78	-88	-72	42	79	10	-28
Bata Ata	-42	-56	-50	-22	-14	-50	-65	-59	-43	1	51	2	-30
Ridiyagama	-35	-51	-36	-20	-25	-68	-73	-76	-58	2	51	16	-32
Mamadola	-37	-56	-46	-24	-35	-65	-71	-75	-53	3	50	2	-35
Hambantota	-33	-63	-51	-30	-36	-62	-68	-73	-56	-6	39	-3	-38
Ambalantota	-40	-63	-48	-40	-27	-61	-72	-70	-54	-2	31	-7	-38
Tissamaharama (Irrigation)	-18	-53	-42	-34	-56	-84	-84	-87	-69	6	66	17	-39
Uduwila	-23	-60	-43	-36	-51	-83	-83	-85	-59	-3	57	5	-40
Palatupana	-7	-39	-51	-39	-61	-83	-83	-86	-79	-9	42	13	-42
Yala	-5	-47	-46	-47	-63	-88	-87	-88	-80	-13	49	13	-44
Bandagiriya	-64	-62	-71	-37	-53	-81	-83	-73	-70	-2	36	23	-44
Embilipitiya	-26	-43	3	16	-21	-70	-72	-76	-53	37	98	35	-16
Tanamalwila	-28	-52	-25	6	-44	-85	-83	-82	-68	52	101	33	-25

Source: Calculated from data of the Meteorology Dept., Colombo, Sri Lanka and Evapotranspiration data from the nearest station of the present station of Thornthwaite Associates calculations in 1963.

throughout the year. They also demonstrate that aridity is growing from west to east. An exception to this pattern of progressive aridity from west to east is a pocket around the station of Bandagiriya which contains the most arid area in the district according to the results of the analysis. The most arid months are July and August. Apart from Kirama, all stations have water deficits which vary from dry subhumid to arid in the period between June and September, but aridity is the dominant feature during this period. The stations Tissamaharama (Irrigation), Uduwila, Palatupana, Yala and Bandagiriya have a continuous eight months period of either semi-arid or arid climate. Another feature of the climate is that February is also a semiarid month at all the stations except for Kirama.

Table 3.9 — Monthly and Annual Climatic Types in Hambantota District

Station	J	F	M	A	M	J	J	A	S	O	N	D	Annual
Kirama	C2	C2	B2	B1	B2	B1	C1	C1	B1	B3	A	A	B2
Middeniya	C1	D	C2	C2	C2	D	E	D	D	B1	A	B2	C1
Udukiriwila	C1	D	C1	C1	C1	D	D	D	C1	C2	B3	B1	C1
Tangalle	D	D	D	C1	C2	C17	D	D	C1	C2	B2	C1	C1
Suriyawewa	D	D	D	C2	D	E	E	E	D	B3	B4	B3	C1
Liyangahatota	C1	D	C1	C1	C1	E	E	E	D	B1	B4	B1	C1
Migahajandura	C1	D	C1	C2	C1	E	E	E	E	B2	B3	C2	C1
Bata Ata	D	D	D	C1	C1	D	D	D	D	C2	B2	C2	C1
Ridiyagama	D	D	D	C1	C1	E	E	E	D	C2	B2	C2	C1
Mamadola	D	D	D	C1	D	D	E	E	D	C2	B2	C2	D
Hambantota	C1	D	D	C1	C1	D	E	E	D	C1	B1	C1	D
Ambalantota	D	D	D	D	C1	D	E	E	D	C1	B1	C1	D
Tissamaharama (Irrigation)	C1	D	D	D	D	E	E	E	E	C2	B3	C2	D
Uduwila	C1	D	D	D	D	E	E	E	D	C1	B2	C2	D
Palatupana	C1	D	D	D	D	E	E	E	E	C1	B2	C2	D
Yala	C1	D	D	D	D	E	E	E	E	C1	B2	C2	D
Bandagiriya	D	D	E	D	D	E	E	E	E	C1	B1	B1	D
Embilipitiya	C1	D	C2	C2	C1	E	E	E	D	B1	B4	B1	C1
Tanamalwila	C1	D	C1	C2	D	E	E	E	E	B2	A	B1	C1

Source: Classified from the data based on Table 3.8.

The most healthy or humid climate for farming activities is the most rainy month of November during which there is not a single station with water deficit in the district. There is also no water deficit in December, apart from the stations Tangalle, Hambantota and Ambalantota. The other wet month in the area, October, has no water deficits in 13 stations. The wet period of the three months from October to December maintains its continuity from the western area up to Tanamalwila area while the coastal belt remains with water deficits. Another feature of the rainfall is that there is a wet period in April at all the stations along the northern boundary of Hambantota district.

3.4 Study Area and Drought

There is not a single study site which has either continuous rainfall data reaching over a longer period or up to today. However, the study sites Migahajandura (from 1930 to 1972) and Suriyawewa (from 1965 to 1979) have limited rainfall data. In order to represent the study site Arabokka, I use the rainfall data of the nearest stations Hambantota and Ambalantota. For other study sites, rainfall data of Embilipitiya Tank is used in addition to the stations Migahajandura and Suriyawewa. Table 3.4 already depicts monthly and annual rainfall, table 3.5 shows rainfall based on the rainy seasons while table 3.6 shows rainfall based on the agricultural seasons which are given in relation to Hambantota district. Since this study is based on farmers and drought hazard, I have focused the rainfall data related to agricultural seasons, in order to examine the occurrence of the drought phenomenon in the study area in this section. Table 3.10 depicts the rainfall behaviour in the agricultural seasons in the study area. This table once again reflects the characteristics of other parts of the Dry and Arid Zones in Hambantota district. However, the data in the table cannot show the behaviour of the rainfall over time. As a result, it is impossible to get an idea about the long-term rainfall behaviour in the agricultural seasons. In order to examine this problem annual rainfall data related to the agricultural seasons were graphed. These graphs prove that rainfall is fluctuating. Even though the graph related to Hambantota does not show any decline in rainfall in recent years, the picture depicted by the graphs in Ambalantota and Embilipitiya Tank is different and show that rainfall is reduced in recent years. (This is also true with the station in Tanamalwila.) (see figure 3.7 to 3.11). An analysis on longterm rainfall behaviour in Sri Lanka is given in appendix G.

Though the above table and graphs show the rainfall behaviour in agricultural seasons the aridity factor is not depicted clearly. Therefore, monthly and annual moisture index values are helpful to comprehend the area's vulnerability to droughts. Table 3.11 gives the moisture index values and climatic types related to the study area. These tables show that there is only a single month (November) which is free from moisture deficit in the study area. However, during the *Maha* season three months are free from water shortages around Suriyawewa, Migahajandura and Embilipitiya. This means that five study sites are situated within this

Table 3.10 — Rainfall Related to Study Area Based on Agricultural Seasons

		1			2			3			Annual	
Station	Period	mm	%	S.D.	mm	%	S.D.	mm	%	S.D.	mm	S.D.
Suriyawewa	1965-79	395	30	93	338	25	73	851	58	153	1337	283
Migahajandura	1930-72	453	37	186	383	31	164	714	58	214	1233	306
Hambantota	1900-87	379	36	149	271	26	130	594	56	203	1060	250
Ambalantota	1922-87	378	36	163	275	26	148	578	55	188	1047	255
Embilipitiya Tank	1916-86	530	37	158	440	31	144	795	56	215	1432	282

Columns: 1 = agricultural season, Yala, for paddy cultivation from March to July, 2 = agricultural season, Yala, for chena cultivation from March to May, 3 = agricultural season, Maha, for both paddy and chena and S.D. = Standard Deviations.

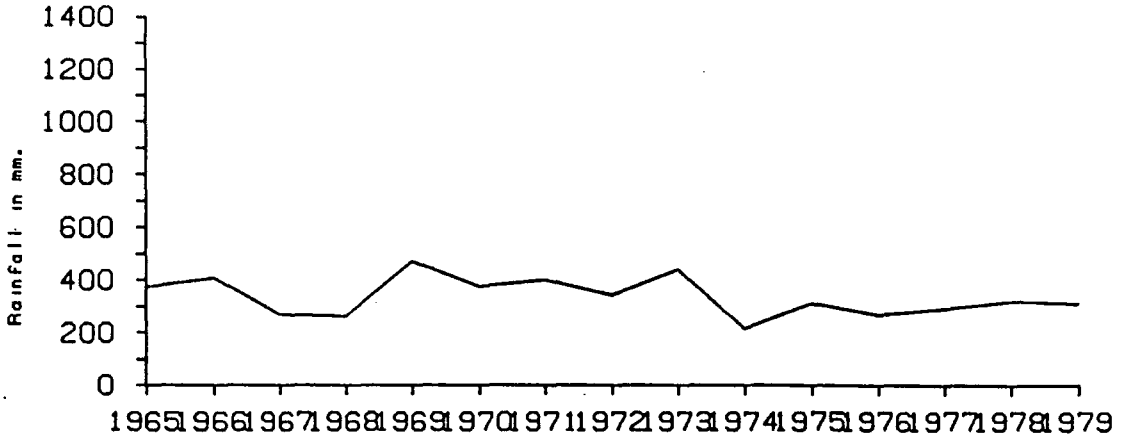
Source: Calculated from data of the Meteorology Dept., Colombo, Sri Lanka.

area. During the *Yala* season, while Hambantota and Ambalantota remain dry, other stations are free from water deficit only in April. These data are classified according to the climatic types in the table below and it shows the vulnerability of the area to droughts.

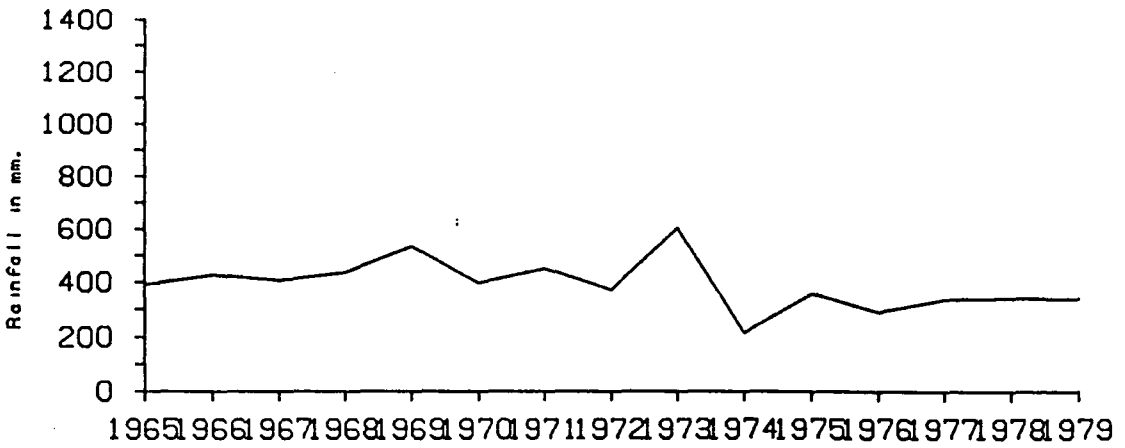
The data given in the tables related to the study area are only mean values. Therefore, depending on the data availability, the moisture index values were calculated based on rainfall in the agricultural seasons for the most recent twenty five years for each of the stations in the above tables. In addition, the climatic types were derived from moisture index values, and then moisture index values were plotted in cumulative probability graphs. All these tables with moisture index data and climatic types, and cumulative probability graphs are given in appendix H. These data are furthermore clarifying the area's vulnerability to droughts, and graphs provide a clear picture about the area and show that *Yala* seasons are extremely susceptible to drought. Even though the main rainy season coincides with the *Maha* agricultural season and *Maha* is considered as the most reliable agricultural season, the probability graphs clearly show that the *Maha* season is also unreliable.

All the analyses made so far very clearly show that the Dry Zone in general,

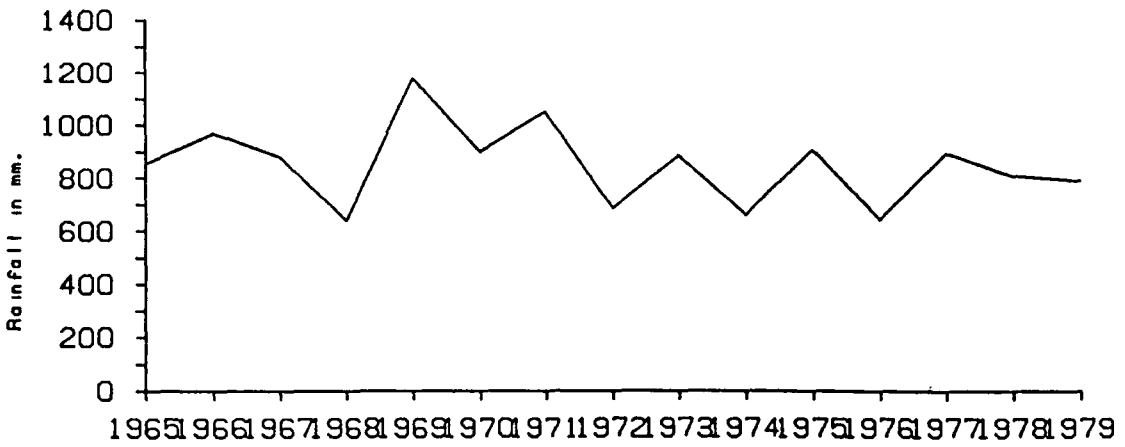
Figure 3.7 — Rainfall Variations in Agricultural Seasons in Suriyawewa: 1965-79



Yala Paddy Season: 1965-1979

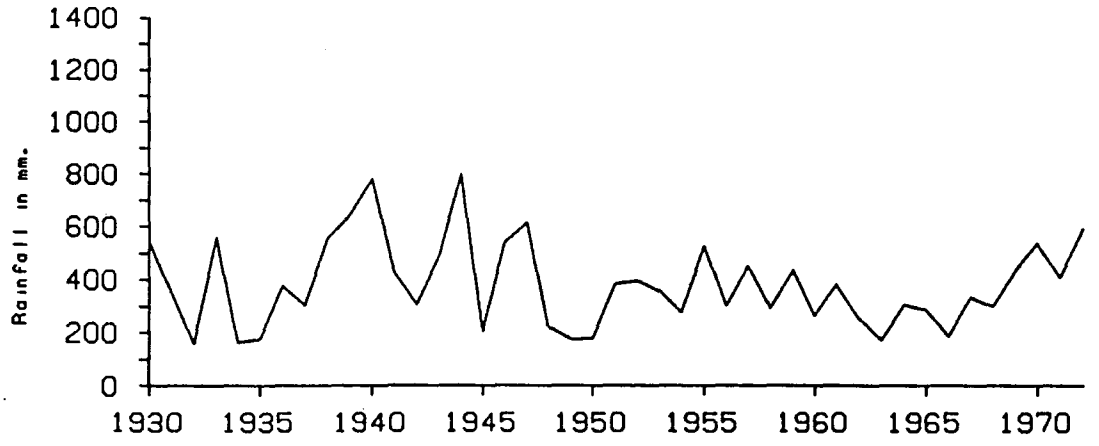


Maha Season: 1965-1979

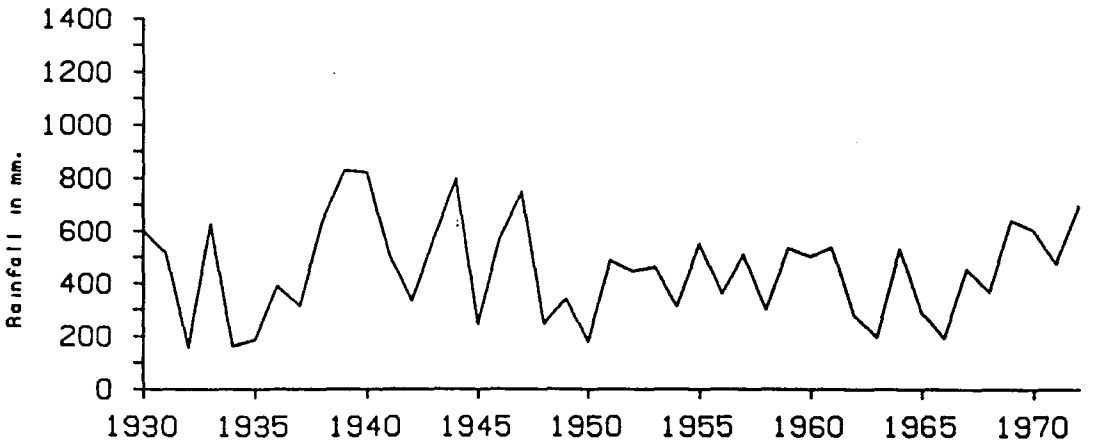


Source: Based on the data of the Meteorology Dept., Colombo, Sri Lanka.

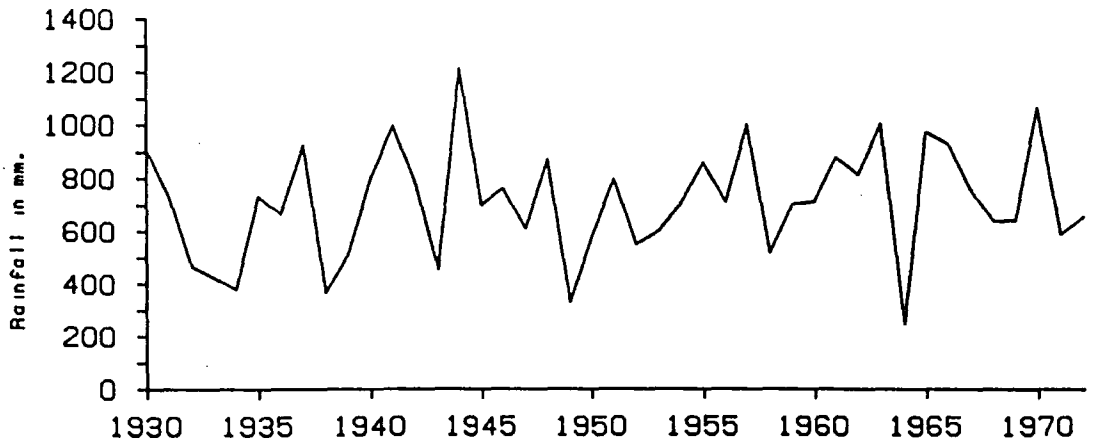
Figure 3.8 — Rainfall Variations in Agricultural Seasons in Migahjandura: 1930-72



Yala Paddy Season: 1930-1972

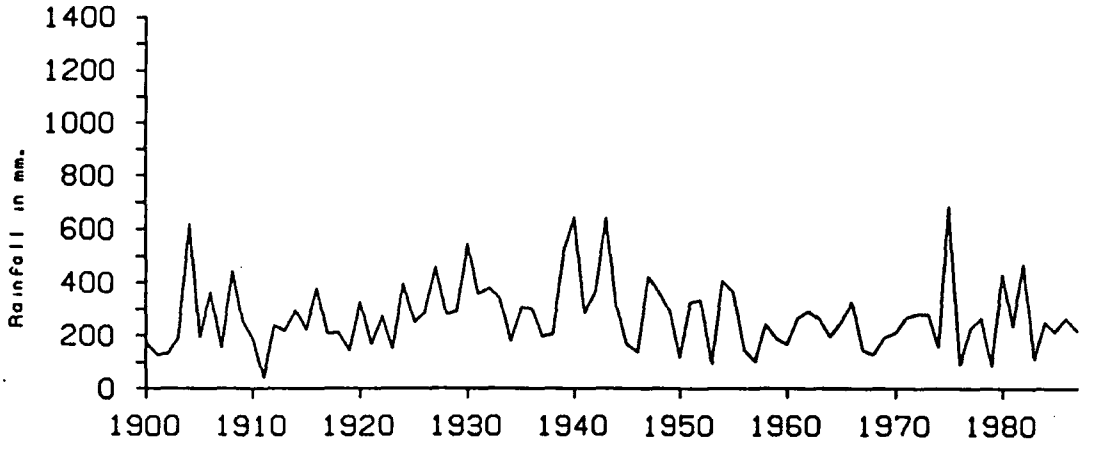


Maha Season: 1930-1972

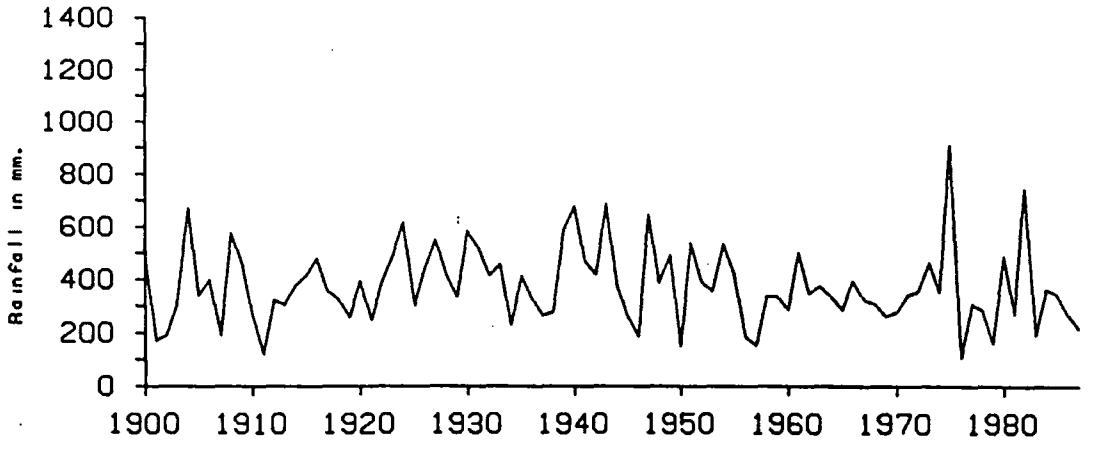


Source: Based on the data of the Meteorology Dept., Colombo, Sri Lanka.

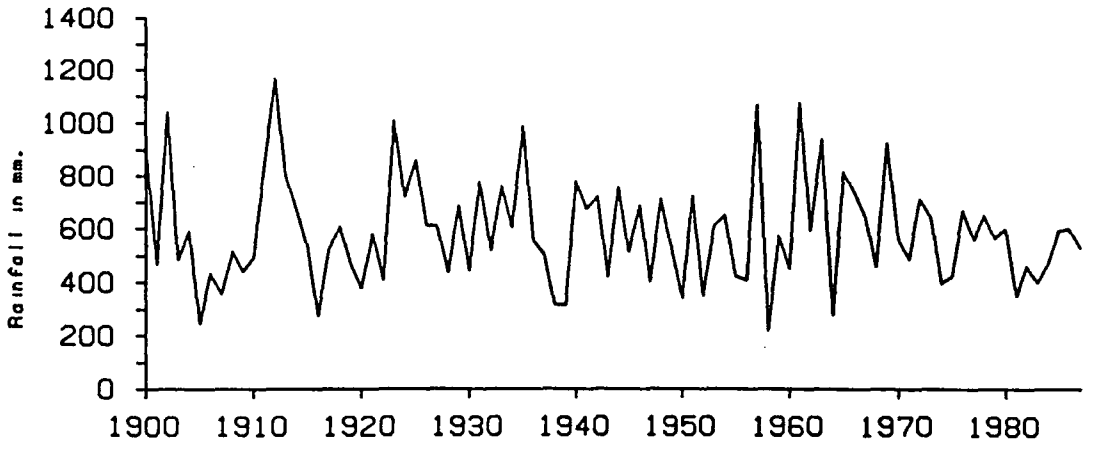
Figure 3.9 — Rainfall Variations in Agricultural Seasons in Hambantota: 1900-87



Yala Paddy Season: 1900-1987

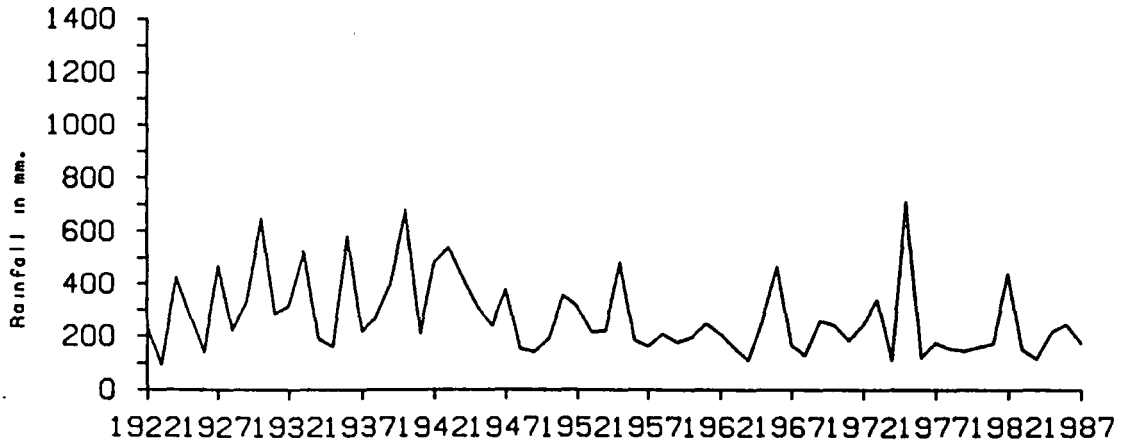


Maha Season: 1900-1987

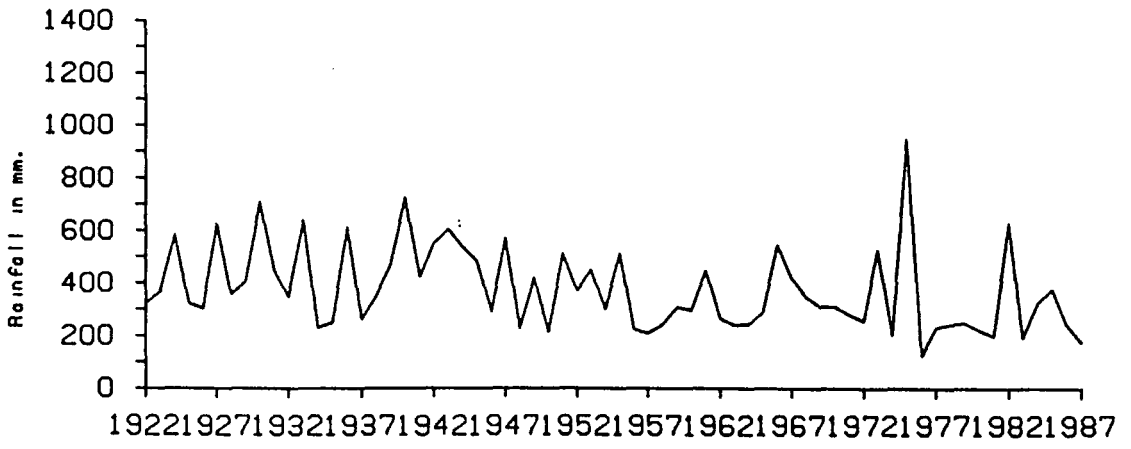


Source: Based on the data of the Meteorology Dept., Colombo, Sri Lanka

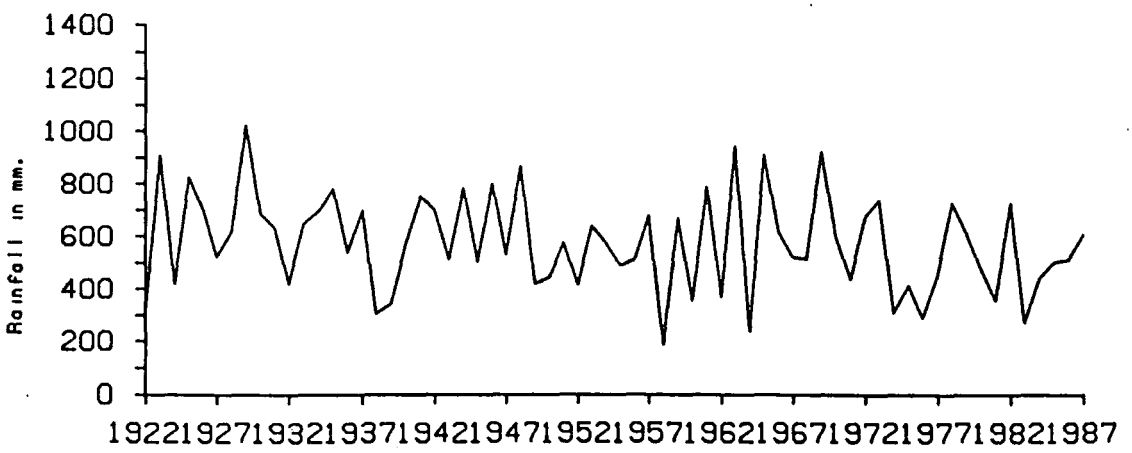
Figure 3.10 — Rainfall Variations in Agricultural Seasons in Ambalantota: 1922-87



Yala Paddy Season: 1922-1987

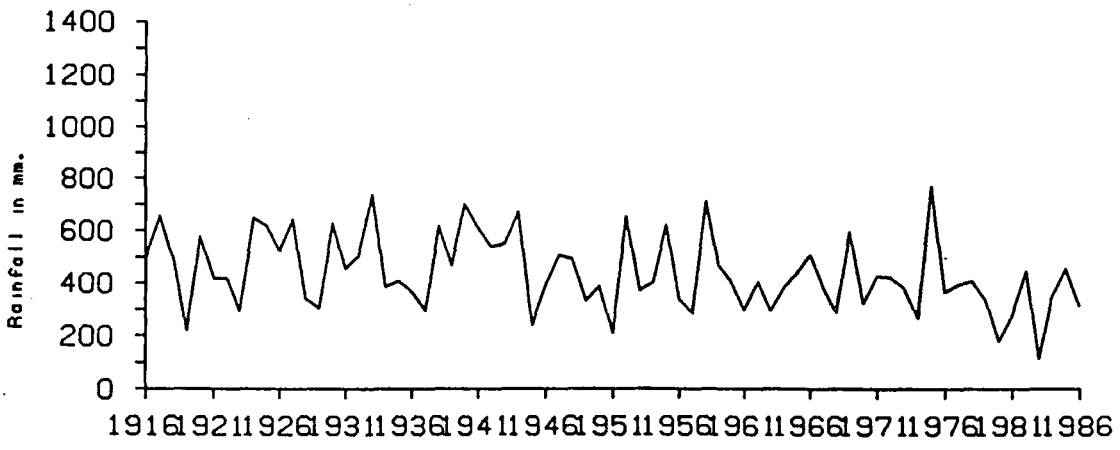


Maha Season: 1922-1987

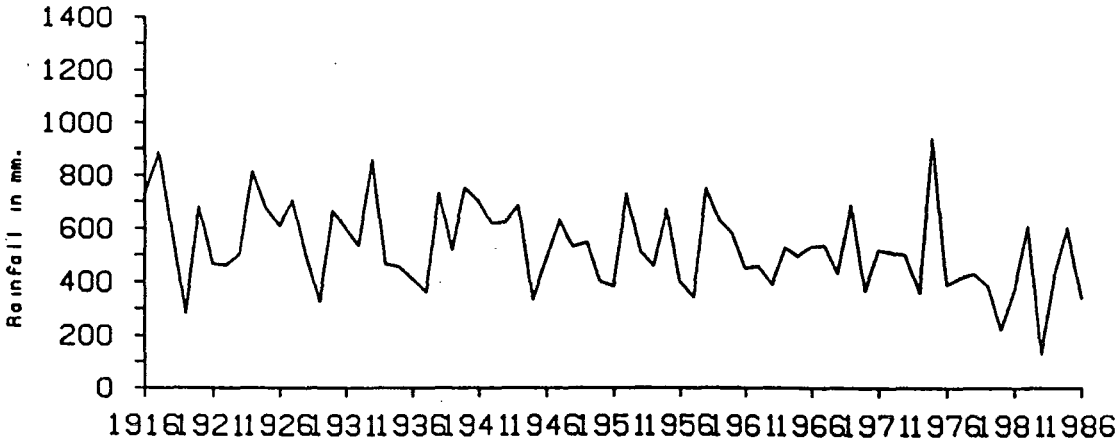


Source: Based on the data of the Meteorology Dept., Colombo, Sri Lanka.

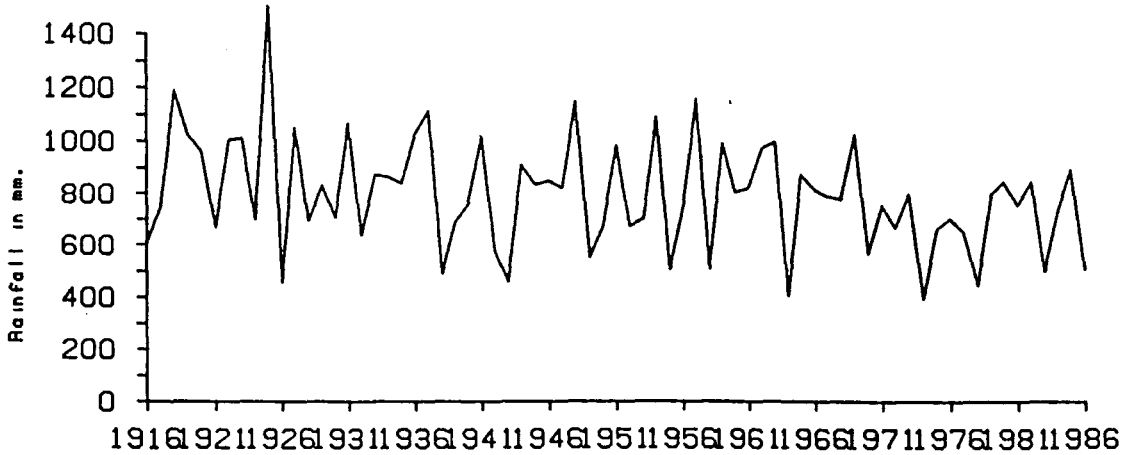
Figure 3.11 — Rainfall Variations in Agricultural Seasons in Embilipitiya Tank: 1916-86



Yala Paddy Season: 1916-1986



Maha Season 1916-1986



Source: Based on the data of the Meteorology Dept., Colombo, Sri Lanka.

Table 3.11 — Monthly and Annual Moisture Index Values with Climatic Types in Study Area

1													
Station	J	F	M	A	M	J	J	A	S	O	N	D	Annual
Suriyawewa	-48	-60	-48	9	-35	-77	-85	-71	-50	64	93	73	-21
Migahajandura	-30	-56	-16	5	-31	-75	-78	-88	-72	42	79	10	-28
Hambantota	-33	-63	-51	-30	-36	-62	-68	-73	-56	-6	39	-3	-38
Ambalantota	-40	-63	-48	-40	-27	-61	-72	-70	-54	-2	31	-7	-38
Embilipitiya	-26	-43	3	16	-21	-70	-72	-76	-53	37	98	35	-16
2													
Station	J	F	M	A	M	J	J	A	S	O	N	D	Annual
Suriyawewa	D	D	D	C2	D	E	E	E	D	B3	B4	B3	C1
Migahajandura	C1	D	C1	C2	C1	E	E	E	E	B2	B3	C2	C1
Hambantota	C1	D	D	C1	C1	D	E	E	D	C1	B1	C1	D
Ambalantota	D	D	D	D	C1	D	E	E	D	C1	B1	C1	D
Embilipitiya	C1	D	C2	C2	C1	E	E	E	D	B1	B4	B1	C1

Sections: **1** = Monthly and annual moisture index values and **2** = Climatic types.

Source: Calculated from data of the Meteorology Dept., Colombo, Sri Lanka and Evapotranspiration data from the nearest station of the present station of Thornthwaite Associates calculations in 1963.

and especially the area under investigation, incessantly faces a water deficit during both *Yala* seasons. Furthermore, the rains in the prominent rainy *Maha* season are also subject to high variations. In relation to this problem it is very helpful to understand the degree to which the agriculture is vulnerable within this kind of environment, that is, if we can measure the amount of water necessary for the the growth of crops so that an economically productive harvest can be obtained. This is made possible with the evaluation of the Consumptive Use of Water of different crop varieties. In this way the basic water requirement for good growth and economic yield of certain crops can be determined. In relation to Sri Lankan Dry Zone conditions the following estimates which were calculated by the Mahailuppallama Agricultural Research Institute in Anuradhapura district show the water consumption of the dominant crops (see table 3.12).

All the crops mentioned in the table are highland crops. The water necessity for lowland paddy farming is particularly high because paddy is, in general, the

Table 3.12 — Estimated Consumptive Use of Water by Dominant Crops

Type of Crop	Duration in days	Season	Water use in mm.
Rice (upland)	130	Maha	517
Maize	120	Yala	596
Ground nut	105	Yala	380
Chilli	180	Yala	750

Source: S. Somasiri (1981, p.11).

most dependent on water among food grains. Considering factors such as soil, humidity, temperature and period of crop maturation, it has been estimated that the water consumption of rice varies from 800 mm to 1900 mm (Palmer, 1972, p. 51). This thirst of the rice for water cannot be quenched by the *Yala* season rains in the Dry Zone. In most parts of Hambantota district this is impossible even during the *Maha* season. Therefore, artificial irrigation has been and still is the decisive factor for successful paddy cultivation.

Considering all the information, analyses, and measurements given above it is now possible to understand how important the role of the water is for farming communities in the Dry Zone. The rains are highly uncertain in all agricultural seasons. The onset of the drought hazard is, therefore, also uncertain. If the rains fail to materialize, however, drought and the destruction of the crops are certain and the lives of the majority of the poverty-stricken farmers become hazardous.

... Notes ...

1. R.E. Bravo *et al.* (1988) 'The effects on zones of agroclimatic suitability for crops' In M.L. Parry *et al.* (eds.) *The Impact of Climatic Variations on Agriculture,* Vol. 2: Assessments in Semi-arid Regions, Dordrecht: Kluwer Academic Publishers. p. 461.

Chapter IV

THE NATURE OF THE AGRICULTURE IN DROUGHT AFFECTED AREAS IN SRI LANKA WITH PARTICULAR REFERENCE TO HAMBANTOTA

Sri Lanka is, as a developing country, very highly dependent on its agriculture in many important aspects. The primary sector (agriculture, forestry, hunting and fishing) provided 50.1% and 45.2% employment opportunities in the years 1971 and 1981 consecutively (Dept. of Census and Statistics, 1983, p. viii). Furthermore, the contribution to Gross Domestic Product from this sector was Rs. 44,355 mil. (27.1%) in 1986 (Statistics Department, Central Bank, no date, p. 19). The agricultural lands in the country represent 30.5% of its total land area (Sri Lanka Census of Agriculture 1982 general report 1987, p.5). Considering the purpose of production, the agriculture in the country is divided into an estate sector and a small holdings sector. In the former, tea, rubber and coconut are the dominant plantations and their production is mainly for the foreign market. The latter sector is dominated by annual crops which produce the necessary foodstuffs in the form of cereals, fruits and vegetables. In this chapter, the emphasis is on agriculture in drought-affected areas, although it is difficult to explain the basic characteristics of the agriculture in drought-affected areas alone, as the available data have not been differentiated according to the country's different climatic zones.

When the area of a holding covers 20 acres or more it is considered as an estate, while holdings below this size are considered as small holdings (Sri Lankan Census of Agriculture 1982 general report 1987, p. 3). The estate sector with tea, rubber and coconut plantations is mainly located in the Wet Zone where the necessary water requirements of these plantations can be met. The small holdings sector is predominant in the Dry Zone.

The dominance of the small holdings sector could suggest that the majority of farmers are poor and that, therefore, their resilience to face a hazard is low. So that it is helpful to compare the data relevant to the areas under small holdings, their size and the number of holdings. See table 4.1.

Table 4.1 — Agricultural Land under Small Holdings and the Estate Sector in Sri Lanka

Area	1	%	2	%	3	4	5	6	7
Hambantota	165,034	91	15,843	09	99.73	.27	3.8	99.2	5.6
Sri Lanka	3,547,326	73	1,330,032	27	99.48	.52	100.0	75.1	5.2

Columns: 1 = number of acres in the small holdings sector, 2 = number of acres in the estate sector, 3 = percentage of the number of holdings in the small holdings sector, 4 = percentage of the number of holdings in the estate sector, 5 = percentage of total number of holdings in Sri Lanka, 6 = percentage of agricultural household population to total population, and 7 = average size of the operator's household (persons).

Source: Department of Census & Statistics (1987) pp. 6, 11 and 70.

Table 4.2 — Agricultural Land by Size of Holdings and Area in 1962 and 1982 (in thousands)

	1962		1982		Change	1962		1982		Change
Size (acres)	1	2	3	4	5	6	7	8	9	10
Below 1	177	3.8	278	5.7	+57.2	459	37.7	755	42.0	64.5
From 1 to 5	1305	28.0	1869	38.3	+43.3	574	47.1	869	48.3	51.4
From 5 to 10	852	18.3	811	16.6	-4.8	132	10.9	130	7.2	-1.5
From 10 to 50	792	17.0	751	15.4	-5.2	46	3.8	42	2.3	-1.5
Above 50	1540	33.0	1169	24.0	-24.1	6	0.5	4	0.2	-8.7
Total	4667	100.0	4877	100.0	4.5	1216	100.0	1800	100.0	48.0

Columns: 1 = extent (acres in thousand), 2 = percentage to total in 1962, 3 = extent (acres in thousands), 4 = percentage to total in 1982, 5 = percentage increase or decrease in 1882 over 1962, 6 = number of holdings in 1962, 7 = percentage to total in 1962, 8 = number of holdings in 1982, 9 = percentage to total and 10 = percentage increase or decrease in 1982 over 1962 (10 is calculated).

Source: Department of Census & Statistics (1987) pp. 10 and 13.

Data in 1962 and 1982 show a growth in the number of holdings below 5 acres during the 20 years period (Table 4.2). This indicates the growing fragmentation of lands and thereby resulting poverty of the farmers and the possible vulnerability of the farmers under hazardous events. By 1982, 90% of the holdings were below 5 acres. Risk is further enhanced by the fact that 42% of the land holdings are under 1 acre. When the land unit becomes smaller the income also becomes

low. Consequently, dependants on this type of agriculture cannot cope with any kind of problem whether it derives from a man-made environment or their natural environment. Especially, since the number of family members in a family is high (see column 7 table 4.1) the low income and environmental uncertainities make peoples' living by means of a small holding more vulnerable.

4.1 Farming Seasons

Farming seasons in Sri Lanka are governed by the behaviour of rainfall. As mentioned in chapter three, Sri Lanka has two traditional agricultural seasons, namely *Maha* and *Yala*. Since it rains everywhere in the country during the *Maha* season agricultural activities are also extensively practiced by the farmers. It is common in the country to divide peasant agricultural lands (small holdings) into two sectors, (a) 'paddy' and (b) 'highlands', the nonirrigable interfluves on which other crops are grown (Farmer 1954). Farmers therefore, grow both paddy and highland crops during the *Maha* season. On the other hand, rainfall during the *Yala* season is reliable only within the areas of the Wet Zone, and agricultural activities also have to be limited to this area in this season. Therefore, agricultural activities in the Dry Zone can only be practised where irrigation facilities are available. However, some farmers cultivate *Yala season* chenas during the short period of the rainy season from March to May, thereby taking a great risk. When crop varieties are concerned, paddy is the most important crop as rice is the staple food of the Sri Lankans. Table 4.3 shows the land area cultivated in the main seasons and seasonal differences.

Table 4.3 — Paddy and Highland Food Crops grown in Sri Lanka (in hectares)

	Maha		Yala		% Change to Maha	
Year	Paddy	Highland	Paddy	Highland	Paddy	Highland
1981/82	567,257	180,949	276,924	130,125	-51	-28
1982/83	582,900	181,491	241,219	117,214	-59	-35
1983/84	606,440	159,836	383,777	103,868	-37	-35

Source: Department of Census & Statistics, (1987a) pp. 112 and from 124 to 130.

4.2 Farming Practices in Drought Affected Areas in Sri Lanka

The main agricultural crops in the drought affected areas are paddy and highland crops. Therefore, it is very important in a study which concerns the farmers' perception and adjustments to drought hazard, to know farmers' practices in relation to these crops. As explained in chapter three, the general pattern of farmers' activities are everywhere the same in the Dry Zone in Sri Lanka, when rains come in the expected time in the season, except in the Jaffna peninsular where tank water is not crucial for agriculture.

As regards paddy, farmers engage in their land preparation in October aiming to harvest in February, provided the *Maha* season rains arrive in early October and the tanks are full. Provided the rains in the *Yala* season arrive in March and April and enough water can be stored in the village tank, they cultivate *Yala* paddy too. In this environment, *Maha* season paddy varieties are long-term (four months) and high yielding because this is the main, long and reliable rainy season, but *Yala* varieties are short-term (three months) and as a result, low yielding due to the short and unreliable rainy season.

Chena cultivation is exclusive to the highland agricultural sector. Farmers engage in highland sector either in *chenas*, away from their homes, or mainly in their home gardens. The main difference from this sector to paddy cultivation is that farmers prepare lands for chena crops well in advance to the *Maha* season rains, whether it will rain or not. Farmers start to clear their lands in late June and this is finished by the end of July. When, by the middle of August, the cleared forest is burnt, and mainly in the home gardens, there are no grass varieties left as a result of the three months dry period. All the prepared chena lands are thus free from any weed variety by the time they are sown and planted in early October. Highland crops start to yield from December onwards, and by February all the crops are harvested. Some farmers start to grow highland crops for the *Yala* season on the same land they cultivate in *Maha* using more drought resistant crops. However, when the *Yala* rains start, chillies and some other vegetable varieties, which were grown in the *Maha* season, again start to grow after their partial death during the dry period from late January to early March. The rains in March, April and May can be regarded as the *Yala Chena* rainy season. After the Maha harvest farmers clear the lands and burn the stubble and dried grass during the February and early

March dry period. Harvesting starts by late May. However, as the data show in table 4.3, both paddy and highland cultivation areas in the *Yala* season are smaller than those of the *Maha* season as a result of the uncertain and low rainfall.

This general pattern of paddy cultivation activities only appears if rains arrive in due time. If rains are late, accordingly the starting of the paddy cultivation is decided. If it does not rain enough, the cultivation of paddy is entirely given up in the due season. But, without considering the rainfall, farmers, in general, prepare for the *Maha* highland agriculture and some for the *Yala* season, and they sow seeds and plants with the first rains in the season. In this case they do not consider the amount of rains they get, but sow mainly drought resistant crops that can survive with little rains when compared to highly water consumptive paddy crop.

4.3 Agriculture in Hambantota

Hambantota, the largest administrative district in the southern province and located in the southern corner of the island, covers the area of 2593 square kilometres. The district was populated with 424,085 inhabitants according to the 1981 census with 59.3% under 24 years of age. The density of population was 164 persons per square kilometer in 1981. Hambantota is mainly under the influence of the Dry Zone, but some areas in the west come under the Wet Zone. The district is mainly rural in character with 90% of the people living in rural areas, and with 99.2% of the population living in agricultural households with the second highest average family size in the country (Department of Census & Statistics 1987).

4.3.1 Background to the Agriculture

The total agricultural area in the district of 180,877 acres makes up 28% of the total land area. There were 165,034 acres (91%) under the small holdings sector (holdings with less than 20 acres) and 15,843 acres (9%) under the estate sector in 1982. They had 67,548 and 186 agricultural operators respectively. The estate sector lands are mainly located in the Wet Zone and, therefore, droughts are not a problem. Small holdings dominate in the parts of the Dry Zone where droughts are a constant threat. When the agricultural landholdings are too small the result is insuffcient production and income for its occupants. Therefore, even without

a drought this situation is hazardous. Thus, when there is a drought, the poor farmers are the first victims. Table 4.4 shows the size of holdings in the district. The average size of a holding in Hambantota was 2.45 acres in 1982. The average size of a holding in the country was also 2.45 in the same year (Department of Census and Statistics 1987, p.14). Nearly 24% of the holdings are less than 1 acre in size and account only about 5% of the operated area. The size group 1-3 acres represent 47% of the total land holdings and 32% of the total area cultivated.

Table 4.4 — The Size of the Agricultural Land Holdings in Hambantota District

Size	No of Holdings	Percentage	Area (acres)	Percentage
Below 1/8	701	1.0	42	0.2
1/8 - 1/4	2083	3.1	294	0.8
1/4 - 1/2	4993	7.4	1313	0.8
1/2 - 1	8227	12.2	4722	2.9
1 - 2	17065	25.3	2021	12.2
2 - 3	14902	22.2	3337	20.2
3 - 4	7022	10.4	2250	13.6
4 - 5	4119	6.1	17374	10.5
5 - 7	5044	7.5	25548	16.8
7 - 10	1871	2.8	14748	8.9
10 - 20	1138	1.7	14539	8.8
Over 20	297	0.4	8353	5.1
Total	67462	100.0	165031	100.0

Source: Department of Census & Statistics, (1984) p. 7.

The miserable condition of the farmers in the district is further indicated by land ownership. Approximately a quarter of the farming community owns no land, but farm others lands. Another quarter has only home gardens which are the most vulnerable to drought. See table 4.5.

Seasonal differences in the cultivated areas between two main seasons are very common in Hambantota district. With more reliable and extensive rains, farmers are able to grow both more paddy and highland crops in the Maha season than in the Yala season which has less and uncertain rains. However, the *chena* cultivation as a dry farming system (Land Commissioner's Department, 1983) is very dominant

Table 4.5 — Landownership of the Agricultural Operators in Hambantota

Ownership	1	Percentage	2	Percentage
Not owning any land	14,862	22.0	-	-
Owning home gardens only	20,530	30.4	17,007	14.5
Owning homegardens and other lands	14,784	21.9	49,534	42.2
Owning other lands only	17,369	25.7	50,924	43.3
Total	67,545	100.0	117,465	100.0

Columns: 1 = number of operators and 2 = area owned (acres)

Source: Department of Census & Statistics, (1984, p. 9).

under the highland sector. Table 4.6 depicts the differences of cultivated areas between the two seasons.

Table 4.6 — Paddy and Highland Food Crops grown in Hambantota (in hectares)

	Maha		Yala		% Change to Maha	
Year	Paddy	Highland	Paddy	Highland	Paddy	Highland
1981/82	17967	7753	14119	6114	-21	-21
1982/83	19737	7007	11780	5999	-40	-14
1983/84	19527	7534	16556	4767	-31	-37

Source: Department of Census & Statistics, (1987a) pp. 105-110 and 124-130.

Since the crop varieties grown in the highland sector represent both Wet and Dry Zone crops the difference between the cultivated areas in the two seasons may not be seen as significant. However, when the data relevant to the main crop varieties grown in the Dry Zone areas are compared, the difference appears very prominent (see table 4.7).

4.3.2 Farming Practices and Combinations in Hambantota

As has been discussed in the section relevant to the whole country, the awareness of the people about their environment is the most important aspect in order

Table 4.7 — Main Crop Varieties grown in the Drought affected Areas (in hectares)

Crop variety	Life time (days)	Maha	Yala	% change to Maha
Kurakkan	60-105	684	190	-72
Maize	105	662	196	-70
Meneri	60-70	82	206	+151
Green Gram	60-80	1444	482	-67
Cow Pea	60-80	883	380	-57
Gingilly	90	594	338	-43
Ground Nuts	90-105	540	272	-50
Chillies	60-150	1004	750	-25

Source: Department of Census & Statistics, (1987a) pp. 129-130.

to understand their perception of and adjustments to droughts in Hambantota district. This awareness is very strong among farmers, and manifest in their observation of the range of cultivation activities, from preparing the land to harvesting, based on their knowledge of rainfall behaviour in different seasons. The particular farming combinations farmers choose reflect this awareness, as does the fact that there are separate seasonal agricultural sectors. It is, therefore, necessary to discuss the farmers' preparations for the different seasons in order to understand their perception of the environment and how they adjust to the turmoil of hazardous situations when they are faced with them. This section, therefore, is used to explain farmers' preparation for the forthcoming agricultural seasons. Without rains or water, farmers in Hambantota first prepare for their agricultural activities in the Highland, and when the necessary amount of water is collected in the reservoirs, activities for the paddy cultivation start.

Farmers grow mainly dry cereal crops and vegetables in the highlands. The lands in this sector are located either in the vicinity, or around, their houses, or far away from their homes and in the forests in chenas. The chenas are the most important in the highland sector in Hambantota district as the livelihood of a considerable number of farmers is based on these. The dependants on chena cultivation among the village study sites comprise 30%, and this situation is, therefore, different from the north-central province where nobody lives on chenas alone (Ten-

nakoon 1986) and where, so far, drought hazard research in Sri Lanka has been focused. On this background, the forthcoming season starts with chena cultivation. Since the Maha season is considered as the starting season in the agricultural year, and considering its importance in the district, it is better to start the discussion with the land preparation activities in chenas in the Maha season. As explained in chapter three, June, July and August are the driest months in the Dry Zone areas of Sri Lanka. Since farmers cultivate their chenas in forests, they need to burn the cut trees and bushes before they sow and plant. Therefore, this dry spell of three months provides the necessary environment to initiate the preparation for chena activities, that is to burn the cut trees and bushes.

Since chenas are located far away from the houses and in the forests, cultivation in isolation by separate plots of land is not practical. Rather, the agreement and harmony among several farmers in order to work together is a precondition and an essential factor to start a chena. The first step is the formation of a group of about three to six farmers. Earlier, when the forests were in greater abundance, the number of farmers in a group might have been up to ten. The group of farmers goes to the forest in June in order to find suitable land for cultivation. When they find a big enough area with grown trees, the farmers choose it as the site for the forthcoming season. Grown trees indicate soil fertility. They then demarcate the area by cutting several trees. This demarcation indicates to other groups that the area is already allocated to a group. After this, no group makes any effort to start chenas next to this land. These practices have become the law for chena cultivators and mutual respect for each other avoids any conflict. This peaceful farming behaviour is still possible because there are enough lands in the area to choose from and to cultivate. When the farmers start to clear the land every farmer has the right to expand his land area according to his labour force. This means that big families can afford larger chenas by which they also meet their greater demand for foodstuffs. The selected lands are cleared in June. By August, branches of cut trees and bushes are cut into smaller pieces, spread over the entire land and burnt in order to stop the growth of weeds. Farmers, in general, perceive that after the 20th of August the wind direction is very variable. As long as the wind direction is unchanged, and the wind is strong, they know they can start to burn the land from the windward side avoiding any extra work as a result of the proper burning of branches and bushes. Chena farmers, therefore, try to finish

the burning of their chenas by the 20th of August. After this, the chena land is finally ready for sowing or planting the crops, though there are no sufficient rains yet until early October. Thus, after the burning of the chenas has been completed, farmers have an interval from late August to early October. During this interval, however, around the 15th of September, they expect a heavy rain. It is called 'Beli Thora' rain. *Belly Thora* is a plant which starts to grow with this rain. During the following dry spell in late September, all the baby plants of *Beli Thora* die. The arrival of the *Beli Thora* rains in the expected time and the subsequent dying is the most reliable indicator for farmers for a bountiful harvest in the forthcoming season with no water shortage. In general, Maha season rains start in the first week of October according to the farmers' knowledge, while the sowing and planting of seeds in the chenas takes place until the 15th of October. Farmers believe that if somebody plants seeds after this date, these are liable to be eaten by rats. Given all these conditions, almost all of the most important land preparation activities are finished in the chenas by the 15th of October. With the advance of the rains, the sown and planted seeds start to come up and must from then on be protected from wild animals and birds until the crops are harvested. During the daytime this task is mainly carried out by children, and at night by adult males.

By the time the farmers have finished their heavy work tasks and completed sowing and planting, the village tanks are also full with water, provided the rains have arrived in due time. By this time the right environment is created to start the activities for paddy cultivation. If the tanks are not full with water, they continue to confine their activities on chena cultivation.

Since the water collected in the tank is the decisive factor for paddy cultivation, once again, harmony among the farmers is a precondition for an effective water management. As regards paddy cultivation, this applies in a much wider sense compared with chena farming groups. In this case, all the farmers who use the water in the tank must work harmoniously. Individual decisions have, therefore, no place in the paddy cultivation activities. Unlike chena cultivation, there are several government officers who take part in the decision making process to grow paddy with tank water. Before the cultivation is started, farmers have to make important decisions in advance for their paddy cultivation. The dates and number of occasions to discharge the tank water, starting dates at different stages of growing paddy,

and the way to protect the entire paddy land area with the tankwater, are the main decisions both farmers and officers have to make before starting the land preparation. They take all these decisions in the 'meeting in the agricultural season' *(Kanna Rasweema)*. For the minor irrigation schemes (irrigated areas less than 200 acres) this meeting is represented by the Assistant Commissioner of the Agrarian Services Department in the district, the Divisional Officer of the Agrarian Services Centre Authority, the Agricultural Extension Services Servant, a technical officer from the Irrigation Department, a cultivation officer and by farmers who cultivate using the respective tank. In the major irrigation schemes (irrigated area more than 200 acres), the Government Agent of the District or the Assistant Government agent, a high ranking officer from the Irrigation Department, colonization officers, and other officers who are responsible in the scheme (different schemes have different officers) also participate.

At this meeting, it is decided on which particular date each activity is to be completed. First, a decision is made about the period necessary to clean the canals and ridges in the paddy tract. After deciding the date on which the clearance is to be completed, the date of discharging the water is decided. Next to be decided is the crop variety to be planted. This is dependent on the date the tank becomes full with rain water. If the tank fills in early October long-term paddy varieties are selected, if not, short-term varieties are chosen. After this, the final date of sowing is determined. The next decision, then, concerns the date of the water stoppage after sowing the paddy. After sowing, the most important thing is also to protect the crop from wild animals and village cattle. Therefore, before the plants become green, fences must be erected and, thus, the last date for completing the fences is decided as well as the first day to open the fences so that the harvest can be brought home by the farmers. The activities from clearing the canal to sowing the plants are generally completed in about a month. Though the dates for discharging and stopping the irrigation water are decided, tank water is not used if there is enough rain. After sowing, water is discharged according to the needs for growing paddy. This general pattern of activities relevant to the paddy cultivation seems very smooth and easy going. However, the reality is very harsh and there is a lack of harmony especially, as a result of the existing social system under which there are different political fractions which carry out their activities hindering overall efficient water management.

The activities relevant to both highland and paddy cultivation can only be done, as explained above, based on one condition, that is, the occurrence of rainfall in due time. Especially, the variation of the time-factor changes the activities relevant to the paddy cultivation. Another characteristic of the rainfall in the area is that the distribution of rainfall over space may be very different, even in the rainy *Maha* season. As a result, not every tank in the area reaches its full capacity in the same period. Therefore, activities relevant to the paddy in the villages take place at different times with different crop varieties. It is possible to see these differences by reference to the activities in the six study sites. Paddy in Arabokka, Swodagama, Mahagalwewa and Suriyawewa was sown in December 1987, in Ihalakumbukwewa February in 1988, and not sown at all in Migahajandura which did not have enough water in the tank during the *Maha* season in 1987/88. The fields in the village of Pahalakumbukwewa which is situated between Migahajandura, Ihalakumbukwewa and Mahagalwewa were prepared in January in the same season.

Farmers have the opportunity to grow paddy only if they have enough water in the tanks. In all of the study sites, farmers grow paddy relying entirely on rain water stored in the tanks. From the time of their ancestors onwards their knowledge about the rainfall vagaries, the soil and the landforms has evolved and, therefore, the farmers have a clear perception of the environment and the knowledge that they have to live with frequent water shortages. Based on this perception and knowledge, they have developed an irrigation system in which the distribution of water is based on gravity flow. The location of tanks very cleary shows farmers' understanding of the physics of nature. There are hundreds of tanks in every valley and river basin in the district, as well as in the other parts of the Dry Zone. Their settlement and land use pattern near each tank also reflects the farmers' adjustment to the environmental risks, and is always aimed at maximising their productivity through agriculture within the limited period available for agricultural activities in the year. Construction of the irrigation tanks along the entire valley allows no rain water to drain to the sea without being first used for the paddy cultivation. If one tank overflows, the water is accumulated in the tank below. The farmers' knowledge about their environment is indicated here in their general pattern of land use (see figure 4.1.) in a Dry Zone village. However, although this pattern is widespread in the Dry Zone, it is not repeated in the colonization schemes which constitute a recent development. Colonization

schemes were designed by outsiders, technocrats and bureaucrats. Farmers have not participated and were not consulted in the procedures of designing and constructing these schemes. Furthermore, when lands were allocated to farmers after the construction of the colonization schemes, a lot of malpractices were carried out by politicians and bureaucrats. As a result, the most important factor for the water management in the schemes, the harmony and peace among farmers, does not prevail in the colonization schemes. The modern schemes are particularly in this situation, and the severity and hazardousness of these activities are further explained in the forthcoming chapters.

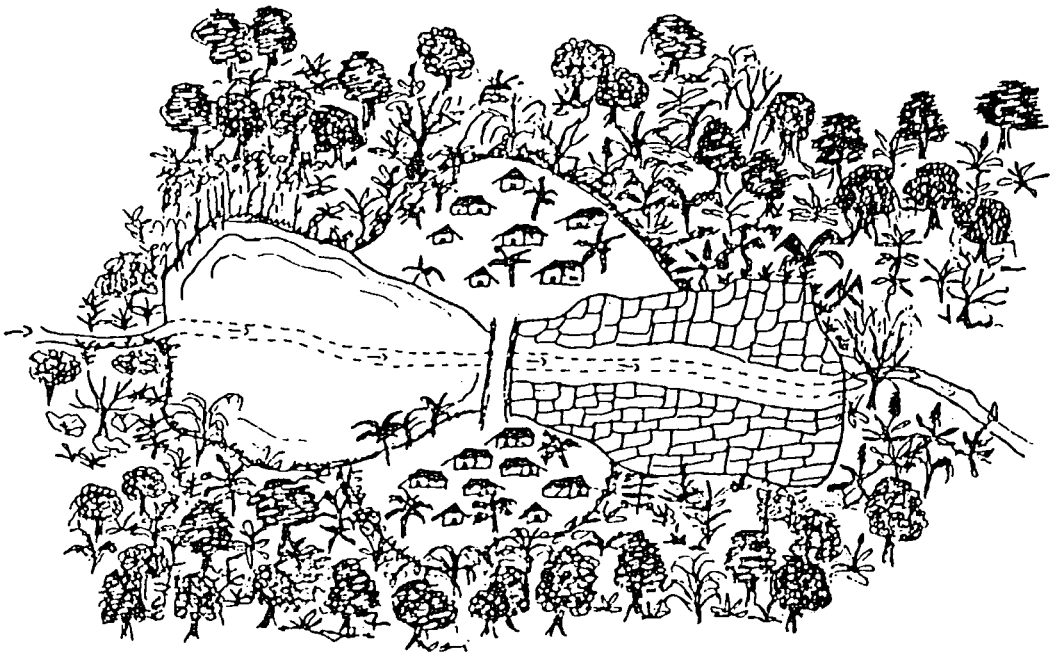


Figure 4.1 — General Pattern of Land Use in a Village of the Dry Zone Hambantota

When considering this environment, it is possible to identify several farming combinations in the drought-affected areas of Hambantota district. Thus, Maha season highland, Maha season paddy, Maha season highland and paddy, Yala season highland, Yala season paddy, Maha and Yala season highland and paddy are the most frequent combinations. However, chena cultivation is the most important farming activity within the highland sector, and especially in the villages in the drought-affected areas. (The farmers' perception about the modern agricultural

inputs and technology in terms of their relative advatages and disadvantages is given in the appendix I.)

Though it is not possible to obtain separate data relevant to Dry Zone agriculture, the discussion clarifies the main features of the agricultural sector in the Dry Zone of Sri Lanka. In summary, the importance of agriculture, the poverty of farmers, and the growing poverty in the most widely practised sector of small holdings (leading the majority of the farmers into more vulnerable conditions as a result of climatic or social imbalance), are the main characteristics cf the agricultural sector in Sri Lanka. The next chapter will explain the farmers' perception of drought hazard.

Chapter V

THE FARMERS' PERCEPTION OF DROUGHT HAZARDS

Perception is a function of all activities relating to the understanding of processes and events through the sensory organs with the help of the mind. In this chapter, the nature of the farmers' perception of drought hazard is analysed. In order to understand their perception of drought numerous aspects will be considered relating to the farmers' activities, their natural environment and major problems created by droughts. The study sites are different from each other as has been shown in chapter two, and therefore, the tables which depict data related to the study sites are not only limited to the separate study sites, but also give the averages for the villages, colonies and all the settlements. The response categories of each table were derived from a pre-data collection period of observation and discussion with numerous farmers in the area.

5.1 Introduction

In this study the major concern is to analyse the farmers' perception of their living environment. The environmental perception of the farmers is seen as a function of all activities related to their knowledge about the processes and events in their living environment, as well as to actions of other members of their society. The study starts with the economic activities of the farmers and the perceived advantages and disadvantages of their living environment.

5.1.1 Activity Types of the Farmers

It is natural for anybody, especially for somebody who lives in a hazardous area, to observe their own living environment in order to reduce any potential risk to their livelihood. Since farmers' perception of drought hazard is influenced by their particular economic activities, the major economic activities in the four villages and the two colonies are the basic starting point in this chapter. In the following the economic activities in the settlements are depicted in detail (see table 5.1).

Table 5.1 — Economic Activity Types of the Farmers in 1987

Activity types	Ar.	Ih.	Mi.	Sw.	Ma.	Su.	Vills.	Cols.	All.
Paddy	0	0	0	0	3	61	0	32	18
Chena	0	42	38	0	3	0	28	2	13
Paddy and chena	0	42	40	53	80	20	38	50	45
Paddy, chena and cattle rearing	75	0	7	33	8	9	18	9	13
Paddy and cattle	17	0	0	0	0	2	2	1	1
Chena and cattle	0	0	0	0	3	2	0	2	1
Paddy, chena and business	0	0	0	13	0	0	2	0	1
Paddy, chena and temporary jobs	0	0	4	0	0	0	2	0	1
Paddy, chena and permanent job	0	0	4	0	0	0	2	0	1
Paddy and permanent job	0	8	0	0	0	5	2	2	2
Paddy and temporary jobs	0	0	0	0	2	2	0	2	1
Chena and temporary jobs	0	4	2	0	0	0	2	0	1
Paddy, cattle and government job	8	0	0	0	0	0	1	0	1
Paddy, chena and self employment	0	0	0	0	2	0	0	1	1
Chena and paddy minor	0	4	2	0	0	0	2	0	1
Paddy and chena minor	0	0	2	0	0	0	1	0	1

Columns: Ar. = Arabokka, Ih. = Ihalakumbukwewa, Mi. = Migahajandura, Sw. = Swodagama, Ma. = Mahagalwewa, Su. = Suriyawewa, Vills. = All villages, Cols. = All colonies and All. = All settlements.

Source: Field data. Data in percentage form. The percentages are calculated according to the number of respondents from each study site. The number of farmers who are represented in the sample are 12, 24, 45, 15, 64 and 64 respectively from Arabokka to Suriyawewa. Since the figures are rounded, the added percentages are either less than, or exceed 100 percent.

The data very clearly show that chena and paddy cultivation and cattle rearing are the main economic activities of the farmers, although their degree of importance varies from village to village. Paddy, chena and cattle rearing are the main activities in Arabokka. However, in reality, the most important activity in Arabokka is cattle rearing. Since it is situated three miles away from Hambantota city, farmers can sell their milk products, especially curd, without greater problems. This village has, therefore, a reputation as a milk-producing village. When the farmers have tank water they cultivate paddy, and, in the Maha season, they cultivate chenas in relatively small areas near to their permanent residence in order to achieve self-sufficiency for the family. On the whole, paddy and chena cultivation are the main economic activities in the other three villages. In real terms,

paddy is cultivated only when the village tanks are full. Whether it will rain or not, chena activities start in anticipation of seasonal rains. The importance of chena cultivation in these villages is reflected in the farmers' saying, "chena cultivation gives us everything except our parents". Even though some farmers have cattle in the other villages, the number of cattle owned by them is very low when compared to the number owned in Arabokka. Most of the people who have either government jobs or other off-farm permanent jobs, also engage in farming activities. In Migahajandura, there are four government officers in the sample and all cultivate chenas and paddy.

The two colonies show a very contrasting concentration of activities, which is a consequence of their nature and location. Mahagalwewa colony is situated in the vicinity of forest, enabling farmers to practise chena cultivation. As a result, both paddy and chena cultivation are very dominant among the other activities. In Suriyawewa there is little possibility for chena cultivation since there is no forest in the vicinity. However, about 25% of the farmers here are practising chena cultivation by going far away from their permanent residences. Irrigation facilities are highly reliable in Suriyawewa in both the Maha and the Yala seasons when compared to Mahagalwewa. Therefore, the farmers can grow paddy twice a year enabling them to collect a good harvest which is sufficient for the maintenance of their family throughout the year. The other activity types represented in both of the colonies are negligible when compared to the paddy and chena activities.

Apart from business and permanent jobs which are negligible in number, water plays the most important role to maintain all the other activities. Therefore, the success or failure of these is entirely dependent on either sufficient rains or reliable irrigation facilities. Rainfall is very uncertain in the area, and, as a result, water storage in the tanks is unreliable as well. Therefore, water shortages, droughts, crop losses, the abandonment of these activities, and various other hardships are very familiar to the farming communities. The uncertain natural conditions mould farmers' perception of the problems involved encouraging them to find ways and means to adjust to their hazardous environment.

5.1.2 Perceived Advantages and Disadvantages of the Settlements

People living in a hazardous area weigh up the relative advantages and disadvantages of their living environment, and these are helpful in a direct way for the understanding of their perception of hazardous phenomena. The farmers mentioned advantages and disadvantages which concern a number of aspects in their living habitats. Table 5.2 depicts the favourable factors the farmers perceive in their settlements.

Table 5.2 — Advantages of Living in the Settlements

Advantages	Ar.	Ih.	Mi.	Sw.	Ma.	Su.	Vills.	Cols.	All.
Availability of chena lands	92	96	100	100	98	27	98	63	78
Relatives and friends	100	79	64	80	72	56	72	64	69
Irrigable lands given	0	0	4	0	64	89	2	77	45
Favourably located paddy fields	0	17	20	7	44	83	15	63	42
School within easy reach	3	50	49	20	53	24	42	38	40
Irrigation facilities	0	0	2	0	47	92	1	70	40
Soil fertility	8	13	7	33	52	70	13	61	40
Place of birth	100	71	11	0	9	3	35	6	19
Availability of grazing lands	83	13	2	40	11	2	21	6	13
Availability of non-farm employment	25	0	0	0	3	39	3	21	13
Land and a house given	0	0	0	100	0	6	16	3	8

Columns: Ar. = Arabokka, Ih. = Ihalakumbukwewa, Mi. = Migahajandura, Sw. = Swodagama, Ma. = Mahagalwewa, Su. = Suriyawewa, Vills. = All villages, Cols. = All colonies and All. = All settlements.

Source: Field data. Data in percentage form. The percentages are calculated according to the number of respondents in each village. The numbers of farmers who represent the sample are 12, 24, 45, 15, 64 and 64 respectively from Arabokka to Suriyawewa. Each respondent has given several answers, and therefore, the added percentages exceed 100. This procedure continues also in the other relevant tables with field data in this chapter as well as in the forthcoming tables relevant to field data from the study sites.

Two major advantages are perceived by farmers of all the settlements, except in Suriyawewa, that is the availability of chena lands, and to have relatives and friends. The others greatly vary in importance between the settlements. The data further show that the environmental conditions, which could be considered as crucial for farming activities, represent very low values indicating the vulnerability of the farmers' subsistence (or, most often, the mere maintenance of their lives) in a frequent drought hit area.

In the villages, chena cultivation is the most important economic activity, except in Arabokka. It represents the most well-adjusted activity in an area frequently affected by drought. There is no land shortage for chenas in the area, and, as a result, any farmer can cultivate any amount of land in the forest depending on the extent of his labour capacity. In general, a farmer receives his necessary agricultural labour from his family. If a farmer uses a lot of waged labour and then faces drought conditions, he cannot bear the loss and has no way to recover it. Crops grown in chenas give farmers both money and food stuffs; the cereal varieties are storable for a longer period. Therefore, most farmers consider the availability of chena lands as their most important advantage in the village.

The human activities in the villages are greatly determined by the natural environment. Therefore, harmony between these two is as important as the harmony among the resource managers for the continuity of a society and for the prevention of major set-backs. In any society, there is great harmony among relatives and friends and many consider this as an advantage whether they live in their settlement or far away. Relatives and friends who live in the farmer's own settlement are very important for several reasons: a) farmers are not always self-sufficient and, as a result, they need frequent mutual help, b) chena cultivation is very important and adult males have to protect their chenas by staying there at night; in the case of an accident or any other problem in the permanent residence, neighbouring relatives and friends are the people who first come to help and take over the protection of his chenas, c) most farmers interchange their labour with their relatives and friends and d) farmers' contacts with the people outside the village are very low. If some do have contacts, these are mainly with friends and relatives living in neighbouring villages. In conclusion, the farmers cannot live in isolation in an environment where harmony among themselves and others is essential for their survival. As a result, healthy relationships among relatives and friends, particularly within the settlements, are very important at all times to the farmers and they are considered as an advantage.

Apart from Arabokka, all the villages have a school since the country provides free education. The quality is not high, however, and they are nominal schools only, like many other rural schools in the country lacking many basic necessities. As in any other society, people are aware that school buildings and teachers are

a necessary precondition for a reasonable education system, and that additional resources have to be provided. Many farmers, therefore, do not consider their village school as an advantage since they have a knowledge about the facilities which are given to several leading schools in the country.

It is one of the important cultural traits in Sri Lanka to admire and appreciate one's place of birth. This applies especially to the situation where someone is born and brought up in the same village. If someone migrates to another village in the area, he is considered a 'foreigner' which could be taken as an insult. This mentality is so strong in Arabokka that migrants are not even allowed to settle there. Original villagers are also high in number in Ihalakumbukwewa, where the farmers have a similar attitude towards migrants. Thus, all farmers in Arabokka and nearly three quarters of the farmers in Ihalakumbukwewa who were born in their village consider this as a great advantage.

Grazing lands are important for the livestock farmers. There are large areas without cultivation around both Arabokka and Swodagama. There is a considerable number of farmers who have cattle and goats in Swodagama. All farmers in Arabokka have cattle. Clearly, grazing lands must be considered an advantage for the farmers of both villages.

Swodagama has been renovated under the Village Reawakening Programme which is sponsored by the Sri Lankan government. As a result, all farmers have been given a house and land, and both have become an advantage in this settlement. The other advantages mentioned in the table are not so well represented here.

The variations in the perception of advantages between the two colonies are related to their different economies. Availability of chena lands was mentioned as an advantage, for example, by almost all the farmers in Mahagalwewa which is largely surrounded by forest. Suriyawewa, on the other hand, does not have lands for chena cultivation within easy reach.

The most important advantage in Suriyawewa are the irrigation facilities (which was mentioned twice as much by the farmers in the other colony). Irrigation facilities in Suriyawewa are fed by one of the largest irrigation schemes in the country. Therefore, their reliability here is relatively high, enabling farmers to cultivate in

both seasons, Maha and Yala. Irrigation facilities in Mahagalwewa, in contrast, are entirely dependent on a village tank with a small catchment area without all-year-round flow, and with no access to other irrigation schemes to augment the tank water when needed. As a result, water supply here is not as reliable as in Suriyawewa, especially in the Yala season.

Though a very important advantage for colony farmers is that of receiving irrigable land, for Suriyawewa farmers irrigable paddy land is the prime hope for their livelihood. For the cultivation of paddy in the colonies, it is necessary to follow the rules, i.e officers' orders. However, farmers have a much greater freedom as chena cultivators in Mahagalwewa, if they have enough labour. As a result, irrigable land supplied by the government is not as strongly appreciated by the farmers here as by the farmers in Suriyawewa.

Relatives and friends are an important factor. Mahagalwewa values this higher since almost all its farmers are cultivating chenas. Therefore, this factor is appreciated and applies to the colonies as well as to the villages. In Suriyawewa, where paddy cultivation dominates all activities, friends and relatives are not needed to protect the fields. In addition, Suriyawewa is one of the town centres in the area and provides basic services to the area. Therefore, people are not as dependent on friends and relatives as in the villages in order to protect their families because most of the basic necessities are available without the help of others.

Soil fertility is another perceived advantage. If there is enough water, the paddy land is considered fertile in this area, although it may be further increased by chemical fertilizers. The lower figure in Mahagalwewa reflects the chena system, under which lands are abandoned when they become infertile. Thus, Mahagalwewa farmers have now lost their fertile chena lands in the vicinity of their settlements, and have to go into forest, far away from their homes, in order to find fertile soil.

The value of a school within easy reach varies for social reasons. It seems that the farmers in Mahagalwewa do not take such a strong interest in the facilities in the school as Suriyawewa farmers do. Farmers in Suriyawewa consider this fact very highly. Thus, although their school is one of the biggest in the country, they perceive its facilities as very poor. The result is that the farmers in Suriyawewa do not consider their large school as a great advantage. The other advantages mentioned by some farmers are not well represented in either settlement.

The most striking factor one can observe from the data is that the most important advantages in those settlements where chena activities are carried out are not so important in Suriyawewa where the main activity is paddy cultivation with reliable irrigation water. Furthermore, based on some socio-economic factors, the advantages 'grazing lands', 'place of birth' and 'land and house given' have emerged as prominent advantages in Arabokka and Swodagama. On the other hand, all the farmers appear to prefer chena cultivation to paddy (even though they have been given irrigable paddy fields) if these lands are available in the vicinity of their settlements.

Though the farmers have advantages in their settlements, they have also serious problems, since these settlements are located in an area which is hit by frequent droughts. The farmers relate various disadvantages to this situation and these are very helpful in order to understand the hazardous nature of their settlements. Table 5.3 depicts the disadvantages in the settlements according to the farmers' responses.

Table 5.3 — Perceived Disadvantages of the Settlements

Disadvantages	Ar.	Ih.	Mi.	Sw.	Ma.	Su.	Vills.	Cols.	All.
Droughts damage crops	100	100	100	100	98	86	100	92	95
Wild animals damage crops	100	96	96	100	92	44	97	68	80
Income seasonal	33	83	82	80	63	38	76	50	61
Transport difficulties	100	78	71	100	50	33	76	41	56
Inadequacy of water for daily needs	42	63	69	87	66	31	67	48	56
Seasonal food shortage	50	63	69	73	38	42	66	40	56
No marketing facilities for produce	42	67	53	33	56	45	52	51	51
Officers' cooperation insufficient	25	38	38	40	50	73	36	62	51
No satisfactory health facilities	50	54	71	60	58	20	63	39	49
Agricultural lands are far away from home	0	75	84	93	41	17	73	25	48
Farmers' cooperation insufficient	25	13	13	20	50	45	16	48	38
Alkalinity and salinity of the paddy fields	0	0	13	0	20	58	6	39	25
No satisfactory school facilities	0	21	18	7	17	14	15	16	15

Columns: Ar. = Arabokka, Ih. = Ihalakumbukwewa, Mi. = Migahajandura, Sw. = Swodagama, Ma. = Mahagalwewa, Su.= Suriyawewa, Vills. = All villages, Cols. = All colonies and All. = All settlements.

Source: Field data. Data in percentage form.

In summary, the pattern of responses to the disadvantages of the settlements differs strongly from that of the advantages. According to the table 5.3, eight out of thirteen disadvantages were mentioned by more than 50% of the farmers. All the village farmers and almost all the farmers in Mahagalwewa and Suriyawewa perceived drought as their number one disadvantage.

With regard to village farmers, it is clear that they cannot rely on a harvest because of the sheer unreliability of the rains and irrigation facilities in an environment subject to drought conditions. Therefore, crop damages due to drought are common for every farmer in every village, and drought losses are considered as their most severe disadvantage.

The prime importance of chena cultivation for almost all farmers is the reason why wild animals damaging crops is considered as a great disadvantage. Chenas are mainly situated away from the residential area and in the forests. They are very likely to be damaged by wild animals unless farmers stay and protect them, especially at night. Paddy is mainly damaged by birds, but occasionally also by other animals. When the pods of paddy are maturing, the fields should be protected from birds during the day time.

Since agricultural activities correspond with the rainy seasons the income created by the harvest is also seasonal. Most farmers' income is very low, but they have to maintain their living with this income for the whole year. When their already limited income is also seasonal and uncertain, it is bound to be a great disadvantage. This disadvantage is very common for every village, except for Arabokka where cattle rearing allows for a return throughout the year.

It is little wonder that transport difficulties are a major disadvantage. There are no public transport facilities for Arabokka and Swodagama. Thus, everybody has to walk more than three miles in order to reach public transport facilities, unless the farmers have their own vehicles (mainly bicycles). Walking is very difficult, especially during the drought periods. Therefore, every farmer sees this as a disadvantage.

Agricultural lands far away from home are, again, a disadvantage as is implied by the importance of chena cultivation in the three villages. Arabokka is, again, the exception here. Most grazing lands here are in the forest where the cattle

can stray unattended. Because of the freedom Arabokka farmers gain from this they can engage in other activities. If they engaged in chena cultivation far away from their homes, they would not have this freedom and would have to protect their chenas from cattle as well as from other wild animals. Other activities would thereby have to be neglected. Though farmers in Arabokka too cultivate chenas, these are not far away from home, so that most of their family members are able to help and protect the chenas. As a result of frequent chena cultivation around the other three villages, suitable lands for chenas are no longer available within easy reach of the farmers. It is therefore in chenas far away from their homes, in the forest, that wild animals can bring harm to the farmers. The far distance makes for additional transport difficulties for the farmers.

Agricultural success is entirely dependent on rains. Rains are seasonal, limited to one major season and to a very short period in the year and highly uncertain. As a result, agriculture is seasonal and the harvest also becomes uncertain. Therefore, most farmers in every village have to face a seasonal food shortage which further enhances their perception of droughts.

Farmers consider the government activities as neither efficient, sufficient nor reasonable in order to develop their life and their area. Though health and marketing facilities are considered as very important by farmers, their poor quality is a disadvantage for their life in the villages. Even though satisfactory marketing facilities can make a greater impact to develop the villages, satisfactory steps have not yet been taken by the government. Without proper and reasonable interference from the government, however, there is no way for the farmers alone to solve these problems. Therefore, farmers expect the genuine interference of the government in this matter.

When it comes to the farmers in the colonies the general picture in the table very clearly shows that the disadvantages have been more stressed by Mahagalwewa farmers than farmers in Suriyawewa. However, in both colonies farmers see drought and drought-related problems as their biggest disadvantages.

Although the irrigation facilities are relatively reliable during the crop growing periods, almost all the farmers still see drought as a potential threat to their crops. There are several reasons why this is so. Irrigation facilities are only available for paddy, but farmers in both colonies also grow highland crops in their gardens as

well as in their chenas especially in Mahagalwewa. Crop losses due to droughts are very common in the area. For instance, farmers in both colonies could not produce a paddy harvest in the 1987 Yala season: in Mahagalwewa farmers gave up the paddy fields without cultivating, and Suriyawewa farmers were not given irrigation water due to lack of water in the major reservoir in the scheme when their paddy was blossoming. Their general frustration was augmented by the fact that there is yet more land in the surrounding areas which they cannot use for farming activities due to lack of water.

Wild animals also damage the crops of the farmers in the colonies. In Mahagalwewa this dilemma ranks high and is a reflection of its chena cultivation. All chena cultivators whether they live in villages or colonies have to face this problem since chena lands are far away from their settlements and surrounded by forests. For paddy cultivation, bird damage to seeds, paddy, and matured paddy before harvesting is a threat. This damage increases with the distance of paddy lands from the settlements of farmers. Thus, farmers with their paddy fields distant from their home face this problem in particular.

Government officers play a considerable role in enhancing the life of the farming communities. There are a number of officers, especially in colonization schemes, who are given responsibilities to develop the agricultural, economic, social and cultural standards of the farmers. The number of officers and their activities in Suriyawewa are much higher than in Mahagalwewa. The greater interaction between officers and farmers in Suriyawewa leads to conflicts. According to my field observations, most of these officers appeared to be politically appointed, politically partial, and corrupt. When I started field work, the anger of the farmers about these activities was at its highest level and they set fire to the buildings of the corrupt officers (end of July and beginning of August in 1987). Under the prevailing circumstances, cooperation of the officers was lacking not only in relation to agricultural activities, but in every other aspect.

In general, there are no reasonable and efficient marketing facilities for the farmers' produce in the area. Mahagalwewa farmers come to Suriyawewa to sell their produce and to buy their necessities. When the farmers sell, they become frequent victims of black-marketeers, short measurements, condemnation (quality is degraded by buyers) and low prices. They similarly lose when buying goods

by paying high prices for short measurements, low quality and adulterated goods. Though there are government organisations and officers to deal with these matters, they turn a blind eye on these problems as they are treated by the businessmen at the expense of growing hazardousness. Therefore, officers who work for these organisations have no commitment to stop these activities.

In Mahagalwewa, farmers carry out their agricultural activities with a high reliability during the Maha season, while in the Yala season agriculture is highly uncertain. Therefore, most of the farmers' income is seasonal, putting them under greater economic hardships. The income of farmers in Suriyawewa is dependent on the harvest of two seasons which are highly reliable. This reliability of their harvest made possible by their reliable irrigation facilities does not allow them to consider their income as seasonal.

Another considerable disadvantage, especially for Mahagalwewa, is the inadequacy of water for daily needs. Given the sparsity of rainfall, the lack of cooperation among farmers in relation to water management is a further disadvantage which neither settlement can afford. Other considerable disadvantages in Mahagalwewa are the lack of satisfactory health facilities and transport difficulties. Suriyawewa is a town and these are, therefore, not considered as disadvantages.

In Suriyawewa, the alkalinity and salinity of the paddy fields represent a considerable problem. This area was to produce cotton under the initial development plan of the Walawa irrigation scheme. The reason for this was the high suitability of the soil here for cotton, but not for paddy. However, with the introduction of the open economy after 1977, national industries could not compete with foreign goods and became the first victims, and consequently, the demand for cotton was lost. Farmers gave up cotton and started to grow paddy. However, there still remains the unfavourable soil for the paddy farmers to cope with.

In Mahagalwewa, the location of the agricultural lands presents a great disadvantage and is very frequently mentioned by the farmers. Chena lands are mainly located far away from the permanent residence of farmers. As chena cultivation is very dominant in Mahagalwewa farmers inevitably have to face this problem.

5.2 Drought Definitions

Since drought is the ever-present major problem facing farmers and their activities, I tried to find their actual definitions of the phenomenon in order to elicit more precisely its perceived nature. Their responses to my direct questioning can be grouped into two, water-related and harvest-related definitions (see table 5.4).

Table 5.4 — Drought Definitions of Farmers

Definitions	Ar.	Ih.	Mi.	Sw.	Ma.	Su.	Vills.	Cols.	All.
Water-related Definitions									
No rain for cultivation	100	92	100	93	98	81	97	90	93
No rain in Maha season	92	79	98	87	98	81	91	90	90
A dry year	25	88	64	33	67	53	60	61	60
No irrigation water for cultivation	17	33	42	27	58	98	34	34	59
Entirely dried-up tanks	67	79	93	93	45	28	84	78	58
Less than normal rainfall	42	13	44	40	70	52	35	60	50
Several dry years	42	54	27	13	53	14	33	14	33
A dry period of several months	75	33	27	33	16	11	35	37	23
Harvest-related definitions									
Entire crop loss in one season without rain or water	100	75	80	73	92	97	80	94	88
Entire crop loss within one year without rain or water	100	71	66	73	76	59	73	68	70
Entire crop loss within several years without rain or water	0	17	29	20	36	36	21	36	29
Less than normal harvest	25	21	33	33	28	25	29	25	28
Much less than normal harvest	25	13	33	13	23	27	26	19	25
No grass for cattle	92	25	16	40	23	14	31	27	24

Columns: Ar. = Arabokka, Ih. = Ihalakumbukwewa, Mi. = Migahajandura, Sw. = Swodagama, Ma. = Mahagalwewa, Su. = Suriyawewa, Vills. = All villages, Cols. = All colonies and All. = All settlements.

Source: Field data. Data in percentage form.

The responses very close to the farmers' agricultural activities dominate the list of definitions. The two most common definitions mentioned by almost all the village farmers were "no rain for cultivation" and "no rain in the Maha season" (e.g. in the main agricultural season which has a high probability of rains). Another frequent definition concerned the tank. Tank water is used for agricultural activities and daily necessities, especially for bathing and washing. Since an entirely dry tank speaks of prolonged severe drought conditions, thereby bringing

stringent hardships to the peasant community, such a definition is readily understandable. "A dry period of several months" is of a high significance in Arabokka alone. The explanation for this is that all farmers in this village keep cattle. Under the dry conditions, even within a period of several months, grass varieties can wither and die, thereby producing a fodder shortage. This relationship is confirmed by the uniquely high figure for the definition "no grass for cattle" found in this village among the harvest-related definitions. Among the harvest-related definitions, there are two which are uniformly high in all four villages. They reflect the hazard under which the people continually live, totally dependent as they are on the climate.

In the colonies, the variety of definitions of Mahagalwewa farmers is relatively high compared to Suriyawewa farmers. Farmers in Mahagalwewa emphasize the importance of rainwater while their counterparts in Suriyawewa focus their attention more on irrigation water. It is evident that, though both colonies have irrigation facilities, the higher reliability of these in Suriyawewa means almost all farmers there have defined drought in terms of lack of irrigation water. On the whole, farmers are unable to bear an entire crop loss in one season because of their poor economic standards. If they loose the crops in one season, then the situation they have to face is definitely very difficult. Therefore, almost all the farmers in both colonies have defined a drought in terms of crop losses in a season without rain or water under the harvest-related definitions.

The responses which are most closely related to the farmers' agricultural activities dominate the list of definitions. Another identifiable characteristic is the variety of definitions given by the colony farmers, even though their irrigation facilities are considered reliable. This reflects the destructive effects of drought on their lives and their awareness of the destructive force of the droughts on several levels.

In the villages the definition "entirely dried up tanks" is high; it indicates the role which is played by the village tank to counter attack their major environmental enemy, drought. If the village tank is entirely dried-up it means that people living in the village suffer severe day-to-day water shortages, especially for bathing and washing. Thus, they have to go far away from the villages for these essential daily necessities especially in a hot, dry and dusty drought period. Furthermore, farmers

are not very anxious if they cannot grow paddy under the village tank because their main activity is chena cultivation.

However, the tanks in the two colonies are never entirely dried-up by droughts, and therefore, farmers do not measure drought in terms of dried-up tanks. On the other hand, the farmers in the colonies measure droughts in terms of unavailable irrigation water. This definition, however, has a very low recognition in the villages proving the fact that they are not very keen on irrigation under the existing environmental conditions and according to their economic activities. The harvest related definitions show that farmers cannot cope with drought if they have to face a crop loss in one or two seasons due to droughts. Therefore, the entire loss of crops within one season or one year without rain or water has become a very important definition in all the settlements. Furthermore, when the farmers' main economic activities are damaged by drought they also consider this fact as a definition of drought. It follows that all the farmers define drought in terms of crop losses.

When these definitions are seen in conjunction with the farmers' perceptions of the other aspects of the settlements discussed elsewhere in this chapter, their interconnectedness becomes very clear. As a result, we are able to understand the importance of drought and the way in which it affects every facet of the farmers' everyday life. At the same time it is possible to appreciate their depth of understanding of the causal and contingent linkages between drought and their economic and social behaviour.

5.3 The Farmers' Discussion of the Drought

Drought in the area is the focal point of discussion on most occasions. Being the major problem for the farming people, they discuss it whether or not they can receive relief aid (see table 5.5).

The table 5.5 shows that over four-fifths of the village farmers discuss the drought problem with neighbours. According to field observations the most important place for the farmers to gather appeared to be the village shop, the source for basic necessities and for tea drinking, smoking and beetle chewing facilities. Most of the farmers gather in front of the shop on several benches provided by the shop owner. Here, while having refreshments, farmers discuss various matters which vary from the puberty of a village girl to contemporary important international

Table 5.5 — The Farmers' Discussion of Drought Hazard

Discussions with	Ar.	Ih.	Mi.	Sw.	Ma.	Su.	Vills.	Cols.	All.
Neighbouring farmers	75	100	73	100	86	55	84	70	76
Government officers	33	33	64	87	52	70	55	61	59
Settlement basis organization	17	25	4	47	13	17	18	15	16
Politicians in the area	17	0	4	13	3	2	6	2	4
Elites in the village and colony	17	0	4	20	9	5	7	7	7

Columns: Ar. = Arabokka, Ih. = Ihalakumbukwewa, Mi. = Migahajandura, Sw. = Swodagama, Ma. = Mahagalwewa, Su. = Suriyawewa, Vills. = All villages, Cols. = All colonies and All. = All settlements.

Source: Field data. Data in percentage form.

events. Village farmers are therefore well informed. During drought conditions, they have little else to do in their village and thus spend most of their time in front of the shop playing cards or draughts and talking to each other. This pattern of behaviour has become the main element to condition their overall perception of nature, economy, society, politics and culture.

The drought problem is discussed with government officers by over half of the farmers of all villages, although this figure varies between migrant and non-migrant villagers. Local villagers appear pusillanimous before officers; migrants, on the other hand, have a more business-like relationship with government officers and they obtain many facilities.

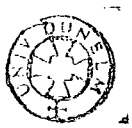
Since Swodagama is a newly established village, they have village level organizations to discuss their problems. The politicians and elites in the villages are not popular amongst farmers and are usually not admitted to these discussions. Anybody who associates with the village community can understand how the hazardousness is being increased by the politicians and elites in the villages.

The colony farmers also show that their most frequent discussions are with neighbouring farmers, followed in frequency by discussions with government officers. However, the values are contrasting between the two colonies because of the domination of chena cultivation in Mahagalwewa where harmony among farmers is necessary, and the domination of government officers in Suriyawewa, on whose assistance farmers rely for many of their necessities.

Mahagalwewa is highly rural in character with fewer modern facilities and with few government officers in the colony. As a result, decisions on farmers' activities here do not rely so much on the advice of government officers. For the farmers the most profitable people with whom to discuss their problems are their neighbouring farmers. At the same time, however, more than half of the farmers discuss the drought problem with the government officers. Suriyawewa contrasts with Mahagalwewa in many respects. Though it too has rural characteristics, it is rapidly developing into an urban centre. Therefore, it is exposed to modern facilities. Most of the government offices have been located here. Discussions with regard to agricultural activities, irrigation facilities and most of the other activities of the farmers are heavily or entirely controlled by the officers. Being thus heavily dependent, they tend to discuss their problems with officers rather than with their neighbours. As almost all are migrants from various parts of southern Sri Lanka, there do not seem to exist very amiable relationships among the farmers as in the villages and in Mahagalwewa. The lower cohesion among farmers has led to their bribing of officers. Thus, farmers who have money and influence take advantage of the public funds and facilities. Bribery has become the social norm in the area. Though the private sector is normally believed to be the more efficient system, the bribery-ridden government sector has, by its action, become the most efficient for the people who can afford the bribes. There are drought relief and other relief aids supplied by the government to poor people in the area, but because of bribery, rich people are also receiving so-called relief aids. Field observations very clearly showed the anger of farmers against corrupt officers, especially the Walawa Scheme officers. (The Walawa scheme has been amalgamated with the Mahaweli Scheme which is the largest irrigation scheme in the country at the present). This is the unhappy background for officers' and farmers' relationship in Suriyawewa where farmers discuss the drought problem mostly with government officers.

Very few farmers in the colonies discuss their problems with organisations, politicians and elites. Amongst these, politicians have an immense supporting power when farmers are in distress. Apart from the election periods their commitment to help the poor farmers is negligible, and knowing this condition, farmers do not seek their help or discussion.

When all the settlements are considered, it is clear that the farmers prefer



to discuss their major problem with their neighbouring colleagues to any other individual or organization. However, their potential to cope with the hazardousness of droughts can be heightened if they can organize themselves on the settlement level.

5.4 Farmers' Memory of Drought from 1980 to 1987

All the village farmers and 92% of the farmers in the colonies mentioned drought as their major disadvantage. The next logical step was to test their memory of the frequency of this phenomenon in order to study their degree of awareness about the drought hazard. I confined this investigation to the period between 1980 and 1987 and I asked the farmers which were the drought-affected years in their settlement from 1980 to 1987. Table 5.6 gives the farmers' answers in percentages.

Table 5.6 — Farmers' Memory of Drought Affected Years from 1980 to 1987

Year	Rainfall (mm.)	Ar.	Ih.	Mi.	Sw.	Ma.	Su.	Vills.	Cols.	All.
1980	1126	17	21	20	20	16	13	18	15	18
1981	751	67	92	69	47	31	30	71	31	48
1982	1235	17	50	29	13	30	13	30	22	29
1983	639	92	100	93	80	86	55	93	71	80
1984	995	58	67	76	73	44	38	71	41	59
1985	1064	17	29	64	60	36	20	49	28	38
1986	973	92	100	98	100	95	75	98	85	91
1987	889	92	100	100	100	100	100	99	100	99

Columns: Ar. = Arabokka, Ih. = Ihalakumbukwewa, Mi. = Migahajandura, Sw. = Swodagama, Ma. = Mahagalwewa, Su. = Suriyawewa, Vills. = All villages, Cols. = All colonies and All. = All settlements.

Source: Rainfall data, Dept. of Meteorology, Sri Lanka and field data. Data in percentage form.

For an objective analysis, these data should be compared with the actual rainfall figures. The relevant data for this period is only available from Hambantota station, where the average annual rainfall is 1060 mm. These data clearly show that, in 5 of the 8 years rainfall had been lower than the average. Therefore, it is not unfair to consider this period as one affected by drought. When we compare

the rainfall figures with the farmers' memory it is evident that their memory too reflects the picture given by the rainfall figures. The reasons for their accuracy are that the period was short and quite recent and the fact that the farmers' memories are reinforced by the pattern of their past agricultural activities. This was evident in the manner of their replies to my questions on rainfall. Thus they recollected whether their tanks were over-flown, whether they were able to cultivate or had to abandon the paddy, and how they faced crop losses in the chenas, and then finally characterized the year as a drought, or drought free year.

The data in table 5.6 show that the farmers in the villages remember the drought years and that these years also coincide with the years with very low rainfall. Drought in 1983 affected the Wet Zone as well as the Dry Zone and was, therefore, very memorable. In 1986 and 1987 there was also a very severe and prolonged drought condition, even damaging most of the perennial crops like coconut which are normally resistant to droughts. Even very old coconut trees died under the severity of this drought. Thus, most of the farmers mentioned the 1986-1987 drought as one of the most disastrous droughts. Table 5.6 shows that the farmers in the villages have a good memory. The reasons for this are that the tank water was unreliable and insufficient for their paddy cultivation, and that almost all of them have chenas which are entirely dependent on rain water. Since the drought stops and destroys their economic activities and drives them into poverty and hardship, it is not surprising that they should remember it very clearly.

When the memories of the colony farmers are concerned table 5.6 shows that, except in 1987, in all other years the perceived effect of drought in Mahagalwewa is higher than that of Suriyawewa. The latter is a colony which is irrigated by one of the major irrigation schemes, "The Walawe" in which the water is impounded by damming the Walawe river which has its origin in the Wet Zone and a very large catchment area. Accordingly, paddy fields can be irrigated in both seasons, Maha and Yala. In Mahagalwewa, by contrast, the irrigation facilities do not have a high reliability. The river Malala Ara is impounded at Mahagalwewa to build the Mahagalwewa tank. But this is a very small river which starts within the Dry Zone with a small catchment area without a year-round flow. A reliable water supply from Mahagalwewa tank for the two seasons is thus unreliable, especially for the Yala season.

There is a second reason for the Mahagalwewa farmers recording a higher experience of drought. It is their chena cultivation which is entirely dependent upon rains. Farmers in Mahagalwewa practise both paddy and chena cultivation. Their cultivation area, therefore, is bigger in relation to that of the Suriyawewa farmers. In the event of drought they have to face greater damages because of their larger cultivated areas under paddy and chenas. In 1983, 1986 and 1987 most parts of the country were severely affected by droughts. Though the table shows this too, the difference between the two colonies is higher for 1983 and 1986. The reason is that the reliable irrigation facilities from the larger Walawa reservoir which receives its water form the river Walawa which starts from the Wet Zone had reduced the severity of droughts in Suriyawewa, while Mahagalwewa was suffering because of its inability to augment the water level in the tank due to its smaller catchment area. Although, the farmers in Suriyawewa cultivated paddy, they could not reap the harvest in 1987 because, during the period paddy was blossoming, irrigation was stopped due to lack of water in the Walawa reservoir. As a result, 1987 was registered in all farmers' minds as a drought year. Because of the agricultural destruction due to the drought, farmers in both of the colonies were given drought relief aid by the government in late 1987 and early 1988.

It is clear from this general picture that the farmers' memory is more accurate in the villages than that of their counterparts in the colonies. It indicates that droughts damage farming activities and create more hardships for the village communities than for the farmers in the colonies.

5.5 Perception of the Pattern of Drought Occurrence

It is clear that the damaging effects of droughts for the farming community in the settlements are immense, and that occurrences of droughts are frequent. Since drought in the area is a frequent recurrent phenomenon, it seems logical to study whether the farmers have perceived any kind of pattern of the occurrence of this hazard. Therefore, I asked them whether they could identify any pattern related to the occurrence in order to elicit their perceived pattern of drought occurrence. Table 5.7 summarizes the results for this question.

Only 29% of the farmers from all the settlements could not identify a pattern or regularity of drought occurrence. The most common pattern identified by the

Table 5.7 — Pattern of Perceived Drought Occurrence

Pattern	Ar.	Ih.	Mi.	Sw.	Ma.	Su.	Vills.	Cols.	All.
No pattern	33	8	20	20	27	45	19	36	29
Annually	17	4	24	13	0	11	17	6	10
Once every two years	50	83	51	60	63	41	60	52	56
Once every three years	0	4	4	0	10	3	3	7	5
Once every four years	0	4	0	7	0	0	2	0	1

Columns: Ar. = Arabokka, Ih. = Ihalakumbukwewa, Mi. = Migahajandura, Sw. = Swodagama, Ma. = Mahagalwewa, Vills. = All villages, Cols. = All colonies and All. = All settlements.

Source: Field data. Data in percentage form.

farmers is that of drought occurring once every two years. Also, there are little local differences in the responses of the farmers.

Since the farmers in Ihalakumbukwewa, Migahajandura and Swodagama are mainly chena cultivators, they cannot survive by cultivating in the October to December rainy season alone. Therefore, however high the drought risk is in the rainy season around April, some of them try chena cultivation. In these three villages, farmers have also identified the pattern of drought occurrence with a high accuracy. In all villages, 60% of the farmers have perceived drought as a biannual phenomenon, and 17% as an annual incidence. Furthermore, farmers consider a crop loss within one season without water as a drought (see drought definitions). Therefore, the chena cultivation which is entirely dependent on rains is faced with frequent crop losses due to highly unreliable rains, thus enhancing the frequency of the events which are considered as droughts.

The picture of perceived drought occurrence shows that the majority of the farmers in the colonies also have perceived the phenomenon as biannual. One-third of the farmers could not identify any pattern of drought occurrence. But, taken as a whole, a clear difference can be seen amongst the data between these two colonies. In Mahagalwewa three-quarters of the farmers have identified some kind of pattern, while in Suriyawewa less than half of them have. The nature and type of agricultural practices and differences between irrigation facilities are responsible for this contrast.

When the figures of drought occurrence (table 5.7) are compared with moisture index data and cumulative probability graphs related to agricultural seasons (appendix H) it can be seen that the majority of the farmers in every settlement have perceived a pattern of drought occurrence very near to recorded reality, i.e. a biannual pattern.

5.6 Perceived Special Characteristics in a Drought-free Year

Since farmers live permanently in a drought - no drought situation, the emphasis put on various aspects of a drought-free year were sought in an effort to gauge their general perception. The responses are given in table 5.8.

Table 5.8 — Special Characteristics in a Drought-free Year

Special characteristics	Ar.	Ih.	Mi.	Sw.	Ma.	Su.	Vills.	Cols.	All.
A very good harvest	100	100	91	87	95	88	94	91	92
Successful agriculture in both seasons	100	92	89	87	88	80	91	84	87
Sound family economy	58	67	96	80	86	78	78	82	82
Tanks overflow with rains	100	92	64	87	95	38	79	66	72
Green trees with many fruits	50	58	38	87	78	55	52	66	60
More than normal rain	50	33	51	26	77	63	46	70	59
No water scarcity in the settlement	17	29	49	67	56	45	43	51	47
Several rains in every month	25	42	38	40	44	33	38	38	38

Columns: Ar. = Arabokka, Ih. = Ihalakumbukwewa, Mi. = Migahajandura, Sw. = Swodagama, Ma. = Mahagalwewa, Su. = Suriyawewa, Vills. = All villages, Cols. = All colonies and All. = All settlements.

Source: Field data. Data in percentage form.

The table clearly confirms that the farmers in the villages evaluate a drought-free year in terms of a very good harvest and their year-round agricultural activities. They are less aware of the character of rainfall than of the overflowing village tanks. The immediate effective environmental factors, to be seen everywhere in their settlements, have been emphasized, rather than less frequent and less visible rainfall. Green trees with fruits are important in the villages to a considerable level because of the surrounding forest. With a majority being chena cultivators, farmers' association with the forest is very close in the villages. 'No water scarcity in the settlement', refers to the daily water needs of the family, rather than those

of agriculture. The low value for this compared to the other characteristics reflects this. Most farmers, knowing the impossibility of several rains within every month, do not consider this as a special characteristic during a drought-free year.

The most important characteristics for the colony farmers are also shared by the village farmers, viz., a very good harvest and successful agriculture during the whole year. For a very good harvest, the year-round agricultural activities should be practised and the consequence is a sound family economy. These conditions are represented by the characteristics in the table. More than normal rainfall, as a drought-free indicator, shows high values for both of the colonies, while the contrasting figures for an overflowing tank result from the previously mentioned difference in type of irrigation among both colonies. 'Green trees with fruits' as a drought free characteristic is very important in Mahagalwewa while with the completely depleted forest in Suriyawewa, the farmers cannot see this in their settlement. Other characteristics mentioned by the colony farmers are of the same nature as in the villages.

The farmers in every settlement consider a very good harvest with year round agricultural activities as the most important indicator of a drought-free year. However, in the settlements where agricultural activities depend on the irrigation tank over-flow is considered to be the outstanding factor in a drought-free year. In Suriyawewa where irrigation is fed by the big Walawa irrigation scheme, farmers do not see overflowing tanks as an important factor. Consistent with the conclusions, the definitions of a drought-free year offered by the respondents are those given above for droughts. Therefore, they are helpful in a study of farmers' drought perception and adjustments.

5.7 Drought-predicting Indicators of the Farmers

Given that the hardships created by droughts are so harsh and long-lasting, it is natural that the farmers are very sensitive to environmental changes which may herald a drought. The knowledge they have gathered in this respect with their observations through generations help them to a certain extent to face and prepare for their major problem in advance. According to the farmers' traditional wisdom they have indicators that predict a forthcoming drought, and these are given in table 5.9.

Table 5.9 — Drought-predicting Indicators

Indicators	Ar.	Ih.	Mi.	Sw.	Ma.	Su.	Vills.	Cols.	All.
Not enough rain in expected rainy days	75	92	98	93	97	88	93	92	92
Wind direction changes frequently	100	96	89	87	92	88	92	90	91
Fewer fruits in forest fruit trees	67	67	69	67	78	33	68	55	61
Reddish sun in the mornings and evenings	67	67	56	53	67	58	59	64	61
Hill country cannot be seen	100	67	62	60	63	42	68	52	59
Heavy dew in the mornings	50	58	62	60	42	42	59	42	50
Dark blue sky	50	42	53	53	56	42	50	49	50
Chilly weather at nights and mornings	58	38	62	27	73	22	50	48	49
Heavy mist in the mornings	42	33	49	53	48	50	45	49	47
Rainy season starts with three thunders	33	33	42	40	41	31	39	36	37
Cracked ground surface	42	42	33	47	38	30	39	34	36
Sky dense with stars at night	33	38	24	40	47	28	31	38	35
Cloudless clear sky	25	13	42	27	50	22	30	36	33
Hawks fly very high in the sky	25	33	29	20	41	31	28	36	33
No rain in April and May	42	25	38	20	38	17	32	27	29
These are not so reliable as formerly	50	63	51	40	72	39	52	55	54

Columns: Ar. = Arabokka, Ih. = Ihalakumbukwewa, Mi. = Migahajandura, Sw. = Swodagama, Ma. = Mahagalwewa, Su. = Suriyawewa, Vills. = All villages, Cols. = All colonies, and All. = All settlements.

Source: Field data. Data in percentage form.

For all the farmers, the most important indicator relates to the incidence of rainfall. If the rainy season does not start in October, and the rains are not sufficient in the major agricultural rainy Maha season, the probability of a drought in the year is extremely high. The accuracy of this indicator is proven by the cumulative probability of moisture index values graphs in appendix H. In addition, the rainfall data related to Hambantota district in chapter three contribute greatly to clarify the gross limitations and uncertainties of the rains even in the main agricultural Maha season. Furthermore, the farmers' drought definitions 'no rain for cultivation' and 'no rain in Maha season' also prove the validity of this as an indicator. 'Frequent changes in wind direction' is the second most important indicator. The farmers' awareness of the behaviour of the wind direction is also clear and has been mentioned in chapter four in the context of the preparations for chena cultivation. When this feature occurs, the cloud formation is restricted

and, consequently, substantial rain is impossible.

Apart from these major indicators whose validity is irrefutable, other indicators are not mentioned very frequently in the settlements. However, their number shows that the farmers are observing a variety of phenomena in order to foresee the arrival of their major enemy. The importance of forest for the people in five of the settlements is very clear by now. Being so closely linked to the forest the farmers have observed some of the changes which occur in the forest when a drought is approaching. Among other things they have observed that a lack of fruit on trees is a clear indication for a future drought. 'Reddish sun in the mornings and evenings' as an indicator to predict drought is very common even in the Wet Zone. The hilly area in the centre of the country can be seen very clearly by anybody in the area because the surrounding landscape is relatively flat.

Especially at night, one can see the electric lights of the cities in the hill country. However, when the hilly area is covered by mist and fog it cannot be seen. When fog and mist form, there is no possibility of forming clouds. When clouds appear in the hilly area, the winds bring them into the study area and rains occur. Therefore, farmers' perception of this as an indicator further shows their knowledge and awareness of environmental matters. When the drought hits a larger area, not only the hill country but also other parts are covered by a veil of mist and dew. A 'dark blue sky' means the absence of clouds and chilly weather at night and in the mornings. All the other indicators with low values also show that the farmers are observing the changes of their living environment carefully in order to predict future droughts. Another important fact is that the farmers do not make references to rainfall behaviour during the Yala season. Their lack of concern with the Yala agricultural rainy season is apparent in the relatively low response rate to the indicator 'no rain in April and May'. The reason may be that they know this season to be highly drought prone, and therefore take it for granted that it would not rain.

Finally, probably the most important insight to be gained from the table is that these indicators have been very reliable for the farmers in the past. The farmers mentioned that about twentyfive years ago these indicators were highly reliable in order to predict future droughts. But, more than half of the farmers in the settlements mentioned that these indicators, once reliable, are no longer so.

The farmers' judgement is based on their life-long experience and should not be dismissed, not least because it is possible to compare it with the existing data for rainfall figures. When the rainfall data were analysed in chapter three, it was clear that during the past 20 - 25 years rainfall decreased considerably.

In conclusion, the table shows that the farmers proffered 15 different drought indicators, and more than half of them doubted their present validity. The variety and type of observations show that farmers habitually observe the changes in their environment which indicate the advance of a drought or a dry spell. Thereby, they can attempt to avoid losses and prepare for the forthcoming hazardous event.

5.8 Rain-predicting Indicators of the Farmers

While the previous section was concerned with drought predicting indicators, this section argues that farmers are also examining signs in their environment for approaching rains. When a community, especially a farming community, has to face frequent droughts, rain is eagerly awaited by them. Thus, the alertness of the farmers to rain-predicting indicators is to be expected, and the farmers in all settlements were able to offer a long list of over two dozen indicators (see table 5.10).

Of the total of 24 indicators, 15 relate to bird and animal behaviour, and 4 to humans. The remaining are concerned with changes in the environment. Since the number of indicators is relatively high, they are classified under five headings in the table.

The section related to climate lists seven indicators, and the most frequently mentioned indicator is that of high temperature. When the air is dry there are no agents in the atmosphere to be heated and thereby to increase temperature. Therefore, during a drought period chilly weather especially at night and in the morning is normal, but when rains come, the level of atmospheric humidity increases. As water particles in the air are heated through insolation the air temperature goes up and clearly affects the human body. (This indicator to predict rains is not only limited to the study area but also applies to the Wet Zone from my own experience.) The rains for the Maha and Yala seasons start with thunder storms. In general, lightning and thunder come from the direction of the coast and the farmers are keen to observe this direction. If the thunder storms come from any

Table 5.10 — Rain-predicting Indicators

Indicators	Ar.	Ih.	Mi.	Sw.	Ma.	Su.	Vils.	Cols.	All.
Climate related indicators									
Temperature increases rapidly	75	86	93	93	95	86	90	91	90
Particular direction of thunder	92	96	91	100	91	81	92	86	89
Absence of winds	100	83	80	87	94	72	84	81	83
Sudden willy-willies or dust devils	83	86	82	87	80	58	84	69	75
Direction of the origin of clouds	33	58	40	47	73	56	45	65	56
Rainbows	42	21	20	20	33	34	23	34	29
Thunders start one week before rains	25	50	36	47	44	14	40	29	33
Body related indicators									
High perspiration	75	79	84	80	91	83	81	87	84
Very great thirst	75	86	80	73	80	81	80	81	80
Body is very dry	75	75	73	80	83	77	75	80	78
Bodily discomfort	75	75	76	87	81	72	77	77	77
Animal related indicators									
Chameleons make noise	58	71	80	73	75	55	74	66	69
Hawks make noise	50	54	69	67	64	61	63	63	63
Elephants make noise	83	79	60	87	80	31	72	51	63
Frogs make loud noise	92	71	67	53	63	52	69	57	62
Monkies make noise	42	33	42	80	45	38	46	41	43
Diyakawa (a bird) makes noise	50	33	33	73	45	28	42	37	39
Kedetta (a bird) makes noise	42	33	33	40	48	38	35	43	35
Seru flocks (birds) make noise	75	33	29	33	39	19	36	27	31
Insect related indicators									
White ants emerge from rubbish piles	42	67	42	67	56	59	52	58	55
Ants emerge from ant-hills	58	63	47	47	45	38	52	41	46
White ants with feathers come out	33	42	47	47	41	48	44	45	44
Other indicators									
Many fruits on forest trees	75	75	69	73	77	33	72	55	62
Hill country can be seen	100	67	60	60	61	42	67	52	58
These are not so reliable as formerly	50	58	53	40	59	42	52	51	51

Columns: Ar. = Arabokka, Ih. = Ihalakumbukwewa, Mi. = Migahajandura, Sw. = Swodagama, Ma. = Mahagalwewa, Su. = Suriyawewa, Vills. = All villages, Cols. = All colonies and All. = All settlements.

Source: Field data. Data in percentage form.

other direction they do not hold hope for future rains. When the area is affected by thunder storms or convectional rains local winds are absent. Therefore, the

absence of winds is a reliable indicator. However, even though there are no winds, convectional processes produce dust devils in the area as a common feature. The convectional formation of clouds takes place over the hilly area.

These interrelated changes in the environment generally occur in the area over about one week before the rains start, and during this period thundering in the evening is a common phenomenon. All these climate-related indicators do not change very much from settlement to settlement.

The indicators related to body, animals and insects are the direct result of suddenly heightened temperature. When the temperature is high, the incidence of high perspiration is obvious. When perspiration is high the body starts to dry out and a person ends up feeling bodily discomfort. By the time a drought is about to finish, the water courses in the area are either entirely dried-up or with very little water left, suddenly raised temperature often results in the total depletion of whatever is left. Then water shortage causes unbearable pains to the animals and insects. Therefore, their behavioural patterns change remarkably before the real rains start. The farmers are well aware of these changes.

Many fruits in the forest trees and the hill country are important indicators to predict future rains while very little or no fruits are important in order to predict droughts. Therefore, the validity of these indicators is clear.

The evidence so far supports the conclusion that farmers in the area observe phenomena in their living environment with a view to cope with the drought hazard. However, as with drought-predicting indicators, half of the farmers considered rain-predicting indicators also as less reliable compared with the past.

The general picture of the data in the table shows that, with a few exceptions, most of the indicators are not very different from settlement to settlement. However, in this case also, it is very important to consider not only the farmers' experience with their natural surroundings, but also the reasons for their perceptions.

5.9 The Reasons for Drought Hazard as Perceived by Farmers

The farmers perceive drought as having a destructive effect on their livelihoods. In order to avoid hardships created by droughts they react to this problem in every possible way. Based on an observant attitude, they can be seen to formulate their own reasons for the drought hazard. Table 5.11 summarizes what they perceive as causing drought.

Table 5.11 — Reasons for Droughts

Reasons for droughts	Ar.	Ih.	Mi.	Sw.	Ma.	Su.	Vills.	Cols.	All.
Deforestation and related consequences	100	96	100	100	100	100	99	100	99
Unjust rulers	58	91	96	100	92	94	90	93	92
God's anger	67	79	82	93	88	80	81	84	83
Rapid growth of population	33	75	80	100	94	80	76	87	82
Siltation in the tanks	67	92	98	100	81	64	93	73	81
Unjust people	17	67	69	80	73	67	64	70	67
Careless irrigation water consumption	8	8	29	40	61	88	23	74	52
Planetary effects	17	46	47	47	56	50	43	53	49
No hills in the area	25	46	47	53	59	42	45	51	48
Unfavourable winds in rainy seasons	17	33	47	47	20	39	40	30	34
Location of the area	25	17	49	47	48	48	38	48	44
Climatic changes	0	13	36	47	22	28	47	25	26

Columns: Ar. = Arabokka, Ih. = Ihalakumbukwewa, Mi. = Migahajandura, Sw. = Swodagama, Ma. = Mahagalwewa and Su. = Suriyawewa, Vils. = All villages, Cols. = All colonies and All = All settlements.

Source: Field data. Data in percentage form.

The data in the table shows that almost all the farmers believe that there is a close relationship between drought occurrence and deforestation. Farmers are aware of several consequences of deforestation and know that they are interrelated. Deforestation increases the wind velocity, absorbing and reducing soil moisture in the surface soil layers. When the surface soil layer is exposed in semi-arid climates increasing wind speed causes the soil to start blowing away (Lockwood, 1988), and soil erosion is inevitable due to torrential rains in the rainy season. The depletion of the top soil with its nutrients weakens the permeability of the soil and helps to increase the runoff, thus causing further erosion. Exposed and degraded soil

cannot absorb rain water and retain soil moisture for plant growth and agriculture. The ground water table is disturbed and tends to sink. At the same time, the total rainfall has decreased and become more uncertain over the last two decades, while migrant chena farmers, officers and politicians are incessantly destroying the forests. From the 1960s corrupt officers, politicians and their helpers, who work as thugs to decimate the opposition groups of the ruling parties, have destroyed the forest cover (Obeyesekara (1984). This background of destruction makes farmers consider deforestation as the major reason for drought.

'Unjust rulers', 'unjust people' and 'Gods' (there are a number of gods according to the Sri Lankan culture) anger' reflect the recent carnage in the country. People in the southern part of the country, especially in Hambantota district, are under severe and constant threats from both rulers and opposition groups. Yet the Dry Zone generally, has been considered as country of the God with a strict moral code of behaviour. People firmly believe, that if the leaders of the country are cruel and unjust, the ordinary people automatically become cruel too. The overall effect of these activities is to invoke Gods' anger, and as a result, rulers as well as people have to suffer from various fears in the form of epidemics and disasters, both natural and man-made. During the long history of Buddhist influence, morality has become a dominant feature in the farming communities. Farmers believe that the morality of the leaders of the country has an immense effect on other people and the natural world. If the rulers have an exemplary and magnanimous way of life, others will also follow them. As a result the natural environment also becomes very pleasant and thus free from hazards.

For the Buddhists, Pirith Chanting is very important. Pirith is one section of the Buddha's teaching which emphasises the moral aspect of the secular world of the people, and is especially important on stressful occasions. The chanting always winds up with the following Gatha (= psalm):

D⁻ evo Vassatu Kālēna!	**May Gods give rains in the season!**
Sassa Sampaththi Hēthucha!	**May the harvest be prosperous!**
Bētho Bavathu Lōkōcha!	**May all fears disappear from all living beings!**
Rājā Bavathu Dhammikō!"	**May the king be righteous!"**

This long-inherited belief still firmly exists within the farming society and this

is why 92% of the farmers mentioned unjust rulers as a reason for drought. During the period of my field survey I had enough opportunity to see, on several occasions, the disfigured, dead bodies of youths who had been killed by government forces and their supporters. Opposition groups did the same to the government officers and supporters.

High population growth is perceived as one cause for the growing hazardousness of drought, except in Arabokka where migrants are not allowed to settle. Because of the inward migration, the other villages have experienced a large population growth which has enhanced environmental degradation such as deforestation and over-cultivation due to a shortned fallow period which reduces agricultural output, opportunities and other economic activities based on forest, especially in the vicinity of the villages. In the colonies inward-migration is very high too even though suitable agricultural lands are unavailable. Therefore, most of them live on marginal lands, on the lands of the colonies which have been reserved to use in the emerging future necessities. Therefore, migrants have no irrigable paddy fields unless they buy or lease land. This environment pushes migrants towards chena cultivation, which means they destroy the forest without considering the consequences. This process is very familiar to Mahagalwewa farmers. The rapid migration into this area started after the inception of irrigation facilities in the Suriyawewa area from the West Bank canal of the Walawa scheme. Though the data on the migration of these people are unavailable, the growth of student numbers at Suriyawewa school to become one of the biggest in Sri Lanka is a measure of this increase.

Tank siltation is also a by-product of rapid deforestation. As mentioned earlier, deforestation has increased the soil erosion to a very high degree. Deforestation takes place in the highland areas and normally these are the catchment areas for the village tanks. Catchment areas free from trees lead to high erosion and result in tank siltation, reducing the water storing capacity of the tank thus reducing the area which can be irrigated. In the absence of rain for several months the water level either rapidly reduces, or the tank dries up entirely. If there is left-over water in the tank in a drought period, the quality of the water is unsuitable for human use and consumption.

Irrigation facilities are not crucial for the village farmers. In contrast, irriga-

tion facilities are very important to both colonies. It is clear from field observation that, though there are certain rules and procedures which have to be followed, partial officers and influential farmers do not always take these into account. The maintenance of canals, sluices and anicuts is not of the standard necessary for efficient water management. The following picture (see plate 5.1) shows how buffaloes are damaging one bank of the main irrigation canal of the Walawa Scheme in Suriyawewa. If this is the level of maintenance of the main canal, then one fears for the upkeep of the other small canals and anicuts. Another problem of the irrigation canals is their inferior standard as far as workmanship is concerned. All the constructing and repairing activities (except for the major canals and dams) of the irrigation infrastructure are done by contractors who are either politicians' or officers' friends. As a result, there is no quality control over these activities.

Plate 5.1 — Buffaloes damage the Main Canal

Careless water consumption has been further aggravated by the "Corrupt Democratic" party politics. Though a harmonious way of life is an essential con-

dition for efficient water management, people have been politically divided by the ruling parties of the country. Thus, in order to obtain employment, irrigable land under the new irrigation schemes, a transfer or promotion from a job, or drought relief or poverty relief from the government, people have to support the ruling party in the country at present. Since this is so repulsive, support of deprived youths can be obtained for any kind of activity. As a result, terrorist groups emerge and terror reigns, adding a man-made hazard also to the country. Therefore, the harmony which is the most important factor for efficient water management and farming activities is not available in this environment.

On the whole, the causes of drought which are widely accepted by the farmers can be divided into two groups, one representing the environmental changes in the area, the other, representing deeply-rooted cultural values. The causes relevant to changes in the environment are deforestation, tank siltation and a highly increased population; the cultural factors lead to arguments that unjust rulers and unjust people incur God's anger and that this brings forth droughts. However, these reasons are not given equal weight by the farmers of every settlements. When all the causes are grouped into human and physical, it emerges that farmers believe that drought is above all a human created hazard.

5.10 Changes in the Settlements after a Drought

The changes farmers observe in the environment after a drought are a further step towards understanding the farmers' drought perception. It is interesting to see the farmers' immediate responses to their eagerly awaited rains and to compare them with the responses under drought conditions. The changes as perceived by the farmers are given in Table 5.12.

The general pattern clearly shows that the village farmers' perception of differences after a drought progressively increases from Arabokka, which has no migrants, to Swodagama, where the village is relatively new and all farmers are migrants. This suggests that the farmers who have lived in the area for generations tend to take the changes for granted. Among these changes, the absence of dust is seen as the most important. During drought periods, dust can be seen everywhere, harassing everybody in the area. When drought ends family labour-intensive agricultural activities begin. At the same time, the spread of fever, flu and water-borne

Table 5.12 — Changes in the Settlement after a Drought

Changes	Ar.	Ih.	Mi.	Sw.	Ma.	Su.	Vills.	Cols.	All.
No dust	58	58	91	100	95	89	80	92	87
Plants are green	42	54	71	73	80	63	64	71	68
No water scarcity in the settlements	25	63	67	40	75	69	56	72	65
People are very busy with agriculture	50	67	80	87	70	44	74	57	64
Everything is lively	17	46	80	80	61	69	64	65	64
Diseases spread	67	79	71	87	70	39	75	55	63
People are happy	42	50	71	73	61	50	60	55	58

Columns: Ar. = Arabokka, Ih. = Ihalakumbukwewa, Mi. = Migahajandura, Sw. = Swodagama, Ma. = Mahagalwewa, Su. = Suriyawewa, Vills. = All villages, Cols. = All colonies and All. = All settlements.

Source: Field data. Data in percentage form.

diseases is high, and perhaps with disastrous effects on the community. During drought conditions, there is no shade under the leafless trees, so that everything and everyone is exposed to the severe effects of the sun. Everything changes when the rain comes, not least the mood of the people, which is now jovial and no longer melancholic.

When the colonies are concerned the farmers see the same changes as in the villages with a high response rate. However, the strength of these responses differs very clearly between the two colonies. The farmers in Mahagalwewa with uncertain water availability are more alert to these changes than their counterparts in Suriyawewa. In general, drought disappears with the rains in the Maha season. Especially the farmers who cultivate chenas have no time to waste when the rainy season starts. However, those farmers who grow paddy cannot start their agricultural activities as soon as it rains. Before this background it is not a surprise that the farmers in Suriyawewa show a low response to the indicator 'people are very busy in agriculture'. This fact is proven even by the farmers in Arabokka where cattle rearing is the most important agricultural activity. The other indicators of changes apply in the colonies as they do in the villages.

The general picture based on these changes in every settlement shows that dust is a constant and universal problem during a drought period. With rains, therefore, the most striking change is 'no dust'. The other changes also have a relatively high

acceptance among the farmers, except for four changes in Arabokka. Apart from the change 'diseases spread', all the others indicate that the disastrous drought loses power with the start of rains. Farmers now have the necessary environmental conditions to revive their impaired livelihoods once again.

5.11 Negative Effects of Drought

Drought causes social, economic and various other kinds of problems and hardships for the village farmers. Since these directly influence their perception and adjustments to the drought hazard, the negative effects of the hazard are very important to note. Table 5.13 summarizes them.

Table 5.13 — Negative Effects of Drought

Negative effects	Ar.	Ih.	Mi.	Sw.	Ma.	Su.	Vills.	Cols.	All.
Destruction of annual crops	100	100	100	100	100	98	100	99	99
Water shortages for all purposes	100	100	100	100	91	78	100	84	91
Loss of employment opportunities	0	58	96	100	88	92	75	90	83
Food shortage	100	96	100	100	63	75	99	69	82
Diseases spread	33	86	84	93	83	78	80	80	80
Tanks dry up entirely	83	96	100	100	69	59	97	64	78
Loss of income sources	83	96	93	100	67	61	94	64	77
Destruction of perennial crops	25	96	71	87	80	56	74	68	71
Destruction of animals	100	86	53	93	67	64	74	66	69
Aggravated social problems	67	71	80	73	56	39	75	48	59
Aggravated family problems	17	79	74	40	55	53	64	54	58
Difficult to retain officers	8	25	36	40	58	75	30	66	51
Some evacuate the settlement	0	50	73	60	28	47	56	38	46
Increased fear of thefts	8	50	38	53	50	47	40	48	45
Waste of human resources	25	54	31	27	31	44	35	38	37

Columns: Ar. = Arabokka, Ih. = Ihalakumbukwewa, Mi. = Migahajandura, Sw. = Swodagama, Ma. = Mahagalwewa, Su. = Suriyawewa, Vills. = All villages, Cols. = All colonies and All. = All settlements.

Source: Field data. Data in percentage form.

The immediate picture in anybody's mind of a drought-affected farming community consists of three characteristics, a) not enough water for the farming community, so that, b) crops are either destroyed or not grown, and therefore, c) people

have severe food shortages. This picture is true for the farming communities in the settlements under investigation.

The farmers of all the villages in the area stress their grievances and difficulties. The individual issues of suffering are very much interlinked. The most important negative effects are related to crop destruction, hunger, water shortages, and economic hardships. The lower figures for some entries for Arabokka reflects its different economic base. The destruction of animals is an important feature for all, except in Migahajandura where no dense forest cover surrounds the village. The farmers from the other three villages see the growth of hunting, theft and selling of animals (mainly cattle), and animals dying without water as alarming trends during drought periods.

It is clear that the negative effects of drought have been strongly emphasized by the farmers. 11 out of 14 negative effects show that more than half of all the farmers mentioned them. Another feature is the interrelationship of these effects. How farmers' activities are damaged and what their sufferings are in both colonies is also very clear. The major crops grown by the farmers are paddy and short-term chena crops which are severely damaged by droughts.

5.12 Proposals of the Farmers to Mitigate Drought Losses

Their frequent suffering from droughts make the farmers think about the losses and how to mitigate them. When they were asked whether they have any remedies to control the hazardousness of drought all the farmers put forward several actions to be taken in this direction (Table 5.14).

In the villages farmers recognize, almost without exception, the advantage of the forest cover as a protection from the hazardousness of droughts. They believe that the forest helps in many ways in this respect. Thus, it acts as an agent to increase the rainfall, to reduce the wind speed, to protect the soil fertility and moisture, and to reduce the harshness of the environment in a drought period. Above all, the farmers in the villages practise chena cultivaton as their main economic activity in the forests, and thereby, they are able to collect and store a considerable amount of food stuffs in the form of cereals. We have seen that they mentioned deforestation as a powerful cause of the drought, so that their proposal of reforestation for drought mitigation was to be expected.

Table 5.14 — Proposals for the Mitigation of Drought Losses

Proposals	Ar.	Ih.	Mi.	Sw.	Ma.	Su.	Vils.	Cols.	All.
Reforestation	100	100	98	100	91	94	99	92	95
Growing of short-term crops	83	75	93	93	94	89	88	91	90
Increase of irrigation facilities	100	96	89	87	80	88	92	84	87
Increase of non-farm employments	8	54	87	100	89	94	71	91	83
Cultivation of drought-resistant crops	83	92	87	87	77	64	88	70	78
Renovate the abandoned old tanks	92	96	84	67	69	73	85	71	77
Be religious and righteous	67	75	89	80	86	56	81	71	75
Inter-cropping in highlands	83	86	91	93	77	34	90	55	70
Crop insurance	25	58	36	67	80	83	45	82	66
Seek outside employment	50	58	73	100	52	50	71	51	59
Drought-relief work sites	0	58	53	53	64	61	48	63	56
Efficiency of water management	0	0	7	13	88	95	5	91	54
Cessation of cultivation in Yala season	83	100	89	80	23	2	90	13	46
Representations to the government	0	25	51	47	45	47	38	46	42

Columns: Ar. = Arabokka, Ih. = Ihalakumbukwewa, Mi. = Migahajandura, Sw. = Swodagama, Ma. = Mahagalwewa, Su. = Suriyawewa, Vills. = All villages, Cols. = All colonies and All. = All settlements.

Source: Field data. Data in percentage form.

Farmers recognize the inability of village tanks to fulfill their water requirements during droughts and seek reliable irrigation systems. Almost all the farmers believe that reliable irrigation facilities in the area could be made available either with the help of the present Walawa scheme, or, in the future, through the prospective Samanala Wewa scheme. The inter-cropping in the highlands and no cultivation of paddy in Yala seasons reflect the knowledge of the farmers about rainfall behaviour. In the highlands in particular, the chena cultivators grow a number of crops, so that, if one crop variety fails, another survives, thus reducing overall loss. The decision not to cultivate paddy in the Yala season and to cultivate drought-resistant and short-term crops, again reflects the farmers' knowledge of rainfall behaviour.

Dry Zone farming societies, in general, are hydraulic. When and where opportunities have allowed it, farmers have, for generations, built tanks and other irrigation facilities. In this area, there are a number of abandoned village tanks which were built many centuries ago. If these were renovated, they would help

to increase the groundwater table and atmospheric humidity, and farmers believe that, thereby, the severity of droughts could be controlled to a certain extent.

It is natural for most societies to turn to religious activities for help when they are in any danger or face a hazard. All farmers are Buddhists, but Hindu beliefs are also with them. Therefore, Buddhist and polytheist Hindu ceremonies are organised in the villages. Most of the people believe that if they follow the religious path and live righteously, the possibility of facing dangers and hazards are minimal. When they explained the reasons for droughts, unjust rulers and people and the resultant anger of the Gods were very important reasons in all settlements. Therefore, a 'righteous way of life' as a proposal to curb the hazardousness of droughts is understandable. Where the economic activities of the farmers are concerned (see table 5.1) all except a few are entirely dependent on farming activities. As a result, drought can destroy all their activities. This is very well understood by the farmers who propose to increase non-farm employments which droughts cannot destroy. There are few economic activities during a drought in the villages, and therefore, the proposal to find employment outside the village show their perception of the hazard as well as their rational thinking about how to avoid the hazardousness of droughts.

The remaining proposals of the village farmers are not so highly represented. However, crop insurance can recover the agricultural losses to a remarkable extent. Unfortunately, the government's insurance activities in the field of agriculture are not intended to cover the areas at risk from droughts or floods. Therefore, the village farmers cannot insure their crops, whether they cultivate paddy under the village tanks or chenas in the forests. (The same is true for areas which are prone to flooding. According to my personal experience, the farmers in our village in the Wet Zone were encouraged to insure their paddy cultivation in 1979. I also cultivated and insured my paddy field. [This is the reason for me to get an Agro Identity Card.] Floods damaged the paddy and we recovered the losses from the insurance. When farmers were planning to insure crops for the next season, our village area where floods cause great damages and are frequent was excluded from the government's agricultural insurance programme. Thus, those who suffer most from floods are deprived due to the profit motivation of the insurance activities.)

It is very clear that the farmers in the colonies which are regarded as settle-

ments with reliable irrigation facilities are also suffering very much from drought hazards. They too mentioned many proposals to reduce the hazardousness of the drought. Most proposals are similar to those of the villagers, and therfore only the dissimilar ones need to be mentioned. Increased non-farm employment reflects the farmers' understanding of their reality. In the colonies the given land cannot be divided among the various children of a family. The owner must hand it over to a single child. Moreover, since colony farmers consider the rapid growth of the population as a problem which cannot be solved by the agricultural development alone, the creation and establishment of non-farm employment is crucial for them. Among their proposals, few are extremely different in their weightage to the village farmers. The 'cessation of cultivation in Yala seasons' in the villages has a very high value while it is the least important proposal in the colonies. While efficient water management in the villages is the least important proposal, 91% of the farmers in the colonies mentioned it. Crop insurance in the villages is not available but is encouraged in the colonies and constitutes a proposal strongly approved there. These differences between the settlements are due to the varying availability of irrigation water.

All the above proposals show that 12 out of 14 are mentioned by more than 50% of the farmers, and seven by more than 75% of the farmers of all the settlements. At the same time, the most representative proposals show the farmers' deep understanding of their living environment and its hazardousness. Another feature of the proposals is that most of them could be implemented without expert knowledge, foreign exchange and other outside resources.

5.13 Comparison of Responses of the Farmers

The differences between study sites were explained in chapter two. The direct consequence of these differences is the different economic activities given in table 5.1. The data in most of the previous tables showed the inter-settlement variations very clearly. Not only are these differences in the tables shown, but also the reasons behind the anomalies have been given. However, the data in the tables were not analysed using any quantitative technique. In order to see whether there are quantitatively significant differences in the responses of the farmers between settlements, the One Way Analysis of Variance test was used. To carry out this

test, all the responses given in each table by each farmer were added together and then the number of responses given by an individual farmer was calculated. Then, these added responses were subjected to the One Way Analysis of Variance test. In this pursuit, tests were carried out separately for villages, colonies, and all the settlements, and the results are given in table 5.15.

Table 5.15 — Comparison of the Significance of the Farmers' Responses between Study Sites

Tables	Tn.	AFV.	Sig.	AFC.	Sig.	AFAS.	Sig.
Advantages	5.2	9.96	.00	10.35	.00	40.40	0.00
Disadvantages	5.3	7.76	.00	21.01	.00	12.30	0.00
Water related definitions	5.4	2.21	.09	15.47	.00	4.73	0.00
Harvest related definitions	5.4	4.21	.00	1.38	.24	2.68	0.02
All the definitions	5.4	2.81	.04	15.49	.00	4.86	0.00
Discussion about drought	5.5	9.61	.00	1.23	.27	6.82	0.00
Drought years	5.6	2.05	.11	5.88	.00	11.20	0.00
Pattern of drought occurrence	5.7	1.54	.21	4.02	.04	3.01	0.01
Drought free year	5.8	1.35	.26	45.13	.00	10.13	0.00
Drought predicting indicators	5.9	0.78	.51	48.48	.00	10.32	0.00
Rain predicting indicators	5.10	1.87	.14	40.58	.00	9.47	0.00
Reasons for the drought	5.11	16.91	.00	0.35	.56	13.83	0.00
Changes after a drought	5.12	9.30	.00	20.20	.00	10.50	0.00
Negative effects of the drought	5.13	19.48	.00	0.23	.63	12.03	0.00
Proposals to control drought	5.14	8.66	.00	7.72	.00	6.76	0.00

Columns: Tn. = Table number, AFV = $ANOVA^*$ F for the villages, Sig. = Significance (95%), AFC. = ANOVA F value for the colonies and AFAS = ANOVA F value for all the settlements. * One Way Analysis of Variance Test.

Source: Field data.

According to the test results, if the value of significance exceeds .05 the variations between the study sites are not significant. When the differences between the villages are concerned the responses in 6 out of 15 tables show that there are no significant differences in the farmers' responses between the villages. In the same token, these constitute the most important measures of drought perception of the farmers. According to these results, the village farmers' perception of drought does not differ significantly between themselves.

When the colony farmers' responses are analysed the test results show that their responses in 11 tables are significantly different from each other. Even in all those tables in which no significant differences are shown, the responses are not directly related to the perception of the farmers. In the colonies, these clearer differences are repercussions of the difference in economic activities and the reliability of the irrigation facilities.

The variations which were found when looking at all the settlements show that there is not a single table which has no significant difference. As a result of remarkably different irrigation facilities and thereby created major economic activities, i.e. paddy, chena and cattle rearing, and combinations of these and a different prominence of these between the settlements, we cannot get homogenous responses from every settlement. However, this is true only if the farmers give a number of answers to a specific question.

On the other hand, when the farmers' answers were expected in the form of a single answer the responses show a greater homogeneity, even though there are differences between the settlements. For instance, in The Sentence Completion Test, 82% of the farmers in the villages, and 85% in the colonies, mention that their major problem in the area is drought. When they were to explain the hazardousness of the drought directly and in a simple manner, once again homogenuity of their responses can be seen, and this fact is depicted in table 5.16 which is based on the farmers' answers to the question 21 in the questionnaire (see appendix C).

Table 5.16 — The Farmers' Perceived Trend of Drought Occurrence

Trend of the occurrence of drought	Ar.	Ih.	Mi.	Sw.	Ma.	Su.	Vills.	Cols.	All.
Less	0	0	2	0	5	3	1	4	3
More	100	96	98	100	95	95	98	95	96
No identifiable difference	0	4	0	0		2	1	1	1

Columns: Ar. = Arabokka, Ih. = Ihalakumbukwewa, Mi. = Migahajandura, Sw. = Swodagama, Ma. = Mahagalwewa, Su. = Suriyawewa, Vills. = All villages, Cols. = All colonies and All. = All settlements.

Source: Field data. Data in percentage form.

The data in the above table is highly compatible with the rainfall data in the area and the rest of the country. It can therefore be established that the farmers

in this area are keen observers, and that their understanding of the environmental phenomena such as drought and rains have a great influence on their life style. Furthermore, these data which derived from poor and uneducated farmers who are always being ridiculed and undermined by Sri Lankan bureaucrats and policy makers show that they are aware of the climatic changes over the last two or three decades, changes that are at present under the scrutiny of world class climatologists and meteorologists.

This discussion shows that the farmers in all the settlements are suffering from a variety of problems as a result of droughts. Therefore, their life is full of hardships, and thus they have been forced to observe and understand their environment very carefully in order to resist the hazardousness of the drought. In chapters 3 and 4, rainfall behaviour and the farmers' behaviour also depict the interconnections between rainfall and farming practices, demonstrating farmers' careful and vigilant study of their environment. In order to understand fully their perception of drought hazard, it is necessary to analyse how they use this understanding in practice in order to confront and reduce the hardships which are created by droughts. It is therefore necessary to look at their adjustments to drought. This aspect will be explained in the next chapter.

Chapter VI

THE FARMERS' ADJUSTMENTS TO DROUGHT HAZARDS

The range of adaptations and adjustments to natural hazards vary with regard to the severity of the hazard, the topography of the area, the activity types, the density of population and the knowledge and cultural values of the people. Adaptations and adjustments are a function of the above conditions, and thus provide the obvious basis for analysis in different ways, viz.,

1. according to the level of technology (pre-industrial or folk, modern or technological, industrial or comprehensive) (White, *et al.* 1970; Kates 1970; White 1974 and Tennakoon 1986);

2. according to the nature of hazard adjustments affecting the basic causes of hazards, modification of the hazard effects and loss potential, dealings with recurrent losses by suffering and sharing (Berry *et al.* 1971; Hankins 1974; Heijnen and Kates 1974; Dupree and Roder 1974 and Tennakoon 1986);

3. according to either purposeful or incidential adjustments (change of location and use, prevention of effects, modification of effects, sharing of losses, bearing of losses, discount of losses and reduction of losses) (Burton, *et al.* 1978);

4. under different themes (social, cultural, economic, agricultural, political and so on), and

5. based on time (before, during and after the hazards).

All these different possible ways of categorizing and analysing the adjustments show that they may be derived from the researcher's personal views and interests. However, according to the present natural hazards research, so far, no attention has been given to the explanation of the adjustments which reflect the victims' own categorizations. Therefore, the present researcher, who himself lived in an area which is affected by frequent flood hazards, was brought up in a farming family, and was a farmer himself, will attempt to study and analyse the adjustments to

drought hazards from the point of view of and the way in which the members of the farming community categorize adjustments and their aspirations and goals in order to reduce hazard losses. As a result, the following classification of adjustments is suggested: 1) preventive, 2) precautionary, 3) recouping, 4) opportunistic, 5) survival, and 6) incidental adjustments. This classification is derived from the long practical experience and fieldwork observation of farming communities which are affected by both floods and droughts.

Preventive adjustments represent activities of farmers who try to prevent or halt the hazard through seeking the assistance of super-natural powers. Farmers living in an area prone to natural hazards know that there will be a possibility of a hazardous event at any time in the future. This attitude induces them to take necessary steps in the form of precautionary adjustments. During and after a hazard, people face a number of losses and therefore try to reduce or recover these by undertaking recouping adjustments. The social structure and activities make people consider their behavioural patterns in order to obtain benefits from the existing system, e.g. when government facilities are mainly given to the ruling party supporters, people have to adjust in order to cope with this existing social environment. As a result, people may turn to opportunistic activities. It is natural that people try to maintain a reasonable standard of living and self-respect with their life time. However, under distressful conditions, especially those who are the poorest and deprived have to suffer the most and they start to struggle just for their very survival. Thus under hazard conditions, the activities of some victims concentrate on their mere survival with disregard of self-respect and dignity. The cumulative effects of these processes may induce some activities to cope with the hazard in indirect ways; these can be considered as incidental adjustments to hazards.

6.1 Preventive Adjustments

The Dry Zone in Sri Lanka is called the country of God, which reflects the belief of people on super-natural and in spiritual powers, which have influences on the general day to day activities of the people. When people as a community, family or individual face distress, calamity or hazard, it is the nature of the victims to seek help from super-natural and spiritual powers in order to prevent the future

occurrences of these events. The beliefs of people in this direction are heavily moulded by their main religious beliefs. Thus, the farmers in the Dry Zone of Sri Lanka, being frequent victims of hazards, especially from droughts, and other calamities, seek the help of super-natural powers to enhance their security. Such beliefs are heavily influenced by a mixture of both Buddhism and Hinduism.

Since all the farmers are Buddhists, the activities associated with Buddhism predominate. There is a firm belief that Buddhist hymns and Pirith (scriptures) have a great power to reduce or terminate the fears from hazards like drought and famines. The reason for this is that the Buddha himself practised these Pirith in order to calm the fears caused by famines and droughts when people were affected and frightened by these hazards in some parts of India in the time of Buddha. The message conveyed by Pirith on this type of occasion is to expand and practise Metta[1] (extending unlimited universal love, goodwill and friendship for all living beings). When farmers finish harvesting, they organise ceremonies in the village temple. There are two main parts within these ceremonies: one is all-night chanting of the Pirith, the other is alms giving to the Buddhist monks who chanted the Pirith on the following day. These ceremonies symbolize the purification of the people and nature, bolstering their beliefs in a hazard-free future and agricultural success. The main purpose of these activities are to prevent any sort of possible future disaster.

Apart from the Buddhist influence, Hindu beliefs also exist among the farming community. Therefore, natural forces which determine successful agriculture and other activities are worshipped. In performing these activities, farmers express their humble gratitude to the natural forces which hold the key to successful agriculture and prosperity. Therefore, the Sun, Moon, Rain, Thunder, the Earth, and the wealth of the world are represented by individual Gods. Farmers know that without these forces, and their effects in due season, the survival of the farming community is impossible. The farmers pay their tribute in return for divine assistance. When they collect their harvest, for instance, they allocate a quota of cereals as a donation before they start the consumption of new harvest. After harvesting is fully completed, farmers organise a ceremony to perform their offerings to the Gods on an agreed day in a common place in the settlement. The performance of rituals goes on throughout the night and ends with the offerings to

the Gods made from the newly collected harvest. These activities are also similar to the practices relevant to the Buddhist ceremonies, and a greater emphasis is given to them when the drought seems to be very clear. In general these collective activities have uplifted the farming community while the activities of the urban-oriented officers and elites have degraded the standards of the farming community (Siriwardene, 1984). These worshipping practices of the farmers are not done with a blind eye, as so-called most 'pure scientists' would explain. If science is to enhance the quality of the life and the environment, then the farmers are scientists and their activities are scientific. But they do not worship money, rather worship all the natural energy sources and thereby hope to maintain harmoney with the nature which leads to create equilibrium of their living environment. It is obvious as Harriss and Harriss (1989) explained that peasants may understand their environment much better than outside experts.

The performance of the above practices requires the participation of all the farmers in the settlement. Within this pattern, there are three different types of activities seeking assistance from super-natural powers for paddy, chenas and cattle rearing. These are practised either individually or as a group with several neighbouring farmers. The main purpose of these rituals is to appease the guardian Gods and Deities in the village and region. In paddy cultivation, when either land preparation is in progress or just after completion, farmers organise offerings called *Mada Dānaya* (alms or offerings during the land preparation in the paddy fields). Such activities are confined to men, since women are considered as unclean and thus not allowed to participate. In the chenas, cultivators organise alms or offerings called *Pani Bath Dānaya* (alms of sweet rice). In general, when farmers see the first ears of maize in their chenas, they start to organise *Pani Bath Dānaya* (this is also a male-only activity). Farmers who have cattle start the milking at the beginning of the Maha season. The first collected milk they offer to the guardian Gods of the cattle. This ritual is mainly performed on an individual basis. Here too, the preparation of offerings are limited to men. The main purpose of these performances is to appease the guardian Gods in the hope that they will protect their chenas and livelihoods until they collect their harvest without facing any major disaster, namely drought.

All the above activities are practised by almost all the farmers; they are per-

formed mainly with a view to prevent possible future hazards (mainly droughts) and other distresses. Should someone be opposed to those activities, he may have to face bitter discrimination in his agricultural as well as in his social activities.

Astrology plays an important role in the decision making process of the farmers about their agricultural practices in Sri Lanka. Before starting an activity, for instance, most farmers seek an auspicious time from the village astrologer in order to start their activities. Otherwise, activities are begun on Sundays, Thursdays and Fridays, these being considered the best days in the week to start any productive and profitable activity. The main reason for this behaviour is that the farmers believe in planetary effects on humans beings and their activities. Farmers in the country are very concerned about the changes of the phases of the moon. When the moon is in the waning phase they avoid planting and sowing because these acts under the waning phase reduce fertility and harvest. This is a fact that has been accepted (also for human fertility) in many parts of the world (Naish, 1989). Even when they store their harvest for future consumption they consider this fact again.

If somebody were to ask a farmer whether he believed in the ability of Gods to prevent hazards, he would take it as an insult and answer "if somebody wants to live here in the country of God, he should believe in Gods and Buddha and behave according to those beliefs". The influence of these beliefs is ingrained in everyday activities. Living by agriculture cannot be guaranteed, predetermined or preplanned. Farmers do not want to forecast their future activities. Their general belief is that failures and successes will depend on the will of Gods. The strength of this attitude can be seen from people who are planning to go on a long journey. They do not like to say when they are going to end this journey and when they are going to return; they do not even want to comment about these matters with their own family members. Vehicle drivers, for instance, are very particular not to mention the time of arrival from one place to an another destination. My experience with the first visit from Hambantota city to Suriyawewa by bus well illustrates this condition. The distance for the journey is 25 miles through the jungle. I asked the driver the time it takes for that distance. He stared at me and remarked "Mr., I can understand that you are new to this area. Please keep this in mind: this is God's country. Therefore we cannot tell anything beforehand

until it is completed." I bore his advice in mind and subsequently experienced the widespread truth of this comment.

There are no great cultural and social differences between village farmers and colony farmers. Therefore, farmers in the colonies also perform similar religious rituals with common goals. When the colony farmers have problems in relation to environment or society, they pray to the Gods, vow to pay homage and perform religious activities and rituals seeking help of supernatural powers in order to make their environment more amicable and less hazardous. They are very keen to perform these activities, especially to avoid droughts and to assure sufficient rains in time for the success of their agricultural activities. The colonists also follow astrological signs in order to start their agricultural activities, and thereby hope not to face crop failures.

Two preventive adjustments can be identified; 1) to seek support from supernatural powers and 2) to work according to astrological signs in order to avoid disastrous events.

6.2 Precautionary Adjustments

Human beings weigh up the advantages and disadvantages in order to achieve goals for their betterment and survival. If a community is living under a potential hazard, the number and effectiveness of precautions they take to minimize the risks vary according to perception, possible alternatives and socio-economic levels of the victims. Since the data and information were gathered in the field using several methods, it is not possible to quantify all the adjustments. Adjustments in quantitative terms are only possible with questionnaire data.

The number of precautionary adjustments is relatively high. For the sake of analysis, they are therefore categorized under the following sections; 1) agricultural; 2) produce management and 3) financial management.

6.2.1 Precautionary Adjustments with Regard to the Agriculture

On the whole, adjustments related to the agriculture are based on the main agricultural activities: paddy and chena cultivation. It is better to explain these adjustments separately in order to get a clearer picture.

Adjustments with Paddy Cultivation

Under paddy cultivation, there are two types of precautionary adjustments; one before sowing, the other after sowing. If there is likely to be a drought in the coming season, pre-sowing adjustments are practised. If the farmers have to face a drought condition before the harvesting, after-sowing adjustments are practised.

Pre-sowing Adjustments of the Farmers

The main purpose of pre-sowing adjustments is to reduce the risk and to minimize the losses from a perceived forthcoming drought. With their life long experience, the farmers know many adjustments to follow in relation to paddy cultivation in the event of a foreseeable drought during the coming season. Table 6.1 summarizes their pre-sowing adjustments.

Table 6.1 — Pre-sowing Adjustments of the Farmers

Adjustments	Ar.	Ih.	Mi.	Sw.	Ma.	Su.	Vills.	Cols.	All.
Abandon paddy lands	100	100	98	100	70	2	99	36	63
Grow of short-term paddy	92	83	98	100	91	66	94	78	85
Grow more drought resistant crops	75	96	91	93	38	25	91	31	57
Pray to the Gods	100	88	84	93	84	55	88	70	78
Confine cultivation to highlands	42	58	73	80	59	13	67	36	49
Take collective decision	67	58	44	20	73	53	47	63	56
Cultivate paddy lands, taking a risk	42	4	16	13	58	70	16	64	43
Work according to official instructions	8	0	11	27	69	88	10	78	49
Grow subsidiary food crops	25	0	2	0	41	83	4	62	37
Cultivate outside the settlement	8	0	29	20	25	22	18	23	21
Abandon both paddy and chenas	0	0	4	20	0	0	5	0	2

Columns: Ar. = Arabokka, Ih. = Ihalakumbukwewa, Mi = Migahajandura, 4 = Swodagama, Ma. = Mahagalwewa, Su. = Suriyawewa, Vills. = All villages, Cols. = All colonies and All. = All Settlements

Source: Field data. Data in percentage form. Percentages are calculated as the field data in the tables of chapter five.

The farmers' preferences for these adjustments differ remarkably between villages and colonies, and the village farmers' adjustments can be explained according to the importance of their sequence as follows. Paddy, being a highly water-

consuming plant, is grown in the irrigable lands of village tanks. The rain in the Maha season is relatively reliable when compared to the Yala season. According to farmers' belief rainfall at present is very uncertain in both seasons. In the past farmers have cultivated paddy expecting rains especially in Maha seasons, whether the village tanks were full or not. However, their recent experience does not encourage them to cultivate paddy unless the tank is full from rain water. In the past, the farmers cultivated paddy even outside lands irrigated from tanks. This practice is currently very rare due to the changes in rainfall. However, there are still some farmers who do not perceive the dangers of cultivating paddy out-side the tank, just relying on rainfall. Plate 6.1 shows an example. The foreground of the picture shows a drought-hit paddy field cultivated by a farmer during the *Maha* season in 1987/88. The researcher himself is standing in the drought hit paddy field which was cultivated outside the irrigable area under a village tank. The farmer has cultivated paddy expecting rains and drained water from the paddy fields under the village tank. Unfortunately, it had not rained enough, and therefore, the water in the tank was used very carefully just to keep the life of the paddy underneath it. The green area shows the paddy fields which were saved by the tank water. However, later I came to know that this land was cultivated by an officer who was influential and therefore, all the inputs he used for this land were free of charge. For instance, tractor owners were competing to plough the land. The farmers had voluntarily offered their labour. The public funds helped him to fence it with brand new barbed wire. With all these, therefore, this was not a hazard for him, but if an ordinary farmer had to face the damage, it would have been a catastrophe for him. On the other hand, if this marginal cultivation was successful, then it would have been an encouragement for the ordinary farmers to follow, and thereby to increase the hazardousness. However, the farmers with a greater wisdom about the mechanics of their living environment do not begin to plant paddy unless they have enough water in their tank, and this helps to minimize their losses. The validity of this adjustment is also shown in table 6.2.

The table shows that the farmers only cultivate when the tank is overflowing. All the village tanks are under minor irrigation schemes. Furthermore, the comparison of national figures of cultivated and harvested areas (see table 6.3) under minor irrigation schemes shows the validity of this practice.

Plate 6.1 — A Destroyed Paddy Land outside the Accepted Irrigation Area

The life of paddy plants varies from 3 to 4 1/2 months. The 4 1/2 months plant varieties give high yields. Therefore, farmers like to grow these varieties. If the agricultural season receives enough rain at the beginning and tanks overflow, farmers can grow long-term paddy varieties. If the rains are delayed and the water levels of the tanks are low, farmers have to face a difficult situation in which they have two alternatives: one is to abandon the paddy, the other is to cultivate. If the water level in the tank is low, then normally farmers abandon paddy cultivation. Though they have taken this decision, if the tank is subsequently filled, then farmers start to cultivate short-term paddy varieties. In the 1987/88 Maha season, people decided not to cultivate paddy using the Ihalakumbukwewa tank due to lack of water. But at the end of December the tank was full and 3 months

Table 6.2 — The Relationship between Paddy Cultivation and Overflowing Tank

		Tank overflowing		Cultivation of Paddy	
Village	Year	Yala	Maha	Yala	Maha
Arabokka	1983	No	No	No	No
Arabokka	1984	No	No	No	No
Arabokka	1985	No	Yes	No	Yes
Arabokka	1986	No	No	No	No
Arabokka	1987	No	Yes	No	Yes
Ihalakumbukwewa	1983	No	No	No	No
Ihalakumbukwewa	1984	No	Yes	No	Yes
Ihalakumbukwewa	1985	No	No	No	No
Ihalakumbukwewa	1986	No	No	No	No
Ihalakumbukwewa	1987	No	Yes	No	Yes
Migahajandura	1983	No	No	No	No
Migahajandura	1984	No	Yes	No	Yes
Migahajandura	1985	No	No	No	No
Migahajandura	1986	No	No	No	No
Migahajandura	1987	No	No	No	No

Source: Field data

Table 6.3 — Paddy: Sown and Harvested under Minor Irrigation Schemes for Maha and Yala (in hectares)

	Cultivated			Harvested		
Year	Maha	Yala	Total	Maha	Yala	Total
1981/82	120838 (70%)	51346 (30%)	172184 (100%)	96047 (66%)	49447 (34%)	172184 (100%)
1982/83	127011 (77%)	38369 (23%)	165380 (100%)	117955 (79%)	31395 (21%)	149350 (100%)
1983/84	145149 (63%)	86767 (37%)	231916 (100%)	132277 (61%)	85505 (39%)	217782 (100%)

Source: Department of Census and Statistics, (1987a) pp. 105-110.

paddy varieties were cultivated in February. However, the Migahajandura tank did not fill up and people there abandoned their paddy fields. In the other villages the rains were also delayed and as a result short-term paddy varieties were cultivated.

The number of crops grown in a chena plot is remarkably high when compared to the area of a chena. The average number of crops grown in a *chena* was 7 during the *Maha* season in 1987/88; the maximum was 14. However, the average size of a *chena* land was 1.9 acres in the *Yala* season in 1987 and the figure for the *Maha* season was 2.79 in 1987/88 (field data). When it rains at the expected time, the confidence of the farmers in further rainfall will be increased. As a result, a number of crops, among which some are drought resistant and some are not, are grown. When farmers perceive a drought is likely to occur within the season, they tend to cultivate more drought-resistant crops in order to reduce the losses. This is proved by the Yala chena cultivation. Rainfall being highly unreliable during the Yala season, farmers select highly drought-resistant crops like millet *(Mineri)* and gingilly. For the millet crop, two rains are sufficient; one for the germination, the other when it starts to flower. Therefore, millet is a widespread crop when there is likely to be a drought. Farmers do not need to protect gingilly from cattle and wild animals because they do not eat this crop. This allows farmers just to clear the land and broadcast the seeds. Whether gingilly grows or not, farmers do not worry unduly. If it grows, farmers can harvest it, otherwise it is only a minor loss. Therefore, farmers can engage in their other activities without staying in their chenas protecting their crops.

Another widespread pre-sowing adjustment is to confine cultivation to the highlands. This is a complement of the adjustment of abandoning paddy lands. The figure for Arabokka in this case is lower than for other villages because it is a cattle-rearing village.

Collective decisions are very important in the paddy cultivation. (see chapter four to clarify this collective decision process). Success or failure depends on the availability of tank water. Therefore, an individual cannot use the tank water as he pleases, but has to adhere to collective decisions. In Swodagama the relevant figure is low for collective decisions. This, however, is because it is a new village, where the tank was only completed for the Maha season in 1987. Before that, their activities were mainly chena and labourer-type work outside the village.

The colony farmers show that they also follow these adjustments as village farmers, but with different weightings. Farmers prefer to grow high-yielding long-term paddy rather than short-term low-yielding varieties. Their decision of select-

ing the crop variety to be grown is not determined by yield alone but by the water level in the tank and their perception of the reliability of forthcoming rains. In the colonies, agricultural activities for the forthcoming season are planned in advance at a meeting between officers and farmers after storing enough water in the tank. The crop variety for the season has to be determined at this meeting according to the time of the season and water level in the tank.

There are various officers who are assigned to carry out different activities in the colonies. As a result, the freedom of the farmers to make decision which are relevant to agriculture by themselves is very low compared to village farmers. Thus, colony farmers are heavily dependent on officers' decisions, and the dominance of the offficers in the colonies clearly emerges from the table above. This background in the colonies means that the farmers behave as subordinates to the officers.

When farmers think there is likely to be a drought from the beginning of the agricultural season, it is their nature to pray to the Gods. However, there is a remarkable difference between the two colonies. Irrigation facilities in Suriyawewa are highly reliable; most farmers are migrants, and relatively young; it is open to urban influences. Mahagalwewa has contrasting conditions, with chena activities enhancing the farmers' beliefs towards Gods. Relatively reliable irrigation facilities in Suriyawewa have enhanced the farmers' confidence to cultivate even when there is likely to be a drought during the coming season. However, this confidence is lower in Mahagalwewa because of its small tank. As a result, the cultivation of paddy lands by taking a risk has a lower value here.

It is highly disastrous to cultivate paddy when drought conditions are expected. However, there are subsidiary food crops, mainly vegetables, which can be grown with less water. The crops under this group have been grown especially in the Yala season during the last few years. Though this is a new system for the area, the farmers are getting used to it, and it has already shown its suitability and potentiality for expansion in the area, as it reduces drought losses by reducing the area under paddy which consumes more water.

Farmers are thus reluctant to abandon paddy cultivation in Suriyawewa in the face of prospective droughts, given the reliable irrigation facilities. However, Mahagalwewa has an entirely contrasting response because farmers know that their water resources cannot be augmented when it is reduced. Thus, with the

drought in 1987 Yala season, paddy lands were abandoned in Mahagalwewa. Thus farmers of this village did not have to face vast financial or material losses. In contrast, Suriyawewa farmers cultivated paddy in this season, their cultivation was completely destroyed by drought and they were subsequently deprived not only of the harvest of that season but also of the money and labour they had spent.

Mahagalwewa farmers cultivate their chenas even though they have to abandon the paddy. Because there are very few farmers who are chena cultivators in Suriyawewa, the confinement of cultivation to the highlands is not so important for them. The two other adjustments mentioned in table 6.1 are not practiced by many farmers.

The farmers thus have several adjustments to practise before they sow their paddy fields in order to avoid drought losses. However, the contrast between the villages and colonies is remarkable, (see table 6.1) and shows that the different economic activities of the farmers with varying irrigation facilities have created these differences.

After-sowing Adjustments of the Farmers

Though farmers are very particular about the prospective droughts in the coming season and follow the pre-sowing adjustments, there is still a possibility to face drought conditions unexpectedly after paddy is cultivated, but before harvesting. On these occasions, farmers practise several after-sowing adjustments, either to protect the paddy or to reduce further losses. These are given in table 6.4.

Village farmers practising both paddy and chena cultivation know from their experience that paddy is more vulnerable to drought than chenas. However, chenas require attention both day and night in order to protect them from wild animals. If farmers perceive a possible drought before the harvesting, there is no need to protect the highly water consuming paddy and they give their full attention to the chenas in which a number of drought resistant crops are grown.

When farmers, after sowing the paddy, see clear signs of a drought their attitude towards the tank water becomes very frugal in order to reduce the danger for

Table 6.4 — After-sowing Adjustments in the Settlements

After-sowing Adjustments	Ar.	Ih.	Mi.	Sw.	Ma.	Su.	Vills.	Cols.	All.
Extremely careful with tank water usage	75	88	87	100	83	83	88	83	85
Pray and vow to Gods	100	92	87	87	81	72	90	77	82
Give up paddy for chenas	100	96	100	100	89	16	99	52	72
Reduce the inputs for paddy	67	79	67	80	64	67	72	66	68
Use machines to pump left-over tank water	67	79	80	100	78	6	81	42	59
Subsidiary crops grown in paddy lands	25	0	13	66	38	89	20	63	45

Columns: Ar. = Arabokka, Ih. = Ihalakumbukwewa, Mi. = Migahajandura, Sw. = Swodagama, Ma. = Mahagalwewa, Su. = Suriyawewa, Vills. = All villages, Cols. = All colonies and All. = All settlements.

Source: Field data. Data in percentage form.

paddy cultivation. Their behaviour is entirely different during the rainy season.

The structure of the bunds of tanks and sluices do not allow all the water in the tank to drain naturally. There is an amount of left-over water in the tank, the volume of which varies according to the size of the tank and the nature of the tank bed. When the gravity flow is ended, the only way to utilise this water is by machines. During the 1987 Maha season in Swodagama farmers practised this adjustment when they ran short of water during the flowering period. As a result, the tank was dried up within three days. Plate 6.2 depicts the area under left-over water and an almost totally dried up tank after the extraction of the left-over water by machines.

Inputs are normally higher for paddy cultivation than for chena cultivation and they are expensive when related to farmers' income. If farmers anticipate a drought and the destruction of their paddy cultivation before harvesting, they realize that their further input to paddy will not be productive. They, therefore, cease inputs, thereby hoping to reduce drought losses.

Subsidiary food crops grown in paddy lands as an after-sowing adjustment is not so viable. Though farmers mentioned this as a possible adjustment, they actually do not practise this method in the villages. However, there is a high possibility of practising such activities before sowing the paddy if the villagers and relevant government authorities consider this possibility seriously.

Plate 6.2 — Dried up Tank after Using the Water Pumps (Machines)

Colony farmers also have to make after-sowing adjustments. However, the importance of their adjustments are significantly different from that of the villagers. The table 6.4 suggests that farmers are hesitating whether to continue or to abandon their cultivated paddy lands.

When farmers are certain that they cannot obtain irrigation water to face drought conditions, one sensible thing they can do in order to reduce further losses is to reduce the inputs for paddy. This is very frequently practiced in both colonies. Even though paddy cannot be protected from drought, subsidiary food crops can be grown to a certain extent with less water. This practice in the paddy field has been started in the recent past in Suriyawewa and has already proved its high growing potential in the future. Because of chena cultivation, this type of system is still not considered by farmers in Mahagalwewa.

Since farmers in Suriyawewa were given 1/4 of an acre in the highlands, they cannot cultivate in their homesteads because of their limited land spaces. On the

other hand, some farmers from this colony who cultivate chenas can give their attention to chena crops. Mahagalwewa farmers have been given 2 acres for their homesteads, so, they are able to cultivate in their chenas as well as their homesteads. As a result, these farmers can give up paddy for highland cultivation.

Irrigation water for Suriyawewa paddy fields are mainly distributed through the left bank main canal of the Walawa Scheme. Therefore, though there is a small tank in Suriyawewa, farmers are not allowed to pump left-over water from this tank. There is another reason for this. When the water is stopped for the major canals, tank water in Suriyawewa is only for drinking and bathing. Having their own tank in Mahagalwewa, farmers there use machines to pump out left-over water to protect their crops. Furthermore, this tank is larger than the Suriyawewa tank. According to the construction of the tanks' bund and sluices, 8 feet of water remain when its gravity flow is stopped due to the decline of the water level, thus facilitating pumping in Mahagalwewa.

Adjustments Related to Chena Cultivation

Chena as an agricultural system has evolved in the area from time immemorial. The agricultural practices in this system suggest that specific activities from the selection of lands for the cultivation to harvesting aim to minimise the hazardousness of droughts. Farmers have very clearly perceived the behaviour of the rainfall in the area and carry out chena cultivation accordingly. *Chena* lands are abandoned by the farmers after cultivating it for a few years with growing soil infertility and inability to control weeds. Consequently the hut (a small shelter) made in the *chenas* is also impermanent (Burton *et al.*, 1978). We can identify a variety of drought adjustments under chena cultivation, from land preparation to storing and selling the produce. These adjustments may be analysed under several sections, viz., adjustments with the chena morphology; land preparation; crop varieties; planting and working practices.

Adjustments with the Chena Morphology

Farmers are heavily dependent on chenas because it is their main livelihood in the villages. Therefore, arbitrary activities and decisions are not common in the chena system. Each activity concerning chena cultivation has its own particular meanings and purposes in exploiting the water during the short-term rainy season in order to cope with droughts. Chenas being mainly located in forests, where it is necessary to take precautions to protect crops from wild animals, farmers do not cultivate in isolation. Rather, farmers form small groups and clear the forest for their chenas. The land cultivated by a particular farmer depends on his possible labour input.

The morphology of chenas is adjusted to fulfil farmers' ambitions. There are two types of morphologies: *Muttagaha* chena and *Irikondu* chena. *Muttagaha* means 'great grandfather tree'. According to this system, the centre of the chena tract has a big tree which is called *Muttagaha.* Farmers can expand their individual chena area from this tree towards the surrounding forest. The following diagram illustrates the main characteristics of a *Muttagaha chena.*

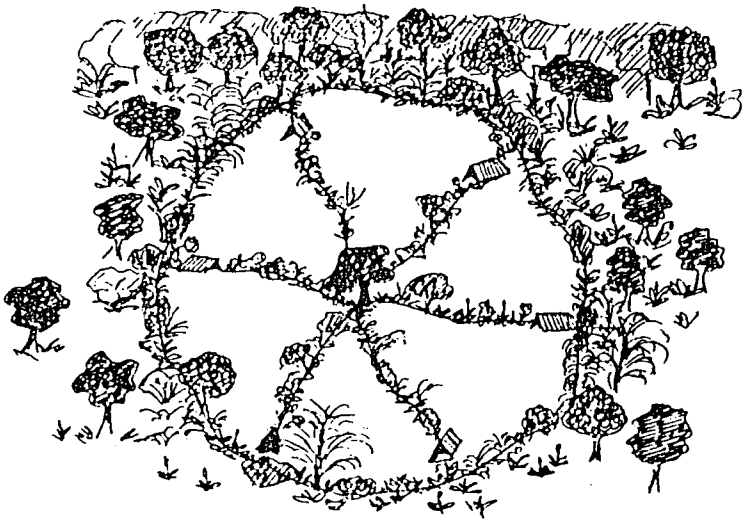


Figure 6.1 — Muttagaha Chena

Farmers build their chena huts in the outer margins of two chenas. Under this system farmers have to protect only one side of their *chena* from wild animals. If farmers have sufficient forest land for chenas, this method is very popular. The

number of farmers for a *Muttagaha* chena varies from 4 to 12 but this type of chena is rarely practised due to lack of big enough forest lands.

Irikondu means 'several lines like backbones'. No particular shape is typical for this chena morpology and it depends on the characteristics of the forest area. However, the number of farmers for this type of chena is 3 to 6. The following diagrams illustrate typical situations.

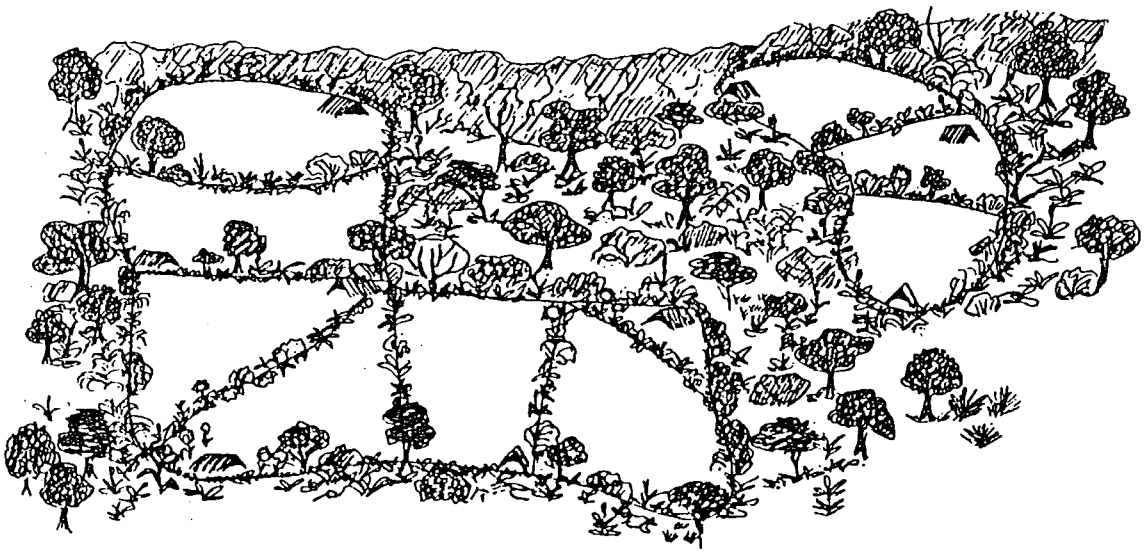


Figure 6.2 — Irikondu Chena

Here the location of the chena hut varies according to the shape of the chena and the individual bias of the farmer, unlike with the *Muttagaha* morpology. If one has to abandon the already started land plot then all the collective activities behind those morpologies are also lost while the hazard remains.[2] In the event that a farmer has to face problems preventing him from chena activities, his colleagues have to carry out the activities in his land plot. When this farmer returns, he has to compensate the others. The nature of these activities and behavioural patterns show that farmers have adjusted to chena cultivation and developed their agricultural methods to make use of the rainy season more efficiently, thus, minimizing the threat from droughts to their living.

Adjustments with the Land Preparation

The land preparation of chenas by farmers is entirely different from that of paddy land. A more detailed explanation of the chena farmers' way of land preparation, and their concern of specific days and times based on their knowledge about the hazardousness of drought and environment, will help to identify the adjustments under this section. (See the section related to agricultural practices and farming combinations in Hambantota in chapter four in order to identify these adjustments more clearly.)

All the forests in the vicinity of settlements which have been subjected to frequent chena cultivation experience a progressive loss of natural soil regeneration. Fertile chena lands are therefore only available far away from the permanent residential areas. This condition makes it necessary for farmers to go far away from their homes in order to find more fertile lands. Farmers who do not do this may have to start their chenas where there is well grown under-growth to cut and burn. Burning the chenas destroys seeds of weeds and other fungi which causes plant diseases. Farmers who cannot burn the land properly have to contend with weeds. If they use tools to weed, then this exposes the surface soil enhancing soil moisture evaporation. Farmers thus use modern herbicides before they start to plant the seeds in order to protect soil moisture in the present time.

More generally, farmers pay much attention to controlling weeds. Burning and the use of herbicides represent an attempt to create favourable growing environment for chena crops without the competition from weeds. When they plant, the farmers try to plant crops in order cover the entire surface, thereby expecting to protect the soil from soil moisture and to control the weeds. When the plant canopy grows enough to shade the soil, farmers are busy on weeding and piling the weeds along the rows of planted crops which are grown following the contours. Thereby, the farmers expect to block the surface run off rain water and allow percolation to increase the soil moisture. I myself helped to weed *chenas* during the fieldwork period, but a researcher studying the chenas towards the northwest from my field area, including Suriyawewa as a study site has reported that farmers do not weed (Hettiarachchy, 1984). Weeding is mentioned in farmers' poems also. (See the section related to the poems in the chapter 7.)

In summary, we can identify four drought adjustments under the land prepa-

ration in chenas: land preparation starting well in advance of the rainy seasons; minimum tillage practices in order to protect soil moisture; herbicides sprayed in chenas to protect soil moisture; intensive weed management with a view to get the highest harvest.

Adjustments with the Crop Varieties

There is a variety of crops which are grown under chena cultivation. Most of them are well adjusted to drought. The rainy season in the area is unreliable and short, thus the crops are short-term and drought-resistant. The growing time of the crops varies from 45 to 120 days. The selection of crops to be mainly cultivated depends on the farmers' perception of the forthcoming rains. If they perceive a prominent forthcoming drought, then, clearly, short-term and more drought-resistant crops will dominate. Within the study area, *Mineri* is a highly drought-resistant crop. Under the highly uncertain and short rains in the *Yala* seasons this crop is widely used. Table 4.7 shows the main chena crops grown in Hambantota District and the discrepancy of the lands under cultivation between Maha and Yala seasons. The table also shows the farmers' response to drought. During the highly drought-affected *Yala* season they reduce the area devoted to almost all crops except *Mineri,* which markedly increases in hectare coverage. Thus two drought adjustments can be identified: the planting of short-term crops and drought resistant crops in chena lands.

Adjustments with the Nature of Planting

Planting begins with the broadcasting of dry seeds of Kurakkan and Mineri over the lowest and level areas of the chena. These seeds start to germinate with the first Maha season rains. With these rains, the cultivators begin to plant germinated seeds of leguminous crops and maize. While doing this, they prepare a nursery, mainly for chilli and some vegetables. When these activities are concluded and the village tank is overflowing, the farmers have to cultivate the paddy fields too. After the paddy cultivation is attended to, the farmers turn to the chenas. By this time, they can see the small plants all over the chena. But here and there birds and wild animals may have destroyed the crops. In places where the broadcasting was

avoided or thin by mistake, the farmers plant seedlings from the nurseries. This type of stage by stage planting allows them to plant many crops in the chenas to ensure a reliable harvest. Farmers believe that chena cultivation can provide the basis for a happy and successful life. The main objective of this cultivation is to obtain basic food supplies in form of different crops. The variety of crops reduces crop diseases, and if one is destroyed, the remaining crops yield a harvest. They can produce for home consumption and for the market. In this manner multi-cropping in chenas can be seen as an important adjustment to possible drought losses. Crops which are grown from the nursery are also drought-resistant. They are mainly for commercial purposes. When the cultivators plant chilli and some vegetable varieties in Maha seasons, they too suffer the drought period from late January to early March before the *Yala* rains. However, unlike other crops, chilli and some vegetable varieties are not completely dead. After the dry period around February, and then subsequent *Yala* rains start, those partially dead varieties revive and thereby, farmers can reap a harvest once again. Such relay cropping thus becomes an adjustment to the drought hazard.

Chena cultivation is mainly practised on undulating lands. When it rains water is therefore drained very quickly, with the danger of soil erosion. Farmers therefore practice strict contour planting both to enhance percolation and to reduce erosion. As was mentioned above, when they weed the farmers pile the weeds along the rows of crops grown according to contour planting. Thus contour planting is a further adjustment.

In summary, five adjustments are identifiable under this category. Namely they are the broadcasting of dry seeds, stage by stage planting, multi-cropping, relay cropping and contour planting.

Adjustments in the Nature of Working

The time-table of chena cultivators is arranged to make efficient use of the time factor enabling them to exploit to the full both the physical base and rainfall variability. Different crop varieties are therefore grown in the two seasons; long-term crops are dominant in *Maha* seasons during which rainfall is reliable as well as longer, and short-term crops in *Yala* seasons with shorter and unreliable rains.

Chena cultivators start their agricultural activities in June, initiating the land clearance during the months of drought. Cleared land is burnt before the 20th of August. The farmers expect rains during the second half of September. Before the rains, they start to sow some crop varieties, and with the rains in early October other important crop varities are planted. They grow many crops enabling them to work most of their time in the chena. The life-time of the crops varies. By the end of November some crops start to yield. From December to the first half of February harvesting takes place from various crops which give their harvests in different periods with short time spans. When this is finished, there is a dry spell mainly from the second half of January to the first half of March. If someone is going to cultivate in the *Yala* season, this dry period gives him an opportunity to burn the stubble in the land which was cultivated as the *Maha chena* (normally the *Yala chena* is practised on *Maha chena* land). Broadcasting and planting the seeds in the Yala season is finished by early April. Since short-term crops are dominant in the *Yala* season, harvesting is finished by June. This rigorous time table is occasioned by the frequent threat of droughts and short-term and highly unreliable rainy seasons. Another characteristic of *chena* farmers is their restless working pattern. During the short-term rainy season they try to cultivate both the chena and the paddy. However, they cannot enjoy a rest from the chena sector as they can with the paddy, since, from the day the plants are green, farmers have to protect chenas both day and night. Lack of protection for a single day is more than enough to suffer unrecoverable losses. The help of family members is very important to protect *chenas*. Young children, for instance, protect the *chena* in the day time from birds and monkies.

Whether farmers live in villages or colonies, almost all the farmers have to follow the similar types of adjustment in order to reduce the drought losses with chena cultivation. The main reason for this is that the location of the chena lands are in the forest. Therefore, if a farmer wants to cultivate a *chena* he must go to the forest areas and join a group of *chena* farmers. Therefore, the number of farmers who engage in chena cultivation is the decisive factor in influencing these adjustments in any settlement. In Mahagalwewa 97% (field data) of the farmers practised chena cultivation. As a result, these adjustments are very dominant here. On the other hand, only 1/4 (27%) (field data) of the farmers in Suriyawewa cultivated chenas. In general, however, adjustments which are practised by the

village farmers related to chena cultivation are also followed by the colony farmers.

6.2.2 Produce Management Precautionary Adjustments

Living with frequent droughts and under their hazardous effects, farmers know very well their abilities and inabilities regarding their agricultural production line. According to the perception of the majority of farmers, they may have to face drought once every two years. As a result, they have developed management practices with regard to their produce in order to avoid severe food shortages and hardships under drought conditions. It is very clear that all these practices are carried out with a view to face a drought condition and thereby unavoidable crop failures. The following adjustments can be identified from the settlements:

1. storage of some chena produce for future consumption,
2. storage of some paddy produce for future consumption,
3. money loan to paddy farmers who, in return, repay in paddy with 100% interest,
4. taking cereals as wages for agricultural labour and storing for future.
5. cooking customs (especially with rice),
6. preservation of foods.
7. eating perishable foods during harvesting time,
8. selling of excess produce little by little,
9. banking of savings, and
10. straw collection for live-stock.

Farming families handle their agricultural produce with great care, for they know the uncertainty of their activities. When they reap a good harvest, they put aside buffer stocks. There are other reasons too. Agricultural produce put aside, as a buffer stock is a status symbol in this society. If a family does not need to buy rice and other necessary cereals from shops because it is self-sufficient, it has a high status in its settlement.[3] It is a source of pride for the members of the family. After a new harvest is collected, it gives a family a very high esteem if it can say that it is still using the old produce. It is very clear among the farming community in the area that their self-confidence is entirely dependent on the produce stored

in the house for future usage. When the stored produce of a family is exhausted, esteem of the family is weakened, and no self-confidence, but have to live with timidity and submission. In such an environment, therefore, all farming families try their best to maintain reserved produce and buffer stocks.

The very first activity after the harvesting is to separate a portion of harvest in order to donate it to religious and other spiritual activities which are performed in the settlement. Then the farmers separate a considerable amount of the harvest as a buffer-stock and store it in the loft above the kitchen, where constant smoke protects the cereals from decaying and from insects. This stock is the vital strength of a farming family. If this is exhausted before the next harvest, the house has become very unlucky and the family members are helpless and miserable. Most of the farmers cannot provide full meals (full meals here refers only to the quantity but not at all to the quality) for their family members when their stocks are finished. The reason is that the families in general are big, and during the drought their economies collapse, as prices for essential foodstuffs like rice and other cereals go up while income sources gradually diminish. On the other hand, immediately after the drought most farmers have no money to buy their necessary agricultural inputs and other materials. Therefore, they have to borrow these with high interest. When they harvest, money lenders and businessmen come to the agricultural land and collect the produce to cover their money. By the time some farmers pay back their debts, they have nothing left to store but are forced to repeat the borrowings. Thus the vicious circle of poverty in the farming community is helped by the droughts.

Farmers like to store both paddy and chena produce, but not all farmers have both chenas and paddy fields. Most farmers in this category practise the adjustment mentioned under points three and four (see above), thereby storing the food varieties which have not been grown by them.

Some families (especially in the older generation) save a handful of rice each time when they cook rice. In general, a farming family gains prestige if its members can say that they take rice meals three times a day. A family of four adults needs at least 1kg of rice for a meal. When women start cooking, first they measure the necessary amount of rice, and before they start washing the rice, take a handful of rice from the measured portion and place it in a separate pot or a box. This small amount is hardly missed, yet with time this practice can accumulate a considerable

amount of rice, which is then available during a rice shortage, especially under a drought.

Preserved foods are mainly from the jak and bread-fruit trees. These are important perennial crops in the area yielding mainly in May and June. These trees produce heavily but the crops are perishable within a short period. The only way to make full use of them is, therefore, to dry and preserve them for future food shortages. From jak, farmers preserve both the flesh and nuts but bread-fruit only gives flesh.

When farmers start to reap the harvest in their chenas, they have several food varieties. Some are perishable, but cereal varieties can be stored and therefore be consumed when necessary. Melon, cucumber and some vegetables represent the perishable group. When these start to give their matured crops, if farmers consume those, they can hardly eat other things, so that they can save the cereals. Furthermore, they are aware of the nutritious value of green crops. Therefore, unmatured ears of maize and leguminous plants are much consumed. This food intake has an effect on the shape of the bodies of people; its influence on the human frame is reflected in various sayings, for instance, "when the maize ears mature, village girls become very beautiful". The main reason for this type of saying is the contrast with the time before the Maha season harvest when people in the area generally experience a food shortage due to drought.

After separating portions for religious activities and stocks, some farmers have an excess produce to sell. If they sell all the excess at once, and when this money is in their hands, the temptation to spend all the money quickly and unnecessarily is very high, even though after the harvesting most of them will not have extra income sources. During and just after the harvest, prices are generally low for all the crop varieties. Consequently, farmers do not want to sell their excess at once but in stages, as and when money is needed.

Some farmers with good relations with the bank recognise the advantages of maintaining an account. If they deposit money in the bank, it is safe and can be withdrawn when they are in need of money. If they are in good standing with the bank , they can also borrow money at low interest when they face hazardous conditions in order to carry out agriculture.

After the paddy harvest is finished farmers can collect a lot of straw for the cattle. Therefore, farmers who have cattle try to store as much straw as possible, thereby hoping to solve the food crisis of their cattle in drought periods. It is evident from these adjustments that farmers have developed a logical and diverse produce handling management.

6.2.3 Financial Management Precautionary Adjustments

Adjustments related to produce management, and also those with regard to the financial management are similar in all the settlements. Almost all farmers are living in an economically backward environment, and only with a good harvest do their economies become strong for a short period. The word 'strong' conveys the farmers' happy feelings with their harvest, rather than any relation to their indebtedness or other problems. The list below depicts the adjustments under this section;

1. payment of all the debts after harvesting,
2. placating of government officers,
3. placating of friends and relatives,
4. *sīttu* (a method of saving money),
5. investment in housing,
6. purchase of school equipment for the whole year,
7. encouragement of students to work for money,
8. repair of broken agricultural and household equipment,
9. purchase of valuable and luxury goods and
10. spending of money on celebrations.

By the time farmers finish their harvesting, most of them are indebted to both organisations and private money lenders. Most of the time the main cause of their indebtedness is crop losses due to droughts. The farmers are not certain about drought years and drought-free years, but they know that there is a high possibility of facing a drought even after the sowing and planting. Therefore, indebtedness of the farmers continues, as a result of drought in the area. It is clear that the

indebtedness creates problems and hardships for the farmers, on the other hand, borrowing does reduce their great hardships during drought in this type of socio-economic environment. Since many farmers have no prolonged reliable support available to resist drought, this vicious circle of indebtedness helps to a certain extent. Therefore, when they sell their produce farmers try to pay off all their debts and thereby assure their credibility with money lenders. This allows them to borrow money as well as goods from shops when they are in the next hazardous period.

Government officers have a great power over the farmers and their activities, whether there is a drought or not. For a bountiful harvest, hybrid seeds, fertilizer, agrochemicals, and instructions are necessary, and these are mainly available from government organisations. For these inputs, farmers have to pay if they have money, otherwise they can be borrowed. In order to have these facilities in due time, farmers always try to placate officers and satisfy them. On the other hand, when they face drought, they need the officers' support to obtain drought relief supplied by the government to reduce hardship. The attitude of most officers towards the public in this area as well as in other parts of the country, is extremely different from that of the British officers.[4] In the field area most officers from the lowest level to the top expect royal treatment from the farmers, giving no concession to those deprived in return.

There are few farmers in the villages who are self-sufficient and can withstand prolonged drought without external help. Most farmers have a number of friends and relatives who help them when in need. As this support is very helpful to farmers when they face hardships they placate friends and relatives in order to ensure their assistance when they have to face hardship.

After the harvesting, farmers have money for a short period, but they know that when the money is in their hands it is likely to be spent little by little, without realising it or using it in a productive way. However, all farmers like to buy valuable goods even though most of them cannot buy with ready cash due to insufficient money. In order to overcome such financial problems some people and businessmen organise *Sīttu* which is practiced in three main ways in the country. In the first of these, a group of ten fifteen people is formed. This group is organised by a person who has economic power and credibility. They decide how much money

one can pay every month at a particular date. The amount depends mainly on the income of the group. The money collected during the first month is taken by the organizer, and subsequent beneficiaries are selected by drawing lots amongst the formed group members. This type of *sīttu* is mainly practised by women and can be found in many parts of the country.

The second type follows similar procedures as the former method but the amount of money is more variable. With this method, there is no sequence. Instead, *sīttu* is auctioned in every month. Who gets the money is determined by auctioning the *sīttu*. In order to get the chance, members have to bargain, and in this process the amount of money one expects has to be reduced if one wants to get the opportunity. For instance, if the group has 10 members and the agreed amount to be collected is Rs. 1000 a month, the auction will start at Rs. 1000 and members put bids in which reduce the amount of money one would like to accept. If a person is ready to accept Rs. 500 in a particular month, then each member has to pay only Rs. 50 for that month. If the amount is Rs. 800, then the share will be Rs. 80 and so on.

The third type of *sīttu,* the most relevant to this study, is organised by the businessmen. For the former two methods the stable income of the members is a precondition, otherwise it is difficult to collect money in every month at a particular date. Therefore, the earlier two methods are difficult, uncertain and very risky in the drought stricken study area. According to the third method, the farmers do not get money, but the businessman who organized the *sīttu* provides a valuable household equipment or a good as approved by the group members in the beginning. Money is collected as a single instalment from each member at the beginning. When all the members pay their agreed amount, the total amount collected is a considerable amount and can be used by the businessman as a capital. The capital collected in this way is used by organisers for their businesses and thereby they can earn a lot of profits and are able to give an article for a reduced price. In this case too, the sequence of beneficiaries is determined in the beginning by drawing lots. The last farmer to receive the article will have to wait for a long period but, given his uncertain income source, this nevertheless gives him the opportunity to add a valuable item to his personal belongings. This as an adjustment is becoming increasingly popular in this drought hit area.

Adjustments to droughts also condition the way in which farmers deal with their housing problem. Due to drought related disruptions to their agricultural activities, farmers have no continuous income sources. As a result, though farmers want to build a house, they cannot invest money continuously to complete the house. Farmers can only invest money on building their houses when they have a good harvest, and therefore, take a long time for its completion. Most of their houses are built little by little, and are of very low quality (see the table 6.13).

Seasonal income variations of the farmers clearly affect the quality and activities of school children. The uncertainty of agricultural activities always disturbs family activities and responsibilities among its members. A farmer may be extremely poor, but he tries to give his children a proper education. Although his ambitions can be achieved to a certain extent under the free education system in the country, he will still have to buy books, clothing, and other equipment for his children. (The text books were given free of charge to the students when the fieldwork was carried out. However, even at the end of 1987 academic year, science and mathematics books were not distributed to the schools in the area.) In drought periods they become helpless and cannot even supply essential foodstuffs for the family. Farmers therefore may buy all the necessary things for the whole year for their school-going children as soon as they have reaped their harvest, thereby hoping to reduce the possibility of grievances in case of a drought.

Though farmers are keen on educating their children, some of them encourage the school-going children to work for other farmers and earn money in order to exploit all the available income sources during the agricultural season. Some agricultural activities can be done even by 10 year old students; the wages are the same as the wages of adults; e.g. the land preparation (mudding) of the paddy fields with buffaloes. While agricultural activities are in progress, some students thus seek to work and earn money. Their money mainly goes towards educational activities, and some students are able to pay their private tuition fees for the year well in advance with the money they earn.

Farmers who have broken agricultural or household equipment may not be able to afford repairs in a drought period. Only after they receive money selling their produce after the harvest, are they able to repair their broken goods and malfunctioning machines.

After selling their produce, most of the farmers buy valuables and luxury goods. Among these, radios, cassette recorders, televisions, sewing machines, furniture, jewellery and bicycles are the most popular. The variety of the buying item is dependent on the needs of the each farmer. Their desire to buy these goods is to have enjoyment in their harsh life, even for a short period, and even if they have to sell or mortgage them when later faced with financial hardships mainly caused by droughts.

There are a number of social and individual family celebrations in the villages. Most of the religious and other common celebrations are celebrated in a grand way after a good harvest. Weddings, alms-givings, house-warming ceremonies, growing-up (puberty) ceremonies of the girls, devil dancing and exorcism ceremonies are very common individual family ceremonies after harvesting. Elopements of young couples are also common. Villagers, friends and relatives are invited by the farmers for their household based ceremonies, and the guests offer presents for their host family. The main reason for this behaviour is their knowledge of the hardships they will undoubtedly have to face under future droughts. Under drought conditions they cannot invite and treat others and friends and relatives. Therefore, both hosts and guests are affected by droughts, discouraging their activities related to entertainment.

Farmers' financial management adjustments are similar in both villages and colonies. In addition, the degree of importance of these adjustments is also similar. On the whole, almost all the farmers live in economically backward and unstable conditions. Only with a good harvest does their economy become strong for a short period. However, most of the time in the year their economy is very fragile. Therefore, considering past experiences, evaluating the available amount of money, and expecting future uncertainties, the farmers in all the settlements follow similar financial management adjustments.

6.3 Recouping Adjustments

The saying "something is better than nothing" is very appropriate to describe the activities of drought-hit farmers. It is clear that most farmers are generous, helpful, proud and self-respecting if they are able to follow normal agricultural activities. Unfortunately, these qualities disappear with the destruction of their

crops due to droughts. When their resources are exhausted, they try their best to recoup the drought losses through adjustments with regard to finance, employment, forestry, frugality, cattle rearing and regarding the tanks.

6.3.1 Recouping Adjustments Relating to Finance

When all the saved money and produce are exhausted farmers have to face severe financial problems under the collapsed agricultural system. The lost financial sources, due to crop failure, are replenished in a number of ways as shown in table 6.5.

Table 6.5 — Financial Recouping Adjustments

Recouping Adjustments Relating to Finance	Ar.	Ih.	Mi.	Sw.	Ma.	Su.	Vills.	Cols.	All.
Borrowing from money lenders	42	92	56	67	77	73	65	75	71
Borrowing consumer goods and agro-inputs	42	88	49	80	63	70	63	66	65
Mortgaging or selling jewellery	25	50	40	60	66	75	44	70	59
Leasing or mortgaging paddy field	25	42	31	40	53	61	34	57	47
Mortgaging or selling household equipments	25	50	36	47	50	44	40	47	44
Borrowing cereals from relatives and friends	25	58	27	33	50	41	35	45	41
Borrowing money from relatives and friends	25	50	22	13	22	33	28	27	28
Borrowing from Banks	0	8	2	0	9	42	3	26	16
Leasing or mortgaging highlands	8	17	13	20	16	14	15	15	15
Leasing or mortgaging homestead and house	8	0	2	13	19	13	4	16	11

Columns: Ar. = Arabokka, Ih. = Ihalakumbukwewa, Mi. = Migahajandura, Sw. = Swodagama, Ma. = Mahagalwewa, Su. = Suriyawewa, Vills. = All villages, Cols. = All colonies and All. = All settlements.

Source: Field data. Data in percentage form.

In the villages it is very clear that the farmers in Ihalakumbukwewa and Swodagama are practising these adjustments to a greater degree compared to the other two villages. We can identify a few major adjustments; borrowing, leasing, mortgaging and selling movable and immovable properties. If people have money, their purchasing power is high; if farmers have personal movable and immovable possessions, their borrowing power is also high, and therefore, the most important factor for practising the adjustments in the table is personal belongings. However, banks are unimportant to the village farmers since these are too, inefficient to lend at times best suited and highly urgent to the farmers, and their income is not

certain enough to pay back their loans according to the rules and regulations of the banks.

The borrowing of money from private money lenders is the most important. There are a few farmers in every village who are able to lend money. Either they have their own money or they have contacts with wealthy people in the area which enable them to lend money to those in need of it. For these people to lend money the debtor has to produce a surety. Household equipment and jewellery are the most common sureties in the villages. When these are mortgaged, paddy fields and highlands become the sureties. Interest rates of the money lenders vary from 120% to 240% per annum. Ihalakumbukwewa farmers widely practise this adjustment. Since they have both chena and paddy, they can borrow and immediately repay it with a good harvest. In Swodagama too, a considerable number of farmers use money lenders to recoup their losses. In Arabokka this is much less practiced since cattle rearing gives them an income even under drought conditions.

Money is also borrowed from relatives and friends. In Ihalakumbukwewa, most of the farmers are the original villagers and consequently have many relatives and friends in the surrounding villages from whom they can borrow money. In Arabokka, farmers are relatively well off and most do not need help. In the other two villages, most of them are migrants and thus do not have nearby relatives and friends who can support them with money when they are in need of help or under drought conditions.

Some men and women in the area have high quality gold jewellery, mainly earings, rings, bangles, chains and necklaces. It is very easy to transform golden jewellery into money through mortgaging. In general, however, farmers believe that possession of these will help them to overcome the decisive financial difficulties. On the other hand, money lenders ready to lend money accepting these as sureties, because they have no problems when compared to financial transactions accepting lands.

A third resort of farmers, after the depletion of agricultural produce and jewellery, is to mortgage or sell their house-hold equipment, item by item. The most common equipments mortgaged or sold are sewing machines, radios, furniture, bicycles and agricultural tools. The item is selected depending to the amount of money needed.

When farmers have mortgaged or sold their jewellery and house-hold equipment, most of their movable properties to recoup drought losses are exhausted. If the drought continues further, then they have to mortgage or lease their paddy fields. Leasing is the dominant method. In all the villages under study, during the Maha season in 1987, a farmer was able to receive Rs.1500/- (approximately 25 pounds) per acre when leasing his paddy field for the season. At the end of the season the farmer was able to regain the land without any problem. Paddy fields are so important to the farming community, that they do not practise this as an adjustment to cover their day-to-day expenses. Only if a farmer is faced with an unexpected major demand (e.g. a funeral) during a drought, this sort of adjustment might be practised.

Highlands are seldom a scarce resource to the villagers, hence their mortgage value is low. Leasing, mortgaging or selling highlands is thus an infrequent strategy. Even more infrequent is the leasing, mortgaging or selling of the homestead and home. It is feared by farmers and disliked by the receivers.

The continued consumption of goods from foodstuffs to agricultural inputs ahead of payments is another widespread practice. This applies to goods from both small shops in the village and big shops in the nearby small town. It is particularly the practice of farmers from Ihalakumbukwewa and Swodagama, but much less common for Arabokka and Migahajandura for the same reasons just given.

If farmers have relatives and friends who can supply cereals, farmers like to 'borrow' from them. In general, they do not charge an interest and, if they do, the interest is very low compared to the interest rates of private money lenders. Unfortunately, when there is a drought this type of person is very rare in the local area.

In the colonies also private money lenders play the most important role in this type of situation. In order to borrow money from these people, farmers have to use their properties as sureties. Therefore, mortgaging and leasing as adjustments, mentioned in the table, are mostly related to the borrowing from money lenders. Jewellery is very easy to convert into money, and therefore, it helps very much to get some money in order to get over financial difficulties. Farmers can mortgage their paddy field very easily in a colony unlike in the villages, as a result of more

reliable irrigation facilities, and thereby created ability to cultivate in both seasons. Under a drought, when farmers have no money to buy their daily essential consumer goods, they tend to borrow these from shops. These borrowings start with consumptive goods, and extend to agro-inputs, so that, finally, the farmers agree to sell their products to the shop owner. Careful observation of these activities reveals that the destruction of the agriculture due to drought perpetuates this type of adjustments..

6.3.2 Recouping Adjustments in Relation to Employment

Since farmers have to deviate from their normal agricultural activities in order to maintain their livelihood during droughts, we can identify a number of activities mainly in the form of non-farm adjustments. Most of these activities listed in the table 6.6 as adjustments are temporary. Therefore, farmers may have engaged in several of these within a drought period in order to make both ends meet.

Table 6.6 — Adjustments in relation to Employment

Employment adjustments	Ar.	Ih.	Mi.	Sw.	Ma.	Su.	Vills.	Cols.	All.
Work for the drought relief worksite	58	63	82	73	78	83	73	80	77
Work as labourers outside the settlement	25	38	24	60	19	41	33	30	30
Brick making	0	8	20	20	31	48	15	40	29
Working as labourers in the settlement	25	33	22	20	16	41	25	28	27
Gem hunting	0	38	22	27	9	20	24	15	19
Poultry farming	0	0	4	13	11	5	4	8	6
Working as labourers in the coral pits	25	0	0	0	0	0	0	0	1

Columns: Ar. = Arabokka, Ih. = Ihalakumbukwewa, Mi. = Migahajandura, Sw. = Swodagama, Ma. = Mahagalwewa, Su. = Suriyawewa, Vills. = All Villages, Cols. = All Colonies and All. = All settlements.

Source: Field data. Data in percentage form.

When there is a drought, it is the duty of the government to support the afflicted farmers by supplying aids to them in every possible way. The government policy at present has two goals when supporting drought victims: one is to provide drought relief aids (either money or foodstuffs), the other is, while providing aids, to get farmers to do some communal activities in the settlement such as the

maintenance and repair of the village tanks, roads, and other public facilities. The government uses two criteria in order to select suitable farmers for drought relief aid: one is that the aid receiver should be a farmer, the other is the income level of the farmer. Apart from these, crops of the farmers must have been destroyed by a drought in two consecutive seasons. After selection, suitable farmers have to work two mornings per week in the settlement in order to receive drought relief aid. The material aid provided by the government in return for the farmers consists mainly of rice. While 93% of the farmers in Migahajandura were receiving the drought relief aid in 1987, all the farmers in the other settlements were in such receipt. In theory, any one member of a family who is able to work, must work for the drought relief work-sites in order to get these relief aids.

Some farmers in search of employment go outside the village for the time being. A considerable number of farmers in Swodagama practise this form of adjustment. During a drought few can find temporary work

as labourers within the settlements. There are few farmers who can afford to hire labourers for their most important activities, and during droughts this type of job is very sought after and, as a result, only low wages are paid.

Brick making, as a handicraft, is practised by some farmers during the drought periods. Often they do not find sufficient time for this activity during the normal agricultural round. While some farmers make bricks both for selling and their own use, others make them only for the market. The dry climate is helpful for brick making because it allows the (seasoned) wet bricks to be dried easily. Such brick making gives another advantage in that extra stocks can be made and stored. By the time farmers reap their harvest, they can sell the bricks for high prices because during this period most of the farmers have ready cash, and there is a high demand for building materials.

Some farmers turn to gem-mining during the drought periods, and they go to the gem hunting areas situated along the Walawa river bank and work in the pits for the gem businessmen. However, this practice is absent in Arabokka due to its location far away from the river.

All the villages are located in the vicinity of forests. Therefore, timber to make furniture is available. But farmers, knowing the importance of the forest,

do not readily destroy it in order to make money. In addition, government laws to protect trees are very strict. However, the wood is illegally acquired and some make furniture for a livelihood during a drought.

Some farmers run small businesses such as small village shops, cereal buying, milk collection, selling goods going door to door, selling and buying in the village fairs, and more. The number of farmers engaged in this sort of activity is very high after the harvesting when compared to periods with droughts. During field work, I experienced the truth of this phenomenon. It is four miles along Migahajandura to Suriyawewa Embilipitiya main road. During the 1987 drought period and before harvesting there was only one village shop in Migahajandura by this road. However, with the Maha harvest in 1987, the number of shops increased to five. Though this type of activity is reduced by droughts, some try to make use of the opportunity to earn money as much as possible knowing their difficulties during droughts.

Although there is a strong possibility of improving poultry farming in the settlements, in fact very few farmers practise it in an effort to recoup their drought losses. Especially in the villages, the possibility to carry out free-range poultry farming during the droughts is particularly suitable since agricultural lands do not need protection from damage by flocks.

One final adjustment for some farmers in Arabokka is working in the coral pits. This is explained by its location near to the coast and to Hambantota city, where there are coral pits and a demand for plaster in the building industry.

Most of the activities listed in the table as adjustments are temporary and, therefore, farmers may have engaged in several of these activities within a drought period. There are more opportunities in this regard for the farmers of Suriyawewa since it is a rapidly developing town in the area. However, farmers have no time to engage in these activities when they have water to cultivate.

6.3.3 Recouping Adjustments Related to Forests

Whether farmers live in villages or colonies, they appreciate the importance of the forest for their environment and livelihood. They therefore do not destroy the forest indiscriminately and deliberately, even under drought conditions. Even for

chena cultivation they generally do not destroy the big trees in the forest. The data in table 6.7 clearly show that farmers in all settlements make a negligible amount of harmful demand from the forest during the drought periods. Though they may clear the forest for chena cultivation, they practise a number of activities for its maintenance. In fact, only in Arabokka are forest-related adjustments important, but these are not so harmful. Cattle rearing is the major economic activity for all farmers in Arabokka. Since they face a fodder shortage during drought periods, they bring their cattle to the forest in order to feed them. Normally, when they bring their animals to the forest during a drought, they do not need to control the cattle because there are no agricultural crops requiring protection. This condition allows farmers to engage in other activities. Firewood is a source of income in Arabokka, which is located near to Hambantota city and Colombo Kataragama main road. The collection and cutting of firewood is therefore important. The meat of wild animals plays an important role both as a food source and as a source of income, especially during the drought periods in Arabokka. Arabokka farmers find a ready market in Hambantota city. Farmers in Arabokka also obtain timber from the forest, which is another reflection of its closeness to the market. Few farmers collect honey although earlier this has been an important activity. The introduction of agro-chemicals has now almost decimated the bee population. Thus somebody who wants to collect honey today may have to walk for a long time in the jungle, and even then perhaps may not find a single beehive. The collection of medicinal herbs has also been an important activity in the past during drought periods, but now Western medicine dominates.

6.3.4 Frugality Adjustments

Many things and aspects of the farmers are dependent on the success of their agricultural activities. If they reap a bountiful harvest, there is happiness, satisfaction, self-respect, pride and peace for the whole farming community. On the other hand, the effect of drought on their agricultural activities can mean that farmers have to adjust to a miserable way of life during which they have to give up many things and become extremely frugal in order to eventually recoup drought losses. Table 6.8 lists the various adjustments.

These adjustments clearly indicate the misery of the farmers during drought

Table 6.7 — Adjustments in Relation to the Forest

Adjustments	Ar.	Ih.	Mi.	Sw.	Ma.	Su.	Vills.	Cols.	Cols.
Cattle fodder	100	13	2	0	0	0	17	0	17
Firewood	42	4	9	7	2	3	11	2	6
Wild animals' meat	33	4	11	0	6	6	10	6	8
Timber	25	4	0	7	0	6	5	3	4
Honey	8	0	2	0	2	0	2	1	1
Yams or tubers	0	8	0	0	2	0	2	1	1
Medicinal herbs	0	4	0	0	3	2	1	3	2

Columns: Ar. = Arabokka, Ih. = Ihalakumbukwewa, Mi. = Migahajandura, Sw. = Swodagama, Ma. = Mahagalwewa, Su. = Suriyawewa, Vills. = All villages, Cols. = All colonies and All. = All settlements.

Source: Field data. Data in percentage form.

Table 6.8 — The Farmers' Adjustments to a Frugal Life-style

Frugality adjustments	Ar.	Ih.	Mi.	Sw.	Ma.	Su.	Vills.	Cols.	All.
Extremely economical behaviour	83	96	62	93	77	78	78	77	78
Reduction of entertainment expenses	50	83	62	93	61	41	71	51	59
Reduction of travelling expenses	42	88	38	93	55	61	59	58	58
Sending children to relatives and friends	33	33	24	40	30	27	30	28	29

Columns: Ar. = Arabokka, Ih. = Ihalakumbukwewa, Mi. = Migahajandura, Sw. = Swodagama, Ma. = Mahagalwewa, Su. = Suriyawewa, Vills. = All villages, Cols. = All colonies and All. = All settlements.

Source: Field data. Data in percentage form.

periods. Farmers have to give up most of the things which make life happy and comfortable. Almost all the farming families in the villages become very economical under the shrinking income during the droughts.

If somebody visits a farming family after a successful harvest, he realizes how farmers like to entertain their visitors. But, with exhausted resources during droughts, they do not like people to visit their houses because of their inability to treat them as they would wish. My personal experience with farmers amply bore out this feature.

Farmers normally visit their relatives and friends who live far away from their

villages, often incurring a considerable expense. Travel to see other parts of the country is also common. Most of these expenses have to be cut or dispensed within drought periods. If a farmer has cattle, his freedom to travel and stay a few days away from his home is low since most of them believe nobody looks after the cattle as the owner does. The farmers in Arabokka, being cattle rearers, show a lower willingness to travel, for instance, farmers in Migahajandura, have even fewer contacts with their relatives and friends since their economy is, in general, not so sound.

While farmers may exchange money and cereals with friends and relatives during a drought, some also send their children to stay with them. This practice aims at reducing their hardships under their collapsed economic activities. It is heartbreaking to hear the parents' grievances when they talk about the hunger their small children have to suffer. Their main worry is that as adults they can understand the situation, but they cannot bear small innocent children have to suffer as a result of food shortages. Because children cannot understand the problems.

Though the data in the table are only available for the above frugality adjustments, there are other adjustments belonging to this category as the list below shows.

1. buying low quality goods,
2. reduction of purchasing,
3. lessening of investments,
4. deliveries at home,
5. reduction of medicaments,
6. fewer lamps at night,
7. forgoing newspapers,
8. forgoing radios when batteries exhausted,
9. retiring to bed early,
10. reduction of philanthropy and
11. being satisfied with what one can get.

Farmers change their consumer behaviour as a result of the effect of droughts. After a successful harvest, the purchase of high-priced goods becomes widespread. Businessmen, knowing this behaviour of farmers, increase the prices of all the goods. Farmers are very keen to buy clothes and other luxury items, and there is a high competition among farmers to buy. Most of them smoke cigarettes, use soap with pleasant smell, eat luxury foods from shops. But when drought demolishes their economy, they begin to smoke cheapest low quality Beedi, use soap which irritates the skin, and eat cereals without proper curry. In order to tide over their drought losses, this change is one of the prevalent practices.

Under the shrinking income, another result is the change from bulk purchasing to buying goods in small quantities, sufficient to cover the daily necessities. This is practised by most of the farming families during droughts.

Another consequence of the collapsed economy under drought is the reduction of investments. However, most farmers invest their money on very important activities when they have money after a successful harvest.

Though the government medical facilities are free for everybody, most farmers have to go a considerable distance in order to obtain these facilities. Therefore, farmers who live far away from the health centres come to these centres only when they have money. When they have little money, they cannot go to these places. Under such hardships, very poor mothers, for instance, do not go to government health centres for the delivery of their babies. As a result, their deliveries take place at home.

On the whole, farmers are very keen to preserve their health when they have money. After a good harvest, even for a simple disease like a cold or fever, some try to obtain treatment from specialist doctors. Most receive their medicaments from private doctors, paying high medical fees. This behaviour dramatically changes under the drought-hit economy and they cannot afford to receive medicines from private doctors even for a severe health problem. Therefore, most of them have to satisfy themselves by using traditional medicaments consisting mainly of spices.

Many lamps at night in a house are an indicator of a sound economy. But drought causes a reduction in the number of lamps burning at night in most farming families. Not only the number of lamps, but the number of hours they are alight

is also reduced. Money which normally goes to buy kerosene is thus saved.

Most of the farmers do not buy daily newspapers. But weekly newspapers and specific newspapers of interest to farmers are bought when the economy is good. However, farmers give up this habit during droughts in order to preserve funds.

Radios and noisy cassette players in most of the farming families are another indicator of a successful harvest. Although there is no electricity in the villages, these machines are frequently used. They have to buy batteries frequently, but after a drought they cannot afford them and, as a result, there are no radios, no music and no enjoyment. This is a widely observed phenomenon among farmers.

With money farmers can enjoy the night with radios, newspapers, chatting with each other and indoor games like drafts etc. But drought deprives farmers of most of these things. As a consequence, farmers retire early to bed, thereby saving on expenditure.

Earlier, I also discussed the farmers' generous nature when they have money. All being Buddhists, many prefer to donate and to practise meritorious activities. Most of the farmers in the country repeat the saying, "The things we donated have a good smell, but the things we ate have a bad smell". Further, they believe, that if they donate something, after their death this meritorious act will help to obtain a good life when they are reborn. Though they have this type of belief and attitude, most of them cannot practise these under economic hardships. When the droughts harass them, they have to give up such good practices. Even beggars know farmers' poor condition during drought and as a result, leave the area while drought persists.

Farmers who cover most of their necessities by a good harvest, can be changed drastically by drought. After the exhaustion of most of their resources, their life-style changes drastically, but a certain resigned contentment may remain. Then farmers are satisfied with whatever they receive. This mentality helps most of the farmers to survive even the severest drought losses.

If we consider the frugal life style of the farmers in general, the Sri Lankan saying "The hearth knows how we eat" is very suitable to describe the frugal life-style of the drought-hit farmers. People who have experience with farming communities under normal conditions may think that the life-style of the farmers,

and most of their other qualities are very nice. However, farmers do not show the difficulties of their real life to outsiders even under drought, and thus only their hearth and kitchen knows how and what they are living on.

6.3.5 Adjustments Related to Cattle Rearing

Cattle rearing as a means of generating income is an important activity and drought adjustment for some farmers in order to recoup the collapsed agricultural activities. The separate adjustments are given in Table 6.9.

Table 6.9 — Adjustments Related to Cattle Rearing

Adjustments with cattle	Ar.	Ih.	Mi.	Sw.	Ma.	Su.	Vills.	Cols.	All.
Grazing animals in the forest	100	25	7	40	6	3	28	5	15
Taking animals to an another village	67	13	13	7	13	3	19	8	13
Selling the cattle	58	13	9	13	9	8	17	9	11
Allowing animals to stray in the village	33	21	7	20	13	1	16	7	11

Columns: Ar. = Arabokka, Ih. = Ihalakumbukwewa, Mi. = Migahajandura, Sw. = Swodagama, Ma. = Mahagalwewa, Su. = Suriyawewa, Vills. = All villages, Cols. = All colonies and All. = All settlements

Source: Field data. Data in percentage form.

In general the importance of cattle rearing is gradually diminishing in most of the Dry Zone settlements at present due to high population growth and accompanying expansion of agricultural lands. However, all the farmers in Arabokka have cattle; here the number of cattle owned per farmer is also very high when compared to other settlements.

Fodder shortage is the main consequence of drought, but since all the settlements except Suriyawewa are either surrounded by or in the vicinity of the forest, most of the farmers take their cattle to the forest and let animals feed with dried grass and leaves freely. Owners meanwhile are able to engage in other activities either in their settlement or outside. This as an adjustment is important to all the farmers in Arabokka.

Some farmers have either friends or relatives in other villages where the effect of droughts may be less severe, particularly if these villages possess a major irrigation scheme. Farmers with major irrigation schemes do not have extensive grazing

lands, and, as a result, most of them have no cattle. Therefore, village farmers may bring their drought-affected cattle to these areas. Because of the irrigation facilities, farmers can cultivate both in the Maha and Yala seasons, especially under major irrigation schemes. Therefore, village cattle owners can engage in land preparation activities with their cattle, enabling them to earn some money. Village farmers in this case, can thus withstand the fodder shortage as well as earn some money.

Cattle can be considered as 'travelling money'. Whether there is a drought or not, the cattle can be converted into money whenever farmers want. Though farmers sell their cattle, they do not like to broadcast the fact, because in general they have to sell them to Muslim butchers. Many benefits (milk, fertilizer, agricultural activities, draught purposes etc.) are derived from the possession of cattle, so that to sell these animals to be killed is considered a disgrace and a sin for the owner in the eyes of the community. Nevertheless, during droughts most farmers sell cattle to cushion the collapsed economy.

During droughts there are no crops in the paddy fields and the chenas in the settlements. Therefore, farmers can allow their cattle to roam anywhere in the settlement in search of fodder. This can be considered as another economic activity which helps to soften some economic losses.

6.3.6 Adjustments related to the Tank

The tank full of water is the life-blood of paddy farmers in the Dry Zone. Success or failure of the paddy cultivation in a season mainly depends on the water level in the tank. During drought periods, tanks dry up or have less water. Depleted supplies in tanks nevertheless may be used in such a way as to reduce losses to the farmers (see table 6.10).

Most of the wells are dried up during prolonged drought so that people have to travel to fetch water. Farmers may start to dig wells in the village tank, where the water table is relatively high and digging is also very easy. This practice is not so popular in Arabokka mainly due to its cattle keeping and its location very near to the sea. But, more importantly, farmers in Arabokka receive pipe water which is brought to the village by a tractor with a big tank from Hambantota city. This water is for drinking only.

Table 6.10 — Adjustments Related to the Village Tank

Adjustments with the village tank	Ar.	Ih.	Mi.	Sw.	Ma.	Su.	Vills.	Cols.	All.
Wells dug in tank	25	100	69	80	44	3	73	23	45
Lotus yam collection	0	96	76	67	66	1	70	3	40
Cultivation of tank bed	8	54	49	33	42	1	43	22	31
Compensation of the daily water needs	25	13	38	40	56	45	30	51	42
Drinking water from the tank wells	8	42	36	33	45	66	29	55	44
Critical use of remaining water for animals	83	25	13	7	38	16	24	27	25
Restriction of bathing and washing	83	8	9	13	94	100	19	97	58
Resorting to fishing	8	21	4	13	16	14	10	15	13

Columns: Ar. = Arabokka, Ih. = Ihalakumbukwewa, Mi. = Migahajandura, Sw. = Swodagama, Ma. = Mahagalwewa, Su. = Suriyawewa, Vills. = All villages, Cols. = All colonies and All. = All settlements.

Source: Field data. Data in percentage form.

Lotuses grow in the village tank. Lotus yam is considered as a herbal food, and therefore it has a very high demand in the market, especially in the urban areas. Thus farmers collect yam and thereby collect a major income source for a short period during droughts. Most of the family members engage in this practice and, as a result, yams in the tank bed are exhausted within a short period.

Some farmers grow vegetables in the tank bed when there is little water in the tank. This is a demanding work because careful and continuous watering of the plants is necessary. Since these crops must be protected especially from cattle, this is a negligible activity in Arabokka. But some farmers practise this, especially in Ihalakumbukwewa and Migahajandura.

By the time wells and canals start to dry up, either the remaining water in the tank or the newly dug wells in the tanks compensate for the water farmers formerly derived from the wells. But by this stage, they have to cut down their level of water usage in every aspect.

Though there is water in the wells during droughts, the quality of the water deteriorates and becomes brackish and undrinkable for humans. Then main drinking water sources in the villages become the newly dug wells in the tank with relatively low brackishness.

Water for animals, mainly for cattle, is normally available from the village tanks and canals. If a farmer has cattle, left-over water in the tank is an immense help for cattle owners. If the tank is entirely dried up, farmers have to take their cattle to other tanks where some water remains available.

Villagers bathe and wash their bodies frequently when they have enough water in the tanks, canals and wells. With droughts, they are first deprived of the water from the canals and wells and, as a result, the frequency of these activities depends on the water availability in the tank. When the village tanks are dried up, villagers have to go for a long distance in order to bathe. Farmers in Ihalakumbukwewa and Migahajandura go to Mahagalwewa tank and people in Swodagama go to Suriyawewa tank for a bath. In Arabokka, people go to Hambantota city and bathe in pipe-borne water.

Fishing is generally done by a certain caste in the country and it is not considered a respectable activity among farming communities. Nevertheless, some farmers fish in the village tank during the drought until it dries up entirely.

6.4 Opportunistic Adjustments

The Sri Lankan government plays an important role in attempting to combat the drought problem. Unfortunately, this effort is not progressing satisfactorily at the village and regional level. All the government activities seem to be entangled, confused and therefore handicapped. The most important reason for this condition which hinders the rural progress is the abused power by the corrupt politicians and government officers. In order to carry out their activities without having great problems, a group of obedient supporters among the farmers is selected, and their work is to play the role of middle man who connects the needy farmers to either the politicians or officers in most cases by way of bribery.

The main government activity to help the farmers is to develop the irrigation facilities. Consequently, the area of agricultural land can be increased and then farmers are able to cultivate in both the Maha and Yala seasons. When an irrigation scheme is completed, the government makes necessary arrangements to distribute the lands under the scheme by calling for applications. After the lands are distributed between farmers, they have to follow the rules and regulations which mainly relate to water management, community activities and collective

activities under the scheme. Though there are laws, regulations, authorities and officers in order to carry out these activities efficiently and reasonably, these are not properly practised by farmers, officers and politicians. The officers, authorities and politicians are unjust and corrupt. The ruling political parties initiated irrigation projects in the Dry Zone since independence from British empire. Giving a small piece of irrigable land, politicians hope to gain the political control (David, 1982; Schrijvers, 1988). Therefore, if a farmer wants not only an irrigable land but also irrigation water, agricultural inputs, drought relief aids, and other government facilities, they may well have to line the pocket of, or in some way advantage, the government officers as well as ruling party supporters. If a farmer is unable to act in this manner, he is isolated and deprived. Having perceived such a social system, farmers have become opportunistic in order to achieve these facilities and thereby reduce the drought losses. The activities which can be considered opportunistic adjustments are as follows: 1) bribery, 2) support of ruling political party, 3) 'treating' officers, 4) marriage of convenience, 5) richer gets more opportunities, and 6) agreements with businessmen. Evidence to justify the existence of these adjustments were collected from replies to the sentence completion tests, which are summarized in table 6.11.

Bribery is an important, as well as a very powerful, force in the area not only for irrigable lands but to obtain many other things from the Government authorities and departments. Eight of the reply forms represent different shades of bribery. If a farmer who has no qualifications applies for irrigable land, then bribery can make him eligible. Most of the officers need to be satisfied, and bribery appears to be the only way. Bribes have to be given either to the local ruling party politicians on the local level or to some government officers who support the ruling party or both. During the period the field work was carried out, there were some distributions of lands under newly built or renovated tanks. Bribery had played an important role and bribes of Rs.5000/- were made in order to get a land.

Under Sri Lanka's corrupt democracy, most of the government benefits go to ruling party supporters. When the government offers employment to the youths or lands for the farmers, widespread bias is shown. There is a very high competition among farmers to receive an irrigable paddy field in the Dry Zone. Therefore, farmers either directly support or pretend to support the ruling party.

Table 6.11 — Replies to the Sentence Completion Test

Replies	Ar.	Ih.	Mi.	Sw.	Ma.	Su.	Vills.	Cols.	All.
Give bribery	42	8	13	20	14	63	17	38	29
Must have qualifications	17	0	13	27	13	41	13	27	21
Politically influential	42	21	31	7	20	8	26	14	19
Improve relationships with officers	0	71	18	40	42	5	32	23	27
Apply for the lands	0	46	44	7	8	14	33	11	21
Lands should be given reasonably	67	17	0	0	9	5	12	7	9
If reasonably given, it is very good	17	0	0	0	8	20	2	14	9
Not given reasonably	17	79	89	93	81	73	78	77	78
Given reasonably	50	0	11	7	1	1	13	2	4
Cultivate friendship to officers	50	4	27	40	13	38	26	25	25
Work for the drought relief	50	88	84	47	59	63	75	61	67
Inform the Government Agent	0	4	4	0	28	0	3	14	9
Tell grievances to village head (G.S.)	0	4	7	20	0	0	7	0	3
Be eligible farmers	0	0	8	0	0	0	0	0	2

Columns: Ar. = Arabokka, Ih. = Ihalakumbukwewa, Mi. = Migahajandura, Sw. = Swodagama, Ma. = Mahagalwewa, Su. = Suriyawewa, Vills. = All villages, Cols. = All colonies and All. = All settlements.

Source: Field data. Data in percentage form.

Since the government is carrying out a number of welfare activities in the country, especially in the Dry Zone, government officers have an authority over the farmers' activities, and create disharmony and atrocities with their many interferences. Irrigable lands, irrigation facilities, drought relief aid, aid as agricultural inputs and other major and minor activities are handled by the government officers. Though they are servants of the people, most of them behave as though the people were their servants and subordinates. Officials have created this mentality in the minds of most farmers. If farmers treat officers well, then officers will support the farmers. Therefore, most of the farmers try to treat government officers within their limited resources, and the farmers' treatments vary according to their level of income. In return, government officers' support for the farmers varies according to the level of treatment they have had from the farmers.

One of the qualifications which is needed in order to obtain an irrigable land from the government is that the applicant should be married. Though the officers can help to achieve other qualifications for some farmers, they can hardly turn

a blind eye to this condition. Therefore, if an applicant is unmarried, he has to marry and so some farmers find women and register their marriage to fulfill this condition, even though it may be a marriage of convenience. Some marry just in order to achieve the necessary status and do not live as husbands and wives.

The above adjustments show that there is a high possibility for rich and influential farmers to exploit the resources and facilities which are derived from public funds. When this type of farmer has an opportunity, he makes use of it in order to obtain further benefits. As a result, poor and uninfluential farmers are deprived and suffer from both the drought and the social system.

Farmers suffer in many ways when drought destroys their economy. When the drought is over, and when they want to restart their agricultural activities, their poverty deprives them of the necessary inputs and consumer goods. In order to overcome this problem, farmers make agreements with businessmen who sell the inputs and consumer goods. According to these agreements, when farmers collect their harvest, they must sell it to the businessmen with whom farmers have an agreement. Businessmen charge high prices and high interest for their loans. When the farmer collects his produce, the businessman expects that the farmer will sell all his produce to him. But even if the farmer does so, the latter is not given the total amount of money there and then, but gets it in instalments instead. Further, farmers' produce can be subjected to short measurements. Aware of these activities, farmers respond by not bringing their excess produce to the businessman. They bring the necessary amount which covers his debt with interests, and sell the remaining excess produce for higher prices to other buyers.

There is a Sri Lankan saying, "Dēse hatiyata bhāse", which literally means, "The way of speaking must be according to the area" (here area means either opportunity, situation or existing environment). This phrase summarizes an opportunistic behavioural patteqrn of people.

6.5 Survival Adjustments

Although farmers make every effort to live as respectable village people, droughts always disturb their life-style, and drive them to misery, especially among the poorest group. Being the poorest, and therefore the most needy, they are the most neglected. When the droughts continue for a long time, some farmers, es-

pecially in the poorest group, practise some activities which are not normally acceptable among the farming community. They are a last resort in order to survive. After harvesting, they give them up and try to resume their normal life with a self-respect. The various kinds of activities, classified as survival adjustments, are numerous. They include the reduction of the number, quantity and quality of meals, the drinking of gruel, the consumption of seeds, the intake of the same meals for a long period, the hiring of children as servants, the stopping of children from schooling, the hiring of children for illegal activities, the brewing of illicit liquor, petty thefts, prostitution, gambling and illegal abortions. Table 6.12 depicts the survival adjustments with quantitative data.

Table 6.12 — Survival Adjustments of the Farmers

Survival adjustments	Ar.	Ih.	Mi.	Sw.	Ma.	Su.	Vills.	Cols.	All.
Petty thefts	67	75	82	93	69	97	80	83	82
Reduction of quality of meals	75	79	60	93	83	81	72	82	78
Reduction of quantity of meals	8	92	71	87	81	59	71	70	71
Drinking of gruel	0	38	24	27	19	11	25	15	19
Reduction of the number of meals	8	75	62	87	81	52	63	66	65
Consumption of reserved seeds	17	50	22	60	59	67	34	63	51
Hiring of children as servants	8	26	16	7	13	9	18	11	14
Stopping children from schooling	8	21	9	7	19	14	11	16	14

Columns: Ar. = Arabokka, Ih. = Ihalakumbukwewa, Mi. = Migahajandura, Sw. = Swodagama, Ma. = Mahagalwewa, Su. = Suriyawewa, Vills. = All villages, Cols. = All colonies and All. = All settlements.

Source: Field data. Data in percentage form.

Considering the nature and qualities of all the survival adjustments, these can be analysed under three sections related to food shortage, children and illegal activities.

6.5.1 Adjustments Concerning Food Shortages

When asked whether they have faced food shortages during droughts, over 82% of the village farmers and 86% in the colony farmers responded in the affirmative (field data). Though they have to face food shortages, they try their best to maintain normal food intake. It is very clear that in all the settlements all farmers

try to maintain their self-respect. When their bodies become thin and skinny it is an indicator of their miserable condition and they consider it as a disgrace. Therefore, they always try to maintain a sufficient food intake in order to avoid a thin, skinny and weak body although, unfortunately, they may have to change food habits as a last resort just to survive.

After harvesting, when the economy is restored, most of the farmers tend to consume chicken and even western foods, like butter, from the markets. These are considered as luxury foods in the country. Another feature of their restored economy is their use of a number of curries with rice, various types of foods. But with a prolonged drought, the farmers have to reduce the quantity and quality of their meals in order to survive. This is a very common adjustment.

A good farmer is supposed to eat a huge meal normal for a physically working man. When a farmer can eat a big meal, it is an indicator of his strength and efficiency of his activities, especially of his agricultural activities. As a result he is respected since he can work hard, and he can work more than the people who take small meals. All farmers appreciate this but, most reluctantly, have to give up this habit during a drought, except in Arabokka where cattle rearing helps farmers in that they can earn an extra income to mitigate losses.

Gruel[5] which is made out of rice, water and salt, is a liquid diet for sick people, in general. When a normal person drinks gruel, it is an indication of his economic misery, for it affects his external appearance, he cannot work as efficiently as the others, and is, therefore, subjected to hurtful remarks. There is also the belief among farmers that if a family drinks gruel as their meal, it will be subjected to many more deprivations as regards many secular things. Therefore, to drink gruel, apart from sickness, is a disgrace according to the values of the farming society. But, when such poor farmers cannot find other means for their livelihood, they have to resort to these things whether they are appreciated or not by the society. Apart from Arabokka, in the three villages a limited number of farmers have to resort to this in order to survive.

Farmers are generally very particular about their meals in order to maintain their physical strength and health. Under severe droughts, those farmers who are not thrown back upon gruel may still have to reduce the amount of their meals in a day. A more unfortunate adjustment is when farmers are driven to consume

reserves of their seed varieties. even though this is considered as an evil omen for the future.

Most drought victims have to make do with monotonous meals, that is either with rice or *Kurakkan* flour, with a curry which is merely made with chilli, salt and water. This meal is very similar to the that of Scottish oat cakes which was once considered as a meal of the poor, and which is without any flavour. This as an adjustment is very common in all the villages.

One may argue that activities such as the reduction of the quantity and the quality of the meals are still practised by some people, especially by some women, even in developed countries. Yes, it is true, but the reasons behind these are different. Drought-stricken Sri Lankan farmers follow these adjustments as their last resort for their very survival. Farmers who do much hard manual labour know the disadvantages of these adjustments.

6.5.2 Adjustments with Children

Among the farming communities children are clearly considered as a resource as well as a family prestige by their parents. When a farmer has a big family, especially of boys, it is an indicator of his ability to cultivate a large area, especially a chena, without the help from others. If there is a turmoil about the ownership of lands or any other personal conflicts, the families with a large number of males are less likely to be threatened by others due to their family strength. Family bondage is close, so that all the family members rise as one against the opponent if one is attacked or provoked. Farmers, therefore, treat their children very well. However, under severe drought conditions, some farmers hire their children as servants to government officers or rich people, who live mainly outside the settlements.

Again, most farmers try their best to give a good education to their children, but when they have to face financial problems due to drought, they cannot afford school uniforms, books and other things for school-going children. On the childrens' side, they may have to wear the same uniform for a long period without being properly washed. Some may not even be able to afford soap, so that their general appearance becomes dirty. The combined effect is the creation of an inferiority complex in the minds of children which forces them to stop attending school. This category represents only a limited number of children in every settlement.

In the settlements there are illegal activities going on. Businessmen hire poor farmers' children for selling their illicit liquor and to have help for gambling. When children sell illicit liquor, police officers do not easily suspect them as they suspect an adult. On the other hand, the external appearance of a drought-hit poor child does not allow anybody to think of him as a child who does such nasty acts. Therefore, businessmen can mislead the police to a certain extent by hiring children. Some people run illegal gambling spots. They hire children as spies. These places are mainly located where motorable roads do not exist. When the police come to seize any gambling spot, the hired children convey the message to the gamblers before the arrival of police. Parents allow them to act thus because they are in dire need of financial support and they do not mind where the money comes from.

6.5.3 Survival Adjustments Related to Illegal Activities

When agricultural activities are in progress, farmers have no time to engage in other activities; but after harvesting they have money and they can buy liquor from either legal liquor shops or illicit sellers in the village. Under these conditions, liquor is not brewed in the village but brought to the village from other areas. During droughts, farmers may start to brew illicit liquor *(Kasippu)* mainly from suger and dates, and sell it to other areas because they have no proper market in the village. However, this type of activity is condemned by most farmers. Therefore, survival activities like this are few in every village. Though petty thefts as an adjustment shows very high values in the settlements, it does not mean that almost all the farmers engage in this adjustment. The reason for this high value is that these figures were calculated according to the answers for question 53, "Do the number of petty thefts increase during the drought periods". Many more farmers answered 'Yes' and field observations proved that some of the farmers practise it simply for their survival. Although the number of people who practise these illegal adjustments is very low in the settlements their effect is extensive. Agricultural equipment, household goods, and clothes are the main items which are subjected to theft. Apart from these, cattle theft increases rapidly during a drought.

Under the collapsed economy in the villages, some farmers go outside the settlements in order to find a means of living. There is no certainty of finding an

economic activity. If a farmer is successful, his problems are solved to a certain extent. Otherwise, his problems may be increased and complicated. When this happens, his wife has to take the responsibility of the family as the principal caretaker without her husband. As a result, a wife is forced to do whatever she can to earn some money in order to survive, and some women resort even to prostitution.

Some farmers run illegal gambling spots, but since the majority of the farmers are poor and do not gamble, this is not a widespread activity. But in every village, there is a group who gambles during droughts. Organizers of gambling have inter-relationships, though they live in different villages. In order to protect themselves from seizure by police, gambling does not take place in the same village for any number of days, but venues change frequently.

Though farmers appreciate their children, some consider their children as a burden for the family when they have to face economic hardships created by droughts. With agricultural prosperity, the general attitude of the farmers is to increase their number of children; while they are suffering under drought, they consider a pregnant wife as a burden and try to abort the pregnancy. Abortions are illegal in Sri Lanka except under special circumstances. Qualified government medical officers practise abortions illegally, but their service is too expensive. Therefore, most farmers cannot afford for qualified services in a drought period. There are unqualified people who will do illegal abortions for lower fees, and, in general, farmers accept their service. Such illegal abortions, carry a great risk for the life of the women, but are practised simply in order to survive in the drought-hit environment.

None of these survival adjustments are acceptable to the farming communities under normal conditions, but some of them are forced to practise these as their last resort in order to survive under prolonged droughts. Though there are illegal actions outside the drought periods, those actions and the actions which are mentioned here have a clear difference because some members of the society commit these simply in order to survive. When farmers have water to cultivate crops they have no time to engage in these activities.

6.6 Incidental Adjustments

In addition to a direct and clear relationship between drought hazard and adjustments of the farmers, there are incidental drought adjustments, which have developed in the area, and work in an indirect way to cope with the losses and problems created by droughts. All the adjustments under this category, could be analysed under two sub-headings, namely, 1) house, family and people, and 2) social norms and values.

6.6.1 Adjustments relevant to House, Family and People

Every farmer is very keen to maintain his self-respect in his settlement. The condition of the house is one of the most important aspects for a farmers' self-respect. According to the general acceptance in the country, a proper house should have a hook tiled roof, plastered walls, a cemented floor, and enough space. However, a frequently drought-hit economy does not allow most of them to build a house as they would wish. On the other hand, some farmers having had enough resources to make a proper house, do not build a house with the qualities mentioned above because these are not suitable for an area with frequent droughts. However, cadjan or local tiled roof, wattle and daub walls, and mud floored houses are the most comfortable during drought conditions because of their cooling effects (see table 6.13 for the qualities of the houses).

The data very clearly show wide variations in the features of houses between settlements. Swodagama is a new village which was developed under the 'village reawakening programme' sponsored by the Sri Lankan Government. As a result, all the houses are the same, but since they are not made to ease the harshness of droughts, residents suffer heavily due to high temperature and dry air. In Arabokka where farmers are relatively rich compared to the farmers in other settlements, and located very near to the sea, most of the houses are constructed in order to maintain the qualities of a proper house.

Frequently, drought-affected poor farmers cannot afford hired labour when agricultural activities begin. At this time the demand for labour is high and the resultant high wage costs are a double blow. Chena cultivators, in particular, cannot take a chance with their agricultural activities, for if they delay their activities, they might have to face unrecoverable losses leading to greater misery. In order

Table 6.13 — Selected House Features

House features	Ar.	Ih.	Mi.	Sw.	Ma.	Su.	Vills.	Cols.	All.
Roof									
Cadjan	17	29	31	0	27	50	24	38	32
Mana	0	4	0	0	1	3	1	2	2
Local tiles	42	50	13	0	13	6	24	9	16
Hook tiles	42	8	56	100	59	34	49	47	48
Sheets	0	4	0	0	0	6	1	3	2
Walls									
Wattle and daub	25	79	40	0	34	55	42	45	43
Bricks	8	13	49	0	53	30	27	41	35
Unseasoned bricks	8	0	2	0	0	0	2	0	2
Plastered	58	8	9	100	14	16	29	15	21
Floor									
Mud	25	75	47	0	50	59	44	55	50
Cemented	75	25	53	100	53	39	56	46	50
The number of rooms									
One	0	13	2	0	5	3	4	4	4
Two	25	33	29	0	33	39	25	36	31
Three	25	33	27	100	39	38	40	38	39
Four	0	17	31	0	16	17	18	16	17
Five	33	4	4	0	3	1	7	2	4
Six and more	17	0	4	0	5	1	4	3	4

Columns: Ar. = Arabokka, Ih. = Ihalakumbukwewa, Mi. = Migahajandura, Sw. = Swodagama, Ma. = Mahagalwewa, Su. = Suriyawewa, Vills. = All villages, Cols. = All colonies and All. = All settlements.

Source: Field data. Data in percentage form.

to avoid these problems, the only feasible alternative they have seems to be to rely on the children of their large families. Table 6.14 shows the varying family size. The table very clearly shows the importance of a big family for the village farmers, except in Swodagama, which is a new village where most of the farmers are relatively young (see also table 2.3).

Another adjustment is women taking charge of the household. Chena cultivation is one of the main main economic activities for most of the farmers except in Suriyawewa. In general, chenas are located far away from the permanent residence of the farmers, and when the chena crops start to germinate farmers have to stay in

Table 6.14 — Family Size in the Settlements

Family size	Ar.	Ih.	Mi.	Sw.	Ma.	Su.	Vills.	Cols.	All.
Members from 1 to 5	25	29	40	67	34	25	40	30	34
Members from 6 to 7	25	38	22	27	27	41	27	37	31
Members from 8 to 14	50	33	38	7	39	34	33	37	35

Columns: Ar. = Arabokka, Ih. = Ihalakumbukwewa, Mi. = Migahajandura, Sw. = Swodagama, Ma. = Mahagalwewa, Su. = Suriyawewa, Vills. = All villages, Cols. = All colonies and All. = All settlement.

Source: Field data. Data in percentage form.

the chena both day and night in order to protect it from wild animals. Therefore, most of the other family responsibilities and most of the decisions related to the family have to be taken by the wife who stays in the permanent residence during the agricultural season. Under drought periods, some farmers leave the villages in order to find any sort of livelihood. Then, once again, the wife has to take the family responsibilities while her husband is trying to make ends meet.

Farmers, in general, are very keen to give a very good education for their children believing that education is the best way of solving their future problems. Droughts create problems, and since they do not help to improve the quality of education in village schools teachers loose interest in their occupation due to unfavourable environmental conditions. According to the existing administrative regulations, most of the teachers are not allowed a transfer to an area with a more favourable physical environment in other parts of the country. Although the teachers who teach in difficult areas are paid a special allowance, bureaucrats in the administrative offices have not separated properly the 'difficult' schools from 'comfortable' schools. Though there are schools in Ihalakumbukwewa, Migahajandura and Swodagama, difficult area allowance is only paid for the teachers in Swodagama, even though other schools have the same difficulties as in Swodagama. In addition, education facilities in the villages are nominal and insufficient for achieving a proper general education. As a result of all these problems, farmers who have money send their children to relatives, friends or board outside the village in order to give their children a relatively a good education. This type of farmer, however, is very limited in all the settlements and therefore this type of adjustment is not widely practised.

In a tropical area, people like to bathe and to wash their body several times every day. Though they can practise this in the rainy seasons, under droughts even drinking water is very difficult to obtain, and, as a result, they have to cut down body cleaning drastically with the result that their bodies exude an unpleasant odour. This condition is further worsened by the reduction of washing clothes and high perspiration.

No farming family has a commode-type lavatory in any of the settlements because such are impossible to use without continuous pumped water supply. The next most hygienic lavatory are water-seal squatting type lavatories. Though this is highly popular in most parts of Sri Lanka, this type also creates problems in areas of droughts. Therefore, most of the farming families use squatting pits which do not need extra water to flush. People do not use toilet paper in the lavatories but they wash with the left hand. When there is a severe drought, it is doubtful whether they wash themselves properly. Again, this condition is very common in all the settlements.

6.6.2 Adjustments Related to Social Norms and Values

The social norms and values influenced by Buddhism are the foundation of Sri Lanka's society. However, these traditional norms and values cannot be maintained under severe hardships. Droughts cause certain recognizable adjustments in this respect, viz., obvious breaking of social norms and values, deviation from religious activities, reduction of collective social activities, parents' inability to fulfill family responsibilities, reluctance to entertain, reduction of marriages, family disintegration, increase of loitering, increase in animosities, and limitation of activities to certain times of the day.

Social norms and values which developed from time immemorial, such as mutual understanding and relationships, mutual help, kindness, generosity and compassion can be greatly damaged by drought, when desperation and hunger prevail.

Religious ceremonies accompany both the main events of a farmers' life as well as important activities of agriculture and commerce. All associated religious activities are performed by Buddhist monks who also have the authority to advise, instruct, and lead people into the appropriate direction in order to maintain the sanctity, peace, prosperity and harmony in every village. Even though the peo-

ple are religious, severe droughts can still induce non-religious behaviour such as stealing, gambling, prostitution, loitering, hunting, fishing, the neglect of family responsibilities, the development of animosities and so on.

There are a lot of family responsibilities such as feeding, protecting, educating and directing children which are expected to be fulfilled by the parents. All these are accomplished naturally by the parents and without any hesitation if their economy is sound. When the parents' responsibilities are fulfilled, the other members of the family also fulfill their family responsibilities. As a result, everybody is happy and can be efficient in their family activities, thereby further enhancing the quality of the family. This healthy environment is entirely jeopardized by droughts which prevent parents from fulfilling their family responsibilities.

Entertaining farmers' relatives and friends is one of the most characteristic features of the village communities. Although they would like to maintain this habit, they can do so only when their economy is strong with a good harvest. After a good harvest, most farmers insist that their relatives and friends visit them and conversation includes talking and showing their newly-bought goods and other things achieved through a good harvest. This possibility is entirely destroyed by drought, in that they do not want to be visited by relatives and friends. If a relative who lives in a distant place sends a letter to inform of his intention to visit, the farmer tries his best to put off a meeting, even to the extent of telling lies.

The number of marriages increases after the harvesting season. Besides conventional marriages, liaisons not approved of lead to elopements, often with later parental approval. The number of marriages reduces dramatically during droughts. Even people who can afford a wedding do not celebrate it during the drought period, knowing and respecting the difficulties which fellow farmers are facing.

There is a multitude of activities for anybody who lives in the villages under normal conditions. When water is scarce the agricultural activities disappear, making an environment in the villages where most are deprived of their economic activities. Though these activities are lost, the necessities of the family remain to be satisfied, thereby pressurizing farmers to find money in order to maintain the family. Some leave the villages to go to other areas to find employment. Some are lucky in this quest, some are not. The former are able to help their families, while for others the conditions get progressively worse. In these situations, the farmers'

wives are forced to do socially unacceptable activities, and their children are hired out in order to live. As a result, families disintegrate.

People are very busy with their agricultural activities during the short-term rainy season in order to make maximum use of the rain water. On this depends a good harvest and a happy life. Loitering is unthinkable, but during droughts, loitering, especially in front of the village shops, becomes very common. Though this is not normally considered a desirable habit, drought-stricken farmers receive a kind of relief by discussing their problems here, or playing card games and draughts.

The saying "a hungry man is an angry man" is very appropriate to describe most of the farmers under drought conditions. Most of the human qualities normal during times of economic prosperity disappear during droughts. Less work increases the time for gossiping; poverty forces some to steal; destitution and desperation exist in every direction in the settlement.

During a rainy season, green plants can be seen in every direction, and they have a cooling effect during the day. There are plenty of trees for anybody in order to find shade and rest. With drought the green of the plants changes to brown and, instead of the shade, dry winds are advancing bringing dust with them, especially during the middle of the day. Therefore, most of the people limit their activities to a certain time of day. Shopping, travelling and water collection are done either in the mornings or evenings. Village fairs are mainly limited to several hours in the morning or evening because buyers and sellers come either early in the morning or before nightfall since their activities are very harassing and difficult to maintain during the middle of the day.

All the explanations related to the farmers' activities in the previous chapters very clearly indicate that these are finely adjusted to drought hazard. Farmers' knowledge about this hazard is, therefore, very thorough, having been gathered by them over generations and in a variety of ways (see chapter 5). Farmers' adjustments to drought which have been explained in this chapter vary broadly between the settlements due to their individual characteristics as mentioned in chapter 2. The significance of this variation in adjustments between settlements is shown in table 6.15.

Having perceived the hazardousness of drought, farmers do what they can in

Table 6.15 — Comparison of the Significance of Adjustments between Study Sites

Tables	Tn.	AFV.	Sig.	AFC.	Sig.	AFAS	Sig.
Pre-sowing adjustments	6.1	2.59	.05	23.23	.00	6.97	0.00
After-sowing adjustments	6.4	6.33	.01	34.12	.00	16.67	0.00
Finance	6.5	3.94	.01	.51	.48	4.80	0.00
Employments	6.6	1.93	.13	10.00	.00	3.23	0.00
Forest	6.7	29.68	.00	.00	1.00	18.82	0.00
Frugality	6.8	6.93	.00	.48	.49	4.55	0.00
Cattle	6.9	12.14	.00	1.60	.29	12.16	0.00
Tank	6.10	.64	.59	22.55	.00	5.14	0.00
Survival	6.12	7.53	.00	1.14	.29	5.00	0.00

Columns: Tn. = Table number, AFV. = ANOVA* F for the villages, Sig. = Significance (95%), AFC. = ANOVA* F for the colonies, AFAS. = ANOVA* F for all the settlements. * One Way Analysis of Variance Test.

order to avoid hazardous effects of droughts. In the process to minimize risks, they naturally prepare themselves for the problem even under normal conditions. Among these preparations some are acceptable while others degrade their humanity. Almost everybody believes everywhere in the world that the panacea for drought hazard is irrigation facilities. In this discussion it is made clear, however, that the irrigation facilities in the colonies have not erradicated the hazardousness of droughts. The practical situation tells a different story. Engineering and technological devices developed in the area enhance irrigation facilities, and therefore, the capacity to store rain water and to expand irrigable lands. As a result, population growth is increasing while suitable lands for cultivation are fragmented and reduced. On the other hand, rainfall in the area as well as in the entire country has decreased during the last few decades. If there are not enough rains, the possibility to have reliable irrigation facilities is naturally reduced. Though the colonization schemes are considered to have reliable irrigation schemes, the above adjustments negate the validity of such a consideration, and can only prove that the hazardousness of drought is on the increase in the area.

... Notes ...

1. W. Rahula (1985) *What the Buddha taught,* London: Fontana Paper Back. pp. 75-78.

2. An explanation is given in chapter 4 how farmers start the *chena* cultivation and their intentions behind the norms, values and practices related to this sector from land preparation to harvesting.

3. Middle class people in the country are unable to understand this mentality of the farmers. Their way of life is entirely different from that of the farmers in that they highly appreciate their external appearances and fashions. They have a saying in the country which depicts their mentality, that is, "nobody can see our stomach, but everybody can see our dresses and houses". If a family is living in a village with this mentality it is disgraced by others who make comments such as "though they behave like royal family members - if their stomachs talk we can hear a lot of stories". I perceive farmers' and these peoples' behaviour in terms of their environment. The farmers who cherish their freedom, and who are not urbanized and need a lot of body energy, take pride in their self-sufficiency and regard it as their strength. On the other hand, middle class people are bound to external forces and, therefore, have no power or strength of their own to survive. Therefore, they have to behave in a way that can satisfy external forces, mostly in the form of other people.

4. It seems to me that the officers in Britain know that they are in their offices to serve the public and this is true at any level in with many officers. Therefore, when somebody goes to an office for an official matter, he or she is greeted by the officers and very kindly and pleasantly ask "can I help you Sir or Madam?". This amicable and helpful environment for the general public is neither to be found in the field area nor in Sri Lanka in general.

5. This *gruel* is entirely different in quality to that of the people with wealth. The latter can include a variety of ingredients which are very nutritious like, for instance, fresh green leaves, coconut milk, fresh meat and a variety of cereals.

Chapter VII

FARMERS AND DROUGHT HAZARD: THE SOCIAL-POLITICAL CONTEXT

Whether there is a natural hazard or not, the man-made environment in the country is hazardous. When a natural hazard also occurs the human misery is unavoidable and compulsory, especially the misery of those who have no power and no relationship with the powerful people in society. The comments here, some in terms of anecdotes, reveal the underlying severity and deep-rootedness of problems within the Sri Lankan society itself.

The data mainly collected through the questionnaires described the farmers' perception and their adjustments to drought hazard quantitatively in the previous two chapters. Other, non-quantitative, evidence complements the data thus far discussed, at the same time providing a deeper understanding of the whole subject. A considerable amount of such information has been collected by the researcher, and it can reveal much about the farmers' agricultural activities, their sufferings and the multitude of injustices they face from their fellow humans, all of which enhance the severity of drought hazard. The materials represent a variety of aspects that one can divide into several categories on the basis of origin. They are summarized here under the following categories: 1) folk-poems related to the farmers' activities and physical environment, 2) stories and descriptions of their human environment and day to day experience and 3) slogans used when they protest against the injustices of bureaucrats and politicians.

7.1 Evidence Related to Folk-poems

In Sri Lanka, there is a tradition of composing and singing poems simultaneously, and on the spot. Even though this tradition is gradually disappearing in urban areas, it still is powerful in rural areas. The 'poets' have a knowledge of their environment and its problems, and when they compose poems, these reflect almost every aspect of their life. For example, *chena* farmers' agricultural lands are susceptible to damages from wild animals, and therefore, have to be protected.

This job is very tiring, and they have to face anxiety and deprivation. Especially at night, when the farmers protect their *chenas* they sing poems and songs which reflect their knowledge and understanding about their environment, society, economy, and political affairs. The songs I am going to mention here are listed below according to these different themes.

In explaining social injustice, they sing songs in which exploitation and class conflicts are depicted. The following song explains the poor farmers' understanding about social injustice by stating how powerful groups mistreat farmers.

There were two bulls grazing in the paddy field (after harvesting).
One, without a tail, struggled with the blood-sucking
flies to graze in peace.
The other bull, with tail, hit the flies and could graze in peace.
Poverty is also like the bull without a tail.

Vel yāyaka gon dedenek kaka	*unī*
In eka gonek valigē nathiva vani	*vanī*
Valigē ati gona massanta bata	*dunī*
Duppath kamath valigē nati gona	*vanī.*

In some villages there are a few people who have more lands than others, but they do not cultivate all their lands, which lie fallow as a result. When a landless farmer asks the landowner if he could cultivate this fallow land, the landlord lets it happily. The reason for this is that, after a greater effort to clear (uproot the trees and bushes) and level the land, this farmer can convert this hitherto uneconomic land into profitable land. However, the landlord can use his power and stop the tenant farmer from cultivating at any time, and some use this power. Though a law exists in order to prevent this type of incident, it does not always work. In fact, when the tenant farmer goes to seek lawful help, in most cases he loses because of the landowners' influential contacts. The researcher's own experience related to this is given in appendix J: (a). The following poem explains such a bitter experience of one poor farmer. The family name Atapattu refers to one of the politically and economically powerful aristocratic families in Hambantota district.

What did landlord Atapattu do to me?
He prohibited me from cultivating the land
I asveddumized.
Only I know what a great effort I made
in order to asveddumize.
Alas! I don't know why
the Sun rises to this country
which has no justice.

Pin ati Atapattu mata karapu *kāriyā*
Mā vada kala kumbura vapuranna *nāriyā*
Gas mul uduranna mā karapu *viriyā*
Nadu nathi ratata mota pāyada *sūriyā*

Poor farmers are also the main *chena* cultivators and, in the Dry Zone, farmers who do not have paddy lands have to engage in *chena* or highland cultivation. As already mentioned, *chena* is a very tiresome and stressful agricultural practice. The farmers have to protect their *chenas* staying there from the day the seedlings become green until harvesting. The following poem of *chena* cultivators exhibits this fact. Another important factor related to these poor farmers' activities is that while the landscape becomes beautiful with their maturing crop, wild animals also find it very attractive and try to steal his harvest. In the following poem the farmer despairs about this and finally accuses even Gods for eating his harvest (normally meals are offered to the gods).

Ma vee **is maturing on the beautiful hill slope.**
I ward off the elephants who give me sufferings.
Oh god! you also eat my rice harvest.
Because of the poverty I am protecting my *chena*.

Lassana himavathē māvī *pasennē*
Dukdena ali athun pannā *harinnē*
Rakmena deviyanē vela batha *budinnē*

Duppathkama nisai mama pal rakinnē.

Drought, of course, is the all pervasive hazard. When the area is hit by drought, it becomes like a burnt area with dead crops. The farmers believe that these hazardous events coincide when the time is unfavourable and, consequently, all living beings are threatened. When the times are bad, they say, even god cannot help them and cannot see their suffering. The following poem expresses this kind of helplessness.

The country is burnt without water and rains.
All the crops (crops including *Kurakkan*) are killed.
This cannot be seen by the eyes of God Katharagama.
Thus, a very dangerous period has come for
all living beings.

Vathura vasi nathiva rata gini vadichchī
Vapula goda bōga kurahan marichchī
Katharagama devige denethata nopenechchī
Napuru kalak sathahata dan lanvechchī.

The God Katharagama is the most powerful regional God in this area. Another important aspect here presented is that the farmers do not consider themselves as the sole victims of drought. All living beings have to face hazard; this shows the farmers' desire to live harmoniously with their surrounding nature.

If a person can cultivate a *chena* on his own, he is considered an independent adult. By doing this, he shows that he is ready to start his independent family life. After collection of the *chena* harvest, this type of young farmer is ready to marry. This phenomenon is depicted in the next poem.

I will cultivate a very good *chena* and
Plant *Kurakkan* and other crops.
When they are harvested I will fill the barn.
Then I will escort my fiancée to my little house
Because, I have no economic hardships and food shortages.

Vava ismaththe hēnak kotala yasata
Vapura Kurakkan pasenā vita ruvata
Atukotu puravalā aga hinga novennata
Kandā emi nagō numba magē palata.

Though the farmers are Buddhists, they have Hindu beliefs. Among these beliefs, is the caste system (which is entirely against Buddhist philosophy). However, if a family or an individual has money, the caste system does not apply. The wealth of the people in the area is associated with rain and bountiful harvests. In this way, even so-called low-caste people are respected when they have a very good harvest, and, thereby, economic power. On the other hand, bright sunshine without water destroys farmers' wealth. Then class division, caste segregation, discriminations, and all the other kinds of social injustice emerge. This change which occurs with the different environmental conditions is the subject of the following poem.

All the sown crops are fertile when there are rains.
But all these are not flourished only with the bright sun.
When there is money the problem of caste disappears.
With the collapsed economy, all the social injustices arises.

Vapula bōga vasi athi kalata saru vethī
Vipula rivi rasin ema deya saru novethī
Mudala thibu kalata adu kulaya vahi yathī
Akula diru kalata kula malaya pādethī.

With *chena* cultivation family problems also emerge. The husband has to go to the *chena* at night. If the farmer has grown-up children they can help with the protection, but for a farmer with small children, there is no way for him to protect his *chena* other than going himself. In those families, with the husbands having to protect the *chena* at night, some of the wives maintain relationships with other men. This type of incident is subject of another poem shown next.

Where did Thiru Aiya go today?
Did he go to the Ambagamuve paddy field?
Oh! I wonder whether I should eat a chew of betel.
Anyway, did Thiru Aiya go to protect the *chena*?

Thiru Aiyā ada kothanaka *giyēdō*
Ambagamuvē wela rakumata *giyādō*
Paiya athata gena bulathuth *kandādō*
Thiru Aiyā pal rakumata *giyādō?*

In this song the paramour asks the wife of Thiru Aiya where her husband went. If he has gone to see the paddy fields in Ambagamuve, he will definitely come back to his house because farmers in general do not stay in the paddy fields at night. If Thiru Aiya has gone to his *chena* the paramour is safe. This type of activity ends up in family turmoils and leads to anxieties since the farmer cannot concentrate properly on his agricultural activities.

In activities related to both the *chena* and the paddy cultivation, the time factor is very important. Living in an area where rainfall is highly seasonal and short-term, the farmers have to observe rainfall behaviour in order to initiate their agricultural activities. Even though they have a knowledge of rainfall behaviour, they know that some years will be hit by droughts. By the same token, they collect a bountiful harvest if everything goes favourably. Life is also like this; sometimes it is full of prosperity, at other times, full of deprivation, and, consequently, life is a continuous process of suffering derived from both happiness and sorrow. According to the farmers' main faith, Buddhist philosophy, they have to go through these extremes until they attain the status of *Nirvana.* Another reason of their misery is considered to be related to the influence of the planet Saturn. Such an outlook enables them to resist any kind of problem, or hazard, as the following poem makes it clear.

Without observing the seasonal changes, do we cultivate?
Without having an efflorescence, do we reap a harvest?
Without the influence of Saturn, do we have droughts?

Oh! when shall we see the coming Buddha to attain *Nirvana?*

Kalbalā noveda govithan *karannē*
Malwarā noveda kiri vadi *pasennē*
Senasurā noveda vasipala *nodunnē*
Lovthurā Budhun kavada *dakinnē.*

Some researchers (Yalman, 1967) and policy makers consider *chena* cultivation as a simple practice. However, only the farmers know the reality: that they have to face many difficulties, dangers, and a variety of problems. When somebody has to stay the night in a jungle, where they are bitten by mosquitoes, and having to ward off wild animals, their life becomes miserable and also dangerous. But, going through all these experiences, farmers develop a strong and patient mentality. Therefore, even though mosquitoes suck their blood, without killing them, the farmer in the next song sarcastically warns these insects they might get pains on their mouths when stinging farmers' bodies.

Oh! do we come to the *chena* **at night because we like it?**
Mosquitoes also come to the hut and do a clever job.
Oh! why innocent am I being bitten?
Be careful mosquitoes not to get pains on your mouths.

Rissa velāvada api pal *rakinnē*
Dassa kamak ū avidin *karannē*
Nissa dō anē mē mata *karannē*
Hossa ridei aninā *maduruvannē.*

At the opposite extreme is the danger from elephants.

Chewing dried betel and spitting it around the threshing floor,
The *Kurakkan* **crop was reaped and collected,**
And filed in the *chena.*
The mother cooked rice and curry at home.
Alas! on the way back to home from the *chena*

The elephant attacked.

Kapā kurakkan hēnē goda keruvā
Hapā mala bulath kamathē kela gasuvā
Uyā bath mālu ammā gei thabuvā
Hēnen gedara enakota aliyā gasuvā.

Most of the farmers strongly believe in astrology. When one is under the influence of the planet Saturn they commonly believe it is due to this planet that everything one does ends up in disaster. This belief is explained in the song below where the term 'bad time' refers, in general, to bad planetary influences such as periods under the Saturn.

In the right time I cleared the land,
Prepared it and sowed the crops.
Then made the hut and protected the
chena **at night.**
Despite all the efforts and the continuous
Energy for a long period,
Everything was given to destruction
Because of the bad time.

Valkotalā biju vapurā nisi kalē
Palbandalā nidi varalā rā kalē
Dukvindalā sari kala muth hama vēlē
Kalapalā velā kisivak natha sapalē.

In Sri Lanka when people do not use coconut for their cooking, it is an indicator of poverty. Since the majority of *chena* farmers are poor, they might not even have coconut to prepare their meals within their *chena* hut. They just use flour, water, salt and mix and knead these ingredients. Then small balls are made out of this kneaded mixture. These balls are then flattened and baked in a pot. The final product is called *roti.* However, this poor man's version of *roti* has no taste. Therefore, some farmers try to hunt an animal and roast it to eat with *roti* while

some eat it with roasted dried fish. When the farmers are poor they have also no proper clothing, merely pieces which just cover their genitals and hip area. But, even though they have to face all these sufferings, they sing songs in their *chena* at night.

Let us cook a *roti* in the *chena* hut.
Let us eat it in this country without coconut
with roasted meat.
Even though the old clothes are dressed around the hip,
Let us sing poems sitting in the *chena* hut.

Palpoththak yata inda rotiyak uyalā
Polnathi ratē pulutak samagin kalā
Kalgiya redi kadak inawata davatālā
Palkavi kiyamu api ada pala udata welā.

In Sri Lanka, women of rich families have a greater, but invisible, power over their settlements. This is particularly relevant to the rural settlements. Almost all private money lending, pawn-broking, purchasing of land, and mortgaging of lands belong to the poorer farmers are mainly done by these women. Their husbands have no real power before them and over their activities. These women also control their own agricultural lands and some treat their tenant farmers ruthlessly. The following song of a tenant paddy farmer shows a landlady vigilantly watching him, standing by the side of his paddy field doing nothing, but her behaviour makes the poor man angry. The word *Menike* is used differently to address women. In this case, it is used as an honorary term for landlady. But the same is also used as a lovable term for wives and fiancées, while parents use it for their daughters.

All the day Menike is walking on the ridges of
the paddy field.
By mistake, a very small amount of mud was sprayed
On the edge of her clothes.
Thousand apologies, Menike, for my mistake,
And go to your home and mind your own business.

Manikē avith ada thissē niyara pita
Mada dingak isunai neri karallata
Kamāvela māthin vū varaddata
Manikē ithin yanavākō valavvata.

When farmers start to work they want to finish it as soon as possible. If a friend comes to the paddy field to see him, he usually joins in the work while he is talking to him. This behaviour is not unrelated to the climatic factor. Since water is the decisive factor, farmers have to cultivate in time in order not to face unavoidable losses. This is applicable to both the Dry Zone and the Wet Zone. However, the woman in the song (even though she is the wife of the landlord) is not only observing this poor farmer's work, but also disturbing him with her conversation. When she talks to the farmer, he cannot answer without stopping because if he answered while working she would think that she was neglected and not respected. Then the result might be hazardous for the tenant farmer, as he would most probably be expelled from the paddy land. (This type of power may be the reason why women enter politics in many Asian countries once their husbands, or fathers, who were leading politicians, have died or have been assassinated.)

Farmers borrow money from money lenders (mainly leading Menikes in the villages) in order to accomplish urgent financial necessities. With the harvest they pay their debt, and, once again, become poor. On the other hand, they have to suffer from droughts. Therefore, poor farmers suffer from both the man-made and natural environments. Thus, the hazardousness of the area is a function of both droughts and humans' inhumanity. Their grievances related to these phenomena is given in this song.

On one hand, we are roasted by drought.
On the other, we are squeezed by the ' haves'.
The sporadic heavy rains disappeared with the hot sun.
The hardly collected bountiful paddy harvest is given to Menike.

Eka paththakin niyagin apa karavenavā
Thava paththakin athi ayagen mirikenavā

Indahita labū maha vasi avvata *yanavā*
Kalakin labū saru batha Meniketa *denavā.*

Again:

The entire crop of the last *Maha* **was**
Completely burnt.
I did not have any shortage of debts.
Menike took away the harvest of this *Maha.*
Oh God, how can I bear all these deprivations.

Pasugiya mahē asvanu dā *giyēyā*
Naya thurus walin aduvak *noviyā*
Meda mahē asvenna Menike *genagiyā*
Anē deviyanē mata unu *viyoyā.*

Poor *chena* farmers not only suffer from these leading village women Menikes, but some are also strongly controlled by their own wives, as the next song illustrates. According to the *chena* morpology, the cultivation is practised among small groups of farmers but on separate lands. Therefore, when they protect their *chenas* at night in isolation they sometimes visit the neighbouring farmers of their group. On such an occasion, somebody has stolen a farmer's mat from his *chena* hut. This farmer laments, in the next song, that if he had to go back home without his mat, his wife would start to quarrel and make him unbearable troubles. Therefore, he complains loudly about this incident in his *chena* saying that anybody who gives back his mat would be his best friend and relative to him.

Oh god, look at my deprivation and agony!
The mat in the *chena* **hut has been stolen.**
If I go back home without the mat,
I will be destroyed by my wife.
Anybody who gives back the mat would be
The best friend and relative of mine.

Aiyō deviyanē mata vu *viyōyā*
Palē padura horu aragena *giyōyā*
Gedara giyoth mā nothabathi *liyōyā*
Padura dun keneki mage nā *siyōyā.*

During the day time both husband and wife work in the *chena;* during this process they may sing together. When the crops are maturing, birds, and especially, parrots come to the *chenas* in order to eat cereals. Sitting on the surrounding trees, they start to damage the crops, but their owners stay in the *chena* in order to chase them away. However, appreciating his beloved wife, some farmers make poems in which the parrots have come to the *chena* not in order to destroy, but to listen to his wife's songs. After the harvesting of the *chena* is completed some farmers go to their *chena* lands (most probably for the *Yala* season cultivation), and see parrots are still roaming around the *chena.* By this time, along the *chena* fence, creepers (*Madu)* have grown and bear flowers. When the farmers see these he starts to praise his wife.

The *Madu* flowers blossom along the *chena* fence
in order to make garlands for your neck to be decorated.
Still parrots come to the *chena* as they did before.
Because they want to hear songs and poems which
came out of your mouth.

Obē karata mal malā *damannata*
Madu mal pipenavā hēnē vata *digata*
Obē katin gī sīpada *ahannata*
Thavamath girav enavā pera *puruddata.*

In the agricultural sector in Sri Lanka, women are assigned the light farming activities such as weeding. Several women together may enjoy the work, but a lonely weeder is less certain:

Sitting here and there, beautiful women are weeding
In that *chena.*
Here, in this *chena* **I am suffering alone in the Sun**
With full of sweat on the forehead.

Sinduth sīpadath thana thana inda kiyanā
Binduth dahadiyay nalalē thora novenā
Landuth sonda ruvai hēnē val nelanā
Manduk vindimi al hēnē vēleminā.

The earlier explanations about the agricultural practices of the *chena* farmers in the Dry Zone showed that their behaviour is conditioned by their environmental knowledge. From land clearance to harvesting, they cautiously follow set rules.

The rain is reduced.
The severity of drought has increased.
We go to the jungle with our knives
During July and August.

Varusāva aduvelā
Thada niyanga vadivelā
Ahala maha nikinniya
Kathi ragena kalē gos.

Chena farmers start their activities in the forest according to (astrologically) auspicious times. When they find out about the auspicious time from the village astrologer, they go to the chosen land plot and perform simple rituals praying and vowwing to the Gods, and afterwards start to cut the first bush with a knife exactly to the auspicious time. This process is explained in the following poem where an astrologer explains to the farmers.

I tell the truth according to the
Astrological laws,

And calculated an auspicious time to
Achieve the goals.
Contemplate the gods and their power always,
And cut the first bush and start your activities.

Aththa thamai pavasannē niyama kota
Saththa athi nakath suba horā evita
Niththa niranthara deviyan mudun kota
Kaththa genath gevadithi mul pandur vata.

In Sri Lanka, farmers exchange their labour in an organized manner. In this process, farmers form a group according to their land areas, and carry out their activities mainly for land preparation and harvesting. The advantages of this system are immense. It enhances the harmony among the farmers; they work efficiently. The reason for this efficiency is that they do not work just for the money. Agricultural labourers have a different attitude. They come to work around 8.00 a.m., and look at the sky in order to stop for tea, lunch, and to leave the work before 4.00 p.m. They have no feeling about the quality of the work or whether it is finished or not, because it does not affect their future work, since another farmer will give them work next day again. According to the farmers' traditional labour exchange system, everybody in the group comes as early as possible to the field (early means around 6.30 am). If the farmer goes to the field very early in the morning he is freed from the effects of the burning sun for about three hours. Not only do they come very early, but also they work without looking at the sky to mark the time and try their best to finish their work properly. If somebody is not following these norms and values, nobody accepts such a person as a member in a group. The following poem is an evidence of the farmers' labour exchange system, and explains the sowing activities of a group of farmers who follow this labour exchange mechanism. In the country, this labour exchange mechanism is called by several terms such as *Attama, Kaiya* and *Muththettuva. Muththettuva* is the southern term.

Paddy seeds have germinated properly.
Throwing hard mud lumps into the very soft

Muddy areas,
Land is levelled,
And nice foods are cooked
For the Muththettuva.

Pēru athiva vī pala kara gannē
Sīru athiva muthhettu uyannē
Pōru gagā vala godali makannē
Pōru kalal mada mathata issinnē.

Farmers like to cultivate both in the *Yala* and the *Maha* seasons. Since the *Maha* season is the most important and frequently cultivable season, farmers have a lot of incidents related to the *Maha* season. A crop failure in *Maha* is particularly disastrous for farmers. When crops are destroyed in the *Maha* season due to drought, the consequence is the empty barn during the *Yala* season. Such a crop failure is explained in this poem in a subtle way.

Knife only knows the way I cut the jungle.
The boundary of the paddy field knows
the way I made the fence.
The mat only knows how I did protect the *chena.*
Only the barn knows that there is no cereal
in this *Yala* **season.**

Kalē gosin ini kapuvā kaththa danī
Velē gosin vata saduvā niyara danī
Palē gosin pal laggā padura danī
Medā yalē vī nathuvā atuva danī.

All the agricultural activities are started not only according to an auspicious time, but also with worshipping and praying to the Gods. The sun, moon, and earth are Gods for the farmers and the following poem depicts the way harvesting of paddy is started.

Worshipped the sun God and got the permission.
Worshipped the moon God and got the permission.
Worshipped the Mother Earth and got the permission.
Worshipped the Paddy Crop and got the permission to harvest.

Irata vandala iru devi avasara gathimī
Sandata vandala sanda devi avasara gathimī
Polovata vandala mihikata avasara gathimī
Goyamata vandala nelumata avasara gathimī.

Members among farming communities are encouraged to 'measure' their acts before practise. In their tradition, all their activities must be measured in terms of wholesome and unwholesome acts. Business activities are likewise 'measured'.

There are five types of business not to be practised.
Goods must be weighted correctly.
Over-charging should not be done.
These must be learnt to run
The business reasonably and successfully.

Pav veladan pahakuth atha danaganda
In veladan kiralā vikunā inda
Dan veladan karathi anaduve mila ganda
Min danagan veladan kara gala venda.

These folk poems so far given, elucidate major aspects of the life of the farming communities. The harmony and care within the society, community and family members increase their resistance to any sort of disastrous effect. However, money-motivated activities of the few members have the reverse effects, which force the society into disarray, disharmony and disaster.

7.2 Qualitative Material Derived from the Farmers' Stories

Anecdotal evidence from farmers, ordinary people and officers from the field area are given in this section. They show once again that humans have increased the general hazardousness in this environmentally fragile area.

There is no argument about the fact that this area has a dry period from June to September in every year. (By the time, I started fieldwork in June 1987 the study area was under a severe drought. The signs of drought were visible from the withered faces of people, skinny cattle and trees without leaves, and especially, dead coconut trees.) Apart from this period, around February, there is another dry period. However, the farmers in general view these periods differently because they provide the necessary environment to clear and burn the lands for *chena* and highland cultivation. Apart from these two periods, their agricultural activities are designed to obtain maximum benefit from the rainy periods. Therefore, they are well prepared to harness the benefits of the short-term and uncertain rains during the rainy seasons. Farmers say that if they do not work like black ants they would have to face greater hardships. (In Sri Lanka, black ants are considered as highly industrious insects which collect and store foods in order to prepare for food shortages in the rainy season).

Most politicians and officers contribute to the hazardousness of life in the area. In Hambantota district, there is, for instance, an Integrated Rural Development Project which is funded by the Norwegian government. The officers who work in the district under this programme are both Sri Lankan and Norwegian. Their work seems very impressive, and they are very clever in the way they show the progress of their activities. Thus, in the course of their propaganda, they illustrate others' as well as earlier activities as their own successful work. I will give an example of this behaviour in relation to the Norwegian officers. Though this area is not as environmentally favourable as the Wet Zone, it has been occupied by people from time immemorial. Therefore, before 1979 (before the Norwegian project started) this area was already 'alive'; in fact, a number of development projects had been initiated by the early rulers. Among these, there were reafforestation programmes and other irrigation programes. However, when the Norwegian officers wrote their progress report about their activities in 1986, they showed one of these previous activities as their own successful work. The following picture (plate 7.1)

was inserted in one of their progress reports (Smith 1986, p. 42.) to show the progress of their reafforestation activities. However, it is evident from the trees in this picture that they are much older than six years, and according to the size of trees, they must be at least 10 years old or more. If native officers were to make such a deception I would understand it, but why Norwegian officers should do these things is beyond my comprehension. The sustainable achievements of this Integrated Rural Development project is quite suspicious for me as a person with farming experience. The reason lies with the human discrimination. The Sri Lankan as well as the foreign experts and officers have no genuine commitment for the development of the rural community especially those who are deprived. All these existing activities are taken for granted and the rural community is inferior to English speaking Sri Lankans who behave as foreigners in their country and to the real foreigners. With this sick mentality, nobody can identify a problem and subsequently the solutions. In order to prove this aspect, I attached two pages (similar sections) of the publication (Samaranayake 1983) which gives the basic characteristics about Hambantota district (see the case attached to the backcover). The Sinhalese version is for the 'inferior rural community' and English version is for the 'superior power handling people'. The difference of the quality of these pages reflects exactly the beneficiaries of the Integrated Rural Development Project.

It is clear that most of the officers have neither commitment nor responsibility for their official activities in order to develop the area. Most of the officers whose work is related to the farmers are able to say that whether the farmers can reap a harvest or not it would not matter for them as, at the end of the month, they would get their salary packet. This is not only limited to the many officers in Hambantota, but extends also into my village area and many parts of the country.[1]

When I was collecting field data well-to-do people also received drought relief aids with the help of corrupt officers but without fulfilling any of the necessary qualification. Grama Sevaka (GS = the government officer appointed to replace the village headman whose post was designated under the British rule) had an immense power to select the relief receivers, and in most villages this officer abused his power. This officer pretended to the poor and helpless farmers that there were a lot of barriers for the selection of eligible farmers for drought relief aids, and therefore, GS had to make a lot of effort to make the farmer eligible. Giving this impression

Plate 7.1 — Reafforestation in Hambantota

to the poor farmers, he expected bribes from them in return. When the farmers did not respond satisfactorily towards GS, he had several ways of revenge and this happened to farmers in most of cases. In Migahajandura village, GS beat a poor village woman because her family did not give bribes to GS after receiving drought relief aids. Not only that, he was helping to brew and sell illicit liquor (*Kasippu*) in the village, and the police raided his residence and took his supporter into custody. This happened when I was doing fieldwork in Migahajandura. The most ironical aspect related to the official power of the GS lies with his character certificates (these certificates are are a must) to the people who are seeking employment.

There is a rural hospital in Migahajandura. It was started with western medicine, but now it is converted into an *Aurvedic* (local medical system) hos-

pital. The reason for this conversion is not the development of the native medical system, but to increase private business. According to the people in the area, the Member of Parliament in the area (Tissamaharama) is a western medical practitioner and has his private clinic in the city. The hospitals with western medicine are still the most popular among the farming community and serve thousands of people in the area. Now that the hospital provides Sri Lankan *Aurvedic* medical treatment very few people receive the service compared to the past. The patients have to go to Hambantota city for their medicine now, and therefore, have to suffer in many ways. They have to make a special effort to travel because the city is located 25 miles away from this area and they have to spend money. Earlier, when they went to the village hospital they also did not need to wear their best clothes. Now it takes a whole day to get medicine and they also have to make special arrangements concerning their children and for other home-front activities.

During the December holidays in 1987, Migahajandura school was white-washed and repaired. This job was done by a contractor. I was talking to the contractor and he told me the difficulties he had in order to get this job. The officers who are responsible for the supervision of this work had to be paid 22% of the total sum of money he received from the government. As this is the norm, contractors call it 'the commission'. Therefore, if the contractor still wanted to make a profit, the only way was to degrade the quality of his workmanship. And that was what he did. On the day when part of the hall was being cemented, I was observing the job and realized its poor quality. The following day I went and observed the newly cemented section. Everywhere, the entire newly cemented area was covered with lines caused by fractures. After a few days, I saw the officer, who came to certify the repair work, entertaining the contractor. However, 22% of this officers' commission is still much lower when compared to the politicians' siphonning off of 30% (Alexis 1986, p. 288) of the total project costs of the Rs. 11000 mil. (Ministry of Mahaweli Development, no date, p. 2) Mahaweli Development Scheme, the largest development project in the country. This means that the total amount subjected to siphonning was Rs. 3300 mil. which is roughly similar to the the total estimated project cost of Rs. 3500 mil by the previous government (before 1977). The farmers face even greater problems when the construction works related to irrigation facilities are built in this manner.

There was a very big *baniyan* tree on the dam of Migahajandura tank. The farmers believe that there was a deity protecting the village associated with this tree. This was cut in 1980 by the officers to renovate the dam. This tank was not overflown with water from 1980 to 1987. During the 1987 *Maha* season, apart from this one, all the other tanks were filled and lands cultivated under them. The farmers believed that their misery was a result of the officers act which provoked the anger of the deity.

While visiting and talking to the farmers in the colonies I listened to many stories critical of officials. Thus: 'When we poor people apply for lands (when the government distributes irrigation land to the farmers) from the government there are a thousand-and-one regulations. But *mudalāli* (businessmen) who already have lands in this scheme have been given lands also in the other schemes'.

'When a government agent (the government agent used to be the responsible officer with the highest power within a district until the present government came into power in 1977) distributes land to the farmers, these activities were done impartially and reasonably. Now everything is done in favour of the party supporters. But this does not mean that every party supporter is treated in a similar manner. The people who have money are supported with lands, jobs and contracts and so on. The reason is that they will give their support for the Member of Parliament in his next election campaign. Even though poor people supported the M.P. in the election, he does not support them as the *mudalāli* as their support does not supply money for him'.

'The lands in the irrigation scheme do not all have equal facilities. The lands with facilities are for the people with political power, money and family influences. I have none of these. Therefore, I have been allocated this land where the water is not able to get everywhere equally. I have to walk several miles from home to the paddy field. Wild animals also damage my cultivation'.

'My 2.5 acre land is smaller than my neighbouring *mudalāli's* 2.5 acres. The reason is that the surveyor who demarcated the land plots was bought by the *mudalāli*. I complained about this matter to the relevant officers but all my complaints are similar to playing the *Vīṇa* to an old deaf elephant'. The (*Vīṇa* is considered as one of the most melodious musical instruments while elephants are considered as very sensitive to music according to the culture in Sri Lanka.)'

'I am a poor farmer. I did not have the means to satisfy the officers. Therefore, I was given a land which is not suitable for cultivating paddy. It is full with pebbles'.

'We cannot sell our produce for a reasonable price. We must bring our things to Suriyaweva *pola* (weekly fair). There all the businessmen are organised. They do not let any other businessman come and buy. If a new businessman comes his vehicle is damaged, and he may even be harassed or physically tortured. Though there are government organizations to buy our produce they do not do their job efficiently and reasonably. The officers in the government organizations have been bought by the black market businessmen. Therefore, during the time we bring our things to sell to these organizations they have not made any arrangement to buy our things yet so that we are forced to sell it to the black marketeers. Even the government organizations do not measure our produce correctly and do degrade it unduly. Even though there are government organizations to buy our agricultural produce, they all are really dens of thieves. This is our fate'.

One day I saw a very old farmer crying and squatting by the main street in Suriyawewa town. I asked what his problem was. He told me '*mahaththayō* (anyone who wears trousers is addressed *mahaththayō* by ordinary Sri Lankan people which means Sir, or Mister) only I know what a difficult life I had in my *chena* in order to practise my agricultural activities to finally bring these cereals here. I walked six miles through the jungle and came to the fair to sell these 10 kg of green gram. By now I have been to eight places. All measured my cereals and told me this was less than 9 kg. Not only that, last week's price for green gram was Rs. 10/- per kg. Today, it is less than Rs. 8/-. I cannot do anything now. I am helpless'. He started to cry again, and finally cursed even God asking 'are your eyes blind God?'. There are government officers to prevent and punish such activities related to short measurement, but it seems not only God but most of the people who have power are also blind.

During my fieldwork period I often heard farmers summarize their root problems which is social injustice (see appendix J: (b) for more details on this aspect in relation to eastern Hambantota district) in various ways. 'We farmers have a frugal life style. Therefore, we can survive in this area. But, if we manage to produce an excess with all the difficulties it still cannot be sold for a reasonable

price. On the other hand, our products and the value the government puts on it is detrimental to the development of our area. While our products are bought cheaply, we buy goods from outside at high prices. Therefore, how can we develop this area?'.

'*Mahaththayo,* though this is the country of the Gods, powerful men are more powerful than the Gods. If a powerful man wants to take revenge on a poor man he considers as an enemy, false litigation is simple for him. The rich man can buy the police, can hire people to give bogus evidence, and thereby get all the ancillary support in order to send a poor man to prison'. This type of behaviour characteristic of the village headman and the *mudalāli* co-operating, has been dramatized, and very clearly explained by Leonard Woolf (1981) in his novel *The Village in the Jungle* which was based on Hambantota district where Woolf worked as an Assistant Government Agent under the British rule, and the situation in the recent past by Harriss (1977). (The book was originally published in 1913 by Edward Arnold Ltd..) This shows that the practice is not new. But this type of corruption was always done by the local powerful people. When I talked especially with the farmers of the older generation (above 70 years) they always cursed the local authorities and said that when *Suddo* (British people) rule the country at least they could talk about their problem with the highest officers. However, if there was a problem which hindered their complaint on the way to the highest officer it always originated from the local corrupt officers.

As a result of the political divisions among the villagers, there are groups in every village which treat each other as their enemies. At the same time, they compete with each other over taking charge of the important posts in the village. If there is, for instance, a village development society in the village, they compete over who is to hold the office. Once this is over, the group which won the office considers the others as its enemies. When they organize common activities to be carried out, they are not supported by all the villagers with this mentality even though the prospective activity may be crucial for all the community members.

In Migahajandura, there are two rival elite families which compete for the control of the village. Their members expect all the leading posts in any important village organization. If one gets a post, he is not supported by the supporters of his rival family. These rival activities badly affect the water management of the

village tank. There must be a lock with keys to the sluice in every tank. However, there is no key to the tank in this village. The power to handle the sluice is given to the tract leader (The tract leader or *Yāye nāyaka* who is appointed in every year by the vote of farmers who cultivate their paddy lands under a particular tank). Therefore, in theory, the sluice key must be with this leader. Though the power to open and close the sluice according to the water requirements of the paddy tract is in the hands of tract leader, in this particular village, the family members of these two leading families open and close the sluice as they please. Since they are powerful in every aspect, nobody can do anything against their power. They are well-known amongst almost all the leading officers. When I told some leading officers that one of my study sites was Migahajandura, their immediate answer referred to these two families, and suggested that the only people who were civilized in this village belong to these families. Furthermore, they praised these two families because when they go on official visits in this area they are entertained by one of these families. The high ranking officers therefore, recommend anybody they consider as high ranking to go to these families if he goes to this village. They recommended me to go to these families. Since my friends and students as teachers in the village school were living with both the family members, I learnt from them that one of the main reasons of the increasing hazard of this village was these two families. Their information was confirmed by the stories of the villagers and village level officers.

Another insight, this time, into how officers misuse their power in order to profit I received from some young graduate officers who worked for the Suriyawewa scheme. The officers in this colonization scheme in Suriyawewa have created a very bad image of the farmers working in the scheme. But this is not an instance limited to this area. In reality, it is fuelled by an empire of corrupt officers. As a result of their corrupt behaviour, these officers are earning a lot of money and if they were to be transferred to another area, they would lose this ground for their 'treasure hunting'. They have therefore propagated that working with the farmers in the Suriyawewa area is like living with brutal animals. This propaganda was spread by them as far as to the Colombo offices and with this they made sure that no officer willingly comes to the Suriyawewa area for his service. This negative impression has also been given to other officers in the area.

The officers expect every respect from the farmers. The farmers, however, do not even receive a consolatory word from many officers. On top of this respect, the officers in Hambantota enjoy a lot of privileges. Most of the farmers cannot respect the officers. Their activities are cruel, unjust, and very biased to people with money. The government medical officer, for instance, told me the farmers were very rough and ungrateful, but when he treated (medically) officers they remembered what he did for them and were very grateful. However, telling me this, I was suspicious whether this man was even healthy enough to medically advise his patients. This type of adverse behaviour of Sri Lankan people with authority is evident to me in every sphere within as well as outside the country (see appendix J: (c) for more details).

In many settlements, it is possible to identify a small group of people which holds almost all the important posts of any settlement level organization. For them, these posts are taken for granted, but not in order to develop or improve the settlement, but for the mere prestige these posts provide. For instance, in many settlements, we can find persons literally called Mr. Secretary, Mr. Chairman, Mr. Member, and so on. The reason for this is that these posts are occupied by these persons for their entire life time. Every year, when officers are appointed for any organisation, these people come forward and Mr. Secretary gets the post of secretary, and Mr. Chairman the post of chairman. Others in the village are deprived while these immortal officers may act irresponsibly. In Mahagalwewa, for instance, there is a man called Grandfather Chairman. Even though he is old, has old-fashioned ideas and is not fit to work with the present generation, he still does not let others talk when an officer visits the settlement. It goes without saying that this factor presents another hindrance which helps to exacerbate hazard.

A member of parliament once came to Suriyawewa in order to declare open a newly-build maternity clinic. This clinic only provides a service to check pregnant mothers. On that day, while having dinner, the M.P. was told by the local medical doctor that a ward with facilities to deliver babies was very essential for Suriyawewa. The immediate answer of the M.P. to the doctor was that if every facility was given to the area he would have nothing to promise to the people in the next general election, and that it was therefore premature to ask him at that time.

In Sri Lanka, there was once a system called *rajakariya* in order to maintain our irrigation works. The British imperial officers abolished this system. As a result, farmers neglected the maintenance of the irrigation works. When we had this system, before starting agricultural activities, the farmers under the particular tank had to repair the dam of the tank before the rainy season. Before starting the agricultural activities, all the irrigation canals had to be cleaned and repaired. Thereby, the village tank was maintained properly. The same story was told to me by farmers as well as officers on many occasions. The British researchers B.H. Farmer (1957) and Sir Edmond R. Leach (1962), who both have done several studies on Dry Zone agriculture in Sri Lanka, as well as recent British researchers (E. Goldsmith and N. Hildyard (1984), have also blamed the British colonial rule for abolishing the traditional *rajakariya* system. Despite this, I would like to present two anecdotes (in appendix J: (d) because they are outside the field area), as evidence of the dangers of feudalism, which was also connected with activities such as the *rajakariya* system.

Almost everybody below the middle class has to participate actively in the families' economic activities. This applies to both the males and the females. From their very early childhood onwards the farmers' children join in with the agricultural activities of the family; first, with the very light activities, and, with their growing strength, with the heavy duties, until they finally get the confidence and ability to cultivate on their own. My study area is therefore not exceptional, and the accompanying photos (plate 7.2) which I took in *chenas* more than three miles away from the farmers' permanent residence show very small children staying in *chenas*. This fact is very important in order to understand the farmers' perception not only of their environment but also in respect to many other facets of their life.

With all these it is very clear that there is much negligence and ignorance from the side of power manipulation in the country. (When I talked to my own people they are quite worried about the discrimination based on racism in the western countries. However, most of these people do not see how they discriminate against millions of people who are deprived in almost everything in their lives in their countries.) A final anecdote is included here to show that the socially hazardous environment is derived not from an uneducated politician or politically appointed bureaucrat without qualifications, but from a researcher addressing problems which

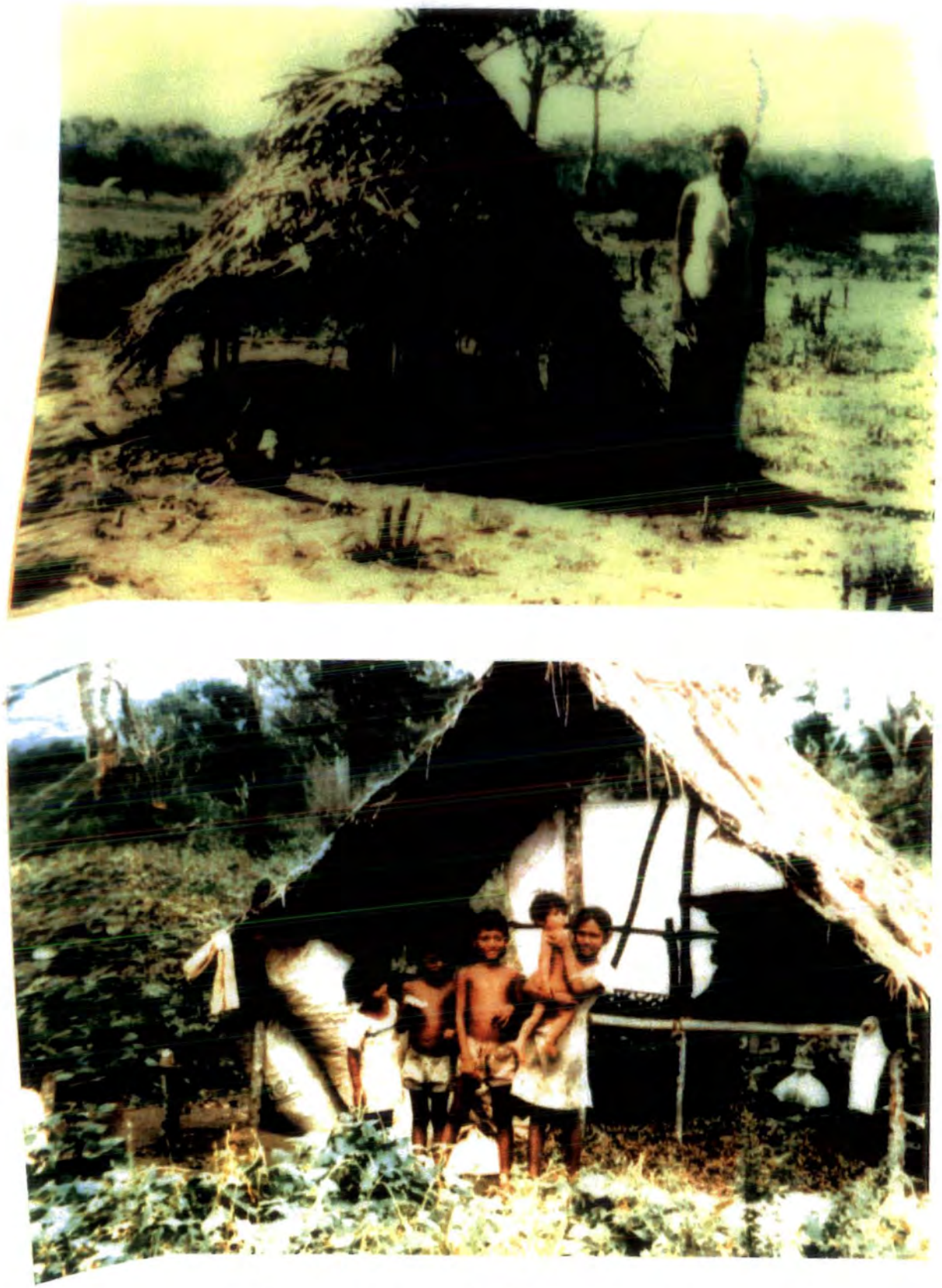


Plate 7.2 — Children in the Chena Lands with Parents

hinder rural development. This is the incident I witnessed in a *chena* where I was weeding together with a farmer.

A gentleman with expensive external appearance came to the *chena*. The reason for his arrival was that he had heard about me and wanted to meet me. Because of his arrival, we stopped our work and went to the *chena* hut to talk to him. My farmer friend asked him to sit down on his multi-purpose *massa* which was made out of thin strong and long plant varieties and was used as a bed and to sit down at the same time. The man did not sit down. My friend immediately prepared tea and offered it to him (we used a canned fish tin as a kettle to boil water and, with the help of a wire the tin was hung over the fire). But tea was also refused by him. The *chena* farmer I worked with was not an ordinary farmer but a graduate (Bachelor of Commerce degree holder) and worked as a teacher in the village school. The stranger and the farmer had once studied in the same university and had both graduated with second class upper division passes in the same period, but had never seen and talked to each other before. Since my friend was a farmer's son he had to stay in the village. The stranger had come back to Sri Lanka from England a few months ago to do fieldwork for his Ph.D., and unfortunately, behaved like a tourist without knowing the cultural values and people's attitudes. He started to boast, and by the time he was ready to leave us, he had made my friend angry. He did not show his anger openly to the stranger. However, after this man's departure, my friend's comments and likely reactions in the future towards this stranger were very disastrous for this man's further research in the area. My friend told me that he was going to inform the students and teachers in his school about this man, and he also wanted to inform other teachers in the area not to support this man. The teachers in rural areas in the country still have a great power and influence within the village community (Yalman 1967). Therefore, in order to get reliable data and information from this type of farming community the boasting type of behaviour and the ignorance of farmers' dignity and culture on the parqt of the researcher are highly detrimental.

7.3 Slogans used by the Farmers

During every election campaign politicians give many promises and pledges to the people. In Hambantota district, the most important aspects for the community are related to the supply of water, land and employment. Among these, water is the most important and depicts the impact of drought. The existing ruling political party has promised the people to provide all of these and people, believing them, have voted for them. However, the farmers voted for them not only for their individual benefit, but in their common belief that without these three important things, they could not develop their villages.

Votes were taken to give water
Votes were taken to give lands
Votes were taken to give jobs
For giving all this to develop the village.

Chande gaththe vathura denna
Chande gaththe idam denna
Chande gaththe rassa denna
Meva dīla gama hadanna.

We voted in order to get water
We voted in order to get lands
We voted in order to get jobs
To get all of these to develop the village.

Chande dunne vathura ganna
Chande dunne idam ganna
Chande dunne rassa ganna
Mēva ragena gama hadanna.

No water, no lands.
No jobs, not even a village.

By dividing the people, the village was eaten.
By dividing the country, the country was eaten.

Vathurath naha idamuth naha
Rassath naha gamakuth naha
Dana bedamin gama kāva
Rata bedamin rata kāva.

The hopes of the people evaporated. Not only that, they also lost their future expectations. The harmony of the people is a crucial factor for any action or programme to be successfully carried out in this area. Unfortunately, though this is crucial and paramount, it has disappeared. People are divided. Therefore, the villages are also divided. Furthermore, the country as a whole has been divided.

No lands to give us.
No money to give water.
The money goes to Swiss Banks.
Don't let this happen any more.

Apata denna idam nathē
Wathura denna salli nathē
Salli swiss banku yathē
Mevata ida denne nathē.

Irrigation canals were initiated but abandoned in this area half way through. When the farmers asked the authorities to complete these, their answer was they had no money. However, they did not believe this. They believed the money was misused by the power handling elites. Therefore, their anger and their determination to stop these things can be seen from the above slogan.

We have no path, son.
We have no country, son.
We have no future, son.
Our tolerance is over now.

Apata puthe magak nathē
Apata puthe ratak nathē
Apata puthe hetak nathē
Dan hondatama hitiya athē.

The farmers are concerned about the future of their children. When they see unjust activities continuing, they worry and address their children. They know if they tolerate these things their children will lose everything in the future. Therefore, they say, they are fighting.

There is no water to moisten our tongue.
There are no meals to fill our stomach.
There is no limit to our sufferings and troubles.
Now it is enough what we have tolerated.

Diva themanna wathura nathē
Kusa pirenna ahara nathē
Duk karadara nimak nathē
Me jaramara vinda athē.

The farmers' life is one of continuous suffering. They believe that all this is a result of the ignorance and the cruelty of powerful people. When they cannot see an end to these things they say their suffering is too much to bear any more.

Mum, dad, hear this.
Elder sister, brother, hear this.
Younger sister, brother, hear this.
Support the farmers' struggle.

Amme appe mē ahanna
Akke aiye mē ahanna
Nange malē mē ahanna
Govi satanata shaya denna.

On their protest march, the farmers request all of their community members to support them.

There is no money to develop the country.
Whisky is drunk with the money the country has.
If we let these things to continue
We have to eat their (people who do these activities) flesh.[2]

Rata hadanna salli nathē
Thibena salli whiskey bothē
Mēvata thava idak nathē
Munge malu kanna wethē.

According to the above slogan, the farmers know that the government spends the most precious foreign exchange for whiskey imports though there is no money for the development in the area. (Apart from whiskey, natural water is also imported by Sri Lanka, but it seems just as a prestige good as, according to my own experience, the quality of Sri Lankan natural water is much higher compared to the natural water in England and Germany).

For the common man, the police baton.
Instead of water, they fire bullets.
Drinking whiskey without a neck,
The Member of Parliament lives in luxurious bungalows.

Podu janayata police polla
Wathura valata vedi thabilla
Whiskey bibī nathiva bella
Manthiri sapa mandira vala.

Farmers have noticed that before a Member of Parliament is elected he has a thin, skinny physical appearance. But once he is elected he starts to indulge in sensual pleasures and thereby completely forgets what he told the people. In this process, his physical appearance also changes from a gaunt man to a giant with

hanging flesh until, finally, his neck has completely disappeared. The term 'without neck' is used in the slogan to symbolize the luxury these M.P.s enjoy at the expense of thousands of poor people whose disapproval is kept under control with the use of weapons. Engaging in all these malpractices, powerful people start to accumulate money within the country. This accumulation has nothing to do with investing money into production in order to create wealth in the country. Rather, abusing the power, depressing and depriving the ordinary people, the power handling group siphons off the public funds. When people ask for water, land and employment, these people answer them with arms rather than solving the common problems.

Don't, don't, don't, don't, we don't want iron bullets.
Don't, don't, don't, don't, we don't want police batons.
Don't, don't, don't, don't, we don't want whiskey to drink.
Don't, don't, don't, don't, we don't want ham bacon.
Don't, don't, don't, don't, we don't let the country to be eaten.

Epā epā epā epā yakada unda apata epā
Epā epā epā epā polis polla apata epā
Epā epā epā epā bonda whiskey apata epā
Epā epā epā epā ham bekan apata epā
Epā epā epā epā rata kannata denna epā.

The people have not expected their destruction from the politicians and other elites. Neither, on the other hand, they have expected a luxurious life. Therefore, they say that they do not want ham, bacon and whiskey. In the same token, they did not expect the government's suppression with armed force. When they see all the disastrous activities and their resultant consequences, they are not ready to close their eyes and continue to live amidst this environment.

Triggering the death trap for everybody,
J.R. ate the country.
Rajiv Gandhi ate the rifle butt.

Apa hamatama maru atavā
J R rata kīva
Rajiv Gandhi guti kīva.

Here J.R. refers to the former president of Sri Lanka, Mr.J.R. Jayewardene. This man is considered as one of the most cruel leaders in the Sri Lankan history after independence in 1948. In order to stay in power, the constitution of Sri Lanka was changed few times by him. At the time he came into power in 1977, the country was one of the most peaceful countries in the world. However, by the time I was doing field work for this research people never knew whether a person leaving the house would come back safely. Therefore, not only the farmers, but everybody has to suffer in the country now.

All these things go back to the activities of the present ruling party. However, so far, people have been deceived by all the ruling parties in Sri Lanka after independence from the British in 1948. The following slogans which were used by the supporters of former Sri Lankan Prime Minister Mrs. Sirima Bandaranayake reflect the way of their deception.

Sirimavo will come soon.
Rice will be taken from the moon.
Two measures of rice will be given.

Sirimavo langa envā
Handen hāl gena enavā
Hāl sēru deka denavā.

This slogan was very extensively used by the supporters of Mrs. Bandaranayake during her election campaign in 1970. The ruling party from 1965 to 1970 reduced the rationed amount of rice from four to two pounds. Even though the amount was reduced it was given to the people free of charge. In those days, one of the most important factors to win an election was to ensure the supply of rice for the people. Mrs. Bandaranayake promised to give four pounds of rice once again. She even said that if there was no rice in the world market, rice would be taken from the moon if necessary. Deceiving the people, Mrs. Bandaranayake won the

election. Unfortunatly, not only rice, but also many of the other necessary food stuffs were supplied inadequately for the people during most of the period under her regime. While all poor people had to suffer in a way they had never suffered before in their life, infants were deprived of milk products, mothers who had no meals could not breastfeed their children. After her defeat in the election in 1977, it was revealed that the finance minister (of Sirimavo's government in 1977) who was a poultry farm owner had fed infant milk products to the hens in his farm.

In this chapter, it is evident that human mis-management has created a dangerous, even disastrous environment. While this phenomenon continues, few activities can be initiated in order to develop this area and reduce the impact of drought to the farming communities. It is doubtful whether the Sri Lankan government or any other non-governmental organization can reduce the drought hazard, but it is equally doubtful whether foreign aid which is being handled by the type of people decribed above can relieve the needy in the development process.

... Notes ...

1. Apart from the officers, many teachers are also able to say without any shame that whether their students learn or not they get their salary at the end of the month. This highly disastrous attitiude exists even among some University dons in Sri Lanka and I have heard their comments in relation this attitiude.
2. In the way powerful people behave, almost everything is deprived from the majority rank and file. Finally, majority would have nothing left to eat but the hanging flesh of the powerful few people if the existing injustice activities are allowed to be continued. This is the message conveyed by the phrase 'to eat their flesh'.

Chapter VIII

SUMMARY, CONCLUSIONS AND SUGGESTIONS

8.1 Summary

Natural hazards cause problems in various degrees and guises to people who live in areas where these events occur. They can bring death to thousands of people within a few hours (e.g. cyclones), but also severe hardships and sufferings to whole countries with tens of millions of people within a period of several years (e.g. droughts).

Natural hazards have been known to humankind from time immemorial. Even so, until 1945 no systematic research efforts were made to study these disasters, and the first effort made by White (1945) did not make a greater impact on the later development of this field of research until the 1960s. Though White and his close associates were geographers, their research influenced academics from several other fields, and made them consider the potential of this research. As a result, from the 1960s onwards, researchers representing various academic fields explored different aspects of natural hazards. Even without a wider publicity White's first effort made an impact on the policy makers in the USA, but despite the increasing amount of research done in relation to natural hazards, so did damages and deaths caused by hazards. Consequently, the capability and validity of such research on natural hazards in order to mitigate hazard-related problems were questioned, and subsequently, the hitherto collective and centralized activities of the White's Group split up, and research groups with other approaches came into being. One particular group (Hewitt 1983) blamed White's research group for their heavy reliance on the technocratic approach in order to solve the hazard problem. At the same time, they emphasized the need for radical changes on the global level in order to avoid existing injustices, especially in relation to the world economic system which they saw a major cause for the growth of hazards, particularly in Third World countries. In the meantime, occurrence of hazards in the world continues to grow while all kinds of academics and researchers increase the amount of natural

hazard research. On this background, natural hazard research mainly concerning floods and droughts was carried out in Sri Lanka, with the latter largely modelled on the research of the White Group. Considering the relative nature of the problem, and having tasted the bitterness and harshness of the flood and drought hazards himself, the present researcher made a deliberate attempt in this study not to follow any of these groups, but to approach the problem naively by attempting to see it as it is.

The first part of the second chapter focused on drought hazard in Sri Lanka and its hazardous effects in order to show the importance of studies related to this event in the country. From this it became clear that the occurrence of drought hazard is growing in number and geographical area during the period for which relevant data are available. Even though there are major and minor irrigation schemes almost everywhere in the Dry Zone, the hazardousness of drought is still growing. After explaining the hazardousness, it emerged that drought as a natural hazard caused great damage to the poor farmers in the Dry Zone in particular, and to the whole country at large, by damaging the most important economic activity (agriculture) for Sri Lankans. The second part of the chapter discussed the research methodology. In this part, the background of the researcher, the study sites, the reasons for their selection, sampling procedure, and the different ways of data and information collection were explained. There was a period of nine months of extensive fieldwork in Sri Lanka.

The third chapter outlined the drought-affected areas in Sri Lanka with special emphasis on Hambantota district where the study sites are located. Rainfall varies remarkably from place to place. Even within the Dry Zone, the changes prove to be remarkable, and between the study sites which are located relatively close to each other one can observe this changing nature again. Though climatic zones and variations based on temperature do not exist, it is possible to divide the country into several zones based on rainfall as mentioned in section 3.1. The uncertainty of the onset, amount and duration of rains can be clearly demonstrated. Farmers who were the subject of this study were shown to have made observations regarding the decrease in rainfall over time as climatologists make their observations. In relation to rainfall behaviour in the study area, it is clear that it is being afflicted by frequent droughts. A good indicator was the moisture index data relating

to agricultural seasons and their comparison between seasons. These data show that the *Maha* agricultural season is the most reliable for cultivation activities, while the *Yala* season is very unreliable for farmers. Even though agricultural activities in the *Maha* season are more certain, this is modified to a certain extent when looking closer at the data derived from the moisture index values. Thus the absolute rainfall data may show that the area receives very high rainfall, but this may happen within a single day or on few occasions. This is seen as the real danger farmers have to face, as crops grown without irrigation facilities have no guarantee of survival. According to their own definitions, the farmers have to face droughts frequently (section 5.3), and hazardousness is very high.

The fourth chapter outlined the nature of agriculture in the Dry Zone where drought presents a constant hazard for farmers. In the first place, the characteristics of Sri Lankan agriculture were explained. It was shown that the hazardousness of the drought is intensified by the predominance of the small holdings sector and fragmentation of agricultural land. Next, the farming seasons were explained, and the fact that rainy and farming seasons overlap. The major agricultural *Maha* season is used for agricultural activities all over the country, with the rainy season from October to January. During the *Yala* season the pattern of agricultural activities changes. Thus, for the Dry Zone farmers, the security of their crops during this period is very low, and their vulnerability to droughts is very high. Farmers' awareness and understanding about their environment was clear. Every activity farmers engage in has its special meaning in the environment and to their livelihood. When we focus attention from the Dry Zone to the specific study area, the farmers show a remarkable knowledge and awareness. They too follow the general Dry Zone pattern of activity, but living in this driest of areas in the country, they have to face the enemy 'drought' more frequently than other Dry Zone farmers. This background encourages them to study the behaviour of environmental phenomena even more carefully and is evident in their agricultural practices. If they do not have guaranteed water supplies, they do not cultivate paddy. However, whether it rains in due time or not in a season, especially in the *Maha* season, almost all the village farmers and the farmers in Mahagalwewa tend to cultivate a *chena,* because it presents the most reliable and profitable form of agriculture for them.

The analysis contained in the fifth chapter provided another kind of evidence for the farmers' detailed knowledge about their living environment. As explained in chapter two, the settlements are clearly different from each other in terms of major economic activities of the farmers, their origin, irrigation facilities and settlement structure. Although these types of variation occur between settlements, almost all the farmers have perceived drought and the related water shortage as their number one problem. According to their definitions of drought, 'no rain for cultivation' and 'crop failure in one season' were the most representative. According to these farmers' definitions, their mentioning of the high frequency of drought is no surprise. This is also consistent with the highly uncertain and variable rainfall in the area. The observant nature of farmers has heightened their perception of drought and related problems. As a result, they strongly retain memories about the occurrence of hazards and the patterns of their occurrence, as well as indicators to predict drought and rains. Farmers possessed their own reasoning for growing hazardousness. According to the farmers' view the most important reason is to be seen in the harmful human activities, especially the ruthless destruction of forest, even though drought is a natural event. The other important aspect to be considered in this chapter was the farmers' proposals to mitigate hazardousness of drought. Their proposals are consistent with the reasons they gave as causes for droughts. On the whole, farmers perception of drought is high and their heightened perception is furthermore shown by their many adjustment to drought as given in chapter six.

The sixth chapter dealt with the farmers' adjustments and explained how farmers put their heightened perception into practice in order to mitigate this hazard. When the adjustments are observed it emerged that the farmers do not cling to certain limited activities. On the contrary, they show that they are flexible, making a number of adjustment to cope with the hazard. In summary, all the adjustments followed by them were classified into six different categories. Preventive adjustments which belong to the first category, are not so powerful at present even though they have an invisible but wholesome effect by way of strengthening and enhancing the harmony of the farming communities. This harmony is shown to be essential in order to live in an area where there is hazardousness. The farmers' understanding about the hazardousness of drought in their living environment is high, and this leads them to be cautious at any time in the event of a drought. This process is categorized as precautionary adjustments; in these, they prepare against the haz-

ards in relation to their agriculture, produce and finance. But, even though their awareness is high, poor farmers become extremely miserable when a drought hits the area. The economies of most of the farming families are damaged and collapse, and they are driven to recoup their losses by unusual farming activities (recouping adjustments). In this type of adjustments they not only learn about drought, they also examine their existing socio-political environment. It was shown that there has been created a man-made environment between the farming communities to achieve selfish goals against their long inherited cultural values and norms which were mainly based on collective goals by the present socio-political authorities. This hazardous trend has especially grown up during the last twenty five years in Sri Lanka as a whole. This environment or background is very well understood by the farmers, and therefore the fourth category of adjustments has to do with the farmers' opportunism. Practising this form of adjustment the farmers show their support to the authorities in order to get as much help as possible from the government. As all these adjustments do not completely help to mitigate the drought losses, and some farmers have to go beyond their dignity and self-respect for their very survival (survival adjustments). Apart from these direct adjustments, some farmers' other activities work indirectly in order to cope with the drought, but their number is relatively low (incidental adjustments).

Chapter seven took a new path of inquiry based on three different kinds of qualitative evidence in the field area concerned with the social and economic environment of the farming community. There are many farmers who are struggling in order to maintain their very survival, while few farmers and more bureaucrats are trying their best to maintain and impose their attitudes and power over the farming communities. The qualitative evidence substantiated the explanations given by farmers in chapter five and six.

8.2 Conclusions

This section consists of two parts. The first part relates to the findings and conclusions based on the study area of the present research. The second is a comparison of the results of this study with the findings of the leading natural hazards research groups in relation to their hazard studies and adjustment theories.

8.2.1 Conclusions from the Study

Drought is a recurrent climatic phenomenon in the area, and therefore, living in this environment farmers have strongly perceived the hazardousness of drought. Since its occurrence is frequent and crippling to their economies, the farmers are alert all the aspects related to this phenomenon, and at the same time, use their knowledge gained through these observations in order to mitigate the hazardousness of drought through numerous adjustments.

The Sri Lankan government has implemented several policies in order to develop the area. Amongst these policies are the Integrated Rural Development Program in Hambantota and various other development projects aimed to increase facilities for irrigation and agriculture. In order to implement and increase these facilities many officers have been put in charge, from grass-root levels to the national level, but most of them have no understanding of the environment, the farming communities, the hazardousness of the area, and, above all, the cultural traits which play a great role enhancing the harmony between farming communities, people and nature. Most of these officers' activities have directly increased the hazardousness within the area. The authority given to these officers in order to develop the area is similar to the situation expressed in the Sri Lankan saying: "it is like the man who employs a fox to look after his poultry farm, and afterwards asks the fox what happened to the flock". It is here the mentioned concepts of *Avijjā* and *Pragñgña* in section 8.2.2 come into play and it can be concluded that officers without *Pragñgña,* but full of *Avijjā,* should not engage in any act which is aimed at the development of the area. Harriss (1977) has explained this aspect in Hambantota district.

The corrupt activities of the officers do not affect their promotions, annual salary increments and many other privileges which they are entitled to receive as government officers. All these are obtained, in most cases, with the help of corrupt politicians. After an election, the corrupt politicians might be defeated, but corrupt bureaucrats maintain their positions until they retire at the age of 55. When new politicians take on responsibility, corrupt unchanged bureaucratic virus gradually attacks them and later takes full control and these politicians also start to practise corrupt acts in every aspect within society. This problem could be reversed, if the officers were given promotions and salary increments on a democratic basis. In

this case, farmers votes would be considered as a decisive factor. At the present time, officers' posts are permanent, and whether they work or not, they are paid (explained in chapter seven). As a result, most of them are static, lethargic and above all no commitment for their duties and responsibilities. This behaviour can only be converted into an efficient and a dynamic one if they are posted under contract or on a temporary basis. The officers' contribution in the development process can be gauged consulting the farmers. If farmers recommend an officer who works in relation to improve their living standards, as efficient, committed to his work genuinely and help the farming communities, the officer's contract period to continue work should be renewed, but not to be appointed for a permenent basis.

There are historical stories in which, not only ordinary people but also very powerful rulers, such as Emperor Ashoka in India and King Dutugamunu in Sri Lanka, who listened to very ordinary people and took their instructions and advice. In Ashoka's case, his war-mongering behaviour was completely reversed by talking to the seven year old Buddhist monk Nigrodha. Dutugamunu was advised by a poor old woman, and taking her advice, he was able to liberate his country from Indian invaders. Farmers at the present are very unfortunate in this sense as nobody appreciate their wisdom. As a result most of the development projects are alien to the area, the culture, the people and the environment. (Under reafforestation programmes, pines and terpentine trees are grown even though people express their experience which show the practical environmental problems they face in the area after growing these trees.) Farmers practical knowledge and advice must be heard by the authorities in any development activity if favourable results are to be achieved.

Apart from many officers, the other powerful and responsible people in the area to be held responsible for the growing hazardousness are politicians. Not only the present ruling party, but also many politicians who have ruled the country, cannot see that they have polluted the human and natural environment. The hazardousness of their activities which has grown over the last few decades was very clearly explained by the leading Sri Lankan sociology Professor G. Obeyesekare (1984, pp. 159-160.), who is now working as a professor in America, as follows.

"One of the features of the politics of Sri Lanka since the 1960's is the use made by politicians of all parties of these dissatisfied urban people. Nowadays it is routine to use them to intimidate opponents or voters. Since the 1960's, it has been common place for ordinary citizens to use phrases like "So-and-so's (Politicians) thugs". Furthermore, increasingly disturbing trends have occurred in the use of these elements for political 'thuggery' (as it is called in Sri Lanka). These trends are not my inventions - they have been widely reported in the local press. Here are three examples.

First, thugs who are at the service of politicians in power are linked on the local level to merchants, some of them genuine businessmen but others involved in a variety of illegal activities, the most common of which are *Kassippu (moonshine)* distillation, and the felling of trees from forest reserves. In recent visit to villages in Sri Lanka I have come across MPs serving remote areas actively involved in these activities, ..."[1]

Farmers themselves had already mentioned unjust rulers as a powerful cause for the growing hazardousness (chapter 5, 6 and 7). Both politicians and officers are responsible for forming policies to distribute drought relief to the victims. Their ignorance is furthermore proven by the most recent legislation with regard to drought relief. The most recent legislation with regard to drought relief was passed in 1989 by the Department of Social Services, which is the responsible government authority under circular number 389. The following is a list of the qualifications farmers must possess to be eligible for drought relief:

1. The monthly income of the receiver of relief must be equal or less than Rs. 700/- (less than ten Pounds Sterling).
2. The crops must be destroyed by droughts in two consecutive seasons.
3. There should be no other income source for the family.

It is very clear that almost all the farmers are a part of a very fragile and poor economy. Therefore, even without a drought, by the time their crops start to blossom, most have no food reserves in their homes. If their crops fail, in this background situation,their lives are in extreme misery until they harvest crops in the next season. In real terms this means that if their crops are damaged, especially in the *Maha* season in which harvest is more reliable, they have to live with constant hunger until they collect the *Yala* season harvest. According to rainfall behaviour in the area (chapter three), it is clear that, most of the time, the *Yala* crops are

vulnerable to droughts, and that farmers therefore do not cultivate their crops at all for this season. However, if they give up cultivation, there is no way their crops can be destroyed. In this case, some officers may apply the second criterion above and do not give relief aid to the victims. This happened in Mahagalwewa during the period of my fieldwork. GS (the government officer appointed as the village headman) considered that since farmers did not cultivate their lands, they had no crop failures and that according to the regulations, drought relief aids could not be given to farmers in Mahagalwewa. Because of this type of interpretation, the farming community had suffered severely, but later farmers in Mahagalwewa were offered drought relief because all the farmers in surrounding settlements were given relief aids. Another aspect of this problem is that the officers who support political opposition parties are transferred to very difficult areas such as Hambantota, or the northern and eastern provinces from the favourable areas such as the Wet Zone in order to extract revenge from them. When the officer is this type of political victim, on most occasions, official activities do not function as they should be, in effect, again increases the hazardousness of the area. (One should not think that if the rules and regulations are enforced the system can work employee efficiently. The employee's mentality must also be considered in order to get work efficiently done. With this type of revenging political transfers, officers' families are seperated, and pull them into misery. But the government expect an efficient service from them.) It can therefore be concluded that in order to reduce vulnerability of farmers, it is necessary to distribute relief aids even when the farmers have to face crop loss within a single season, and not only be based on crop failures alone, but also on their inability to cultivate as a result of droughts.

Chena cultivation constitutes the only reliable basis for the farmers' livelihood in almost all the villages. But this, in itself as a viable agricultural system, is subject to controversy. Most of scientists, researchers and policy makers try to show the disadvantages of this system in general, and suggest its replacement by a permanent agricultural system. However, if a permanent agricultural land use system for the highland sector in the area is introduced, migrant farmers will occupy the highlands in the forest. They will increase population growth and pressure in the area, and completely remove the remaining forest cover, opening it up to continuous hazards. On the other hand, farmers do not ruthlessly and deliberatley destroy their forest. They make use of it only in order to maintain their

livelihood; they are probably the only ones who really know its importance and priceless value. The forests belong to the government. It can be used by anybody when I was doing my fieldwork. Migrants who have no intention to live in the area apart from growing and collecting some harvest, thereby earning some money, destroy the forest indiscriminately. On top of this, politicians, businessmen and officers destroy especially the big valuable trees which are generally worshipped by the farmers. Even though the government officers in the area are there to protect the forest, they can be bribed and bought by anybody. The only possibility to protect and control the exploitation of the forest, then, is surely, to put farmers in control of the area. If every village were demarcated, including the surrounding forest area, and farmers were given the power to control it, they would not allow outsiders to destroy it indiscriminately.

Marketing facilities to sell the farmers' agricultural produce are appaling (in chapter six and seven). Therefore, the farmers are being exploited in different ways as shown in table 8.1. There are public and private organizations and people to buy the agricultural produce, but all treat and act in a similar manner in general. Therefore, farmers must organise themselves into organizations to manage, sell their produce and to provide agricultural inputs. This aspect has an immense power to reduce the growing hazardousness.

Table 8.1 — The Major Difficulties of Selling the Produce as Mentioned by the Farmers

Difficulty	Ar.	Ih.	Mi.	Sw.	Ma.	Su.	Av.	Ac.	As.
Short measurements	92	88	91	100	98	98	92	98	96
Low prices	67	83	84	100	100	97	84	98	92
Produce is degraded	67	63	91	73	94	83	78	88	84
No marketing facilities	50	50	33	87	95	80	48	88	71
Transport problems	100	58	49	80	53	23	63	38	49

Columns: Ar. = Arabokka, Ih. = Ihalakumbukwewa, Mi. = Migahajandura, Sw. = Swodagama, Ma. = Mahagalwewa, Su. = Suriyawewa, Av. = All villages, Ac. = All colonies and As. = All settlements.

Source: Field data. Data in percentage form.

During the harvesting season, there are a glut of fruits and vegetables. As a result, selling the excess is not easy and most of the production perishes. This can be avoided if the farmers are given some sort of food processing facility in order to preserve the perishable product. If this facility were available, farming communities could reduce their hardships created by droughts to a certain extent.

The poultry and livestock farming could be developed. In case of a drought, farmers could avoid greater losses by selling stocks and keeping buffer stocks of fodder through collecting the straw after harvesting. On the other hand, farmers could collect a lot of green leaves in the area during the rainy season and dry and store them in order to feed livestock in a drought period. The advantage of developing this sector would be to create a healthy and physically strong farming society which could carry-out its agricultural activities efficiently and quickly. As a result, farmers could use the limited and the most important water resources more efficiently and fruitfully.

Most of the government officers working in the area at present are outsiders. They are there only to do their occupation. Their families and children (especially the high ranking, more responsible officers) are not living in the area (in most cases they live and study the more prestigious Colombo). As a result, whether the area is developed or not it is not so important for them, and most of their time and energy are spent on finding the ways and opportunities to increase the number of official visits to Colombo. Therefore, it is necessary to give as many employment opportunities as possible to the people in the area. Then they not only stay in the area, they know the area and its problems, and they have the sense of responsiblity to develop it. When new employment opportunities are created, the priority must be given to the local people.

Though the country is governed by a democratically elected parliament, democracy is by no means practised. Therefore, the existing political and social system is hazardous even without drought hazards. All the above mentioned activities of the powerful people are the result of this undemocratic social system. Practical, rather than nominal, democracy is a necessary precondition for any sort of attempt to reduce drought hazard. If there were real democracy all people who are engaged in hazard causing activities could be prosecuted without a threat to the prosecutors' own life. Neither police nor others try to bring these people to justice at present,

because it is dangerous for the complainants. For instance, if a police officer were to take a man with politicians support, into custody who engages in illegal forest destruction, and were to prosecute him, this officer would be immediately transferred to the northern or eastern part of the country where he would have to face constant death threats from the Tamil guerrillas. Therefore, establishing human rights, under a real democracy is seen as necessary tool to fight drought in this environment.

The relationship between population growth and growing hazardousness is evident. Therefore, necessary steps in order to control this problem are esssential. Firstly, efficient family planning facilities must be provided in order to curb the natural growth. Secondly, inward migration should be discouraged to this area. However, so far, in every general election campaign, all the candidates have promised to provide irrigation facilities for forested areas, and thereby to expand agricultural land in order to solve the problems of landless farmers. The ultimate result is that people from areas where the land-hunger is extremely serious come to a forest, clear it, and settle in this area with high hopes of obtaining water in the future, and to live as a free farmer. But after the elections, elected members settle down in a luxurious bungalow in Colombo and seldom visit the farmers, breaking their promises over water. Natural population growth is also high. In essence, this population growth increases the pressure on the natural environment, and therefore, it is necessary to take this problem equally seriously, as it can jeopardize any kind of development program.

Irrigation facilities must be developed. However, irrigation alone cannot reduce the hazardousness of droughts. Once again, the success or failure of these facilities lies especially in the hands of powerful officers and politicians. If these people cannot change their present concept of *avijjā* as explained in section 8.2.2 and realize its disastrous effects, irrigation facilities alone cannot make any impact on the reduction of the danger of drought in the area, but will increase the vulnerability to droughts. An example, concerning irrigation facilities in relation to drinking water can illuminate this conclusion. In every village of the study area tube wells were dug. However, nobody can drink water from these wells because the quality of water is not even suitable for animals, especially within a drought period. On the other hand, extraction of water from tube-wells has affected the

ground water table to be lowered. Thus, the ordinary wells some of which were never completely dried-up, and quenched the farming communities are dried-up at present as a result of sinking water table. It does not seem, therefore, that the policy makers considered the quality and side-effects of this initiative, but tried to make an impression in the country that we developed the Dry Zone.

The conclusions and suggestions given above mainly represent the academics' and researchers' solutions to a particular problem. Living in a drought affected area and tasting the bitterness of drought, the farmers as real victims also have their perceived solutions which are more compatible with the living environment. In this aspect, farmers' proposals to mitigate the drought losses are very important (see table 5.14). The proposals shown in the table indicate that they are neither alien to the community nor to the area. The highly represented proposals of the farmers furthermore indicate that it is not necessary to spend a lot of money (except for irrigation facilities) in order to implement them.

When the hypotheses (in chapter two) are concerned, it is clear that the results of this study strengthen the validity of all the hypotheses.

8.2.2 Conclusions in the Light of Hazard Research Theories

This study showed that almost all the farmers consider drought as their number one problem and that they mostly define drought in terms of its magnitude and frequency. This is also a proven theory established by hazard researchers all over the world (White, 1974). As a consequence of the magnitude and high frequency of the occurrence of drought, farmers accumulate more experience and knowledge related to every aspect of the drought related problems. This applies to the farming communities in the area. Although, the aridity and the rainfall vary between the study sites, and highly reliable irrigation facilities are available (Suriyawewa) in the colonies, almost all the farmers of every settlement have perceived drought as a hazard. When all these aspects are considered, the farmers' perception does not differ on the basis of their origins. And also when their socio-economic activities are considered, drought remains a hazard for almost everybody. However, once their perception of drought is carefully studied, it emerges that it is influenced in various ways. In the analysis related to the farmers' perception in chapter five, therefore, different weight was given to the various factors which heighten their

perception. These were found to depend mainly on the variations between the study sites.

When the farmers' adjustments are compared with the three adjustment theories for natural hazards given in chapter one, it can be concluded that all three theories are applicable to this study. Sri Lanka is a developing country and according to the transition theory which explains adjustment in terms of the level of the development of a country, folk responses can be seen dominating all the adjustments. As the originators (White, *et al.* 1970; Kates 1970; White 1974 and Burton *et al.* 1978) of this theory explain, these responses have positive characteristics such as good cultural adaptation, flexibility, and minimal costs. All these qualities can be seen to be inherent in most of their adjustments explained in chapter six. Adjustments of this nature are also practised by the farmers in north-central province in Sri Lanka (Tennakoon 1986).

The lessening and worsening theory proposed by Kates and his collegues at Clark University (Bowden, *et al.* 1979) suggests that improvements in responses as suggested in the transitional theory can reduce the impact of a given hazard. They conclude that in this process future events will be less damaging. In order to achieve these goals, they furthermore suggest that international aid should be coordinated in order to assist and rehabilitate the future victims more than has been so in the past. The latter constitutes the positive side, but in negative terms this would mean that the growing interdependence of world economies could result in even wider repercussions in areas where natural disasters occur. Because of the dependence on international aid, and the fact that natural hazards increase the food prices on the world market, food shortages would be the ultimate result (O'Riordan 1986). These conditions and situations are very relevant to the farmers of this study.

The third, vulnerability thesis, (Wisner, *et al.* 1977 and Hewitt 1983) is very much applicable to this study. Human activities have increased the vulnerability of the hazardousness of droughts. Farmers have strong opinions here. When the farmers put forward reasons for drought hazard, the most widely represented ones were related to human activities. On top of these activities, the existing political and social system are as hazardous for farmers as the droughts, and apart from a very few, the majority of the farmers are powerless and therefore helpless. Even

without a drought, most of them are poor, and their life is miserable. This poverty has ultimately bonded them to the vicious circle of the debt trap, and there is no strategy capable of breaking this circle within the present socio-econo-political environment. All of this has ultimately increased the vulnerability and helps to perpetuate the dependency of farmers' life style. O'Riordan's (1986) comment on the vulnerability theory - *'vulnerability is essentially associated with poverty and powerlessness, which are often linked to ignorance and defencelessness'* - is very much applicable to this study. But ignorance is with the power controlling people for the majority farmers remain powerless. In the process of doing this research, one of the most important Sri Lankan concepts I found to explain this process is called that of *Avijjā*. This has a wide meaning, but the nearest word for this in English is 'ignorance'. When people, especially the ones in power have *Avijjā,* they become selfish and power hungry, and cannot see the hazardous effects of their acts which deprive the poor of almost every thing. The most dangerous fact is in relation to deprivation and violation of human rights. As a result, even a minor natural extreme event ends up causing severe hardships to the whole community. Therefore, an area where *Avijjā* reigns is always hazardous for all living beings. But unless *Avijjā* and its disastrous effects are realized and given up by the people, and especially the authorities, the cycle of Avijjā continues while the hazardousness is growing in every aspect - as in present Sri Lanka (see figure 8.1).

If the unwholesome cycle of *Avijjā* perpetuates and increases hazardousness, the only way to reverse it is to use the opposite wholesome force of *Avijjā*. This wholesome force as a concept in Sri Lanka is called *Pragñgña*. Again, there is no similar English term in order to fully explain this wider concept, the nearest term for this concept is 'wisdom'. However, *Pragñgña* is used in a much wider sense than 'wisdom'. But even though *Pragñgña* is so powerful in order to solve the problems and to reduce hazardousness, there appears to be no place for this concept in the study area or in Sri Lanka as a whole. The figure 8.2 depicts the way *Pragñgña* can work in order to reduce hazardousness.

Apart from adopting the *Pragñgña* concept, I can see no way of reducing the growing vulnerability of drought within the study area to create a safer place in future in both this area and in Sri Lanka as a whole. Though the vulnerability thesis blames the world market forces dominated by the developed countries for

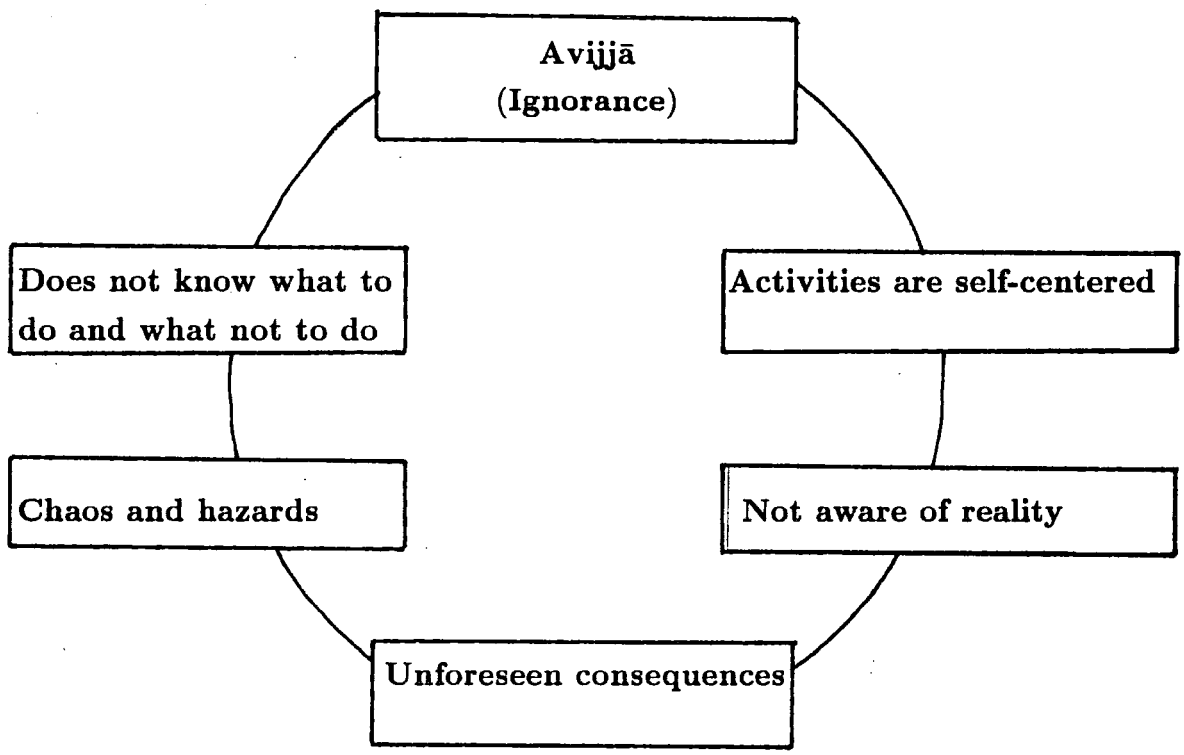


Figure 8.1 — The cycle of Avijjā

the growing hazardousness, this is only one side of the problem. Rich countries are able to keep their forces going at the expense of the Third World, because the power handling people in these countries are full with *Avijjā*. If this could be realized, and replaced by *Pragñgña*, the Third World would be able to achieve an environmentaly sound and sustainable development without having to beg from the so-called developed countries. (The aid given to Sri Lanka by deveveloped countries is not used in order to develop the poor and deprived, but to enrich the already rich and privileged.) What we as Third World people must and can really do is to change our attitude and behaviour from the concept of *Avijjā* to the concept of *Pragñgña*. Once we can stand on our own feet, then we can strengthen ourselves in order to reach practical and reasonable solutions related to the problems in the world market. Otherwise, beggars have no choice.

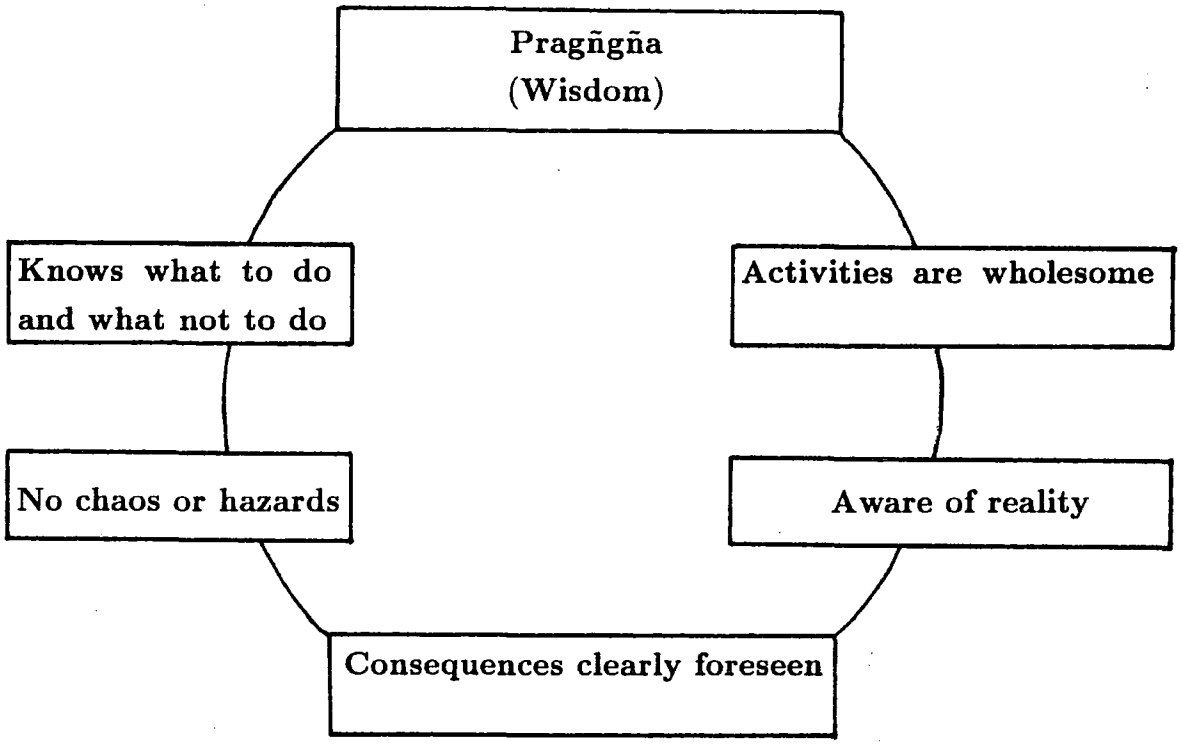


Figure 8.2 — The Cycle of Pragñgña

8.3 Suggestions for Further Research

As a researcher who tries to understand and find solutions to reduce the hazardousness of drought, the major cause I realize for the growing hazardousness due to drought is partly a function of bias human behaviour. Therefore, attaching rigidly to a particular method of study hinders the possibility of identifying the problem. This behaviour is not helpful to find meaningful solutions. If research is for the sake of knowledge only, and not to help the victims, such rigidity of approach is not a problem. Therefore, researchers without rigid methodology can address the problem clearly with the help of data collected in variety of ways.

In Sri Lanka, there have been few studies of drought hazard although two thirds of the country suffers from drought. This study is based on an area where all people are Sinhalese and Buddhists. The Dry Zone itself as a geographical area represents a multi-racial-religious-caste-party society. Therefore, differences between the communities are high and their interactions are complex. Consequently, the necessity for more village, electorate, district and provincial level drought hazard research will definitely be needed in order to understand the hazardousness

of drought. In the process of doing research, both the case study and survey approaches will help immensely to reveal every aspect in the problems in micro and macro level as Farmer (1980, p. 2.) mentioned.

> The case study approach gives an insight and familiarity that the survey approach can never give; and, on the other hand, that approach can never given the reliable quantitative estimates that the survey approach makes possible and without which it is difficult to grasp the dimensions of any problem.

The handful of natural hazard research carried out in Sri Lanka have been done by geographers. Therefore, research in this field must be broadened into other disciplines also in order to make Sri Lankan natural hazard research more meaningful. In this process inter-disciplinary research will be immensely helpful, and thus, hitherto neglected aspects and problems related to natural hazards can be addressed.

The natural hazards research in the Third World is mainly carried out by the researchers in the Developed World. As a result, the severety of these extreme events cannot be addressed. On the other hand, in most of the cases they cannot understand and realize what is going on in the societies of these countries because their data are mainly derived from the people who have no knowledge and understanding about the native languages, culture and philosophies (see chapter 1 flood hazard in Ratnapura). The frequently used so called 'radical approaches' have shown no sign of reducing the growing hazardousness apart from showing us a facinating, imaginary world. However, in the field of natural hazards research, the active participation of the Third World researchers is essential in international organizations. Currently, International Research Organizations are dominated by the researchers in the Developed World. They have the power to control these institutes, and they do control them without properly considering the importance of the Third World researchers' participation. Therefore, the membership fees; and other rules and regulations of these instituions are to satisfy the rich and powerful few researchers in the Developed World, while many poor and powerless researchers in the Third World are being deprived. For instance, if I want to get the membership of the International Geographical Union, as a Third World academic and a researcher with a monthly salary of £80/- (eighty), I have to pay the same membership fee which is paid by a British Professor whose monthly salary

exceeds £2000/- (two thousand). There is the necessity as White (1974) pointed out to share the knowledge and skills between the nations of the world family, and it is therefore very important to consider the genuine participation of the academics and researchers in the Third World in the international academic and reserach events. In this process, it is necessary to determine the fees and charges of the conferences, institutions and workshops on the basis of the participants' and the members' monthly salary which enables different ideologies and concepts to be critically evaluated, and to find meaningful, practical and acceptable solutions to the problems related to natural hazards.

Appendix A

SRI LANKAN NATURAL HAZARDS (EXCEPT DROUGHT)

The occurrence of natural hazards is not an uncommon phenomenon in Sri Lanka even though it is a very small island of 65,610 square kilometres. Though the occurrence of natural hazards goes back to historical periods, relevant information and data about these hazards are available with a certain reliability only since 1947. The data are collected by the Department of Social Services, which is the responsible authority for hazards relief activities. These data and information are based on the name of the hazard, its location, its time of occurrence and money spent for relief activities after it occurred. Continuous data relevant to the number of affected families and individuals are not available. However, a general picture about individual hazards and their severity can be given with the available data as seen below.

Flood hazards

The occurrence of floods in the country is as significant as droughts in their geographical expansion, their frequency of occurrence, and their damaging effects on the country. However, floods do not last as long as droughts. There have been floods in 23 out of the 40 years of which data are available. The number of affected districts varies from 4 to 16 during the period. Floods comprise the greatest hazard in the Wet Zone, where the highest rainfall is experienced. However, this does not mean that the Dry Zone, where rainfall is relatively low, is free from floods. On the contrary, in the years with very high rainfall, very extensive floods occur in the Dry Zone, and the damages here may be even higher than in the Wet Zone. This is a result of its plain landscape and the wattle and daub structures of the houses of many peasant farmers. Appendix A: table 1 shows the data on floods from 1947 to 1987. Appendix A: figure 1 depicts the geographical distribution of floods.

Appendix A: Table 1: Occurrence of Floods in Sri Lanka: 1947-87

Year	1	2	3
1947	6	n/a	1,885,077
1949	7	n/a	428,708
1951	4	n/a	67,280
1957	12	500,000	7,240,581
1959	5	n/a	458,306
1960	5	n/a	217,672
1961	5	n/a	365,360
1963	11	100,000	173,415
1964	6	8,226	1,935,622
1966	4	150,000	471,718
1968	4	116,346	466,748
1969	4	n/a	466,748
1970	7	n/a	n/a
1971	8	n/a	n/a
1973	6	6,700	127,382
1974	12	88,138	712,204
1978	3	175	36,983
1980	9	6,922	305,782
1981	12	15,096	2,096,223
1982	14	129,469	14,143,168
1984	16	297,237	49,068,276
1985	11	17,448	2,511,625
1986	9	118,336	9,322,860

Columns: 1 = number of districts affected, 2 = number of families affected and 3 = government expenditure (Rs.) on relief activities.

Source: Unpublished data, Dept. of Social Services, Colombo, Sri Lanka; (n/a = not available).

Landslides

The most tragic natural hazard in Sri Lanka is landslides. Though the occurrence of landslides is not so extensive and frequent as droughts and floods, within a few minutes time it may bury hundreds of human beings and other animals alive. This hazard affects only the hilly areas in the Wet Zone. Appendix A: table 2 shows how it affects the country and its growing hazardousness during the recent past.

Appendix A: Table 2: Occurrence of Landslides in Sri Lanka: 1947-87

Year	1	2	3
1952	2	n/a	14,975
1964	1	19	10,098
1982	2	593	469,475
1984	1	280	95,000
1985	3	934	31,988
1986	5	19,754	4,272,887

Columns: 1 = number of districts affected, 2 = number of families affected and 3 = government expenditure (Rs.) on relief activities.

Source: Unpublished data, Dept. of Social Services, Colombo, Sri Lanka; (n/a = not available).

Cyclones

Cyclones occurred only in five years during the period in which data are available. These data also show the growing hazardousness caused by cyclones during the last decade. The eastern, northern, and north-western parts of the country are affected by cyclones. The cyclones which occurred in 1964 and in 1978 were the most hazardous and caused 280 and 940 deaths respectively. Appendix A: table 3 gives the data relevant to cyclones during the affected five years.

Appendix A: Table 3: Occurrence of Cyclones in Sri Lanka: 1947-87

Year	1	2	3
1952	1	n/a	183,442
1964	3	75,000	3,571,000
1978	5	250,000	600,000,000
1985	7	1,176	167,806
1986	2	158	80,505

Columns: 1 = number of districts affected, 2 = number of families affected and 3 = government expenditure (Rs.) on relief activities.

Source: Unpublished data, Dept. of Social services, Colombo, Sri Lanka; (n/a = not available).

Other Natural Hazards

There are three other minor natural hazards during the period with which we are concerned - forest fires, malaria epidemic and sea-erosion. When compared to the previously mentioned hazards, their magnitude, frequency and damaging effects are negligible. The hazardousness of malaria epidemics has been successfully controlled with the use of chemicals. Forest fires as hazards can only occur where there are large amounts of forest lands. However, if the present speed of clearing of forests continues the possibility of future forest fires will be diminished. Sea-erosion has become a hazard for people in some parts of the south-western coastal belts where coral reefs are being extensively extracted from the sea. The possibility for the future growth of this hazard is therefore very high, if necessary actions to control the extraction of coral are not implemented. Appendix A: table 4 shows the occurrence of the the above mentioned minor natural hazards.

Appendix A: Table 4: Occurrence of Minor Natural Hazards in Sri Lanka: 1947-87

Year	Hazard	1	2	3
1952	Malaria	2	n/a	6,000
1959	Forest fire	1	29	7,000
1966	Forest fire	1	100	n/a
1986	Sea-erosion	1	221	221,000

Columns: 1 = number of districts affected, 2 = number of families affected and 3 = government expenditure (Rs.) on relief activities.

Source: Unpublished data, Dept. of Social services, Colombo, Sri Lanka; (n/a = not available).

With the help of the data shown in the tables, the natural hazards in Sri Lanka can be categorized based on the hazards' magnitude, their frequency of occurrence, their influence on people and the economic damages they cause. Thus three groups of hazards can be identified, i.e. major hazards, medium hazards and minor hazards. The major group of hazards is represented by droughts and floods. The medium group comprises landslides and cyclones, while malaria, forest fires and sea-erosion represent minor hazards.

Distribution of Natural Hazards in Sri Lanka: 1947-87

The occurrence of each type of natural hazard in space shows that there are specific areas where its severity is more prominent than in other parts of the country (see Appendix A: table 5). Since the country is ecologically divided into two parts, namely, the Dry Zone and the Wet Zone, one may think that while droughts are limited to the Dry Zone, floods occur only in the Wet Zone. Although it is true that floods dominate in the Wet Zone and droughts in the Dry Zone, floods have been more extensive than droughts because all the districts have been affected by flood at some stage during the period of 40 years. The data on droughts show that there were only 5 districts where droughts have not been experienced. Landslides are limited entirely to the hilly areas of the Wet Zone, whereas the effects of cyclones are mainly limited to the eastern, northern and north-western parts of the country. Appendix A: figure 1 shows more clearly the spatial variations of floods for the period from 1947 to 1987.

The Losses from Natural Hazards

Lack of data is the main hindrance for an analysis of the damages caused by natural hazards in Sri Lanka. Though there are data in relation to relief expenditures and the number of affected families, they have not been recorded continuously over time.

Hazards create losses in different ways; they destroy and disrupt production processes inhibiting the development of the country, disorganise and dislocate the people in the affected areas, produce mental problems and economic hardship for the people, and, in extreme cases, cause human fatalities which can amount to more than 200,000 in a single occurrence as in the 1970's wind and flood hazard in Bangladesh. However acute the shortage of data, it is possible to provide data about hazard losses to a certain extent using available limited data for a limited period (see Appendix A: table 6). As Sri Lanka is one of the poorest countries in the world, hazard relief expenditures here cannot be considered as a small fraction of its Gross National Income. If we could collect data relevant to the real damages caused to Sri Lanka's agricultural sector alone we would have been able to see that a considerable amount of damage has been done to that sector by these hazards.

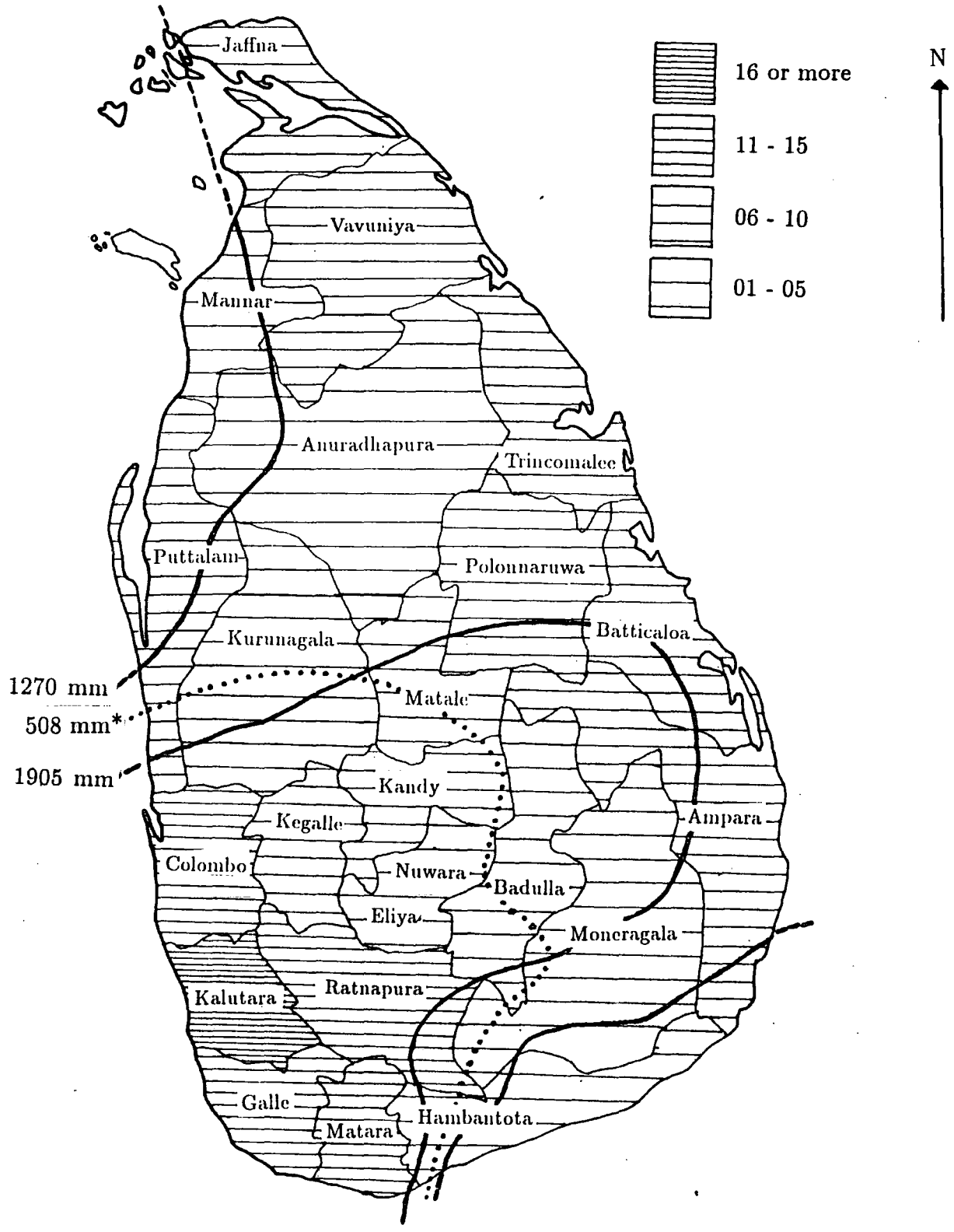
Appendix A: Table 5: Distribution of Natural Hazards in Sri Lanka: 1947-87

District	Droughts	Floods	Landslides	Cyclones	Others	Total
Colombo	0	14	0	1	0	15
Kalutara	0	17	1	0	0	18
Kandy	6	8	2	0	0	16
Ratnapura	3	14	3	1	1	22
Kegalle	4	10	2	0	0	16
Galle	0	15	0	1	0	16
Matara	0	11	0	0	1	12
Nuwara Eliya	2	3	3	0	0	8
Gampaha	0	4	0	1	0	5
Matale	10	4	1	0	0	15
Badulla	11	1	1	2	0	15
Monaragala	7	2	1	1	0	11
Trincomalee	11	8	0	1	2	22
Batticaloa	8	9	0	1	0	18
Puttalam	14	9	0	1	3	27
Anuradhapura	20	5	0	1	1	27
Kurunegala	11	5	0	0	0	16
Hambantota	16	5	0	0	0	21
Jaffna	7	10	0	1	0	18
Ampara	10	6	0	1	0	17
Polonnaruwa	9	6	0	1	0	16
Vavuniya	13	6	0	1	0	20
Mannar	13	3	0	2	1	19
Mullativu	4	2	0	0	0	6
Kilinochchi	2	2	0	0	0	4
Total	**181**	**179**	**14**	**17**	**9**	**400**

Source: Unpublished data, Dept. of Social Services, Colombo, Sri Lanka.

Appendix A: table 7 summarizes the occurrence of each natural hazard; it gives the frequency of its occurrence and the magnitude of the affected area using the data which is available from the period between 1947 and 1987 inclusively. This table shows the extent to which droughts and floods dominate. The frequent

Appendix A: Figure 1: The distribution of the occurrence of floods in Sri Lanka: 1947-87



*During the Southwest Monsoon

Appendix A: Table 6: Relief Expenditure as a Fraction of Gross National Income (mil. Rs.)

Year	Gross National Income	Drought relief	Flood relief	All hazards relief	Percentage of GNI
1981	281,906	42	02	44	0.015
1982	328,571	187	14	201	0.061
1983	396,136	198	0	198	0.049
1984	483,685	0	49	49	0.010

Source: Unpublished data, Dept. of Social Services, Colombo, Sri Lanka.

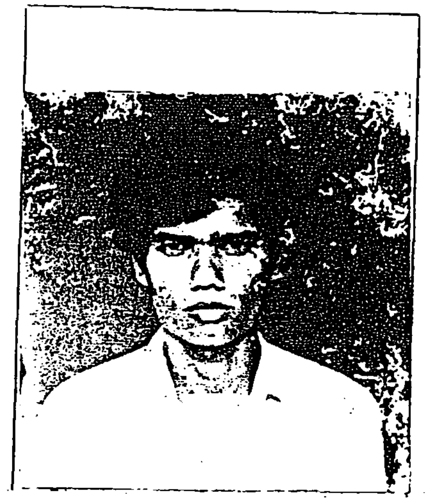
droughts and floods have created an uncertain environment and a fragile farming economy in the areas affected by these hazards.

Appendix A: Table 7:The Frequency and the Magnitude of Natural Hazards in Sri Lanka: 1947-87

Hazard	2	3	4	5
Droughts	25	181	7	28
Floods	23	179	7	28
Landslides	6	14	2	8
Cyclones	5	17	3	12
Forest-fires	2	2	1	4
Malaria	1	2	2	8
Sea-erosion	1	1	1	4

Columns: 2 = Hazard affected no. of years, 3 = total no. of occurrence in all districts in 40 years, 4 = Hazard affected average no. of districts during 40 years and 5 = percentage of the districts affected in a hazard affected year

Source: 1 and 2 from the Dept. of Social services, (unpublished) Colombo, Sri Lanka. 3, 4, and 5 are calculated.



Appendix B

THE AGRO IDENTITY CARD OF THE RESEARCHER

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கமத்தொழில் அபிவிருத்தி ஆராய்ச்சி அமைச்சு
MINISTRY OF AGRICULTURAL DEVELOPMENT AND RESEARCH

ගොවි හැඳුනුම් පත
விவசாய அறிமுக அட்டை
AGRO IDENTITY CARD

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ගොවිජන සේවා දෙපාර්තමේන්තුවෙන් නිකුත් කරන ලදී.
கமநல சேவைகள் திணைக்களத்தினால் வழங்கப்பட்டது.
Issued by the Department of Agrarian Services.

වලංගු කාලය / செல்லுபடியாகும் காலம் / Period of Validity } 79.12.02 දක්වා / வரை / To } 80.12.01

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නම / பெயர் / Name } හාමාණ්ඩිකාර ලියනගේ අමරදාස කරුණාරත්න

ලිපිනය / முகவரி / Address } හෝරම්බ, වලගෙදර.

උපන් දිනය/වයස / பிறந்த திகதி/வயது / Date of Birth/Age } 1954.07.04

ජාතික හැඳුනුම් පතේ අංකය / தேசிய அடையாள அட்டை இல. / National Identity Card No. } ....

2

ප්‍රධාන රැකියාව / பிரதான தொழில் / Main Occupation } ගොවිතැන

ආදර්ශ අත්සන / மாதிரிக் கையொப்பம் / Specimen Signature } [signature]

ස්වාමිපුරුෂයාගේ/භාර්යාවගේ නම / கணவரின்/மனைவியின் பெயர் / Name of Husband/Wife } —

යැපෙන්නන් සංඛ්‍යාව / தங்கி வாழ்வோரின் எண்ணிக்கை / No. of Dependents } —

එකතුව-අවු. 18 ට වැඩි-රැකියාවක නියුක්තවූ / மொத்தம்-18 வயதுக்கு மேல்-தொழில் புரிவோர் / Total—Above 18 Yrs. Employed } —

4

කුඹුරු ඉඩම්වල විස්තර / நெற்காணி விபரங்கள் / DETAILS OF PADDY LANDS

ගොවි නිලධාරි තැනගේ ප්‍රදේශය / பயிர்ச்செய்கை உத்தியோகத்தர் பிரதேசம் / Cultivation Officer's Area } වලගෙදර.

ගො. සේ. මධ්‍යස්ථානය / கமநலச் சேவை நிலையம் / A.S.Centre } වලගෙදර.

ඉඩම් කොටස්/යායවල නම / நிலப்பிரிவின்/பிரிவுகளின் பெயர் / Name of Tract/Tracts: කලවෙල්ලාව කොට

කු.ඉ.ලේඛනයේ අනුක්‍රමික අංකය / விவசாயக் காணி இடாப்பில் வரிசை எண் / Serial No. A.L. Register	කුඹුරේ නම/බිම් කට්ටි අංකය / விவசாயக் காணியின் பெயர்/காணித் தொகுதி இல. / Name of Paddy Field/ Lot No.	අයිතිකරුද? අඳගොවියාද? / சொந்தக்காரர்/வாரக்காரர் / Owner/Tenant	අයිතිකරු නම් අඳගොවියාගේ නම අඳගොවි නම් අයිතිකරුගේ නම / சொந்தக்காரராயின் வாரக்காரரின் பெயர் வாரக்காரராயின் சொந்தக்காரரின் பெயர் / If Owner—Tenant's Name If Tenant—Owner's Name	විස්තීර්ණය / பரப்பு / Extent: අක්. / ஏக். / A.	රූ. / றூ. / R.	පර්. / பே. / P.	තට්ටුමාරු ද? නැද්ද? / மாற்றுப் பயிர்ச் செய்கை முறையா அல்லதா? / Thattumaru or not
47	දෙකතා කට්ට	අයිතිකරු	—	00	02	00	නැත.
153	කැලමිල්ල ගෙ	අයිතිකරු	—	01	01	00	නැත.
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Appendix C

QUESTIONNAIRE

(1) Number of members within the family. [...]

(2) Age of the head of household. [...]

(3) Marital status of head.

a). Married. [...]

b). Unmarried. [...]

c). Widowed or divorced. [...]

(4) Educational level of head of household. [...]

(5) Number of years lived in this settlement. [...]

(6) What is your main economic activity?

a). Paddy cultivation. [...]

b). Chena cultivation. [...]

c). Paddy and chena cultivation. [...]

d). Paddy, chena and cattle rearing. [...]

e). Paddy and cattle rearing. [...]

f). Chena and cattle rearing. [...]

g). Paddy, chena and business. [...]

h). Paddy, chena and temporary jobs. [...]

i). Paddy, chena and permanent job. [...]

j). Paddy and permanent job. [...]

k). Paddy and temporary jobs. [...]

l). Chena and temporary jobs. [...]

m). Chena, cattle and permanent job. [...]

n). Paddy, chena and self employment [...]

o). Chena and paddy (minor). [...]

p). Paddy and chena (minor). [...]

(7) Particulars related to agricultural lands belonging to the family.

a). Paddy acres. [...]

b). Homestead acres. [...]

c). Chena acres. [...]

d). More than one paddy plot. [...]

e). More than one chena plot. [...]

f). Paddy lands under the same tank. [...]

g). Paddy lands under different tanks. [...]

(8) Origin of the farmers.

(i) From where did you come to this village?

a). Hambantota Dry Zone. [...]

b). Hambantota Wet Zone. [...]

c). Other Dry Zone. [...]

d). Other Wet Zone. [...]

e). Born in this village. [...]

(ii) From which district did you come?

a). Hambantota. [...]

b). Matara. [...]

c). Ratnapura. [...]

d). Galle. [...]

e). Monaragla. [...]

f). Other Wet Zone district. [...]

g). Other Dry Zone district. [...]

(iii) How long did you live in your born village? [...]

(9) What are the major advantages you have living in this settlement?

a). Relatives and friends were there. [...]
b). Ready availability of chena land. [...]
c). Favourably located paddy fields. [...]
d). Ready availability of grazing lands. [...]
e). Soil fertility. [...]
f). Availability of non-farm employment. [...]
g). It is the place of birth. [...]
h). Irrigation facilities available. [...]
i). School within easy reach. [...]
j). Availability of agricultural labour. [...]
k). Land and a house given. [...]

(10) What are the major disadvantages you have living in this settlement?

a). Damages to crops by wild animals. [...]
b). Damages to crops from droughts. [...]
c). Inadequacy of water for daily needs. [...]
d). Marketing problems to sell our produce. [...]
e). Transport difficulties. [...]
f). No co-operation among farmers in water management. [...]
g). Agricultural lands are far away from home. [...]
h). Officers' co-opration in agriculture is insufficient. [...]
i). No satisfactory health facilities [...]
j). No satisfactory school facilities for children. [...]
i). Seasonal food shortage [...]
j). Income seasonal [...]
k). Alkalinity and salinity of the paddy fields [...]

(11) What were the drought affected years from 1980 to 1987?

a). 1980. [...]
b). 1981. [...]
c). 1982. [...]
d). 1983. [...]

e). 1984. [...]
f). 1985. [...]
g). 1986. [...]
h). 1987. [...]

(12) With whom do you normally discuss drought hazard?
a). With neighbouring farmers. [...]
b). With government officers. [...]
c). With settlement basis organization. [...]
d). With politicians in the area. [...]
e). With elites in the village or colony. [...]

(13) Do you get any kind of relief from these discussions?
a). Yes. [...]
b). No. [...]

(14) Can you predict whether there will be a drought according to the nature of the onset of *Maha* rains?
a). Yes. [...]
b). No. [...]

(15) What do you consider as a drought?
(i) According to rainfall characteristics.
a). Less than normal rainfall. [...]
b). A dry period of several months. [...]
c). A dry year. [...]
d). Several dry years. [...]
e). Entirely dried up tanks. [...]
f). No irrigation water for cultivation. [...]
g). No rain in Maha Season. [...]
h). No rain for cultivation. [...]
(ii) According to harvest characteristics.
a). Less than normal harvest. [...]

b). Much less than normal harvest. [...]

c). Entire crop loss within one season. [...]

d). Entire crop loss within one year. [...]

e). Entire crop loss within several years. [...]

f). No grass for cattle. [...]

(16) What are the specific characteristics you see within a drought free year?

a). More than normal rain. [...]

b). Successful agriculture in both seasons. [...]

c). Tanks overflow with rains. [...]

d). No water scarcity in the settlement. [...]

e). A very good harvest. [...]

f). Green trees with many fruits. [...]

g). Sound family economy. [...]

h). Several rains in every months. [...]

(17) If you could get enough rain water and tank water for your agricultural activities, would you consider the dry periods from January to March, and from May to September as drought periods?

a). Yes. [...]

b). No. [...]

c). Give your reasons: .....

.....

.....

.....

(18) What are the indicators you use to predict a future drought?

a). Reddish sun in the morning and evening. [...]

b). Dark blue sky. [...]

c). Heavy mist in the morning. [...]

d). Heavy dew in the morning. [...]

e). Wind direction changes frequently. [...]
f). Chilly weather. [...]
g). Hill country cannot be seen. [...]
h). Cloudless, clear sky. [...]
i). Sky dense with stars at night. [...]
j). Splitting of surface soil. [...]
k). Hawks fly high in the sky. [...]
l). Rainy season starts with three thunders. [...]
m). No rain in April and May. [...]
n). Not enough rains in expected rainy days. [...]
o). Fewer fruits in fruit trees in forest [...]
p). These indicators are not as reliable as formerly. [...]

(19) What are the indicators you use to predict future rains?
a). White ants emerge from out-door rubbish piles. [...]
b). Ants emerge from ant-hills. [...]
c). White ants with feathers come out from ant-hills. [...]
d). Thunder from particular direction. [...]
e). Thundering starts one week before rains. [...]
f). Direction of the origin of clouds. [...]
g). Frogs make noise and start to walk on the ground. [...]
h). Chameleons make noise. [...]
i). Hawks make noise. [...]
j). Kadetta makes noise. [...]
k). Diyakawa makes noise. [...]
l). Monkies make noise. [...]
m). Elephants make noise. [...]
n). Seru flocks make noise. [...]
o). Day time temperature increases unbearably. [...]
p). Absence of winds and very calm atmosphere. [...]
q). Sudden willy-willies or dust devils. [...]
r). Many fruits on forest trees. [...]
s). Hill country can be seen very clearly. [...]
t). Rainbows emerge. [...]

u). High perspiration. [...]

v). Body is highly dried out. [...]

w). Very great thirst. [...]

x). Bodily discomfort. [...]

y). These indicators are not so reliable as formerly. [...]

(20) If this is a drought affected year, what will be the likelihood of a drought during next year?

(i). a). Less likely. [...]

b). More likely. [...]

c). No difference. [...]

d). Not known. [...]

(ii). If yes for a or b, give reasons. .....

.....

.....

.....

(21) Do you think the occurrence of droughts has increased or decreased when compared to the past?

a. Less droughts. [...]

b. More droughts. [...]

c. No difference. [...]

(22) What are the reasons you see for the occurrence of drought hazard?

a). Deforestation and related consequences. [...]

b). Unfavourable winds during rainy seasons. [...]

c). Climatic changes. [...]

d). Careless water irrigation water usage. [...]

e). Unjust rulers. [...]

f). Unjust people. [...]

g). God's anger. [...]

h). Siltation of the tanks. [...]

i). Planetary effects. [...]
j). No hills in the area. [...]
k). High growth of population. [...]
l). Location of the area. [...]

(23) Can you see any pattern in the occurrence of droughts?
(i) [Yes] [No]
(ii) If yes,
a). Annually. [...]
b). Once every two years. [...]
c). Once every three years. [...]
d). Once every four years. [...]
e). Once every five years. [...]

(24) When you experience a long drought period and it finally ends with the rains, what are the main characteristics that clearly change in the environment?
a). Diseases spread. [...]
b). People are very busy in agriculture. [...]
c). Plants are green. [...]
d). People are happy. [...]
e). No water scarecity in the settlement. [...]
f). Everything is lively. [...]
g). No dust. [...]

(25) What are the negative effects you have to face in your settlement when it is hit by a drought?
a). Destruction of annual crops. [...]
b). Diseases spread. [...]
c). Destruction of animals. [...]
d). Destruction of perennial crops. [...]
e). Tank dries up entirely. [...]
f). Increased fear of theft. [...]

g). Aggravation of family problems. [...]
h). Some people evacuate the village. [...]
i). Difficult to retain the government officers. [...]
j). Reduction of employments in the settlements. [...]
k). Food shortage. [...]
l). Loss of income sources. [...]
m). Wastage of human resources in the settlement. [...]
n). Social problems are aggravated. [...]
o). Water shortages for all purposes. [...]

(26) Are there ways to control drought hazard?
1). Yes. [...]
2). No. [...]
3). Not known. [...]

(27) Suppose you are a member of an organization which works for the development of the settlement. In a meeting of this organization, you are asked to give your proposals to control drought hazard. What would be your proposals?
a). Renovation of all the abandoned tanks in the settlement and in the forest to collect water. [...]
b). Reaforestation. [...]
c). Cultivation of drought resistant crops. [...]
d). Crop insurance. [...]
e). Intercropping in highlands. [...]
f). No cultivation in the Yala season. [...]
g). Increase of irrigation facilities. [...]
h). Establishment of drought relief work sites. [...]
i). Increase of non-farm employment. [...]
j). Go outside the settlement for employment. [...]
k). Be religious and righteous. [...]
l). Explain to the government. [...]

(28) When you can see a drought approaching what are your strategies to reduce the losses before you cultivate paddy?

a). Observe rainfall in the first month of the season, the water level in the tank, and cultivate short-term paddy. [...]

b). If season's rainfall is delayed, work according to officer's instructions. [...]

c). Without cultivating in own settlement, cultivate in other settlement. [...]

d). Grow more drought resistant crops in the chenas with the first rains in the season. [...]

e). Due to lack of tank water, confine cultivation to to highlands. [...]

f). Cultivate paddy lands taking a risk. [...]

g). Grow subsidiary food crops in paddy lands. [...]

h). Abandon both paddy and chenas. [...]

i). Abandon paddy lands. [...]

j). Vow and pray to gods and start cultivation. [...]

k). Work according to a collective dicision. [...]

(29) What are your strategies to reduce losses caused by drought after you cultivated paddy?

a). If paddy is going to be unsuccessful, give attention to chena cultivation. [...]

b). Grow subsidiary food crops in paddy fields. [...]

c). Extremely careful with tank water consumption. [...]

d). Use the machines to pump the left over water from the tanks. [...]

e). Stop the inputs for paddy [...]

f). Pray and vow to Gods. [...]

(30) What are the advantages of the agro-chemicals used by you?

a). High yield. [...]

b). Crop diseases easily controlled. [...]
c). Easy usage. [...]
d). Easy availability. [...]
e). Weeds properly controlled. [...]

(31) What are the disadvantages of the agro-chemicals used by you?
a). High price. [...]
b). Adds poisonous substances to the produce. [...]
c). Leads to diseases after consumption of the produce. [...]
d). Poisonous substances added to water sources. [...]
e). Farmers don't have a proper knowledge to use them. [...]
f). Some diseases cannot be controlled [...]
g). Leads to accidents. [...]
h). Reduces the plant growth for a short period. [...]
i). Destruction of favourable pests, birds, and worms. [...]
j). Environment is polluted [...]

(32) Can you control the weeds in your paddy fields using water?
(i) a). Yes. [...]
b). No. [...]
c). Do not know. [...]
(ii) If Yes, explain how:.....
.....
.....
.....

(33) What are the advantages of chemical fertilizers used by you?
a). High yield. [...]
b). Easy availability. [...]
c). Easy usage. [...]

(34) What are the disadvantages of chemical fertilizers used by you?

a). High price. [...]
b). Destroys favourable insects and worms. [...]
c). Growth of weeds. [...]
d). Leads to crop diseases. [...]
e). Deepens the mud layer of the field. [...]
f). Weed seeds are mixed with fertilizers [...]

(35) What are the advantages of hybrid seed varieties cultivated by you?

a). High yield. [...]
b). Plants do not fall because they are short. [...]
c). Easy availability. [...]
d). High germination. [...]
e). Seed amount needed is low. [...]
f). Not mix with other crop seeds [...]

(36) What are the disadvantages of hybrid seed varieties cultivated by you?

a). Abundance of diseases. [...]
b). High maintenance cost. [...]
c). High growth of weeds. [...]
d). Yield decays very soon. [...]
e). Rice less tasty. [...]
f). Low weight of rice. [...]
g). Harvesting wastages are high. [...]
h). Low drought resistance. [...]
i). Mixed with weed seeds [...]
j). Very expensive [...]

(37) What are the advantages of land preparation with a tractor?

a). Land preparation in a short time [...]
b). Land preparation is proper. [...]
c). Water wastages are very low. [...]
d). Very easy for the farmer. [...]
e). Low cost [...]

(38) What are the disadvantages of land preparation with a tractor?
a). High cost. [...]
b). Infertile soil comes to the surface. [...]
c). Difficult to find tractor when we need it. [...]
d). Water wastages are high [...]
e). Payments should be made in ready cash. [...]
f). Takes time to season soil [...]
g).corners of the paddy tracts do not mud [...]

(39) What are the advantages of land preparation with water-buffaloes?
a). Takes less time to season the paddy fields [...]
b). The holes made by crabs in the field are closed [...]
c). Soil does not change unfavourably. [...]
d). Payments can be made with paddy harvest. [...]
e). Very good for the paddy plant. [...]
f). Less water wastages. [...]

(40) What are the disadvantages of land preparation with water-buffaloes?
a). Takes time. [...]
b). Wastes water. [...]
c). Unavailable when we need them. [...]
d). Very difficult preparing meals and other things for labourers. [...]
e). High cost. [...]

(41) Have you cultivated outside the settlement in drought years?

(i) a). Yes. [...]

b). No. [...]

(ii) If yes, explain your activities: .....

.....

.....

.....

(42) Do you seek the help of Gods and the Buddha to avoid drought hazards?

(i) a). Yes. [...]

b). No. [...]

(ii) If yes, describe how: .....

.....

.....

.....

(43) In order to recoup drought losses did you mortage, lease or sell your properties?

(i) a). Yes. [...]

b). No. [...]

(ii) If yes,

a). Lease, mortgage, or sell the paddy fields. [...]

b). Lease, mortgage, or sell the highlands. [...]

c). Mortgage, or sell wife's jewellery. [...]

d). Mortgage, or sell household equipments. [...]

e). Sell cattle. [...]

f). Lease, mortgage, or sell homestead and home. [...]

(44) Did you have to be a debtor as a result of drought hazard?

(i) a). Yes. [...]

b). No. [...]

(ii) If yes,

a). Borrowed cereals from relatives and friends. [...]

b). Borrowed money from relatives and friends. [...]

c). Borrowed money from money lenders. [...]

d). Borrowed money from banks. [...]

e). Borrowed consumer goods and agro-inputs. [...]

(45) Were you in an employment in this drought year?

(i) a). Yes. [...]

b). No. [...]

(ii) If yes,

a). Work as a labourer in settlement. [...]

b). Work as a labourer outside the settlement. [...]

c). Work for the drought relief work site. [...]

d). Gem hunting. [...]

e). Poultry farming. [...]

f). Brick making. [...]

g). Worked as a labourer in the coral pits. [...]

(46) Did you have to face food shortages due to droughts?

(i) a. Yes. [...]

b. No. [...]

(ii) If no,

a. Reserved paddy. [...]

b. Reserved chena produce. [...]

c. Reserved seeds. [...]

d. Borrowed food. [...]

e. Reduced food intake. [...]

f. Reduced the number of meals. [...]

(47) Did you have enough finacial resources to maintain

your family during drought periods?

(i) a). Yes. [...]

b). No. [...]

(ii) If no,

a). Sent children to live with relatives. [...]

b). Hired children as house maids. [...]

c). Children had to stop their schooling. [...]

d). Reduced the number and quality of the meals. [...]

e). Reduced travelling. [...]

f). Reduced recreation activities. [...]

(48) Do you use the forest in order to obtain edible plants, fruits, or financial sources during droughts?

(i) a). Yes. [...]

b). No. [...]

(ii) If yes,

a). Wild animals' meat. [...]

b). Honey. [...]

c). Medicinal herbs. [...]

d). Timber. [...]

e). Yams or tubers. [...]

f). Fire wood. [...]

g). For cattle fodder. [...]

(49) When droughts create hardships to you, are there government officers who are supposed to help you to reduce your hardships?

(i) a). Yes [...]

b). No. [...]

(ii) If yes, do you receive their help?

a). Yes. [...]

b). No. [...]

(iii) If not, explain the reasons: .....

.....

.....

.....

(50) Do you have cattle?

(i) a). Yes. [...]

b). No. [...]

(ii) If yes, do you have to face fodder shortages in your settelement due to drought?

a). Yes [...]

b). No. [...]

(iii) If yes, how do you normally avoid this shortage?

a). Grazing animals in the forest. [...]

b). sell the cattle. [...]

c). Let cattle stray in the villages. [...]

d). Bring cattle to an another settlement. [...]

(iv) Do you sell your cattle in order to recoup your losses during droughts?

a). Yes. [...]

b). No. [...]

(v) How is the rate of cattle thefts during droughts?

a). High. [...]

b). Low. [...]

(51) Paddy cultivation.	[Maha 86/87]	[Yala '87]
(i) Cultivated area (acres)	[...]	[...]
(ii) Partially damaged due to drought (acres)	[...]	[...]
(iii) Completely damaged due to drought (acres)	[...]	[...]
(iv) Completely abandoned due to drought (acres)	[...]	[...]

(52) *Chena* cultivation	[Maha 86/87]	[Yala '87]
(i) Cultivated area (acres)	[...]	[...]
(ii) Partially damaged due to drought (acres)	[...]	[...]

(iii) Completely damaged due to drought (acres) [...] [...]

(iv) Completely abandoned due to drought (acres) [...] [...]

(v) Crops grown in *chenas*

a). Paddy. [...] [...]

b). Kurakkan. [...] [...]

c). Mineri. [...] [...]

d). Gingelly. [...] [...]

e). Maize. [...] [...]

f). Cow-pea. [...] [...]

g). Custard. [...] [...]

h). Chillies. [...] [...]

i). Pumpkin. [...] [...]

j). Alington. [...] [...]

k). Bushita. [...] [...]

l). Ground-nut. [...] [...]

m). Water melon. [...] [...]

n). Ma or beans. [...] [...]

o). Others [...] [...]

(vi) The reasons to cultivate many crops on *chena* land.

a). Limited land. [...]

b). Preference to have variety of food. [...]

c). It is the only way to provide most of our needs. [...]

d). If some crops destroyed some always survive. [...]

(vii) How do you choose land for a *chena?*

a). According to soil. [...]

b). According to slope. [...]

c). According to soil moisture. [...]

d). According to possibilities to protect crops. [...]

e). According to growth of forest. [...]

(53) What are the major problems you have to face when you sell your agricultural produce?

1). Transport problem. [...]

2). Low price for the produce. [...]

3). Short measurements. [...]

4). No marketing facilities. [...]

5). Produce is degraded. [...]

(54) What is the rate of thefts during drought periods?

(i) a). High. [...]

b). Low. [...]

(ii) If high, describe nature of thefts: ....

.....

.....

.....

(55) What type of economic activities have you got in your settlement during a drought period?

(i) Activities.

1). Labour. [...]

2). Hunting. [...]

3). Collecting forest goods. [...]

4). Gemming. [...]

5). Brick making. [...]

6). Furniture making. [...]

7). Fishing. [...]

8). Cattle rearing and milk production. [...]

9). Small business. [...]

10). Fire wood cutting. [...]

11). Livestock. [...]

12). Collect lotus yam in the tank. [...]

(ii) Do you go outside of the settlement to find employment during droughts?

a). Yes. [...]

b). No. [...]

(56) What are the advantages you can have from your settlement tank during a drought period?

a). Compensation of the daily water needs. [...]
b). For cultivation of the tank bed. [...]
c). Critical use of remaining water for animals. [...]
d). Lotus yam collection. [...]
e). Resorting to fishing. [...]
f). Digging wells in the tank bed. [...]
g). Restriction of bathing and washing. [...]
h). Drinking water from the tank wells. [...]

(57) The availability of water during a drought period.

(i) From where do you get your water for daily household activities in general?

a). Tank. [...]
b). Well. [...]
c). Canal. [...]
d). Tube well. [...]
e). Water pipes. [...]

(ii) How far the water source from your home? Miles [...] Yards [....]

(iii) How do you get your water for daily household activities in general during a drought period?

a). Tank. [...]
b). Well. [...]
c). Canal. [...]
d). Tube well. [...]
e). Water pipes. [...]

(iv) How far is the water source away from your home? Miles [...] Yards [...]

(v) How far do you have to go for your bathing during a drought? Miles [...] Yards [...]

(vi) Can you drink the water from your tube-well during a drought period?

a). Yes. [...]

b). No. [...]

(vii) If not, what are the reasons?

a). Rusty flavour. [...]

b). Brackishness. [...]

(58) Are you getting drought relief aids?

(i) a). Yes. [...]

b). No. [...]

(ii) If yes, did you have to face difficulties in the process of getting the aids?

a). Yes. [...]

b). No.

(iii) If yes, explain: .....
.....
.....
.....

(iv) If no, give reasons: .....
.....
.....
.....

(59) Could you please tell me your average monthly income? [Rs. ...]

(60) Could you please tell me your average monthly expenditure?[Rs. ..]

(61) The condition of the house.

(i) The roof.

a). Cadjan (woven coconut leaves). [...]

b). Mana (a grass variety). [...]

c). Local tiles. [...]

d). Hook tiles. [...]

e). Sheets. [...]

(ii) The walls.

a). Wattle and daub. [...]

b). Bricks. [...]

c). Unseasoned bricks. [...]

d). Plastered. [...]

(iii) The floor.

a). Earthen. [...]

b). Cemented. [...]

(vi) The number of rooms. [...]

Appendix D

SENTENCE COMPLETION TEST

(1) If there is a prediction that there is going to be a drought in the near future, I will .....
.....

(2) The major problem of the farmers living in this area is .....
.....

(3) The most important thing to overcome this major problem is ...
.....

(4) When there is going to be a drought, my first feeling is .....
.....

(5) During a drought period, I .....
.....

(6) When my life is concerned Gods .....
.....

(7) When I was living in a drought period my feelings were.....
.....

(8) When we have to live in a drought period the responsibilities of the community memmbers are .....
.....

(9) I believe luck .....
.....

(10) When a drought is over I .....
.....

(11) When the people have to face a drought in their settlement, the feelings of the people are .....
.....

(12) When I properly consider the future I .....
.....

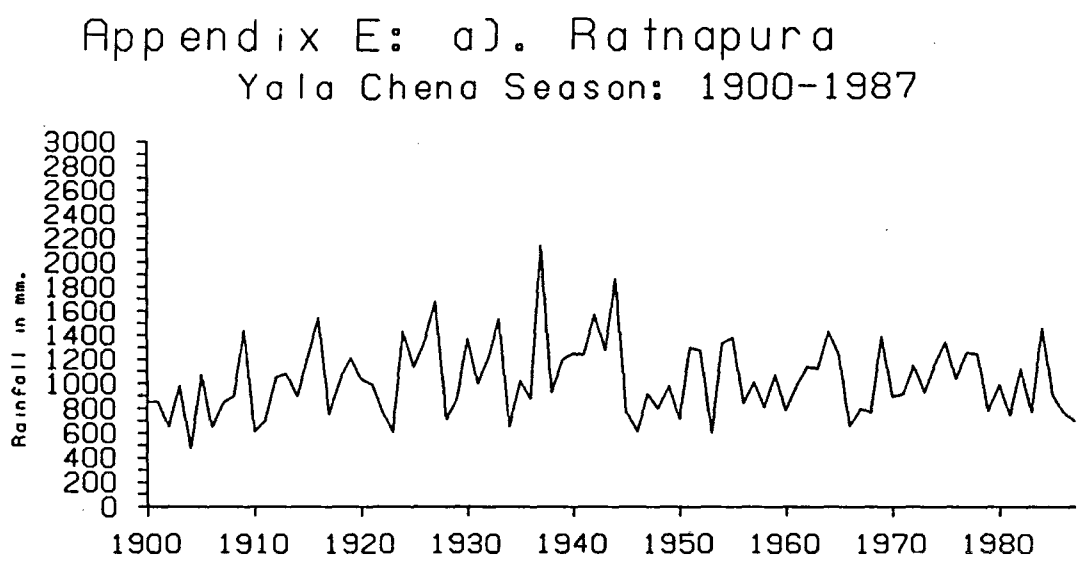
(13) In order to get lands with irrigation facilities from the government, the farmers have .....
.....

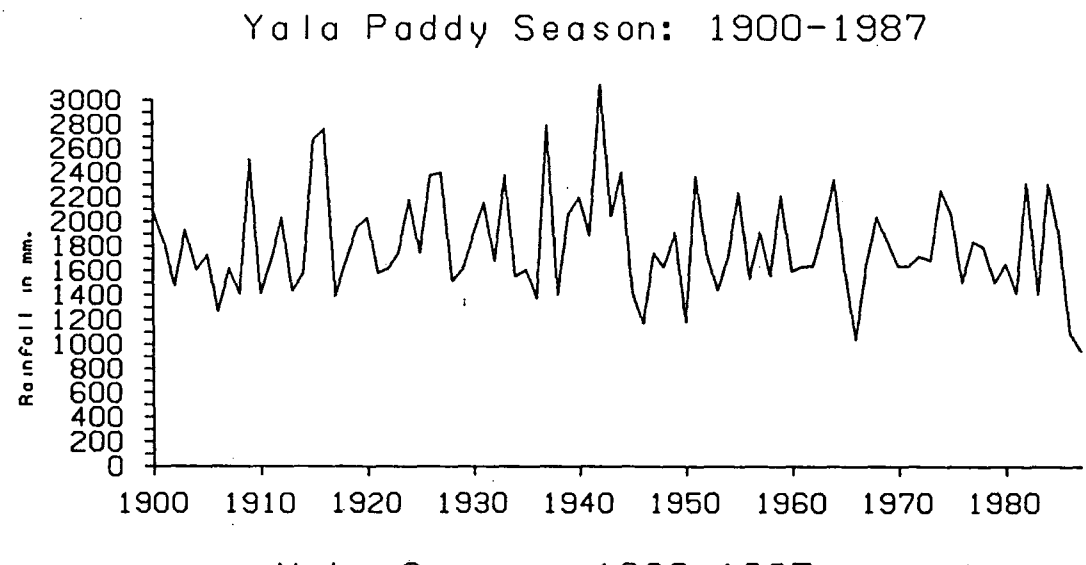
(14) In order to obtain an irrigable land under a government irrigation scheme, farmers have to .....
.....

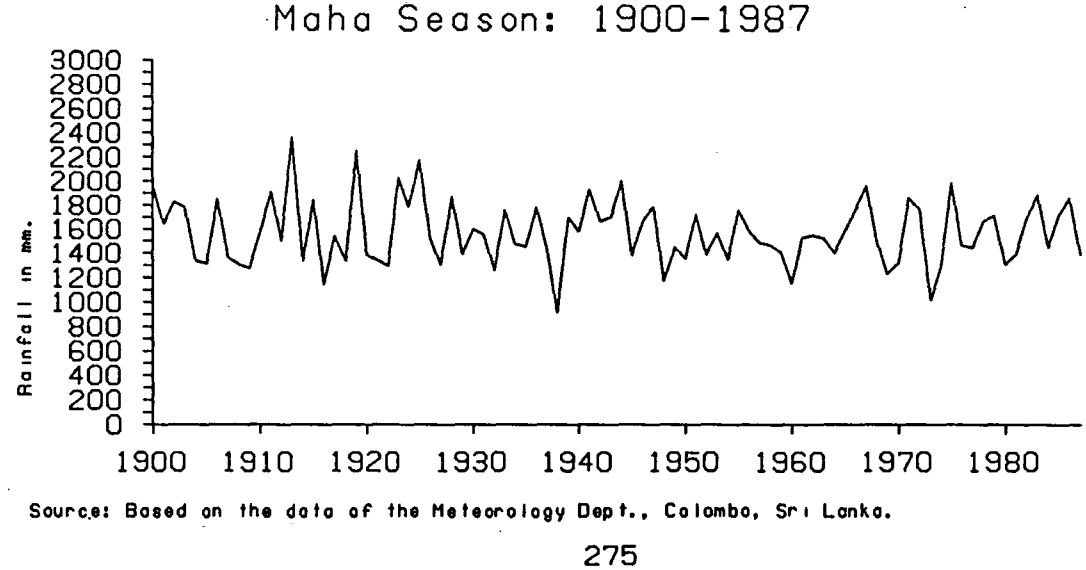
(15) In order to get drought relief aids, the farmers have to.....
.....

Appendix E

GRAPHS RELATED TO THE STATIONS IN THE TABLE 3.2



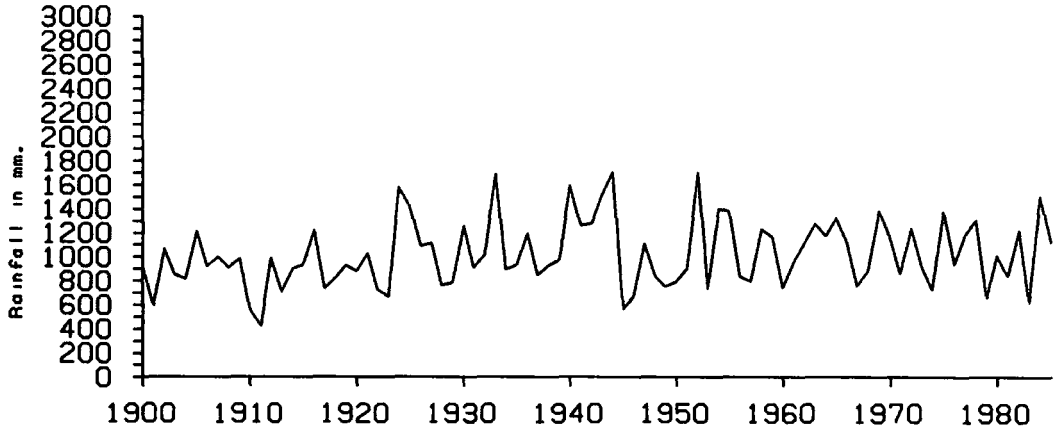




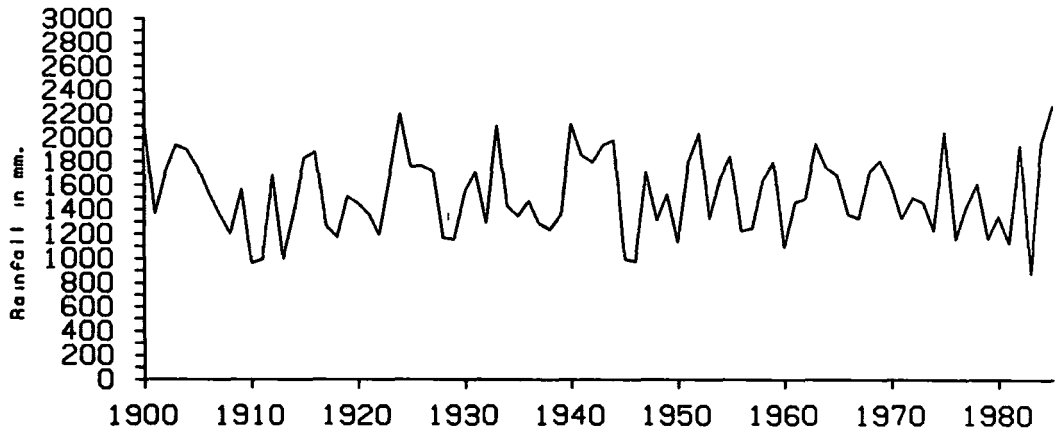
Source: Based on the data of the Meteorology Dept., Colombo, Sri Lanka.

Appendix E: b). Aninkanda

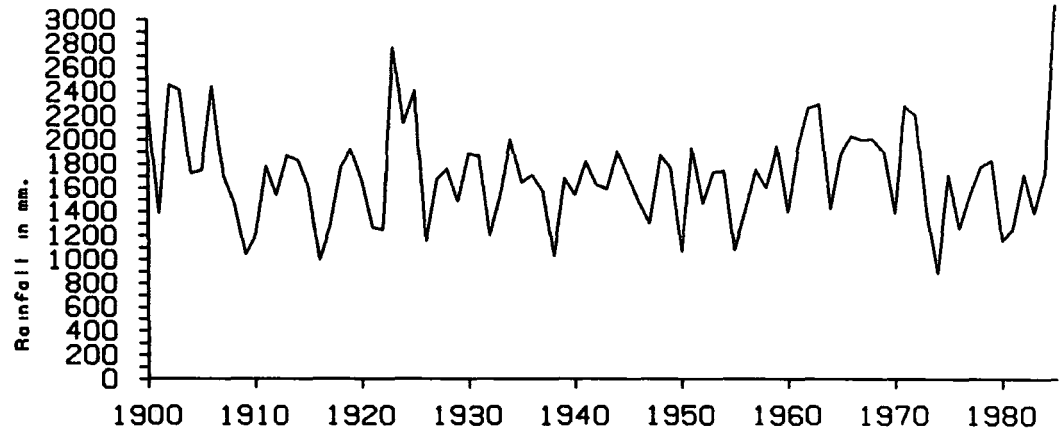
Yala Chena Season: 1900-1985



Yala Paddy Season: 1900-1985



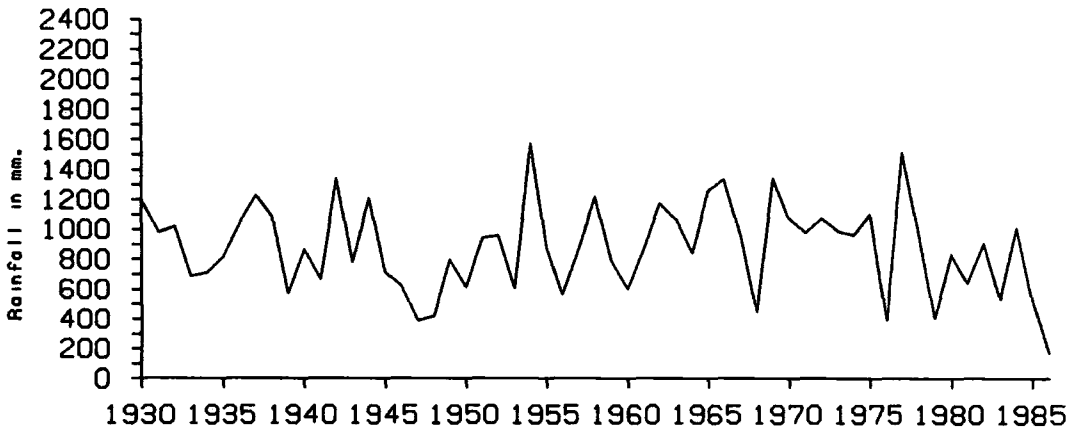
Maha Season: 1900-1985



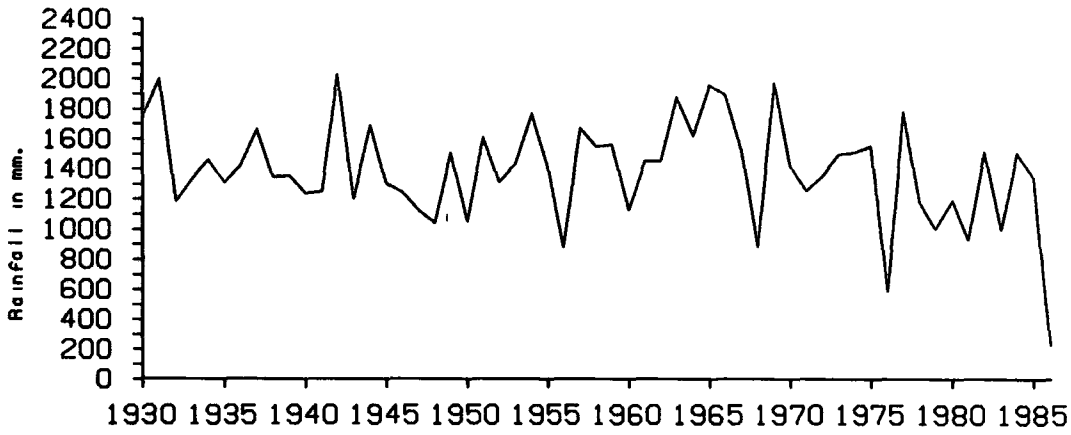
Source: Based on the data of the Meteorology Dept., Colombo, Sri Lanka.

Appendix E: c). Dompe

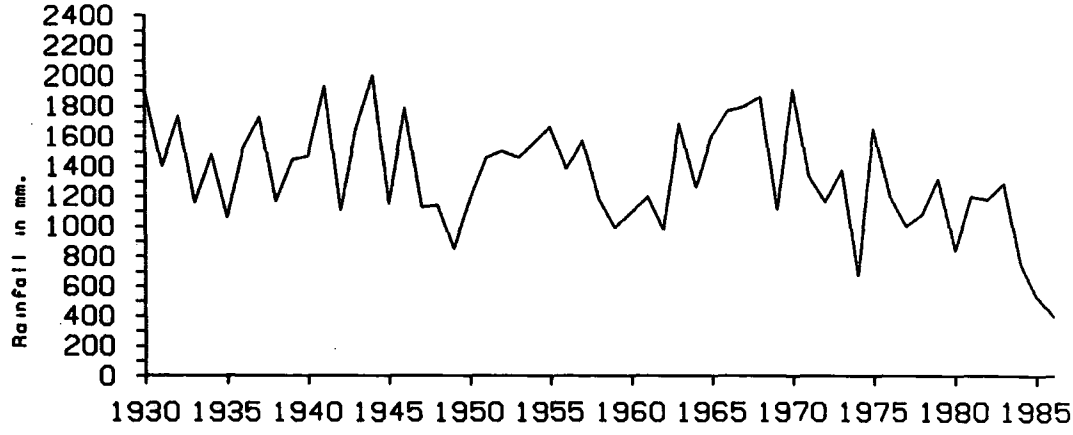
Yala Chena Season: 1930-1986



Yala Paddy Season: 1930-1986



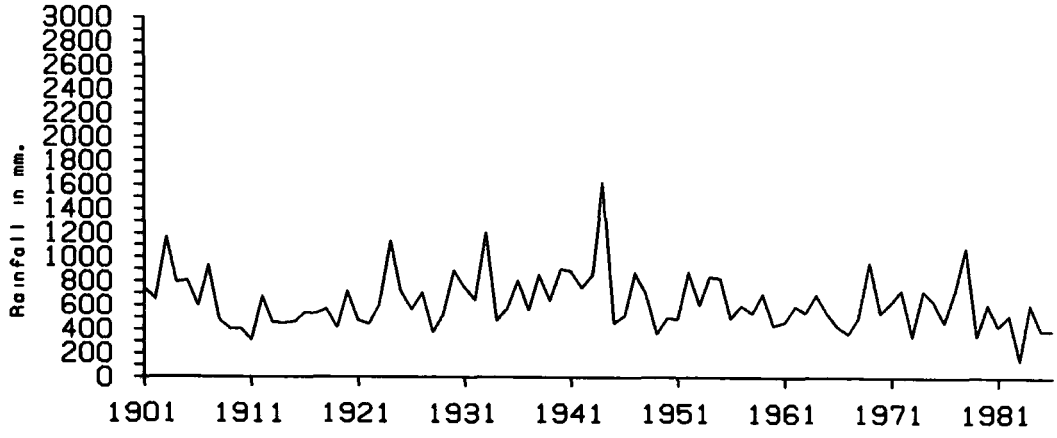
Maha Season: 1930-1986



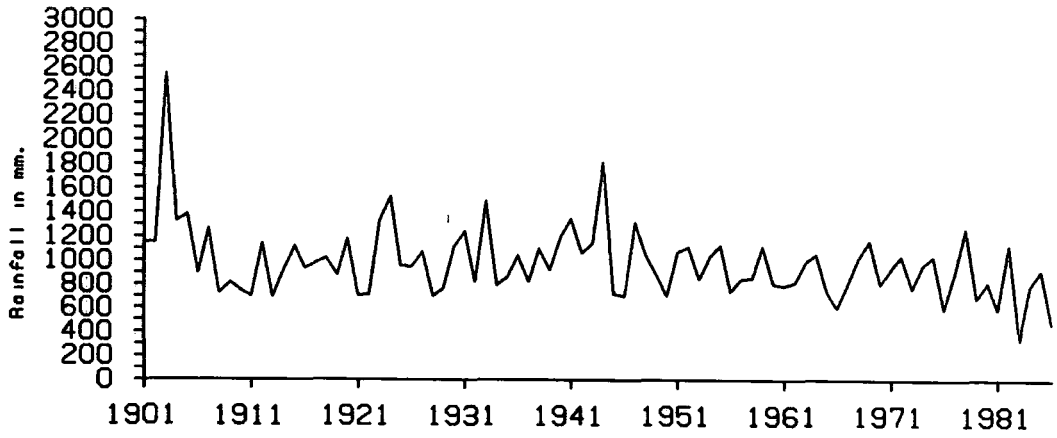
Source: Based on the data of the Meteorology Dept., Colombo, Sri Lanka.

Appendix E: d). Kirama

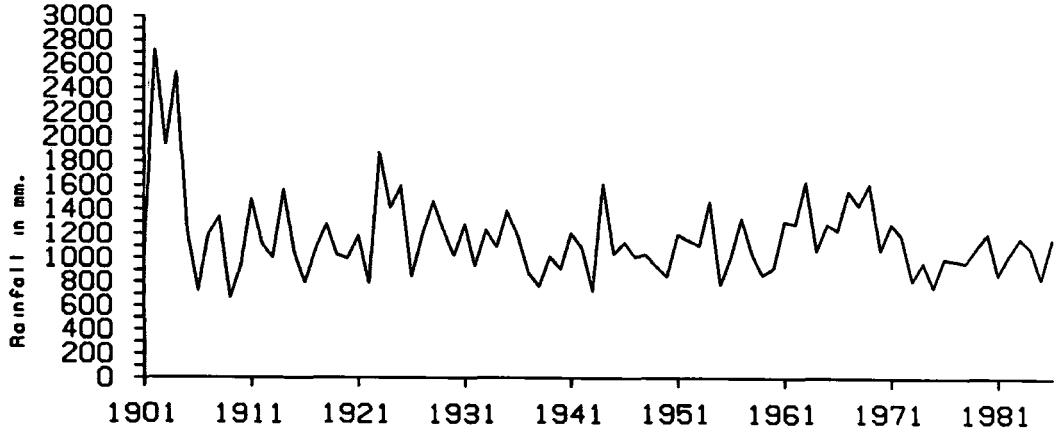
Yala Chena Season: 1901-1986



Yala Paddy Season: 1901-1986



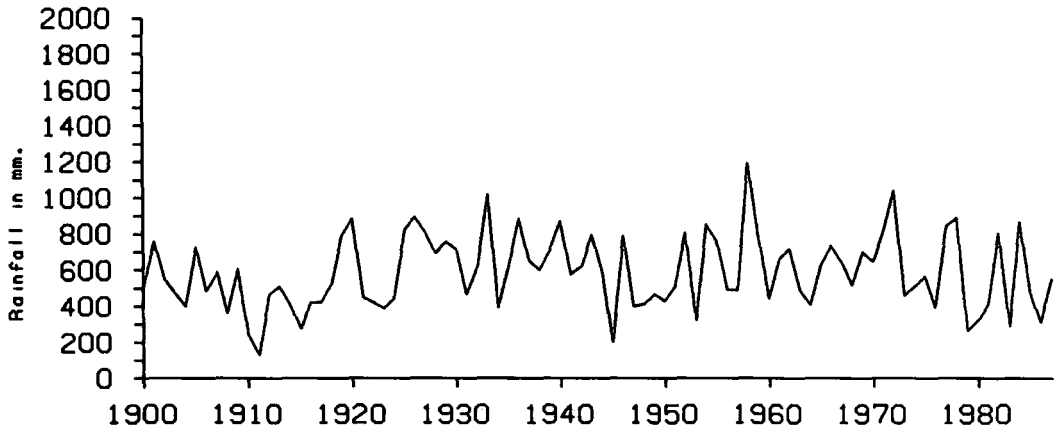
Maha Season: 1901-1986



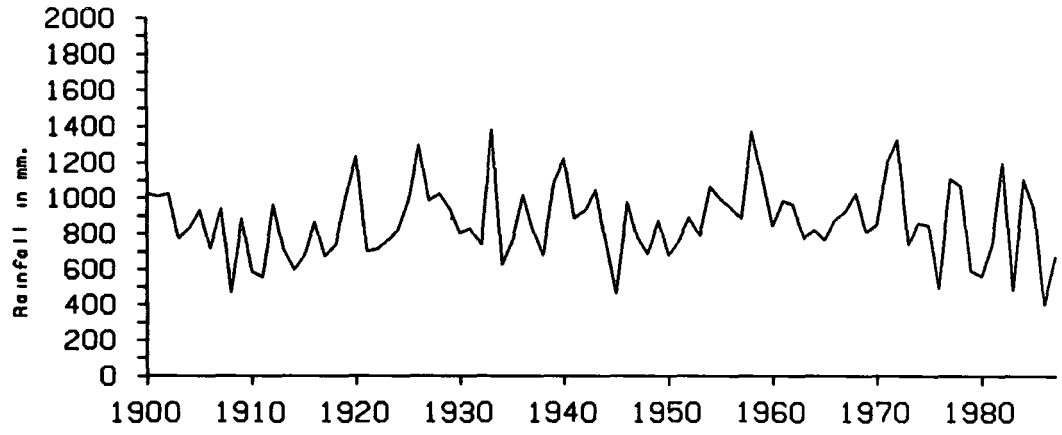
Source: Based on the data of the Meteorology Dept., Colombo, Sri Lanka.

Appendix E: e). Kurunagala

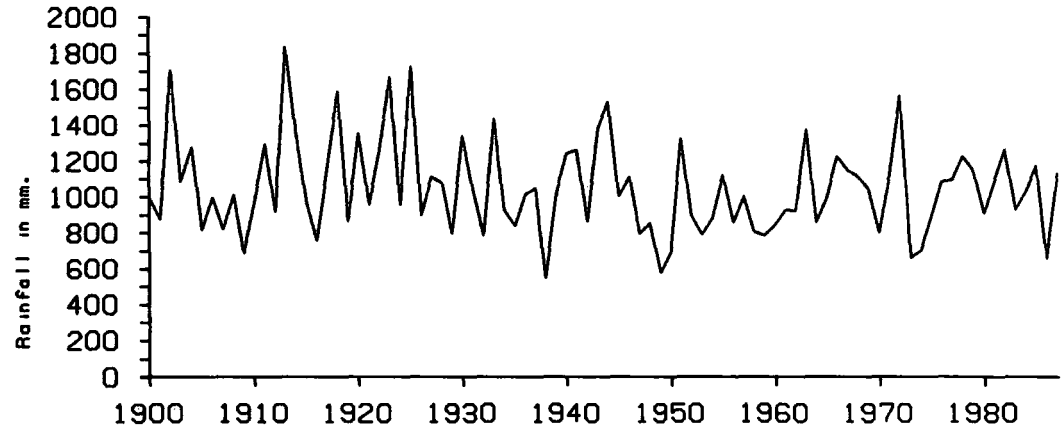
Yala Chena Season: 1900-1987



Yala Paddy Season: 1900-1987



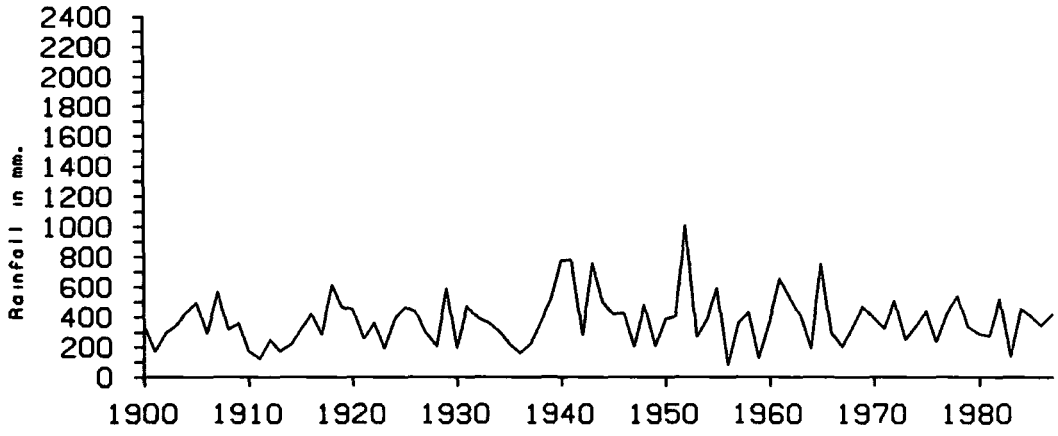
Maha Season: 1900-1987



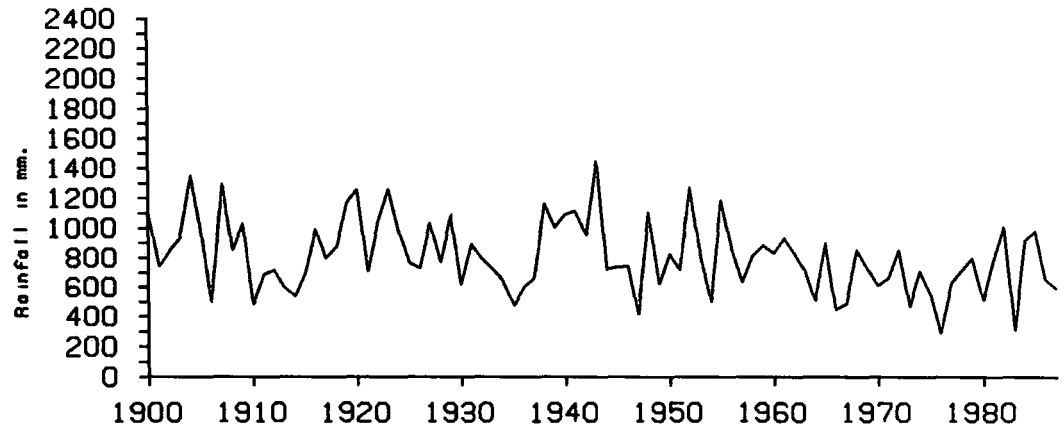
Source: Based on the data of the Meteorology Dept., Colombo, Sri Lanka.

Appendix E: f). Nuwara Eliya

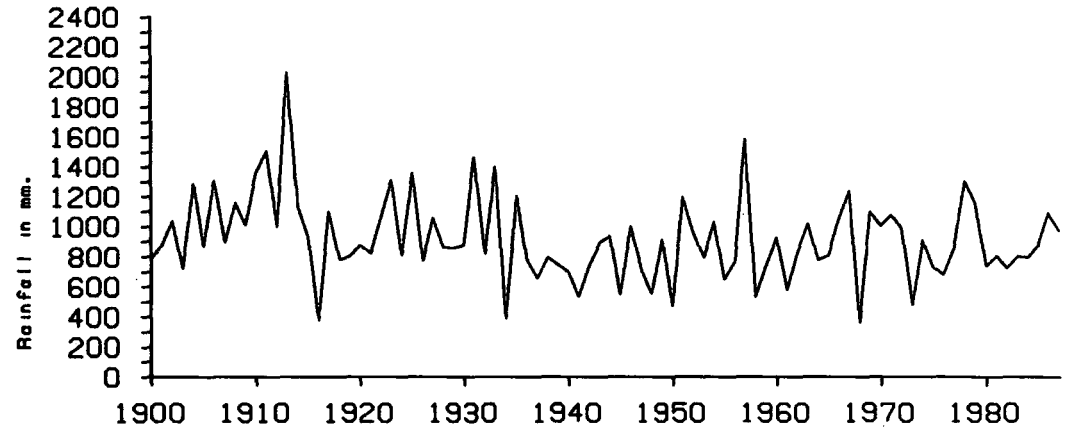
Yala Chena Season: 1900-1987



Yala Paddy Season: 1900-1987



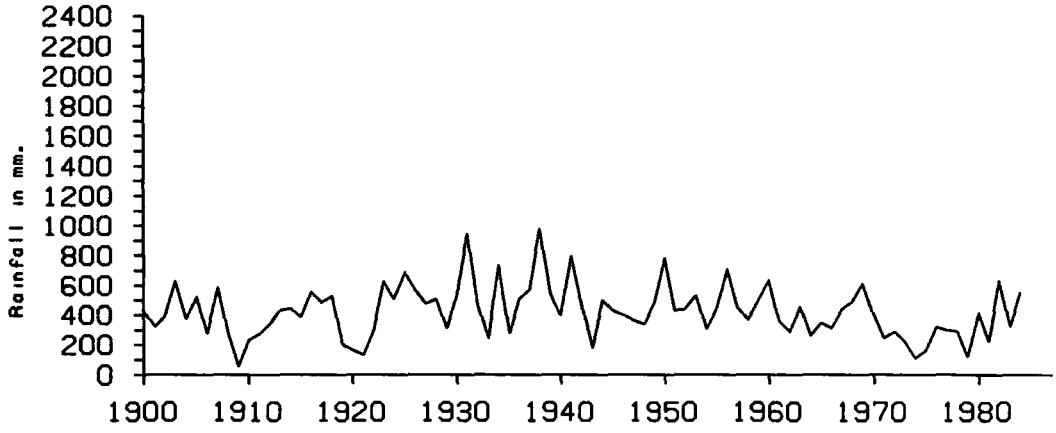
Maha Season: 1900-1987



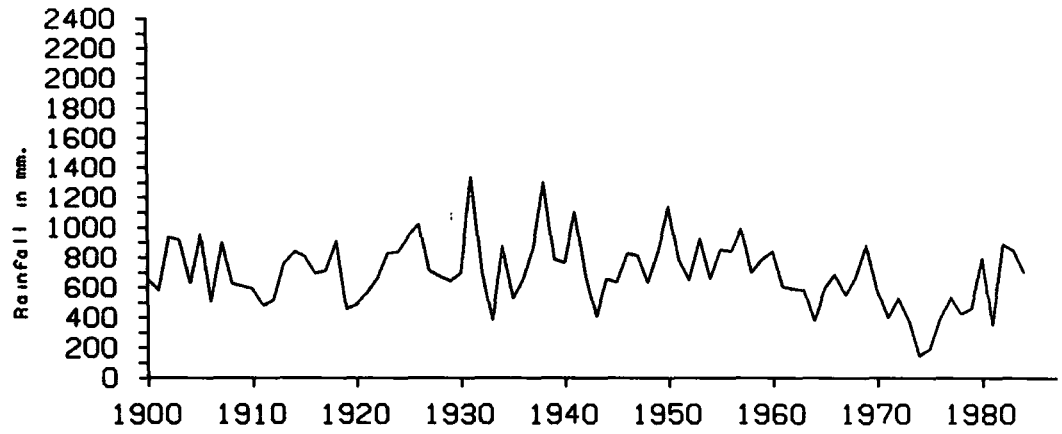
Source: Based on the data of the Meteorology Dept., Colombo, Sri lanka.

Appendix E: g). Matale

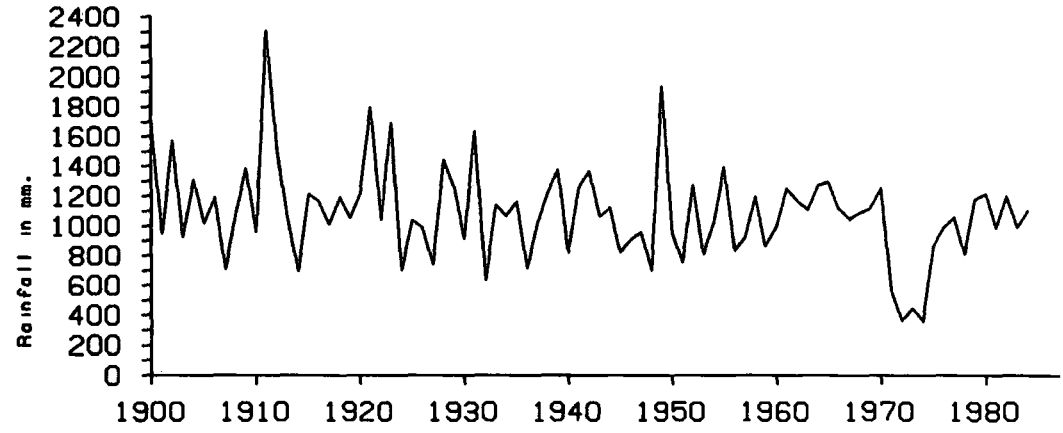
Yala Chena Season: 1900-1987



Yala Paddy Season: 1900-1987



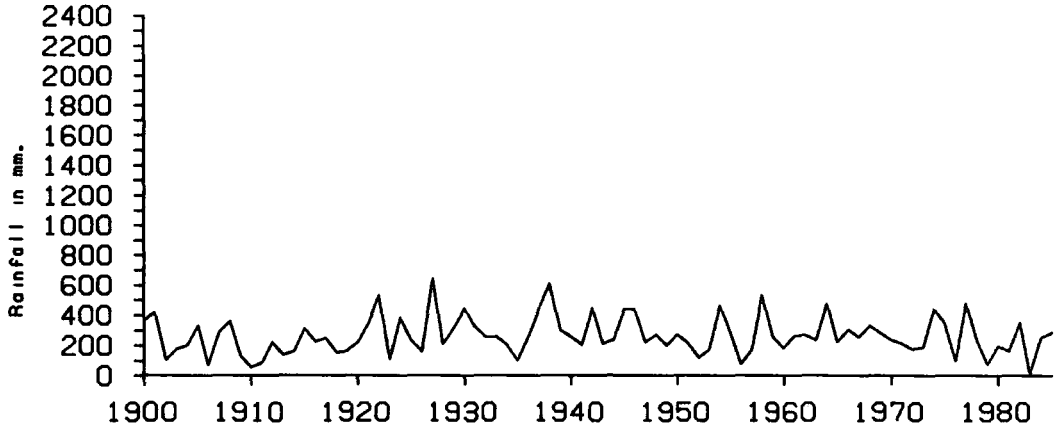
Maha Season: 1900-1987



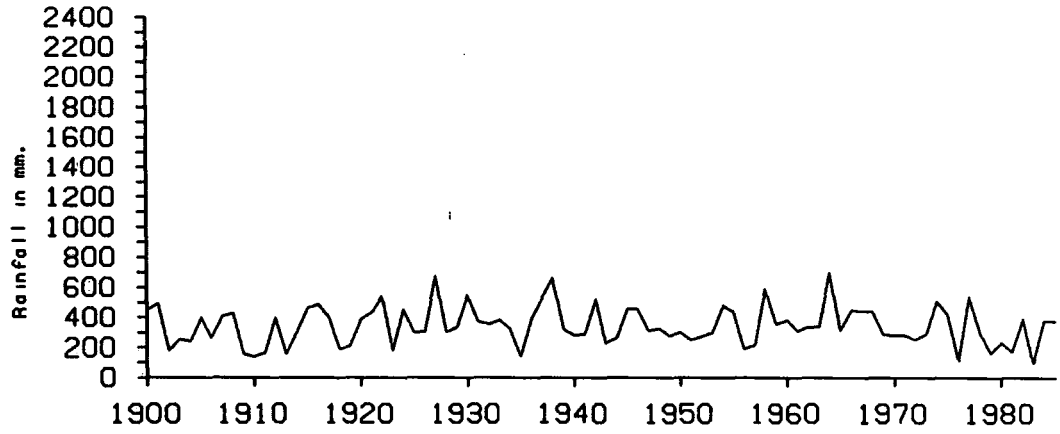
Source: Based on the data of the Meteorology Dept., Colombo, Sri Lanka.

Appendix E: h). Ampara Tank

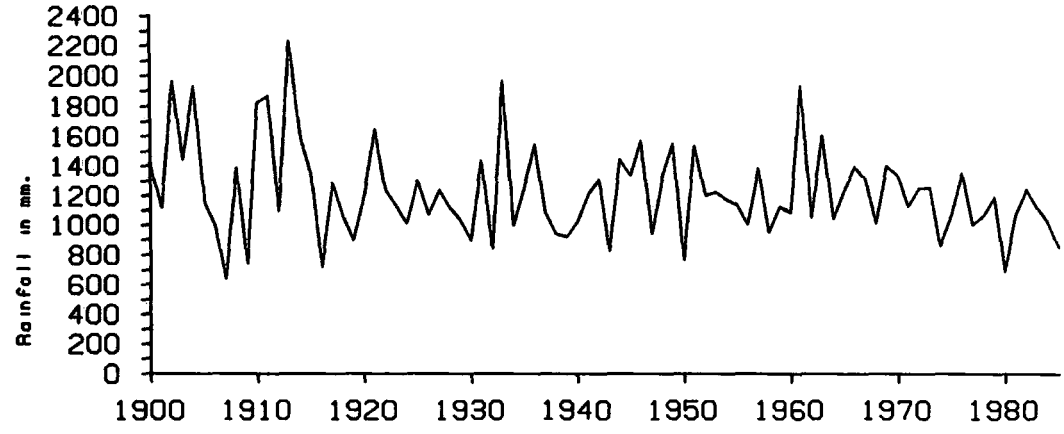
Yala Chena Season: 1900-1985



Yala Paddy Season: 1900-1985



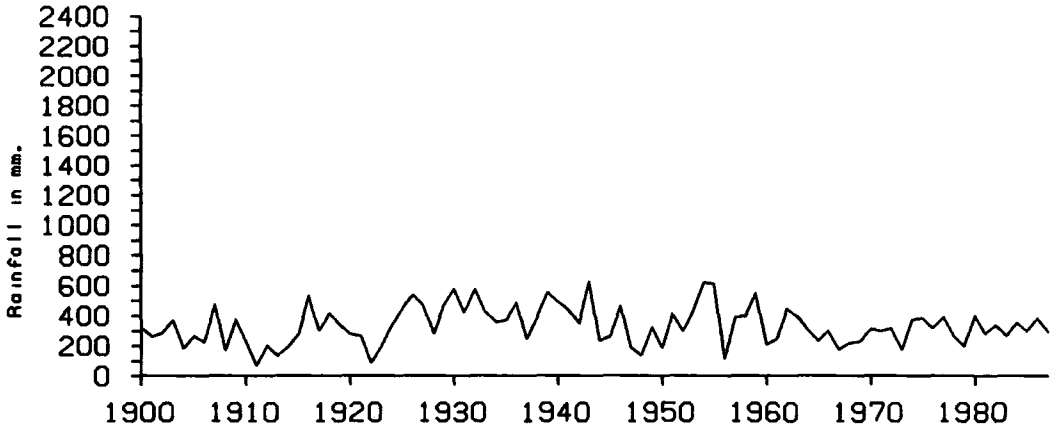
Maha Season: 1900-1985



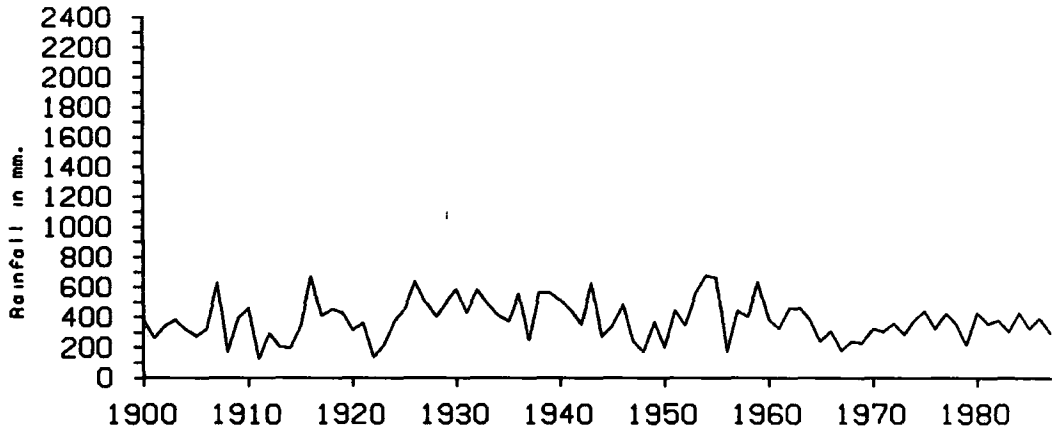
Source: Based on the data of the Meteorology Dept., Colombo, Sri Lanka.

Appendix E: i). Anuradhapura

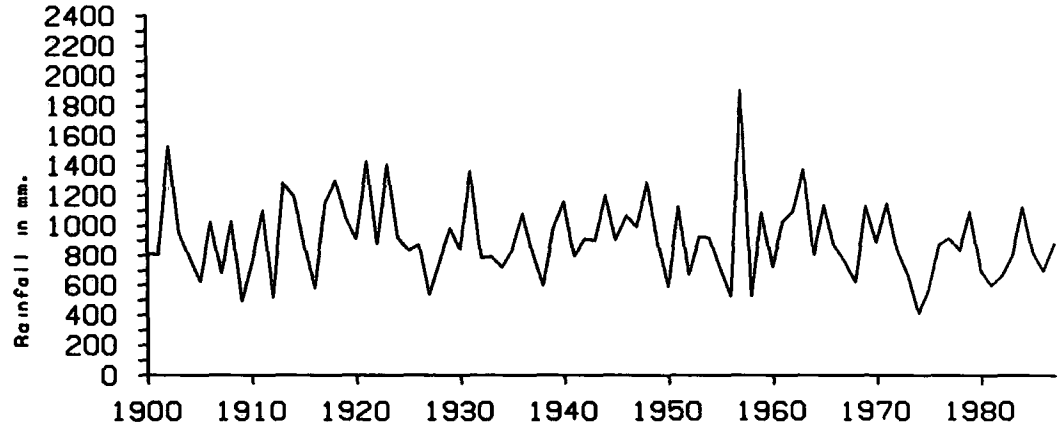
Yala Chena Season: 1900-1987



Yala Paddy Season: 1900-1987



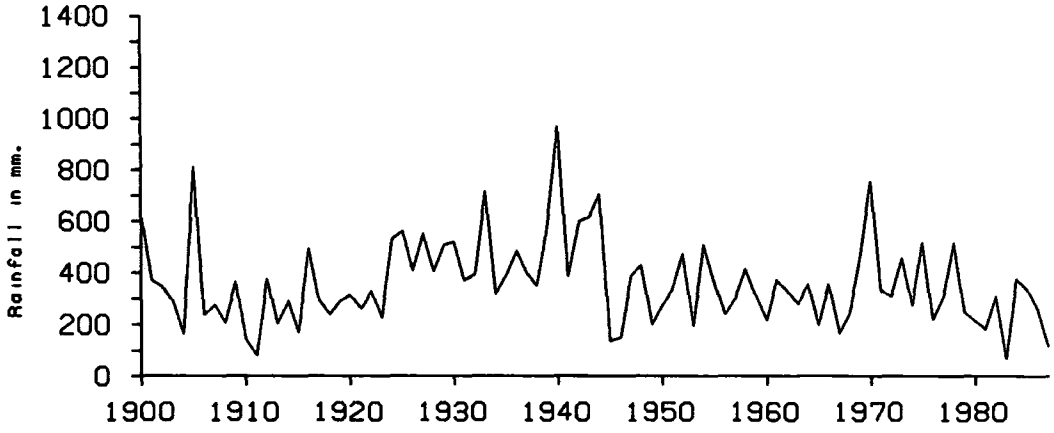
Maha Season: 1900-1987



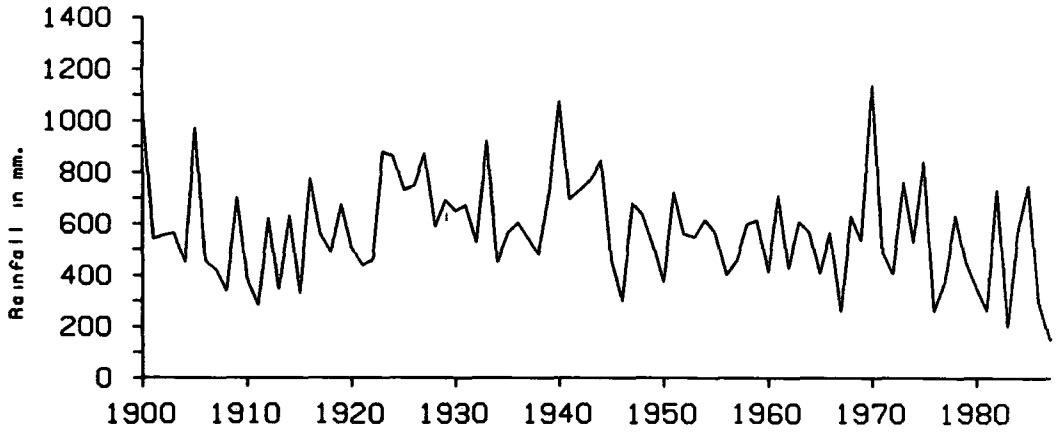
Source: Based on the data of the Meteorology Dept., Colombo, Sri Lanka.

Appendix E: J). Tangalla

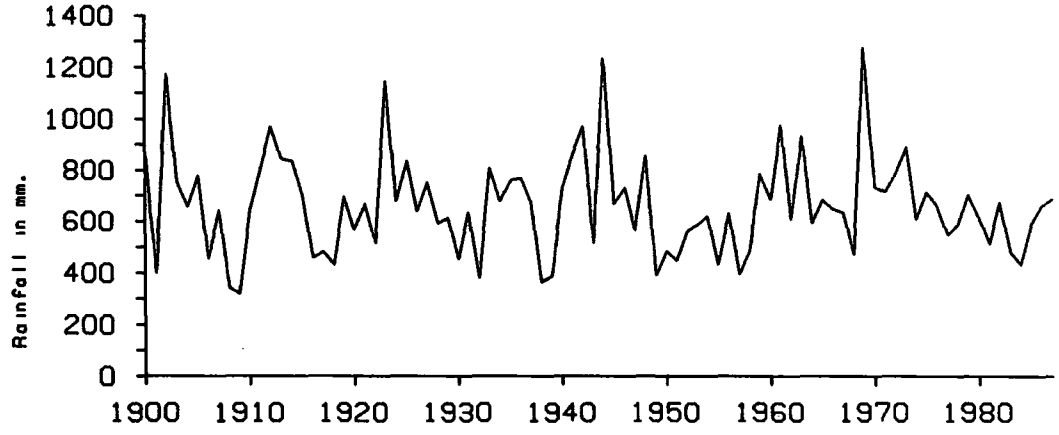
Yala Chena Season: 1900-1987



Yala Paddy Season: 1900-1987



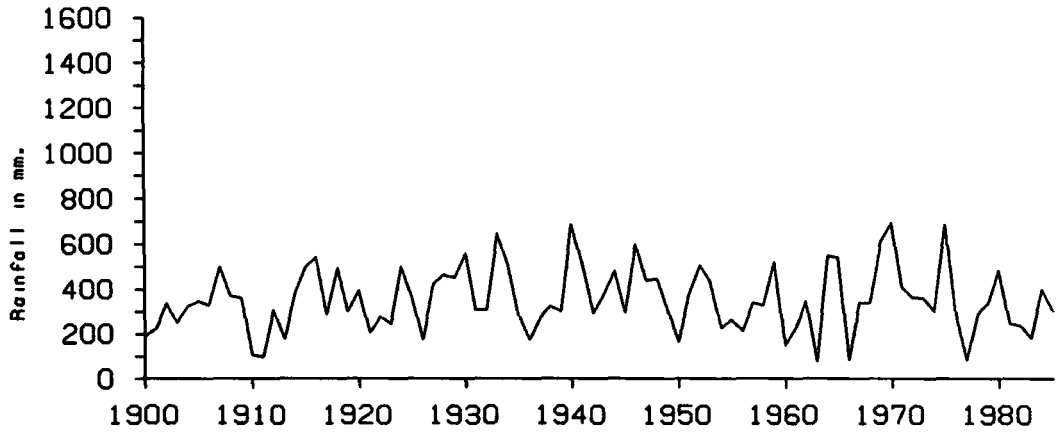
Maha Season: 1900-1987



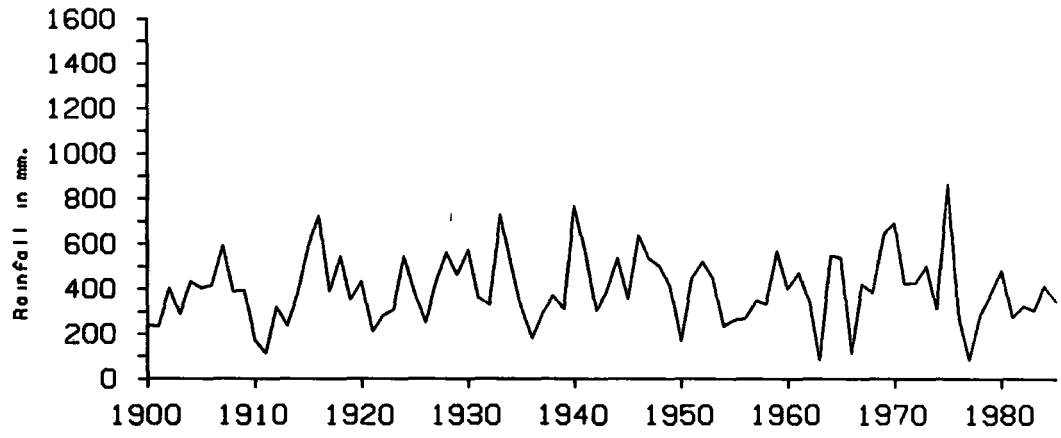
Source: Based on the data of the Meteorology Dept., Colombo, Sri Lanka.

Appendix E: k). Tanamalwila

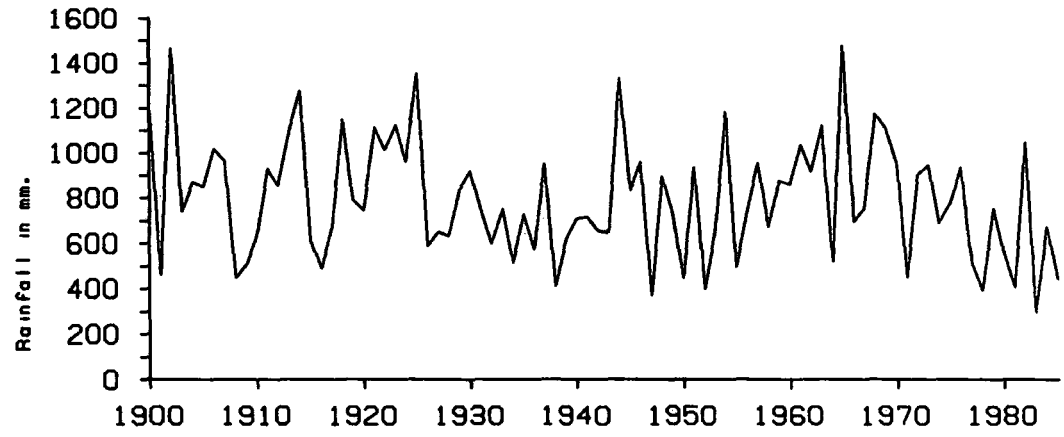
Yala Chena Season: 1900-1985



Yala Paddy Season: 1900-1985



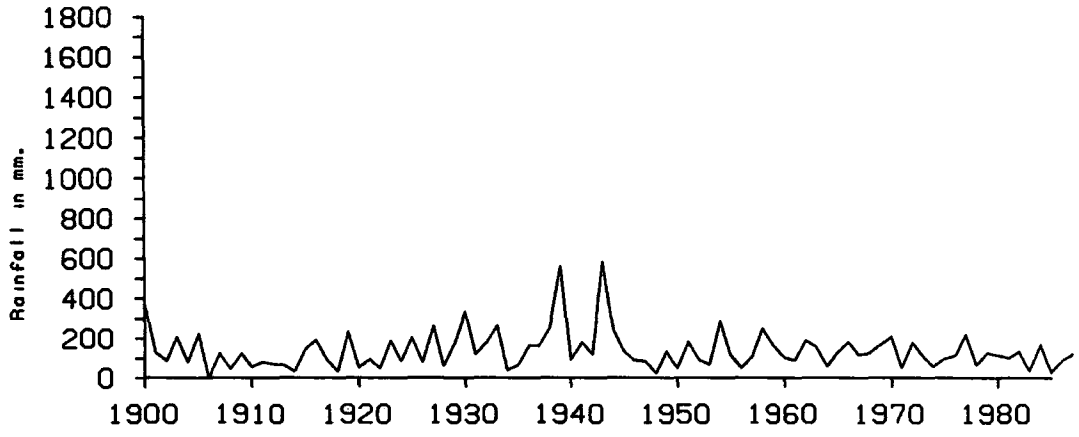
Maha Season: 1900-1985



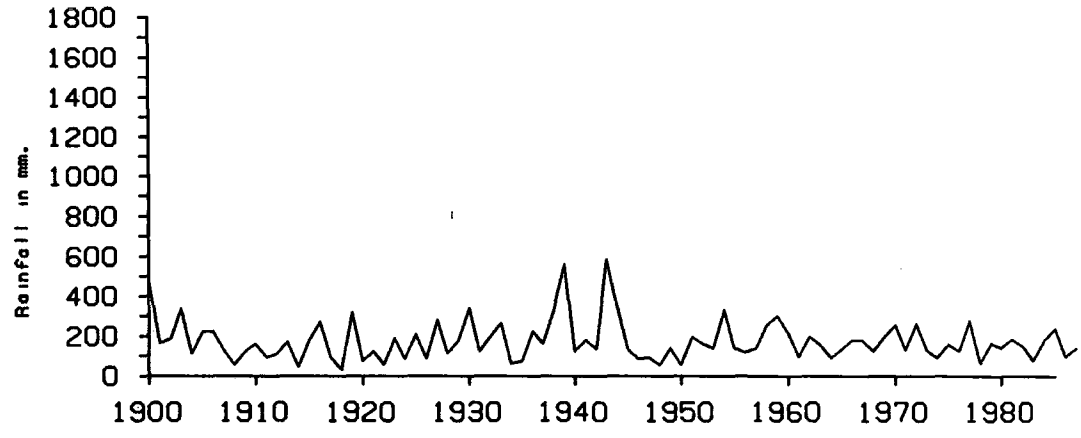
Source: Based on the data of the Meteorology Dept., Colombo, Sri Lanka

Appendix E: 1). Jaffna

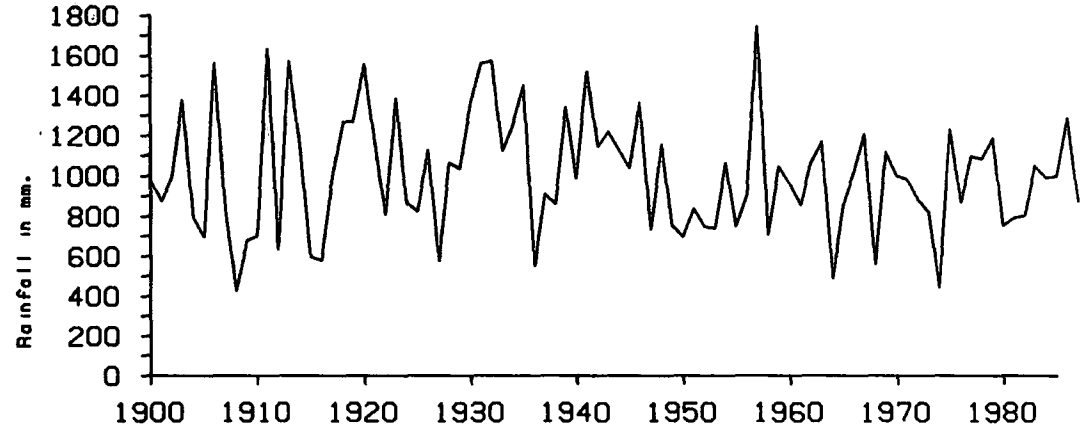
Yala Chena Season: 1900-1987



Yala Paddy Season: 1900-1987



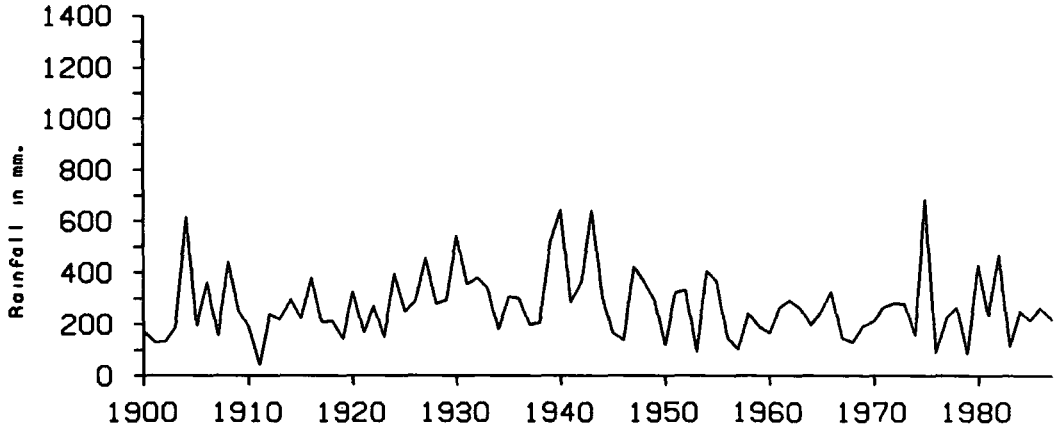
Maha Season: 1900-1987



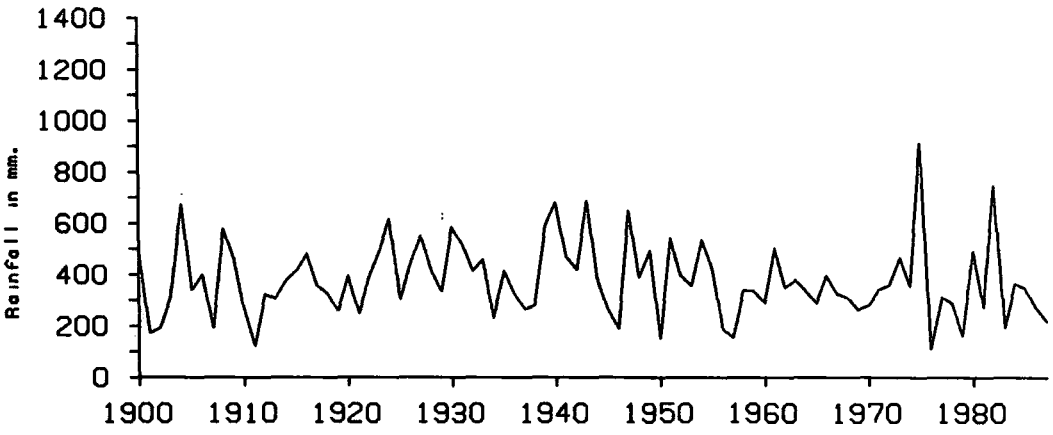
Source: Based on the data of the Meteorology Dept., Colombo, Sri Lanka.

Appendix E: m). Hambantota

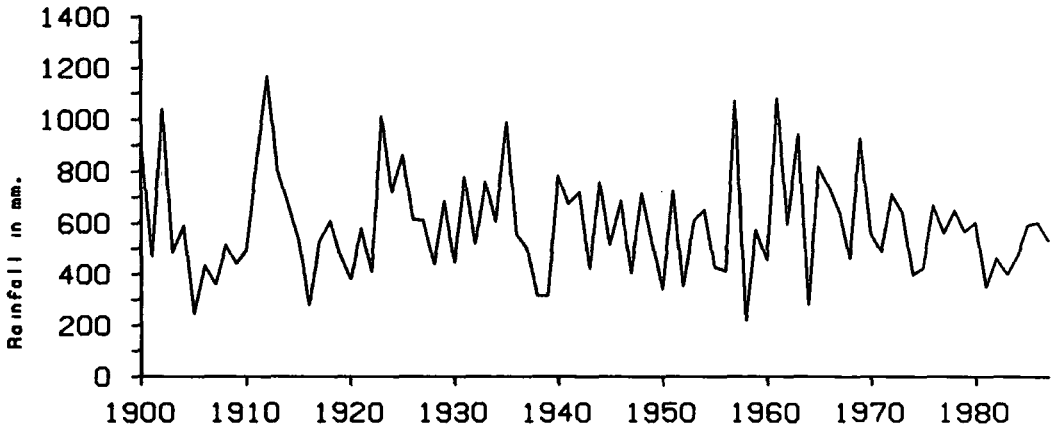
Yala Chena Season: 1900-1987



Yala Paddy Season: 1900-1987

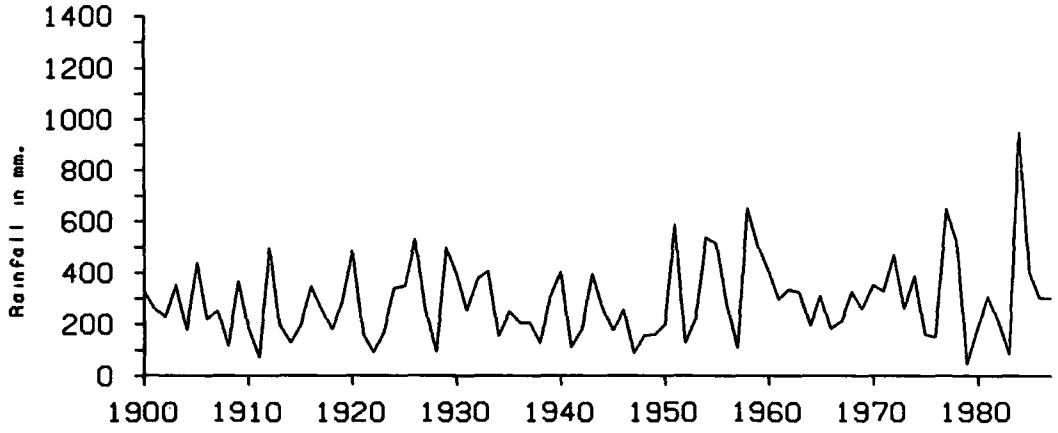


Maha Season: 1900-1987

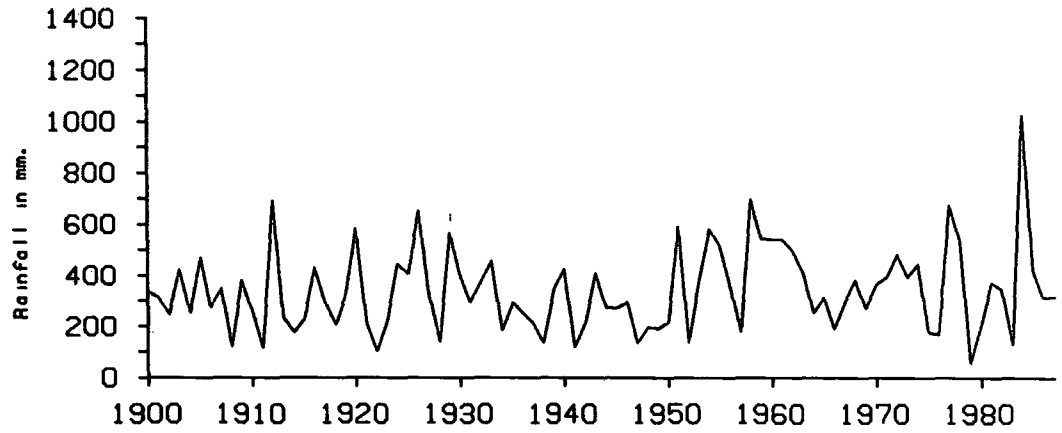


Source: Based on the data of the Meteorology Dept., Colombo, Sri Lanka

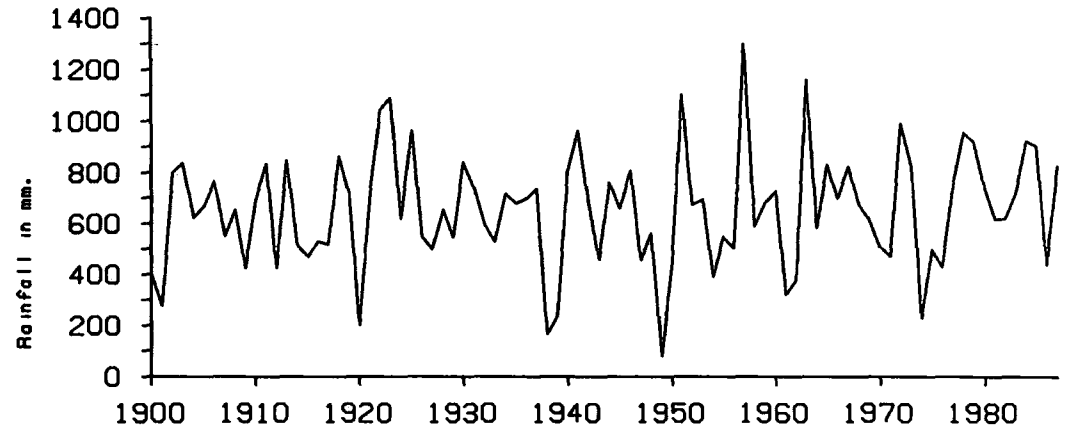
Appendix E: n). Puttalam



Yala Paddy Season: 1900-1987



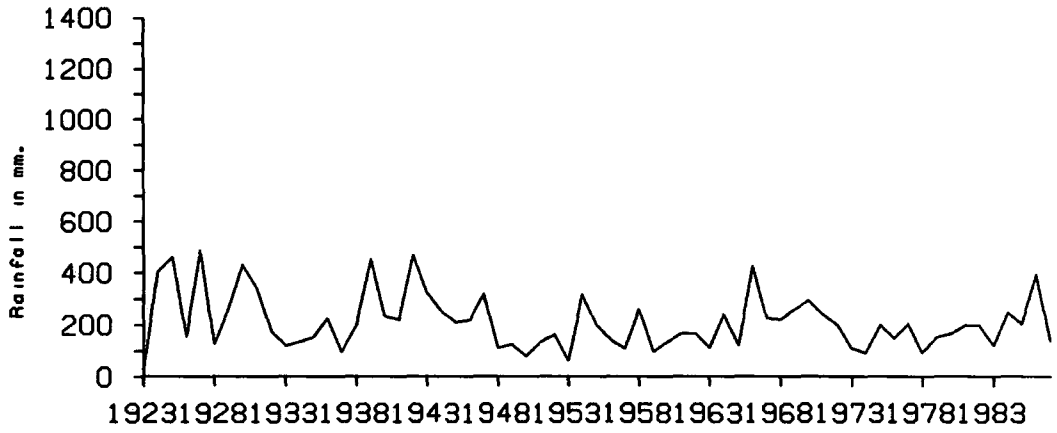
Maha Season: 1900-1987



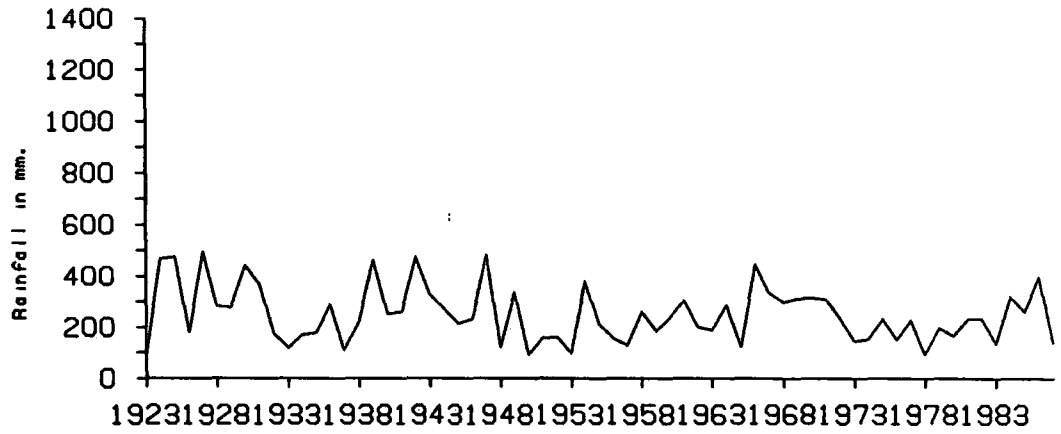
Source: Based on the data of the Meteorology Dept., Colombo, Sri Lanka.

Appendix E: o). Yala

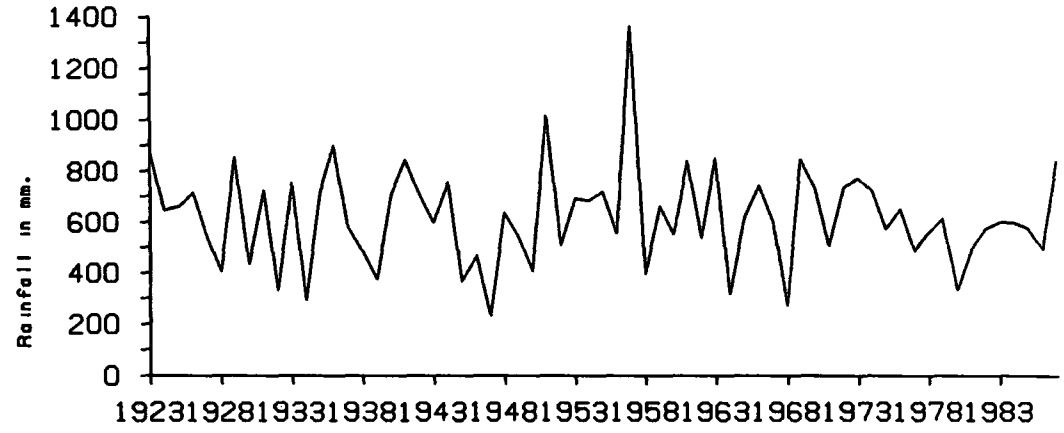
Yala Chena Season: 1923-1987



Yala Paddy Season: 1923-1987



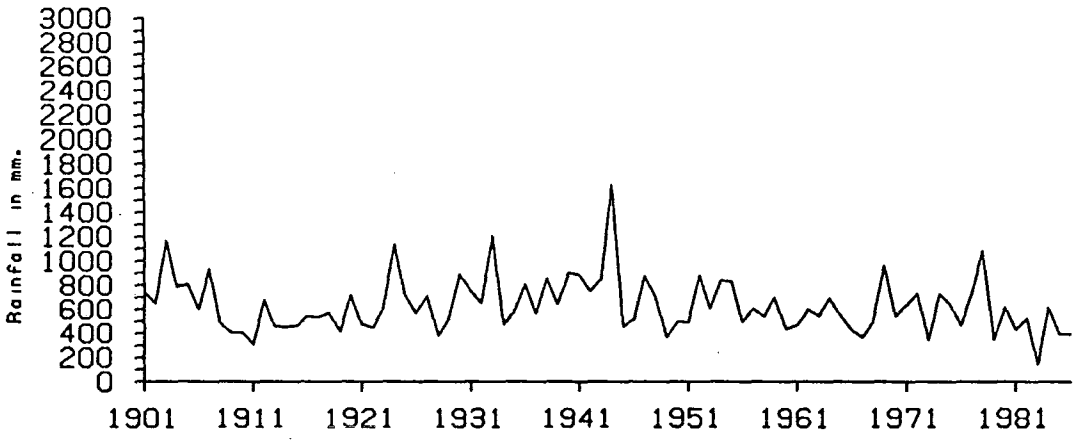
Maha Season: 1923-1987

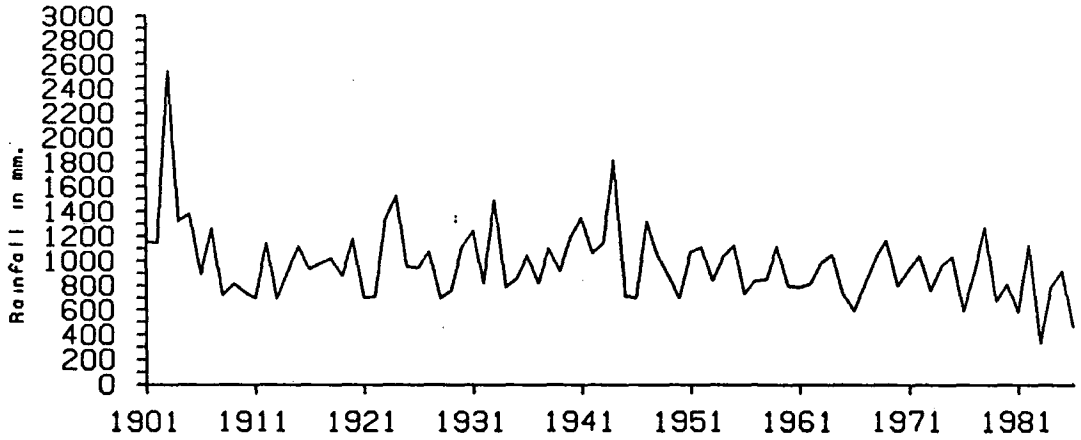


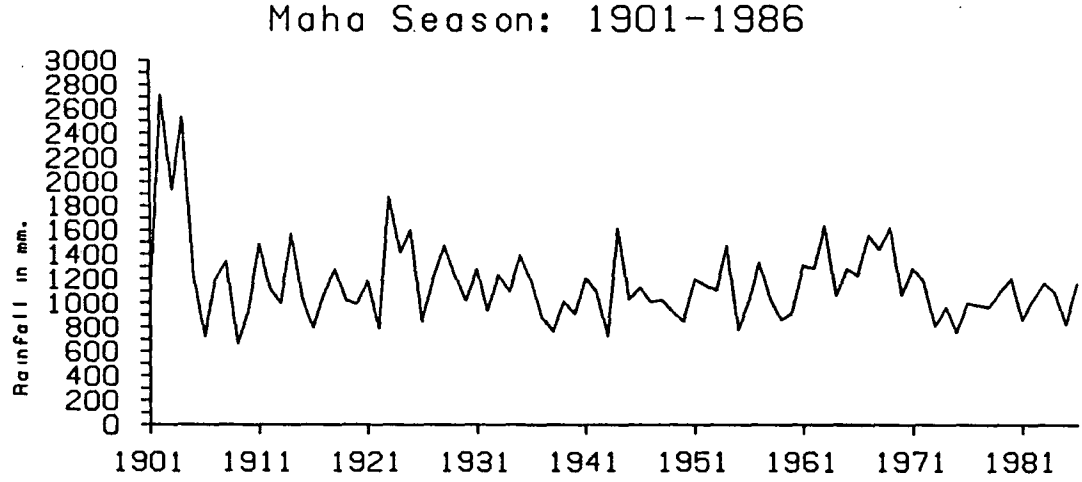
Source: Based on the data of the Meteorology Dept., Colombo, Sri Lanka.

Appendix F

GRAPHS RELATED TO THE STATIONS IN THE TABLE 3.6



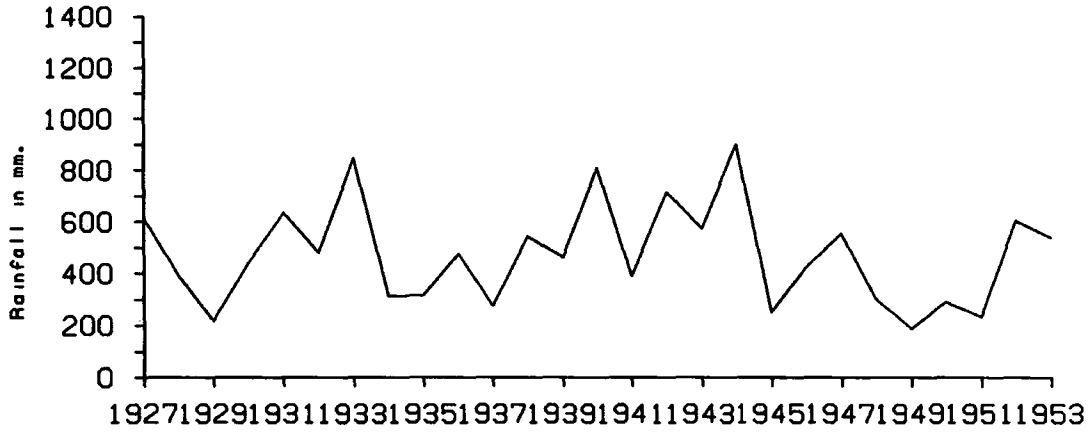




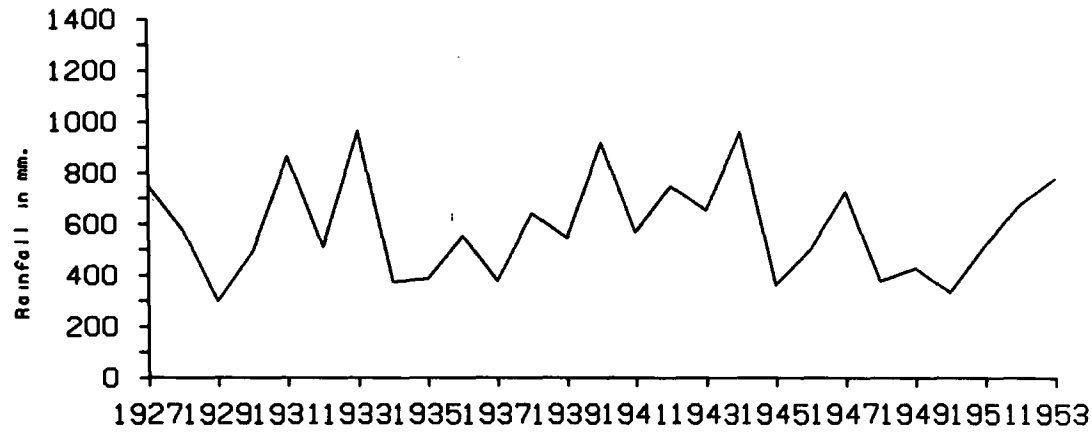
Source: Based on the data of the Meteorology Dept., Colombo, Sri Lanka.

Appendix F: b). Middeniya

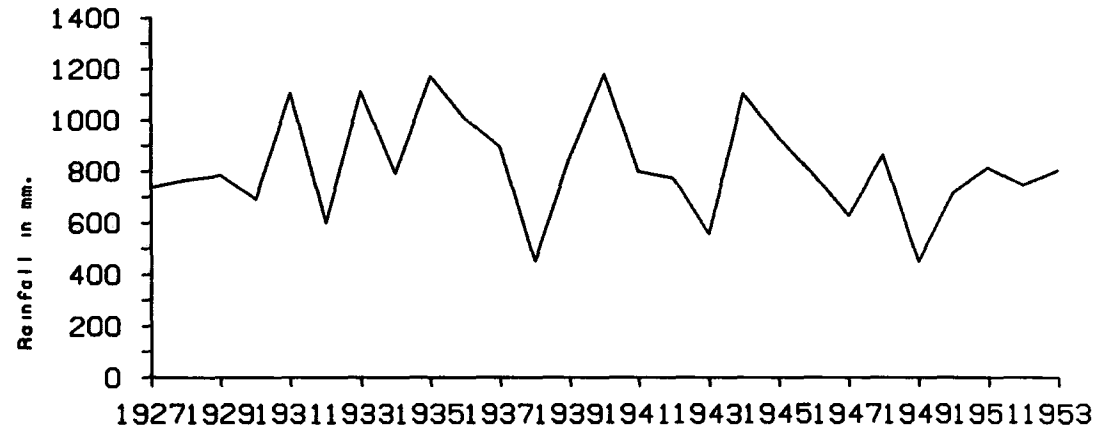
Yala Chena Season: 1927-1953



Yala Paddy Season: 1922-1987



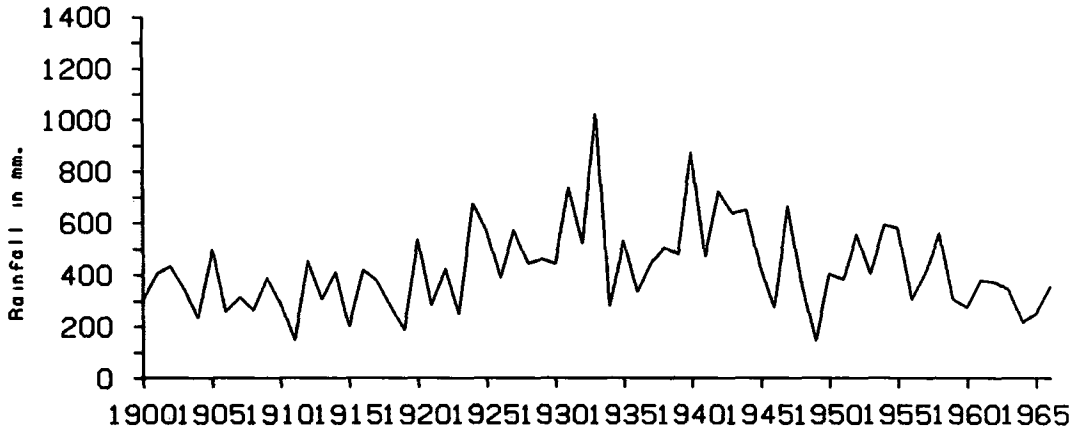
Maha Season: 1927-1953



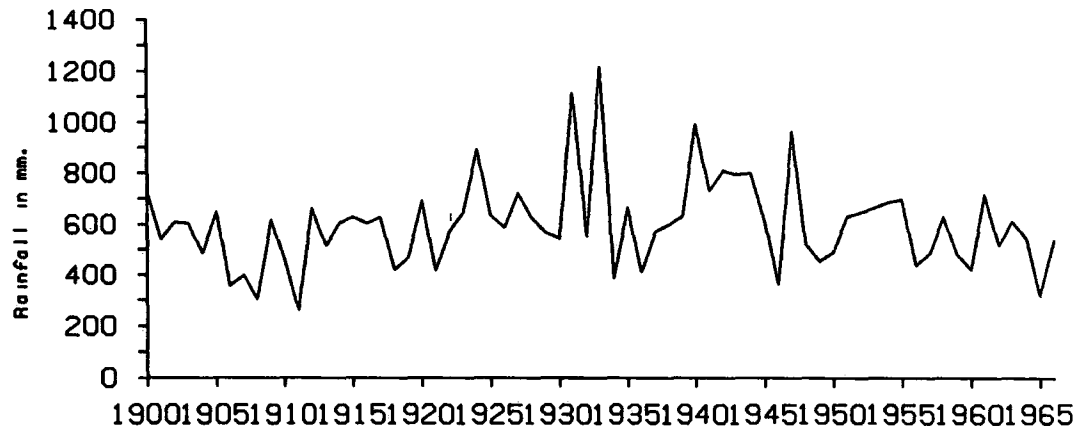
Source: Based on the data of the Meteorology Dept., Colombo, Sri Lanka.

Appendix F: c). Udukiriwila

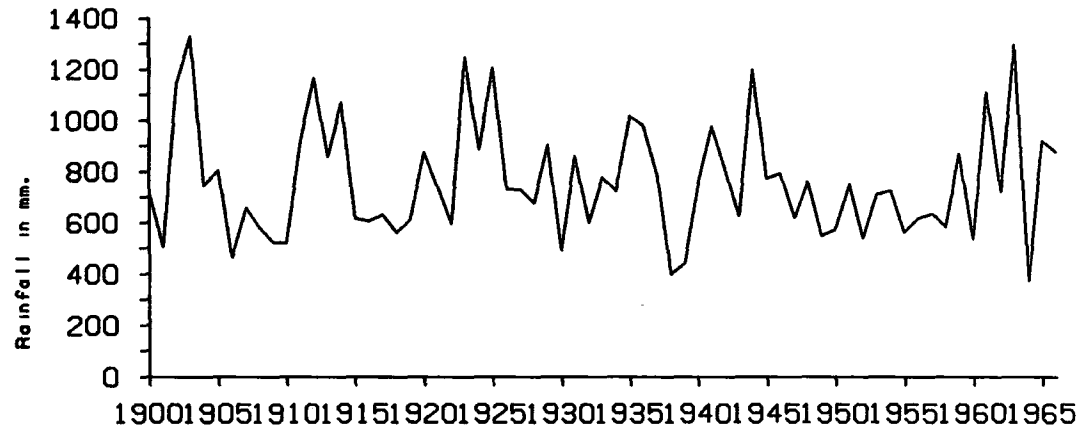
Yala Chena Season: 1900-1966



Yala Paddy Season: 1900-1966



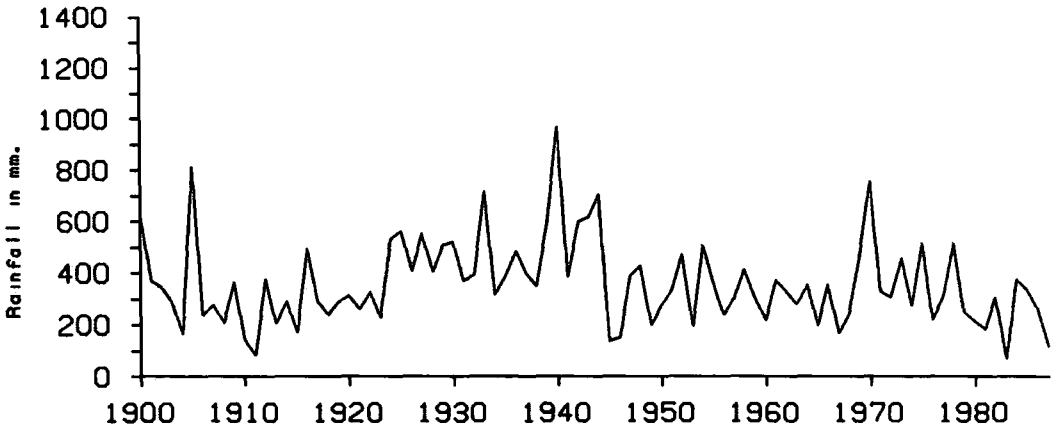
Maha Season: 1900-1966



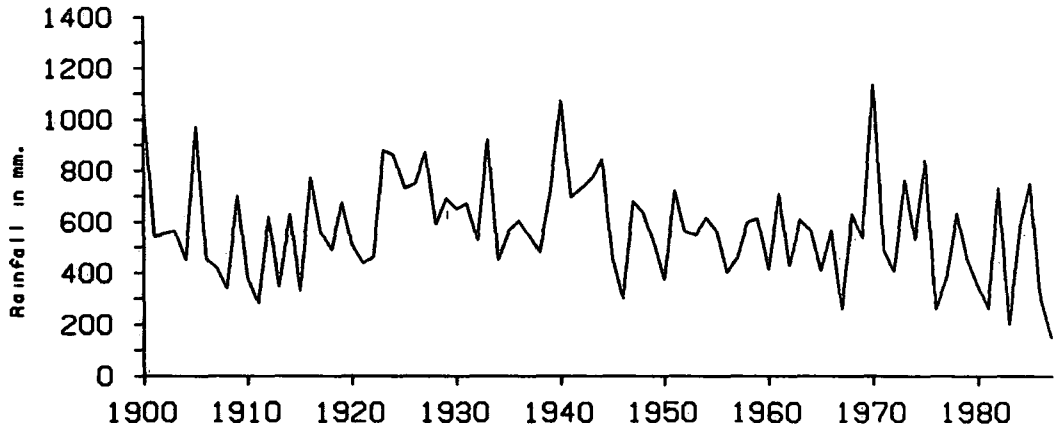
Source: Based on the data of the Meteorology Dept., Colombo, Sri Lanka.

Appendix F: d). Tangalla

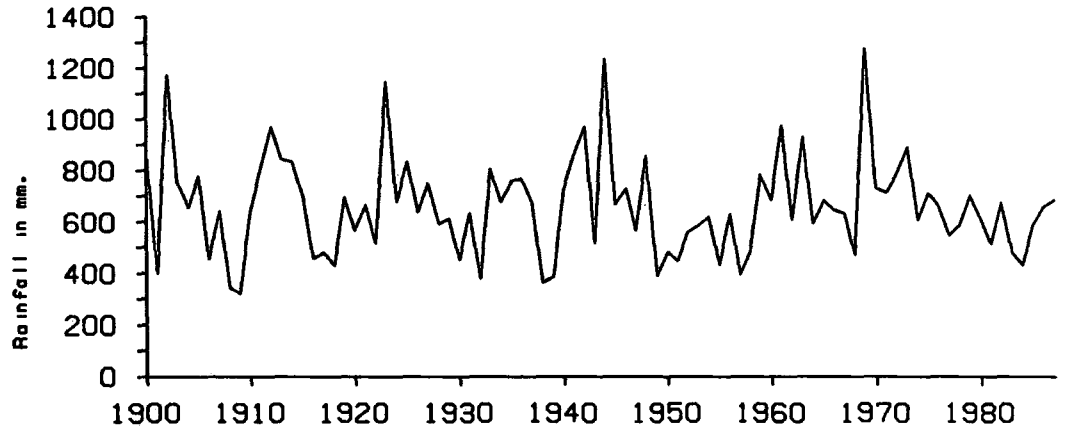
Yala Chena Season: 1900-1987



Yala Paddy Season: 1900-1987



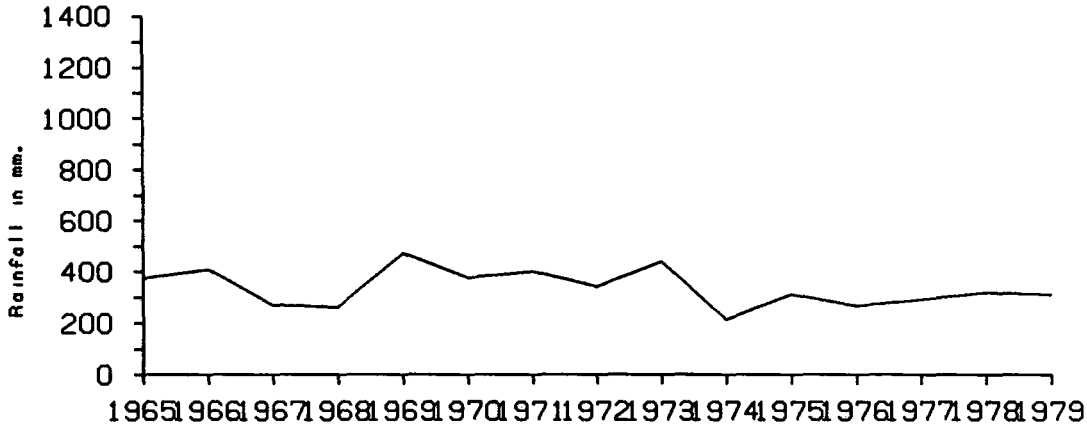
Maha Season: 1900-1987



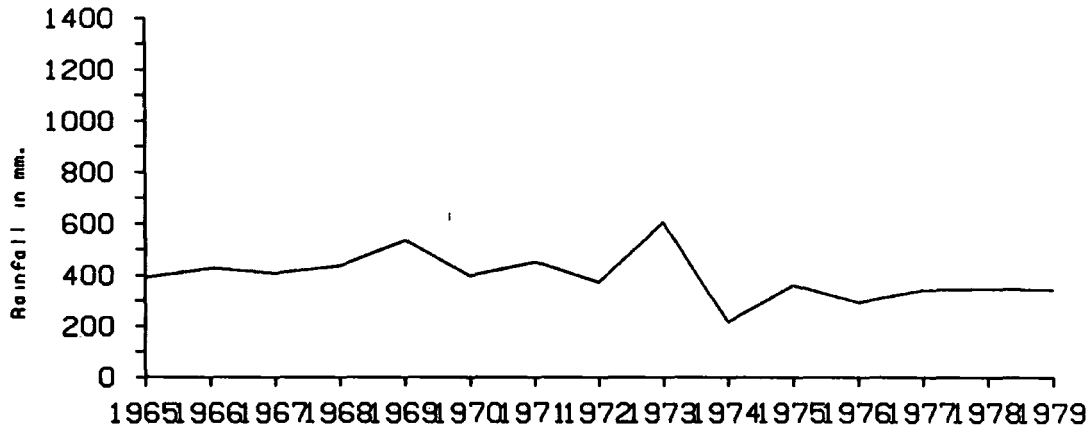
Source: Based on the data of the Meteorology Dept., Colombo, Sri Lanka.

Appendix F: e). Suriyawewa

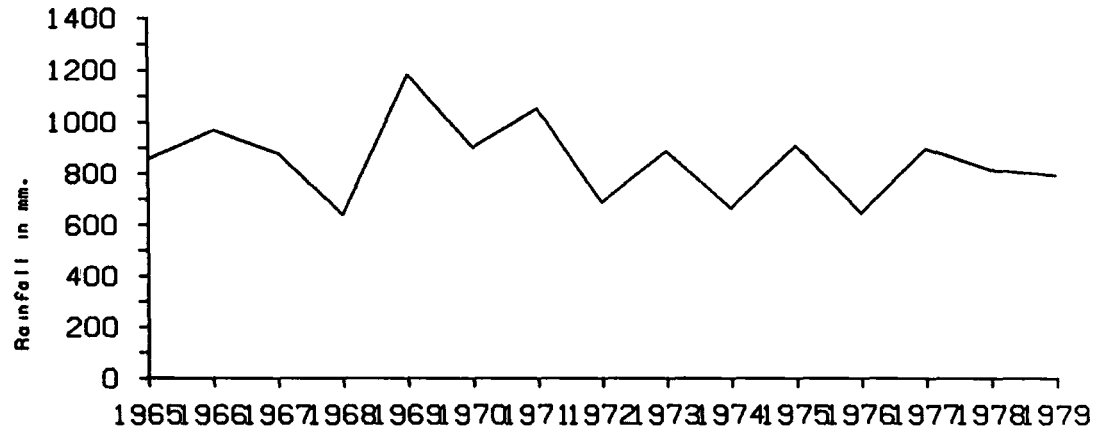
Yala Chena Season: 1965-1979



Yala Paddy Season: 1965-1979



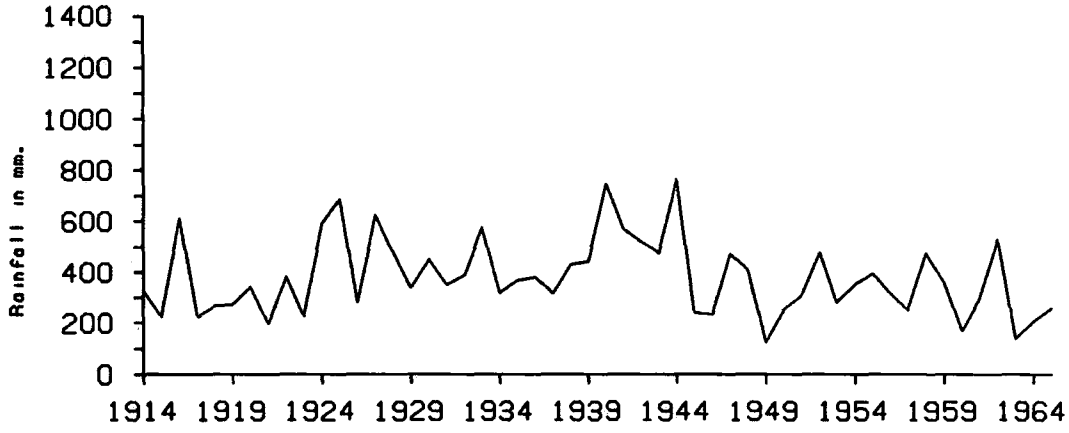
Maha Season: 1965-1979



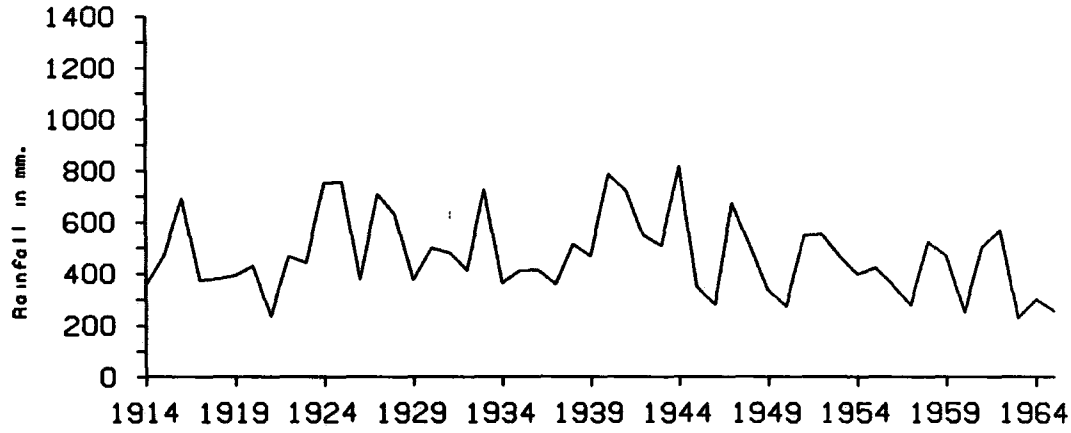
Source: Based on the data of the Meteorology Dept., Colombo, Sri Lanka.

Appendix F: f). Liyangahatota

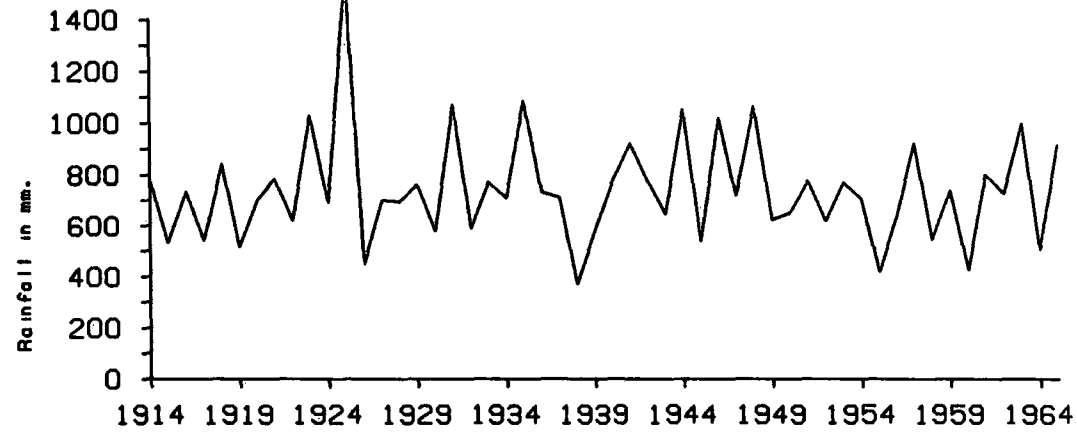
Yala Chena Season: 1914-1965



Yala Paddy Season: 1914-1965



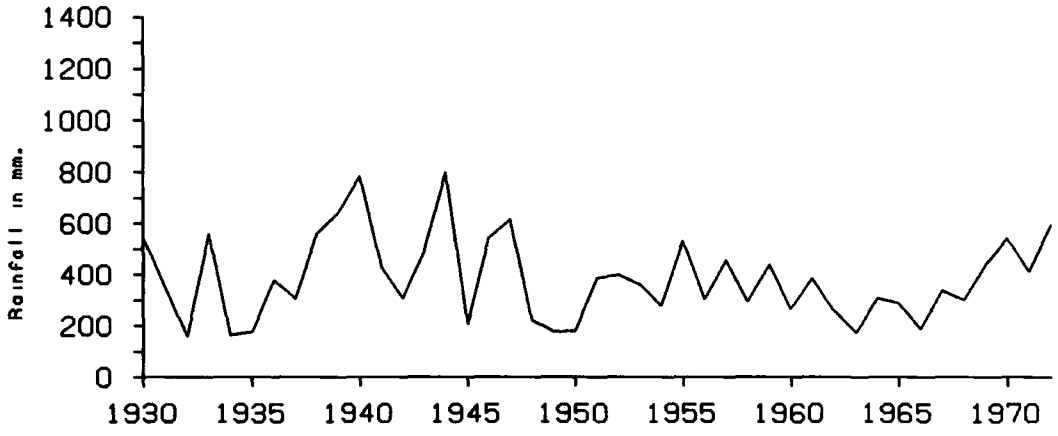
Maha Season: 1914-191965



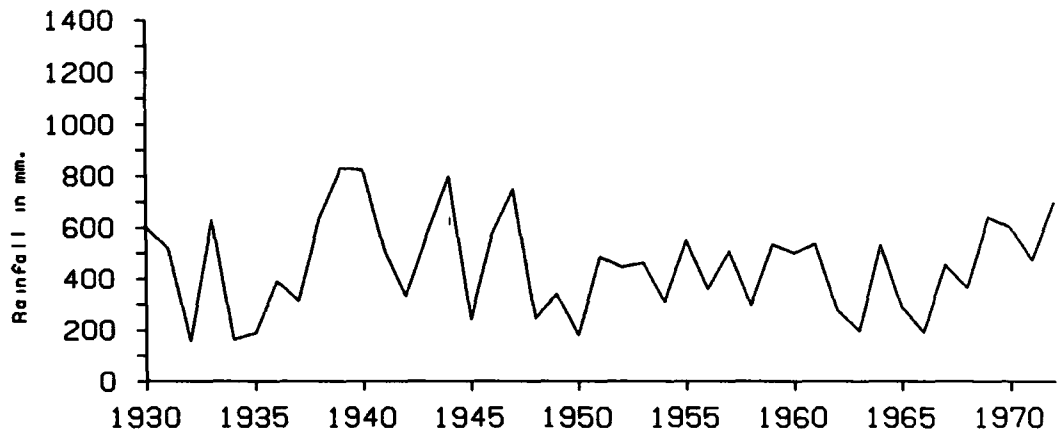
Source: Based on the data of the Meteorology Dept., Colombo, Sri Lanka.

Appendix F: g). Migahajandura

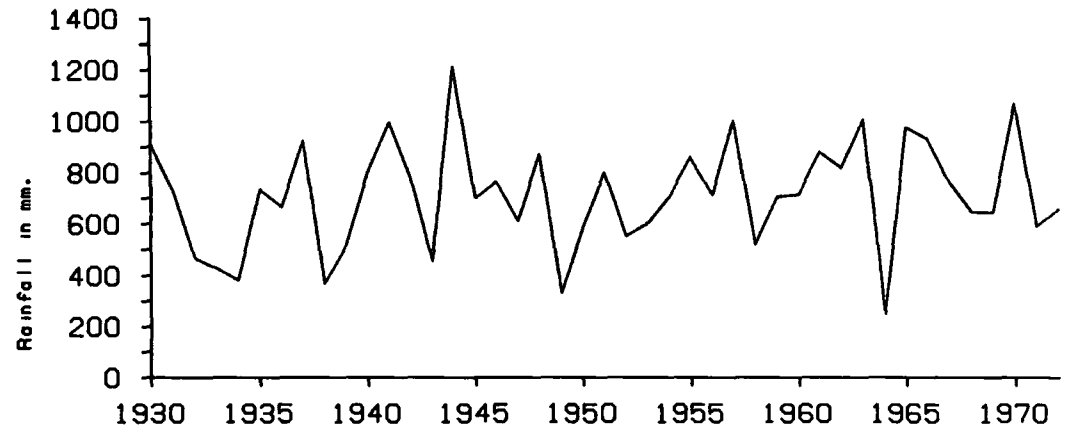
Yala Chena Season: 1930-1972



Yala Paddy Season: 1930-1972



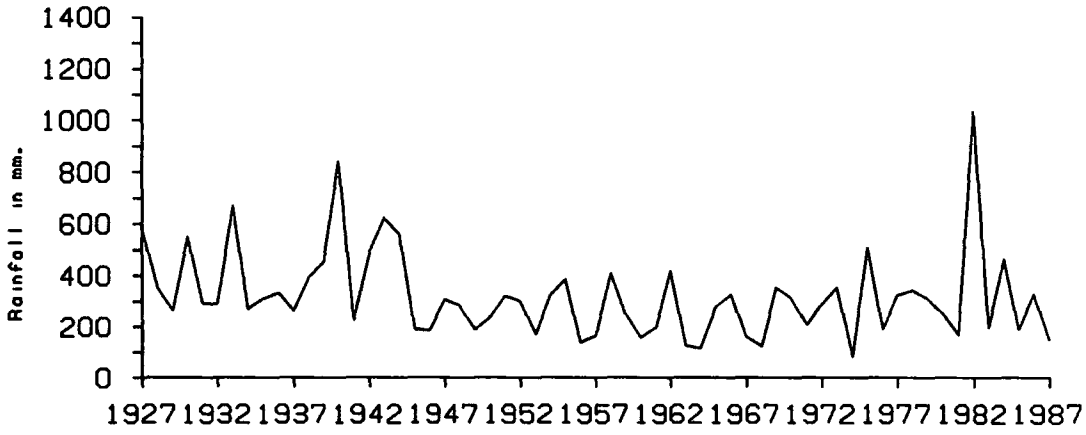
Maha Season: 1930-1972



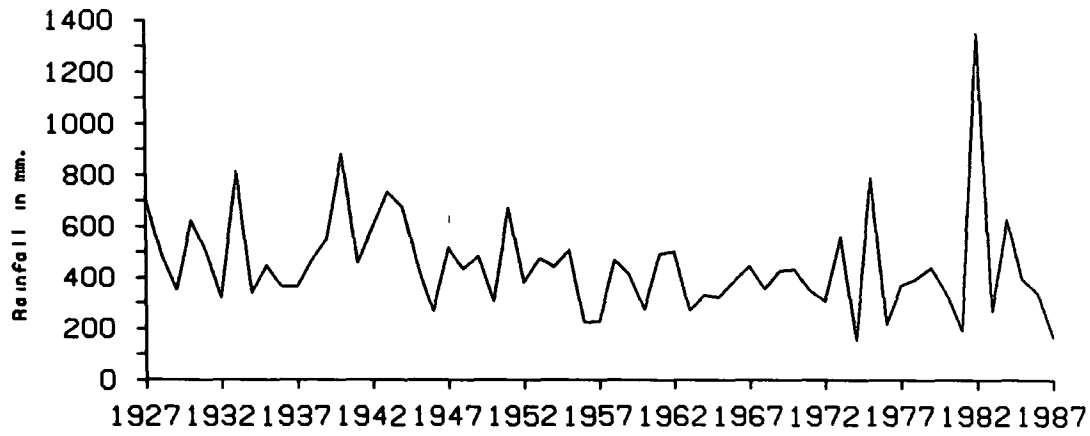
Source: Based on the data of the Meteorology Dept., Colombo, Sri Lanka.

Appendix F: h). Bata Ata

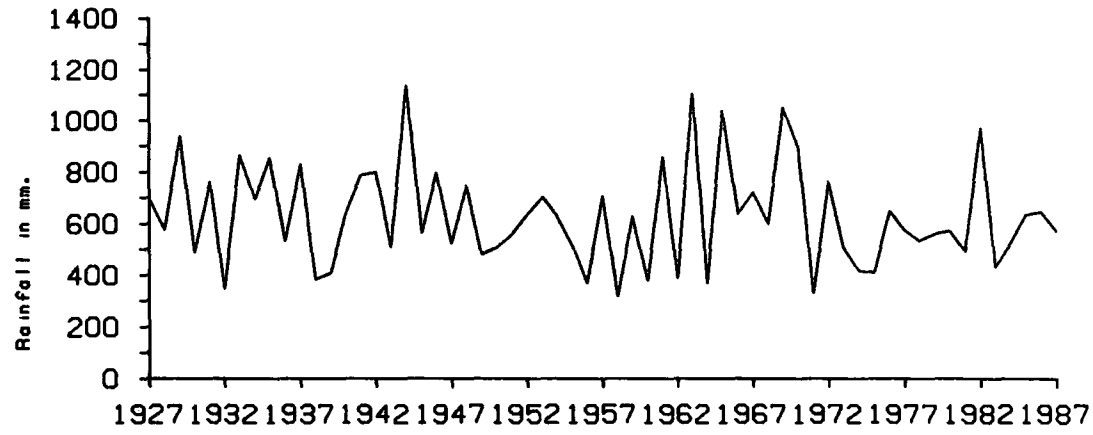
Yala Chena Season: 1927-1987



Yala Paddy Season: 1927-1987



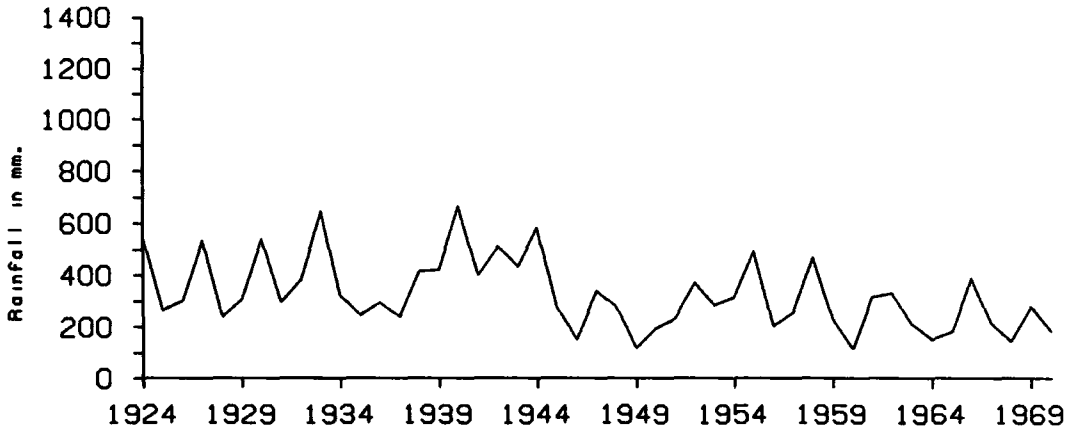
Maha Season: 1927-1987



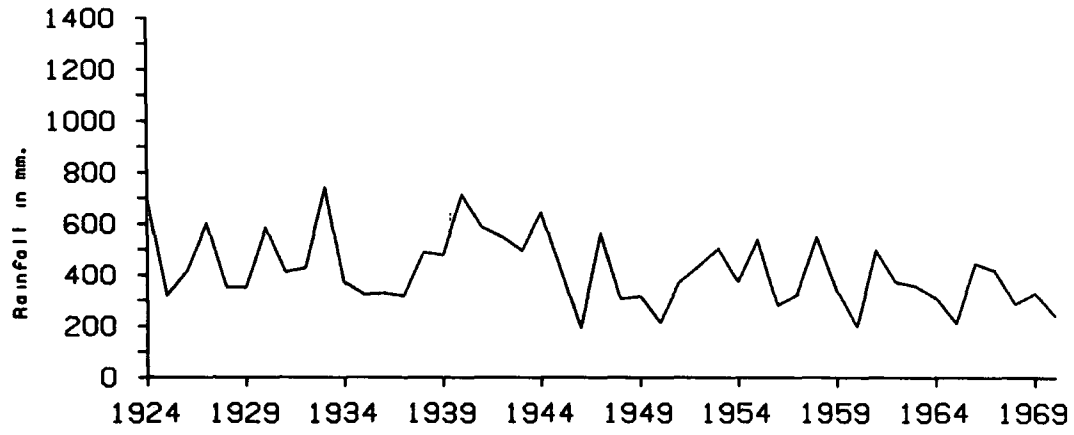
Source: Based on the data of the Meteorology Dept., Colombo, Sri Lanka.

Appendix F: i). Ridiyagama

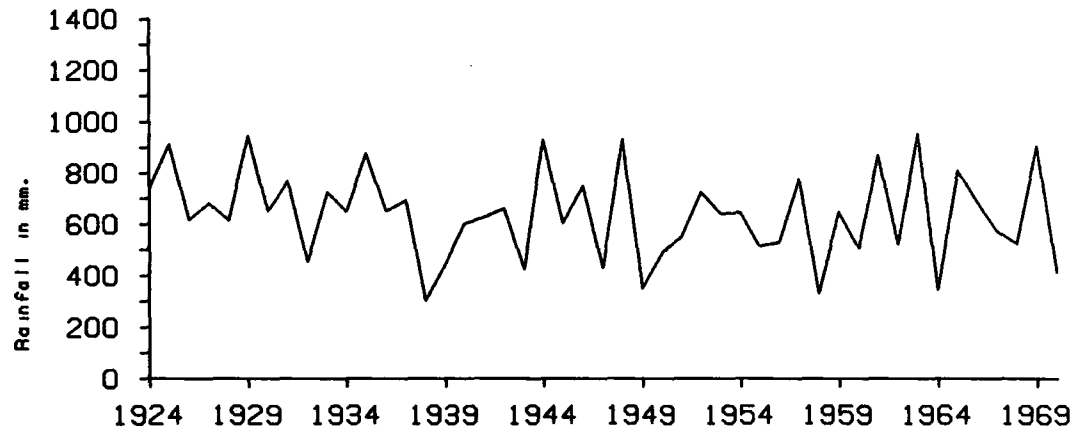
Yala Chena Season: 1924-1970



Yala Paddy Season: 1924-1970



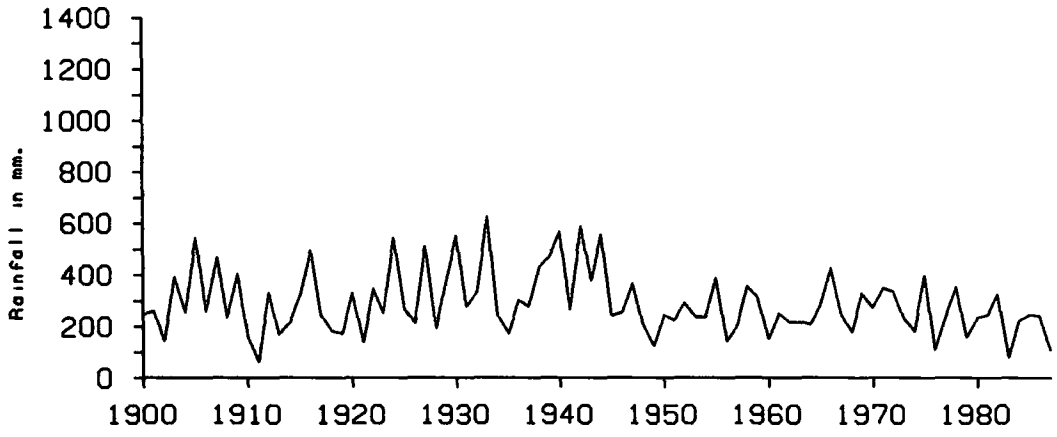
Maha Season: 1924-1970



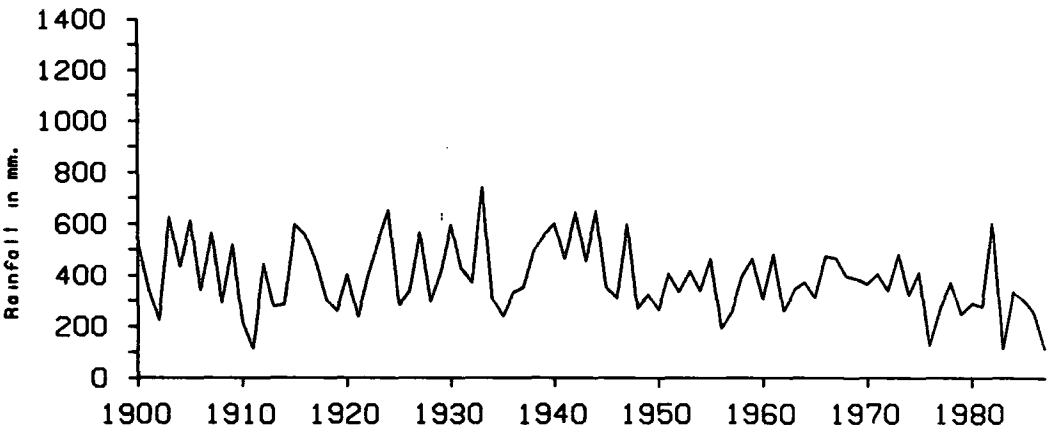
Source: Based on the data of the Meteorology Dept., Colombo, Sri Lanka.

Appendix F: J). Mamadola

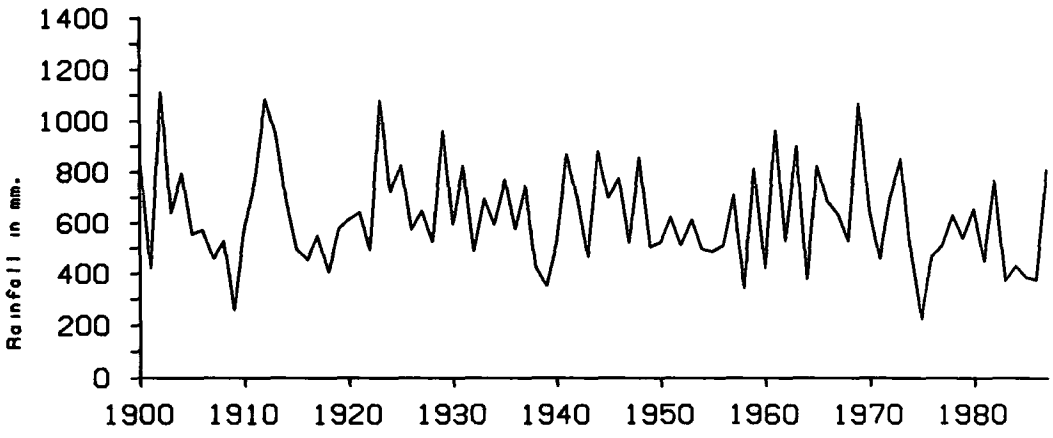
Yala Chena Season: 1900-1987



Yala Paddy Season: 1900-1987



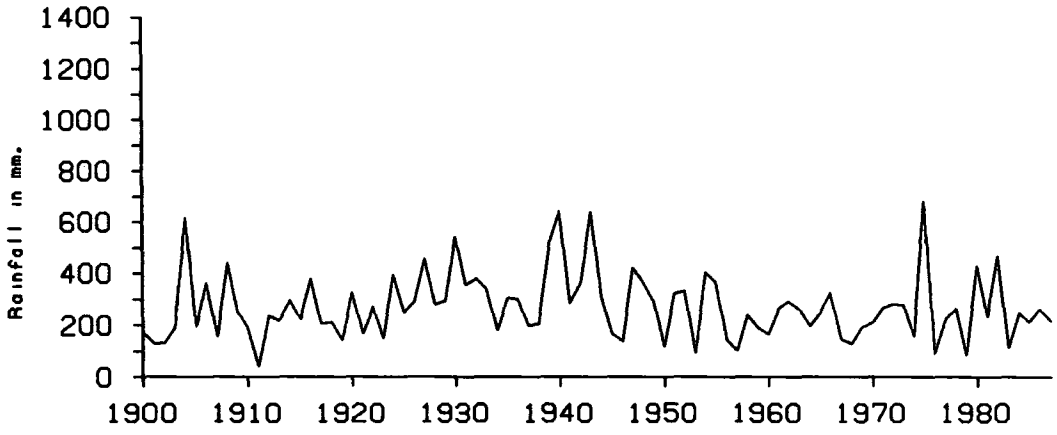
Maha Season: 1900-1987



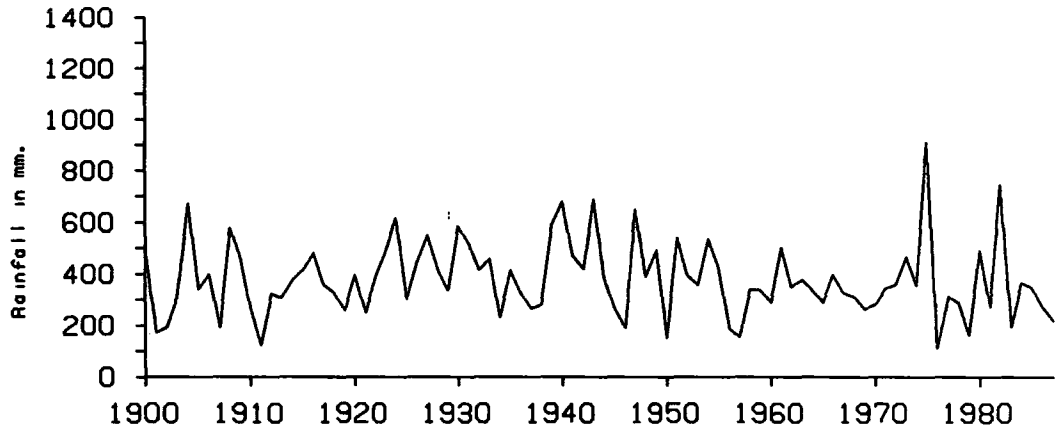
Source: Based on the data of the Meteorology Dept,. Colombo, Sri Lanka.

Appendix F: k). Hambantota

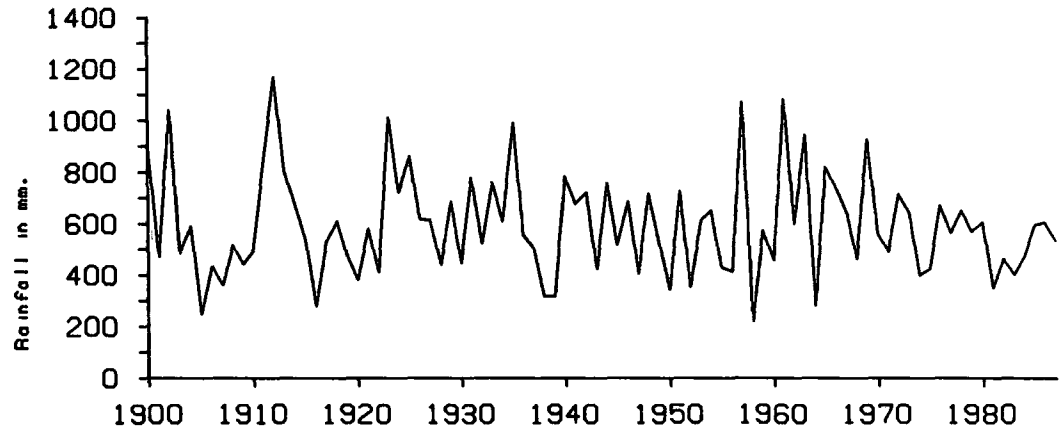
Yala Chena Season: 1900-1987



Yala Paddy Season: 1900-1987



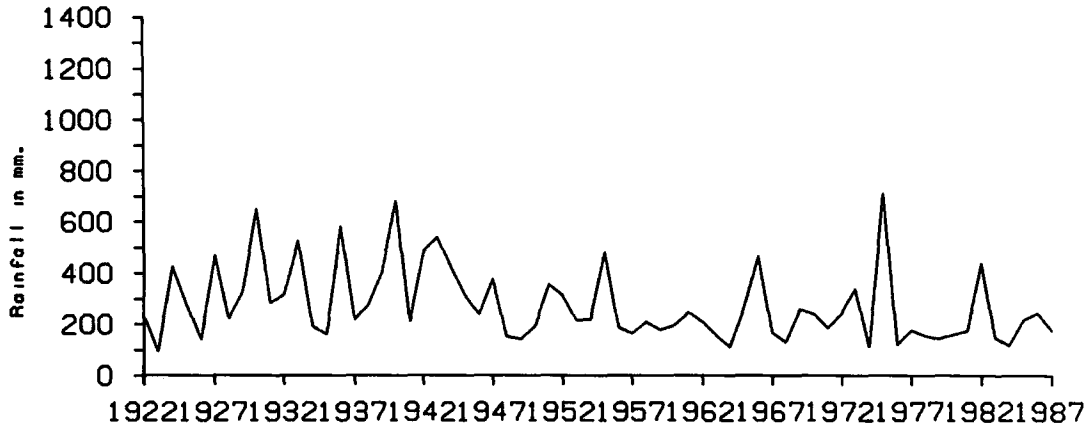
Maha Season: 1900-1987



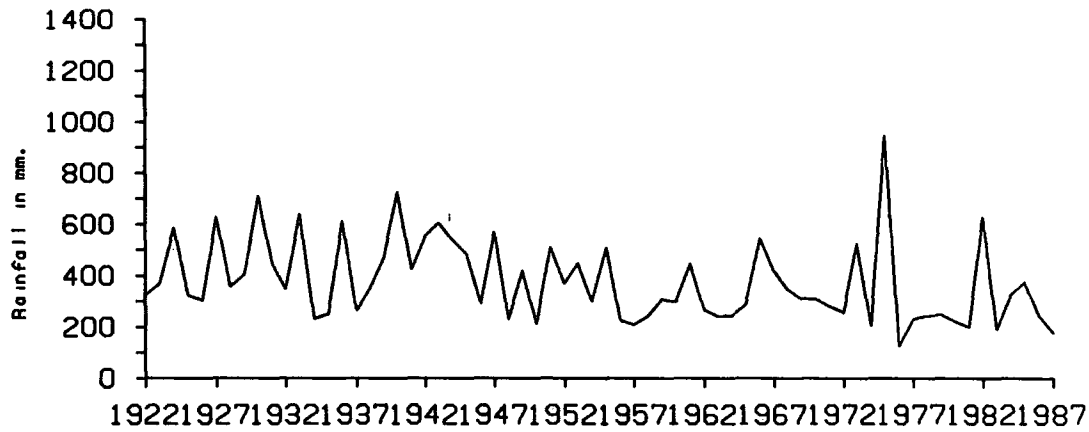
Source: Based on the data of the Meteorology Dept., Colombo, Sri Lanka

Appendix F: 1). Ambalantota

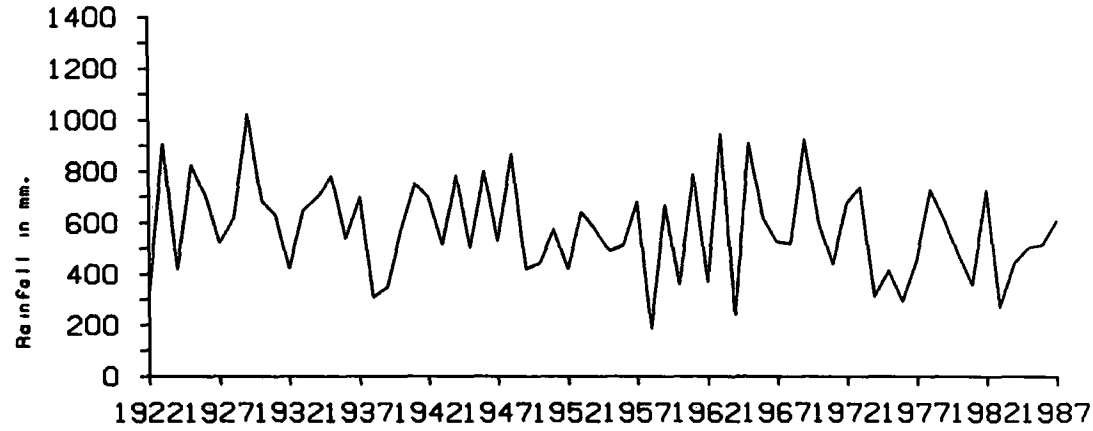
Yala Chena Season: 1922-1987



Yala Paddy Season: 1922-1987



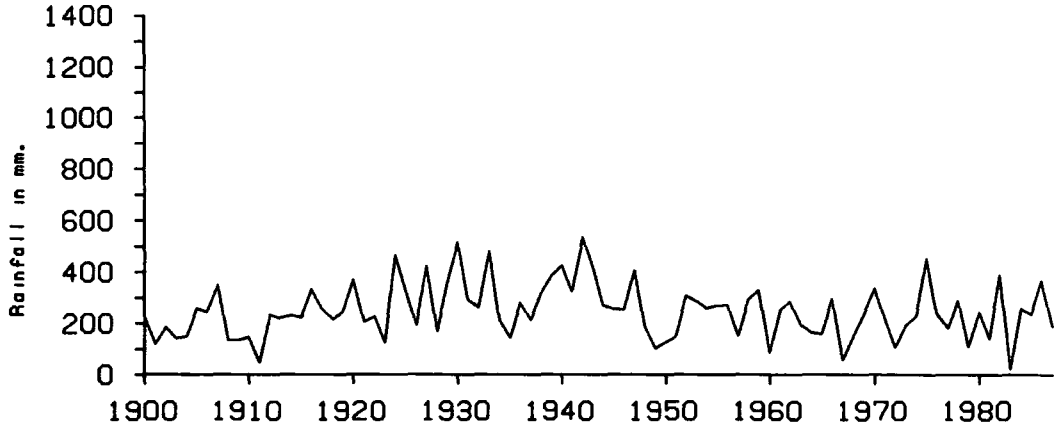
Maha Season: 1922-1987



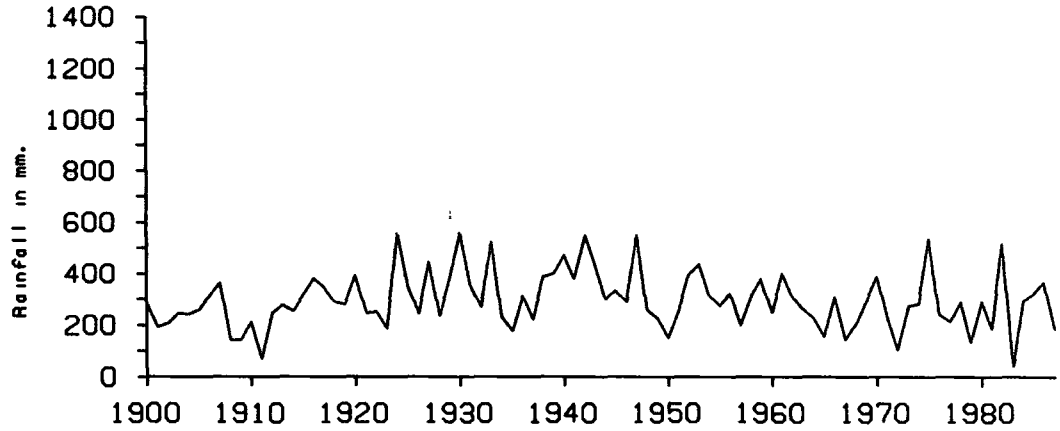
Source: Based on the data of the Meteorology Dept., Colombo, Sri Lanka.

Appendix F: m). Tissamaharama

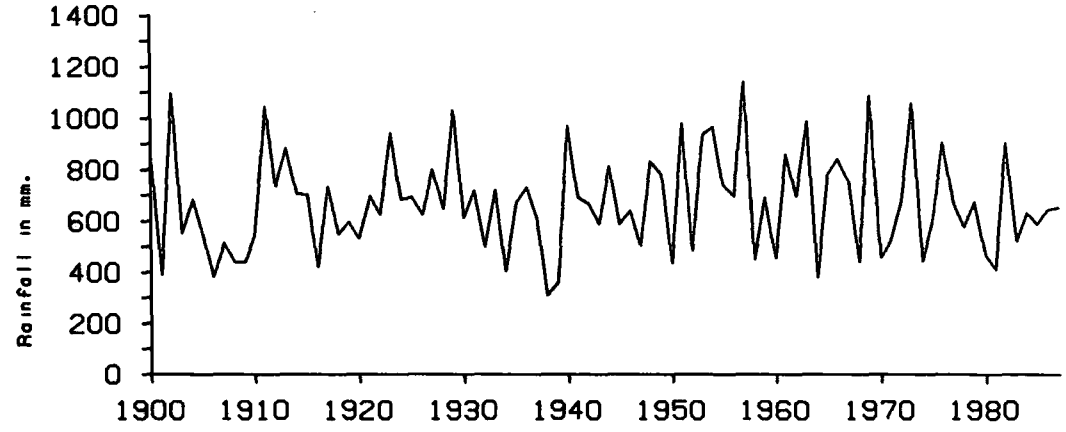
Yala Chena Season: 1900-1987



Yala Paddy Season: 1900-1987



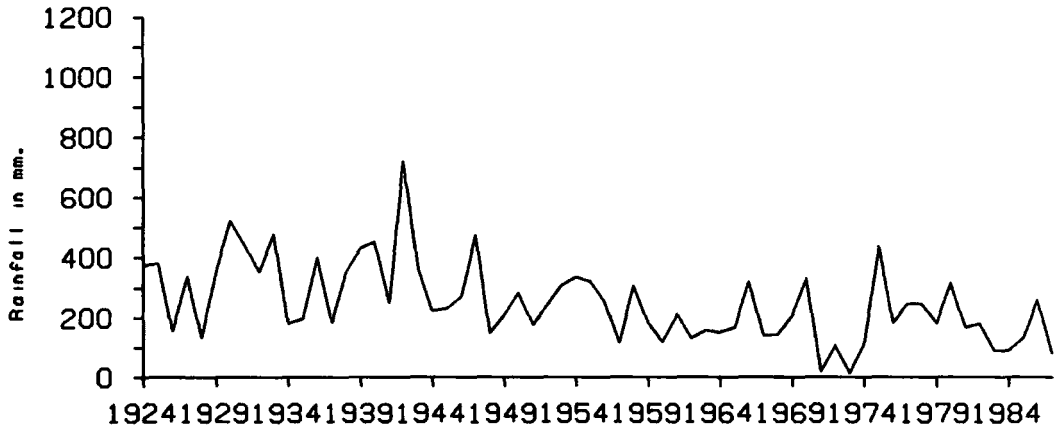
Maha Season: 1900-1987



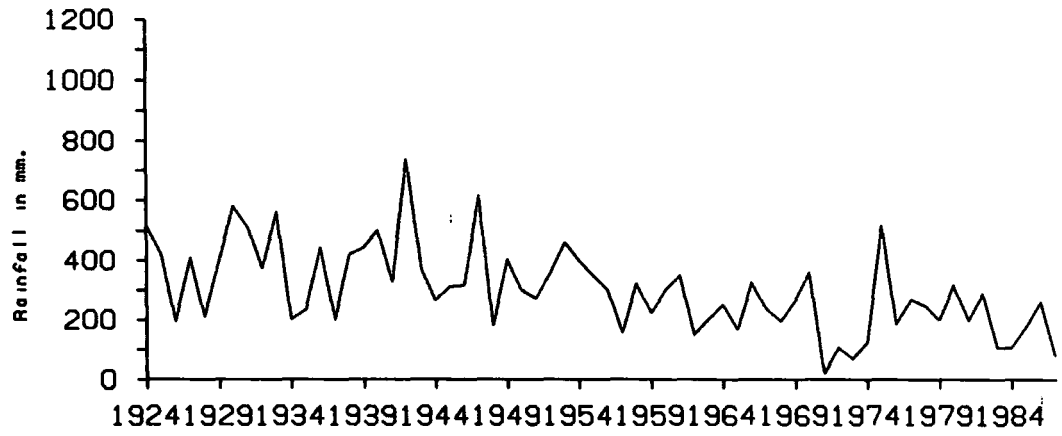
Source: Based on the data of the Meteorology Dept., Colombo, Sri Lanka.

Appendix F: n). Uduwila

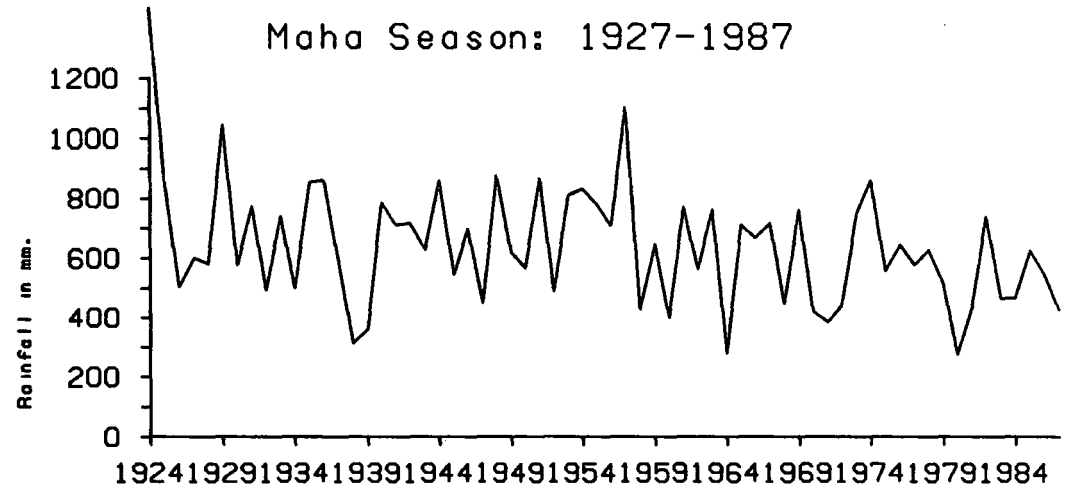
Yala Chena Season: 1924-1987



Yala Paddy Season: 1924-1987



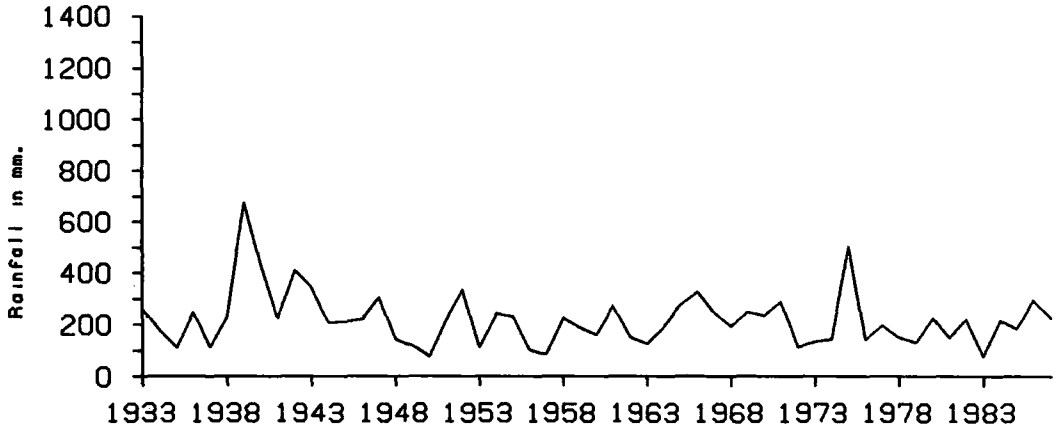
Maha Season: 1927-1987



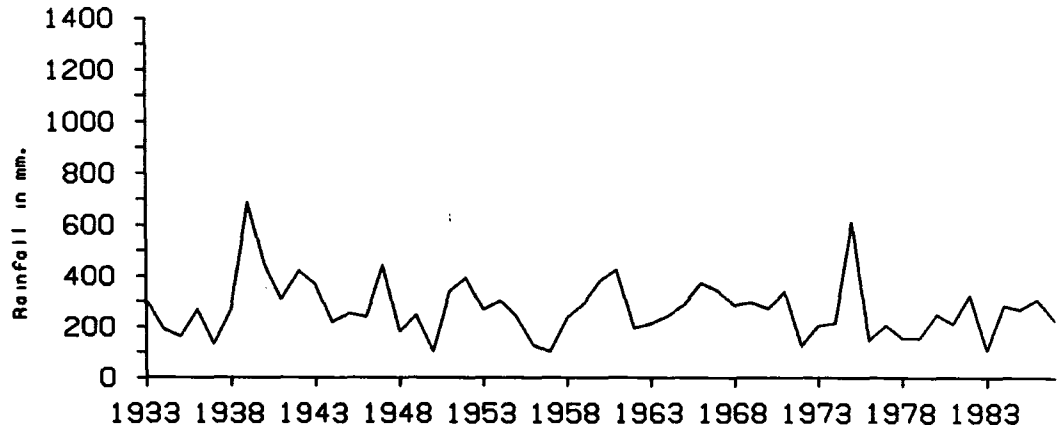
Source: Based on the data of the Meteorology Dept., Colombo, Sri Lanka.

Appendix F: o). Palatupana

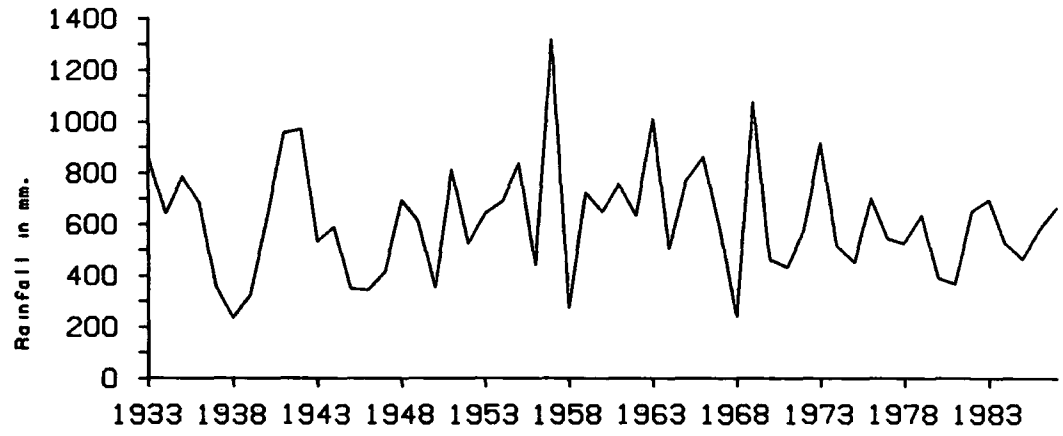
Yala Chena Season: 1933-1987



Yala Paddy Season: 1933-1987



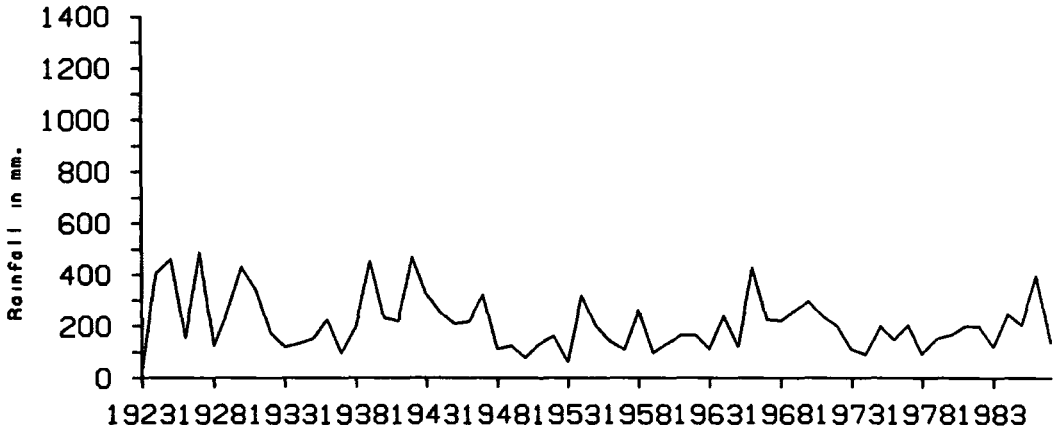
Maha Season: 1933-1987



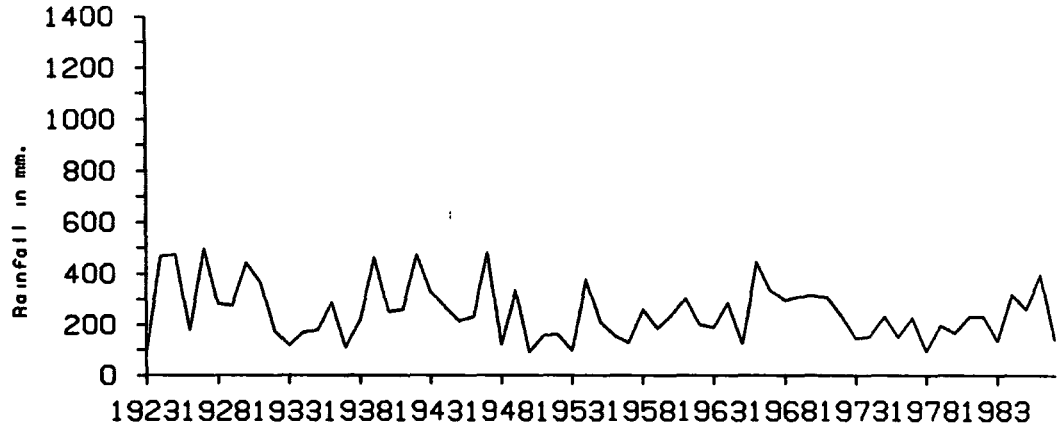
Source: Based on the data of the Meteorology Dept., Colombo, Sri Lanka.

Appendix F: p). Yala

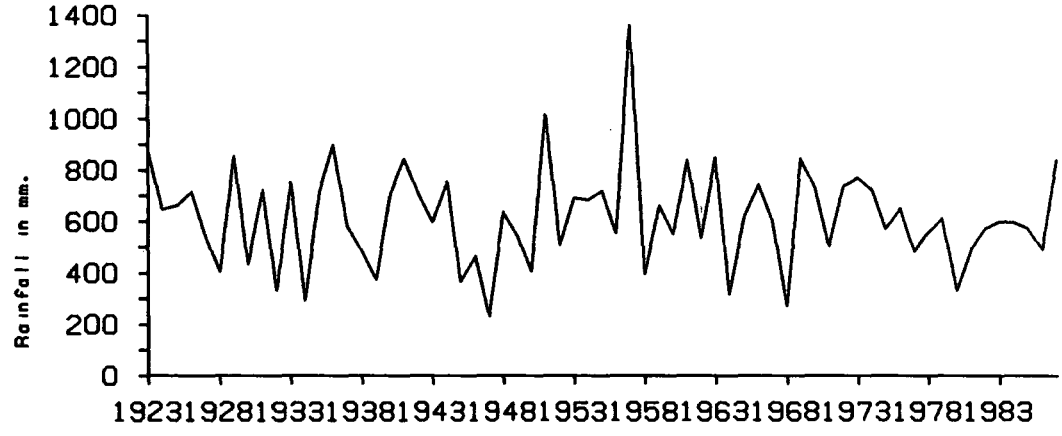
Yala Chena Season: 1923-1987



Yala Paddy Season: 1923-1987



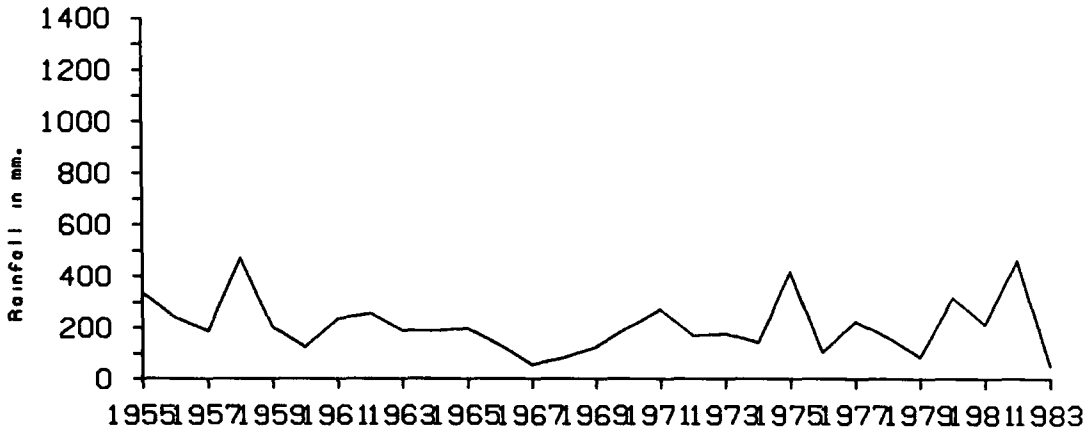
Maha Season: 1923-1987



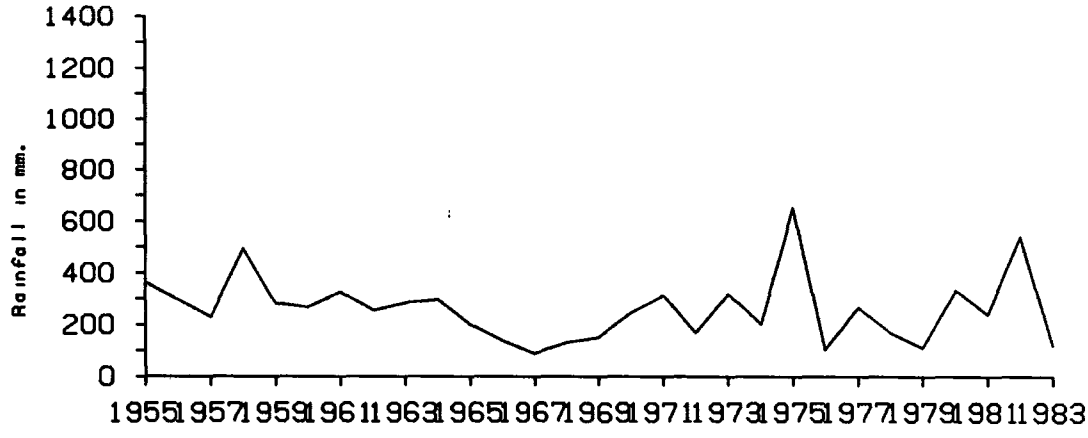
Source: Based on the data of the Meteorology Dept., Colombo, Sri Lanka.

Appendix F: q). Bandagiriya

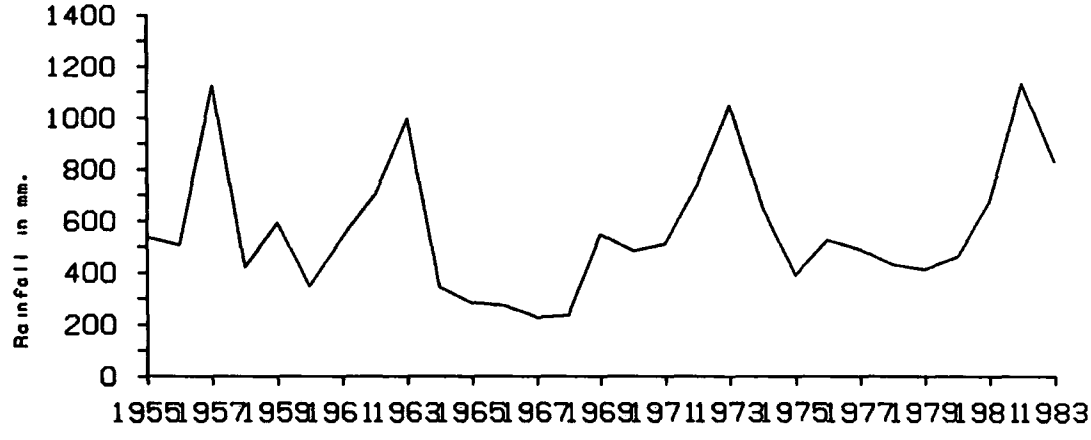
Yala Chena Season: 1955-1983



Yala Paddy Season: 1955-1983



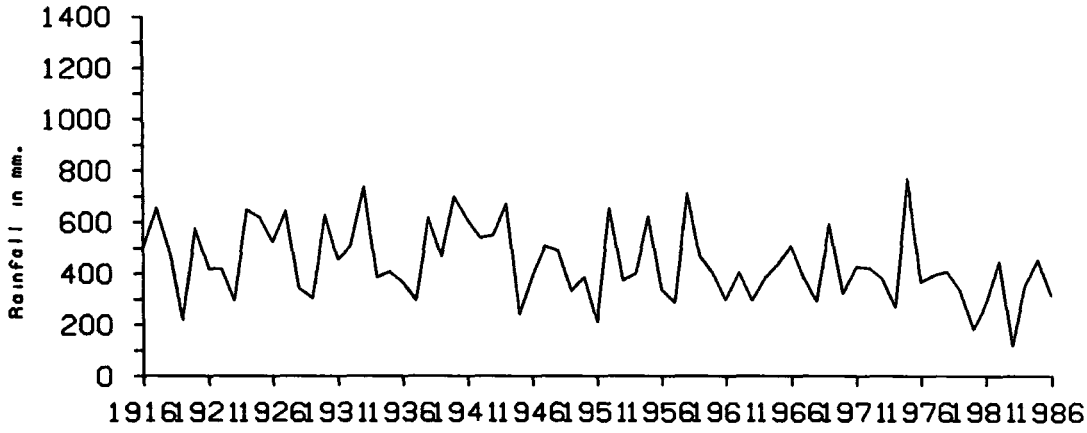
Maha Season: 1955-1983



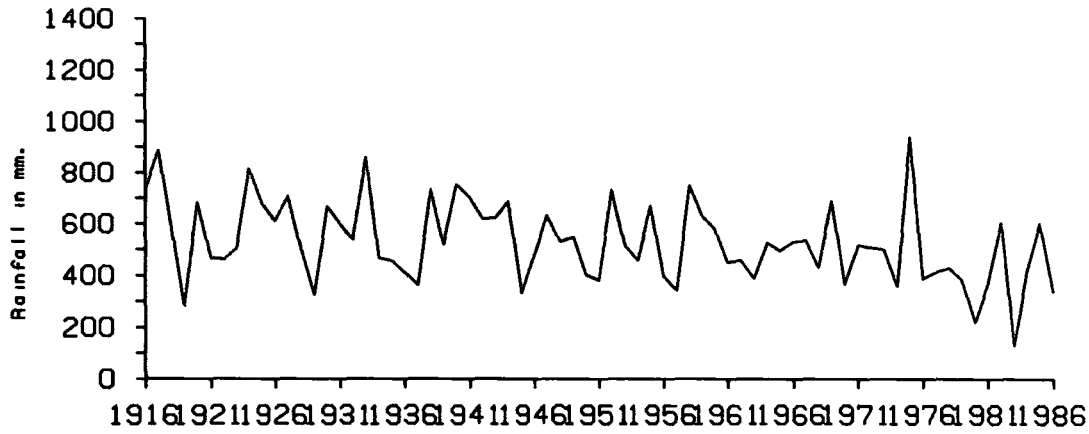
Source: Based on the data of the Meteorology Dept., Colombo, Sri Lanka.

Appendix F: r). Embilipitiya Tank

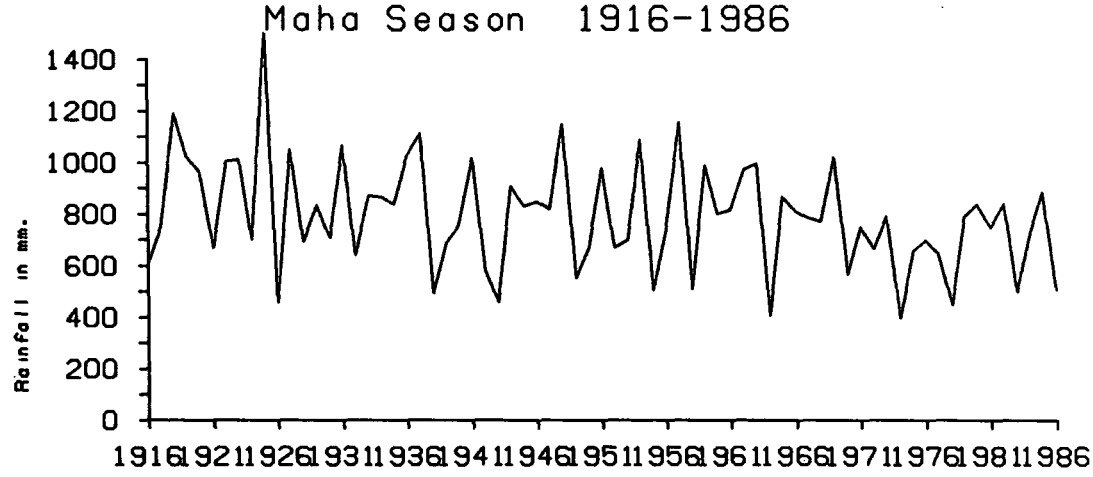
Yala Chena Season: 1916-1986



Yala Paddy Season: 1916-1986



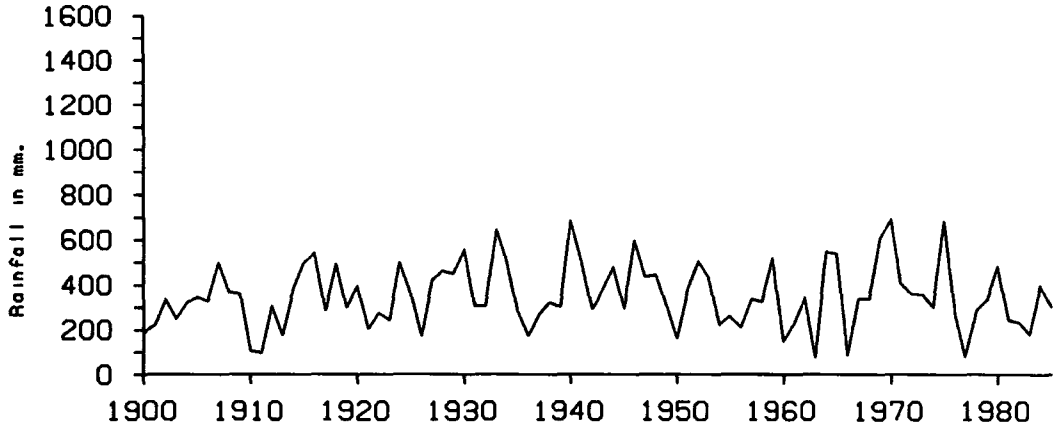
Maha Season 1916-1986



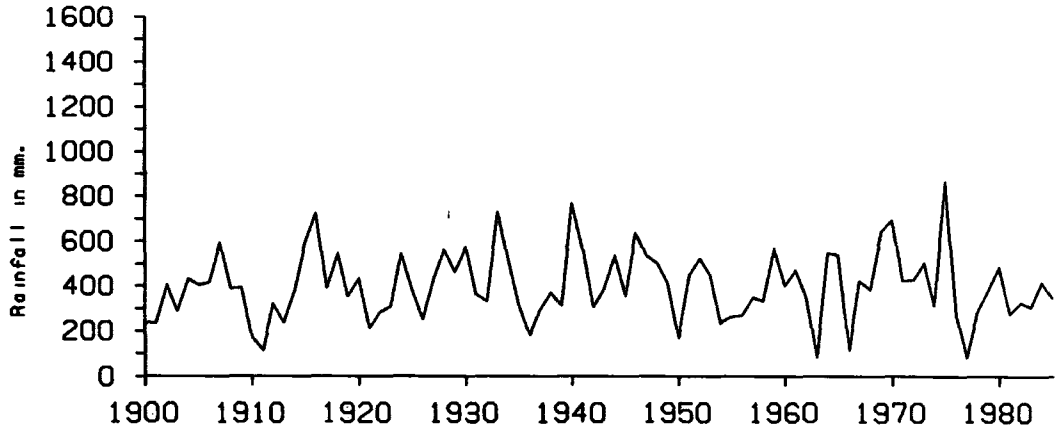
Source: Based on the data of the Meteorology Dept., Colombo, Sri Lanka.

Appendix F: s). Tanamalwila

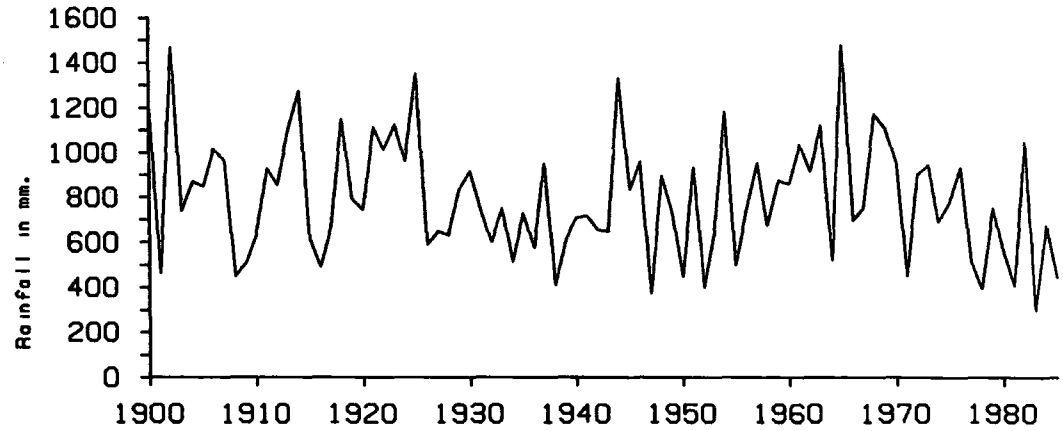
Yala Chena Season: 1900-1985



Yala Paddy Season: 1900-1985



Maha Season: 1900-1985



Source: Based on the data of the Meteorology Dept., Colombo, Sri Lanka

Appendix G

LONGTERM RAINFALL BEHAVIOUR IN SRI LANKA

The farmers' responses indicated that Sri Lankas' rainfall and environment have been changing adversely for their activities over the last 25 years. (see also tables 5.7 and 5.18.) Living in a farming community I myself also have experienced these changes. In order to test these subjective judgements in a more objective manner, rainfall data available to me at present (but representing the whole island) were analysed with the help of the Analysis of Variance Test. In the analysis, selected all the stations have data for more than an eighty years period. In order to carry-out the test, eighty year period in every station was divided into eight periods of ten years. The Analysis of Variance Tests were done based on previously mentioned rainy, agricultural and annual divisions, and their results are shown in appendix G: table 1.

The 'F Table' value according to the significance level 0.001 is 4.09 under the 72/2 degrees of freedom. All the calculated 'F' values in the above table are below the table value. Therefore, the results of this analysis reject the idea that there has been a change in the seasonal and annual rainfall over the eighty year period under investigation. This is evident from all the stations with a 99.9% of significance level.

Since the above test results do not show the variations between periods, data were subjected to the Multiple Classification Analysis. For this analysis, among the stations in appendix G: table 1, ten stations were selected. In these stations only continuous data are available from 1908 to 1987 eighty years period and thus able to compare between stations. The appendix G: table 2 summarizes the result of the unadjusted deviations of the analysis. The plus values represent the number of stations where rainfall exceeded the Grand Means while minus values indicate the opposite.

This analysis helps to identify the changes of rainfall patterns between periods. In order to understand these changes better, I added all the plus and minus values together of which the appendix G: table 3 is the result.

Appendix G: Table 1: The results of the Analysis of Variance

Station	Period	1	2	3	4	5	6	7	8	9
Ratnapura	1908-87	0.36	0.92	0.60	0.77	0.73	0.60	0.48	0.72	72/7
Aninkanda	1906-85	0.37	0.67	0.82	0.78	0.48	1.16	0.45	0.87	72/7
Kurunagala	1908-87	2.0	0.43	0.46	0.83	1.61	2.51	1.42	1.15	72/7
Nuwara Eliya	1908-87	1.03	2.68	0.87	1.47	2.90	1.72	1.85	1.81	72/7
Matale	1907-86	1.77	1.03	1.05	0.99	2.32	2.32	1.20	2.66	72/7
Ampara Tank	1906-85	1.60	1.33	1.01	0.89	1.06	1.44	0.90	1.84	72/7
Anuradhapura	1908-87	2.18	0.64	0.38	0.66	1.36	1.99	0.72	1.31	72/7
Tangalla	1908-87	1.46	1.20	1.50	1.3	2.1	3.2	1.24	1.90	72/7
Tanamalwila	1906-85	1.17	1.43	1.58	1.85	1.03	1.03	2.32	2.54	72/7
Jaffna	1908-87	2.4	1.45	1.29	0.68	1.66	2.39	1.48	1.86	72/7
Puttalam	1908-87	0.52	1.60	1.52	1.09	0.89	0.69	0.77	1.38	72/7
Hambantota	1908-87	0.50	0.78	0.29	1.82	0.68	1.33	0.41	0.63	72/7
Kirama	1907-86	0.87	1.25	0.51	1.14	1.59	1.99	0.95	1.09	72/7
Tissamaharama (Irrigation)	1908-87	1.88	1.19	0.51	3.0	2.4	3.1	0.95	0.62	72/7
Mamadola	1908-87	1.95	1.80	.48	1.54	2.77	3.02	0.53	1.87	72/7

Columns: 1 = intermonsoonal season from March and April, 2 = south-west monsoonal season from May to September, 3 = intermonsoonal season from October and November, 4 = north-east monsoonal season from December to February, 5 = agricultural season Yala for paddy cultivation from March to July, 6 = agricultural season Yala for Chena cultivation from March to May, 7 = main agricultural season in the country from September to January, 8 = annual rainfall, and 9 = degrees of freedom.

Source: Calculated from rainfall data of the Meteorology Dept., Colombo, Sri Lanka.

From this table it becomes clear that rainfall during the periods 1908-17, 1948-57 and 1978-87 has been lower than in other periods. Another trend becoming visible here is that the values of the minus numbers have increased continuously during the agricultural *Yala* paddy season in which rainfall is from both seasons 1 and 2 in the table from 1918 to 1987. Thus, it can be concluded with the help of test results that, in the long run, rainfall behaviour fluctuates over the time. This behaviour is furthermore depicted by the graphs (based on the data in the stations in table related to agricultural seasons in appendix E and F).

Appendix G: Table 2: The Number of Occurrences of Rainfall above and below the Grand Means

	1		2		3		4		5		6		7		Annual	
Period	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+
1908-17	09	01	06	04	07	03	04	06	09	01	10	00	05	05	07	03
1918-27	01	09	04	06	05	05	06	04	02	08	02	08	01	09	01	09
1928-37	01	09	04	06	06	04	02	08	02	08	02	08	06	04	01	09
1938-47	01	09	02	08	03	07	06	04	01	09	01	09	04	06	03	07
1948-57	05	05	09	01	09	01	02	08	08	02	08	02	07	03	06	04
1958-67	06	04	03	07	02	08	05	05	06	04	06	04	04	06	03	07
1968-77	06	04	05	05	07	03	07	03	06	04	06	04	08	02	07	03
1978-87	09	01	07	03	03	07	08	02	08	02	09	01	06	04	09	01

Columns: 1 = intermonsoonal season from March and April, 2 = south-west monsoonal season from May to September, 3 = intermonsoonal season from October and November, 4 = north-east monsoonal season from December to February, 5 = agricultural season , *Yala* for paddy cultivation from March to July, 6 = agricultural season, *Yala* for Chena cultivation from March to May and 7 = main agricultural season in the country from September to January

Source: Calculated from rainfall data of the Meteorology Dept, Colombo, Sri Lanka.

However, the data in the above tables can also justify the farmers' and my subjective judgement about the reduction of rainfall in the last two decades. Thus I have perceived the rainfall behaviour during the last two decades in my village Henpita which belongs to the Wet Zone in the following way. When I was a teenage farmer, some of our farmers in the village had marshy paddy fields. When they levelled their lands to broadcast the seeds it seemed I could see little more than their heads and hands. The rest of their body had disappeared deep under the mud. My father has water buffaloes. When the paddy fields were harvested, we brought the buffaloes to the paddy fields to graze. In those marshy areas the grass was very fertile and attractive, but none of these animals ever tried to go and graze them because they also had perceived the dangerous nature of the marshy fields. Today this picture has changed entirely. When I was doing my field work for this research I also went to my village. On those occassions I was able to observe the changes in the village environment and to recollect my memories of the past. When the lands are prepared now, farmers legs sink into the mud only a little beyond their knees. Our buffaloes were grazing and their calves are playing in the

Appendix G: Table 3: The added values of the plus and minus values for 10 year periods

	1		2		3		4		5		6		7		Annual	
Period	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+
1908-17	413	20	297	198	341	53	144	453	520	68	736	0	220	352	718	189
1918-27	18	256	99	602	85	284	157	136	31	513	15	206	01	669	9	859
1928-37	36	217	153	131	97	269	59	316	62	292	63	475	76	286	29	592
1938-47	27	377	87	466	93	383	252	118	79	878	60	853	311	307	167	970
1948-57	101	37	513	2	441	21	67	444	208	45	243	39	491	177	568	315
1958-67	159	130	135	325	74	183	199	81	283	185	216	156	225	180	285	426
1968-77	131	65	233	134	249	62	268	60	287	128	100	151	520	97	751	158
1978-87	313	43	394	49	123	247	597	74	674	30	492	40	394	170	1138	155

Columns: 1 = intermonsoonal season from March and April, 2 = south-west monsoonal season from May to September, 3 = intermonsoonal season from October and November, 4 = north-east monsoonal season from December to February, 5 = agricultural season Yala for paddy cultivation from March to July, 6 = agricultural season Yala for Chena cultivation from March to May and 7 = main agricultural season in the country from September to January

Source: Calculated from the rainfall data, Dept. of Meteorology, Colombo, Sri Lanka.

formerly marshy paddy lands which their ancestors were unable to reach. I also remember, from my village experience in earlier days, that we never abandoned cultivation in the Yala season due to lack of water. This situation has now also changed and the farmers have abandoned their paddy fields due to lack of rain caused by the irregularities of the southwest monsoon rains. When this happens, only the people who have cattle remain happy as they have no problem to feed their animals in the uncultivated paddy fields. One may argue that the above changes have been created by other factors such as soil erosion and changes in the underground water drainage patterns and so on. However, these arguments are refutable also considering the extinction of almost the entire leech community in our village area. When we visit our relatives, especially, the ones who live near Colombo, they still make a joke in relation to the blood sucking leech and thereby the created difficulties for anybody who comes to visit our area. When I was a small boy and went to look after our cattle, to bring a piece of soap was a must in order to protect the body from the leech. Nowadays this problem is not apparent any more in our village area as leech cannot survive under frequent dry spells.

Appendix H

MOISTURE INDEX DATA, CLIMATIC TYPES AND CUMULATIVE PROBABILITY GRAPHS

Appendix H: Table 1: Moisture Index Values and Climatic Types for Suriyawewa

Year	Yala Paddy	Yala Chena	Maha	Annual	Yala Paddy	Yala Chena	Maha	Annual
1965	-48	-16	+27	-13	D	C1	B1	C1
1966	-43	- 8	+44	-15	D	C1	B2	C1
1967	-46	-39	+31	-18	D	D	B1	C1
1968	-42	-41	- 5	-37	D	D	C1	D
1969	-29	+ 6	+76	+17	C1	C2	B3	C2
1970	-47	-16	+34	-12	D	C1	B1	C1
1971	-40	-10	+56	- 3	D	C1	B2	C1
1972	-50	-23	+ 2	-34	D	C1	C2	D
1973	-19	- 1	+32	-12	C1	C1	B1	C1
1974	-71	-51	- 1	-48	E	D	C1	D
1975	-52	-30	+35	-21	D	C1	B1	C1
1976	-61	-40	- 4	-44	D	D	C1	D
1977	-55	-34	+33	-23	D	D	B1	C1
1978	-54	-28	+21	-27	D	C1	B1	C1
1979	-54	-30	+18	-31	D	C1	C2	C1

Source: Calculated from data of the Meteorology Dept., Colombo, Sri Lanka and Evapotranspiration data calculated by the Thornthwaite Associates for the Hambantota station in 1963.

Appendix H: Table 2: Moisture Index Values and Climatic Types for Migahajandura

Year	Yala Paddy	Yala Chena	Maha	Annual	Yala Paddy	Yala Chena	Maha	Annual
1948	-67	-50	+30	-34	E	D	B1	D
1949	-55	-61	-50	-60	D	D	D	D
1950	-76	-60	-14	-50	E	D	C1	D
1951	-35	-13	+19	-21	D	C1	C2	C1
1952	-41	-11	-18	-40	D	C1	C1	D
1953	-38	-22	-10	-34	D	C1	C1	D
1954	-58	-37	+ 5	-40	D	D	C2	D
1955	-27	-19	+28	-14	C1	C1	B1	C1
1956	-52	-32	+ 6	-37	D	C1	C2	D
1957	-32	+ 2	+49	- 6	C1	C2	B2	C1
1958	-60	-34	-23	-50	D	C1	C1	D
1959	-29	- 2	+ 5	-21	C1	C1	C2	C1
1960	-33	-40	+ 7	-20	C1	D	C2	C1
1961	-29	-15	+31	- 9	C1	C1	B1	C1
1962	-63	-42	+22	-26	D	D	B1	C1
1963	-74	-61	+50	-28	E	D	B2	C1
1964	-29	-32	-63	-47	C1	C1	D	D
1965	-62	-35	+45	-12	D	D	B2	C1
1966	-74	-58	+39	-39	E	D	B1	D
1967	-40	-25	+13	-25	D	C1	C2	C1
1968	-51	-33	- 4	-40	D	C1	C1	D
1969	-15	- 3	- 4	-20	C1	C1	C1	C1
1970	-20	+20	+59	+ 6	C1	C2	B2	C2
1971	-37	- 8	-12	-36	C1	C1	C1	D
1972	- 7	+33	- 2	-20	C1	B1	C1	C1

Source: Calculated from data of the Meteorology Dept., Colombo, Sri Lanka and Evapotranspiration data calculated by the Thornthwaite Associates for the Hambantota station in 1963.

Appendix H: Table 3: Moisture Index Values and Climatic Types for Hambantota

Year	Yala Paddy	Yala Chena	Maha	Annual	Yala Paddy	Yala Chena	Maha	Annual
1963	-50	-42	+40	-10	D	D	B2	C1
1964	-55	-56	-58	-48	D	D	D	D
1965	-62	-44	+22	-27	D	D	B1	C1
1966	-47	-27	+10	-31	D	C1	C2	C1
1967	-56	-67	-4	-36	D	E	C1	D
1968	-59	-71	-31	-53	D	E	C1	D
1969	-65	-56	+38	-18	D	D	B1	C1
1970	-62	-53	-17	-39	D	D	C1	D
1971	-54	-40	-27	-47	D	D	C1	D
1972	-53	-37	+6	-33	D	D	C2	C1
1974	-53	-64	-41	-51	D	D	D	D
1975	-22	+53	-37	-15	C1	B2	D	C1
1976	-85	-79	-1	-53	E	E	C1	D
1977	-58	-49	-16	-43	D	D	C1	D
1978	-62	-41	-3	-43	D	D	C1	D
1979	-78	-80	-16	-53	E	E	C1	D
1980	-34	- 4	-11	-34	D	C1	C1	D
1981	-63	-48	-48	-56	D	D	D	D
1982	- 3	+ 5	-32	-27	C1	C2	C1	C1
1983	-74	-74	-4	-62	E	E	C1	D
1984	-51	-44	-29	-41	D	D	C1	D
1985	-54	-52	-12	-37	D	D	C1	D
1986	-64	-41	-11	-43	D	D	C1	D
1987	-71	-51	-21	-48	E	D	C1	D

Source: Calculated from data of the Meteorology Dept., Colombo, Sri Lanka and Evapotranspiration data calculated by the Thornthwaite Associates for the Hambantota station in 1963.

Appendix H: Table 4: Moisture Index Values and Climatic Types for Ambalantota

Year	Yala Paddy	Yala Chena	Maha	Annual	Yala Paddy	Yala Chena	Maha	Annual
1963	-68	-65	+40	-22	E	D	B2	C2
1964	-68	-75	-64	-57	E	E	D	D
1965	-62	-41	+35	-15	D	D	B1	C2
1966	-27	+4	-8	-31	C2	C1	C2	C2
1967	-44	-62	-22	-39	D	D	C2	D
1968	-54	-71	-23	-48	D	E	C2	D
1969	-59	-42	-372	-15	D	D	D	C2
1970	-59	-46	-11	-35	D	D	C2	D
1971	-62	-58	-35	-52	D	D	D	D
1972	-66	-45	0.0	-42	D	D	C1	D
1973	-30	-24	+9	-25	C2	C2	C1	C2
1974	-73	-75	-54	-66	E	E	D	D
1975	+26	+59	-39	-15	B1	B2	D	C2
1976	-83	-73	-57	-72	E	E	D	E
1977	-69	-60	-32	-54	E	D	C2	D
1978	-68	-66	+8	-38	E	D	C1	D
1979	-67	-67	-9	-41	E	E	C2	D
1980	-71	-64	-29	-55	E	D	C2	D
1981	-74	-61	-47	-62	E	D	D	D
1982	-16	-1	+8	-18	C2	C2	C1	C2
1983	-74	-67	-60	-67	E	E	D	E
1984	-57	-73	-34	-49	D	E	D	D
1985	-50	-51	-25	-44	D	D	C2	D
1986	-68	-45	-24	-50	E	D	C2	D
1987	-76	-60	-10	-47	E	D	C2	D

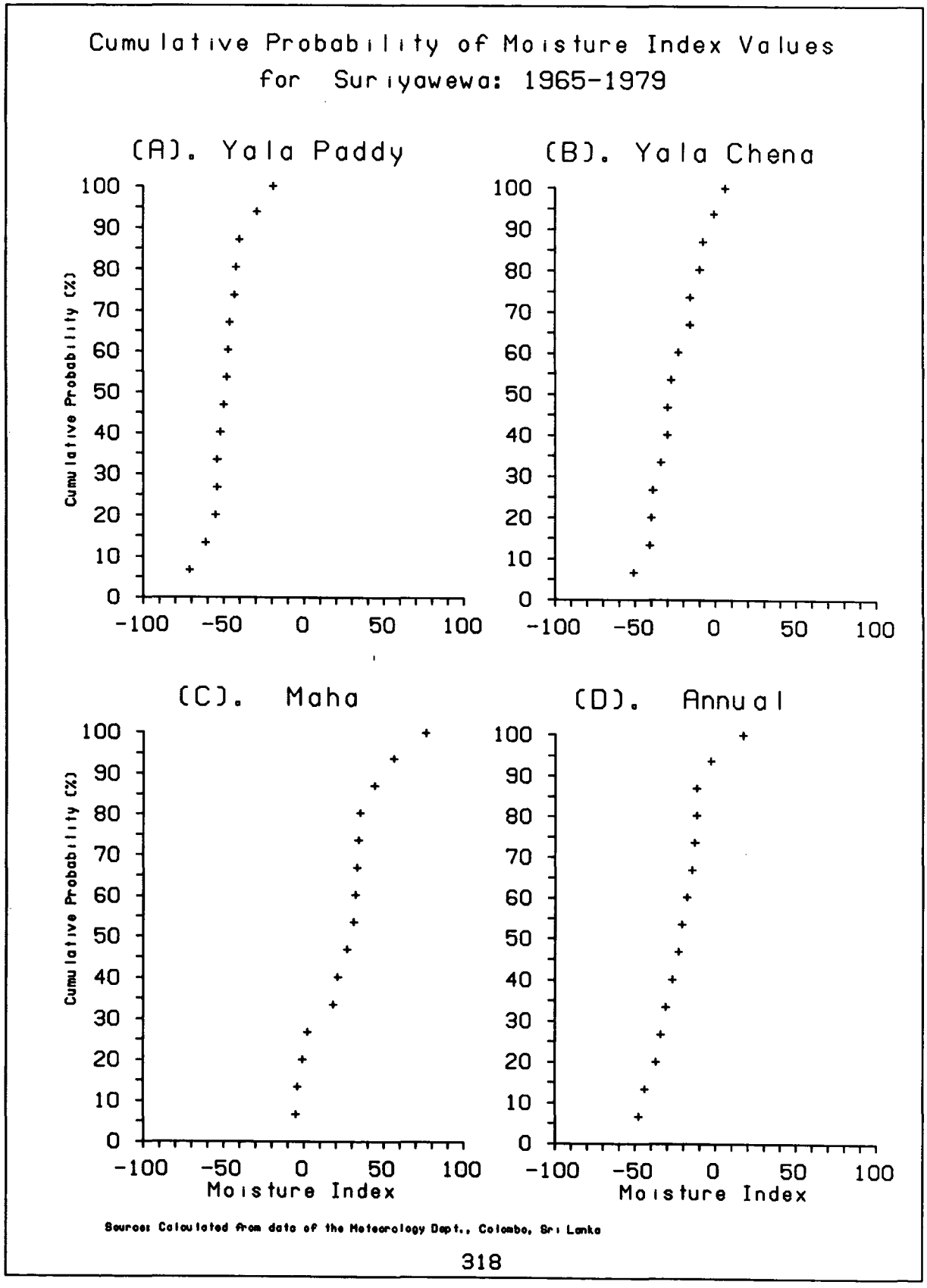
Source: Calculated from data of the Meteorology Dept., Colombo, Sri Lanka and Evapotranspiration data calculated by the Thornthwaite Associates for the Hambantota station in 1963.

Appendix H: Table 5: Moisture Index values and Climatic Types for Embilipitiya Tank

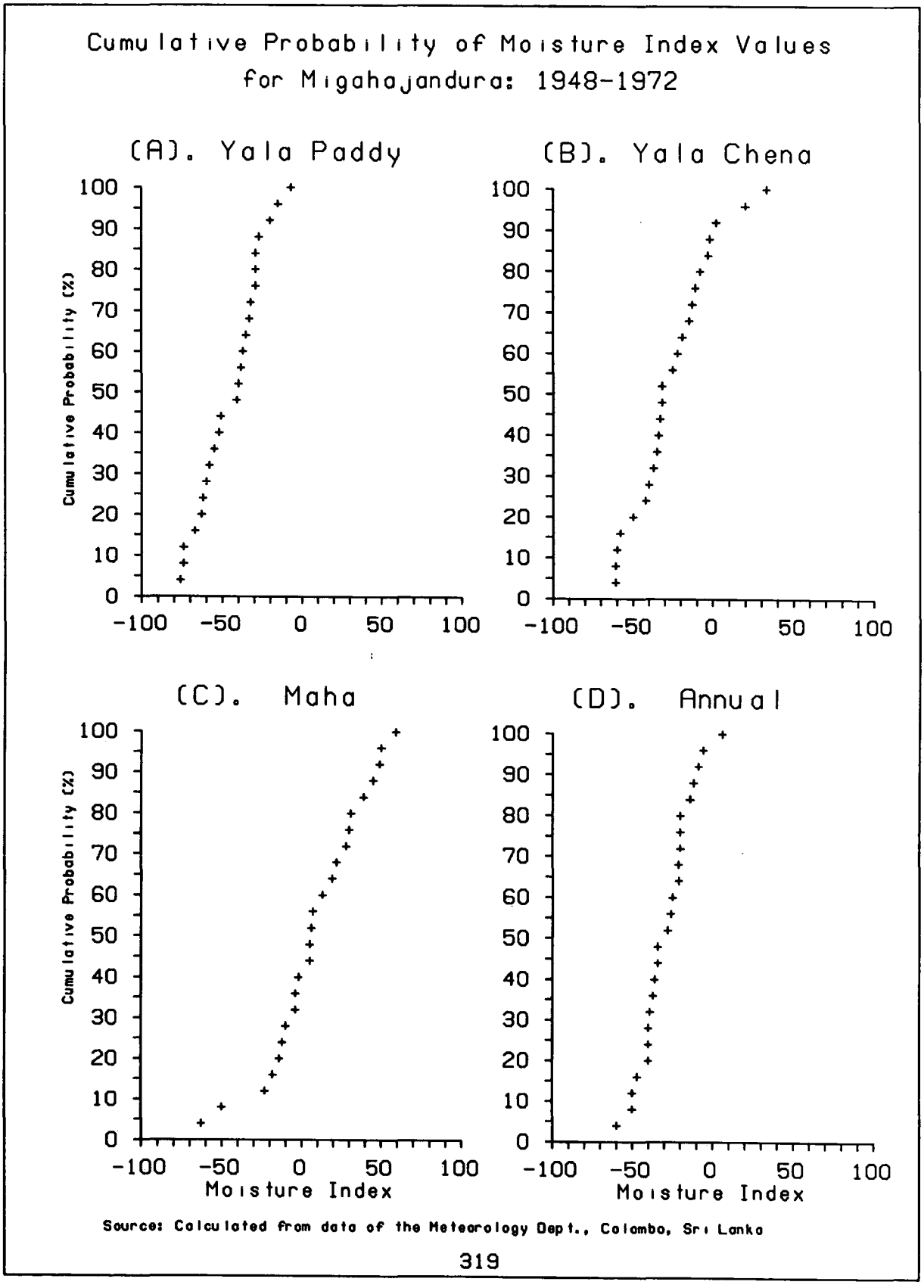
Year	Yala Paddy	Yala Chena	Maha	Annual	Yala Paddy	Yala Chena	Maha	Annual
1962	-39	- 9	+44	-13	D	C1	B2	C1
1963	-48	-34	+48	-13	D	D	B2	C1
1964	-30	-15	-40	-32	C1	C1	D	C1
1965	-34	- 2	+29	- 7	C1	C1	B1	C1
1962	-29	+14	+21	-15	C1	C2	B1	C1
1929	-29	-13	+17	-17	C1	C1	C2	C1
1428	-42	-35	+15	-29	D	D	C2	C1
1869	- 8	+35	+52	+14	C1	B1	B2	C2
1970	-51	-27	-16	-39	D	C1	C1	D
1971	-31	- 4	+11	-19	C1	C1	C2	C1
1972	-32	- 4	- 1	-29	C1	C1	C1	C1
1973	-33	-14	+18	-18	C1	C1	C2	C1
1974	-52	-40	-41	-48	D	D	D	D
1975	+25	+72	- 2	+ 5	B1	B3	C1	C2
1976	-48	-18	+ 4	-34	D	C1	C2	D
1977	-45	-11	- 4	-53	D	C1	C1	D
1978	-43	- 9	-33	-44	D	C1	C1	D
1979	-49	-25	+18	-24	D	C1	C2	C1
1980	-70	-60	+25	-37	E	D	B1	D
1981	-51	-37	+11	-28	D	D	C2	C1
1982	-19	+ 1	+25	- 9	C1	C2	B1	C1
1983	-83	-73	-26	-61	E	E	C1	D
1984	-45	-21	+ 8	-22	D	C1	C2	C1
1985	-20	+ 2	+32	- 8	C1	C2	B1	C1
1986	-55	-29	-25	-41	D	D	C1	D

Source: Calculated from data of the Meteorology Dept., Colombo, Sri Lanka and Evapotranspiration data calculated by the Thornthwaite Associates for the Hambantota station in 1963.

Appendix H: Figure 1:

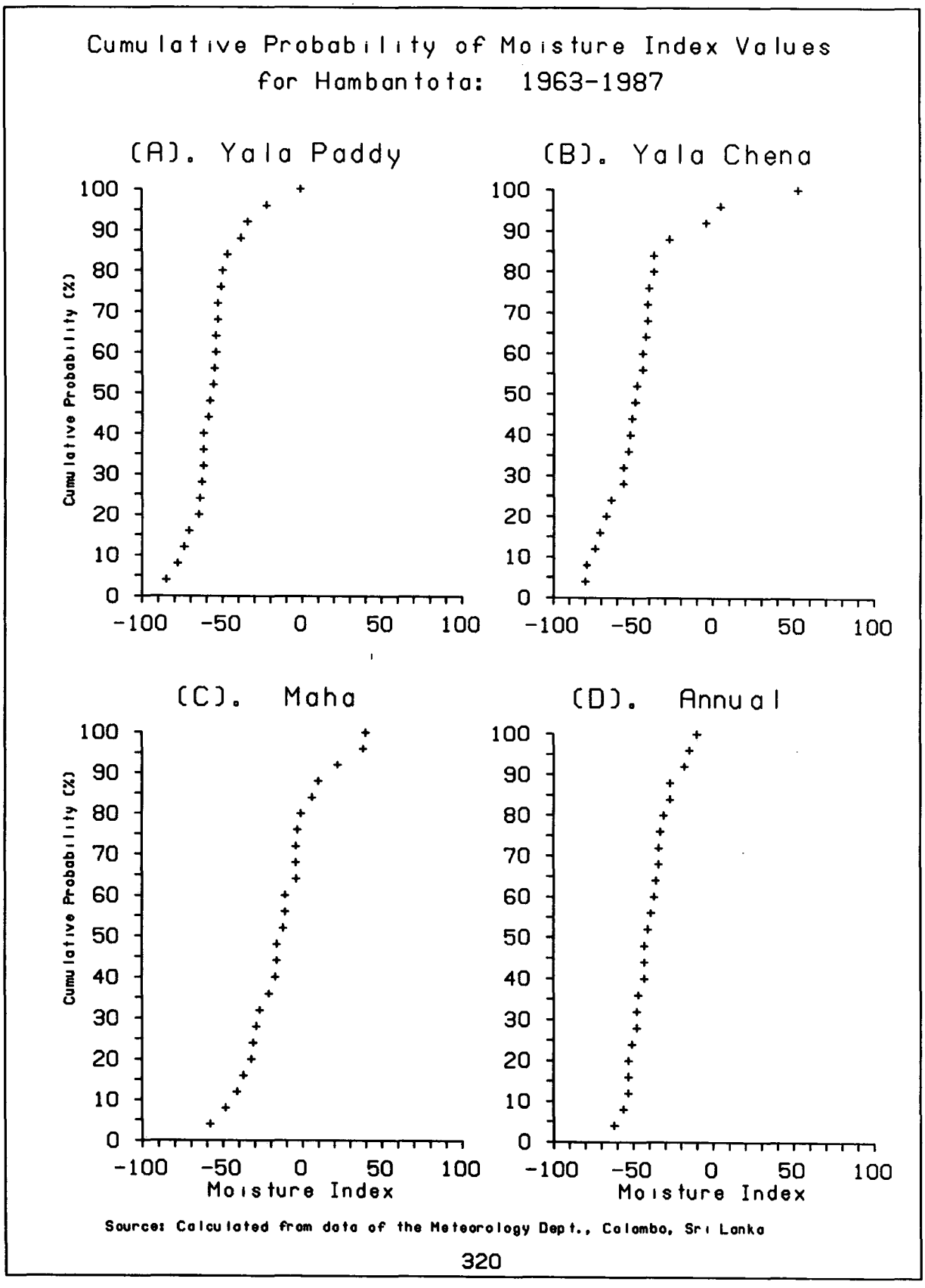


Appendix H: Figure 2:

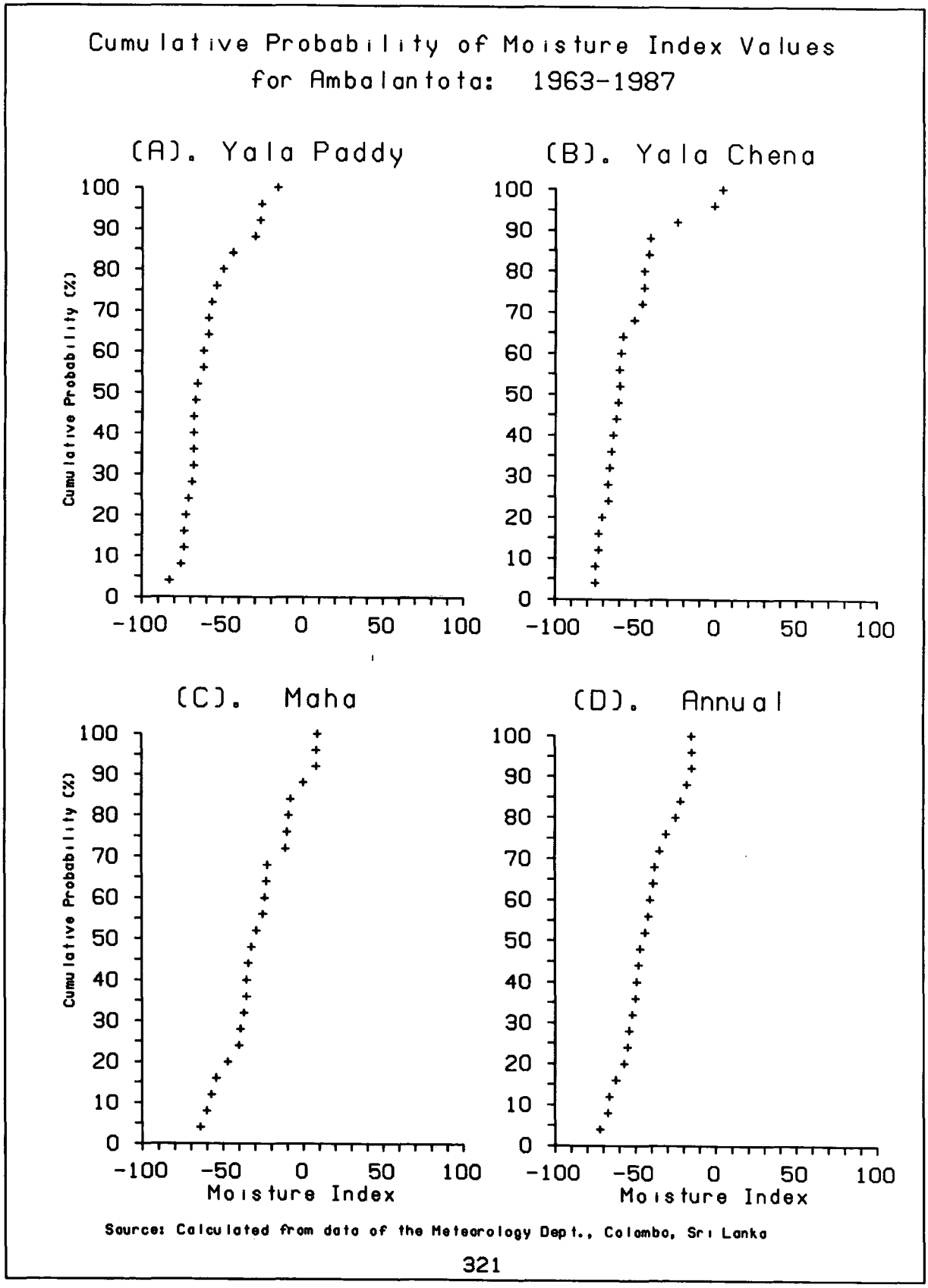


Source: Calculated from data of the Meteorology Dept., Colombo, Sri Lanka

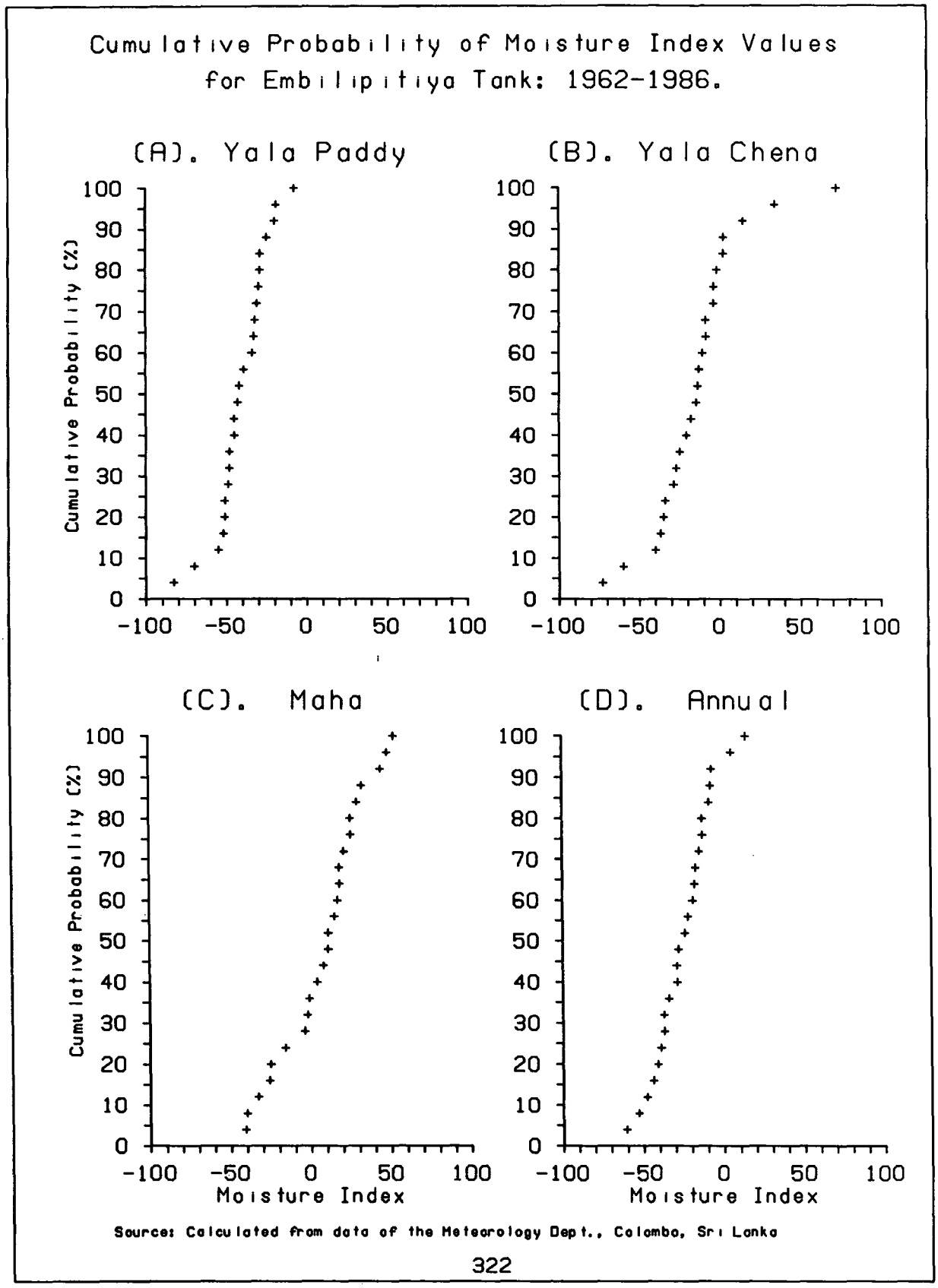
Appendix H: Figure 3:



Appendix H: Figure 4:



Appendix H: Figure 5:



Source: Calculated from data of the Meteorology Dept., Colombo, Sri Lanka

Appendix I

FARMERS' PERCEPTION OF AGRICULTURAL INNOVATIONS IN THE STUDY AREA

Additional data were also collected in order to see farmers' perception of agricultural innovations and their possibility among farming communities to reduce the vulnerability of drought hazard. In this process the usage of agrochemicals, chemical fertilizers, hybrid seed varieties, and the usage of tractors were studied based on the farmers' perceived advantages and disadvantages of these technologies. In addition, the land preparation with cattle is also discussed. Tables from 1 to 4 in appendix I depict the result of this investigation.

Appendix I: Table 1: Advantages and Disadvantages of Agrochemicals

Advantages	Av.	Ac.	As.
High yield	97	88	92
Weeds properly controlled	91	91	91
Diseases controlled	88	77	82
Easy usage	9	34	24
Easy availability	10	20	16
Disadvantages			
Destruction of favourable living beings	86	91	89
High price	89	86	87
Reduces plant growth	90	84	87
Some diseases cannot be controlled	77	79	78
Environment is polluted	73	52	61
Water sources are poisoned	42	73	60
Produce contaminated with poison	55	59	57
Farmers do not have a knowledge	54	55	55
Leads to accidents	54	52	53
Leads to diseases	40	48	45

Columns: Av. = All villages, Ac. = All colonies and As. = All settlements.

Source: Fielcd data. Data in the percentage form. (The number of farmers in the villages are 96, 128 in the colonies, and 224 in all the settlements.)

A comparison of the farmers' perceived advantages and disadvantages of agro-

chemicals (weedicides and pestisides) shows that what they achieved with the help these chemicals has not helped to increase their productivity in real terms (Appendix I: table 1). The farmers accept that their harvest is increased, but this at the expense of their living environment. Among the disadvantages, the most relevant factors for this study are the 'destruction of favourable living beings', the 'reduction of the growth of plants', that 'some diseases cannot be controlled' and that this 'leads to crop diseases'. Worms who loosen the soil and bring up the wet deep soil and so moisten the dry surface soil, bees which helps to pollinate the plants, birds who eat insects, reptiles which destroy rats, rabbits and insects and some other micro-organisms which help to maintain the balance of the soil structure, are all farmers' very good friends. As a result of agrochemical usage, most of these useful living beings have been destroyed by now, and their natural favourable functions crippled. Especially, the destruction of worms has reduced the loosening process of the soil, and thereby, checked the power of absorbing water. Instead, this has led to the environmentally disastrous desication process which increases the hazardousness of the drought. Furthermore, the power of agrochemicals to control both diseases and harmful pests has reduced over the time scale, which, in turn, has led to crop diseases. Moreover, each time the farmers use chemicals they reduce the growth of the plants. As a result, they have to wait longer periods for the harvest, and thereby enhance the probability of the destruction of their crops in this highly drought stricken area in which rains are highly uncertain. There are still a few farmers in the area who do not use agrochemicals. Discussing this issue with them, I was convinced by them that though their harvest is a little lower than that of the farmers who use agrochemicals, this does not make any difference in real terms because they do not spend a lot of money on technological inputs. Furthermore, they can harvest their crops before the others and, therefore, reduce the potential hazardous effects on the crops which are due to lack of water. Another devastating aspect of agrochemicals is their intensive use by the businessmen in their stores in order to protect the cereals from pests, fungi and bacteria. In a Third World country, where there is little awareness about the danger of these chemicals, the health aspect of the cereals is not considered very important. Cereals become, therefore, contaminated. In general, these growing hazardous factors were perceived by the farmers of every settlement to a considerable extent. Another aspect of the technological innovation package concerns chemical fertilizers,

Appendix I: Table 2: Advantages and Disadvantages of Chemical Fertilizers

Advantages	Av.	Ac.	As.
High yield	99	98	99
Easy availability	34	36	35
Easy usage	21	30	26
Disadvantages			
High price	82	79	80
Growth of weeds	69	48	57
Leads to diseases	56	55	55
Fertilizer is mixed with weed seeds	56	49	52
Destruction of favourable creatures	57	45	50
Fertilizer is adulterated	43	34	38

Columns: Av. = All villages, Ac. = All colonies and As. = All settlements.

Source: Field data. Data in the percentage form.

and the farmers' opinion about these is given in appendix I: table 2.

Farmers have had high yields with the use of chemical fertilizers. However, the number and degree of the bad effects of their use have diminished and outnumbered their favourable effect of high yields. The interconnections between the disadvantages of fertilizers and those mentioned in appendix I: table 1 are clear. One aspect, however, which must be given special attention among the disadvantages of fertilizers is that they are found mixed with the seeds of the weeds. This has even occured in the Wet Zone where I was cultivating paddy. We started to use chemical fertilizer in 1960s for the first time in our area. Before this sort was introduced all the usual weed varieties in the area were destroyed along with growing paddy, and by maintaining a certain water level in the paddy fields. However, after the introduction of the new fertilizers, strange new weed varieties which also happen to be very strong and which destroy entire paddy plots have come into being. As a result, very strong agrochemicals have to be used if a farmer really wants to control them and protect the crop. The problem of this matter cannot be overlooked and belittled, and is certainly worthy of further investigation if real agricultural development is supposed to come about. It is also apparent that fertilizers are not only mixed with weeds but also adulterated by the businessmen.

The direct effect of agrochemicals on the hazardousness of a drought stricken area is very high and immediately understandable. When all these disadvantages are considered it seems quite ironical that agrochemicals, chemical fertilizers, as well as hybrid seed varieties are considered as virtuous innovations supporting the course of the green revolution because they are supposed to eradicate the hunger from the human minds, bellies and from this earth forever.

In the next instance, the farmers' understanding about hybrid plant varieties is to be explained, and appendix I: table 3 provides a picture of the farmers' view on this issue. In Sri Lanka, hybrid seed varieties are called "the government seeds" because they are distributed and propagated by the government authorities.

Appendix I: Table 3: Advantages and Disadvantages of the Government Seeds

Advantages	Av.	Ac.	As.
High yield	77	98	89
Plants are not flatten by the winds	91	77	83
High germination	68	59	63
Not mixed with other varieties	55	38	45
Seed amount low	49	38	43
Easy availability	9	34	23
Disadvantages			
Maintenance cost is high	99	93	96
Expensive	82	77	79
Abundance of diseases	71	70	71
High growth of weeds	71	65	67
Low drought resistance	54	47	50
Mixed with weed seeds	57	38	46
Poor taste of rice	51	33	41
Low weight of rice	38	28	32
Yield decays very soon	30	23	26
Harvesting wastages are high	30	23	26

Columns: Av. = All villages, Ac. = All colonies and As. All settlements.

Source: Field data. Data in the percentage form.

Once again, the capacity of these seeds to produce high yields is established

in the farmers' minds. At the same time, there are two other highly accepted virtues attached to these seeds, i.e. the plants are not flatten by the winds and the high germination of the seeds. However, when their unfavourable effects are concerned, these virtues are, again, outnumberd by their disadvantages. The cost to maintain the hybrid seed varieties is remarkably high. When the farmer who grows these seeds does not use the modern agrochemicals and fertilizers according to instruction, no farmer can reap a good harvest. Another disadvantage is that hybrid plants have a low resistance to drought according to half of the farmers interviewed. Moreover, very strong and disastrous weed varieties were distributed mixed together with these seeds in the same way it was carried out with the fertilizers. The colour and the taste of the rice is quite important for Sri Lankan farmers. Thus they know that the rice grains with red skin are the most nutritious, healthy and tasty. Though most of the hybrid seed varieties provide high yields, unfortunately, their colour is white and their taste is not appreciable so, when they eat a full plate of this rice they get hungry very soon. Villagers with this experience, therefore, say that they are eating straw but not rice and have, as a result, no physical strength for their agricultural duties one of the most important factors for agricultural success. I have no doubt about this complaint about hybrid paddy varieties as I myself have gone through this process. The data in the above table, furthermore, reveals that the disadvantages related to the agrochemicals, fertilizers and hybrid seed varieties are very high and that they are also directly related to the increase of the hazardousness of the area. The result of this investigation is that the modern technological aids cannot develop the area, let alone cope with or help to overcome the drought problems in the first place.

As far as the land preparation is concerned, there are two major ways in the area to perform this activity, viz., 1) by tractor and 2) by cattle (mainly with water buffaloes). As with the previously discussed three technological devices, land preparation with these means have pros and cons which are, in effect, very helpful to understand the attitudes and knowledge of the farming community. In this investigation the work of the tractor is considered first and appendix I: table 4 shows the advantages and disadvantages of the tractor as perceived by the farmers.

When farmers hire tractors they only need to pay the money. Therefore, they say it is very easy to hire a tractor for their land preparation. As soon as the land

Appendix I: Table 4: Advantages and Disadvantages of the Usage of a Tractor

Advantages	Av.	Ac.	As.
Very easy for the farmers	86	94	91
Land preparation is proper	57	66	62
Land preparation in a short time	63	54	58
Water wastages are low	31	26	28
Low cost	0	1	.4
Disadvantages			
High cost	81	77	79
Takes time to season soil	72	55	62
Water wastages are high	74	50	60
Infertile soil comes to surface	65	46	54
Tractors difficult to find	55	52	54
Payments must be in ready cash	53	41	46
Corners of the paddy tracts do not mud	49	38	43

Columns: Av. = All villages, Ac. = All colonies and As. All settlements.

Source: Field data. Data in the percentage form.

is ploughed by a tractor newly dug and turned soil is clearly visible giving the impression to the farmers that the land is ploughed properly; this in contrast to the paddy fields mudded by water buffaloes. Similarly, the time taken by a tractor to plough or level the lands is shorter, leading the farmers to think that the land preparation done by a tractor is saving time. For the first tillage of a field in a season, a tractor can plough the soil even without the use of water, and therefore, a few farmers think it even saves water. However, the two major disadvantages of the use of a tractor is its high cost, and the fact that the vulnerability of the agriculture to drought is increased by the longer period the ploughed land takes to season and to smoothen.

In effect, tractors not only waste time. After the first ploughing, it is necessary to cover the paddy fields with water in order to destroy the weeds and season the soil. Therefore, the more prolonged the time for the soil to season, the more water, i.e. the crucial resource for paddy cultivation, is wasted through evaporation enhancing its vulnerability to drought. Furthermore, according to my observations,

the number of tractors in the area is considerably few so that the demand for them is too high. The tractor operators are thus very busy during the season and try to finish their accepted work as soon as possible. Accordingly, the quality of their workmanship is inferior. The latter problem has been addressed among the disadvantages in the table as the last point. Therefore, no farmer in the area can use a hired tractor as he pleases unless it belongs to him. On the other hand, a considerable amount of farmers still hire buffaloes for their land preparation, and the advantages and disadvantages arising from their usage are given in appendix I: table 5.

Appendix I: Table 5: Advantages and Disadvantages of Land Preparation with Cattle

Advantages	Av.	Ac.	As.
Soil does not change	73	69	71
Less water wastage	67	56	61
Takes less time	51	59	56
Very good for the paddy plants	41	62	53
Payments can be made with harvest	53	41	46
The holes made by crabs are closed	38	48	44
Disadvantages			
Very difficult for farmers	89	95	92
High cost	35	38	37
Difficult to obtain	38	35	36
Takes time	31	25	28
Wastes water	17	19	18

Columns: Av. = All villages, Ac. = All colonies and As. All settlements.

Source: Field data. Data in the percentage form.

The table clearly shows that the advantages of land preparation with cattle are higher than the disadvantages. While a tractor destabilises the structure of the soil buffaloes do not do any harm in this respect. In order to mud the paddy field buffaloes are brought around the paddy plots until their hooves penetrate the surface soil. The hoove of animals have a specific power which can loosen the soil within a few days time. However, this quick seasonning of the soil cannot be achieved with tractors. Since the soil is thus loosened and seasoned properly

farmers can easily repair the ridges which are crucial in the protection of the water dammed in small plots within the paddy fields. The lands ploughed by tractors do not yield soils with these qualities, and therefore, though the farmers repair their ridges the lumpy and disintegrated soils which has holes cannot protect the water properly which finally leads to leakages. The quality of the soil prepared with the two different methods described above and its effects can be compared to properly and improperly mixed cement in order to make a concrete construction. Since the soil seasons quickly, farmers who use buffaloes can sow paddy seeds within fifteen days from the date they start work whereas a field which is ploughed by a tractor takes a period of a month or more to season. Because of the time saved with the buffaloes, in turn, a lot of water can be prevented from evaporation, seaping, percolation as well as from draining and leaking through the damaged ridges and holes made by crabs. Especially the holes made through ridges by crabs cannot be closed by tractors, and only the buffaloes who walk many rounds in the field and over the ridges are able to close them completely. Farmers who need buffaloes have the freedom to borrow them from farmers who own them. Not only that, the farmer who borrowed buffaloes must also feed them during their working day. Therefore, even though the farmers have to face difficulties, they can finish their work as they please because no control is imposed on the farmer by the owner as in the event of hiring a tractor. Furthermore, especially also poor farmers can use buffaloes because they can pay the due charges after harvesting. On the other hand, among the disadvantages of using buffaloes only one factor is shown as very dominant in the investigation. When the buffaloes are used by the owner or hired from an owner, there are several activities he has to complete before he starts his land preparation. The first thing is to feed the animals. After this, several people must be hired to work with the buffaloes. In this case, mostly children from the area are hired. These workers must also be fed with both food and tea while, in addition, smoking as well as beetles have to be supplied. As a result, all the members of the family have to engage in various activities when the farmer hires and uses buffaloes. All these activities make the farmers to conclude that using buffaloes for their land preparation is very difficult. Since these problems are not connected with the use of tractors they mentioned the use of tractor as very easy. However, some farmers consider the animals as costly. The main reason for this is that the farmers have to afford supplies in several ways (as described above)

while they are using the buffaloes. During the cultivation season buffaloes are not easily available. The farmers' perception that working with buffaloes 'takes time' here means the time they need in comparison to the time a tractor takes to finish ploughing a big area. On the other hand, their perception that buffaloes' work 'wastes water' indicates that the buffaloes while going around the paddy plots over and over ridges damaging them with their hooves which finally leads to the leakage of water from the land plot. These ridges can be repaired easily, however, and, normally, farmers must repair their ridges whether they are damaged or not. Altogether this investigation shows that the favourable effects of using cattle for the land preparation clearly outweigh the negative effects and that it is more appreciable in this drought stricken area.

The comparison between appendix I: tables from 1 to 4 shows that the farmers do not have a greater faith in modern agricultural technologies in respect to solving their problems. They may be effective in other parts of the country or world, but the farmers in this drought stricken area do not indicate that these have helped them to reduce the growing hazardousness of the droughts. However, the farmers have very clearly shown that they are good observers which enables them to see the good and bad effects of the technological devices discussed.

Appendix J

HUMAN ACTIONS THAT INCREASE HAZARDOUSNESS

Appendix J: (a)

All the legislations to protect the farmers in Sri Lanka are passed by Parliament. Acts have been passed by this institute of highest authority, in order to protect the rights of tenant farmers from suppression, or exploitation by landlords and to strengthen the confidence of the farmers while assuring them land for cultivation. Since the farmers in the country are suffering an acute land hunger there is a considerable number of farmers who cultivate as tenants. They are constantly harassed by the landowners, and this type of legal environment is therefore necessary to protect the the farmers' rights. However, in practice, these laws are only on paper and a person with political and economic power can override these parliamentary laws in Sri Lanka without difficulty, even with the help of Members of Parliament. This is the researcher's own experience and thus I present a personal anecdotal evidence here. We (my family) cultivated a piece of paddy land which belonged to a government officer. While he lived far away from this paddy land, it was very close to our home. In the case of an emergency, the owner mortgaged this land to my mother. After several years, he redeemed it, but allowed us to cultivate. This was in the 1950s. My father was registered as the tenant farmer of this paddy land. The landowner later died and his son took charge of the ownership, and we did not have any conflict with him and continued to cultivate it as tenant farmers. In 1977 this man sold the land to a rich political supporter of the present ruling party. The new man immediately wanted to deprive us of our legal tenant right, and asked us not to cultivate. According to the legal right, we cultivated however. He then went to the magistrate court. According to the normal legal procedure, when there is a dispute over land between the landowner and the tenant farmer, and if they seek legal help the tenant farmer has the right to continue the cultivation of the land under dispute until the problem is solved. However, in this dispute my father was deprived his right and he subsequently

complained about the matter to the Agrarian Services Department officers who are responsible to solve this type of problem. When the official inquiry started, we had to produce evidence that we were cultivating the land as tenants. In this case, we had to bring the officers of the Village Agrarian Committee with their registers in which my father's name was registered for every year as the tenant farmer for this particular land. When the higher officers checked this information, most of the pages which indicated my father as the tenant farmer were either torn off or removed from the registers. As a result, my father failed in this instance. He appealed again. In the the appealed case, the head inquiring officer was the Assistant Commissioner of the Agrarian Services Department of the district. This time when the inquiry started the solicitor of the new landowner was the Member of Parliament who represented the neighbouring electorate of ours. (Last year I came to know that this M.P. who was very cruel and nasty, was killed by the guerillas). Now the government officer could not solve the problem because a leading politician was helping the landowner, and so he put the case to the district court. In the district court, my father could not prove that he had cultivated the land as a tenant because his name had also disappeared from most of the village level land registers. However, if he did not agree with the decision of the district court he was able to put the case before the high court within a certain number of days. My father therefore did not give up hope as he was not discouraged and wanted to make use of his right to appeal to the high court. On this occasion, the landowner and his solicitor hired several people with solicitors type dresses, and bribed some brokers who normally help people to find solicitors to proceed their cases in the high courts. As soon as my father came out from the court building, several brokers had surrounded him and asked whether they could help him to proceed his case to high court. As that was what my father needed, he was very pleased and went to one of the bogus solicitors with a broker, paid his charges, and appealed to the high court. At that time, he was not aware that he was deceived by the bogus solicitor who was hired by the new landowner, and prepared himself for the final legal battle. Only later he realised that he was deceived when he did not receive any news from the high court and subsequent inquiries. Additional to his deception, my father had to pay a large sum of money to cover the cost of bogus solicitors and deceptors of the politically powerful new land owner.

Appendix J: (b)

My original study plan was to select also study sites from the driest parts of the district, in eastern Hambantota. Therefore, I had collected the particulars related to these parts as well. In the eastern part of Hambantota district, the most important agricultural area is located along the valley of Kirindi Oya (the major river). When my fieldwork was in progress, the major irrigation scheme, Lunugam Vehera Project, was being built. Under this scheme, thousands of acres were to be irrigated. Therefore, the government spent a lot of money. Even though it was not completed, some people have been given lands here to cultivate well in advance, for instance, even in 1985. However, as a result of this scheme, many farmers had to move away from their lands and to face problems. On the other hand, the farmers who migrated from areas such as Rathnapura district where they lived without water shortages (Some parts of Ratnapura are the wettest areas in the country) were suffering without water after being given lands from this scheme. People in Rathnapura live with an acute land hunger, and therefore, poor people will migrate to any difficult area if they are given lands for cultivation. The following stories reflect the appalling conditions these poor farmers were faced with.

(a). "We were asked to cultivate during the *Maha* season in 1986, and were even provided with loans to buy inputs. When the cultivation was finished, the officers stopped the water supply and said, there was no water due to drought. We had to face loss and now we are even asked to pay back the loans we got from the banks".

(b). "We were told that we will be given water for cultivation, and Rs. 11,000/- (£approx. 170) in order to build our houses in the new irrigation scheme. We came, but so far, we have seen no water and no money. The government officers told in the radio, that money to built our houses was being distributed. We did not get a single cent and God knows who got it".

(c). "I am a poor farmer without any support from politicians or officers. In order to get my land, I had to work in this project for more than one year as a labourer, apart from the ordinary qualifications in order to get a land. Finally, I got a piece of land, but it has no top soil. (The lands were bulldozed in order to level them and to supply irrigation.) However, there are people who got the best lands, and I have never seen them working in this project before. They are the friends of

politicians and officers. *Mahaththayo,* even God does not see these crimes liable to be lightened and thundered".

(d). "We were asked to cultivate in October 1987. We cultivated according to the officers' instructions. While our paddy cultivation was growing, our water supply was stopped. The officers told us that terrorists have threatened them with bursting the dam of the tank. Therefore, they had opened the gates and emptied the tank. All these are rumours, but we are the sufferers. The officers have everything. Therefore, whether the tank is empty or not it has nothing to do with their life style; they are safe. We can only curse them and tell the Gods all these cruelties, even though this does not help to put out the fire in the stomach".

(e). "By now, I have virtually no income. The only support I receive for my life is the drought relief. It provides rice, lentil and dried fish. Can one survive with these alone? People who govern the country think we have no other necessities. For themselves, everything is necessary. I have seen the life of political leaders and high ranking officers. I do not expect to have a such a life. But I think, we poor must also be given at least very basic human necessities".

Appendix J: (c)

During the south west monsoon rainy season in Sri Lanka in 1988 there were heavy floods in the Wet Zone. In some of these floods, hundreds of people died and tens of thousands were deprived of their homes and finally became as refugees. Therefore, thousands of people had to live in refugee camps losing many of their possessions. Before this, in the same year there were floods in Kartoom in Sudan and in Bangladesh and thousands of people had to suffer there as well. In these two cases, the Sudanese ambassador as well as the Bangladeshi ambassador in Britain appealed to people in Britain via television to help their countries so that they could rehabilitate the areas devastated by floods. In the Sri Lankan case, our ambassador made no attempts to request the help of British people. However, having lived with devastating floods and suffering hunger as a result of floods, I know how difficult the life of the victims is. I thought that the Sri Lankan ambassador might have arranged some other activity to help the Sri Lankan flood victims because he did not ask help through television. Since I wanted to send

some money for the rehabilitation activities of the flood affected area in Sri Lanka, I telephoned the Sri Lankan embassy to find out a way to send some money. A lady which was answering my call told me that there was no arrangement from the embassy. I told the reason for my enquiry that I was doing a research about natural hazards in Sri Lanka, and that I wanted to help the flood victims. She told me that the ambassador was not there but that she would inform him when he is back and took my telephone number. On the same day, in the evening (at about 4.00 p.m.) the Sri Lankan ambassador rang me. I asked him how serious the floods were and he answered that he still did not get the exact figures but that a number of people had died, and tens of thousands of people had lost their homes. I told him I wanted to send some money to the rehabilitation activities in the country and asked him how I could do it. He answered that there was no arrangement, but if I wanted he could open an account in the bank and can give me the account number. I was amazed by his irresponsible manner while he immediately changed the subject. He started to talk about cricket and told that Sri Lankan players is going to play a cricket match somewhere in England (I do not remeber the place) and I was asked to come to watch the match. With this he stopped the conversation. Afterwards, I started to reflect upon our cultural traits, and remembered that we used to have a very strong sense of social responsibility when people had to face hazards which created deaths and homelessness for many members of the country. I also remembered that on this type of occasions, we did not have any kind of discrimination either. I finally started to contemplate whether we can develop or achieve anything to help many deprived millions in the country while they are being governed by this type of people.

Appendix J: (d)

I went to one of the Dry Zone villages with the University students in order to renovate a village tank. This village is situated in the Anamaduva electorate. When I talked with the local people and asked their names I was astonished when they told me some of their names. I had never heard such names before, but finally, I found out the reason of their origin. The villagers are considered as low caste. Every time a baby was born, the parents registered the birth giving the baby

a beautiful and meaningful name. The registrar post is held by an aristocratic family member, considered as high caste in this area. But this family maintained a situation under which not to allow others, especially the poor and the so-called low caste people to live with dignity. Therefore, when the parents named their children with the names they had chosen, the registrar recorded them on a piece of paper, but wrote a disgraceful name in the real register. The existing system does not issue a birth certificate on the spot as in Britain when the birth is registered. By the time the child reaches school going age, their parents want to have the birth certificate of the child in order to send them to school. Otherwise they need not to have the birth certificate at all. Then immediately they realize that the name they gave their child was not in the birth certificate. If they named the boy *Kirthi* (*Sinhalese* meaning goodwill), in the birth certificate, his name now is black ant (black ant, red ant, white ant, and most other animal names are very disgraceful according to our culture). Therefore, right from their birth, these villagers are being suppressed, disgraced and deprived by powerful people with feudal values. An article about the traditional agriculture in Sri Lanka by Goldsmith & Hildyard (reference in chapter VII) gives an example of the keenness of the leaders to solve the problems related to agriculture in the country. He also used anecdotal evidence, in that a cousin brother of the Prime Minister in Sri Lanka from 1965 to 1970 has visited rural areas and saw that the paddy fields are full with weeds. He was said to be shocked by this scene. Therefore, he advised his cousin brother (Prime Minister) to mobilize the school children to weed the paddy fields after school (the normal school time those days was from 7.30 a.m to 1.30 pm). The head masters of the schools were instructed to send the students to transplant and weed the paddy fields in the area. At that time, I was in secondary school. We were also sent but only to the paddy fields belonging to rich families in the area but not to the needy poor farmers' lands. (It is better to explain how I studied in school in order to clarify the picture of village life. Already, I explained that I was a farmer cum student. From my village to secondary school I had to walk three miles. I had to get up very early in the morning and had to help to milk. And then I brought the curd we made to the market. The normal weight of the load of curd was about 15 kgs. After I had finished all these activities and came to the classroom, many days I was late, and the teacher had already arrived to the classroom and started first lesson. Coming late is a punishable offence, and

therefore, I was sent to the principal. The principal never ever asked me why I was late and I did not tell him either. According to our present system treatment is for the outcome, and not for the root of the problem. In our school we had only the basic facilities, and all the students came from the surrounding villages from ordinary families. This is the background of the many students and the shools in the country apart from a handful of schools for the members of the privileged families.) We were instructed to go to the paddy fields of the previleged families in our village areas for the uprooting of paddy seedlings from the nurseries, and for transplanting and later for weeding the paddy fields. Normally, we had our breakfast at home, for the interval, a bun was provided from the school for each student which was impossible to eat because of its appalling smell. Therefore, most of us threw it away or played making balls. In the days we had to go to do the agricultural work after school I have never had a meal from the people we had to work for free. All despite the fact that we had to work without a meal, in the middle of the day when temperatures were also particularly high and we had to do these things in a very inhuman way. This situation was very similar in character to the now abolished *rajakariya* system. Here it was also the ordinary people who had to do the work, while the village headman and other priviledged people were free from *rajakariya* duties. Likewise, while we village school students were weeding and planting the paddy fields under the burning sun without having a meal, the students in the privileged colleges practised cricket having the blessings of all the powerful people. Furthermore, some of my school mates had only one shirt and a short as their school uniform. When we have to work in the paddy fields, our uniform became dirty and mud stained. Therefore, when these were washed in the evening, in the following day, students who had only one uniform could not come to the school. Therefore, whoever, worked against the feudal *rajakariya* system was correct and did a wholesome act for millions of people. Unfortunately, the researchers who have predetermined conceptions cannot see these things and talk and write only considering seeming actions as absolute phenomenon. One can observe, however, that the same as has been described above in the anecdotes, happens in Sri Lanka at large, at the present, in that, we inherit a democratic system which is run by people without democratic minds, but minds which are full of feudal values and motives leading to unavoidable hazardousness. There is a free education system in the country. This was also initiated by the British

imperial rulers while the party and those people who proposed the mobilization of school children in the above case were working dead against for the free education system in the country. (Unfortunately, I have not the time and the documents at hand to quote what Council Members of this group said in the State Council in the debates over granting free education). The minister of education under the British rule who granted free education came from the electorate where my village is located. Even now, the highest and the most important political achievement for the ordinary people in the country lies with the granting of free education. However, even though this act was so virtuous and wholesome, this great and most compassionate statesman who offered us free education, and thereby, made us see the world, the Honourable Mr. C.W.W. Kannangara was defeated in the the State Council election by the feudals using their power in order to rig and buy votes. These undemocratic and feudal values within the country stem mostly from south Indian Hindu influences from the 14th century A.D.. According to Buddhist tradition, which was once the core of Sri Lankan traditional philosophy, democracy is fundamental on every level of social interaction be it within the family, the regional, national, or international level. Therefore, the period when the country was governed according to this tradition during the Anuradhapura Era (up to 11th century A.D.) is still considered as the golden era of the country. Still, there are people who blame the British rulers for granting free education. I have noticed this fact in Sri Lanka as well as among some Sri Lankans in this country who are full with hazardous feudal values and attitudes. For all the reasons mentioned in the above anecdotes it is therefore neither reasonable nor helpful to blame British colonial rule for the growing hazardousness in Sri Lanka. Sri Lanka obtained its independence 43 years ago in 1948. In this context, it would also be fair to ask if the British had made mistakes during their reign which hindered our development, would a period of 43 years have been too short in order to reverse their mistakes. (It is better to remember that the Germans and Japanese have taken the same period to bring their devastated countries to the present state after the Second World War. An another difference is that Sri Lankans inherited an economy with strong annual budget surplus from British while Germans and Japanese started with ash, debris and debts.) In this place, I would like to quote another powerful saying which is used by the village community and which shows that if we want to solve the problems or to be productive we have to deal with the real causes

of the problems but not the mentally created projections as causes which end up deceiving everybody making a hazardous environment. That is, "*there is no way to intercourse using testicles hiding the penis*".

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Introduction

The heroic efforts of the people of Ruhuna to increase national output are indeed praiseworthy especially as they are making the efforts in the midst of an arid and hostile environment. There is no doubt at all that given the requisite facilities, they are capable of contributing immensely to the task of bringing prosperity to Sri Lanka.

The region which today languishes in a state of under-development was in ancient times the centre of a flourishing civilization. It was in this region that great kingdoms such as *"Magama"* and *"Dolosdahasrata"* had emerged. Historical evidence reveals that the region in that age was blessed with fertile fields, a stupendous irrigation network and outstanding religious edificies.

This region which had enjoyed such greatness witnessed a rapid decline during the dark ages of the nation's history. As a result of being subjected to innumerable hardships and problems the region is today admittedly, one of the most backward districts of the Island.

Though abandoned today as a backward, it should not be forgotten that this region has claims to rich resources and therefore has great potential for future development.

The Government has already launched a number of projects within the region which will no doubt help to uplift the conditions of the people of Ruhuna and bring back the glories of ancient "Magama". Moreover, this region has been made the focal point of a series of social studies, surveys and researches which will greatly facilitate its future development. A number of local as well as foreign organisations are presently engaged in this task.

The need to publish a comprehensive book to provide basic information on the Hambantota District which could form the basis for such studies has been felt for some time.

It is to fulfil the above need that we have now taken steps to publish this book about the District of Hambantota.

I am sure that this publication will prove useful to regional planners, those engaged in special studies about the District, school students and to other scholars.

I express my sincere gratitude to NORAD who financed the publication of this book and to Mr. Ranjith Samaranayake, Assistant Director of this Ministry, the author of this volume, and also to all those who assisted in making this publication a success.

Dr. Wickrema Weerasooria

Secretary,
Ministry of Plan Implementation,
Colombo 01.

Towards the end of July 1975, just before leaving Colombo to take up my first appointment at the Government Agent's Office, Hambantota, I called at the Lake House to bid farewell to the then Deputy Editor of "The Observer", who was well known to me.

He congratulated me on my new appointment and in the course of the conversation that followed he pointed out the need to publish a book about Ruhuna and prayed that I might be able to fulfil that need.

I consider it a great privilege indeed to have been able to fulfil that desire within a few years.

The Hambantota District is really an administrative division that was originally carved out by the British nearly two centuries ago. This area has, to date, continued as a District within the framework of the provincial administration. There are several factors which make the Hambantota District unique among the administrative districts of the Island.

The territory that comes under the Hambantota District is regarded as one of the cradles of the civilization of the Sinhala people. Its history can be traced right back to the very beginning of the nation. Kingdoms such as *'Magama', 'Tissa'* and *'Dolosdahasrata'* which reached the zenith of ancient civilization emerged within its boundaries.

The Hambantota District possesses a wealth of fauna and flora. Some of Sri Lanka's very rare species of birds, insects and other type of creatures were first found within this District. A number of very rare and valuable herbs of great medicinal value in indigenous medicine too have been discovered in the forests here.

It is within the sea beloning to this District that the two world famous lighthouses known as the **'Great Basses'** and the **'Little Basses'** are located.

Kirinda, which is so famous among foreigners, the magnificent **Yala National Park** as well as some of the most attractive sea beaches are also to be found within this District. A number of world acclaimed award winning cinematic works such as **"Beneath the Seas of Ceylon"** and **"The Living Wild"** which depict Sri Lanka were filmed on locations within the Hambantota District.

The world's first Rural Energy Centre which was sponsored by the UNEP too is located in a village belonging to the District.

The renowned Ruhuna curd and Hambantota salt are two of the main products of this region.

A number of the most important development projects of the Island too are being implemented within the Hambantota District.

This region was the background to a number of world famous literary works such as **"The Village in the Jungle"** and **"Under the Palm Grooves"**. This region also produced a significant generation of writers, artists and craftsmen who enrich not only the Matara Period of the Sinhala Literature, but also the different branches of arts such as low country dancing and the Ruhuna tradition of art and sculpture.

ප්‍රස්තාවනාව

හම්බන්තොට දිසාපති කාර්යාලයේ **පත්වීමක්** ලැබූ මා එවකට **ඔබ්සර්වර්** පුවත්පතේ නියෝජ්‍ය කර්තෘ-ධූරය දැරූ හිතවතකුගෙන් සමුගැනීමට 1975 ජූලි මස අග භාගයේ දිනයක ඔහුගේ කන්තෝරුවට ගියෙමි.

මගේ පත්වීම පිළිබඳව ඇසූ ඔහු තම සතුට ප්‍රකාශ කළේය. තවදුරටත් මා සමග පිළිසඳරට වැටුන ඔහු, රුහුණු පිළිබඳව කෘතියක් පළකිරීමේ වැදගත්කම පෙන්වා දුන් අතර, එවැන්නක් කරලීමට මට හැකියාවක් ලැබේවායි ප්‍රාර්ථනා කළේය.

මෙම **සිද්ධියෙන්** වසර කිහිපයකට පසුව, ඒ අදහස මුදුන්පත් කරගැනීමට හැකිවීම භාග්‍යයක් **ලෙස** සලකමි.

හම්බන්තොට දිස්ත්‍රික්කයට අයත්වන බිම් තීරය මීට සියවස් දෙකකට ආසන්න කාලයකට ඉහතදී බ්‍රිතාන්‍ය පාලකයන් විසින් ඇති කරන ලද පරිපාලන බෙදීමකි. එතැන්සිට අද දක්වාම මේ ප්‍රදේශය රටේ ප්‍රාදේශීය පරිපාලන රටාවේ එක් දිස්ත්‍රික්කයක් වශයෙන් පැවත ආවේය. කරුණු කිහිපයක්ම අනුව හම්බන්-තොට, දිවයිනේ සෙසු දිස්ත්‍රික්ක අතර විශේෂත්වයක් දරණ බැව් පෙනේ.

හම්බන්තොට දිස්ත්‍රික්කයට අයත්වන බිම් ඉසව්ව සිංහල **සංස්කෘතියේ** හා සභ්‍යත්වයේ මූලාරම්භක පියෙසක් වශයෙන් සැලකේ. හෙළ වංශකථාව තරමටම පැරණි ඉතිහාසයකට මේ ප්‍රදේශය උරුමකම් කියයි. **'මාගම'**,**'තිස්ස'**,**'දොළොස්දහස් රට'** වැනි සවිසිරියෙන් ඉසුරුමත් වූ රජදහන් මෙම පියෙසෙහි ගොඩ නැගුනි.

හම්බන්තොට දිස්ත්‍රික්කය සත්ව හා ශාක සම්පතින් පොහොසත් ප්‍රදේශයකි. මෙරට දක්නට ලැබෙන බෙහෙවින් දුර්ලභ ගණයට අයත් කෘමී, පක්ෂි හා වෙනත් ප්‍රාණීන් වර්ග, හම්බන්තොට දිස්ත්‍රික්කයෙන් පමණක් මුල්වරට සොයා ගෙන ඇත. ආයුර්වේද වෛද්‍ය විද්‍යාවේ වැදගත්වන දුර්ලභ බෙහෙත් පැලැටි කිහිපයක්ම මේ ප්‍රදේශයේ වනාන්තරවලින් හමුවී තිබේ.

'ශ්‍රේට්බාසස්' (මහරාවණ කොටුව) **'ලිට්ල් බාසස්'** (කුඩා රාවණ කොටුව) යන නම්වලින් සුපතළ වූ ලොව විශ්මයජනක ප්‍රදීපාගාර දෙක පිහිටියේ ද, මෙම දිස්ත්‍රික්කයට අයත් මුහුදු ඉසව්වෙහිය.

විදේශීන් අතර පරසිදුකිරින්ද, ප්‍රදේශයේ මනස්කාන්ත මුහුදු ලෝකයත්, දැකුම් කළු යාල ජාතික උද්‍යාන-යත් අයත් වන්නේ මෙම ප්‍රදේශයටය. බටහිර ලෝකයේ බෙහෙවින්ම ජනාදරයට පත්වූ **'Beneath the Seas of Ceylon'**, **'The Living Wild'** වැනි ශ්‍රී ලංකාව පිළිබඳව විස්තර වන සම්මානනීය සිනමා කෘතීන්ට විෂය ගතවී ඇත්තේ ද මෙම ප්‍රදේශයයි.

එක්සත් ජාතීන්ගේ පරිසරාත්මක වැඩ සටහන මගින් ඇතිකළ ලෝකයේ මුල්ම බහු බල ශක්ති මධ්‍යස්-ථානය දක්නට ලැබෙන්නේ ද, මේ දිස්ත්‍රික්කයට අයත් ගම්මානයකය.

සුපතළ නමක් ගත් රුහුණේ ප්‍රණීත කිරිපැනි හා හම්බන්තොට ලුණු මේ ප්‍රදේශයේ ප්‍රධාන තම නිෂ්පාදන-යන්ගෙන් සමහරකි.

දිවයිනේ ප්‍රධානතම සංවර්ධන ව්‍යාපාර රැසක්ම දක්නට ඇත්තේ ද, මේ ප්‍රදේශයෙහිය.

විශ්ව සාහිත්‍යයේ ප්‍රකට වූ **'The Village in the Jungle'**, **'Under the Palm Grooves'** වැනි කලාත්මක සාහිත්‍ය නිර්මාණ මෙම ප්‍රදේශය පසුබිම් කොට ලියැවී තිබේ. පහත රට නැටුම් කලාව, මාතර සාහිත්‍ය වංශය, රුහුණු කැටයම් හා ප්‍රතිමා කලාව පෝෂණය කිරීමෙහි ලා විශිෂ්ඨ සේවාවක් කළ කලා පරපුරක් මේ ප්‍රදේශ-යෙන් බිහිවිය.

හම්බන්තොට දිස්ත්‍රික්කයට විශේෂත්වයක් ලැබෙන මෙවැනි වැදගත් කරුණු පිළිබඳව පාඨකයනට වැටහීමක් ලබාදීම මෙම ග්‍රන්ථය පළකිරීමේ එක් අරමුණකි.

රුහුණු ජනතාව අතර ප්‍රචලිත දැනට වැළලී යන ජනප්‍රවාද, ඉතිහාසගත තොරතුරු ලේඛනගත කිරීම මෙම ග්‍රන්ථ කරණයේ තවත් අරමුණකි.

ප්‍රදේශයෙහි පන ගැන්වී ඇත. මීට පෙරදාක නොවූ විරූ තරම් සංවර්ධන ව්‍යාපාර රැසක් මේ කලාපයෙහි අරඹා තිබේ. විවිධ ආර්ථික, සාමාජික, සංස්කෘතික සමීක්ෂණ හා අධ්‍යයන මාලාවකට මෙම පියෙස විෂයගත වී ඇත. ප්‍රදේශයේ ආර්ථික සංවර්ධන සැලසුම් සම්පාදනයටත්, සංවර්ධන උපාය මාර්ග මෙහෙයවීමටත්, විවිධ සමීක්ෂණ හා පර්යේෂණ පැවැත්වීමට අවශ්‍ය වන මූලික විස්තර හා සංඛ්‍යාලේඛන ලබා ගැනීමටත් අවකාශයක් සැලසීම මෙම ග්‍රන්ථය සම්පාදනය කිරීමේ තවත් වැදගත් පරමාර්ථයකි.

හම්බන්තොට දිස්ත්‍රික්කය පිළිබඳ භෞතික, ඓතිහාසික, ආර්ථික, සාමාජික හා සංස්කෘතික තොරතුරු මෙම ග්‍රන්ථයෙහි අන්තර්ගත වේ. රුහුණේ ඉතිහාසය පිළිබඳ විවාදයට පත් තොරතුරු ඒ ආකාරයෙන්ම ග්‍රන්ථයෙහි සඳහන් වේ.

මෙවැනි මහඟු කටයුත්තකට මා මෙහෙයවූ සැලසුම් ක්‍රියාත්මක කිරීමේ අමාත්‍යාංශයේ ලේකම් ආචාර්ය **වික්‍රම විරසූරිය** මැතිතුමන්ට මෙම ග්‍රන්ථය එළිදැක්වීමේ ගෞරවය හිමි වේ. මේ කාර්‍යයට අවශ්‍ය පහසුකම් සලසා දී මා දෛර්‍යවත් කළ ප්‍රාදේශීය සංවර්ධන අධ්‍යක්ෂ **කේ. පී. ජී. ඇම්. පෙරේරා** හා හම්බන්තොට මහ දිසාපති **ක්‍රිස්ටි සිල්වා** මහතුන්ද කෘතඥතා පූර්වකව සිහිපත් කරමි.

ග්‍රන්ථය සම්පාදනය කිරීමේදී විටින්විට මා වෙත උපදෙස් දුන් ලෝපතළ විද්‍යාඥයකු හා විද්‍යා ප්‍රබන්ධ ලේඛකයකු වන, මොරටුව විශ්ව විද්‍යාලයේ කුලපති **ආතර් සී. ක්ලාක්**, බෞද්ධ විශ්ව කෝෂයේ ප්‍රධාන සංස්කාරක **මහාචාර්‍ය ඩී. ඊ. හෙට්ටිආරච්චි** ජාතික ලේඛනාරක්ෂක දෙපාර්තමේන්තුවේ සහකාර අධ්‍යක්ෂ **කේ. ටී. ජී. විමලරත්න** මහතුනට මගේ හෘදයාංගම ස්තුතිය පුද කරමි.

හම්බන්තොට දිස්ත්‍රික්කයේ අප්‍රකට තොරතුරු රැසක් මට හෙළි කළ අනුරපුර බුද්ධ ශ්‍රාවක ධර්ම පීඨයේ හිටපු මහාචාර්‍ය නාකුළුගමුවේ ජයතිලකාරාමාධිපති පූජ්‍ය සිනිපැල්ලේ **ඉන්ද්‍රවංශ නාහිමියන්**, බ්‍රිතාන්‍ය යුගයේ අග භාගයේදී හම්බන්තොට කුවේරියේ කාර්‍යාල සහකාර ධූරය දැරූ ලංකාවේ යටත් විජිතවාදී යුගය පිළිබඳ විද්‍යාර්ථියකු හා ලේඛකයකු වන **වර්නන් ක්ලාස්**, වන සත්ව සංරක්ෂක දෙපාර්තමේන්තුවේ සහකාර අධ්‍යක්ෂ, **විල්ඩර්ස් ජයවර්ධන**, පහත රට නැටුම් කලාව පිළිබඳ සුප්‍රකට කලාගුරු තංගල්ලේ **සවරිස් සිල්වා** මහතුන්ද, හම්බන්තොට දිස්ත්‍රික්කය පිළිබඳව ලියැවුණ දුලබ පොත්පත් හා ලිපි ලේඛන රැසක් මා වෙත සපයා දුන් හම්බන්තොට පදිංචි **දොස්තර එම්. සී. බුල්ජන්ස්** හා **මැක්සි අන්ද්‍රාදෝ**මහතුන්ද ස්තුති පූර්වකව සඳහන් කරමි.

මේහි ඇතුළත් වන වටිනා ඡායාරූප ලබාදුන් ප්‍රවෘත්ති දෙපාර්තමේන්තුවේ ප්‍රධාන ඡායාරූප ශිල්පී **ඩී. ඩී. පෙරේරා**, රජයේ චිත්‍රපට ආයතනයේ කැමරා ශිල්පී **කීර්ති ශ්‍රී. පෙරේරා**, වන සත්ව සංරක්ෂණ අධ්‍යක්ෂ **ලින් ද අල්විස්**, එක්සත් ජාතීන්ගේ ළමා අරමුදලේ ආචාර්‍ය **ඇල්. ටැල්බට්, මැක්ස් හෙම්පල්**, මයික් **විල්සන්** මහතුන්ටත්, ගුවන් ඡායාරූප සපයාදුන් ලංකා ගුවන් හමුදාවේ පියසර අණදෙන නිළධාරී, **ඒ. බී. සූසා**, කපිතන් **ඒ. ඩබ්ලිව්. ප්‍රනාන්දු**, ලයිතන් **ජේ. රණසිංහ** මහතුන්ටත් පුරාවිද්‍යා දෙපාර්තමේන්තුවටත් මගේ කෘතඥතාවය පළ කරමි.

ග්‍රන්ථය සම්පාදනය කිරීමේදී මතු වූ ගැටළු තැන් විසඳාලමින් වටිනා උපදෙස් රැසක් දුන් හම්බන්තොට දිසාපති කාර්‍යාලයේ ක්‍රම සම්පාදන අංශයේ නියෝජ්‍ය අධ්‍යක්ෂ ඩබ්ලිව්. එම්. ලීලසේනමහතාටත්, ප්‍රයෝජනවත් සංඛ්‍යා ලේඛන වාර්තා හා වගු පිළියෙල කරදීමෙන් මාහැඟි සහයෝගයක් පිරිනැමූ හම්බන්තොට සංඛ්‍යාලේඛන නිළධාරිණී. ඒ. සී. ජයසිංහමහතා ඇතුළු එම කාර්‍ය මණ්ඩලයටත්, මහත් උත්සාහයකින් හා උනන්දුවකින් සිතියම් නිර්මාණය කළ සංවර්ධන නිලධාරී, **එස්. එන්. රත්නදාස, ජීනදාස ජායිංහාරච්චි** හා විවිධ විද්‍යාර්ථීන් සමග සාකච්ඡා පවත්වා වැදගත් තොරතුරු රැසක් සපයාදුන් **ගාමිණී සුමනසිල** මහතුන්ටත්, අවශ්‍ය වූ ලියකියවිලි හා පොත්පත් සපයාදුන් ලේඛනාගාරයේ කාර්‍ය මණ්ඩලයටත්, ග්‍රන්ථය එළි දැක්වීමට විවිධාකාරයෙන් උපකාර කළ සමාජ සේවා සහකාර අධ්‍යක්ෂ **එම්. පී. ගමගේ**, හම්බන්තොට උප දිසාපති **ගාමිණී රුදිගු**, කාර්‍යාල සහකාර **ඩී. ඩී. ඇම්. දිසානායක, සෝමපාල නාකන්දල, ඒ. සී. එම්. නිශාම්, මහින්ද දිසානායක**,