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EL-MARJ PLAIN, A GEOGRAPHICAL

STUDY

By

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Thesis submitted for the degree of
Doctor of Philosophy in The University
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Abstract"El-Marj Plain, A Geographical Study"

El-Marj Plain is a closed depression on the upper terrace of the Jebel Akhdar of Cyrenaica. It is the largest karstic basin in the whole of Cyrenaica. The Plain has a subvalley shape with a total area of about 1,100 sq.km. Most of the Arable land is located between 278 and 300 m. above sea-level. The escarpments to the north and the south of the Plain are dissected by numerous wadis making the extension of the road system an expensive task. The water flows in the wadis during the winter and either reaches the sea or disappears into the pervious limestones without being utilised by man. Geologically, the most extensive strata are the Middle Eocene. Rainfall is the main fundamental factor in El-Marj Plain since dry farming is practised there, and there are no means of irrigation except on the coastal plain. El-Marj Plain receives an annual rainfall average varying between 300 and 500 mm. However, the rainfall is erratic both in quantity and distribution. The rather high average of rainfall, topography and heavy Terra Rossa soils determine the vegetation cover in the region. The flora of the Plain is related more to the Maghreb and southern Europe than to the rest of Libya. Shortage of water and soil erosion are the main physical obstacles to economic development. The underground water in El-Marj Plain is contained chiefly in fractures, bedding planes and solution

opening in the limestone country rock. The Terra Rossa soils in El-Marj Plain are quite deep and provide an adequate rooting medium for plants and the limitations found are not so much inherent as related to the system of management. There is no pedalogical reason to suppose that under a good management system the soils of El-Marj Plain should not prove particularly fertile. The long history of the region shows that it was subjected to the invasions of the Greeks, Romans, Arabs, Turks and Italians. The invasion of Bani Sulaim tribally organised nomads in the eleventh century brought an end to a long period of sedentary life. After a long period of stagnation the Italians planned for a demographic colonisation, but this had come to an end in 1943 and the Bedouin again regained the control of the whole of Cyrenaica.

El-Marj Plain's principle natural resource is agriculture and raising livestock. The main crops are barley and wheat followed by olives, almonds and vines. Vegetables are grown in the area on only a small scale. Livestock production in the area probably accounts for a greater value than crop production in most years. After the discovery of oil and the rapid increase in production, capital has become available for economic development. Consequently, the Libyan Government has planned to settle the Bedouin who occupied the former Italian farms. The highly favourable terms offered by the N.A.S.A. scheme for

re-settlement taken along with a powerful internal trend towards sedentary life appears to give grounds for optimism. The total population of El-Marj Plain and the adjacent administrative units is 39,867 (1964). The only urban centre in the region is El-Marj town, which was struck by an earthquake in 1963. A new town will be built to replace the destroyed centre.

<u>CONTENTS</u>	<u>PAGE</u>
PREFACE	III
LIST OF FIGURES	IX
LIST OF PLATES	XIII
LIST OF TABLES	XVI
LIST OF APPENDICES	XXII
INTRODUCTION	1

PART ONE

Chapter I	Relief and Land Forms	15
Chapter II	Geology	51
Chapter III	Climate	74
Chapter IV	Vegetation	115
Chapter V	Water Resources	132
Chapter VI	Soils	155

PART TWO

Chapter VII	Historical Background (Through Land Use)	181
Chapter VIII	Land Use:-	201
	Land Tenure	206
	Sedentary Agriculture	214
	Livestock	294
	Shifting Cultivation	307

		<u>page</u>
Chapter VIII	Land Use:- (Cont)	
	Nomadism	310
	Agricultural Development and Settlement Scheme.	317

PART THREE

Chapter IX	Background of Social Organisation	341
Chapter X	Population	380
Chapter XI	A - Settlement	430
	B - Impact of Oil	461
Chapter XII	Conclusions	477
Appendices		481
Glossary		513
Cyrenaican Place-names frequently mentioned in the text		515
A Selected Bibliography		516
Amendment		523

III

Preface

After the author had completed an earlier study on "the Geography of the Eastern Jebel Akhdar, Cyrenaica" he realised the potentialities of El-Marj Plain as a field for another study for four reasons. First, El-Marj Plain can be considered as having the largest scope for agricultural extension in Cyrenaica and perhaps in the whole of Libya. Secondly, the need for a study of the present state of the Italian concessions and the former Ente farms run today by Libyans. Thirdly, after the discovery of oil and the rapid rise in production, the Libyan Government allocated large sums of money for economic development and El-Marj is one of the few regions in which capital can be invested. Fourthly, in Cyrenaica little geographical research work has been done and further work is desirable.

There have been many difficulties to overcome. First, the statistics are not reliable and do not cover a long period. Secondly, the administrative boundaries are, as frequently happens, not suitable for geographical analysis, thus statistics usually have been given to cover the whole Mutasarrifia of El-Marj; even more the statistics which cover the sub-district of El-Marj include areas outside El-Marj Plain and vice versa. Thirdly, an earthquake struck the town of El-Marj during the field work, many official documents were lost and accommodation became unavailable in the urban centre.

IV

The field work was carried out from October 1962 to September 1963. At first the town of El-Marj had been taken as a centre of the field work. After the earthquake, a daily journey was made between Benghazi and El-Marj. Two months were spent in Tripoli working on the Italian literature and collecting statistics. I came to Durham in October, 1963.

The Libyan Government decided to build a new town to replace the destroyed centre, consequently another trip was made between July and September, 1963 to investigate on the spot the works on the new town, and to obtain detailed information on the newly set up National Agricultural Settlement Authority.

I am most grateful to many people in Cyrenaica and Tripolitania who have shown an active interest in my work. I am greatly indebted to Essayid Abdullah Al-Guairi, the Director of Ministry of State, El-Beida for the provision of valuable information and maps, and to Ess. Mansur Breighith, Assistant Director of Zorda Experimental Station, El-Marj, Ess. Abdulgader Al-Aish, court of El-Marj, and Ess. Abdulsalam Es-Sguri, secretary of the Mutasarrifia of El-Marj for helping me to work out the land use maps for certain farms in El-Marj and in conducting the investigation survey in the town and the Mutasarrifia of El-Marj. Among many who helped and advised me I would especially like to thank the

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LIST OF MAPS, DIAGRAMS AND GRAPHS

- Figure 1. The Position of the Jebel Akhdar.
- Figure 2. Topography of Northern Cyrenaica
- Figure 3. The Physiographic Regions of El-Marj Plain and The Adjacent Areas.
- Figure 4. Contour Map of El-Marj Plain and The Adjacent Areas.
- Figure 5. Levels of The Upper Shoreline and The Spring-farming Marl.
- Figure 6. Karstic Basins of Brac Nataa North East of El-Marj.
- Figure 7. Distribution of Dolines and Cavities in El-Marj Plain and the Adjacent Areas.
- Figure 8. Karstic Basins at the East of El-Marj Plain.
- Figure 9. Wadi System of El-Marj Plain and the Adjacent Areas.
- Figure 10. General Geological Columns, Northern Libya.
- Figure 11. Geology of North Eastern Cyrenaica.
- Figure 12. Structural Map of North Eastern Cyrenaica.
- Figure 13. A General Tectonic Section Across the Jebel From Heiraul El-Agaba to Tobra.
- Figure 14. Oil Discoveries in Libya, by July 1964.
- Figure 15. Main Tracks along which Air Masses enter the Eastern Mediterranean.
- Figure 16. Monthly Temperature 1934, El-Marj, Jardas El-Abid and Tulmeitha.
- Figure 17. Mean Daily Range of Temperatures at El-Marj (1934)
- Figure 18. Annual Average Rainfall Distribution in Northern Cyrenaica.
- Figure 19. A Profile of Rainfall in Relation to Relief

Between Tulmeitha, El-Marj and Jardas El-Abid.

- Figure 20. A Profile in Relation to Relief Between Tocra, Cyrene and Derna.
- Figure 21. A Profile of Rainfall in Relation to Relief Between Benghazi, Tacnis, Khawlan and Timimi.
- Figure 22. Annual Isohets in The El-Marj Area.
- Figure 23. A. Annual Rainfall Fluctuation in El-Marj.
B. Rainfall in Relation to Aridity Index in El-Marj.
B. Wind Roses for Selected Stations For El-Marj.
- Figure 24. Climatic Zones in Relation to Relief.
- Figure 25. Natural Forest of Northern Cyrenaica
- Figure 26. Dominant Forest Species of El-Marj Plain and the Adjacent Areas.
- Figure 27. Distribution of Wells, Springs and Cisterns in El-Marj Plain and The Adjacent Areas.
- Figure 28. The Main Wells in El-Marj Town and Neighbourhood.
- Figure 29. The Debussia-El-Marj Water Supply Scheme, General Plain of Pipeline Routes.
- Figure 30. Locations of Soil Profiles.
- Figure 31. The Roman Cyrenaica.
- Figure 32. Italian Colonisation in Cyrenaica.
- Figure 33. Location of Sample Farms.
- Figure 34. El-Marj Area:- Land Tenure 1938.
- Figure 35. El-Marj Area:- Land Tenure 1964.
- Figure 36. El-Marj Plain:- Land Tenure 1938.
- Figure 37. El-Marj Plain:- Land Tenure 1964.
- Figure 38. Distribution of The Ente Farms in El-Marj Plain and The Adjacent Areas.

- Figure 39. Land Use in Northern Cyrenaica.
- Figure 40. Land Use Map of El-Marj Plain and The Adjacent Areas.
- Figure 41. Wheat Scheme:- El-Marj and District, 1947 Plot Nos. and Areas.
- Figure 42. Land Use in the Ente Farm No.201 in Al-Mandi
- Figure 43. Land Use in the Ente Farm No.2, and Tribal Land in El-Ghariq Area.
- Figure 44. Land Use Map in Hifter Farm (1961 - 62).
- Figure 45. Average Costs of Production £/ha Mutasarrifia of El-Marj.
- Figure 46. Different Factors of Cost of Production in % of the Total Cost of Production in Mutasarrifia of El-Marj.
- Figure 47. Most Frequent Value of Yield in £/ha. for different Crops, Mutasarrifia of El-Marj.
- Figure 48. Pastoral Zones of El-Marj Plain and The Adjacent Areas.
- Figure 49. Distribution of Tribes and Tribal Segments in El-Marj Plain and the Adjacent Areas.
- Figure 50. Divisions of the El-Urfa Tribe (El-Marj Plain).
- Figure 51. Administrative Districts of Benghazi and Derna during the Italian Colonial Era.
- Figure 52. Approximate Administrative Boundaries of the Mutasarrifia of El-Marj.
- Figure 53. Distribution of Population in Cyrenaica, 1964.
- Figure 54. Tribal Density of population According to Ricci (1920).
- Figure 55. Distribution of Tribal Density (1954).
- Figure 56. Population Density in Cyrenaica (1964) by Mutasarrifia (Inhabited Areas only).

- Figure 57. Density of Rural Population in The Mutasarrifia of El-Marj (1964).
- Figure 58. A type of Arab Haush (House) in the Town of El-Marj.
- Figure 59. El-Marj: Land Use Map.
- Figure 60. Plan of Farzugha Village.
- Figure 61. Plan of Batta Village.
- Figure 62. Settlement in El-Marj Plain and The Adjacent Areas.
- Figure 63. El-Marj Plain: Apparent Earthquake intensity.
- Figure 64. El-Marj Town after The Earthquake.
- Figure 65. General Plan of New El-Marj Town Site.

LIST OF PLATES

- Plate 1 (A):- Wadi Bacur emerging from the first escarpment towards the Sahel (The coastal plain).
- Plate 1 (B):- El-Marj Plain looking northwards from the second escarpment. Note El-Ghariq on the right and El-Marj town in the background.
- Plate 2 (A):- Wadi El-Gattara descending from the second escarpment towards El-Marj Plain.
- Plate 2 (B):- The Gorge of Wadi Sha'aba across the crest region and the first escarpment north of El-Marj Plain.
- Plate 3 (A):- Wadi Zaza emerging from the crest region south west of El-Marj Plain towards the Sahel.
- Plate 3 (B):- Karstic phenomenon: Swallow-hole of Haua Bu Uden south east of El-Marj. Note the edge of the depression.
- Plate 4 (A):- Exposure of the Upper Cretaceous in Wadi Bacur west of El-Marj Plain.
- Plate 5 (A):- Cultivated area surrounded by maquis.
- Plate 5 (B):- Typical of maquis vegetation found in El-Marj Plain and the surrounding areas.
- Plate 6 (A):- The Debussia-El-Marj Water Supply Scheme: treatment works on the filtered water tank No.1.
- Plate 6 (B):- The Debussia - El-Marj Water Supply Scheme: Pipelaying in Wadi El-Kuf.
- Plate 7 (A):- An Ente farm house. Note the newly planted olive trees on the left and the tent and a plot cultivated with vegetables on the right.
- Plate 8 (A):- An Ente farm house in a poor state south of Farzughu. Note the cistern on the right and the maquis vegetation which occupies almost all the farm land.
- Plate 9 (A):- Mechanised farm north of El-Marj using combine harvester with the contrast with Plate 9 (B).

- Plate 9 (B):- A farm using manual labour who reap by sickle and thresh under horse's hooves.
- Plate 10 (A):- Tree plantations in the private farms south of El-Marj town. The second escarpment is in the background.
- Plate 11 (A):- El-Ghariq area: ploughing with a wooden plough for summer vegetable crop after the flood water had ceased.
- Plate 12 (A):- Cow herd grazing among the almond trees in the Cerasola (Sanusi) farm west of El-Marj town.
- Plate 13 (A):- El-Ghariq area flooded during the winter season 1962 - 63.
- Plate 14 (A):- Type of settlement: A Bedouin tent 'Beit Shta'a (winter house).
- Plate 15 (A):- Pre-fabricated school erected on the football ground south east of El-Marj town after the earthquake 1963. Note the shanties in the foreground.
- Plate 15 (B):- Type of settlement: Shanties in Algeria Quarter west of El-Marj town.
- Plate 16 (A):- The main street (Istiqlal Street) in El-Marj town in 1920 (adopted from Marinelli).
- Plate 16 (B):- Istiqlal Street in El-Marj (1962).
- Plate 17 (A):- Type of Arab houses in Dohaia El-Huria Street in Mahallah El-Gharbia, west of El-Marj.
- Plate 17 (B):- The suk (market) of El-Marj.
- Plate 18 (A):- Pavement traders and tin shops in the suk of El-Marj after the earthquake of 1963.
- Plate 18 (B):- Type of an Italian agricultural village: Farzuga.
- Plate 19 (A):- The refugee camp at the foot of the second escarpment south of El-Marj town. The camp was erected after the earthquake destroyed most of the town.

Plate 19 (B):-

Plate 20 (A):-

An Aerial view of the Mahallah Esh-Sharqia in El-Marj town which was taken the day after the earthquake hit the town. The main devastation was in the old Arab houses. Rescue vehicles can be seen in Istiqlal Street on the right of the picture. A refugee camp is being set up on the football ground at the top left.

Plate 21 (A):-

The heap of rubble stones in Mahallah Esh-Sharqia. The remain of the fallen roof consisting of wooden rafters. Note the houses of rubble stones with Terra Rossa.

Plate 21 (B):-

The Gasr built by the Turks in El-Marj Town was damaged beyond repair.

Plate 22 (A):-

Severe damage to the Icile concession houses in El-Aweliya (12 Kms. north east. of El-Marj).

Plate 22 (B):-

The damage to a wall of hollow concrete block construction of a typical low-cost dwelling house. These houses units are located in Algeria Quarter on the western fringe of the town.

Plate 23 (A):-

A pre-fabricated school on the site of the demolished Gasr.

LIST OF TABLES

- Table 1:- Mean Monthly Temperature at Selected Stations.
- Table 2:- Monthly Mean Maximum and Minimum of Temperature at Selected Stations.
- Table 3:- Mean Daily Range of Temperature at Selected Stations.
- Table 4:- Monthly Extreme Maximum and Minimum of Temperature at Selected Stations.
- Table 5:- Mean Monthly Rainfall at Selected Stations.
- Table 6:- Monthly Total of Frequency of Rainfall at Selected Stations.
- Table 7:- Pluviometric Gradient at Selected Stations.
- Table 8:- Intensity of Variability of Rainfall in El-Marj in mm.
- Table 9:- The Pluviometric Coefficient in Three Stations According to their Climatic Zones.
- Table 10:- Mean Monthly Rainfall at El-Marj, ElAweliya and Tulmeitha for 1959, 1960 and 1961 in mm.
- Table 11:- Monthly Aridity Index for El-Marj.
- Table 12:- Monthly Relative Humidity at Selected Stations.
- Table 13:- Frequency of Winds from All Directions at El-Marj in 1934.
- Table 14:- Percentage of Frequency of Winds from All Directions in Tulmeitha, Tocras and Tacnis, in 1934.
- Table 15:- The Density of Annual Growth of The Forest Species in the Jebel Akhdar.
- Table 16:- Areas of the Important Species of the Natural Forest in Cyrenaica in ha.
- Table 17:- The Total Areas of Natural and Preserved Forest, and Reafforestation in the Mutasarrifia of El-Marj in ha.
- Table 18:- Reafforestation in The Mutasarrifia of El-Marj with Types of Species (in Unit per tree planted).
- Table 19:- Locations of Soils Sites.

- Table 20:- Classifications of the Soils.
- Table 21:- Activities for Colonisation purposes of Officio Fondiario up to 1931, Areas in hectares.
- Table 22:- Colonist Houses and Families in Cyrenaica (1940).
- Table 23:- Colonist Houses and Families in El-Marj Plain and the Adjacent Areas for the period 1937 - 1940.
- Table 24:- Land Holdings in El-Marj Area in 1938.
- Table 25:- Land Holdings in El-Marj Area in 1964.
- Table 26:- Distribution of Some Types of Land Ownership in El-Marj Plain in 1938.
- Table 27:- Distribution of Some Types of Land Ownership in El-Marj Plain in 1964.
- Table 28:- Number and Area of Holdings by Types of Land Tenure in the Mudiria and The Mutasarrifia of El-Marj, Cyrenaica and Libya (in hectares).
- Table 29:- Number And Areas of the Ente and Private farms in the Mudiria and The Mutasarrifia of El-Marj (in hectares).
- Table 30:- Seed Quantities in El-Marj Plain.
- Table 31:- Utilised Land in the Mutasarrifia of El-Marj By Mudiria (1960).
- Table 31A:- Total Cultivated Land By Types of Crops in The Mutasarrifia of El-Marj by Mudiria, in Relation to Cyrenaica in 1960.
- Table 32:- Area of Cereal Cultivation in The Mutasarrifia of El-Marj By Mudiria, in Relation to Cyrenaica (1960) in ha.
- Table 33:- Wheat and Barley Production for The Mutasarrifia of El-Marj in Relation to Cyrenaica for the Period 1954-1960 (In Quintals).
- Table 34:- Cereal Production for the Mudirias of the Mutasarrifia of El-Marj by Settled and Tribal Agriculture in 1960 (in qtls.)
- Table 35:- Yields of Wheat And Barley in 1959-60 and 1960-61 in The Mutasarrifia of El-Marj.

- Table 36:- Cereal Production and Yield per Hectare in The Mutasarrifia of El-Marj by Mudiria in 1960 (In Quintals).
- Table 37:- Average Yields of Wheat and Barley in Libya And some Neighbouring Countries.
- Table 38:- The Production, Imports, Exports and Consumption of Wheat in Libya 1954-1961 (In Quintals).
- Table 39:- The Production, Imports, Exports and Consumption of Barley in Libya 1954 - 1961 (In qtls.)
- Table 40:- Yields of Chickpeas, Broadbeans and Fenugreek in The Mutasarrifia of El-Marj.
- Table 41:- Areas Sown and Production of Chickpeas and Broad beans in The Mutasarrifia of El-Marj by Mudiria (1960) (areas in hectares, and production in quintals).
- Table 42:- Production of Garden Crops in the Mutasarrifia of El-Marj by Mudiria (1960) in qtls.
- Table 43:- Area and Number of Trees in Private Concessions, Ente and Icle in Cyrenaica up to 1940.
- Table 44:- Number and Areas of Fruit Trees Planted by Ente in the Agricultural Villages in El-Marj Plain and The Adjacent Areas up to 1940.
- Table 45:- Production of Olive Trees in The Mutasarrifia of El-Marj by Mudiria, in the Ente and Private Farms, 1958-1959 (in quintals).
- Table 46:- Area, Number and Production of Olive Trees in The Mutasarrifia of El-Marj (1960).
- Table 47:- The Values of the Imports and Exports of Olive Oil in Libya for the Period 1956-62.
- Table 48:- Olive Oil Production in The Mutasarrifia of El-Marj in Relation to Cyrenaica for the Period 1955-60 in quintals.
- Table 49:- Area, Number and Production of Almond Trees in the Mutasarrifia of El-Marj (1960).
- Table 50:- Area, Number and Production of Vines in the Mutasarrifia of El-Marj in Relation to Cyrenaica (1960).

- Table 51:- Wine Production in the Mutasarrifia of El-Marj and Cyrenaica for the Period 1957 - 1959 (in tons).
- Table 52:- Number and Production of Fruit Trees in The Mutasarrifia of El-Marj (1960).
- Table 53:- Production, Area and Yields of Crops for Hifter Farm in 1960- 61, 61 - 62 and 62 - 63.
- Table 54:- Amount and Kind of Agricultural Machinery in Cyrenaica for the Period 1958-62.
- Table 55:- Use of Power in The Mutasarrifia of El-Marj by Mudiria (1960).
- Table 56:- Farm Population by Age and Sex in The Mutasarrifia of El-Marj by Mudiria (1960).
- Table 57:- Number of Livestock in Cyrenaica and the Mutasarrifia of El-Marj by Mudiria (1960).
- Table 58:- The Relation between the Number of Cattle, the Number of Population and the Area of Arable Land in the Mutasarrifia of El-Marj, Cyrenaica and Libya.
- Table 59:- The Relation between the Number of Cattle, the Number of Population and the Area of Arable Land in the North African Countries.
- Table 60:- Number of Livestock in the Mutasarrifia of El-Marj for 1954-60.
- Table 61:- Number of Sheep, Goats and Cattle exported from Cyrenaica to U.A.R. and Malta.
- Table 62:- Number of Animals killed, Meat Production and per caput in the Mutasarrifia of El-Marj for the Period 1955 - 59 and 1963.
- Table 63:- Wool Production in the Mutasarrifia of El-Marj in 1960 by Mudiria (in quintals).
- Table 64:- Settled Population, Semi-Nomads and Nomads and Percentage to total Population in Libya, Cyrenaica and the Mutasarrifia of El-Marj in 1954.
- Table 65:- Geneological Table of The El-Urfa Tribe.
- Table 66:- Population Table of the El-Urfa Tribe (1922).
- Table 67:- Population Table of the Dursa Tribe (1922).

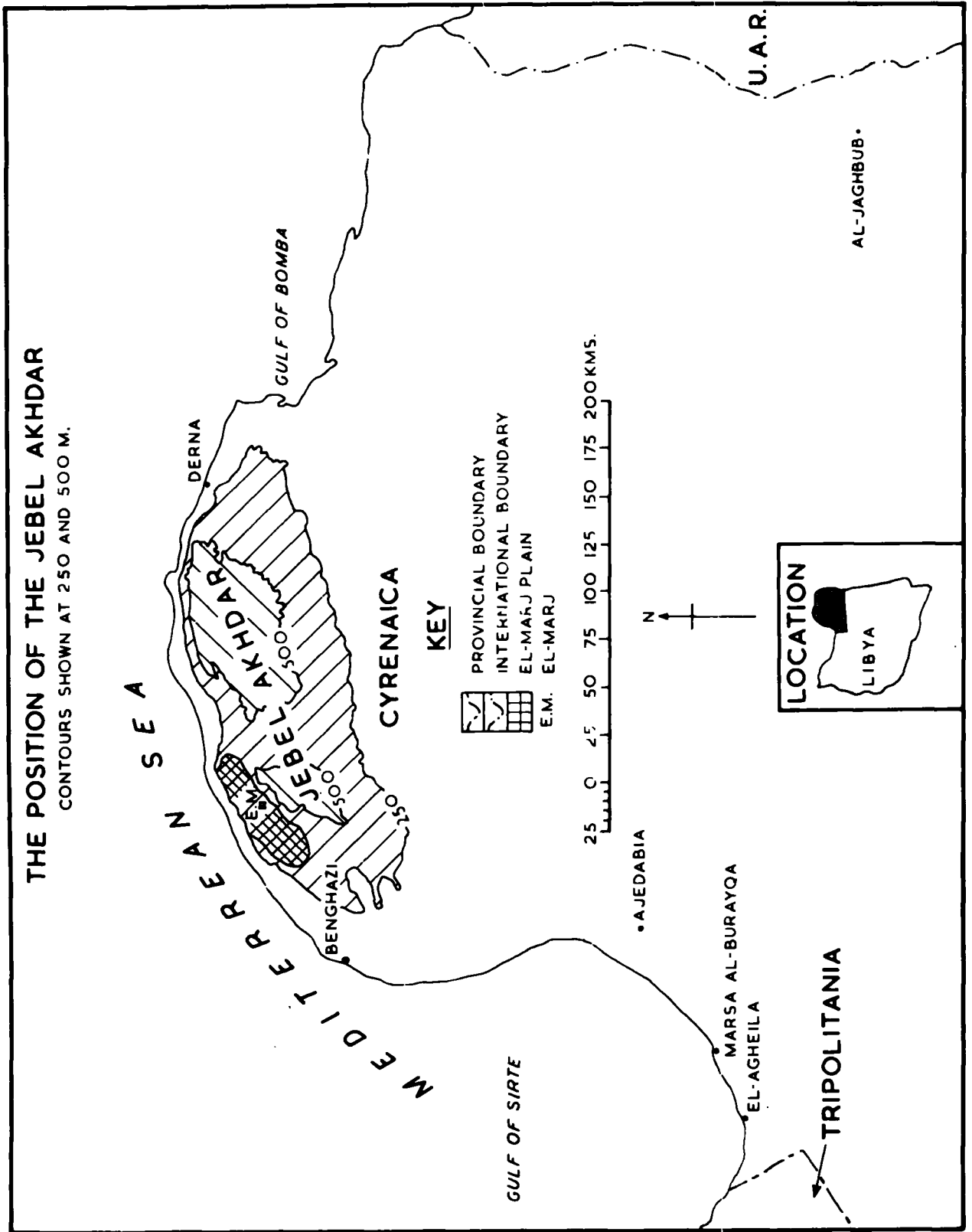
- Table 68:- Population Table of the El-Abid Tribe (1922).
- Table 69:- Population Table of the El-Auaqir Tribe (1922).
- Table 70:- Estimates of Population of Cyrenaica in the 19th Century.
- Table 71:- Native Population Estimates for Cyrenaica in the period 1911 - 1964 (Excluding Kufra).
- Table 72:- Native Population of Cyrenaica 1936, 1954 and 1964.
- Table 73:- Present Native Population in El-Marj District and Benghazi and Derna Provinces 1931 and 1963.
- Table 74:- Total Population of the Muhafadat of the Jebel Akhdar by Mutasarrifia and in the Mutasarrifia of El-Marj.
- Table 75:- Sex-Ratio of Population of the Muhafadat of the Jebel Akhdar and the Mutasarrifia of El-Marj by Mudiria in 1954 and 1964.
- Table 76:- Sex-Ratio by 10-year Age-Group in the Mutasarrifia of El-Marj in 1954.
- Table 77:- Sex-Ratio in the Mutasarrifia of El-Marj, Cyrenaica, Libya and Other Selected countries.
- Table 78:- Number of Citizen Persons in Each Age-Group as a Percentage of the total Number of All Ages in the Mutasarrifia of El-Marj, Cyrenaica and Libya in 1954.
- Table 79:- Percentages to total Population of Persons under 15 in the Mutasarrifia of El-Marj, Cyrenaica, Libya and Other Selected Countries.
- Table 80:- Population 15 years of Age and Over by Marital Status (1954).
- Table 81:- Percentages of Unmarried persons in Each Age Group in the Mutasarrifia of El-Marj in 1954.
- Table 82:- Distribution of Households by size in the Mutasarrifia of El-Marj (1954).
- Table 83:- Distribution of Population of Cyrenaica by Geographical Regions in 1954 and 1964.

- Table 84:- Distribution of Population of the Mutasarrifia of El-Marj by Mudiria in 1954 and 1964 in Percentage.
- Table 85:- Net Change Due to Emigration and Immigration in The Mutasarrifia of El-Marj in 1956 - 1962.
- Table 86:- Proportion of Literate Males and Females in The Mutasarrifia of El-Marj by 10-year Age-Group (1954).
- Table 87:- Number of Schools and Students in the Three Levels in The Mutasarrifia of El-Marj in Relation to Cyrenaica in 1963 - 64.
- Table 88:- Number of Patients, Deaths and T.B. Cases in El-Marj Civil Hospital for 1962.
- Table 89:- Percentage Distribution of Rural and El-Marj Town families by Income Groups (1964).
- Table 90:- Citizen Population, 15 years of Age and Over Classified by Major Occupational Groups for Libya and Cyrenaica (1954).
- Table 91:- Estimates of Population of El-Marj Town in 1922.
- Table 92:- Summary of the Annual External Trade of Libya 1954 - 1964 in £L. million.
- Table 93:- National Income Estimates in 1959 - 1963.
- Table 94:- Shares of Different Sectors in The Five-Year Development Plan, (1963 - 68).

LIST OF APPENDICES

	<u>page</u>
Appendix I Climatic Data.	482
Appendix II Water Resources.	490
Appendix III Details of Soil Analysis of El-Marj Plain.	495
Appendix IV A-Definition of Some terms used by the Libyan Census of Agriculture 1960.	
B-A copy of the Questionnaires put to the farmers.	
C-A copy of the Questionnaires put to the Heads of Families in the town of El-Marj.	500
Appendix V General Remarks and Suggestions for the Proposed Building of the New Town of Barce (El-Marj).	507

Figure 1



Introduction

North and east of the Sahara the two most important habitable regions are the Atlas massif - or Maghreb - and the Nile Valley. Along the greater part of the 2500 Kms. of coast separating the littoral of the ancient province of Libya, the desert is divided from the sea by only a narrow margin of extremely arid steppe.

Historically, the term "Libya" is the ancient Greek designation for Africa or at least what was known of that continent in antiquity. During the 19th century Libya was known to the west simply as "Tripoli" and as one of the four Barbary States. Libya was an Italian Colony from 1911 to 1943, and finally an independent country, when the British and French Military Administrations, who had been administering the country since 1943, transferred their powers to the new Libyan Government in December, 1951 and the independence of the United Kingdom of Libya was finally declared. Libya is constitutionally a hereditary monarchy at first with a federal system. The Federal Union was composed of three provinces, Tripolitania in the north west, Cyrenaica in the east (east of the Gulf of Sirte), and Fezzan in the south west. Each of these three provinces had enjoyed a certain measure of autonomy, and each shared powers with the federal government. The federal system created major problems i.e. the unwieldy administrative system and the increasing powers of the provincial governments. After ten years of the federal system

experience, the country was unified in a central Government.

The larger part of Libya is unproductive, comprising vast expanses of steppe and desert, characterised by slight rainfall, high temperature, sparse vegetation and poor soils. The area suited for human use is estimated to amount to barely 14 million hectares (or less than 8 per cent of the total area of the country) of which some 11 million hectares are suitable only for grazing and the balance is cultivable.⁽¹⁾ The population is, therefore, largely concentrated around the small portion of productive land lying mainly in the fertile coastal belts and to a lesser extent in the better-watered sections of the "Jebels" or high lands of Tripolitania and northern Cyrenaica, and in a few scattered oases in the south. Areas suitable for settlement are so rare that nine-tenths of the people occupy only one-tenth of the land. The Sahara region, or desert area, comprises four-fifths of the total area - one-third of Tripolitania, three-fourths of Cyrenaica and a great part of Fezzan. These areas had a population (in 1954) of 70 thousand persons concentrated in half a dozen remote oases.

According to the 1964 census preliminary results, Libya's total population is 1,559,399 (1,088,889 in 1954), of which 1,029,216 are in Tripolitania (738,338 in 1954), 451,469 in Cyrenaica (291,236 in 1954) and 78,714 in Fezzan (59,315 in 1954). These figures indicate an annual rate of

growth of 4.3 per cent for Libya, 3.9 per cent for Tripolitania, 5.5 per cent for Cyrenaica, and 3.3 per cent for Fezzan. The annual rate of growth for Libya is high. With an area of 1,760,000 sq.Kms. Libya thus ranks amongst the most sparsely populated areas of the world. The population density of less than one person per square kilometre is the lowest in the world with the possible exception of ice-clad Greenland or Bechuanaland in Africa. Tripolitania (250,000 sq.Km.) has a density of 4 persons per square kilometre, Cyrenaica (855,000 sq.Kms.) 0.5 per square kilometre and Fezzan (654,000 sq.Km.) 0.1 per square kilometre. Tripolitania though the smallest in area (250,000 sq.Kms.) is the most populous of the three provinces. With the effective utilisation of the entire cultivable land and the adoption of modern farming it could perhaps support still larger population along its fertile coast, which extends for about 350 Kms. from Zuara on the west to Misurata in the east. The rainfall averages about 350 mm. around Tripoli and rarely less than 200 mm. In Cyrenaica, on the other hand the coastal plain (Sahel) is narrower than in Tripolitania; in places the first escarpment reaches the sea. Only around Benghazi and Derna is the plain wide enough, and the water supply adequate to support much habitation. The most promising area for expanding human settlement in Cyrenaica, and perhaps the whole of Libya, is the Jebel Akhdar, which rises sharply from the coastal plain and the Mediterranean Sea to an elevation of about 500 m. On this limestone plateau, there are scattered

stunted evergreen groves, an average annual rainfall of 300 to 500 mm. (largely confined to winter), lower summer temperature and some humus-rich soil. Further south in Cyrenaica and in the whole of Fezzan the prospect of economic development and expansion of human settlement are closely linked with the discovery of oil, developing agriculture, and establishing ancillary industries and trades. This is not out of the question for Libya's oil revenue can contribute to the development of these areas. Prior to 1962, Libya was a typical underdeveloped country. By definition underdeveloped countries are short of capital*. Both the existing "real capital" (plant, equipment and housing) and the flow of monetary savings available for investment purposes are inadequate in almost any country that could be called underdeveloped.⁽²⁾ Other characteristics of underdeveloped countries are lack of managerial skill, a very high proportion of the population in agriculture, high fertility and mortality rates, low yields per acre and the inferior status and position of women. Capital was scarce in Libya until 1962. Libya in that time could be compared with the poor resource countries such as Jordan and Yemen.

* According to report on "Measures of the Economic Development of Underdeveloped Countries" by experts of the United Nations, the term of underdeveloped countries is used "to mean countries in which per capita real income is low when compared with the per capita real incomes of the United States of America, Canada, Australia and western Europe."

From 1963 onwards the flow of money from oil revenues provided a new source of capital and per capita income increased from £38 per annum in 1959 to about £63 per annum in 1963. However, except for the availability of capital and the increase in per capita income, Libya still bears all the characteristics of the underdeveloped country. Therefore, before the discovery of oil, Libya was resource-poor and stagnant. It had become commonplace for observers of Libyan affairs to describe the economy as "deficitary". There were deficits in the budgets of the federal and the three provincial governments and the municipalities. There was a deficit in the balance of payment. This deficit was not met by net receipts from foreign investments, as it might be in an advanced country, but by grants-in-aid, military expenditure, and investments of foreign powers.

This deficit reflected the hard fact that the whole Libyan economy operated at a deficit. The country did not produce enough to maintain even that low standard of living. For four decades these deficits were made good by foreign governments: by Italy during the thirty years of colonial rule, from 1943 to 1952 by the administering powers, and from 1952 to 1962 by foreign aid and lease of military bases. However, the historical evidence shows that the country was prosperous in the Greek and Roman times. The prosperity had always been a result of foreign investment in the country. From 1517 to 1911 the Turks left the Libyans to their own

devices. During the Italian colonial era, the part of the country most suitable for European settlement was colonised by immigrant nationals and the Libyans were segregated in the less attractive part.

In this peculiar situation, the aid from foreign powers was spent in peculiar ways. The huge administrative system absorbed large sums from aid granted, and the projects planned never came into existence. This latter can partly be explained by the lack of educated people within the country, the budget of the country was plunging into further deficit. A miracle was needed to solve the problem.

In 1959 the first oil well was struck at Zelten in Cyrenaica and this was followed by numerous wells throughout Libya. In 1963, Libya had a favourable balance of trade for the first time. This was due to the production of oil and the continuous increase of crude oil exports since 1962.

The development of the oil deposits has already had the effect of creating major changes in the social and economic life of the country. The impact of the economic, social and political revolutions is giving way to both hope and frustration. There are many problems in Libya which the discovery of oil will, by itself, not solve. As the majority of Libya's population is engaged in agriculture, and a few small industries, planned economic development will be necessary to cope with the social changes. With 70 per cent of oil revenues allocated to the development sector, it is

possible to revive Libyan hopes of a reconstituted sedentary agricultural zone in Cyrenaica.

Cyrenaica is a country of marked contrasts, the mountain and the plain, the forest and the steppe, the rich Terra Rossa and the desert, settled life and nomadism. In Cyrenaica one may distinguish between the Bawadi (the Bedouin) and the Hadur (town dwellers). The Bedouin ways of life are well adapted to their environment, and despite the fact that they are pastoralist at heart they lead what is sometimes called a "dual economy". Most of the Bedouin still lead a very simple life, their diet is plain and their wants are limited and tribal traditions are strong. Cyrenaica is perhaps the most completely Arabized country outside Arabia. No language competes with Arabic, no religion with Islam and no foreign custom with Arab custom. The Bedouin who settled in the former "Ente per la colonizzazione della Libia" farms only did so after 1943. Prior to this date no real attempt was made to improve their condition. Time and again colonists, have been tempted from Italy and Greece by the short sea routes and have settled in the Jebel area and dispossessed the Bedouin, but in the end it is the Bedouin, and not the colonists, who have survived. When one looks at the massive Greek and Roman ruins, and already half-ruined former Italian villages and farm houses, and then on the flimsy tents of the Bedouin, one cannot but reflect that the race is not always to the swift nor the battle to the strong.

As well as oil, agriculture and animal husbandry must clearly continue to be one of the mainstays of the Cyrenaican economy. Agricultural development in Cyrenaica presents a number of challenging problems. Given the sparsity and irregularity of rainfall and the impoverishment of the soil through many centuries of neglect, large investment in soil and water conservation is needed simply to preserve the existing assets and to prevent a further deterioration in farming conditions.

Water is the most important factor in Cyrenaican agriculture and is more precious than oil. Water is the prime mover in the Bedouin life. If an adequate supply of water is available throughout the year in any given area, then the Bedouin might well stay in one place. However, most of the country is desert, only the Jebel Akhdar and the coastal plain between Benghazi and Derna receive an annual average rainfall sufficient for cereal cultivation.

This is a geographical study of El-Marj Plain, known to Europeans as the Barce Plain. The Plain is situated in the west of the Jebel Akhdar, on the area between the first and the second escarpment, known as the upper terrace (Vide Fig. 1). Since regional geographical studies in Cyrenaica are still in their infancy, the first matter, that of recognition and definition of the region, has itself been a pioneer attempt made more difficult by the absence of any existing corpus of knowledge. The second escarpment defines the southern limit of the Plain.

The Plain watershed in the east and north was taken as the eastern and northern limit while in the west and south west the 350 m. contour was used as an arbitrary line across the undulating transition area between El-Marj and Silina and El-Abiar Plains. The rationale behind the adoption of these boundaries will appear in the studies which follow.

El-Marj Plain was colonised in classical times and more recently by the Italians. The rainfall is relatively high and conditions are more favourable for dry farming than in most other parts of Libya. The agricultural potential of El-Marj Plain, however, has not yet been fully exploited, and the general standard of farming in the Plain is lower than in Tripolitania. Despite the fact that most of the Bedouin in El-Marj Plain appear settled at the present time, the majority still look to livestock rather than settled agriculture as their principal source of income. Barley and wheat are the main crops, supplemented by fruit and vegetables. Most of the fruit trees planted by the Italians have died because of neglect. This is due to the fact that the local Bedouin population is almost totally ignorant of the techniques involved and worse, has not yet learnt that orcharding and herding are mutually exclusive.

However, the Bedouin of El-Marj Plain who settled in the former Ente farms are in a transition stage. It is not easy to change the livestock herder into a settled farmer. This will take time, effort and large investment. Fortunately

the sedentary Bedouin are realising the importance of settling down and they have already started mechanizing their farming and planting fruit trees. The establishment of the National Agricultural Settlement Authority is a large step towards the agricultural development and settlement of the Bedouin. Because of this interesting situation of transition and unexploited potential and the question of to what extent it can contribute to the economic development of the country, this region appeared worthy of study even on the basis of tentative pioneering work. The thesis is divided into three parts. Part I is concerned with the physical environment i.e, relief and land forms, geology, climate, vegetation, soils and water resources. For the chapter on geology it has been possible to obtain for the first time an accurate account of the geological structure. The first detailed structural map of the north eastern Cyrenaica is reproduced and the most recent Libyan geological map (1964) is taken as a basis for the geology of the region.

Because data on the soils of El-Marj Plain and Cyrenaica are scanty and scattered, the author collected soil samples from the Plain and these form the basis for the chapter on soils.

Part II deals with sedentary agriculture, livestock, shifting cultivation and nomadism. It was found convenient

to start this part with a note on the historical background stressing the evaluation of the land by people through history. At the end of this section a discussion on the role of the National Agricultural Settlement Authority follows the detailed accounts of the agricultural pattern of the region. The activities of the organisation are vital and the agricultural development in Cyrenaica will depend on the success of this Organisation.

Part III deals with three topics: the background of social organisation, population and settlement. The Chapter on the background of social organisation deals with the racial elements and the tribal structure. As the tribe is the cornerstone of Cyrenaican administrative unity, it was felt necessary to discuss the administrative system at the end of this Chapter. The Chapter on population is an attempt to evaluate the Demographic position of El-Marj Plain and Cyrenaica in the light of the recent censuses including the preliminary results of the 1964 census. General outlines on education, health and living standards are included. The Chapter on settlement deals with types of housing, the urban centre of El-Marj and the main villages. An account of the earthquake that struck the region in 1963 causing damage to the old town of El-Marj must be considered in the thesis because of the implications for the development of a new town of El-Marj to replace the one almost completely destroyed. This central urban centre is of great significance to the

development of the Plain.

Oil has a great impact on the economic and social life and, therefore, a short examination of the social changes occurring at present in Libya and the Five-Year Plan is included. Each Chapter concludes with a summary and conclusion and a general conclusion is presented at the end of the thesis.

The names of the towns, villages and localities are spelled according to the Cyrenaican practice and corresponding to the usage of the American Board on Geographical names in Libya's new topographical map 1 2,000,000.

As the statistics and the administrative boundaries do not correspond with El-Marj Plain on many occasions, it was found necessary to deal with the adjacent areas i.e. the coastal plain, and the high Jebel in the immediate vicinity of El-Marj Plain. This is important because it shows the economic significance of El-Marj Plain to surrounding areas. A comparison between El-Marj Plain and other regions in Cyrenaica and Libya is included. A comparison between Libya and other countries was also taken into consideration. At the time this work is presented, Libya witnesses economic and social changes due in particular to oil production and also as part of a changing world. It is sincerely to be hoped that the country will exploit its new resource in the proper way and for better living standards for the whole nation.

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PART ONE

Chapter I

Relief and Land Forms

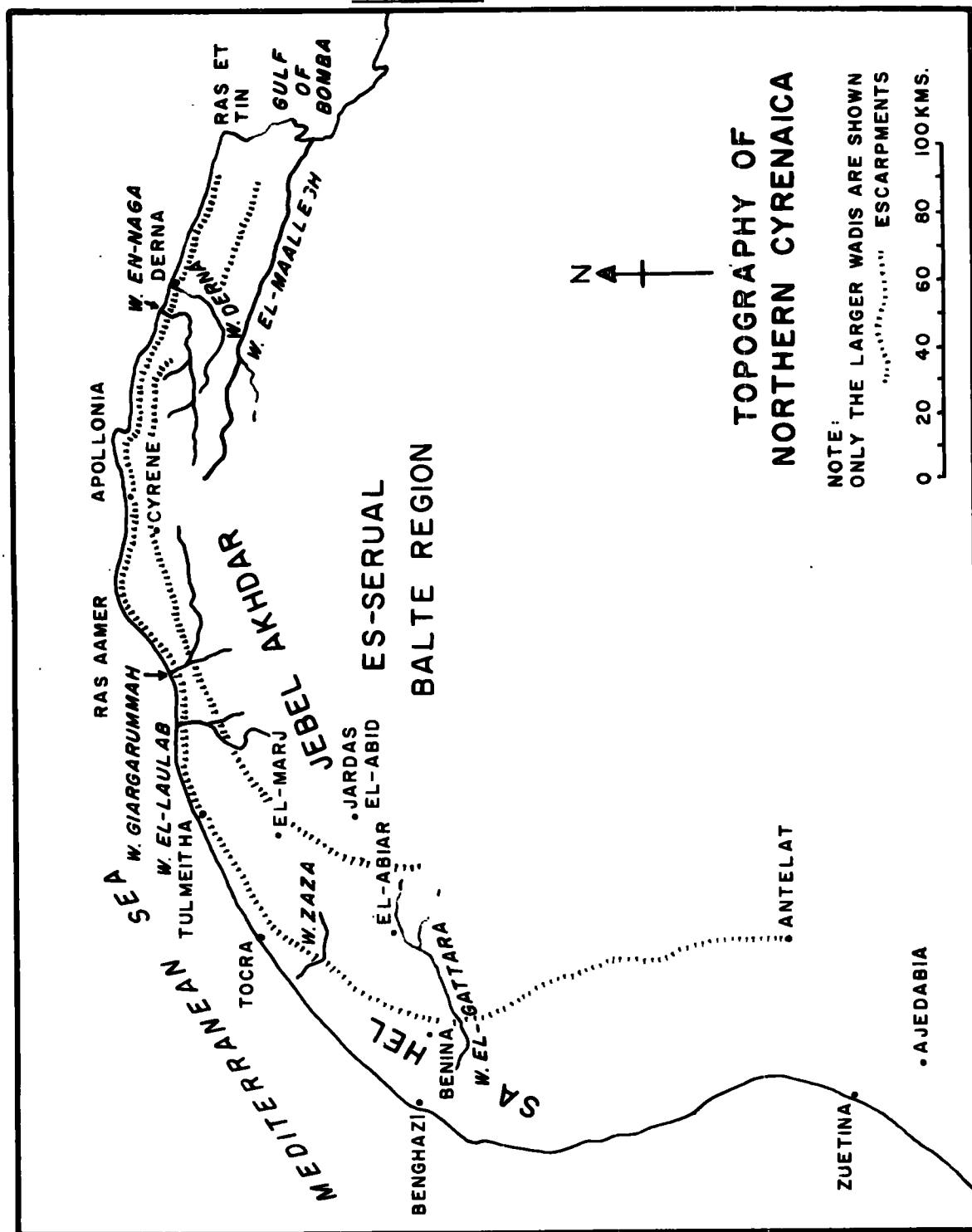
Introduction

The main topographical features of northern Cyrenaica are shown in Figure 2. As can be seen from the inset, this is a region of generally simple relief. The only large area of high ground is that which occupies the most northerly part of the territory, and which is known as the Jebel Akhdar or "Green Mountain"; this is, indeed, the only large area of high ground which occurs between Homs in Tripolitania and Mount Carmel in Palestine.

Northern Cyrenaica may be divided into two main relief regions, the Jebel and the coastal plain. The latter is now usually referred to by its Arabic name, the Sahel, though some Italian writers know it as - lower terrace.

The Jebel is a large and isolated area of high ground about 250 kms. long from east to west. The crest-line of the Jebel, rising in places to over 800 m. above sea-level, lies to the north, always within 50 Kms. of the coast. To the south of this crest-line the ground falls very gradually towards the depressions containing the oases of Marada, Al-Jaghbub and Siua. To the east there is a similarly gentle gradient. Northwards and westwards, however, the Jebel is limited by abrupt slopes in the form of two successive escarpments. Between these escarpments

Figure 2



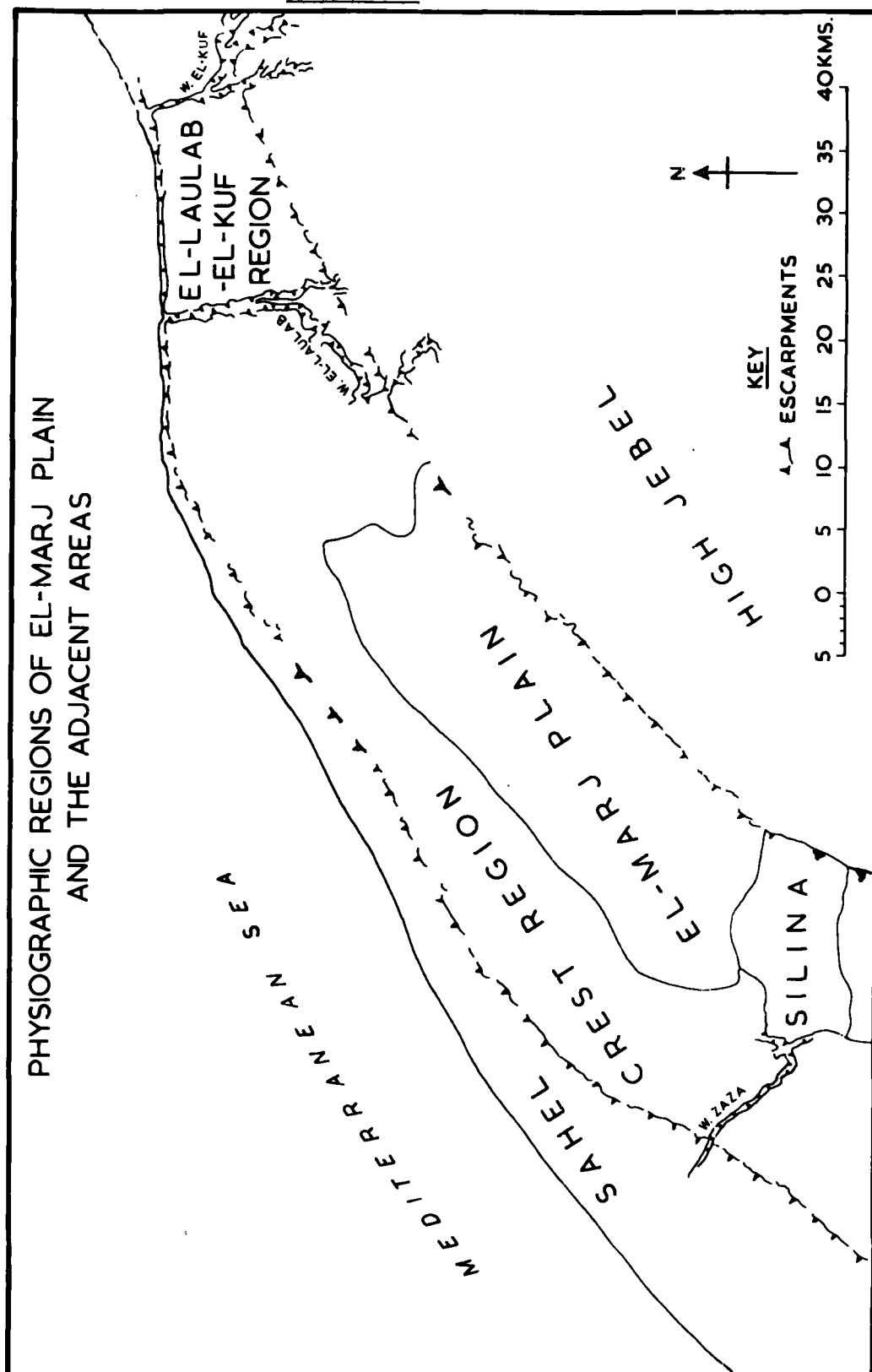
lies a strip of country with gentle slopes; this will be referred to as the "upper terrace". Its width is variable with a maximum of over 25 Kms. in Western Cyrenaica and a minimum of 3 Kms. behind Lathrun. At the south-western end of the terrace "karst" erosion has predominated and has advanced so far as to create a series of inland drainage basins; these, with their thick deposits of Terra Rossa, form the fertile plains of El-Marj (Barce), Silina and El-Abiar (Vide Fig. 3).

The Sahel is a narrow and often discontinuous coastal plain of triangular form which runs from the Gulf of Sirte to the Gulf of Bomba. In places it is only a few hundred metres wide where the coastal, or the first escarpment approaches the sea. It reaches its maximum width 60 Kms. at a point 55 Kms. south of Benghazi. The Sahel as far as Tobra is bordered along the coast by numerous salt-pans fed by the sea.

The Sahel

The coastal plain as far as Ras Aamer has a simple topography, the Sahel and the escarpment together forming a smooth concave surface morphology. Between Ras Aamer and Ras Hamman the coast has a number of inlets at the mouths of the wadis of Giargarummah, El-Laulab and Habbun. According to Desio⁽¹⁾, it appears that marine erosion has largely determined the form of these inlets.

Figure 3



Along the narrow strip of land between the escarpment and the sea a number of small depressions occur, some of which contain water. The wadis descending from the first escarpment flow into these depressions and never reach the sea.

Between Bir El-Agla and Sahel El-Mneitir the escarpment reaches the sea and the coastal plain completely disappears, being replaced by a well marked cliff-line. From Sahel El-Mneitir to the east of Tulmeitha - a distance of 12 Kms. - a narrow coastal strip exists which nowhere exceeds 500 m. in width. Immediately east of Tulmeitha there are two small islands which Desio⁽²⁾ believes to represent submerged consolidated dunes. The coastal plain gradually increases in width westward from half a kilometer at Ras Tulmeitha to two kilometers at Tulmeitha, four at Tobra and 18 at Benghazi.

As far as this part of the Cyrenaican coast is concerned no good harbours exist and few usable coves have been formed by recent coastal submergence⁽³⁾. To the south of Tobra there is a cordon of low coastal dunes which vary in height from 3 to 10 m. They form a long barrier parallel to the seashore separating a strip of low land and salt-pans called Sebkhas, these lying about 1 meter below sea-level. The inland limit of the sebkhas coincides with the limit of the coastal plain. The three main

sebkhas from the north to the south are Bu. Giarrar, Bersis and El-Cuz. It seems that the sebkhas have been formed by sea water seeping inland. The dunes are a product of wind and wave action together with a gradual submergence. To the south of Deriana the sebkhas disappear, to reappear in the area of Sidi Khalifa, north of Benghazi.

The consolidated dune-deposits occasionally form a gently undulating surface of great extent along the coast between Tocra and Tulmeitha. They also form chains of hills rising to considerable heights. Alluvial fans cover certain large areas of ground and attain great thicknesses particularly at the foot of the escarpment.

Between Tulmeitha and Banina a step interrupts the regularity of the gradient of the coastal plain. It lies 18 Kms. east of Benghazi, immediately to the west of the village of Benina. The step runs from north to south and, though hardly a conspicuous feature, it extends for a distance of about 10 Kms. At its extremities it becomes more gentle in gradient and merges into the surrounding country. The foot of the step maintains an altitude of about 90 m. above sea-level, while its crestline lies between 100m. and 120m.

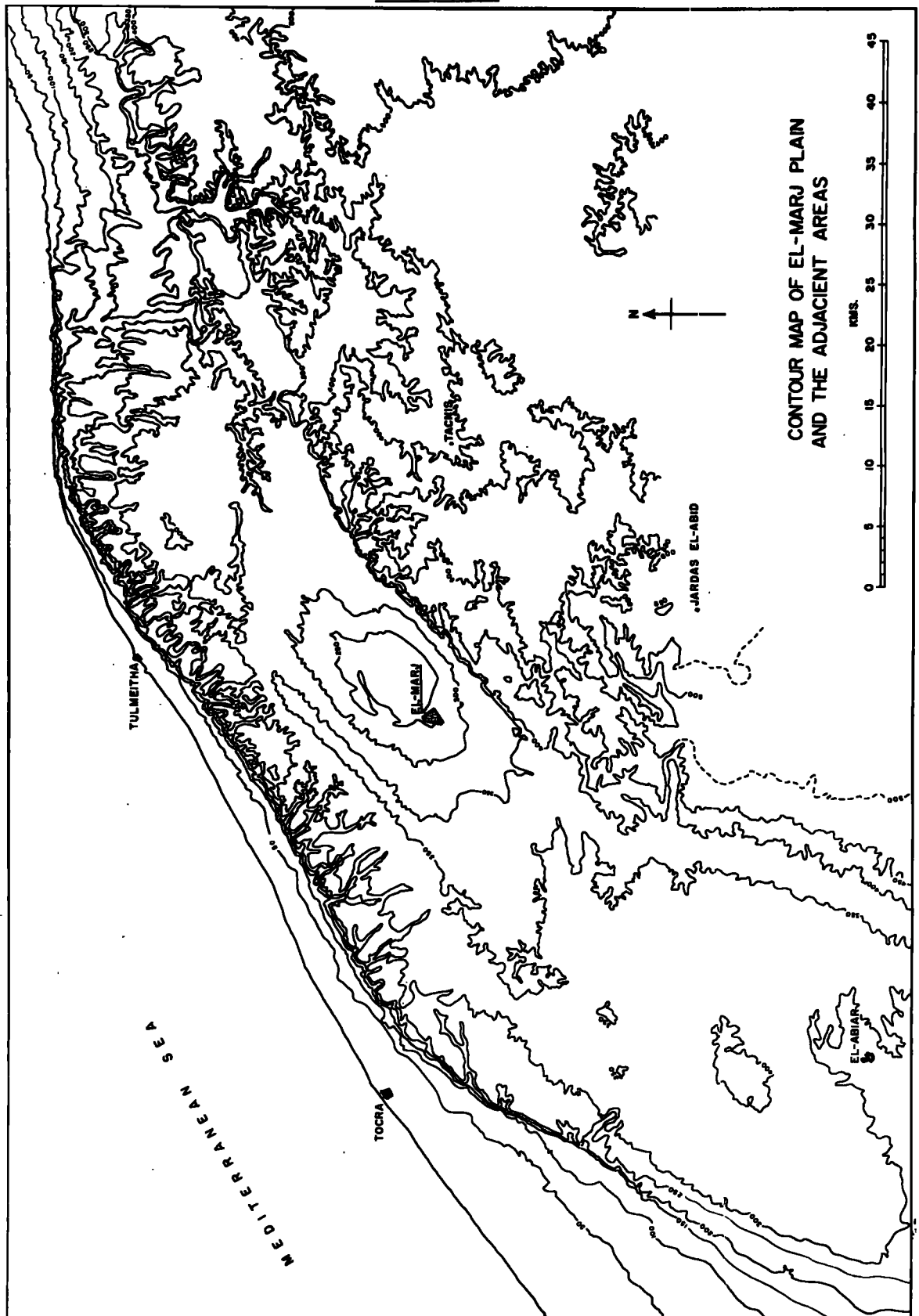
The coastal plain between Tulmeitha and Benghazi has a triangular form, and southwards merges into the open wide region of Sirte. The plain has a characteristically

gentle gradient, and the contour-lines show a remarkably even spacing. The surface of the coastal plain is mainly composed of solid Tertiary limestones. Small wadi furrows have incised themselves into the surface of the Sahel but these generally tend to disappear to the south of Tobra before reaching the sea. Only two of these flow into the sea. These wadis and wadi systems will be dealt with under a separate subtitle in this chapter. The Terra Rossa which covers a large area of the Sahel is mixed with many rock fragments, and only scattered patches are suitable for agriculture.

The first or lower escarpment and its terraces

The crest of the first escarpment comes into existence north of Antelat. The scarp foot lies at an altitude between 150 and 180 m. above sea-level, and it runs in a north-easterly direction to just south of Tulmeitha. The escarpment in this part has a steep average gradient, but this becomes more gentle further to the north-east. Along its entire course, however, the escarpment has a clearly marked lower limit lying always between 150 and 200m. The level of the crest of the escarpment is somewhat variable. It is 294m. at Bacur Rest House and 300m. above sea-level at Tulmeitha (Vide Fig. No.4 and Plate 1a). The continuity of the escarpment

Figure 4



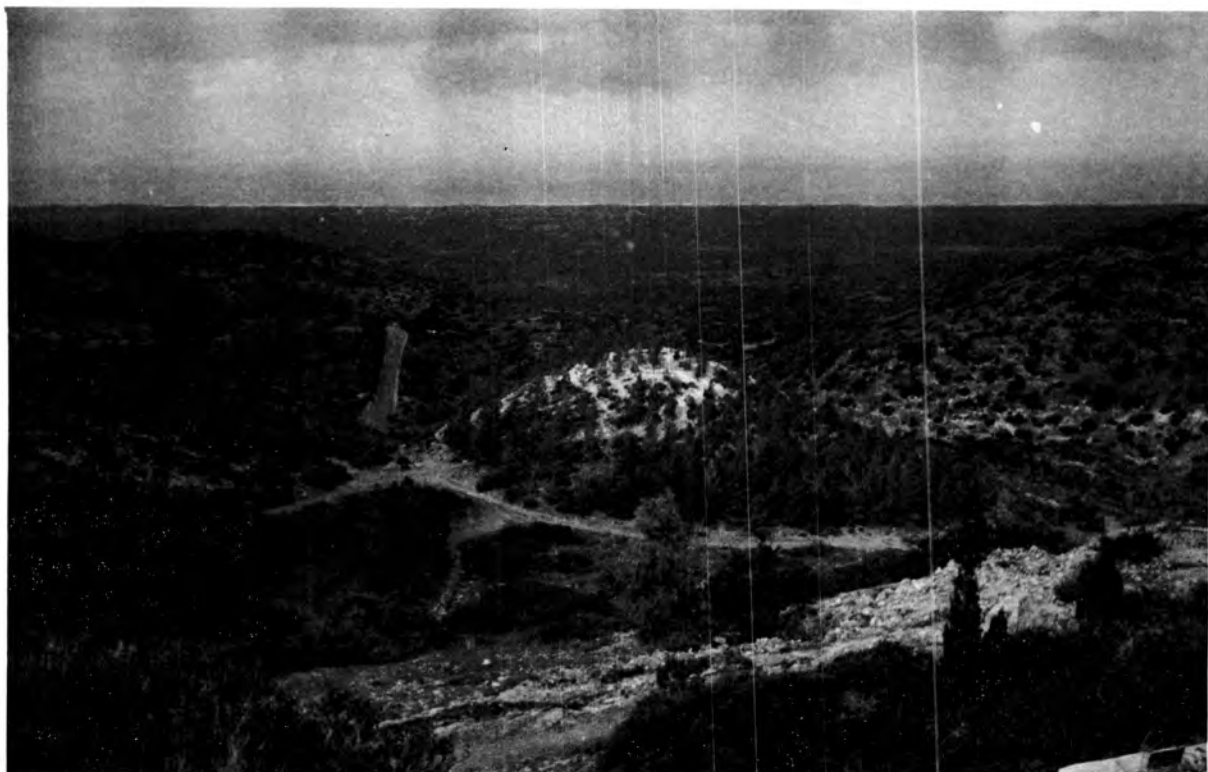


Plate 1(A) - Wadi Bacur emerging from the first escarpment towards the Sāhel (The coastal Plain).



Plate 1(B) - El-Marj Plain looking northwards from the second escarpment. Note El-Ghariq on the right and El-Marj town in the background.

is broken at frequent intervals by deep gorges. To the west of Tulmeitha remnants of two well developed terraces can be distinguished. The lower of the two indicates a shoreline of an approximate level of 20m.⁽⁴⁾ One kilometer east of the town in the banks of Wadi Zuiana a wave-cut platform with beach-deposits can be traced upstream from the modern shoreline. All of these features are completely buried beneath alluvium and consolidated dunes (6.4m. above sea-level, at the foot of a low cliff).⁽⁵⁾ Further upstream a second beach-deposit exists, buried beneath alluvium but resting on bedrock at an altitude of 33 m.

Within 15 Kms. east of Tulmeitha the gradient begins to decrease and terraces are visible. East of Sahel El-Mneitir the escarpment resumes its normal form as far as Meghiunes (19 Kms. west of Wadi Giargarummah). It is extremely steep and apparently without terraces. Just east of Meghiunes there is a zone of landslips. From here eastwards to a point 6 kilometers west of Wadi Giargarummah there is a well marked cliff line, which represents the whole of the escarpment. The remainder of the escarpment as far as 15 Kms. west of Ras Aamer, becomes lower and less steep and seems to have undergone considerable subaerial erosion.

In the vicinity of Wadi Giargarummah the top of

the escarpment descends almost to sea-level. Near its foot is a continuous line of beach conglomerate which, from sections in the sides of the wadi, can be seen to rest upon a narrow platform whose inland edge stands at 6.5m. To the east of this point the height again rises gradually towards Apollonia reaching a maximum in the zone of Ras El-Hilal (551m. above sea-level) and then descending towards Derna where the surface of the escarpment lies at about 250m. From Derna towards the Gulf of Bomba, the height slowly diminishes until reaching almost sea-level near the lighthouse of Ras Et-Tin. The escarpment as a whole is of great length, running for about 400 Kms.

The Upper Terrace

The upper terrace becomes a pronounced feature only in the area where the Jebel edge is broken into two escarpments, and its surface is not horizontal but undulating, dipping from north to south.

On the terrace is a line of depressions which are represented by a series of basins along the foot of the second escarpment. They are separated from the edge of the first escarpment by a zone of regular rounded relief. The following data refer to these geomorphological features, in metres, above sea-level.

Zone	Edge of the first escarpment.	Crest	Basins	Edge of the second escarpment
El-Regima	280	320	220	400
El-Abiar	220	370	260	460
El-Marj	300	370	276	440

To the east of El-Marj the undulations of the upper terrace trend from north and south longitudinally. These undulations cease gradually. In the El-Fahaga area (24 Kms. north east of El-Marj) there are parallel basins and other ridges aligned parallel to them. However, the undulations of the terrace begin in the south-western portion. The altitude increases towards the north reaching a maximum of 417m. above sea-level at Gasr El-Riah (12 Kms. north of El-Abiar). They decline rapidly to 360 m. towards the north-east. The altitude increases again to 393m. at Bu Zueitina (11 Kms. north of El-Marj) and to 403m. at Sidi Ismail (8 Kms. west of Batta). It then descends to sea-level. To the east of Bir El-Agla the upper terrace does not represent an area of marginal relief. To the east of Bir El-Agla the surface of the terrace is dissected by numerous wadis. At this point it seems that it is made up of two steps. However, it dips towards the sea and starts again at the gorge of Wadi Giargarummah where the altitude

increases towards the east. The following data represent the marginal edge of the terrace in metres, above sea-level:-

	Minimum heights of the lower limit of the upper terrace.	Maximum heights of upper limit of the upper terrace.
South of El-Hania	90	350
" " Ras El-Hamman	150	390
" " Ras Aamer	200	420
" " Gorge of W. Giargarummah	220	450
" " Apollonia	300	490
" " Ras El-Hilal	400	540

The Second or the Upper Escarpment

The second escarpment maintains a less distinct individuality than the first, and is much less extensive. Towards the south-west it begins about 10 Kms. south of El-Abiar where sub-aerial erosion has been particularly intensive⁽⁶⁾ and runs parallel to the first with a scarp which initially does not exceed 100m. in height.

The height of the edge of the escarpment rises to 401m. above sea-level at El-Abiar rising to 450m east of Got Silina. The direction of the escarpment in this zone

to Got Silina is north-south, then curving towards the north-east. It declines to the south of El-Marj to 430-420m. The difference here between the two surfaces of the escarpments is about 120m. The escarpment continues in a north-easterly direction at around the same altitude until Eluet Sultana where it declines gradually to 360m. and advances to the sea to a point only 8 Kms. from the seashore. There is an intermediate terrace in this zone at an altitude of between 215 and 220m. The difference here between the two escarpments is about 150m. At Ras El-Hilal where the elevations of the coastal escarpment increases, the maximum height of the second escarpment is also to be found, (670m.). The second escarpment loses its own individuality in the zone dissected by the affluents of W. En-Naga. It extends to Martuba (200-250m.), then it descends to the depressions of Gulf of Bomba where it ends with an abrupt perpendicular fall before dying out towards the south.

The surface of the second escarpment which extends from the edge of the high Jebel is dissimilar to that of the first. To the east of El-Marj and on both sides of Wadi Caab there are undulating platforms at an altitude varying between 420-430m. and extending to 6,7 Kms. from the top of the escarpment towards the interior. These edges continue at the same altitude until they reach the

gorge of Wadi Giargarummah. Then they rise gradually to 510-520m. near Messa, to 670-680m. in the vicinity of El-Beida and to 670-680m. at Zawiyat Tert (60 Kms. west of Derna) where they take a direction towards the interior.

The High Jebel

Although dissected by wadis the higher part of the Jebel, above the second escarpment, is an area of generally low relief and monotonous appearance. It consists essentially of gentle slopes falling away on either side of a crest-line which, though very ill-defined, runs roughly from west-south-west to east-north-east, always within 25 Kms. of the escarpment. South of the crest-line these slopes continue into the dip slope which extends downwards, apparently without a break, as far as the oases depressions. On the north side the slopes of the high Jebel, until truncated by the escarpment itself, are broken by one minor interruption.

In spite of its low relief the area as a whole shows considerable variations of altitude. There are two main areas of culmination divided by a saddle. The higher of the two lies to the south of Cyrene and includes the highest point of the Jebel, 882m. above sea-level. The other lies to the south of El-Marj, and reaches a maximum of 676m. near Jardas El-Abid, whilst the saddle (situated in the vicinity of Tacnis) is at an altitude of between

400 and 500m.

The Origin of the escarpments and terraces

Attempts to explain the escarpments of northern Cyrenaica are still under debate. The three hypotheses are:-

1. differential erosion,
2. fault scarps,
3. marine erosion.

The theories used to explain the escarpments now agree that neither can be ascribed to differential erosion, since both are cut in rocks of varying ages, dips and physical properties. This, however, has left room for the two alternative hypotheses:-

1. That the escarpments could more probably be ascribed to faulting or abrupt folding (Spratt⁽⁷⁾, Gregory⁽⁸⁾ and Desio⁽⁹⁾).
2. That both might be wave-cut cliffs, formed during pauses in the original uplift of the Jebel (Marinelli⁽¹⁰⁾, Ahlman⁽¹¹⁾, and Stefanini⁽¹²⁾).

Marine erosion, in Desio's view, has been confined to certain parts of the coastal plain (Tocra area and Ras Aamer) and has not played an important part. However, Hey⁽¹³⁾ in his recent study on the Pleistocene deposits on northern Cyrenaica finds strong evidence in support of the importance of marine erosion.

According to Hey⁽¹⁴⁾ the entire coastal plain was formed by marine erosion with the plain and the lower escarpment representing respectively a wave-cut platform and its associated cliff-line, both features formed during a single period of high sea-level. According to this theory most of the plain must be older than the Benina and Tocras steps, which thus represent the total effect of subsequent marine erosion. However, the associated faults are relatively ancient, and acted in some way as a line which resisted erosion.

The upper escarpment like the lower cannot be a fault scarp, although the parts near El-Marj and Derna are associated with faults. The theory submitted by Hey⁽¹⁵⁾ is that the upper terrace is a wave-cut platform, and the upper escarpment its associated cliff-line was formed, unlike the lower escarpment, during a single period of high sea-level. Once again the faults merely accounted for its local formation. The dominant opinion at present, therefore, is that marine erosion is responsible for producing the escarpments and the terrace. However, this seems to underestimate the extent to which the Jebel has been subjected to earth movements.

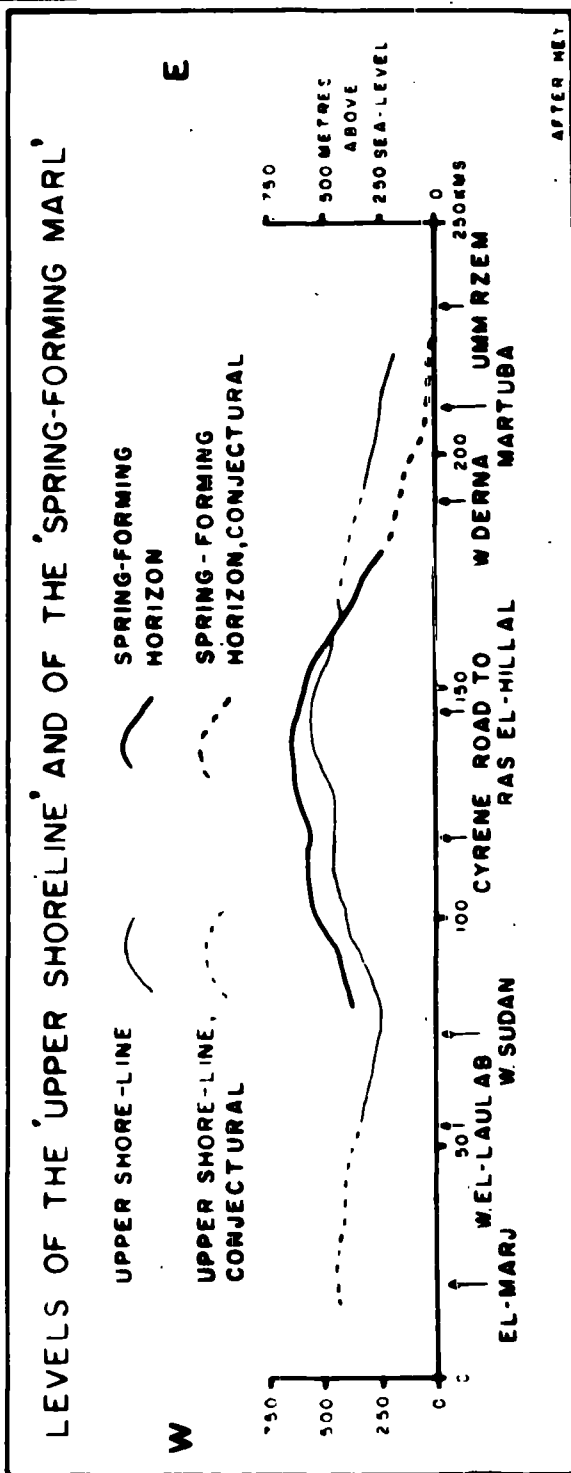
Spratt was the first to indicate the existence of faults in the Jebel and his work was followed by that of Gregory and Marchetti. After the confirmation of the

existence of faults in the Jebel by Marchetti, (16) Desio (1939) revived the idea that the escarpments might be directly ascribed to faulting or monoclinical warping. (17) As has already been pointed out, Hey confirms that the faults are relatively ancient and acted as a line along which erosion was resisted. The tectonics will be dealt with in the chapter on Geology.

Hey (18) constructed a diagram to show the correspondence in height between the shoreline and the escarpment and terrace and thus to show the nature of its subsequent distortion (Fig. No.5). It can be seen from the figure that the shoreline has been warped into a series of undulations which are smooth and gentle but of very large amplitude. At its eastern end, where it can initially be traced, it lies only 150m. above sea-level, this is its lowest point. From here it rises steadily to a maximum of 550m. near Ras El-Hilal and then falls to 250m. at Wadi Sudan (the main tributary of W. Giargarummah). Once more it continues to rise until, 5 Kms. beyond El-Marj, where it reaches 450m. To the west of this point its exact altitude is unknown.

However, if sea-level stood at 200m. above its present level at the beginning of the formation of the lower escarpment it is probable that it stood even higher for the formation of the upper terrace and the second escarpment. The level of the shoreline is not horizontal

Figure 5



now, and it seems that an earth movement has taken place and has uplifted the Jebel.

The high Jebel has undergone relatively little subaerial erosion since the upper escarpment and terrace were formed.⁽¹⁹⁾ According to Desio,⁽²⁰⁾ there is in fact a close correspondence between the undulations of the high Jebel and those of the upper escarpment. Both culminations of the Jebel lie near to parts of the escarpment which are particularly elevated, and the intervening saddle lies just to the south-west of the point where the escarpment sinks to a minimum at Wadi Sudan. The Tacnis saddle is wholly of tectonic origin.⁽²¹⁾ Westwards beyond the Tacnis saddle, the present differences between the altitudes of the Jardas El-Abid culmination and the upper shoreline south-west of El-Marj seem to be about 200m. which suggests that the crest of the Jebel may have maintained its uniform level in this direction; the western culmination as opposed to the eastern, may therefore be entirely due to tectonic uplifts. It thus appears that the Jebel at the time of the formation of the upper escarpment, was a long, low ridge, presumably an island, with a very even profile. Its topography, indeed, was even more monotonous than that of the high Jebel at the present day.⁽²²⁾

According to Hey⁽²³⁾ the limited distribution of sediments later than Middle Miocene suggests that the main uplifts of the Jebel began in Upper Miocene times. It is

probable that all the known faults and monclines of the Jebel were formed during this same period, in one single movement of subsidence towards the present Mediterranean. However, when these movements ceased, the resulting irregularities were planed down by erosion; this on the highest parts of the Jebel, was probably subaerial in character. Erosion was then continued by the sea, which must have stood at a very high level relative to the land, reaching to within 150 m. of the top of the Jebel. At this time the Jebel was undoubtedly an island. While the land continued to be stable the sea-level then dropped by about 150m. and marine erosion began once more to form the upper escarpment and terrace. A period of gentle arching followed, affecting all parts of the Jebel. Some upward warping must have occurred in the region south of El-Marj and Lathrun (40 Kms. west of Derna) - El-Gheghab anticline assumed its present form. Between the areas of uplift down-folding took place along a line passing through W. Sudan and probably running to the south-west. These movements were responsible not only for the distortion of the upper shoreline but also for the present relief of the high Jebel and for much of the present drainage pattern.

Karst phenomena

The remarkable development of karst phenomena in northern Cyrenaica produces a morphology which is similar to

that which has been developed in the karst limestone region in the Eastern Adriatic. The rocky surface of the ground thus becomes modelled into forms characteristic of zones in which the solvent action of waters saturated with carbonic acid is exercised on calcareous rocks. It is certain that this karstic process plays a fundamental and, in many zones, an exclusive function in the characteristics of the detailed morphology. Whilst reviewing the known forms of karstic modelling, one immediately notices that in Cyrenaica furrowed or rounded rocks, or rocks drilled by the action of surface run-off water are very scarce. Various factors can be noted to explain this absence. First, one must consider the low density of limestones which are most frequently friable, coarse or marly and therefore most apt to be disintegrated rather than incised by the action of rain. Indeed, in places where compact and crystalline limestones outcrop over a considerable distance in favourable conditions, some of the characteristics of karstic erosion are found. In particular, one finds knolls of rock rounded and pitted by basin-like cavities regularly distributed and emerging from the covering of Terra Rossa. This can be seen for example in the Eocene limestones north of El-Marj and near Bir Giargarummah. But in general the obvious forms of pitted terrains are lacking. This is especially the case as compared with most European karst zones, where in addition to the compactness of the rock there is a very much more abundant rainfall.

A negative factor which combines with the scarcity of rainfall, is the formation of superficial crusts which sometimes cover the surface of the rocks to a thickness of several decimeters. This phenomenon is common in arid regions and is due to a complex mechanism of alteration and disintegration of the rocky surface, to the percolation and evaporation of dew with the transport of colloidal substances and with successive cementation and oxidation. Thus a superficial concretionary zone is formed of a calcareous nature, rich in iron oxides and fairly compact, which hinders the mechanical and chemical action of modelling by flood waters. This superficial concretion covers the whole rock surface and therefore also has an hydrological effect in as much as it hinders diffuse percolation of water, localising it in the fissures and larger joints.⁽²⁴⁾ Surface crust is almost completely absent on the Jebel, but is particularly well developed in the steppe zone where it is more than one decimeter thick near Tansalukh (south of Tocra).

Percolating of meteoric water by means of fissures leads here, as in all karst zones, to the enlargement of joints in the rocks, with the formation of crevasses of varying width. This is common in zones in which the rock is fairly compact, but where the rock is coarse or earthy, such as on the Oligocene limestones of the western Jebel, these forms are completely lacking. The most widespread of all the karstic

forms in the Jebel are the large karstic basins and the dolines. El-Marj Plain and its dolines will now be considered together.

El-Marj Plain

The El-Marj or Barce Plain is a closed depressed basin on the upper terrace. It is the largest karstic basin in the whole northern Cyrenaica. Fig. No.3 shows the extension and the general form of the Plain. The basin has a subvalley shape and it mainly extends south-west-north-east. It is 42 kms. long and 12 Kms. wide (Vide Plate 1B)

The lowest point of the basin is 276 m. above sea-level, situated one kilometer to the north-east of El-Marj Town, and occupied by an intermittent lake in the winter (see Water Resources).

This basin of El-Ghariq does not lie on solid bedrock of the basin because of the presence of thick deposits of Terra Rossa which reach a depth of at least 50 m. (Vide Fig. No.4).

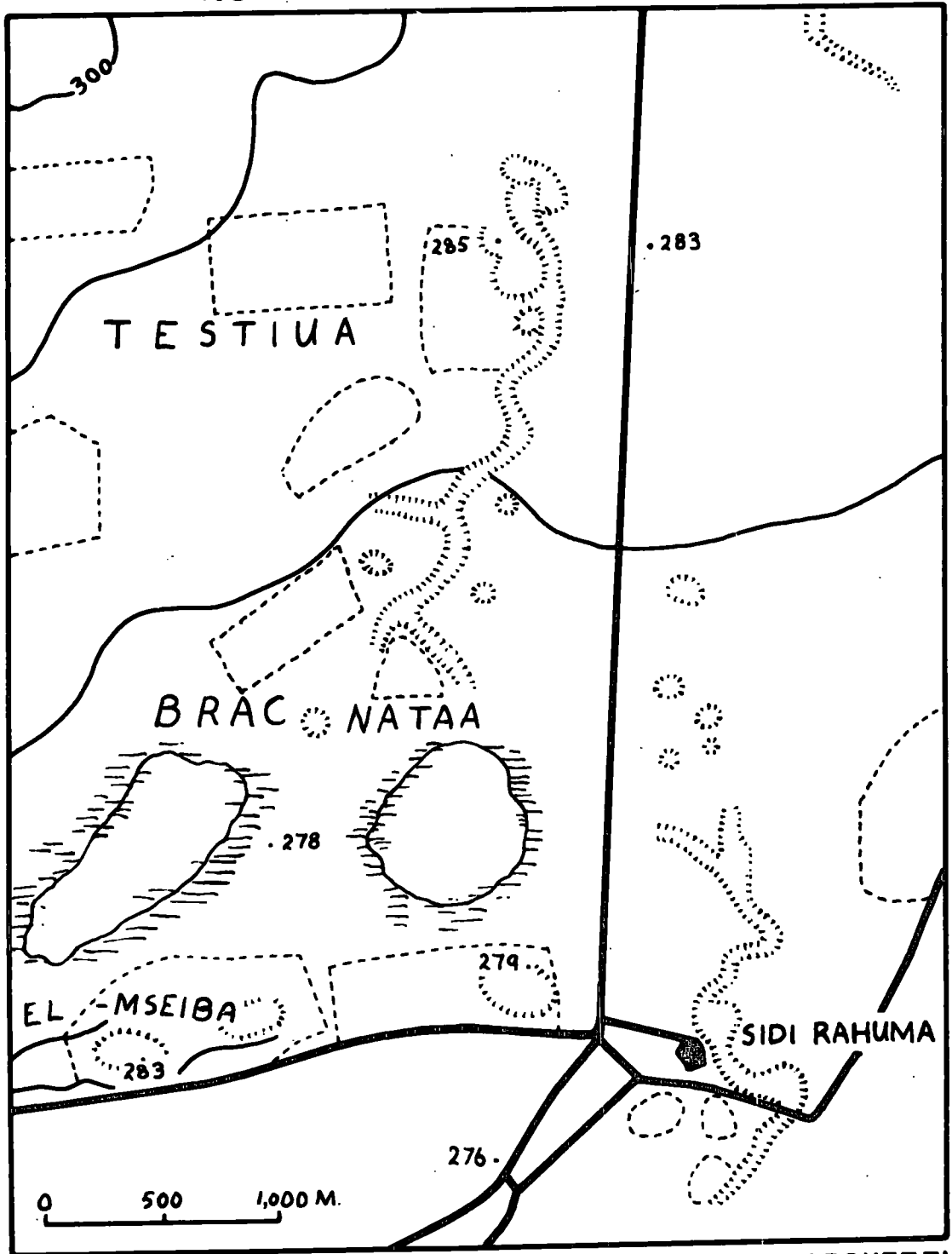
The second escarpment (where a group of wadis descend into the Plain) defines the southern limit of the Plain. To the east, the Plain widens gradually and the surface rises from El-Ghariq to the outlet of Sidi

Said, there is another outlet near Sidi Dakhil in the north. The eastern limit of El-Marj Plain is satisfactorily defined by the watershed of the basin, while to the north the most useful boundary line runs along the watershed and the 350 m. contour. To the west the surface rises gradually from El-Ghariq area to 350 m. and rises again to 369 m. at a point 12 Kms. west of El-Marj town and then declines to 350 m. where the whole of the rise of the land as will appear is best included within our region. To the south west the 350 m. contour has been used as an arbitrary line across the undulating transition between El-Marj Plain and the Silina - El-Abiar plains.

The bedrock can be seen to be uneven from data obtained from the drilling of wells. The depth of the Terra Rossa is variable, and rocky summits emerge from beneath the cover. The surface of El-Marj basin is not flat since there are two small depressions similar to El-Ghariq in the north of the Plain. These two depressions are filled with water during the rainy season and are called Brao Nataa (Fig. No. 6). The total area of El-Marj Plain is 1100 sq. kms. The average slope is about 06% from all directions towards El-Ghariq. Most of the arable land is located between 278 and 300 metres elevation.

Figure 6

THE KARSTIC BASINS OF BRAC NATAA NORTH EAST OF EL-MARJ



AFTER MARCHETTI

The only specific topographic problem in the Plain is the El-Ghariq depression which as pointed out has no visible outlet to permanent streams and will probably create a serious drainage problem for irrigation development.

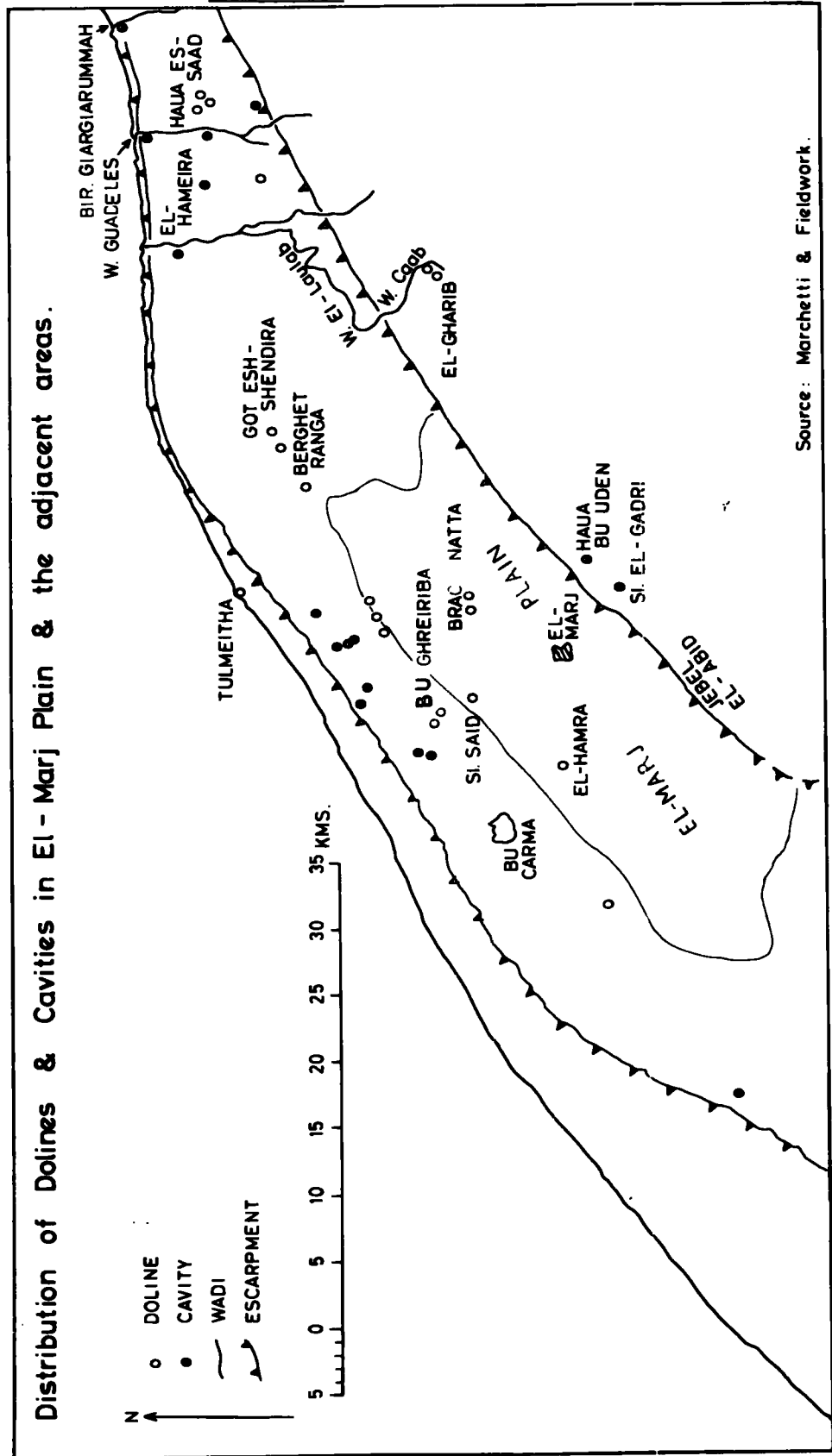
In the undulating area which separates El-Marj Plain from El-Abiar Plain a group of small basins occurs i.e. Sidi Bu Zeid, Silina, and Mletania. Their main characteristic is that they are small and not well-defined like the El-Marj Basin.

Marchetti, Desio and Hey have considered the evolution of the El-Marj Plain and the other smaller basins in the context of karst erosion, while Marinelli believes that the basins are ancient cut-off longitudinal valleys and that karst erosion has modelled and widened the basins. Tectonic movement is clearly important and further discussion is deferred to a consideration of the Geology.

The Dolines

In general, enclosed forms of water percolation give their characteristic morphology to wide areas of the region (Vide Fig. No. 7) especially where the predominant development of subsidence constitutes the fundamental element of the landscape. Dolines are widespread in the Jebel and Benghazi Plain south of El-Mabni but discussion here will be confined to the area east and north-east of El-Marj.

Figure 7



Source: Marchetti & Fieldwork.

To the east of El-Marj karst phenomena manifest themselves all over the undulating surface of the soft Oligocene and Miocene limestones of the upper terrace. For a general idea of the distribution of these phenomena one may note:-

1. The group of wide slightly depressed basins of Berghet Oranga and Got Esh-Shendira (Vide Fig.8).
2. The widespread well marked dolines to the ^{north} east of Sidi Said, especially in the zone of Got Bu Ghreiriba.

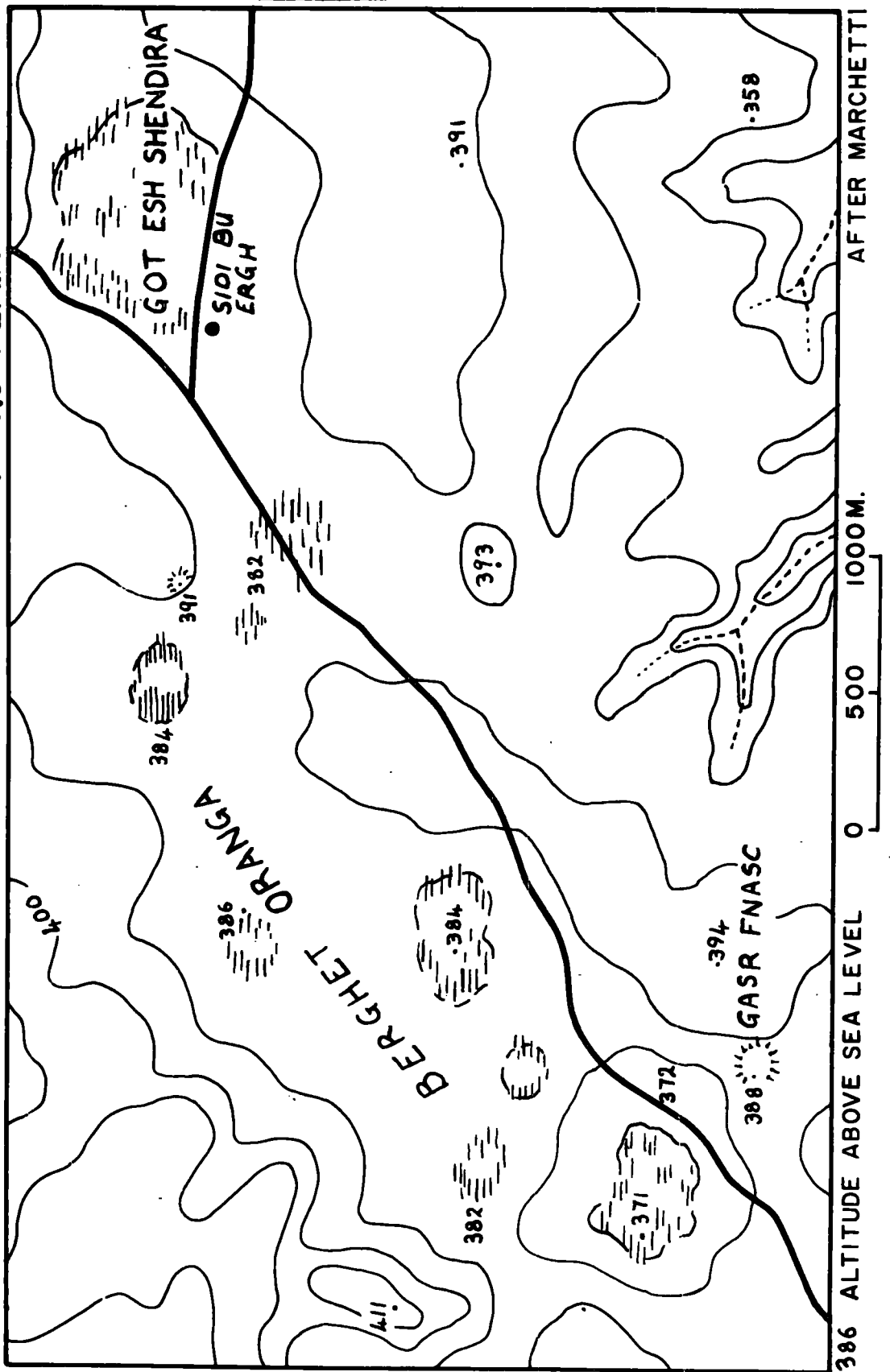
At El-Gharib Muhlhofer⁽²⁵⁾ records two karstic depressions with pot-holes at the bottom of Wadi Caab. There are the large dolines of Haua Es-Sa^ad and Haua Heitini.

According to Marchetti⁽²⁶⁾ the scarcity of funnel-shaped dolines at present in existence is due to the fact that they are filled with sandy, wind transported material. They have given rise to flat or irregular forms rather like the dolines which are at present found on the second escarpment of the Jebel. It should be noted on the other hand that on the surface of the upper terrace to the east of El-Marj they are fairly widespread in the more compact strata of the Eocene rocks and in large or small forms. They have large deposits compared to their diameters, as may be seen in the already mentioned dolines of Heitini (250 x 170m. approx.) which are about 65m. deep.

The form of the dolines of the second escarpment may therefore be explained best by first considering the

Figure 8-

KARSTIC BASINS AT THE EAST OF EL-MARJ PLAIN



less incised forms. The friability of the rocks (Oligocene and Miocene limestones), which are mainly soft, causes a rapid breaking down of the edges and slopes. This is especially the case where there is a slow infiltration of water owing to the absence of well defined and open fissuring.⁽²⁷⁾ As far as older forms are concerned, therefore, the disintegrating work of meteoric agents, compared with the present low rainfall and with the progressive filling up by alluvial Terra Rossa, has contributed to soften the forms into their present aspects. However, Marchetti⁽²⁸⁾ does not believe that among these complex factors the action of the wind can be held to be exclusive or predominant, and in the Cyrenaican karst it has a function exactly comparable to that which is found in other European karst zones, namely, it merely contributes to the distribution of the Terra Rossa in the depressed zones.

Also associated with the surface karst forms, which here testify to localised percolation as a result of fissured zones, there are also vertical drainage patterns and various subterranean forms characteristic of limestone areas, i.e. sink holes and caves. These are brought about by the widening of joints in the rock through the chemical and mechanical action of infiltrating waters which testify to underground circulation.

However, in accordance with the usual events of karst regions, vertical cavities (swallow-holes) predominate in the flat areas; these may be considered as forms of infiltration by vertical drainage or "circulation with high gradient". With the latter it is a case of simple forms connected by gullies with inclined courses (swallow-holes and caves).

It is obvious from what has been said that karst phenomena are represented in northern Cyrenaica in all their classic forms exactly similar to those observed in European countries.

It is probable that this morphological aspect was formed in geological times which were climatically different from the present. Thus, aided by different altimetric and morphological conditions, there was inaugurated in addition to fluvial modelling, a karst system now largely inactive and now largely disproportionate to the present hydrological regime.

However, the karst as a morphological factor is predominant and still partially active in the more rainy parts of the Jebel Akhdar. The karst type of infiltration and internal circulation of water may still be considered to be generally and uniformly distributed throughout the rock zones of Cyrenaica.

Wadis and Wadi Systems.

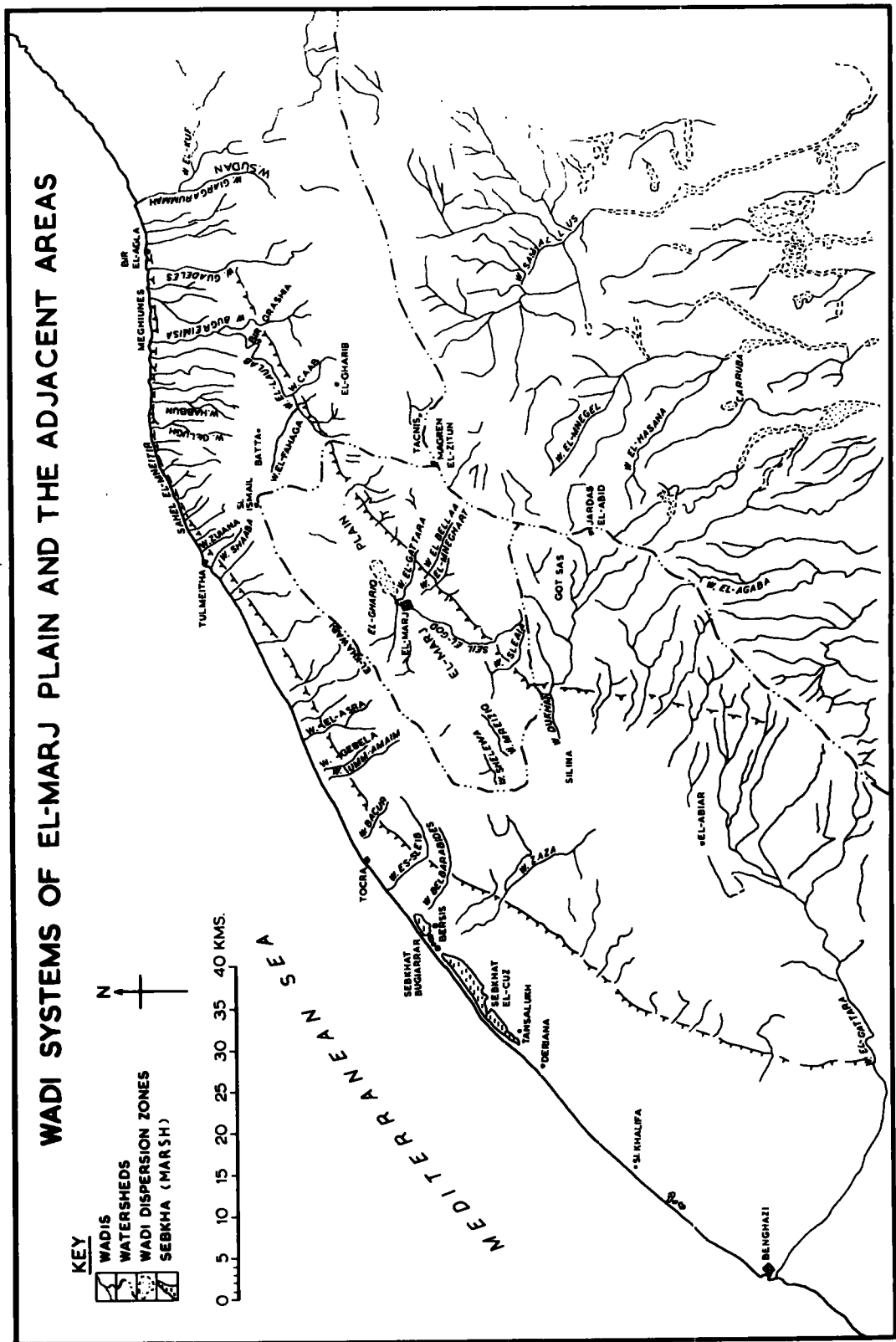
There are no perennial rivers in the whole of Cyrenaica, except in a few wadis in the eastern Jebel which have perennial springs. However, as far as El-Marj Plain is concerned there are not such copious springs.

The hydrographic network is made up of numerous wadi courses which run off in a direction normal to the coast, deeply incising the edge of the escarpment, with embanked beds and precipitous walls, sometimes almost vertical and usually with a rather narrow bottom giving a V shaped section. The great majority of the wadis are less than 20 Kms. long (Vide Fig.9).

On the Jebel the wadis radiate from the watershed following the general slope of the ground. The centre of dispersion of the wadis does not correspond completely with the highest part of the Jebel. The centre of dispersion is slightly farther to the east.

The wadis which originate on the plateau are usually less well developed than those which originate on the lower escarpment. In general they run so far out onto the lower escarpment, but terminate at its foot. In this region only a few of the large wadis cross the lower escarpment and reach the sea. These wadis are Wadi El-Laulab, Wadi El-Sallum (the upper part of W. Guadeles)

Figure 9



and W. El-Kuf in its upper reaches and W. Giargarummah in its lower reaches. W. El-Kuf rises on the high Jebel, flows parallel to the Jebel, turns almost at right angles and descends transversely to both the escarpments to reach the sea.

According to Marchetti⁽²⁹⁾ it seems that the high Jebel has only in a very limited area experienced morphological rejuvenation which, due to lowering of base-level or to variations of rainfall, or to both these factors, has produced the deep incisions noted on the lower courses of the wadis.

A few of these (W. El-Laulab and W. El-Kuf) have extended their regressive erosive action to cut into the second escarpment, but in no case has this reached the head of the valleys in which the profiles exhibit very marked characteristics of advanced maturity. However, in the zone between the watershed and the sea, the morphology of wadis exhibits two different aspects. Of these, one is characterised by embanked deep wadis which generally have a wide almost level bottom, and which are limited to the part nearest to the edge of the escarpment. The second aspect of the middle and upper courses is shown in wide level valleys with gentle slopes surrounded by low rounded hills and passing into enclosed basins.

The main saddle of the Jebel dips towards the north

and consequently the wadis running northwards are gorge-like and short. Due to the lack of water and the calcareous nature of the coast, most of the wadis disappear before reaching the sea. The gradient south of the main watershed is slight and the wadis are long and served by many tributaries.

Having described the general outlines of the wadis, it is now convenient to define the watershed of the Jebel before going into further details. There are two watersheds, the first is the main Mediterranean watershed, and the second the watershed of the inner drainage basin of El-Marj Plain.

In general the main watershed runs close to the sea at a distance varying from between 30-35 Kms. from the sea (Vide Fig. 9).

The wadis north of the watershed run towards the Mediterranean, while the wadis south of the line flow into the closed depressions of the Baltes in the Es-Serual region south of the Jebel Akhdar.

The second watershed is that of the enclosed basin of El-Marj, which is adjacent to the main watershed. The El-Marj Plain watershed coincides with the main watershed on the second escarpment for a distance of 14 Kms. west of Magren El-Zitun (Vide Fig. 9) and runs north-east crossing the second escarpment where it forms a dividing line between W. El-Laulab and El-Marj Plain. It then turns west to a point four kilometers south of Sidi Ismail. It curves

eastwards and then northwards where at the west of Batta village it runs to the west along the undulating hills on the crest of the first escarpment. It here follows the track (Tariq El-Hammar) between Batta and El-Gatris. After this point the line runs to the south east where it crosses the area between W. Zaza which runs to the coast across the lower escarpment and W. Mreiziq which flows into El-Marj Plain. The line crosses the second escarpment and runs through the dissected area of Jebel El-Abid where it encloses the upper parts of Wadis Sleiaia, Cuefia and other wadis which flow into El-Marj Plain. The wadis of Seil El-God and El-Gaftara flow into the ephemeral lake of El-Ghariq (Vide Plate 2a).

Desio⁽³⁰⁾ classifies the wadis of northern Cyrenaica as follows:-

1. Wadis which rise and disappear in the coastal plain.
2. Wadis which begin and die along the scarp of the lower escarpment and do not reach the sea.
3. Wadis which rise on the upper terrace and finish at the foot of the successive scarp or at the upper part of the coastal plain.
4. Wadis which rise and disappear on the scarp of the lower escarpment.
5. Wadis which originate and end on the scarp of the upper escarpment.
6. Wadis which begin on the upper escarpment and disappear at the foot of the successive escarpment.
7. Wadis which originate on the first escarpment or the second escarpment and reach the sea.

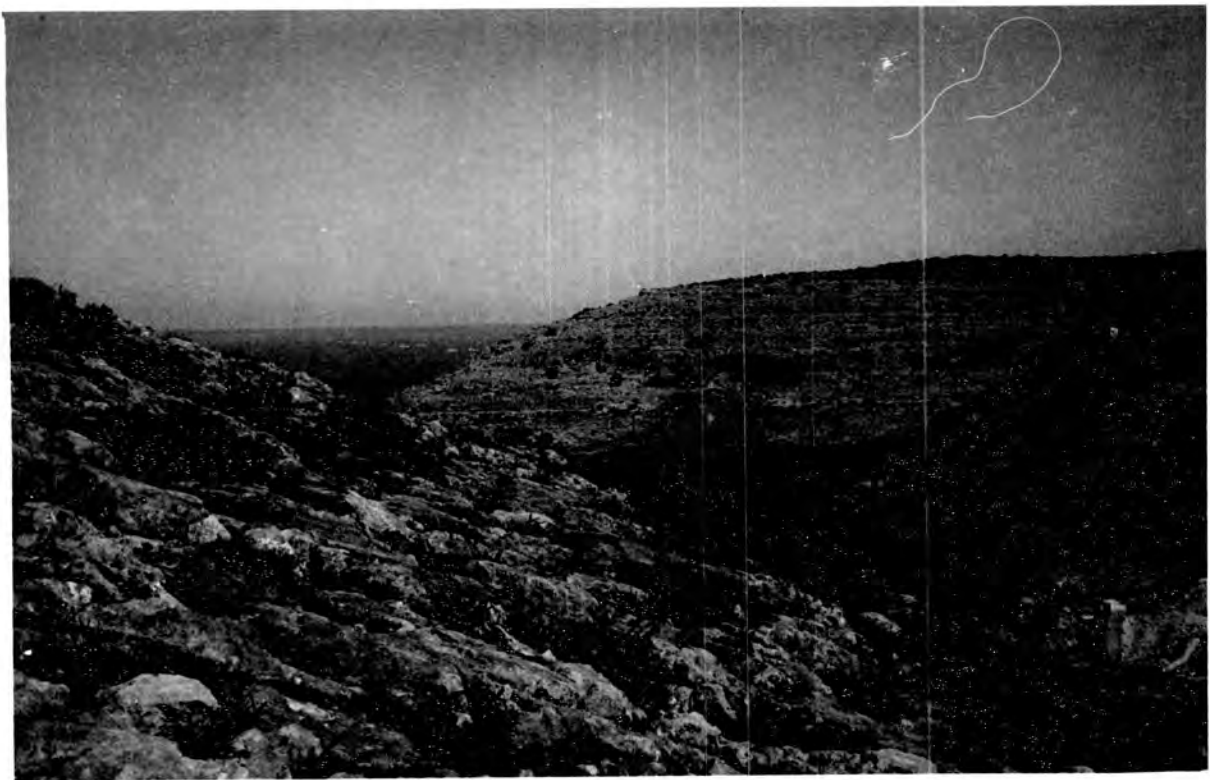


Plate 2 (A) - Wadi El-Gattara descending from the second escarpment towards El-Marj Plain.



Plate 2 (B) - The Gorge of Wadi Shababa across the crest region and the first escarpment north of El-Marj Plain.

All the major wadis do not stop before reaching the sea, but the small wadis disappear either through the pervious limestones or by evaporation. The waters flow in the wadis for a few days suddenly after a period of rain.

The well developed wadis which disappear at the foot of the second escarpment once seem to have reached the sea. Because of disturbance by faults, the wadis can be divided into three parts; the upper part dies at the foot of the escarpment, the water middle part disappears underground into the caves and fissures, while the lower part flows into the sea⁽³¹⁾ (Vide Fig.9). The wadis which rise on the upper terrace have a gorge-like course along the escarpment before disappearing at the foot of the scarp.

However, as a result of faulting, the segments of the wadis took new courses along the fault lines, but the wadis did not develop sufficiently. These two factors, the faults and the development of the karst scenery, therefore, have affected the wadi system and have brought an element of diversity to the wadi development. As a result of this, river capture has occurred and brought new wadis along the fault lines. These wadis originate in the area south of the second escarpment, and run in a northerly direction, cutting deep into the escarpment. On reaching the upper terrace, the first (known as W.Caab in the upper part) runs parallel to the second escarpment

along a fault line, the second (known as W. Guadelès) continues north to reach the sea, and the third runs west in a sharp right angled bend, it runs north (where it is known as W. Giargarummah) until it reaches the sea.

Other wadis on the northward side of the Jebel are, firstly W. Habbun and secondly W. Shaaba where the road between El-Marj and Tulmeitha follows the river bed to the coastal plain (Vide Plate 2b). Also worthy of note are the wadis of the western flank of the Jebel which flow into the Tobra area on the coastal plain. It has already been pointed out that the gradient in this area of the coastal plain is slight but irregular. To the north of El-Mabni, there is a large area covered with Terra Rossa brought down by W. Zaza which rises in the south-west of El-Marj Plain (Vide Plate 3a). To the north of W. Zaza, another wadi called W. Belbarabides has formed a similar deposit in its lower course. To the north of Bu Giarrar there is a small area covered with a transported Terra Rossa which has been carried down by W. Es-Sleib which reaches the sea. Two types of soil are recognisable, the transported Terra Rossa brought down by W. Es-Sleib and the coarse non-compacted sandy soil along the beach and around the coastal sand dunes. The sand dunes form a barrier between the sea and the wadi flood waters. The wadi floods about three times each year during

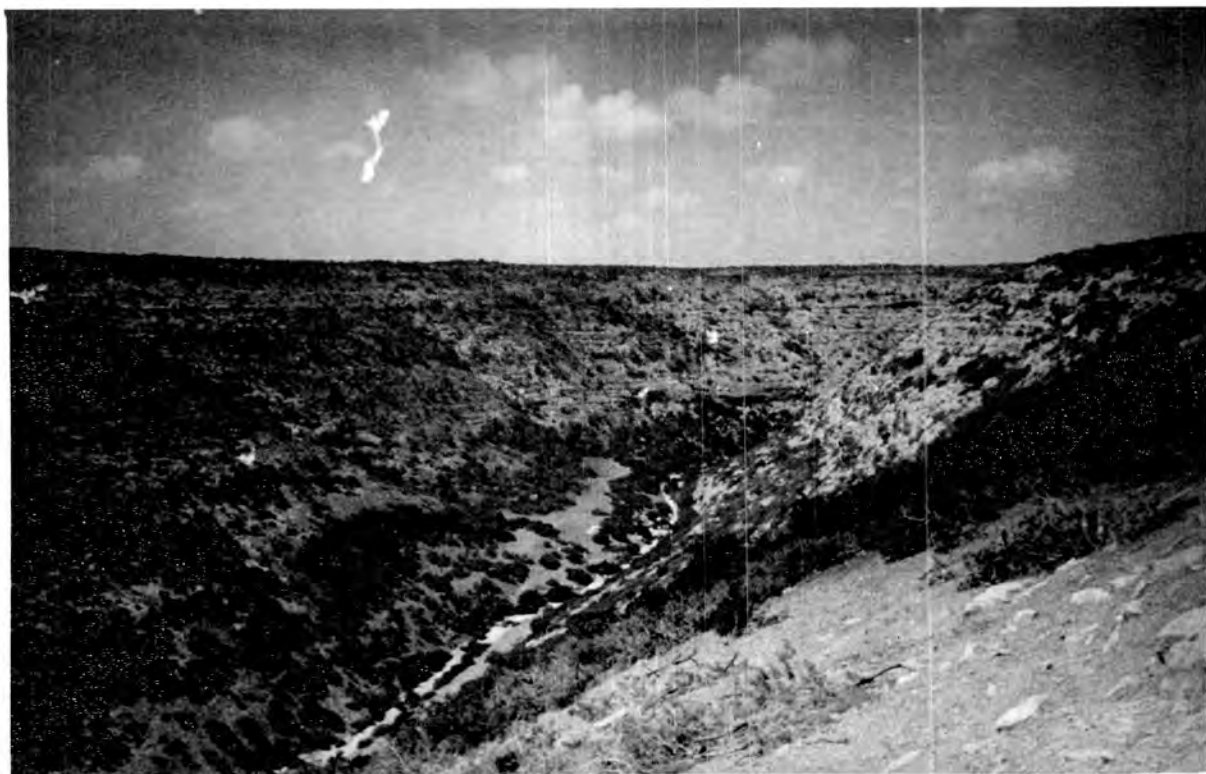


Plate 3(A) - Wadi Zaza emerging from the crest region south west of El-Marj Plain towards the Sahel.



Plate 3(B) - Karstic phenomenon - Swallow-hole of Haua Bu Uden south east of El-Marj. Note the edge of the depression.

winter. W. Bacur has formed only small alluvial deposits because of the short distance between the first escarpment and the sea. Other important wadis played a major part in the distribution of the soils, i.e. Wadis: Umm-Amaim, Gebela and El-Asra. The first two wadis after descending from the plateau form deltaic fans extending to the coastal plain. Their flood waters occasionally reach the sea, and usually disappear by percolating underground during their lower course or on the sands of the beach.

However, Wadi El-Asra in the extreme north east of this zone forms a relatively long wadi (15 Kms.) and it too reaches the sea. It seems that the floods of this wadi occur in vigorous torrents which rush down the wadi and are able to transport many rocks and boulders. If one follows the wadi course on the plateau, one finds that it is cut deeply in the alluvial materials which reach 7 to 8 metres in depth.

All the wadis in this zone have a narrow gorge but more of these gorges appear to continue beyond the lower escarpment because of the hardness and homogeneity of the bedrock.

Abandoned (or dead) Wadis

On the surface of the plateau there are groups of wadis and basins joined together. The bottoms of the

basins are divided into small wadis, whereas those of the wadis are covered with Terra Rossa and have the form of small flat surfaces. Hydrologically the bottoms represent swallow-holes. The general outline of the wadis on the topographic maps represent the minor tributaries of one active wadi.

The Development of the Hydrographic System

If one assumes that all the wadi courses are silting up, it may be observed that there are many cases where the general slope does not correspond with the present wadi courses. Therefore, one may recognise without difficulty the traces of the river captures in the adjacent wadis. The most significant example is W.El-Laulab. W. El-Laulab (Bu Greimisa in its lower reaches) represents an irregular wadi course. The wadi from the Jebel to Bir Grashia has a right angled course in its lower part at the foot of the second escarpment where it corresponds with the fault line. W.El-Fahaga formerly formed a small group of wadis originating on the upper terrace and flowing into the sea east of Ras Tulmeitha. At present W.El-Fahaga is a tributary of W.El-Laulab. The small valleys which originally were contained within the wadi system were gradually isolated from this development because of the downward percolation of their waters.

There is no direct connection between the closed valleys and the active arms of the wadis as far as surface

connections are concerned. A group of wadis flow into the active wadi and disappear in the cavity of the bedrock. Finally, it appears that the small wadis are in fact arms of the ancient hydrological system. According to Desio⁽³²⁾ the abandoned wadis become active again when the basin is silted up. A typical example is represented in an alignment of depressions in the zone between El-Marj and Tacnis. These characteristics are found in Zawiyat El-Gsur east-south-east of El-Marj where a swallow-hole called Haua Bu Uden exists and water collects in it (Vide Plate 3B). Another swallow-hole is to be found near to Got Sidi El-Gadri⁽³³⁾.

SUMMARY

El-Marj Plain, and the coastal plain to the southwest of Tulmeitha represent the greatest scope for agricultural development. The wide flats of El-Marj Plain, where 28, 000 hectares of settled agriculture exist, have a heavy soil of Terra Rossa type. There is in fact no coastal plain east of Tulmeitha because of the approach of the escarpment to the sea. The escarpment is dessected by numerous wadis making the extension of the road system an expensive task. To the east of El-Marj and on the high Jebel the land is rugged and undulating and agriculture occurs in only a few scattered patches. Travel on the plateau is arduous because of the transverse wadis running

across the country to the sea. The water flows in the wadis during the winter and either reaches the sea or disappears into the pervious limestones without being utilised by man.

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CHAPTER II

Geology

Introduction.

The relief and landforms of the El-Marj region and of northern Cyrenaica, as already examined, owe much to geology and structure. In combination with relief and climate, geological factors also control the hydrology and, as we shall see, the nature of the parent material for soils is of extreme importance. Lastly of course there are tectonics most obviously relevant in the earthquake history of El-Marj.

In this chapter are therefore considered, first the general geological situation, and later various aspects of particular importance. Most of the detail is best examined under the heads of other phenomena, such as hydrology, soils etc.

Any understanding of the contemporary human and economic situation in Libya must also necessarily take the recent discovery and exploitation of oil into account.

The geology of Cyrenaica to the north of the oasis depressions is reasonably well known. The first detailed study was made by Pratt (1865) which was followed by Gregory (1908), Crema (1922), Marchetti (1934), Desio (1935) and the recent study by McBurney and Hey (1955). The best

available maps are the one of Desio's (1935) and the most recent one compiled by Conant and Goudarsi (1964).

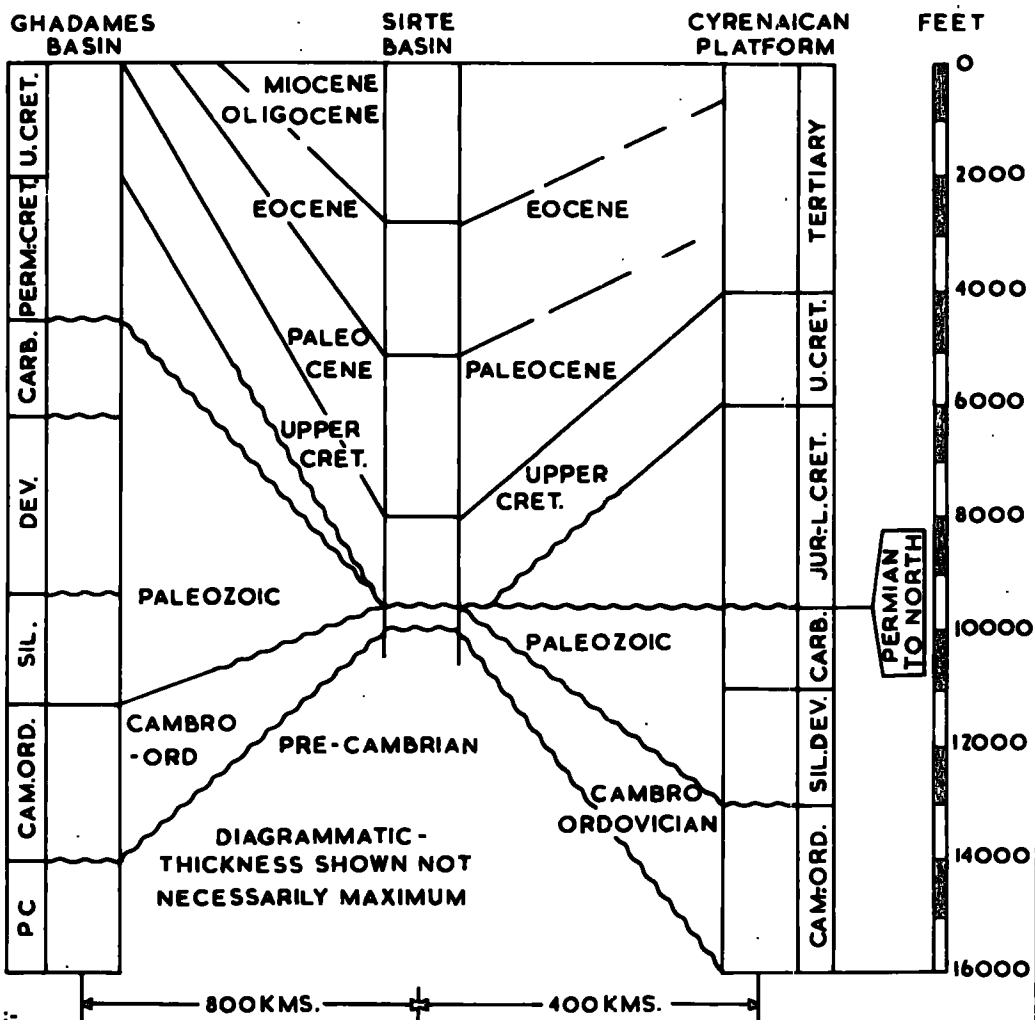
Libya is a part of the Mediterranean foreland which is not complicated by a coastal belt of strongly folded sediments comparable to the Atlas Complex. However, a semblance of mild compressional deformation is seen in the Jebel Akhdar. This range of low mountains is the topographical expression of a highly faulted "anticlinorium" in which Mesozoic rocks have been uplifted exposed at the core.

Epirogenic down-warpage, tilting and block faulting on a lesser scale have differentially depressed the Libyan foreland allowing periodic advance of the ancestral Mediterranean (Tethys) sea. Thus all of the geological systems are represented in the Libyan record, but no single basin appears to contain a complete column (Vide Fig. 10).

However, northern Libya can be divided into three major geological provinces each having its distinctive history of sedimentation. From west to east these are: The Ghadames basin, the Sirte basin or Embayment and the Cyrenaican plateau. The latter is represented by the foreland of easternmost Libya which is a basement platform having gentle northward slope, and on which peisms of Paleozoic, Mesozoic, and Tertiary sediments were deposited. Mesozoic strata thicken markedly in the northern portion

Figure 10

GENERAL GEOLOGICAL COLUMNS NORTHERN LIBYA



SOURCE:-
MINISTRY OF PETROLEUM AFFAIRS-TRIPOLI

of the Cyrenaican platform.

Figure 10 illustrates diagrammatically the subsurface of the three northern provinces. Very little of this section is exposed at the surface. It is interesting to note the broad divisions in lithofacies that are apparent. Whereas an alternation of sands and shales characterise the Paleozoic, carbonates and shales predominate through the late Cretaceous and Tertiary.

As far as the Jebel Akhdar is concerned, of the rocks exposed on the surface, all are of sedimentary origin and almost all are marine limestones. The oldest known are of Upper Cretaceous age; these are confined to two inliers on the crest of the Jebel, and another two localities on the north coast. Eocene and Oligocene beds occupy much larger areas, though these again occur only in and around the Jebel. The greater part of northern Cyrenaica is covered by rocks of Miocene age, those of Middle Miocene being especially widespread. Younger beds, on the other hand apart from these of Pleistocene are only doubtfully present, and must in any case be of very limited distribution (Vide Fig.11).

Most of the region appears to have a very simple geological structure, the beds showing nothing more than a gentle southerly dip. Tectonic complications are known only from Marmarica and from the Jebel itself. In the

latter area, these complications are mainly in the form of faults and monodines, sometimes of considerable downthrow and extent.

The following classification based on the work of Gregory and the Italian geologists has been adapted for the rocks of each system that is known to occur in the area of study:-

Group	System	Series	Stage
Post Tertiary or Quaternary	Recent		
	Pleistocene	Upper	
		Lower	
Tertiary or Cainozoic	Pliocene		
	Miocene	Upper	
		Middle	Tortonion
			Helvetian
		Lower	Langhian
			Aquitanian
	Oligocene	Upper	Chattian
		Middle	Rupelian
		Lower	Lattorfian
	Eocene	Upper	Priabonian
		Middle	Lutetian
		Lower	
Secondary or Mesozoic	Cretaceous	Upper	Danian (including Maestrichtian) Senonian Turonian
			Cenomanian
		Nubian Series	(of Post Pleozoic to pre-Tertiary Age)

The rocks of each system will now be briefly examined beginning with the oldest (Upper Cretaceous) and passing upwards through the series in order of decreasing age to the youngest deposits.

Upper Cretaceous:-

Desio (1933) mentioned one small outcrop of Cretaceous in Cyrenaica, which had been discovered by Crema (1922) in Wadi Bacur, between Tobra and El-Marj, near where the road ascends the face of the Jebel (Vide Plate 4a). This exposure is shown on Desio's geological map as a strip along the same line as Gregory's "Tobra fault". Since then, mainly by Marchetti, Cretaceous rocks have been proved to occur in a number of localities in the Jebel. Marchetti (1934) states that the Cretaceous of Wadi Bacur near Tobra appears as a small lens of white and grey marly limestones with nodules of flint and a few fossils of Upper Cretaceous (Maestrichtian) age, which forms an inlier in a small fold.

The Cretaceous limestones generally vary but slightly, are white or light yellow in colour, mostly nummulitic, some with flint, and are mechanically soft.

According to Marchetti, it is probable that between Tobra and Tulmeitha near the mouth of the deep wadis outcrops of these horizons exist which have not yet been discovered.⁽¹⁾ This was confirmed now on the Conant and Goudazi's geological map (1964), which shows the Upper



Plate 4(A) - Exposure of the Upper Cretaceous in Wadi Bacur west of El-Marj Plain.

Cretaceous beds as a continuous strip along the first escarpment between Tulmeitha and Tobra (Vide Fig. 11).

The largest exposure of Cretaceous beds, roughly 20 km. from north to south and 30 km. from east to west, is around Jardas El-Abid, south of El-Marj. These beds belong to the Upper Cretaceous and are coarse, compact, yellowish limestones, yellow and greyish marly limestones and marls and crystalline limestones. Fossils are abundant but are generally internal casts and badly preserved. At Jardas El-Abid and Got Sas fossils of Cenomanian age were found and lower Senonian fossils occur near Got Sas and a little to the west of Gasr Gebela (12 kms. north east of Tobra). Beds of compact limestone containing oysters and sea-urchins, alternating with coarse limestone appear to represent the upper part of the Cretaceous along the northern margin of this exposure. The western boundary between it and the Eocene is a north to south fault parallel to Sidi Mahius fault; on the north it passes under the Eocene, while on the east and south the Oligocene is transgressive on it.

Desio⁽²⁾ remarks that if faulting has not taken place along the contact between the Upper Cretaceous and the Eocene, the Eocene must be transgressive on the Cretaceous and further research should be undertaken to elucidate this

point as it would be of great practical importance, because of the valuable deposits of phosphate found near the top of the Cretaceous in neighbouring countries.

Tertiary or Cainozoic

Eocene:-

The strata of the Eocene system are widely distributed in the Jebel Akhdar. Throughout this area their lithological features and fossil species remain remarkably constant and they attain a thickness of over 200 m.

a. Lower Eocene:- Gregory's Apollonia limestones; Marchetti states that the passage from the Cretaceous to the Eocene is clearly visible only at Wadi Bacur and Tulmeitha, where the lower marly limestones with the Cretaceous fossils pass insensibly into the overlying compact flint bearing limestones with which they are perfectly conformable.

Lower Eocene beds extend without break between Sahel El-Mneitir (east of Tulmeitha) and Bersis, where they form the base of the first escarpment and also the coastal plain between Sahel El-Mneitir and Tobra. They also appear at the foot of the second escarpment between El-Marj and El-Gharib. They consist of massive compact siliceous limestones with a number of shelly beds containing many foraminifera, and they are terminated at the top by a breccia flint fragments.

b. Middle Eocene:- The most extensive strata in El-Marj Plain are of the Middle Eocene (Gregory's Derma Limestones). They extend from El-Hania to the south west along the crest of the first escarpment, and they form almost the whole of El-Marj Plain to about 40 km. south of El-Hemda. The Middle Eocene beds extend also to the south forming the second escarpment at Jebel El-Abid, and around the Cretaceous of Jardas El-Abid. The second escarpment south of El-Marj continues westwards along the plain of Silina and is formed mainly by the Middle Eocene.

On the eastern Margin of El-Marj Plain the cream coloured limestones with nummulites form the relief features surrounding the plain. Around El-Gsur Desio⁽³⁾ records the existence of soft white nummulitic limestones characterised in parts by the Middle Eocene. Between El-Gsur and the edge of the second escarpment the colour of the limestones becomes yellow.

The Middle Eocene forms the northern boundary of El-Marj Plain at Sidi Said and El-Khawabi where the white soft limestones predominate. These limestones have a sandy aspect and contain extraordinary quantities in siliceous nummulites and apparently of nummulites which are Gizehensis in origin and of Lutetian type. Between the localities of Sidi Said and Sidi Dakhil the Mocene is transgressive on the Middle Eocene.

Along the continuation of the crest of the first escarpment towards the west-south-west, the Lutetian nummulitic limestones appear near El-Gatris on the road to Tobra. They are white soft limestones with other compact cream coloured limestones. The Middle Eocene formations extend around Farzuga and southwards to El-Hemda.

The typical Lutetian appears at the series of the second escarpment south of El-Marj with Nummulites Gizehensis. The strata form a passage to the Upper Eocene⁽⁴⁾.

According to Gregory, six kilometres south of El-Marj there are exposures of a limestone with nummulites, which no doubt belong to Derna limestones⁽⁵⁾ (Middle Eocene). The Middle Eocene outcrops also near Bu Semah. The Middle Eocene yields a good building stone.

C. Upper Eocene.

In the second escarpment south of El-Marj the Upper Eocene is represented by soft, white nummulitic limestones and the Slonta limestones of the Jebel are also now regarded as being of Upper Eocene age.

The Upper Eocene formations of similar lithological characters to the Middle Eocene follow regularly on the top of the Middle Eocene at the faulted junctions of the Eocene with the Cretaceous west of Jardas-El-Abid and runs eastwards along the summit of the

second escarpment to the south of Apollonia. A tongue extends to the east, _ south of El-Beida.

Oligocene:-

The Oligocene formation covers most of the central Jebel. The series from the base upwards consists of soft white limestone with nullipores, small nummulites, sea urchins and molluscs; then sandy limestones with brown shelly beds containing nummulites intermedius, sea-urchins, and molluscs and finally coral limestones.⁽⁶⁾

However, a tongue stretches from the Tacnis area to around the Middle Eocene of Jardas El-Abid Cretaceous. The addition to our knowledge of the Oligocene since 1938 has been its extension to the east of El-Abiar. The geological map of Libya (1964) shows the Oligocene extending northwards across the second escarpment and south west of El-Marj Plain to south-east of Farzugha. It then swings towards the south east in a strip to the north east of El-Abiar, and then to the west where it meets the first escarpment 20 km. east of El-Abiar (Vide Fig. 11) Desio mentions the existence (20 kms. east of El-Marj and around Tacnis) of the Oligocene formations of yellowish flinty porous limestones, associated with white-brownish limestones.

Generally speaking the continuity of the sedimentation between the Eocene and the Oligocene seems well established with the exception of certain points

indicating the existence of certain gaps⁽⁷⁾. The Oligocene formations would be partly coastal and partly continental, while the Upper Oligocene is marked by marine sediments of little depth, the Middle and the Lower are constituted by continental and lagoon formations.

The Miocene:- The Miocene rocks in El-Marj Plain are sparsely represented, and only in the western part of the plain. The Miocene formations constitute almost the whole of Benghazi plain to a point of 18 kms. north east of Tobra in the northern direction.

The Lower Miocene or Aquitanian:- The recent geological map (1964) shows a narrow strip running south to north for about 50 kms. along the summit of the first escarpment west of El-Abiar. The formations are white fossiliferous detrital limestones of earthy material, and become more massive and locally dolomitic above and more massive and locally dolomitic below. Another outcrop of lower Miocene is on the high Jebel 15 kms. east of Jardas El-Abid where it extends eastwards and southwards to constitute most of northern Cyrenaica.

The Middle Miocene or Helvetian Tortonian }:- The Middle Miocene formations in the south west of El-Marj Plain occupy the area between Sidi Bu Zeid in the north, Sleia and Bu Semah in the east, Mletania in the west and southwards they cover the El-Abiar area. The formations are organic detrital

limestones and fossiliferous white sandy limestone and calcareous sandstone of Benghazi Plain.

However, the formations in the south west of El-Marj Plain and in El-Abiar area are represented in the form of white compact fossiliferous limestones. The formations are disposed in horizontal beds and the fossils are well preserved in a form of marked pattern containing snails in the rocks. The calcareous surface is eroded by run-off, and the depressions are covered by thick deposits of Terra Rossa mixed with rubble. This aspect is observed in the area between Bu Semah and El-Abiar.

The coastal plain from a point 18 kms. north of Tobra to a point just east of Benghazi is formed of White, yellowish and ash-coloured limestones with lithothamnium and fossiliferous patches containing ostrea frondosa, pecten adunius etc. These limestones continue southwards to Ajedabia where shelly limestones predominate.

Upper Miocene:- As far as El-Marj Plain is concerned no formations of this age are represented in the region. There are lenses of massive gypsum observed between Benina and El-Regima. According to Stefanini, the El-Regima gypsum belongs to the Upper Miocene. Generally speaking these deposits present no interest from the point of view of economic value.

Pliocene:- There are no Pliocene deposits in the whole of northern Cyrenaica.

Quaternary:- The Quaternary deposits in northern Cyrenaica do not attain the thickness of those of the proceeding formations, but they cover large parts of the region and in places almost completely mask the underlying beds.

We may, with Hey, consider the Pleistocene as follows:-

1. Marine deposits
2. Continental deposits
 - a. Alluvial deposits
 - b. Consolidated due deposits
 - c. Tufaceous deposits

Marine Deposits:- It has already been pointed out in the chapter on relief that the lower escarpment possesses a stepped topography composed of alternate cliffs and terraces. It also has patches of marine deposits on the surface. The terraces are considered to be ancient wave cut platforms and the cliffs to be of marine origin⁽⁸⁾.

The total number of shorelines in the area concerned are five. The following is a list of levels and localities at which ancient shorelines are thought to have been recognised in the region with a fair degree of certainty:-

150-200 m.	Tocra-Antelat (still somewhat doubtful).
90 m.	Benina

33 and 20 m.	Tulmeitha
15+ m.	Benghazi
5-6 m.	Tocra? Coefia, Benghazi.

It is very probable that the escarpment between Tocra and Antelat represents the cliff of a single marine shoreline whose altitudes now lie between 150 and 200 m. If so, it can be concluded that the feature was formed at a time when the sea itself stood between 150 and 200 m. above its present level, and that it has subsequently undergone no important tectonic disturbances.⁽⁹⁾ This would be the time at which the coastal plain was first brought into existence by the action of marine erosion. According to this the plain must be older than Benina and Tocra steps which thus represent the total effects of subsequent marine erosion.⁽¹⁰⁾

According to Hey it is almost sure that the Tocra step with its constant level of 5 m. maintained over a distance of at least 18 kms. must owe its present elevation entirely to a shift of sea-level. It is only slightly less certain that this is also true of the other fragments of shoreline which were found to lie at the same altitude. The Benina step is also a marine cliff. To the west of Tulmeitha the fragments of the two well developed terraces were embanked with consolidated dunes, but the lower of the two indicated a shoreline at an approximate level of 20 m. The Cyrenaican shorelines

may be related to the geological times scales established in the world. Isolated fragments of shoreline levels between 6 and 9 m. have been reported from all over the world, and several good examples are known of shorelines which remain between these levels for great distances. Thus the position of the lowest distinct shoreline on the coast of the eastern United States is marked by a feature known as the Suffolk Scarp which runs for 800 miles (1300 kms.) between New Jersey and Florida. Similarly on the coast of South Africa traces of shoreline at 6 m. have been found for a distance of 1500 kms. from the Nollorth to Durban.⁽¹¹⁾

The 6 m. shoreline has been assigned to the Last Interglacial. On the banks of W. Zuiana, beach deposits are found and could be traced upstream from the modern shore as far as its termination, 6.4 m. above sea-level at the foot of a low cliff.

2. The Continental Deposits:- The Continental Pleistocene deposits are divided into three categories as follows:- deposits composed largely of alluvial material, deposits of consolidated dune, and deposits which include much tufaceous material.

a. Alluvial Deposits:- The greater part of the alluvial deposits occur as fans at the mouths of the gorges which emerge from the lower escarpment in the coastal plain

between W. Es-Sleib (7 kms. S.W. of Tocra) and Derna. The two main constituents of deposits are fragments of rock of local derivation and matrix which generally consists almost entirely of Terra Rossa. The Terra Rossa is obviously derived having presumably originated on the broad and level limestone surface of the higher Jebel where it still occurs. (The Terra Rossa will be dealt with in the chapter on soils.)

In some cases the material is within the gorge itself, its upper surface forming a single terrace. These features overlie the 6 m. shoreline. The material of which they are composed is referred to by Hey as Younger Gravels. The deposits are thought to have been laid down at a time when winter was very cold, the rainfall perhaps moderate and seasonal⁽¹²⁾.

b. Consolidated Dunes:- The deposits of consolidated dunes are of marine origin and most are in the form of genuine fossil dunes, adjacent to the modern shore. It has been made clear in the chapter on relief that the fossil dunes are present around the entire coast between Deriana and a point of 8 kms. N.E. of Tocra, and between W. Giargarummah and El-Hania.

However, the majority of these fossil dunes are younger than the 6 m. shoreline and so they are called younger fossil dunes, presumably formed when the sea-level

stood considerably lower than at present.

There are also submerged fossil dunes offshore Tulmeitha which denote a sea-level no higher than 17 m.; their distribution also indicates north westerly winds. (13)

c. Tufaceous Deposits:- The great majority of the occurrences of the tufaceous deposits were small and local. They are almost a constant feature of those wadis which contain perennial springs at the present day.

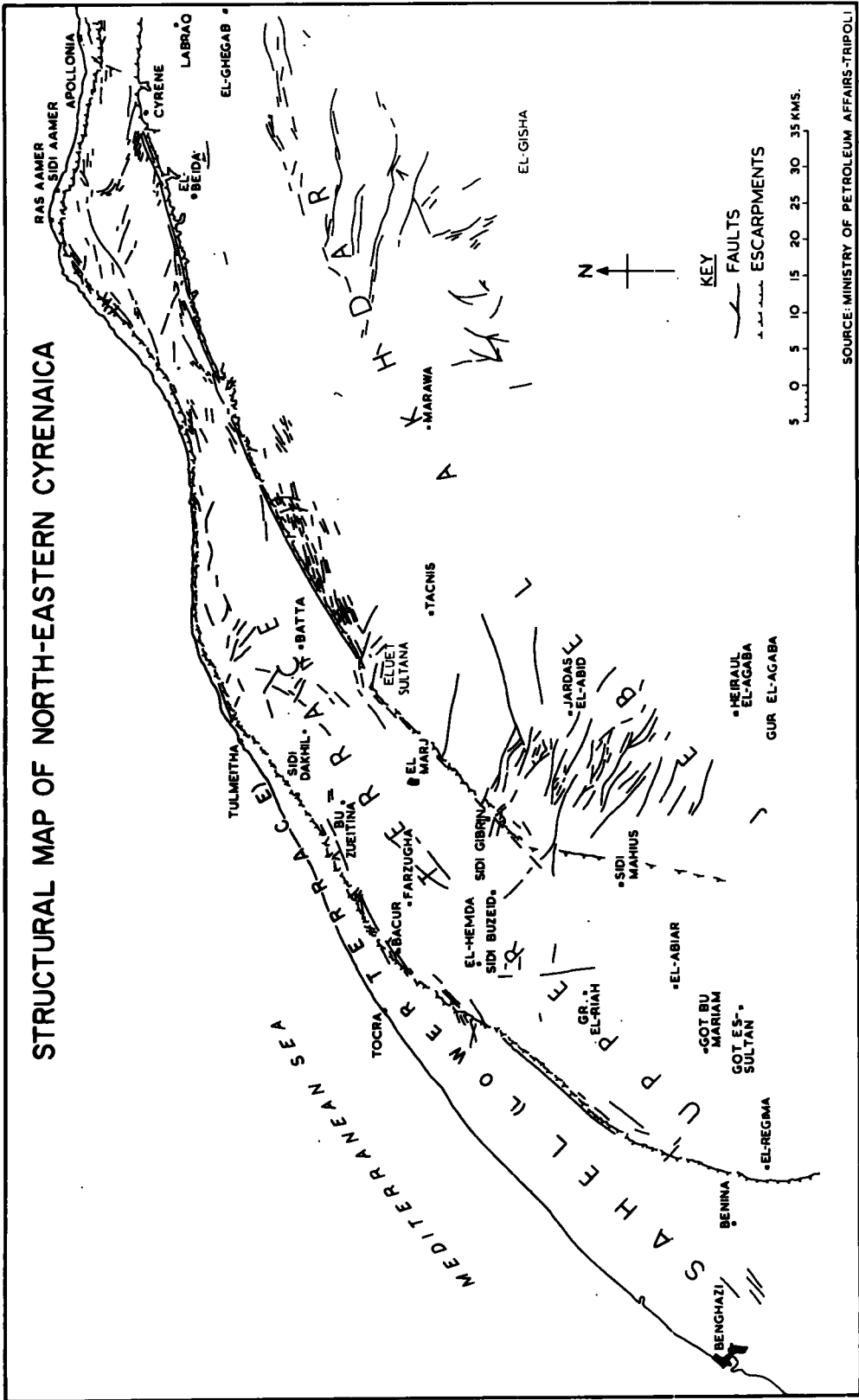
Tectonics:-

On the Jebel some faulting has occurred and there are considerable disturbances (Vide Fig. 12). Gregory claimed that he located five faults. Marchetti in 1934 confirmed the existence of two of the Gregory's faults. One was found to follow the lower escarpment from the N.E. of Benina becoming monodine traceable as far as Tulmeitha. Moreover, Figure No.12 shows that the faulting continues along the first escarpment east of Tulmeitha as far as Apollonia (Susa). The other followed the upper escarpment and can be traced from at least 30 kms. south west of El-Marj to Cyrene.

It must be pointed out that both faults are not quite continuous. The lower escarpment seems to have less faulting along it particularly east of Tulmeitha.

The principal direction of the faults is considered to be almost parallel to the coast and the edge of the

Figure 12



escarpment since the fundamental tectonic trends of northern Cyrenaica are disposed in this direction, i.e. the numerous small faults of El-Marj Plain, Jardas El-Abid, the flexure of Tocra, the anticlinal axis of the dorsal of the high Jebel, the undulation of the area between El-Marj Plain and El-Magahir, and the small faults on the upper terrace between W. Giargarumma and south of Ras Aamer (Vide Fig.12).

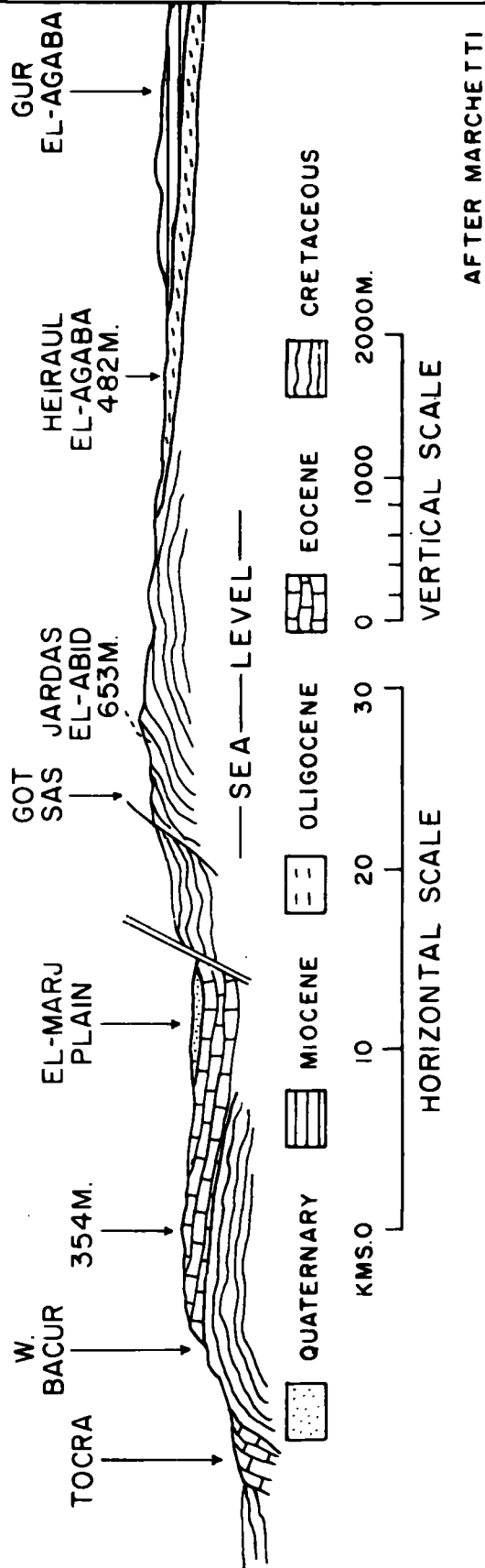
There is a third fault running from the north of Jardas El-Abid to the west which marks the northern and western limits of the Cretaceous of Jardas El-Abid. This fault is the major of numerous minor faults around Jardas El-Abid.

The El-Marj fault brings the Miocene of Sidi Mahius plain (S.W. of El-Marj) into contact with the Eocene of the upper terrace. Further inland, the fault of Jardas El-Abid from the western limit of the Cretaceous outcrop there, against which the Eocene has been faulted down.

Marchetti gives a geological section running south east from Tocra, which passes through El-Marj Plain to Jardas El-Abid and further inland to Heiraul El-Agaba and Gur El-Agaba (Vide Fig. 13), and cuts across two folds⁽¹⁴⁾. The first fold is along the edge of the lower escarpment and is responsible for the Cretaceous outcrops of W. Bacur, Tocra and Tulmeitha. The Eocene beds beneath the plain of El-Marj dip gently to the south east until affected by the fault behind El-Marj, which has dragged them upwards so as

Figure 13

A GENERAL TECTONIC SECTION ACROSS THE JEBEL FROM HEIRAU EL-AGABA TO TOCRA



to form a basin beneath El-Marj Plain between El-Marj and the fault that limits the Cretaceous of Jardas El-Abid on the north west. The Eocene beds, dip gently towards the north west, but as the fault is approached the angle of dip rapidly increases. To the south-east of the axis, the beds dip gently away from it. The relation between the underground hydrology and the tectonics is important. We will deal with this relation in the chapter on the water resources (See also "Earthquakes in El-Marj" - Chapter XI).

Economic Geology

Known valuable resources are few in Libya but oil has so far been discovered in many places, and its future appears highly promising. Export of oil started in 1961. As far as the area under study is concerned no strikes have yet been made but two dry wells have been drilled in Farzughah and Jardas El-Abid. In any case we will deal with oil as a whole in Libya because of its significance and impact on the economic and social life. The impact of oil will be dealt with in another chapter.

Oil:- The first methane outpouring in Libya took place in 1914 in Sidi El-Mesri near Tripoli. The Italians drilled other borings in Tripolitania without success. However, the search for oil in Libya had hardly begun upon the declaration of war. At the end of 1951 Libya achieved independence and with stability the economic aspects of

petroleum exploration were started. Under the Mineral Law of 1953 nine international petroleum companies commenced primary geological reconnaissance in Libya. As this reconnaissance work progressed over a period of two years, petroleum legislation was enacted in 1955. The Libyan petroleum law established the framework for intensive exploration. The terms of the Law appealed to oil companies, who were at that time attracted by the relative political stability of the country. The Government was to receive a $12\frac{1}{2}$ per cent royalty on the value of oil produced and saved. Profits were to be divided on a 50-50 basis, of prices realised and not prices posted. Amendments to the 1955 law in 1961 re-introduced the conversion of the 50-50 agreement on to a posted prices basis, brought in the possibility of participation by the Libyan Government in exploitation, and introduced rather more stringent conditions.

The great competition among the oil companies for new concessions undoubtedly inspired the 1961 amendments to the 1955 Petroleum Law. Indeed, concessions with outlets in Europe have been encouraged by the Petroleum Council, since Europe is the most expanding oil market in the world, and of course, transportation costs from Libya are much less than from the Persian Gulf or Venezuela; European companies are increasing in number. The American Oil Company drilled

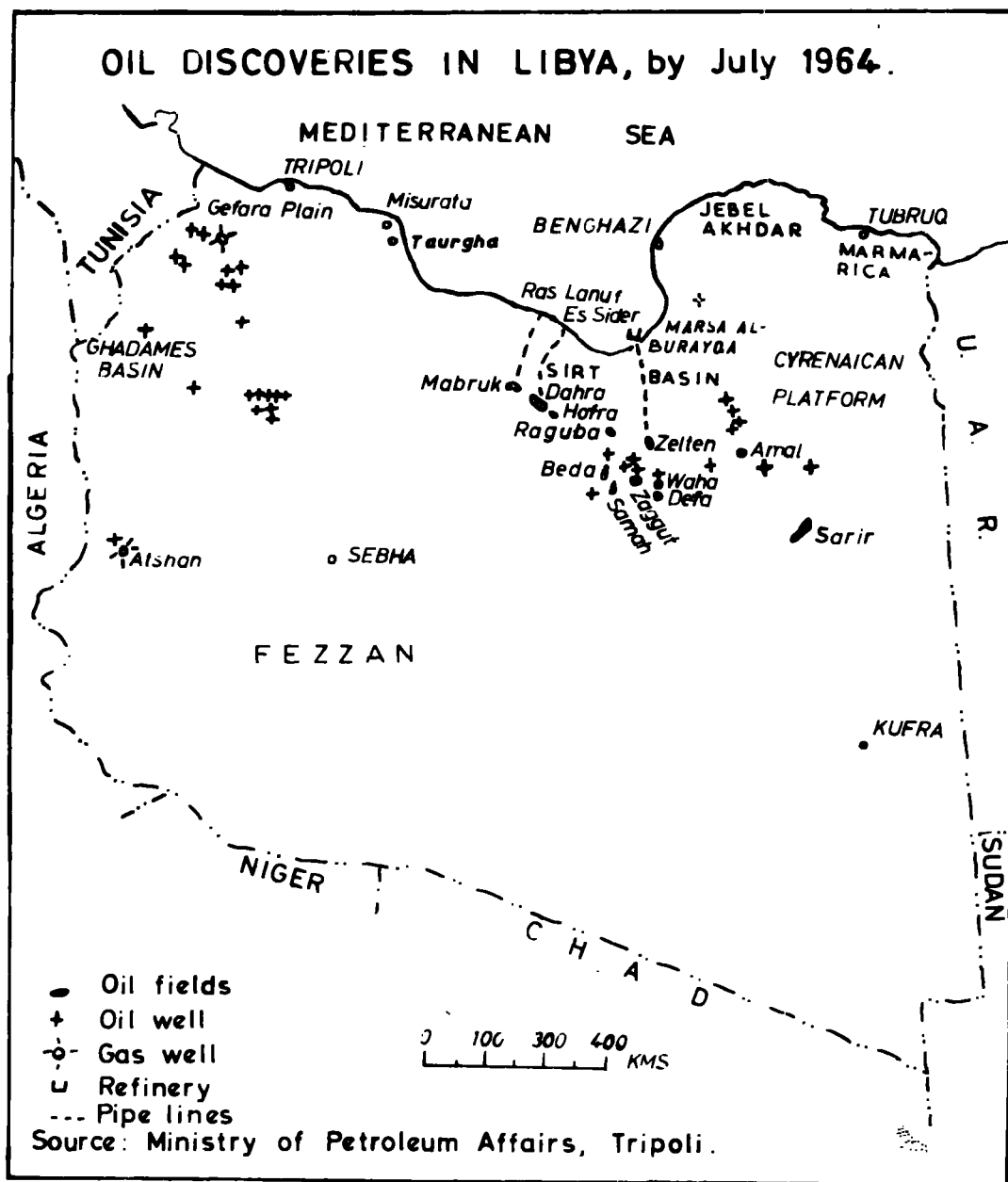
two wells at the Jebel Akhdar in 1956 in Farzugha and Jardas El-Abid, but both wells were found to be dry. The first strike of oil was at Atshan in Fezzan, (Vide Fig.14) with a potential of 500 barrels/day. Other successful strikes were made by mid 1959 in Zelten in the Sirte basin; by July 1964 producing wells totalled 511 and the total exported since September 1961 was 298, 268, 988 barrels.

The major fields are concentrated in the Sirte basin. This part of the desert is free of sand dunes and the topographical features are large expanses of rough sand and gravel pavement. Transportation here has fewer difficulties than in most of the Algerian desert.

The formations which contain oil in Libya are the late Secondary and early Tertiary. The oil is found in the formations of Paleocene and Eocene in the fields of Beda, Mabruk, Dahra, Hofra and Zelten. In Zelten the formations containing oil are beds of marly limestone of the early Eocene called Ruaga Formations. These are found at a depth of 6000 ft. below sea level and their thickness is 1087 ft.

The first shipment of Libyan crude oil was made in September 1961 from Esso Standard's new terminal at Port Marsa Al-Burayga. In 1962 Oasis Oil Company opened their terminal at Ras Sider which receives oil from their fields at Mabruk

Figure 14



Both productive areas are situated not more than 200 kms. from the Mediterranean shore. Mobil Oil have connected their fields with a new terminal at Ras Lanuf. It is planned also that British Petroleum will join their field of Sarir near Jalu with a new terminal at the Port of Tubruq. Esso has built a refinery at Marsa Al-Burayga with a capacity of 8000 barrels/day which came into operation in May 1965. The refinery produces benzene, kerosene and industrial fuel for Libyan consumption.

In conclusion, the natural resources in Libya are few. They did not provide raw material for industrialisation, but with the discovery of oil the picture has become much more favourable. Oil seems to be the only salvation from the poverty the country has been suffering. It will provide capital for the utilisation of Fezzan iron ore and for expansion in industrial and agricultural spheres. The impact of oil on the economic, social life in Libya as a whole and on the El-Marj region in particular is tremendously great, and its effects will be dealt with in Chapter XI.

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-74-
CHAPTER III

Climate

Introduction

The elements of relief of northern Cyrenaica are responsible for local variations in climate both in respect to thermal and precipitation conditions.

Northern Cyrenaica is climatically divided by the influence of the Mediterranean Sea on the coast and altitude of the Jebel in the interior; these differentiate the two zones of continuous habitation from the desert. It is only along the Mediterranean coastline of northern Libya that the influences of the sea bring some rain and coolness and make possible a zone of agricultural settlement and sustained agricultural production. These Mediterranean sea influences, however, do not extend to any appreciable degree beyond the coastal plain into the hinterland of the country.

Northern Cyrenaica enjoys more temperate climate than any other part of Libya, for rainfall is heavier and summer temperatures are lower, facts which are attributable to two factors; namely, its elevation and nearness to the sea. Exposed as it is to the humid sea winds, this mountain barrier gives rise to orographic precipitation which is relatively abundant and frequent.

It is proposed then to mention briefly the meteorological elements affecting the climate of the area of

study, followed by a discussion in detail of the thermal conditions, and precipitation which are the fundamental factors in agricultural production and finally the rest of the climatic elements and zones.

Meteorological elements influencing climate in El-Marj Plain:-

One of the major meteorological elements affecting the structure of climate in El-Marj Plain is the fact that maritime influence from the west is confined mainly to the winter months when the migration south of the major world atmospheric conditions take place.

The Mediterranean Sea, consisting of a large area of water extending into one of the main continental masses, has a major influence on the climate of the adjacent land areas. In winter the sea is warmer than the surrounding land, especially in the north, and the Mediterranean is an area of relatively low mean pressure between the sub-tropical high pressure system of the Atlantic and the winter high pressure system of cold descending air which dominates Central Asia. In summer, on the other hand, the sea is colder than the land masses and a wide ridge of high mean pressure extends eastwards over the Mediterranean from the Azores high.

Winter

In winter air is drawn into the eastern Mediterranean from widely different sources; polar and arctic air from Europe, Russia and the North Atlantic, and Tropical air from

the Sahara. As the colder air masses move south over the warm Mediterranean they are, however, rapidly warmed and moistened and they cause showers over Cyrenaica.

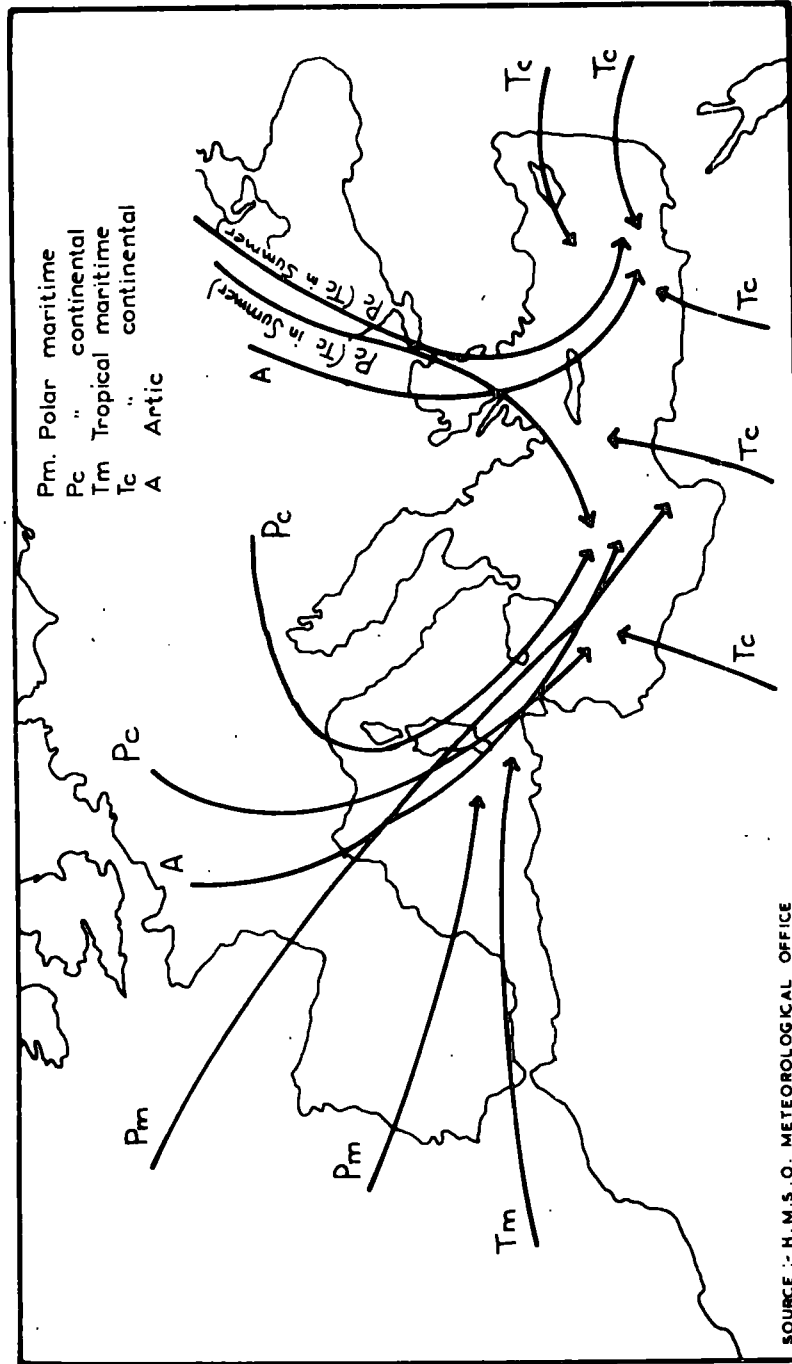
Most of the depressions of the Mediterranean area develop in the western part of the Mediterranean basin and subsequently move eastwards. Some enter the eastern Mediterranean, but others pass to the north either over eastern Europe or the Black Sea.

The distribution of the winds over the eastern Mediterranean is not usually such as to bring the strongly contrasting air masses into immediate juxtaposition, and the only common type of frontal depression which develops over the area is the Ghibli depression which forms near the north African coast and this will be discussed more fully later in this chapter.

The paths by which the cold air masses enter the area are greatly influenced by the position of the gaps in the mountain barrier which bound the Mediterranean to the north. The preferred tracks of cold air entering the eastern Mediterranean are eastwards from the western Mediterranean, and southwards over the Aegean Sea and the lower ground around Istanbul (Vide Fig.15). The deflection of air along this latter track by the high ground of Anatolia often results in the deepening of depressions in the region of Cyprus. Along the coast of eastern Cyrenaica and Egypt gales from between S.W. and N.W. are occasionally associated

Figure 15

MAIN TRACKS ALONG WHICH VARIOUS AIR MASSES ENTER THE EASTERN MEDITERRANEAN



SOURCE :- H. M. S. O. METEOROLOGICAL OFFICE

with a depression near Cyprus. Over Cyrenaica, showers in the polar air behind a depression may be so frequent as to have the appearance of continuous rain, and cloud may cover much of the high ground.

Summer

In summer the eastern Mediterranean lies between the semi-permanent high pressure of the sub tropical Atlantic and the seasonal low pressure over north-west India and Persia. The area is not crossed by moving depressions as in winter and winds are persistently northerly bringing warm continental air from eastern Europe and southern Russia across the cooler sea. The period is one of settled fine weather.

Temperature

Libya experiences extremely hot summers everywhere, on the coast winters are mild, and in some parts frost has never been known. However, in northern Cyrenaica, the coastal plain is backed by the Jebel. There are two factors which cause the climate of the Jebel ranges to differ from that of the coastal plain: distance from the sea and altitude. The sea's moderating influence decreases southwards and temperature ranges increase. The effect of altitude is to reduce temperatures, and in winter both factors combine to make the mean temperature about 2°C colder than the coast.*

* Records of the period 1932-34 have been used where considerations of daily readings have been necessary. Although this is an unfortunate limitation the figures covering this period are more reliable than later data since full-time staff was employed at that time.

Variations in temperatures from place to place resulting from proximity to the sea and altitude can be illustrated by a comparison between Tulmeitha, Tobra and Benghazi on the littoral and El-Marj some 18 kms. inland and about 285 m. above sea-level. Table 1 shows that on the coastal plain the annual mean temperature is 19.9°C at Tulmeitha, 20.1°C . at Tobra, and 19.8°C . at Benghazi, while on the upper terrace the mean is 17.7°C . at El-Marj and 18.4°C . at El-Abiar (290 m. above sea-level). On the high Jebel it is 17.7°C . at Tacnis (424 m. above sea-level), 16.9°C . at Jardas El-Abid (653 m.) and 15.8°C . at Cyrene (621 m.).

The orthodox relationship between relief and mean average temperature between El-Marj and Tulmeitha holds true for seven months of the year from January to April and from November to December. The differences between the two points are at a maximum in winter. It is probably the short distance from the sea and low altitude which makes the differences of the two stations rather lower than those figures of Jardas El-Abid (Vide Fig.16). Table 1 shows that the main differences between the mean temperatures of Tulmeitha on the coast and Jardas El-Abid on the Jebel are during the months between November and March. However, these differences are not so great between El-Marj on the terrace and Jardas El-Abid with the exception of January figures, where El-Marj has a mean of 10.5°C and Jardas El- Abid 8.5°C for that month. Table 2 gives

Station	J	F	M	A	M	J	J	A	S	O	N	D	Ann. Mean	Period of obs- ervation
<u>Coastal Plain</u>														
Tulmeitha	14.0	14.3	16.2	18.3	20.2	23.2	25.0	25.7	24.0	22.6	19.8	15.7	19.9	15 years
Tocra	13.9	14.3	16.2	18.5	21.4	23.2	24.9	25.8	24.8	23.1	19.7	15.6	20.1	11 years
Benghazi	13.0	13.7	15.4	18.5	21.6	23.9	25.0	25.6	24.4	22.6	19.3	15.0	19.8	16 years
<u>Upper Terrace</u>														
El-Marj	10.5	11.0	12.9	15.9	20.0	22.7	23.7	23.8	22.8	20.2	16.6	12.3	17.7	21 years
El-Abiar	10.0	11.0	13.4	17.4	22.1	22.3	25.5	25.2	24.0	21.0	17.1	12.0	18.4	16 years
<u>High Jebel</u>														
Tacnis	9.5	10.2	12.9	16.4	20.1	23.7	24.2	24.5	23.0	20.3	16.0	11.5	17.7	11 years
J.El-Abid	8.5	9.2	11.1	15.6	19.5	22.7	23.7	23.9	23.1	19.5	14.9	11.1	16.9	9 years
Cyrene	8.2	9.1	10.7	14.0	17.9	20.9	22.0	22.2	20.8	18.5	14.7	10.9	15.8	21 years

Source:- Meteorological Office, Tripoli, Libya,

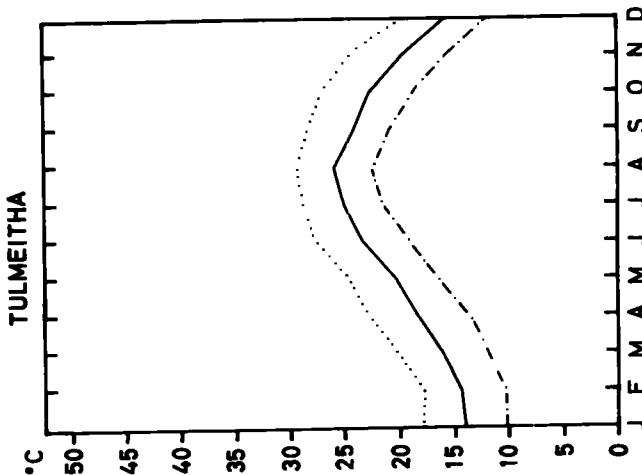
N.B. These figures represent only the means, and

have limited significance since variations are

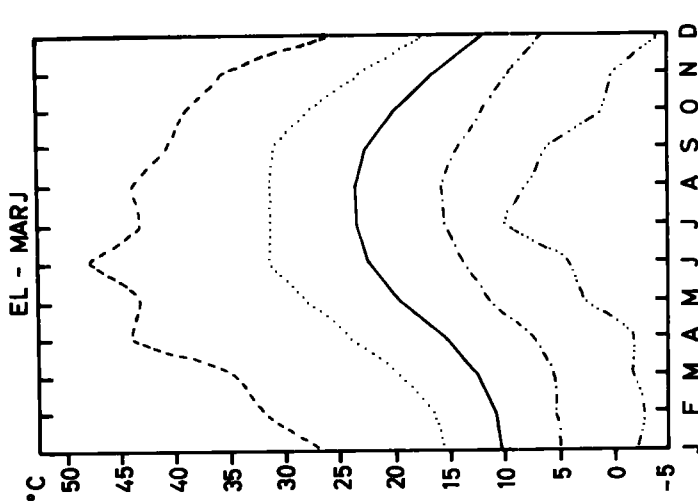
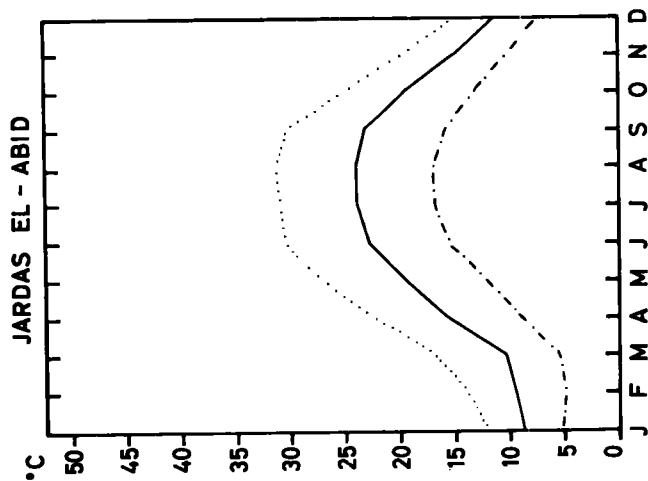
most important in arid regions like Libya.

MONTHLY TEMPERATURE 1934

Mean Maximum
Mean ———
Mean Minimum - - - -



Mean Maximum
Mean ———
Mean Minimum - - - -



Source : Meteorological Office - Tripoli.

Figure 16

TABLE 2

Table 2:- Monthly mean maximum and minimum of temperature at selected stations

Station	J	F	M	A	M	J	J	A	S	O	N	D	Annual
<u>Tulmeitha</u>													
Mean maximum	17.9	17.9	20.3	22.8	24.5	27.5	28.7	29.2	28.2	27.0	24.3	19.8	24.0
" minimum	10.2	10.7	12.1	13.7	15.8	18.9	21.4	22.2	19.8	18.1	15.4	11.6	15.8
<u>Tocra</u>													
Mean maximum	17.7	18.3	20.6	23.7	26.4	27.8	28.5	29.3	28.9	27.5	23.8	19.3	24.3
" minimum	10.1	10.3	11.7	13.3	16.4	18.8	21.3	22.3	20.8	18.6	15.6	11.9	15.9
<u>Benghazi</u>													
Mean maximum	17.3	18.2	20.6	23.9	27.3	29.1	29.5	30.1	29.6	27.9	24.3	19.3	24.8
" minimum	8.8	9.2	10.2	13.0	15.9	18.7	20.6	21.0	19.3	17.2	14.3	10.7	14.9
<u>El-Marj</u>													
Mean maximum	15.8	16.6	19.9	24.3	28.3	31.5	31.5	31.5	31.1	28.2	23.4	17.9	25.0
" minimum	5.1	5.5	5.8	7.6	11.7	14.0	15.8	16.0	14.5	12.2	9.8	6.6	10.4
<u>J.El-Abid</u>													
Mean maximum	12.0	13.7	16.8	22.4	27.0	30.1	30.9	31.1	30.4	25.0	19.8	15.2	22.9
" minimum	5.0	4.7	5.4	8.8	12.0	15.3	16.6	16.7	15.8	13.0	10.0	7.1	10.9

Source:- Meteorological Office Tripoli, Libya.

the mean maximum of temperature and minimum for selected stations. Table 1 in Appendix I gives detailed data for the mean maximum and minimum of temperature in El-Marj for the period of 1921 - 40.

An examination of the table indicates that the mean monthly temperature of El-Marj is 2.0°C . lower than figures of Tulmeitha during August. The figures indicate that El-Marj is hotter in the summer and colder in the winter and indeed this fact applies to the whole of Libya where the annual mean of temperature varies between 17°C . and 23°C . Superficially these mean figures indicate that the whole of Libya has a temperate type of climate since the annual mean maximum of temperature varies between 23°C . and 25°C . on the littoral, and 25°C . and 28°C . in the semi-desert regions whilst it is sometimes as high as 30°C . in the desert. However, as pointed out earlier, these means have only limited significance and variations are very important.

Variation

Perhaps the most marked feature of thermal conditions in the Libyan regime is the large daily range of temperature at any given station.

Along the coastal plain, the daily range of temperature is moderated by the cooling influence of the Mediterranean during the day and the relative warmth of the sea during the night, though as might be expected the daily

range is higher on the Jebel and further inland.

Mean daily ranges of temperature at the coastal plain

averaged between 7.0°C. ^{to 9.1°C.} at Tulmeitha for a period of ten years, 7.0°C. to 10.4°C. at Tobra for eleven year period, and 8.5 to 10.4°C. at Benghazi for a period of thirty one years.

Table 3 shows that the highest mean daily range on the Jebel at El-Marj averaged between 10.7°C. and 17.5°C. , i.e. twice that of the coastal stations. The mean daily range of temperature varies between 9.8 to 16.5°C. at Tacnis, to 7.0°C. to 15.0°C. at Jardas El-Abid (50 km. from the sea), and 8.0 to 13.3°C. at Cyrene. An example of tremendous diurnal range of temperature can be seen in the figures of El-Marj for 1934. A range of 25.9°C. was recorded on April 22nd, 26.8°C. on July 16th, and 26.7°C. on August 10th. Figure No.17 shows the mean daily range of temperature at El-Marj for 1934. Table 2 in Appendix No.1 gives detailed data for the extreme maximum and minimum of temperature in El-Marj for the period of 1921-1940. The mean monthly range is lower during the winter when the differences between the mean annual range and the mean monthly range never exceed four degrees.

The range of temperature in Libya is a product of the high temperature during the day rather than the low night temperatures. A further influence in this respect is the cloud cover in the winter months which tends to modify both the day and night temperatures by limiting insolation during

TABLE 3

Table 3:- Mean daily range of temperature at selected stations.

Station	J	F	M	A	M	J	J	A	S	O	N	D	Annual
Fulmeitha	7.7	7.2	8.2	9.1	8.7	8.7	7.3	7.0	8.4	8.9	8.9	8.2	8.2
Tocra	7.6	8.0	8.9	10.4	10.0	9.0	7.2	7.0	8.1	8.9	8.2	7.4	8.4
Benghazi	8.5	9.0	10.4	10.9	11.4	10.4	8.9	9.1	8.6	10.7	10.0	8.6	9.9
El-Marj	10.7	11.1	14.1	16.7	16.6	17.5	15.7	15.5	16.6	16.0	13.6	11.3	14.6
El-Abiar	10.6	10.8	12.8	15.1	15.4	10.7	15.3	15.1	15.7	14.3	12.3	10.8	13.1
Tacnis	9.8	10.4	13.2	14.9	16.2	16.5	14.7	15.2	14.7	14.6	12.9	10.2	13.6
J.El-Abid	7.0	9.0	11.4	13.6	15.0	14.8	14.3	14.4	14.6	12.0	9.8	8.1	12.0
Cyrene	8.0	8.2	9.9	11.8	13.3	13.1	11.1	10.6	10.8	11.4	9.7	8.2	10.5

Source:- Meteorological Office, Tripoli, Libya

the day and acting as insulator during the night.

January is the coldest month in Cyrenaica as can be seen at El-Marj which has a mean of $10.5^{\circ}\text{C}.$, Tobra $13.9^{\circ}\text{C}.$, $14.0^{\circ}\text{C}.$ at Tulmeitha, $9.5^{\circ}\text{C}.$ at Tacnis and $8.5^{\circ}\text{C}.$ at Jardas El-Abid.

The warmest month is August and not July as occurs in Tripolitania. During this month El-Marj has a mean of $23.8^{\circ}\text{C}.$, while on the coastal plain the figures are $25.7^{\circ}\text{C}.$ at Tulmeitha and $25.8^{\circ}\text{C}.$ at Tobra. Further inland it is $24.5^{\circ}\text{C}.$ at Tacnis and $23.9^{\circ}\text{C}.$ at Jardas El-Abid.

Summer temperature in El-Marj never reaches the extremes of Tripolitania. Figure No.16 indicates that the record peak of $48^{\circ}\text{C}.$ at El-Marj is still 10 degrees below the second established at El-Azizia in Tripolitania (Vide. table 4).

El-Marj has a cold winter, the mean monthly minimum temperature being $5.1^{\circ}\text{C}.$ The lowest recorded temperature at El-Marj is $-3.9^{\circ}\text{C}.$ while the lowest figure in the whole of Cyrenaica is $-5.6^{\circ}\text{C}.$ recorded at Cyrene.

However, on the coastal plain it never freezes. The mean monthly minimum of temperature during the coldest month is $10.2^{\circ}\text{C}.$ at Tulmeitha, $10.1^{\circ}\text{C}.$ at Tobra and $8.8^{\circ}\text{C}.$ at Benghazi.

The conditions are modified by the Ghibli which is an exceedingly hot dry wind coming from the desert south bringing high temperature and considerable diurnal ranges to

Figure 17

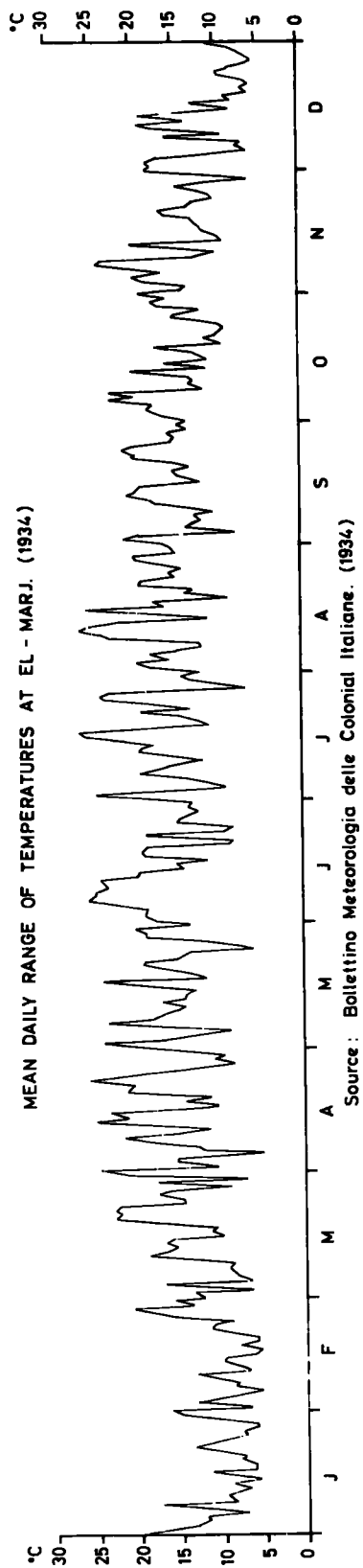


TABLE 4

Table 4:- Monthly extreme maximum and minimum of temperature at selected stations

Station	J	F	M	A	M	J	J	A	S	O	N	D	Annual
<u>El-Marj</u>													
Ext. Max.	27.0	32.3	34.6	44.2	43.3	48.0	43.4	44.1	41.0	39.2	36.0	26.8	48.0
" min.	-2.0	-2.5	-1.5	-1.5	3.6	4.5	10.3	8.3	6.4	1.2	0.4	-3.9	-3.9
<u>Benghazi</u>													
Ext. max.	25.0	28.0	36.6	40.8	42.4	45.0	42.9	41.6	40.5	39.0	34.7	28.0	45.0
" min.	1.2	3.6	2.6	5.1	8.9	12.4	14.9	15.5	10.1	10.7	7.5	3.4	1.2
<u>Cyrene</u>													
Ext. max.	24.8	22.1	29.8	39.5	38.0	43.5	40.0	39.4	38.0	35.0	30.9	26.6	43.5
" min.	-3.4	-2.9	-5.6	-2.6	1.7	4.4	6.8	6.2	1.8	3.2	-4.2	-2.9	-5.6

Source:- Meteorological Office, Tripoli, Libya.

both the Jebel and the coastal plain. Appreciable damage to crops may be caused by the high temperature and low relative humidity associated with the onset of a Ghibli, especially if it occurs at a critical stage in the growing season and is of prolonged duration.

Whilst these extremes in temperature are almost of negligible importance among people with a pastoral economy, they have an immediate impact upon the sedentary cultivation especially in El-Marj Plain. The high day temperature and low night temperature cause intense damage to the maturing wheat and barley especially at the "milk" phase of their growth. Likewise extreme variations in temperature during the flowering phase of the orchards can cause serious losses in quality of fruits and olives, especially when the night temperature nears freezing point. Nevertheless most fruit trees do better on the Ente farms of El-Marj Plain than on the coastal plains where temperatures are higher.

The differences in temperature between El-Marj and the coastal plain bring about differences in the date of ripening in each particular zone of agriculture. The cereals and the leguminous plants ripen in El-Marj about twenty days later than the same plant in the coastal plain. As far as the ripening of fruits is concerned such as apricots, peaches, plums, pears, apples, figs and also the grapes, almonds and olives, there are differences which are still more conspicuous.

Precipitation

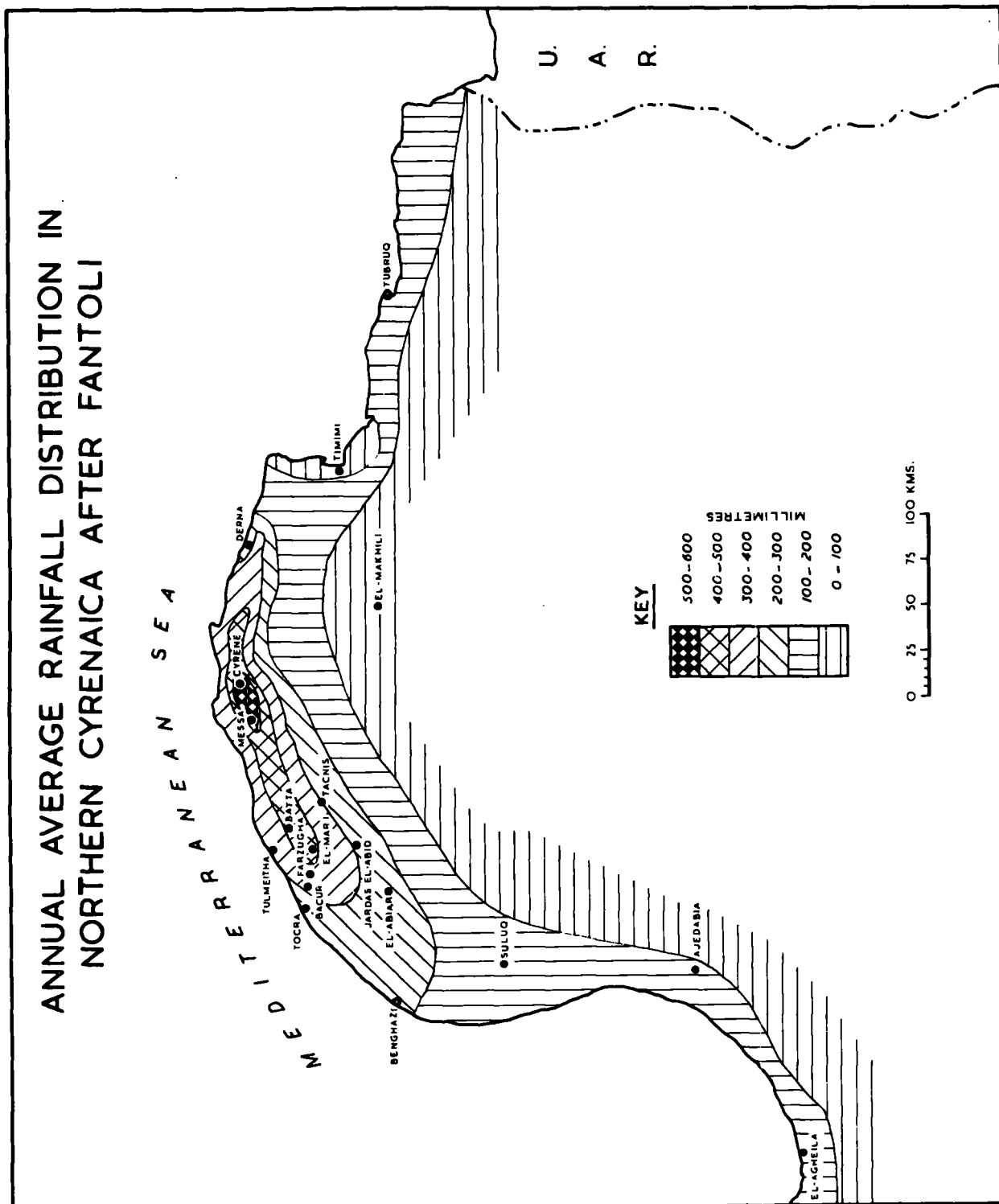
Rainfall is the most limiting factor of climate since dry-farming is practised in El-Marj Plain, and no permanent streams exist for irrigation.

The rain bearing pressure systems affecting the Cyrenaican plateau are generally those which originate in the Aegean and eastern Mediterranean. Westerly and north westerly winds bring an average annual rainfall of over 300 mm. for the whole plateau, 400 mm. over the central portion and from 500-600 mm. in the extreme north (Vide Fig.18). On the other hand, the coastal belt is less fortunate, only a small portion having 200 mm. or more. The rainfall drops off abruptly on all sides of the Jebel.

It is worth noting the main characters of the Libyan rainfall to illustrate the general system of rainfall in the region concerned. The rainfall regimes are clearly related to the relief of the country and to proximity to the sea.

The rainfall starts in autumn with a rapid increase in December and January, and then decreases quickly in the successive months. The peak of rainfall is in December and January. The dry half of the year extends from May to September, but the rainfall may start earlier in September and be prolonged until April, and sometimes even May, especially on the Jebel Akhdar. The rainy half of the year (October-March) receives between 90 to 95% of the total annual

Figure 18



rainfall. The air masses vary in the quantity they contain from one year to another or every two or three successive years. Libyan rainfall tends to vary more in intensity than in frequency, revealing the fact that means have little significance, as shown earlier.

Libyan rainfall is also characterised by the rareness of storms, for according to Fantoli,⁽¹⁾ within 60 years of observation in Tripoli and Benghazi an average of only 5 cases annually were recorded.*

Distribution:- On the coastal plain rainfall ranges from only 200 to 250 mm., and increases from south to north. At Benghazi, rainfall amounts to 265.8 mm., and the general aridity of this region is due mainly to the absence of any considerable orographic element. Rainfall increases in the extreme north of the coastal plain where it is 311.0 mm. at Tobra, and 350.0 mm. at Tulmeitha, whilst rainfall exceeding 300 mm. is found beyond the first escarpment from which point on, it increases to 307 mm. at El-Abiar and to 484.7 mm. at El-Marj (Vide Fig. 18). The highest rainfall is found on the

* Meteorological observation in El-Marj started in 1919, but there are no available records for the first eight months of 1920, and the first seven months, and the last two months of 1941, nor for the period 1942 - November 1943 since the country was a battlefield during the last World War. Observations taken later than that date are not reliable because of the shortage of qualified staff, consequently the present study will refer only to the records of 1919 - 1941, and 1959 - 1960.

northern part of the Jebel Akhdar in the vicinity of Messa and Cyrene. This favoured sector, however, is of limited extent, and to the south, south west, and south east, rainfall declines sharply. Table 5 shows the mean monthly rainfall at selected stations.

Of outstanding significance is the effect of altitude and proximity to the sea in the comparison between Tulmeitha and El-Marj. The latter has an annual average of 484.7 mm. while it is only 250 mm. at Tulmeitha and 311 mm. at Tocras. Bacur which is at an altitude of 285 m. above sea-level has an average of 340.2 mm. The typical case of El-Marj Plain is illustrated by the profile from Tulmeitha and El-Marj to Jardas El-Abid (Vide Fig.19). The rainfall increases as far as El-Marj due to altitude, and then declines despite increased height in consequence of the great distance from the sea, where in Jardas El-Abid (50 kms. from the sea) the average is 324.1 mm.

The different influence of the relief on the amount of rainfall appears more evident in the two sections of the Jebel:- Tocras-El-Marj-Cyrene-Derna (Vide Fig.20), and Benghazi-Jardas El-Abid-Tacnis-Timimi (Vide Fig.21). In figure 20 we notice the increase between Tocras and the first escarpment, and between the latter and El-Marj. This is followed by a decrease between El-Gharib and Gasr Libia, which may be explained by the fact that El-Gharib is sheltered by the second

Figure 19

A PROFILE OF RAINFALL IN RELATION TO RELIEF BETWEEN TULMEITHA, EL-MARJ AND JARDAS EL-ABID

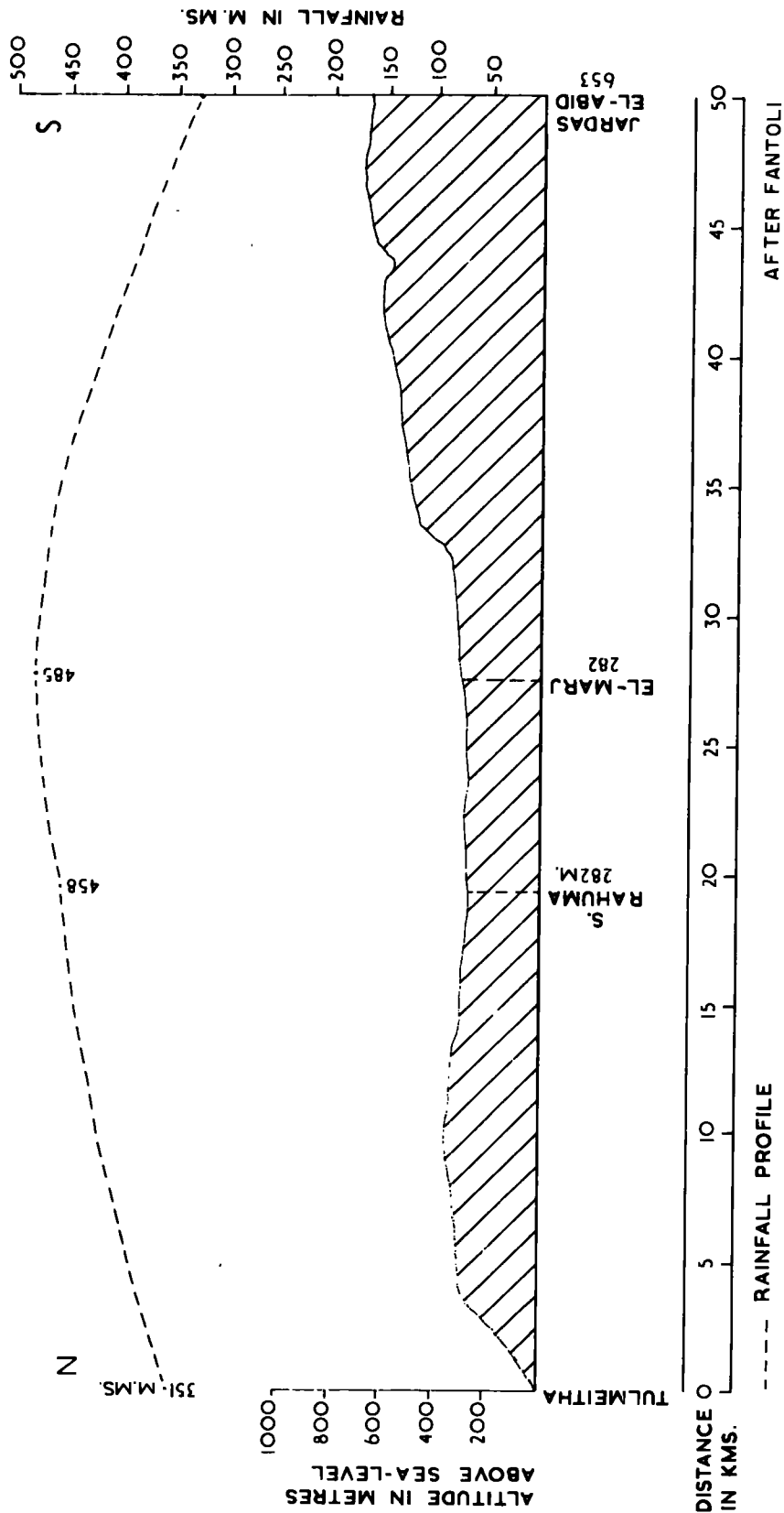


TABLE 5

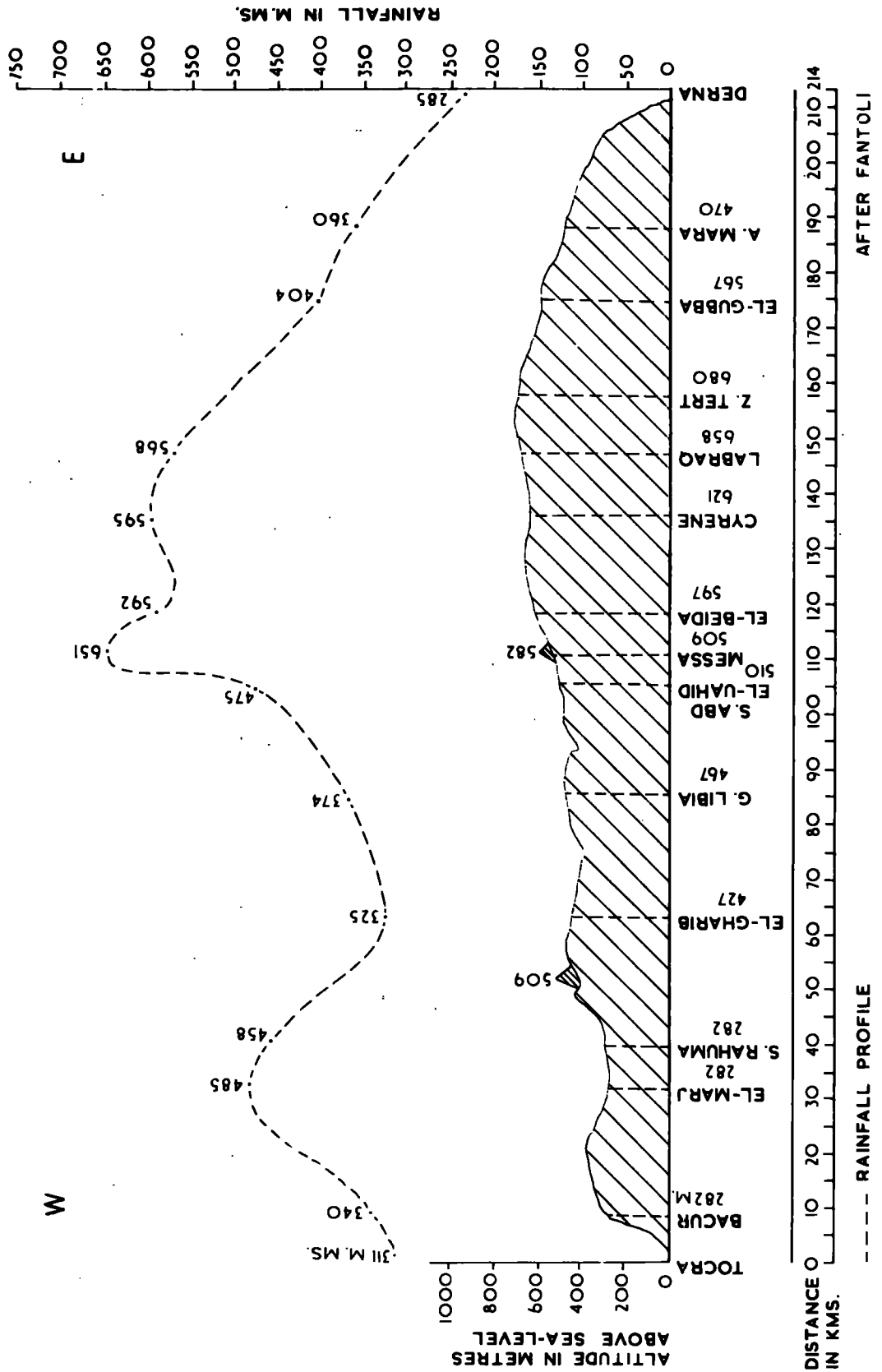
Table 5:- Mean monthly rainfall at selected stations

Station	J	F	M	A	M	J	J	A	S	O	N	D	Annual	Period of ob.
Tulmeitha	97.0	58.1	19.6	6.0	3.9	0.2	0.0	0.1	3.3	22.4	41.2	98.2	350.0	20 yrs.
Tocra	79.0	41.8	25.6	9.3	2.8	0.1	0.0	0.1	2.4	23.3	46.1	80.5	311.0	12 yrs.
Benghazi	67.2	40.4	19.4	4.6	2.0	0.4	0.1	0.0	2.9	16.8	46.4	65.6	265.8	54 yrs.
El-Marj	117.3	86.8	42.2	17.0	6.1	1.2	0.3	0.5	1.9	36.2	56.7	118.5	484.7	23 yrs.
Bacur	87.1	43.1	28.2	6.6	1.7	0.0	0.0	0.0	1.6	28.5	61.2	82.2	340.2	7 yrs.
Tacnis	79.9	60.8	28.2	8.7	4.5	1.2	0.5	0.0	0.4	15.8	34.1	67.4	301.5	14 yrs.
J.El-Abid	83.8	56.8	51.5	10.4	2.6	1.4	0.0	0.0	0.0	9.6	30.6	77.4	324.1	5 yrs.
El-Gharib	82.6	62.2	42.6	16.9	7.4	0.7	0.2	0.0	0.2	16.2	30.1	66.3	325.4	9 yrs.
Cyrene	153.7	78.7	59.7	20.4	12.3	1.4	0.2	0.6	8.9	38.8	60.7	140.1	595.5	27 yrs.
Marawa	75.0	61.1	21.2	11.0	7.9	1.6	0.0	0.1	0.8	17.1	25.3	44.4	265.5	14 yrs.

Source:- "Fantoli, A., Le Pioggie della Libia".

Figure 20

A PROFILE OF RAINFALL IN RELATION TO RELIEF BETWEEN TOCRA, CYRENE AND DERNA



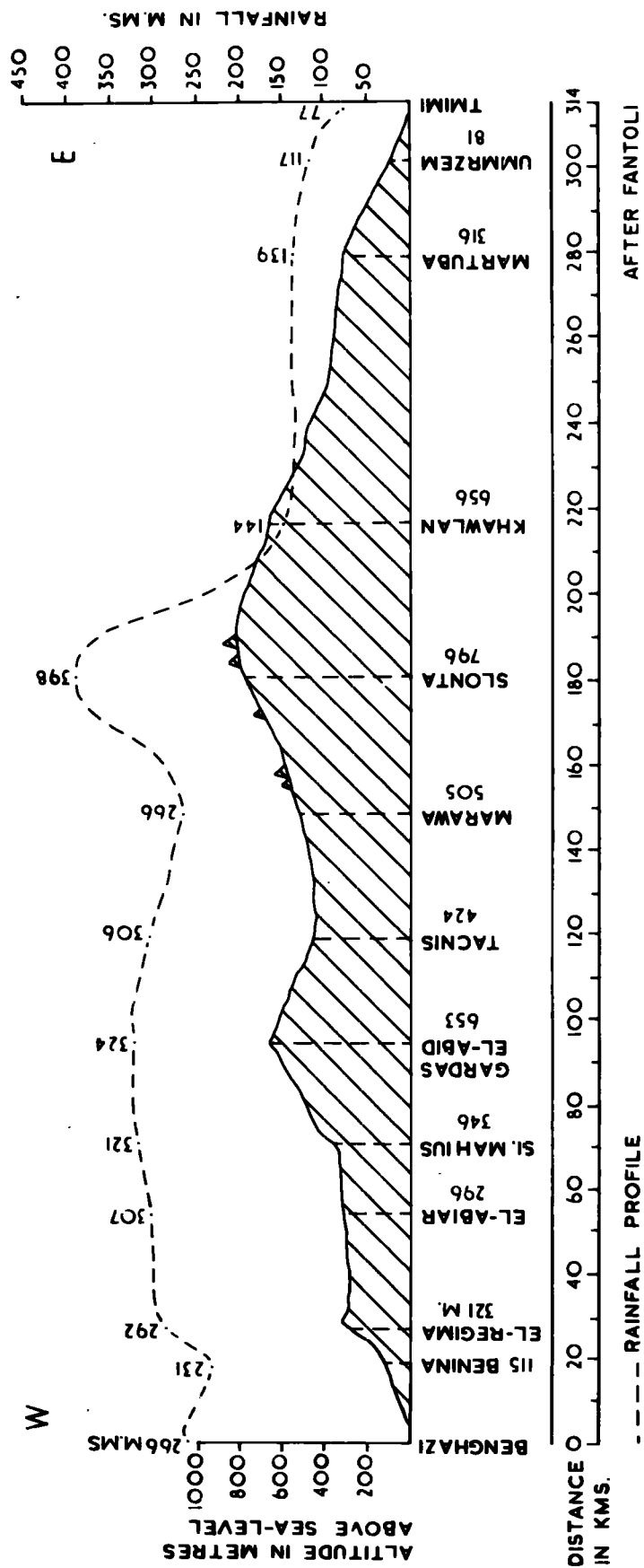
escarpment. Moving east the greater increase is shown at Messa and then follows a decrease caused by the greater coastal prominence of Ras El-Hamman and Ras Aamer where the winds pass through to El-Beida and Cyrene. The decrease is more frequent after Labraq, because the region east of Ras Aamer is under the influence of the rain shadow-effect up to Derna and the Gulf of Bomba.

A profile running west-east, south of the area represented in Figure 20, also illustrates the significance of the relation between rainfall and relief (Vide Fig.21). There is a decrease of rainfall on the escarpment at Benina (226.4 mm.) then an increase due to high altitude at El-Abiar (307 mm.), and Jardas El-Abid (324.1 mm) where the major distance from the sea is compensated for by altitude. The rainfall decreases east of Jardas El-Abid because of the lower altitude between Tacnis (306 mm.) and Marawa (265.5 mm.) which are sheltered by the marginal altitude of the second escarpment. Then the quantity increases because of the higher altitude (reaching 796 m. above sea-level) and exposure to the winds of the northwest, followed by successive decreases because of the lower altitude, until the sea-level at Timimi (74.6 mm.).

The highest amount of rainfall is concentrated, therefore, in the central section of the Jebel and then decreases gradually in all directions except towards the west.

Figure 21

A PROFILE OF RAINFALL IN RELATION TO RELIEF BETWEEN BENGHAZI, TACNIS, KHAWLAN AND TIMIMI

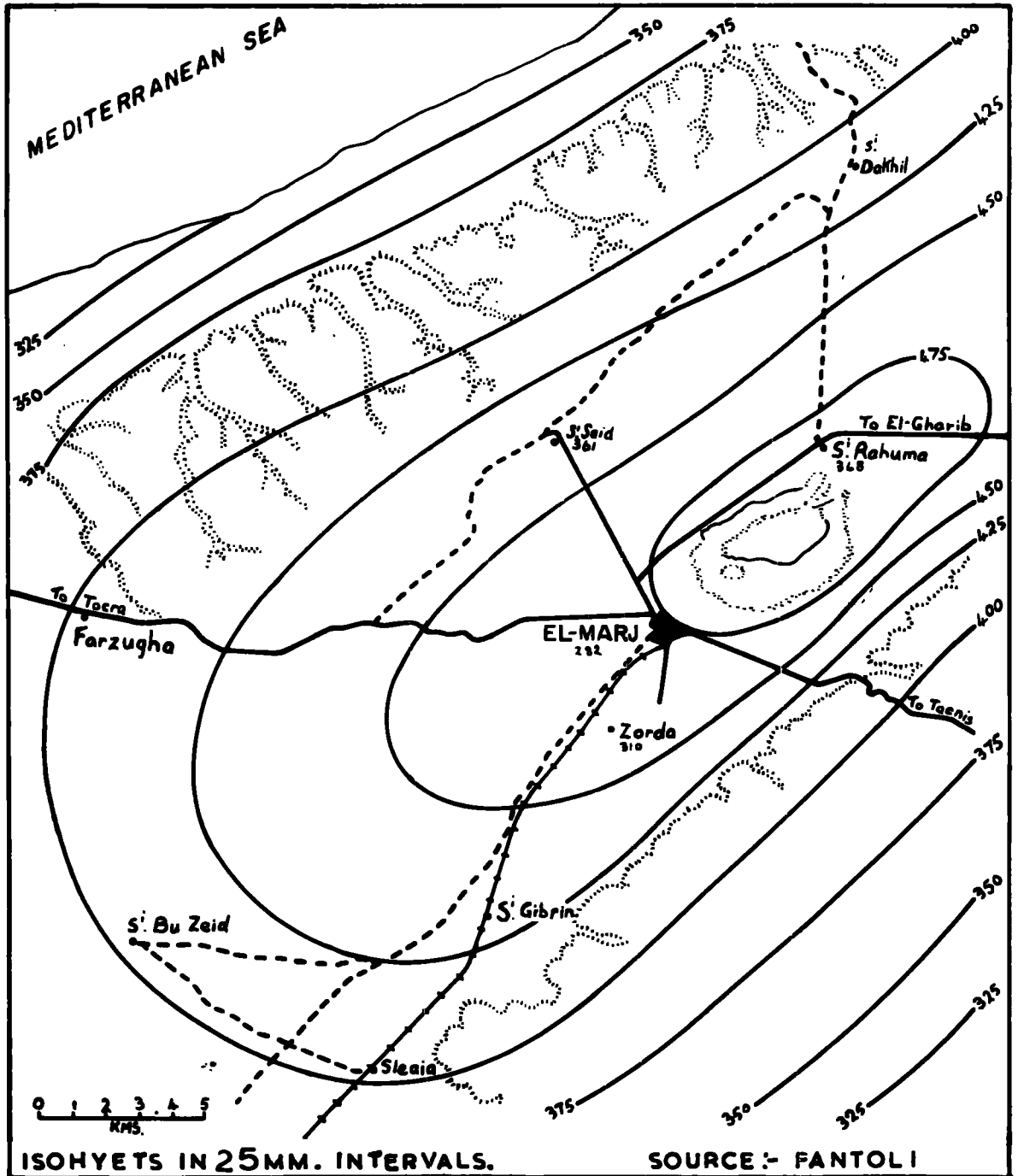


El-Marj Plain has the highest quantity of rainfall after the central section, which may be explained by the fact that El-Marj Plain and the north western flanks of the Jebel are exposed to rain bearing winds, while the eastern part of the Jebel is in the rain shadow. This is obvious if we compare El-Marj (484.7 mm.) with Martuba (139 mm.) in the east which although at the same distance from the central Jebel, have much of different rainfall amounts. El-Marj Plain has a favoured position for receiving a considerable quantity of rainfall. Its orientation ENE-SWS is an important factor for receiving abundant rainfall compared to other sections of northern Cyrenaica. Sidi Rahuma, and El-Marj itself, have from 450 - 480 mm. which quickly diminishes both northwards on the edge of the first escarpment and towards the basin of El-Abiar. In this direction there is a successive decline from 400 mm. at Mletania and Bu Mariam, and in the inner strip east of Mletania to between 300 - 320 mm. at Sidi Mahius, El-Abiar and El-Regima.

The isohegets for El-Marj are shown in Figure 22. The isoheget 400 mm. includes Farzugha, Sidi Bu Zeid, Sleaiia, Sidi Dakhil, El-Aweliya, Dandakh, and Batta. Whilst higher precipitation in the plain between 470 and 480 mm. is concentrated in the area between El-Marj itself and El-Aweliya. The geographical position of the plain, its exposure to rain bearing winds, and the temporary lake of El-Ghariq seem to contribute to the increase of the amount of local rainfall. (2)

Figure 22

ANNUAL ISOHYETS IN THE EL-MARJ AREA



Examination of the monthly rainfall pattern shows that precipitation is greatest between October and March. There is some rain occasionally in the last fifteen days of September, and April and in May. During the three months of June, July and August there is practically total drought. The heaviest rainfall occurs in winter with a single peak in December and January. Table 6 gives the frequency of rainy days at selected stations through time.

The table indicates for El-Marj a total number of rain days of 74.4 of which 65.2 days are in the wet season and 9.2 days in the dry season. As a percentage it is 87.6% for the period October to March, and 12.4% for April to September.

The total annual average of 484.7 mm. at El-Marj is distributed through the rainy months as follows: 20.3% for October-November, 51.5% for December-January, and 28.2% for February-March. This indicates that 94.5% of the total rainfall is in the wet half of the year (October-March), and 5.5% in the dry half (April-September). The precipitation occurs in torrential rains washing away the soil surface, and forming a serious problem of soil erosion.

The fluviometric gradient of rainfall between Tulmeitha and El-Marj for 19 years of observation is 48 mm.

TABLE 6

Table 6:- Monthly total of frequency of rainfall at selected stations

Station	J	F	M	A	M	J	J	A	S	O	N	D	Annual Total
Tulmeitha	12.1	9.8	5.1	2.5	1.3	0.2	0.2	0.2	1.2	3.6	6.1	11.1	53.4
Tocra	13.3	11.7	6.6	3.6	1.9	0.1	0.0	0.1	2.0	4.3	7.6	13.6	64.8
Benghazi	12.5	9.5	5.5	2.1	1.3	0.5	0.1	0.1	1.4	4.1	7.6	12.2	56.9
El-Marj	15.5	13.0	7.9	4.1	2.1	0.8	0.3	0.5	1.4	5.2	8.1	15.5	74.4
Bacur	11.5	8.8	4.5	1.8	1.1	0.0	0.1	0.0	0.8	4.5	6.6	12.3	52.0
Tacnis	15.6	11.7	6.7	3.5	2.1	0.2	0.1	0.2	0.8	4.1	7.7	13.0	65.7
J.El-Abid	15.0	10.2	5.8	2.2	2.0	1.4	0.0	0.0	0.0	3.4	9.2	14.4	63.6
El-Gharib	13.5	10.2	6.2	3.0	1.5	0.3	0.3	0.0	0.5	3.1	5.8	9.0	53.4
Cyrene	15.5	12.6	9.7	4.5	2.7	0.8	0.2	0.4	2.6	6.8	9.3	15.0	80.1
Marawa	12.2	11.6	5.5	2.9	1.4	0.7	0.0	0.2	0.7	3.6	5.2	9.2	53.2

Source:- "Fantoli, A., Le Pioggie della Libia."

for every 100 m. of altitude as shown in the table below.

TABLE 7

Table 7:- Pluviometric gradient at selected stations.

Zone	Station	Altitude above sea- level in m.	Rainfall Annual average*	Pluviometric gradient each 100 m. altitude rainfall in mm.
Western Altipiano	El-Marj	285	492	} 48
Maritime	Tulmeitha	5	351	
Western Altipiano	Bacur	285	347	} 12
Maritime	Tocra	13	312	

Source:- "Fantoli, A. Le Pioggie della Libia".

* The annual average in the table concerns a single station, and not the whole region.

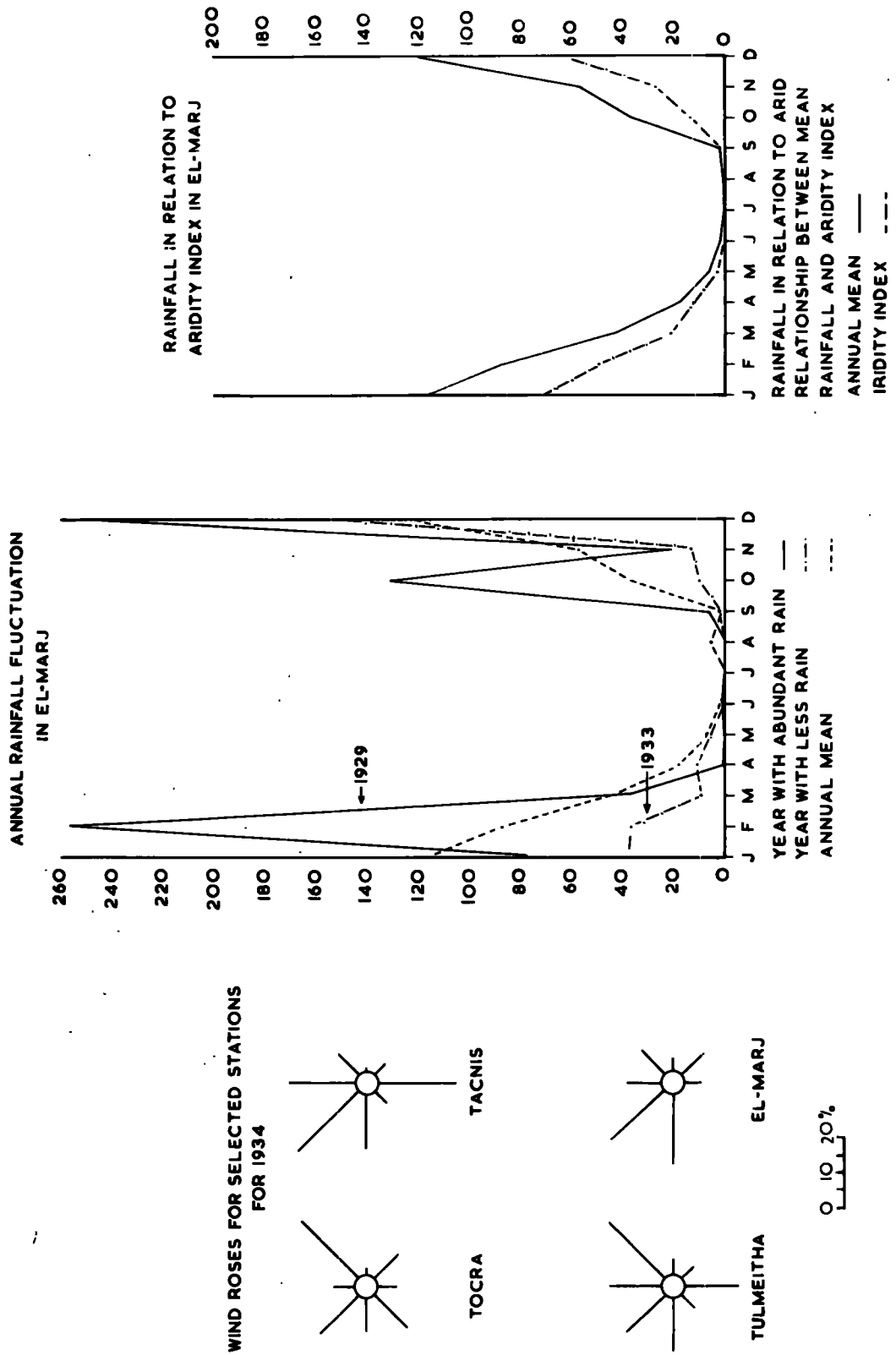
The gradient between Tocra and Bacur is about 12 mm. for every 100 m. While between Apollonia and Cyrene is 25 mm. every 100 m. The figure of El-Marj seems too high in comparison with those stations. An explanation of this may be that the distance between Apollania and Cyrene is only 10 kms. in a straight line, while it is 18 kms. between Tulmeitha and El-Marj. Cyrene is situated on the second escarpment and exposed to the rain bearing winds, while El-Marj is placed in a vast basin surrounded to the north by the first escarpment which rises to 40 - 50 m. above the Plain. To the south the Plain is dominated by Jebel El-Abid which rises to 168 m.

above the Plain, and situated only 5 kilometers from El-Marj.

The annual rainfall, however, varies from year to year, from place to place and even from month to month, more than for example in the central Jebel. For instance, El-Marj received a total of 773.3 mm. in 1929, and 561.5 mm. in 1961, while only 280.3 mm. had fallen in 1933 and 251.7 mm. in 1960. Figure No.23 illustrates the fluctuation of rainfall in two different years, one characterised by abundant rainfall (1929) and another less (1933). According to Micheli⁽³⁾; Zorda, which is only about four kilometers from El-Marj, may experience 70 mm. less rain than in El-Marj itself. El-Aweliya which is 12 kms. from El-Marj received 669.9 mm. in 1961 whereas El-Marj received 561.5 mm. in the same year* Table 3, in Appendix I gives detailed data for the total monthly and annual rainfall and average rainy days in El-Marj (1920 - 40).

* Unfortunately it is impossible to analyse rainfall figures in the local stations in El-Marj Plain, such as in El-Aweliya, Hopps farm, Zorda, Cerasola farm and Warzugha, since the records are not available for longer periods, and the figures are not complete for some months in the period of observation during the Italian occupation, and they have not recovered since the Italians left.

Figure 23



The intensity of variability of rainfall is given in the following table for the maximum and minimum observed in El- Marj in the period of 1921 - 1941.

TABLE 8.

Intensity of variability of rainfall in El-Marj in mm.

	O	N	D	J	F	M
Maximum	131.0	190.4	242.1	240.9	255.4	214.0
Minimum	0.0	0.0	23.8	37.7	19.6	0.6

The annual average of the variability intensity for El-Marj for a different period can be calculated as shown below:-

<u>Period</u>	<u>Five years period</u>	<u>Ten years period</u>	<u>General average for 20 years</u>
1921-25	493.2	547.8	490.9
1926-30	602.7		
1931-35	385.3	434.0	
1936-40	482.8		

The first five years period (1921-25) indicates to a regular average, while an increase is noted in the successive period (1926-30). The third period is characterised by a decrease in rainfall, while an increase occurs in the fourth period (1936-40) and is about the same annual average.

Fantoli calculated the pluviometric coefficient* in

* The pluviometric coefficient for any month is arrived at by expressing the mean monthly rainfall total for a given station as a ratio of the hypothetical amount equivalent to each month's rainfall were the total rainfall for that station to be equally distributed throughout the year.

different climatic zones of Libya to define the specific character of each rainy month. The following table gives the pluviometric coefficient in the western Jebel Akhdar:-

TABLE 9

The Pluviometric Coefficient in three stations according to their climatic zones

	O	N	D	J	F	M
<u>Maritime zone</u>						
Tulmeitha	0.39	0.74	1.71	1.69	1.12	0.33
<u>Steppe zone</u>						
Tacnis	0.32	0.72	1.38	1.64	1.38	0.57
<u>Altipiano zone</u>						
El-Marj	0.46	0.75	1.52	1.51	1.23	0.54

Droughts: Some sections of Libya usually suffer from drought every year, and every few years general droughts covering large areas occur. At El-Marj in any year there is an average of four to five rainless periods and more than fifteen days without rain may be expected in each period.

It is a factor of significant importance that the intense variability of an insufficient rain has been, and will be, a tremendous retarding element in agricultural development and stabilisation which are complementary in Libya, each absorbing an equal share of the national capital resources.

However, droughts may be distinguished as follows:-

1. A noticeable seasonal fluctuation with displacement of the relative maximum.
2. Local excessive drought prolonged from one period to another.
3. Diminishing of the quantity to a half, or third, of the seasonal average.

4. Complete drought with regional or general characteristics, extending from 2 - 3 successive years.

The decrease of rainfall to a half or third of the ordinary average is a risk to the growth of crops, whilst the total absence of rainfall during the agricultural year is a calamity to the economy of the country.

Fantoli⁽⁴⁾ in his study collected evidence for Benghazi from the late nineteenth century and 40 years of the twentieth century in which only 50.9% (of 55 cases) of the crop varied from fairly good to excellent, and 49.1% from a complete failure to a poor crop.

However, the conditions on El-Marj Plain, and on the Jebel as a whole, are more favourable than on the Benghazi plain. At El-Marj, for a period of 40 years of observations, one year in five had a sufficiently high incidence of rainless periods sufficient to give drought conditions. Libya as a whole has suffered general droughts in the years 1915-17, and 1946-48. In Cyrenaica the years of droughts were 1926-27, 1929-32, and 1955-60. Table 10 gives the monthly amount of rainfall in El-Marj, El-Aweliya and Tulmeitha for the year 1960 as a drought year, and 1961 as a good year.

The years 1955-60 were poor in rainfall and crops and animals suffered accordingly, details of which will be discussed in the section on agriculture.

TABLE 10

Table 10:- Mean monthly at El-Marj, Aweliya and Tulmeitha for 1959, 1960, 1961.

	J	F	M	A	M	J	J	A	S	O	N	D	Annual Total
<u>El-Marj</u>													
1959													
Monthly mean	124.0	35.5	20.9	1.5	-	-	-	-	-	14.7	27.8	64.0	288.4
" Rainy days	17	9	5	2	-	-	-	-	-	6	6	12	57
1960													
Monthly mean	59.5	9.5	16	2.5	-	-	-	-	-	-	37	127.2	251.7
" Rainy days	10	5	2	2	-	-	-	-	-	-	5	9	33
1961													
Mon. Mean	112	245.5	12	-	-	-	-	-	-	39.5	-	152.5	561.5
" Rainy days	11	14	3	-	-	-	-	-	-	7	-	14	49
<u>Aweliya</u>													
1959													
Mon. mean	132	32.0	4.5	1.2	-	-	-	-	-	13	15	61	258.7
" Rainy days	13	5	2	1	-	-	-	-	-	4	2	8	35
1960													
Mon. mean	66	4	18	4	-	-	-	-	-	-	79.3	88.3	259.6
" Rainy days	10	2	4	2	-	-	-	-	-	-	5	6	29
1961													
Mon. mean	71	495.5	19	-	-	-	-	-	-	21.4	5.9	57.1	669.9
" Rainy days	9	16	4	-	-	-	-	-	-	7	3	22	61
<u>Tulmeitha</u>													
1959													
Mon. mean	28.5	74.6	15	8.5	-	-	-	-	-	19	8	81	234.6
" Rainy days	5	10	5	4	-	-	-	-	-	2	2	11	39
1960													
Mon. mean	57	9.5	16.5	-	-	-	-	-	-	-	36.5	124.0	243.5
" Rainy days	14	5	9	-	-	-	-	-	-	-	7	10	45
1961													
Mon. mean	76	205.5	20	-	-	-	-	-	-	24	-	88	413.5
" Rainy days	17	21	7	-	-	-	-	-	-	7	-	18	70

Source:- Meteorological Office, Tripoli, Libya.

Aridity Index:- It is obvious that the variability of rainfall is one of the major causative forces behind the aridity of Cyrenaica. From those figures available, significant daily, seasonal and regional variation may be observed. The irregular distribution of frequent torrential rains and the summer droughts make it necessary to formulate an aridity index on which can be based the estimation of ground water reserves and the economic study of irrigation supplies. Ahlman⁽⁵⁾ was the first to find the annual aridity index for some stations in Libya on the De Martonne formula.* He finds that the aridity index in the "exoreic" Cyrene area is 25 but includes in this class, Derna, with its aridity index of 11, taking into consideration the run-off towards the sea. Then in the "endoreic" regions El-Marj has an aridity index ** of 14, where the karstic formations complicate the picture of run-off water flow. In the "areic" humid regions, Benghazi is 9.2. Finally in the semi-"areic" regions, ElRegima has an aridity index of 8. However, Fantoli's work which is probably

* The de Martonne index merely divides two important antagonistic climatic factors: rainfall by temperature.

$$i = \frac{P}{t + 10} \quad (\text{mm. and } ^\circ\text{C})$$

P = average annual rainfall in mm.

t = average annual temperature in $^\circ\text{C}$

For an area such as that under examination this index is a sufficient approximation given the nature and deficiencies of meteorological data.

- ** Exoreism (+20): constant water flow to the sea.
Endoreism (10-20): Intermittent water flow to the sea.
Areism (-5): there is no water flow to the sea.

more reliable since it is based on a longer period of observation, gives the following indices: Cyrene 22.6, El-Marj 17.5, Derna 10.3, Benghazi 8.8 and El-Regima 8.

The monthly aridity index is important since in the Mediterranean climate the dry season coincides with the season of high temperature. El-Marj for example which has an annual index of aridity 17.5, has for the three months June, July and August an index below one whilst the six months from April to September have an index always less than 7 (average 1.8) as shown in Table 11. Figure 23 also illustrates the relationship between rainfall and the aridity index in El-Marj.

It should be noted that the ground water supply for the vegetation depends mainly upon the aridity of the previous winter season. The winter mean aridity index for El-Marj is 38, Tulmeitha 24.8 and Cyrene 50.4.⁽⁶⁾

TABLE 11

Monthly Aridity Index for El-Marj

Station	J	F	M	A	M	J	J	A	S	O	N	D	Ann.
El-Marj	71.2	49.2	20.8	6.4	2.4	0.4	0.0	0.3	1.4	13.9	27.5	62.4	17.5

According to Pioger,⁽⁷⁾ the aridity boundary of index 10 for the winter season seems to follow rather clearly the general borderline of shifting cultivation of cereal crops, and the boundary line of the growing of olive trees is located somewhere between the annual index of 10 and 15 except in the case of the wadi beds or where ground water is at shallow depths.

The index curve 20 delimits the region most favourable for the dry farming of cereals and for reafforestation. El-Marj is situated on the boundary of this curve.

History of Climate:-

Before concluding this section we may ask, has there been any change in the climate of Libya in the historical times? It does not seem that there is any change in the climate regarding the quantity of rainfall. The general geographical similarity of the classical and present conditions is shown by the establishment of the cistern, aqueducts, and utilization of springs by Greek and Romans, and direct evidence confirms the historical records. In Roman times the chief settlements were all around the existing wells, springs and the areas of favourable rainfall.⁽⁸⁾ According to Professor Fisher, the weight of the geographical evidence would suggest broadly unchanged nature in the Libyan climate during the last two or three millennia.⁽⁹⁾

Relation of Rainfall to Agriculture:-

Having discussed the rainfall as a meteorological phenomenon it is convenient to relate it to the agricultural activity in the region of study.

The early autumn rains, if they come too soon, may do some harm since it often happens that after such rains there will be a long period with fine weather and hot days. If the animals have got used to the green grass, and it dries up, they will disdain to eat the remnants of the dry grasses from

the previous year. If the farmer has sown his seeds prematurely some damage may result despite the fact that young seedlings have a considerable resistance to the drought. Spring rainfall is of greatest importance for the harvesting of crops particularly when young crop-plants are already adversely affected by weather conditions. Fortunately spring rainfall comes very often in El-Marj Plain.

The distribution of rainfall is as important as the total amount. Rains after which there is a long period of dry weather are of doubtful use, as also are small amounts of rain because of the slow infiltration of water into the hard soil of El-Marj Plain.

Thus in order to undertake agricultural development it is essential to investigate, in considerable detail, not only the quantity but the character of the rainfall in the particular district.

The region between El-Abiar and Ain Mara, including El-Marj Plain, represents the only area of fair potential for agricultural development, however, adjacent areas with less than 300 mm. per year are suitable for pasture and shifting agriculture.

Relative Humidity:-

Adequate readings of relative humidity are not available. From those figures which are available, significant daily, seasonal, and regional variations may be observed.

The mean monthly values for a 17 year period show a tendency for El-Marj to have a high mean in the winter months during the wet season.

On the coastal plain, the highest humidity is during June, July and August, because of the prevalence of sea winds blowing, and the high rate of evaporation as the temperature increases. The table below shows the relative humidity at selected stations.

TABLE 12

Table 12:- Monthly relative humidity at selected stations

Station	J	F	M	A	M	J	J	A	S	O	N	D	Ann. Mean
El-Marj	74	70	60	52	45	44	50	53	51	55	63	71	57
El-Abiar	72	71	65	48	44	40	46	49	56	57	63	75	57
J.El-Abid	54	54	66	60	45	45	49	51	50	56	68	77	56
Tacnis	72	68	58	54	49	43	54	54	54	57	61	69	58
Cyrene	75	74	68	61	51	48	57	64	64	64	70	74	64
Tulmeitha	64	61	61	62	62	66	67	64	63	59	60	66	63
Tocra	68	64	62	60	65	69	69	69	66	60	57	66	65

Source:- Meteorological Office, Tripoli, Libya.

Tocra shows a higher percentage of relative humidity than Tulmeitha since the former is exposed to the sea winds from north-west and south. The mean monthly Relative Humidity is less than 62.8% for the winter months.

At El-Marj the mean monthly Relative Humidity is well above 65% in the winter months while it is only about 44% in the summer. The same applies to the stations on the Jebel in the winter months. Jardas El-Abid has Relative Humidity 60.8%, Tacnis 64% and El-Abiar 67%.

The Jebel stations during the summer have an average of 50% at Jardas, 62% at Tacnis, and 43.8 at El-Abiar.

The Jebel seems more pleasant in the summer than the coastal plain, where conditions are most debilitating and inhospitable.

It is interesting to note in El-Marj Plain, and especially on the coastal plain that the lowest humidity occurs during the periods of strong Ghibli winds, when the relative humidity is practically nil. In El-Marj Plain, on 24th and 25th April, 1934 the relative humidity was 6% while on the next day it had risen to 57%. In Tulmeitha at the same date it was 5% and 6% respectively and had risen to 59% on 26th April.

The atmospheric humidity has an important influence in El-Marj Plain for drying fruits, especially grapes, where the summer humidity is lower than on the coastal plain and Cyrene.

Winds

The most frequent winds are those from the north west and from the east. The moisture laden winds from the Mediterranean Sea unquestionably contribute to the ability of

the region to support the level of vegetation found there. Table 13 gives the frequency of winds and the percentage, blowing from all directions, for 1934.

The western and north westerly winds are the most frequent winds in El-Marj during the year, whilst the south westerly winds occur mostly in winter and the north westerly in spring.

TABLE 13

Table 13:- Frequency of winds from all directions at El-Marj 1934.

Month	N	NE	E	SE	S	SW	W	NW	calm
January	2	1	4	12	2	28	34	10	-
February	7	9	5	13	6	10	17	17	-
March	4	7	5	16	4	34	16	4	3
April	14	12	3	13	7	5	15	12	9
May	9	22	7	10	4	3	19	12	7
June	13	15	3	5	2	7	20	17	8
July	12	5	1	-	-	-	26	35	14
August	13	4	-	-	-	1	12	51	12
September	16	11	2	1	-	1	13	31	15
October	12	13	3	10	5	9	10	17	14
November	6	8	5	17	8	10	9	10	17
December	1	3	-	1	19	33	23	9	4
Total	109	110	38	98	57	141	214	225	103
Percent..	10	10	3	9	5	13	20	21	9

Source:- Bollettino Meteorologico delle Colonie Italiane, Anno 1934.

On the coastal plain, the north easterly winds predominate especially during summer, autumn and spring, while the southern winds occur frequently in winter, spring and autumn as shown in the Table No.14.

Table 14

Table 14:- Percentage of frequency of winds from all directions in Tulmeitha, Tobra and Tacnis, in 1934.

Station	N	NE	E	SE	S	SW	W	NW	calm
Tulmeitha	15	24	5	5	15	6	15	15	-
Tobra	7	23	2	10	4	12	10	15	17
Tacnis	19	8	1	4	22	5	14	24	3

SourceL- Boll. Meteor. delle, col.Italiano, Anno 1934.

El-Marj, Tulmeitha and Tobra are more or less protected from the southern winds because of their geographical position. Tacnis is more exposed to the southern winds which predominate during seasons of autumn, winter and spring (Vide Fig.23).

The important wind from the standpoint of its effect on vegetation, is the hot and extremely dry Ghibli. In itself, it is invariably a depression wind. During the spring months the Ghibli is associated with low pressure systems from the Atlantic moving approximately parallel to north African coast, though in late spring and summer it is likely that the Ghibili is the result of cyclonic conditions which

have developed over the western Sahara,

The advent of a Ghibli is difficult to forecast since it develops frequently when there are no obvious meteorological conditions discernible from synoptic charts. The end of a Ghibli comes as quickly as the beginning with cooler air blowing from the sea. Unfortunately there are no detailed records available of this wind in El-Marj Plain.

The Ghibli winds on El-Marj Plain have not such disastrous influences as on the coastal plain where they dry up the soils on the surface. The increase of temperature is less in El-Marj Plain, and the soils are in any case more humid in the spring owing to the abundant rainfall in the winter. The exceptional case was in 1950-51 when the whole wheat crop was damaged by the Ghibli. Tree crops suffer less from the Ghibli because of their hard leaves and the fact that the roots are only a little exposed on the surface. The olive trees suffer most if the Ghibli comes in autumn in the period of ripening as also do the peaches, plums, apricots, figs and pears.

Finally, the winds which blow on the areas adjacent to the sea winds carry salt which limits the types of cultivated crops that can be grown. This is the case in the area between Rdanu and Tulmeitha.

Dew

As a consequence of relative low temperatures during the night, the condensation of water vapour is high.

Dew forms mostly in the spring when there are the highest differences in day and night temperatures.

Dew is beneficial to the forage plants. It is also of importance to livestock breeding. It is known that during the period when there is much dew in the morning, it is not advisable to send the animals to the pastures before nine or ten a.m. since large quantities of very humid grass might affect them adversely. In the experimental centre of Zorda and El-Marj, it is possible to see that during the days when there is a strong dew formation, the soil of forage fields remains humid until three or four o'clock in the afternoon.

Mist

It is common on El-Marj Plain to see during autumn, winter and spring quite dense mists even during the day, although on the coastal plain this phenomenon is rare, and occurs, if at all, only during the early hours of the morning.

Mist formation lasts long in El-Marj Plain, and in the small wadis which sometimes interrupt the hills, and in spring is generally harmful to farming especially during the period of blossoming. The harmful effects partly result from later sunscorch but mainly come from virus and fungal infections in high humidity plant level micro-climates. The olive is often severely affected in mist hollows.

Frost

Damage caused by frost is greater in El-Marj Plain than the coastal plain since the temperatures during the night

may fall below zero. The highest incidence of frosts, probably falls in January.

Other meteorological phenomena are hail and snow, the former coming frequently in winter during the period when vegetation is at rest, but it may damage almond trees during the early blossoming period of spring.

Snow, however, is a sort of curiosity on the Jebel, and it is of no interest to agriculture. During the winters of 1933-34 and 1960-61 there came quite an intense snow fall where in some places on the Jebel it exceeded 50 cm.

Climatic Zones

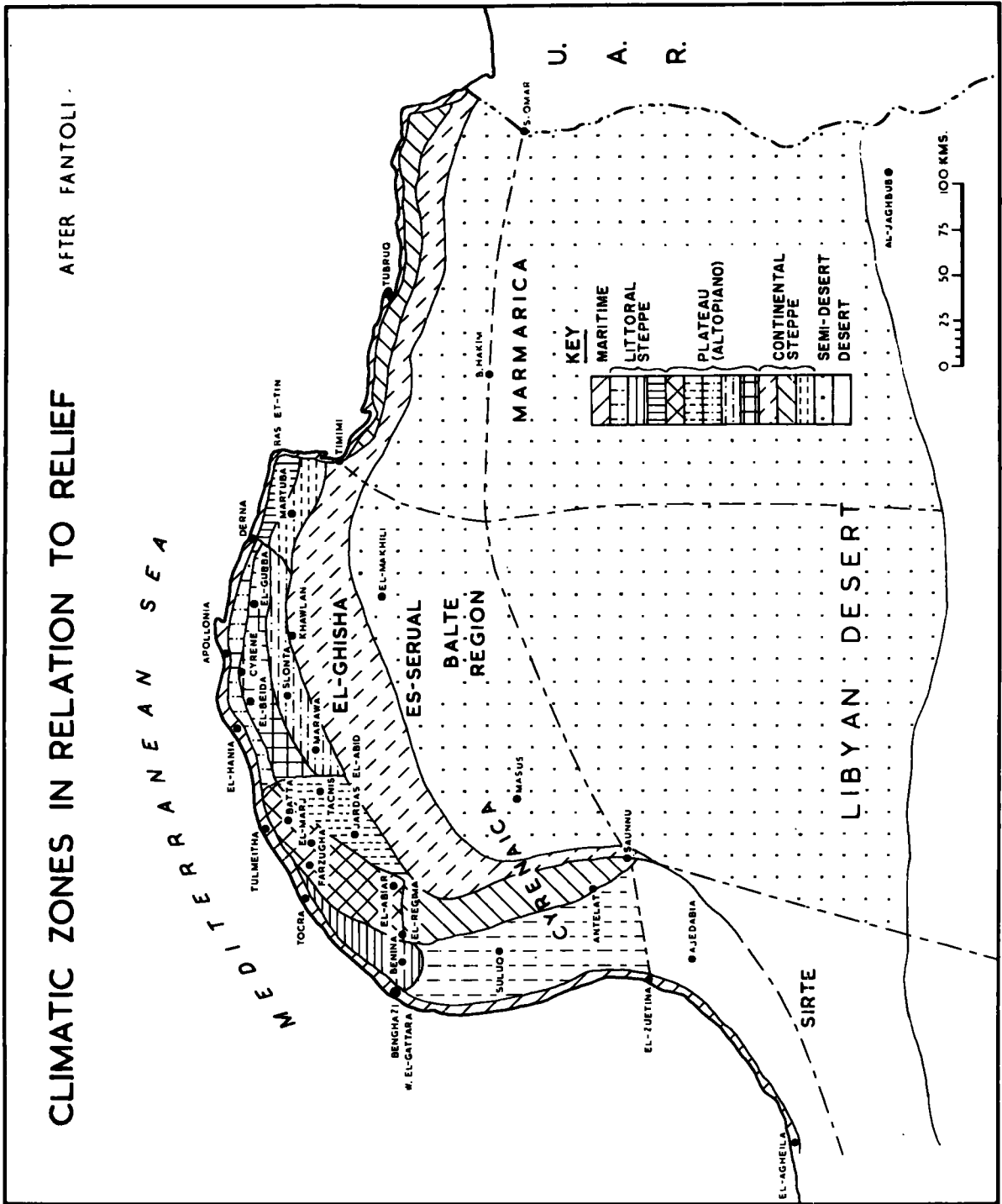
In 1952, Fantoli⁽¹⁰⁾ divided Cyrenaica into what he termed the climatic zones with respect to the geomorphological regions as follows:-

(1) Maritime Zone: This zone comprises the areas adjacent to the sea and never exceeds five kilometres further inland. It extends from Zuetina (south of Benghazi) to the Gulf of Bomba (Vide Fig. 24).

(2) Littoral Steppe Zone: This includes the eastern edge of the Jebel Akhdar between Wadi Derna and Umm-Rzem, and Benghazi plain between the southern boundary of Cyrenaica proper and Tobra where the Jebel descends to the littoral. The coastal plain is slightly drier than the moisture zone.

(3) The Altipiano (Mountain) Zone: This zone consists of the Jebel Akhdar and three sub-zones:- A. The eastern Jebel

Figure 24.



sub-zone and includes El-Fatayah Plain (12 kms. south-east of Derna) between Wadi Derna at the west and the Gulf of Bomba at the east, and Wadi El-Maalleggh in the south.

B. Central sub-zone comprising El-Uasita between Ras Tulmeitha and promontory of Ras El-Hilal, and also the area between Wadi Derna in the east and El-Gharib in the west. It includes also the area between Khawlan (46 Kms south west of Derna) and Marawa extending for about 60 kms. This strip is not well-defined and in fact is a transition zone between the Altipiano zone and continental steppe zone. C. The western sub-zone consisting of Dahr El-Ahmer including El-Marj Plain and Jebel El-Abid between Wadi (El-Gattara and El-Gharib).

Broadly speaking this zone includes the areas between the first escarpment and the main watershed and it is part, particularly, of the Mediterranean sub-humid sub-zone. Excluding the strip between Marawa and Khawlan, and the sub-zone between Derna and the Gulf of Bomba, it is the real forest area.

(4) Continental Steppe Zone: This includes the southern slopes of the Jebel Akhdar, El-Gisha and Es-Serual. It also comprises the area between Wadi El-Gattara and Antelat.

(5) Semi-Desert Climatic Zone: Or the Italian "pre-desert" zone which includes the region of Balte where the wadis from the Jebel descending southwards flow.

(6) Desert Climatic Zone: This includes the whole of the rest of Cyrenaica.

CONCLUSION:

To sum up, rainfall is the fundamental factor in El-Marj Plain since dry-farming is practised there, and there are no means of irrigation, except in the coastal plain. As has already been pointed out, rainfall is erratic both in quantity and distribution. Since agriculture and livestock represent the backbone of El-Marj Plain, it would be of great value for any development to establish meteorological observation stations all over the plain provided with qualified staff to make possible detailed study of rainfall and other meteorological elements. Libya, at present, has the capital to provide such necessities.

The critical nature of most of the climatic characteristics in relation to sedentary land use from cultivation to potable water-supply is obvious. With this in mind it is easier to understand the historical variations (Chapter VII), the peculiar characteristics of Italian development attempts (p. 189) and the problems now facing the state of Libya.

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CHAPTER IV

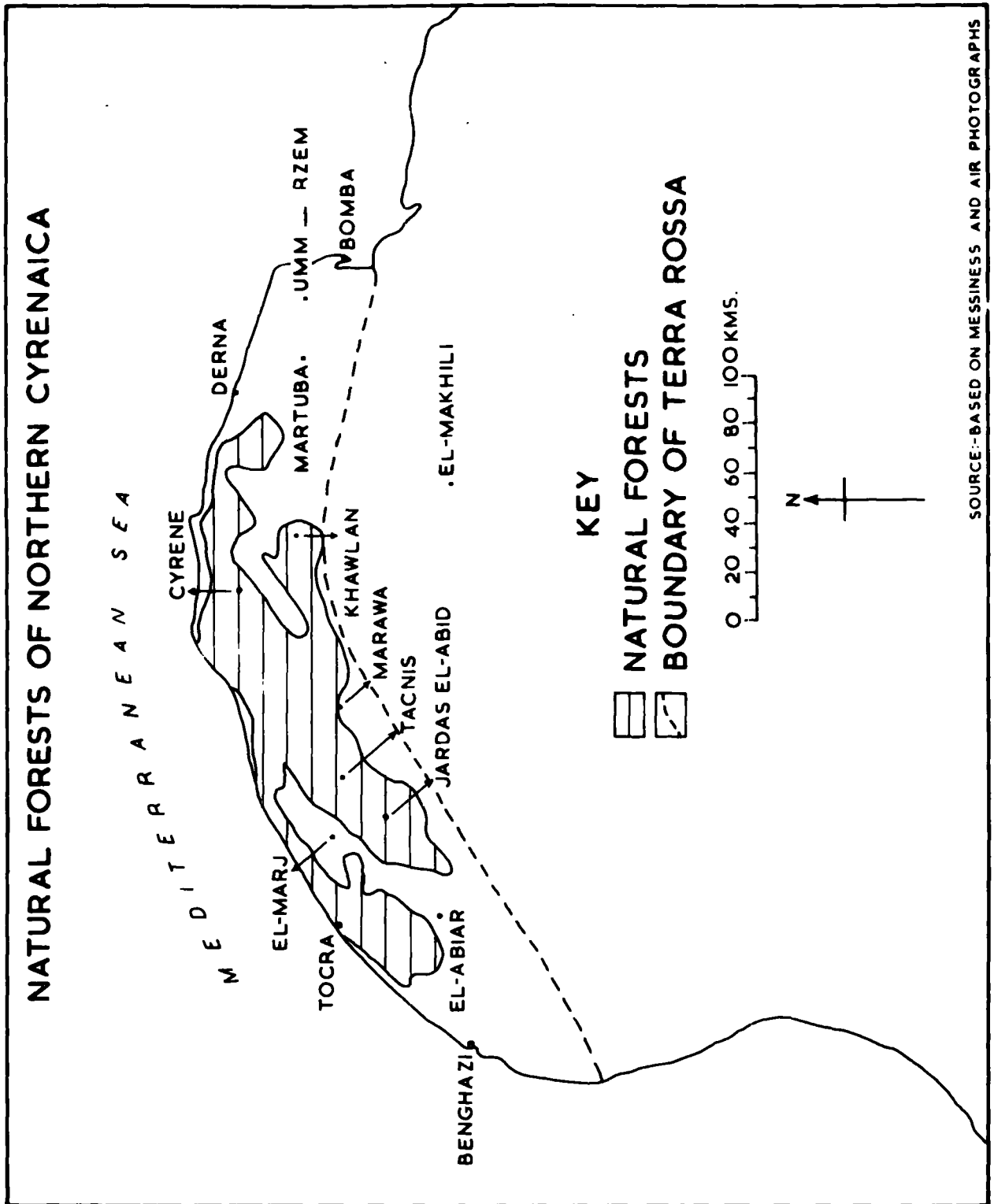
Vegetation

The vegetation cover in Cyrenaica is determined by climate, soils, and the topography of the region. As pointed out most of Cyrenaica is dominated by desert climate conditions, except for northern Cyrenaica which enjoys a more humid climate especially in the Jebel Akhdar where the Mediterranean climate predominates. Consequently, the floral life on the Jebel Akhdar, (or "Green Mountain" in English) is related more to the Maghreb and southern Europe than to the rest of Libya. Topography and soils are also important factors in vegetation distribution between and even within zones. Despite the fact that Terra Rossa soil is characterised by certain associations, as will be shown later, in general the vegetation types may be divided according to the physiographic regions:- the coastal plain (The Sahel between Tobra and Tulmeitha) and the Jebel (Vide Fig.25).

The Coastal Plain:-

The coastal plain between Tobra and Tulmeitha receives rather higher rainfall (300-350 mm) than the southern part of the plain as pointed out in the chapter on climate. This area is of semi-arid Mediterranean climate and is considered to be the richest part of the whole of the Libyan coastal plain in shrubs and herbaceous vegetation. In the sebkhas along the littoral south of Tobra there are halophilous plants, whilst east of Tulmeitha where the first escarpment approaches the sea, vegetation is denser.

Figure 25



However, the forest between Tocra, Tulmeitha and eastwards is tall, consisting mostly of Rhus oxycantas and Pistacia lentiscus (Vide fig. 26). There is also some tamarisk and carob with rare specimens of Spiny broom (*Colycotonie spinorsa*), common fig (*Ficus carica*), and wild common olive (*Olea oleaster*). This thin forest is spread over an area of 20,000 hectares. Rhus and lentisk, the former a characteristic pale green and the latter a darker green, are merely large bushes that are cropped by livestock. Moreover, the forest has been depleted by intensive production of charcoal. The run-off from the first escarpment and the upper terrace have dug deep gullies as far as the sea, and both wind and water erosion have contributed to the degradation of the soil and denudation of tree roots.

The Jebel:-

As far as distribution of vegetation is concerned, one must distinguish between the upper terrace and the high Jebel because of variation in precipitation and the topography of the region.

The area between El-Marj and El-Abiar is semi-arid and rainfall ranges between 200 and 350 mm. In this part of the upper terrace, the vegetation is comprised of plants found in Mediterranean bush and moor lands, typical of which are lotus (*Zizyphus lotus*), *Poterium spinosum*, *Cistus salvipolius*, *Phorinus florcosa*, *Thymelaea hirsuta*, and *Thymus capitatus*. *P. spinosum* is a tiny thorny, many-branched shrub found throughout Cyrenaica. It grows in thin soil on rocky terrain

PHYSIOGRAPHIC REGIONS OF EL-MARJ PLAIN
AND THE ADJACENT AREAS

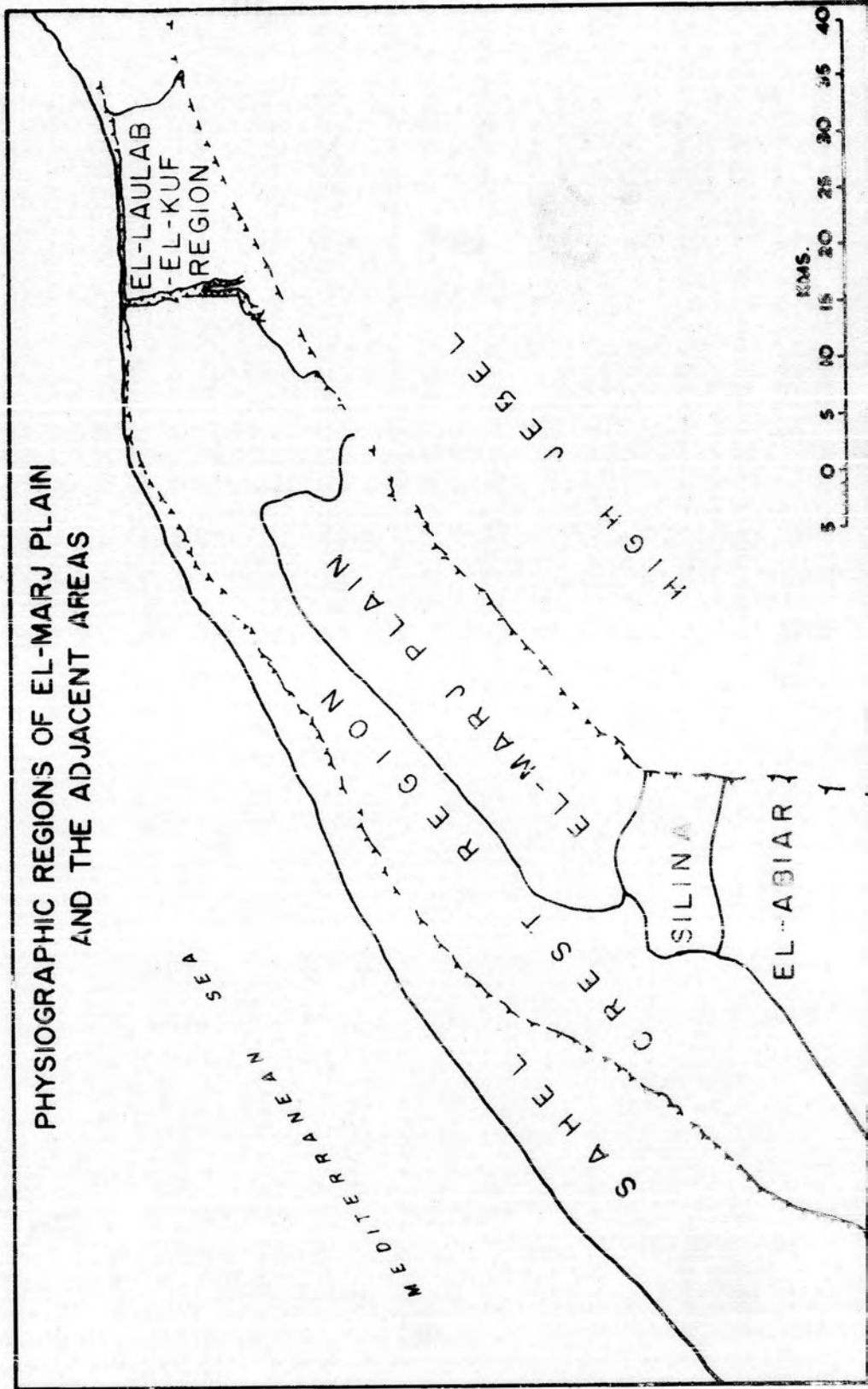
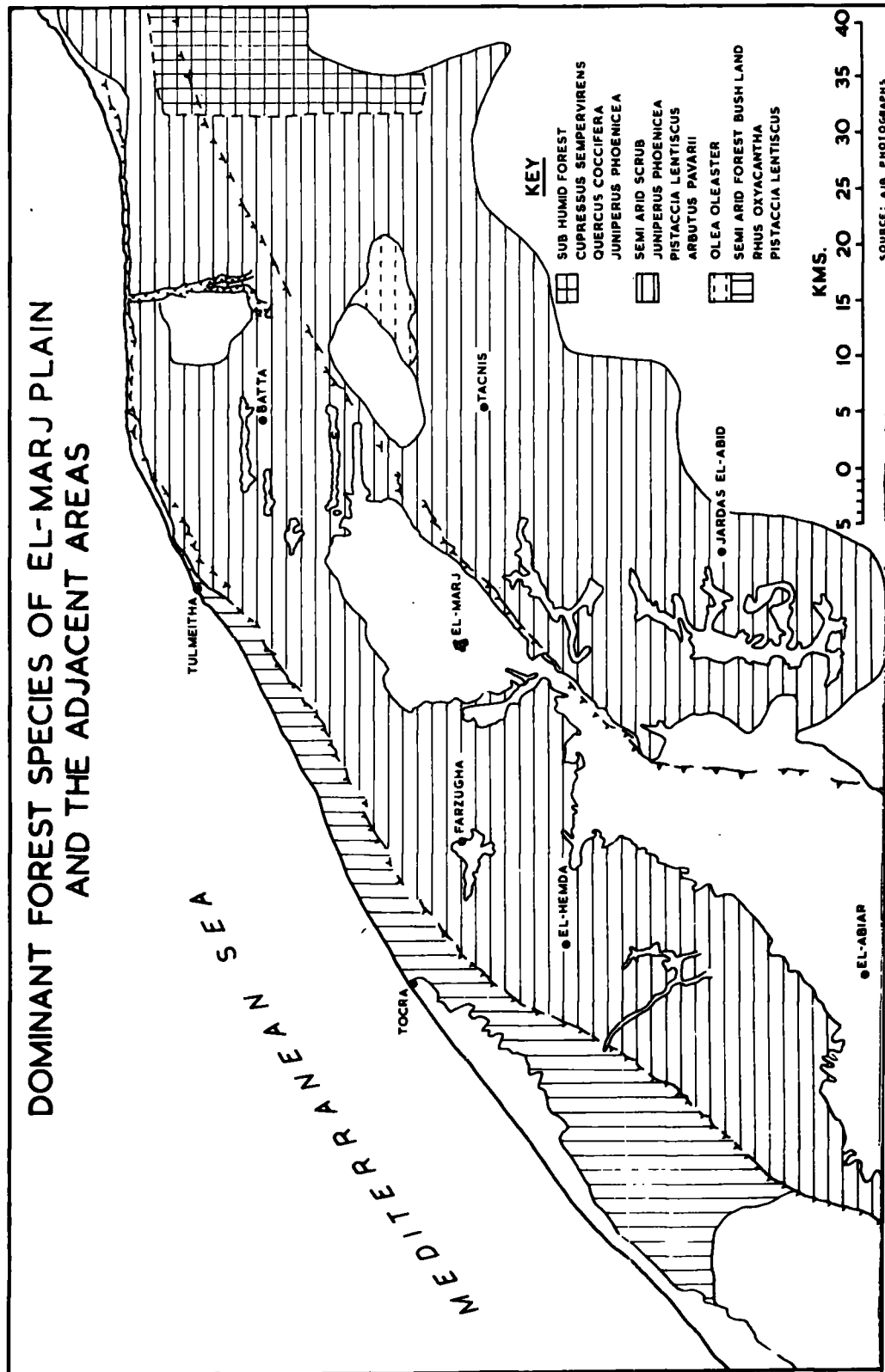


Figure 26



and is usually the sign of age-old degradation of land. This plant has even been found along the littoral but no sizable growth exists except beyond the first escarpment. Its utility for local people is limited to fire-wood and fodder for camels. P. floccosa is also widely distributed in all soils and zones, and more peculiarly to the littoral and the Jebel region. Cistus and Thymus are considerably degraded, due to overgrazing by local tribes, and could do with improvement.

Further north, and to the west of El-Abiar, and 5 kms. west of El-Marj and its surroundings, the whole of the upper terrace and the crest of the first escarpment are occupied by Mediterranean "maquis". The dominant tree is Juniperus Phoenicea which is typical of Terra Rossa soil. It is estimated that the Juniper covers an area of 50,526 ha. in El-Marj Plain and the surrounding areas.⁽²⁾ The juniper is the most widespread tree in the whole of northern Cyrenaica and the only tree extending to the southern edge of the forest region. It represents 43,29% of the total forest species and occupies 200,000 hectares in northern Cyrenaica. It is generally found in mixed stands with other species, mainly lentisk and arbutus, but grows alone in pure stands on the southern limit of the forest. According to Keith,⁽³⁾ juniper was endemic through Libya, but now is confined only to northern Cyrenaica.

Juniper growth is very slow and it is estimated

that the average annual growth in the Jebel Akhdar is 1.420 m^3 per hectare. The following table gives the annual growth and density of juniper and the other species of the forest in the Jebel Akhdar.

TABLE 15 - The Density and annual growth of the forest species in the Jebel Akhdar

Size of forest Density	Area in hectare	Annual growth of juniper per hectare in m^3	Total annual growth of juniper in m^3	Total annual growth of other species in m^3	Total annual growth of all species of the forest
13.7% of the forest high density	73,333	1.982	43,364	44.918	88,282
27% of the forest medium density	144,666	1.375	198.915	62.062	260,977
59.3% of the forest low density	317,001	0.904	196.168	61,131	257,299

Source:- Forestry Department Annual Report 1962 - 63 Benghazi. It is estimated also that the annual increment is 0.4 m^3 per hectare for R. oxyacantha and P. Lentiscus.

Juniper yields an excellent hardwood which is used for fuel either in its natural state or in the form of charcoal. Where no other lumber is available it is even used for light carpentry work in the roofs of the old-fashioned houses and in fences. The height of the juniper tree varies

between 2 and 12 metres. It can be differentiated from the Pinus halepensis by the many branches at the trunk, near to the ground. The juniper is an important factor in soil preservation.

The other abundant shrub tree in the El-Marj-El-Abiar area is Pistacia lentiscus. It is widespread over the Jebel Akhdar. Its fruits produce oil similar to olive oil, but not exploited in Libya for commercial uses. Its leaves contain 28% tans (pyrogallol) which is used locally for tanning. Lentiscus represents the permanent pasture in autumn and winter and in the years of droughts. Lentiscus, however, suffers heavily from grazing since goats eat its leaves, small branches and terminal shoots. This plant grows in the form of a large bush but, despite its vigour, it is not suitable for forest stock, although excellent for charcoal.

The third species of the "maquis" is Arbutus pavarii. It needs deep soil with a high humidity content and usually colonises the northern slopes which are less exposed to the sun, and so it preserves soil humidity for a long period during the year. Arbutus is common throughout the region, but never grows in pure stands. It can be found with juniper, lentisk, carob or wild olive, and fruit similar to roseberry, whilst its hard pink wood is used for fuel or for the production of charcoal.

The zone between El-Marj and Tulumtha has an average rainfall between 350-400 mm., Pistacia lentiscus predominates

on the more humid slopes, and the permeable limestone of the Eocene with a well-developed soil (with a hygroscopic top soil).

To the east of El-Marj with the increase of rainfall to 400 mm. and deep red soil rich in clay (more than 50%), especially in the wadis or depressions which have not been cleared, a typical "maquis" represented by pure stands of P.Lentiscus is found. It is degraded by overgrazing since it surrounds the cultivated area in the north east of El-Marj Plain.

Further to the east and around Wadi El-Laulab juniper and A.pavarii are also dominant, whilst in the more humid areas in the extreme north east of El-Marj Plain and in the wadi bed in the same general area, there are quercus coccifera, Ceratonia siliqua, Olea aleaster (wild olive) and Laurus nobilis. The first two species are found in the wadis of El-Laulab, Shaaba and Zaza, while the wild olive is found scattered among the forest and concentrated in large numbers in El-Gharib area. L. nobilis is rather rare. Pinus halepensis is rare in El-Marj Plain and the surrounding areas. However, it is native in numerous places on the northern rocky slopes of the first escarpment near the sea.

In the zone between the second escarpment and Jardas El-Abid including Tacnis, and extending to El-Bayada and Marawa, the soils are calcareous on dry slopes with an outcrop of parent rock and hill tops, producing an association of juniper and A.pavarii. The juniper seems to have reached a climax

stage in this area. This association cover more than 75% of the forest zone. The P. lentiscus is also found.

The southern limit of the juniper is about five kilometres south of Tacnis. This indicates increasingly arid climatic conditions. To the south west the forest extends as far as eight kilometres south of Jardas El-Abid (Vide Fig.26). Its range is rather limited and it grows in isolated clumps in the midst of the brush wood and especially in wadi Sonob ar south of Batta. Its wood is used for both fuel and lumber.

The following tables give the area of the important species of the natural forest in northern Cyrenaica, and in Mutasarrifia of El-Marj.

TABLE 16:- Areas of the important species of the natural forest in Cyrenaica in ha.

Species	Association	area in ha.	% of other species
Juniperus Phoenicea	conifer	200,000	43.2
Cupressus sempervirens	"	8,000	1.7
Pinus halepensis	"	8,000	1.7
Pistacia lentiscus	broad leaf	135,000	29.2
Arbutus pavarii	"	32,000	6.9
Ceratonia siliqua	"	12,000	2.6
Rhus oxycantha	"	42,000	9.1
Olea oleaster	"	14,000	3.0
Quercus coccifera	"	12,000	2.6
Total		463,000	100.0

TABLE 17 - The total areas of natural and preserved forests, and reafforestation in Mutasarrifia of El-Marj in ha.

Mutasarrifia	Natural Forest		Preserved Forest	Reafforestation	Total
	Conifers	Broadleaf			
El-Marj	102,000	96,000	850	485	199,335
% to Cyrenaica	47	39	37	15	42.7

It is worth mentioning that the "maquis" forest between El-Marj and Yungi Factory can invade the planted area with surprising rapidity. The same situation exists in Farzugha and El-Hemda. The plots of land tilled by the Italian colonists have lain idle for the past twenty years as a result of which they are completely overrun with bush; and were it not for livestock, this bush would develop into full size trees. (Vide Plate 5a).

It is important to deal also with the understory vegetation in El-Marj Plain and the adjacent areas for its significance to animal husbandry. Between Tocrá and Tulmeitha the typical plants are: Calycotorne rigida, Zizyphus lotus, Urginea maritime, Thymelaea hissuta, Haloxylon salicornicum, and Lygeum spartium. C. rigida is important among the "maquis" forest. Z. lotus is a shrub and its seed, unless excreted, germinates with difficulty. U. maritime is typical of maritime climate and common in the whole coastal plain. It is planted along the roads and by the local people to mark boundaries of their fields. It yields a rat poison (a red

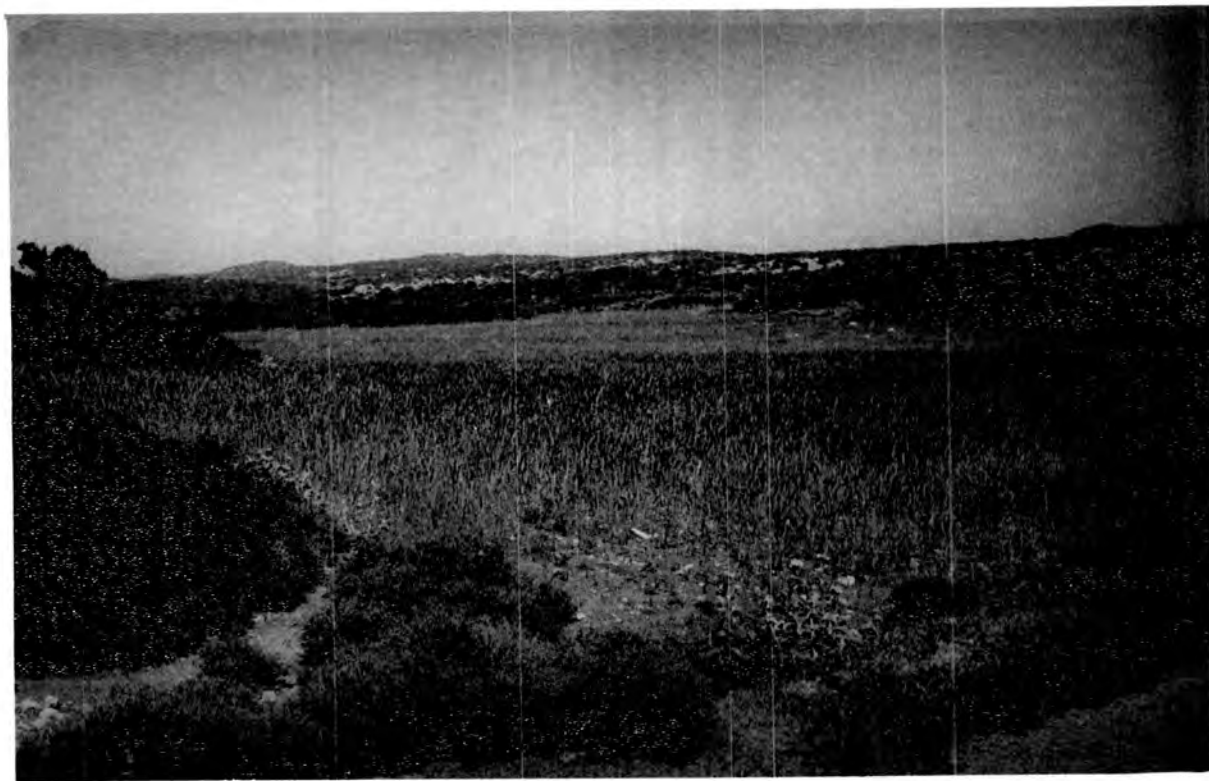


Plate 5 (A) - Cultivated area surrounded by maquis.

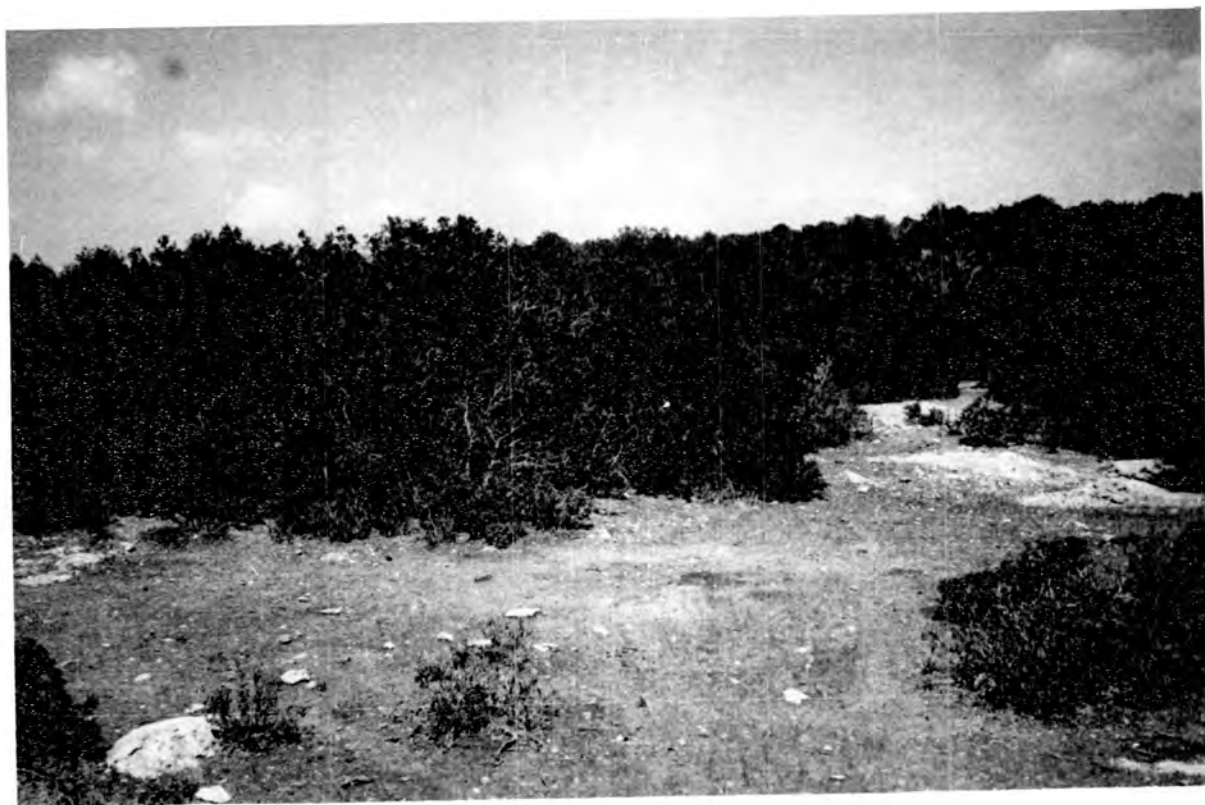


Plate 5 (B) - Typical of maquis vegetation found in El-Marj Plain and the surrounding areas.

squill) but is not so utilised in Libya. T.hissuta grows in the deep fertile soil and occasionally in the wadi beds or on the rocky surface while H. articulatum is also common and is eaten by camels but is poisonous to other livestock.

L.spartium is widespread in the whole of the coastal plain and the Jebel Akhdar.

On the Jebel the shrub and herbaceous vegetation distribution varies according to the types of soils and rainfall. The species found in the area between El-Marj and El-Abiar are Z.lotus, P.spinosum, P.florcosa, T.Hissuta and T.Capitatus. P.spinosum as far as is known is confined to Cyrenaica. There are at least three species but this appears to be representative. It is abundant in many places and constitutes the dominant characteristic of the vegetation. It is extensively used as fuel, and is important in that it appears to indicate areas suitable for afforestation with juniperus cupressus and pinus. P. florcosa is a perennial plant found in the Terra Rossa soil of the El-Marj plain. T.capitatus is a protected plant owing to its great value for bee pasture, the honey produced being regarded as of excellent flavour. It is commonly used in Cyrenaica as it is readily combustible but does not appear to be eaten by livestock.

In the more humid zones of El-Marj Plain the following species are found: P.media, R. officinalis, R.oleoides, M.commonis, C.spinosa and P.harmala. The first and the second species are found among the "maquis" forest and

R. Officinalis roots are reputed to excrete a substance that makes toxic the soil occupied by this species, particularly for wheat, for a short period⁽⁴⁾ at least. R. oleoides, M. communis, C. spinosa are confined to Cyrenaica, and the latter is poisonous to livestock in early spring. P. Harmala is always found near human habitation or where humans have dwelt, and it is likewise poisonous to livestock.

Maugini⁽⁵⁾ in Pampini's study on the flora of Cyrenaica, examined 42 samples of spontaneous and perennial forage plants in certain measured plots in El-Marj Plain, (the details are not available). He found that Avena barbata (wild bearded oats) (of Gramineae family) represents 39.9% of the plants. Medicago denticula (Leguminosae family) is 38% and the Compositae family 18.5%. Other species are 3.6%. The first and the second species are considered to be good as a forage.

At Tacnis and southwards the forest ceases abruptly and the perennial plants are Artimisia herba-Alba and Suaeda fruticosa which spread in the sem-desert zone. The first occurs in association with Haloxylon articulatus and Thymelaea hisuta, and frequently has white wooly galls (thorn) caused by R. hopaloniya navisi Tay which are very characteristic. A. herba-Alba grows on shall soils (loams) or calcareous soils, but not on hilltops with less than 200 mm. of rainfall. It is useful as an indicator for the range of tree growth and also of good agricultural land if irrigated.⁽⁶⁾ S. fruticosa indicates a saline sub-stratum (parent rock).

However, the area at Tacnis, protected since 1951, shows poor regeneration of the spontaneous and perennial forage plants. In 1956, Long⁽⁷⁾ reported that the perennial grasses cover little more than 1-2% of the total area.

The herbaceous vegetation remains green until the first intense heat in spring or summer, when the vegetation rapidly dries up and withers. The graninaceous vegetation is more resistant and especially the Avena barbata species. The pasture in El-Marj Plain withers about 20 days after that of the coastal plain and about a similar period earlier than that of the high Jebel around Cyrene.

Grazing and distribution of pasture will be dealt with in the section on agriculture.

The forest has an important impact on the economic life of El-Marj Plain. It is a supply of fire wood, charcoal, roofs for the houses and poles for support for plants, fencing and some fruit, among which are those of the wild olive, lentisk, carob, and A.pavarii. The forest can also be useful in drought years, when good pasture is scarce for rearing animals especially goats, which can find fodder in the forest (chiefly lentisk) during the most adverse periods.

The charcoal is produced for fuel for the towns on the Jebel and Benghazi, while the wood trees are used directly as a fuel by the local rural people, particularly those living in the former Ente farms or in tents. Due to

this high rate of consumption of the forest products degradation is imminent, a circumstance which has obliged the Forestry Department of the Ministry of Agriculture to organise the production of wood and charcoal through private and licenced firms in each Mutasarrifia. The Forestry Department chooses each year a particular area for cutting wood and production of charcoal. This step has been taken to avoid the excessive cutting of the forest. The following figures give the approximate quantity of wood and charcoal produced in 1962-63:-

wood	70,589 quintals
charcoal	80,432 "
poles	1,124 units

(Source:- Department of Agriculture, Benghazi).

Detailed figures are rare and unreliable: However, the yearly total production of wood in Libya is only 1,000,000 m³ of round wood, 25,000 m³ of which is used for industrial wood, and the rest is used for firewood. According to data⁽⁸⁾, the per capita amount is only 0.78 m³ of fuel wood per year, consequently in 1962 Libya imported wood of value £L.850,000 a figure which is six times that of 1954. The excessive cutting and smuggling of wood and charcoal is carried out throughout the Jebel Akhdar. Goats are also the real enemy of the forest, and it is a familiar scene on the Jebel to see a goat climbing a tree or a shrub tree, in search of fodder.

Outbreaks of fire are common in the forest, particularly during the period of the hot dry Ghibli winds, when public irresponsibility over cooking fires can be disastrous. For example in 1958, eleven outbreaks took place on the Jebel and damaged about 2,245 hectares of the forest, in 1962 only six cases were reported.

However, due to oil discovery and the establishment of an oil refinery to produce gas and kerosine for local consumption, and due to the rise in the standard of living, the demand for, and use of wood and charcoal is declining, so that the forest may yet see a reprieve.

Reafforestation:-

The forest for centuries has been over-utilised by Bedouin for grazing and recently the need for protection and conservation has been felt. In 1950-51, a law was passed for planning such measures. It failed, however, to provide the forest services with the means to implement the proposed policy. In 1952 more regulations were imposed by establishing the Forestry Department which appointed guards for the forest and roads and transportation facilities were made available. The Department declared many areas to be preserved and nurseries were established in El-Marj, Tacnis and El-Abiar to produce species which suit the Libyan environment. The local P.halapensis and that imported from Cyprus seem to adapt to the environment and the result was 95% success. The following table shows the reafforestation

in Mutasarrifia of El-Marj in relation to Cyrenaica.

TABLE 18:- Reafforestation in Mutasarrifia of El-Marj with types of species (in unit per tree planted)

Mutasa.	No.of logs	P.Halepensis	Cupressus semper-virens	Acaccia Cyclopys	Petraclinis articulata	Area in ha.
El-Marj	20,000	13,000	500	5,000	2,000	31
Cyrenaica	98,262	36,000	2,500	30,150	16,100	122

The reafforestation in El-Marj Plain is taking place especially in the area of Zorda-Yungi (south west of El-Marj) Bacur and south of El-Marj Plain at the foot of the escarpment and on the second escarpment.

The activity of the Forestry Department includes also the introduction of both indigenous and foreign species to improve the pasture. The following species gave good results in the nursery of Burgiat at El-Abiar:-

Lolium perenne

Medicago sativa

Millotus alba

Bromus Inermis

Oryzopsis miliacea

Phalaris tuberosa

As for the problem of the relation between vegetation and grazing, a study of the semi-forest or forest associations as they occur in the Jebel can indicate the possibility of a general solution in terms of afforestation

of agricultural development. The Mediterranean red soils which were originally covered by various associations belonging to the Oleo-Ceratonion are certainly suitable for cultivation. They should be used for pastures or permanent grassland only if they are too shallow for intensive systems of crop production.

Reseeding would be almost obligatory in the forest and agricultural zones of El-Marj Plain, because of the tendency of the vegetation to progress towards the forest climax, or the disappearance of sources of grass and legume seed due long cultivation.

To conclude, the flora of El-Marj Plain and the adjacent areas is a paradoxical setting in North Africa, more related to Crete and Greece than to the adjacent deserts of Marmarica and Tripolitania.

The forest is undergoing severe devastation by excessive cutting and over-grazing, yet it would seem to be economically the most efficient user of soil and precipitation in this semi-arid zone, and can counteract soil erosion, which is a particularly serious problem in semi-arid countries. Libya, as one of these countries ought to have, not only a policy of preservation for its existing forest areas, but also an intensive afforestation programme for other similar areas, whose indicators have been discussed above, not at this time actually populated by forest associations. The relationship

between controlled vegetation cover, hydrology and the use of limited ground water resources has not yet been fully appreciated or studied.

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CHAPTER V

Water Resources

It is clear beyond all doubt that water is the most critical factor in Cyrenaican agriculture, and that there is virtually no surface water in the country except in the wadis of Derma and Lathrun, and the latter carries its small quantity of water to the sea.

It is exceedingly difficult to conserve surface water from the rainfall because precipitation is irregular, to some extent, torrential, and the structure and porosity of the soil are unfavourable.

A number of copious springs are concentrated in the eastern Jebel Akhdar, with deep and good underground water on the Jebel, while on the coastal plain water is found rather nearer to the surface than on the Jebel though the water is in places moderately to highly mineralised.

The discussion in the present chapter will deal with the nature of rocks and their relationships to the forming of underground water resources, cisterns or water table in El-Marj Plain, wells, springs, the abandoned Italian pipeline, and the current scheme of the Debussia-El-Marj water supply.

Nature of Rocks as Sources of Water:-

It is incorrect to regard the whole of the precipitation which falls in a given area as forming the underground water resource. The rainfall can be split into three parts:- evaporation, run-off and infiltration fraction

which is absorbed by the ground and in sink holes. On the Jebel no statistics are available on this, since there are no permanent water courses and due to the karstic nature of the area.

The knowledge of the physical character of the rocks with regard to the possibility (or impossibility) of allowing infiltration of meteoric waters and their descent to depth is fundamental to the study of the initial process relating to the formation of underground water. For El-Marj Plain rocks we have no data of value. However, the impermeable rocks are represented by clay and marls to which may be added some very marly limestones which are in practice only very slightly permeable. These types of rocks are not abundant on the Jebel as a whole, but a few horizons of them exist, sufficient to give rise to the aquiferous water table in the eastern Jebel.

The Quaternary, although mainly constituted of subaerial deposits, nevertheless offers a few argillaceous lithological types which are only slightly permeable⁽¹⁾. In the large deposits of Terra Rossa of El-Marj and Sidi Mahius which are at depth, are some strata richer in colloids which form a retaining horizon for local water tables.

The Miocene proves to be richer in impermeable rocks; and in it at the top there is calcareous clay in the zone of Göt Es-Sultan and in El-Abiar.

The Oligocene, particularly the lower part is composed of almost impermeable rocks which outcrop only

to a limited extent in definite argillaceous facies.

The Eocene which covers most of El-Marj Plain is completely devoid of clays and marl, at the same time being very calcareous. Among the rocks less impermeable, but which may be considered as such when in sufficient thickness and in certain depositional conditions, are some very marly varieties of coarse limestone, such as the yellow-brown limestones of the base of the Langhian and the Aquitanian, where they are associated with the more definitely impermeable types.

Permeable rocks (properly so called i.e. of clastic type), are not common in the Jebel, and are mainly found in the only slightly cemented Quaternary deposits. Among these are the very permeable deposits of El-Marj (deep), Got Es-Sultan (surface) and river gravels making up the fans (deltas) of the littoral wadis.

Surface Waters:-

This discharge of water in the wadis occurs abruptly and violently after torrential rainfall, and sometimes only lasts a day or two. The water of the large wadis north of watershed empties in the sea, while the other empties into stagnant pools.

However, the absence of permanent streams is due to the fact that rainfall is scarce on the whole, and due to the nature of the rocks. As has already been pointed out in

the chapter on relief the rocks are mostly of low density limestones, in which numerous joints and fissures allow the rain that falls on the surface to disappear rapidly underground.

The bulk of the rain that falls is used by growing plants, evaporates or runs off on the surface. In some places, however, where bare limestone is exposed, water from rain sinks in directly or sometimes running on the surface for a few tens of metres or less. This is especially true in the coastal plain where fissures, enlarged by solution, intercept the run-off. On the Jebel run-off is restricted to the wadis, in which infiltration is rapid to coarse materials.

Along the base of the first escarpment the run-off from the wadis spreads out and sinks into pervious limestones. When run-off does occur, recharge also takes place in the wadis that drain south and south east from the Jebel towards the interior desert.

El-Ghariq:-

It has been mentioned before that El-Marj Plain is the longest closed karstic basin in northern Cyrenaica. The main wadis descending into the basin from the south are Wadi Seil El-God and Wadi El-Gattara. The run-off waters of these wadis, rainfall and waters of the wide contained basin, form the previously mentioned ephemeral lake known as El-Ghariq which is only one kilometre N.E. of El-Marj town and forms in the large depression which is some 12 kms. wide and 42 kms. long. Most of the water that accumulates in the lake, apart

from that which evaporates and forms a superficial water table in the Terra Rossa deposits, ends up by percolating to depth, where held up by horizons having sufficient impermeability, gives rise to particularly rich and constant water-tables.

The lake fills with water commonly in January after the rainy season starts, but is generally dry by June. The area of the lake is variable from year to year according to the amount of the rainfall. It is usually six kilometres long and 3 kilometres wide. Muhlhofer⁽²⁾ records that in the rainy year of 1924-25 it occupied an area about 24 kilometres by 3 kilometres. In 1961 when the rainfall was high (see chapter on climate) the area of the lake was 8 kilometres long and 5 kilometres wide and the water stagnated until August.

It is estimated that about 5,000 hectares are flooded at a depth of 5 to 8 metres the maximum stage. The depth of the water is usually 2 metres and the low point of the lake is 276 m. above sea-level, whilst the rim is approximately marked by the 300 metre contour (Vide Fig.4).

In the area of the depression of the 300 metre contour the superficial water-table is six to eight metres deep, while the deep water table below the lake bottom is about 100 m.

After the lake dries up, the whole area becomes invaded by low vegetation and various herbaceous plants; the

soil there remains very humid and is used by the local people for growing vegetables as will be discussed later in the chapter on agriculture. The question of salinity is examined in Chapter 6.

Surface Waters Management:-

The wadis descending to the coastal plain from the first escarpment i.e. wadis El-Asra, Es-Sléib and El-Gattara (south of El-Abiar) and all of them almost every year during the rainy season flood the areas where they empty their water, at the minimum three times per year and at the maximum ten times. The attempts to dam up these wadis have produced a negative response because of the nature of the rocks which are pierced through with many caverns. Professor Pantanelli⁽³⁾ calls attention to this fact; however, he does not exclude the possibility of damming up some torrential waterways of the first escarpment near their sources on the upper terrace, without incurring the danger of submerging already cultivated fields - this in the hope that some of these waters can be diverted for irrigation purposes to the northern flanks of the Jebel Akhdar.

As far as the wadis descending the coastal plain between Tulmeitha and Tocrá are concerned, there is no sign that either the Greek or the Romans attempted to utilise the water from them unless this was achieved by a simple method of which no evidence remains today. The impracticability of

constructing reservoirs because of the extreme permeability of the beds of the water courses, is now recognised.

As far as the surface water management is concerned the Italians planned to make use of the stagnating water in El-Ghariq. It was suggested that the water could be gathered in large concrete tanks which would cover the surface of a few hundred hectares and would leave free for cultivation the area which otherwise becomes a bog. This water could then be used for irrigation during the summer months. However, due to the high cost and some doubts about the heavy evaporation factor which would occur in the large tanks, the scheme was abandoned. On the other hand it is probable that if El-Marj Plain were cultivated as well as the neighbouring area, there would be far less water flowing towards El-Ghariq and then perhaps it would be possible to pump the water from El-Ghariq and divert it to the farms nearby and to use the area usually flooded for agriculture.

Cisterns:-

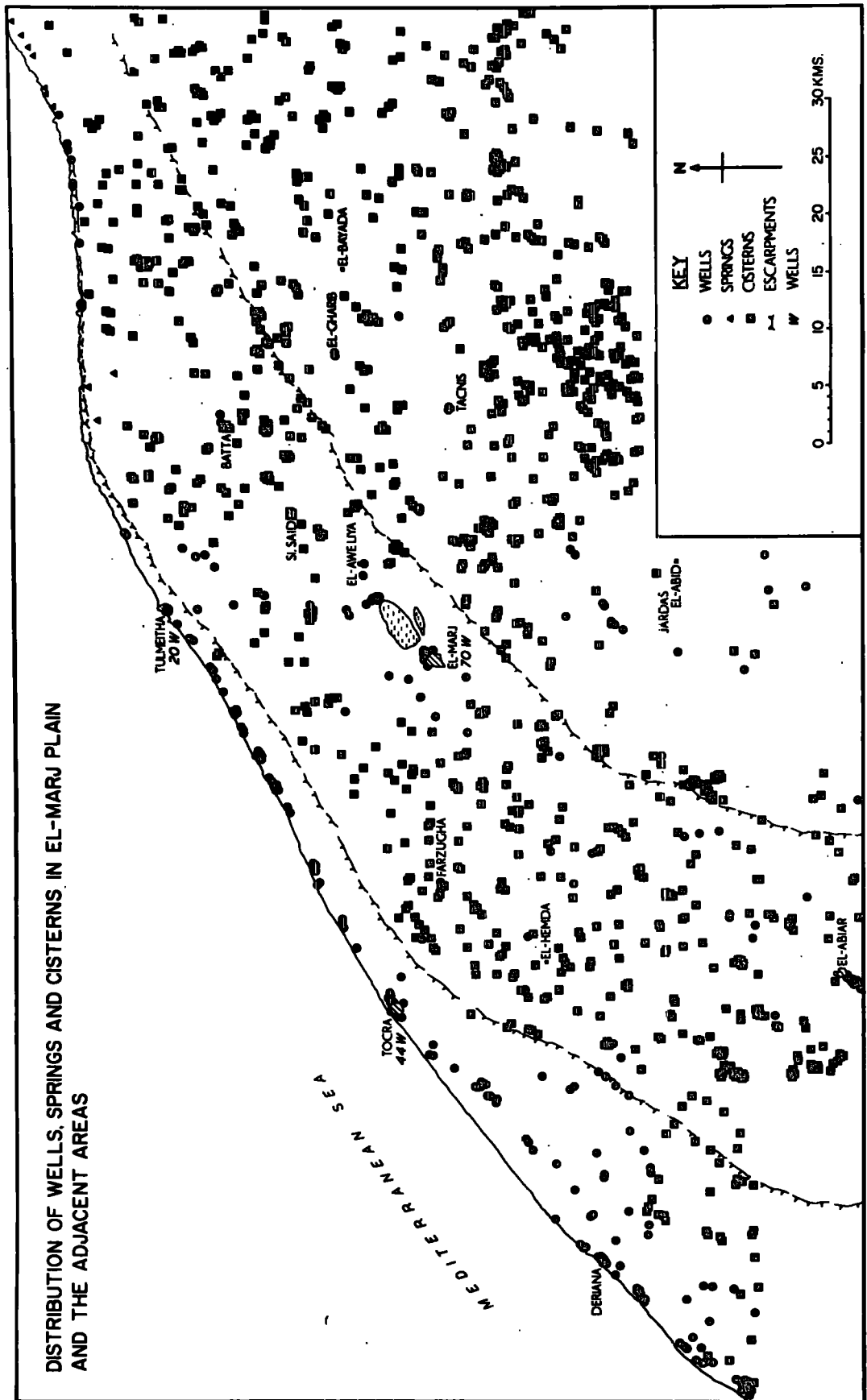
Man's reaction to the crucial need for water was to build cisterns in the Jebel and wells in the coastal plain, and many of these cisterns were built from Greek and Roman times onwards. The survey conducted by the Italian Services⁽⁴⁾ in 1926 covered over 2,300 cisterns in Cyrenaica of which 461 were in El-Marj Plain, the surrounding areas of the second escarpment and the coastal plain. In El-Marj

Plain itself there were 125 cisterns, which are located outside the 300 m contour rim where the underground water is deep and no perennial springs exist (Vide Fig.27).

A large number of the cisterns are found on the second escarpment particularly south of Tacnis, while on the coastal plain the aquifer is near to the surface and so the cisterns are rather few. The ground, which is pierced throughout with natural caverns, lent itself to the construction of small size cisterns without too much labour. Water sources spaced at great distances from one another and the scarcity of wells, made the construction of many cisterns essential, and whilst some of the cisterns had a capacity of several thousand cubic metres, most are rather small. The most important cistern in western Jebel is that supplying the Roman Aqueduct in Tulmeitha.

The ancient small cisterns are usually 4x3 metres in plan and 5 metres deep, most of which are public. On the former Ente farms each house has a cistern which collects the run-off from the roof. These new cisterns are about 10x8 metres wide and 8 metres deep. Most of these cisterns are in good condition since in most places in El-Marj Plain it furnishes the needs of humans and livestock. Some people who own more than one cistern may sell the water for the period between May-October at a cost of about £L12 for the whole capacity of the cistern during the whole period when there is

Figure-27



no rainfall.

The former Italian Ente for colonisation of Libya repaired thousands of cisterns, 52 of which in the vicinity of Tacnis have a combined capacity of 6,050 cum. The British Military Administration repaired some of those destroyed during the second World War, whilst U.S.Aid Mission with the cooperation of the Libyan Government established and repaired many cisterns on the Jebel.

Expansion by the establishment of more cisterns will be essential in the very near future, particularly in the western part of the El-Marj Plain, an area which will not benefit for at least 6 years from the Debussia-El-Marj scheme, and also because of increased agricultural development and the growth in the number of livestock which make the expansion necessary even after the provision of enough water for present needs of humans and livestock.

Underground Water:-

The underground water reservoir underlying El-Marj Plain is recharged by direct infiltration from precipitation and also by infiltration from surface water run-off in wadis and from ponded water in ephemeral lakes. Such recharge probably occurs only during or after relatively intense rainstorms. Recharge from dispersed or light rain is probably negligible. (5)

Wells:-

El-Marj Plain receives an average rainfall of above 300 mm., and the water of the run-off collected in the temporary lake of El-Ghariq. The surface waters, part of which form a superficial water-table in the Terra Rossa deposits, ends up by sinking to depth, where, held up by horizons having sufficient impermeability, they may give rise to particularly rich and constant water-tables. (6)

In El-Marj Plain there are more than 100 shallow wells six to seven metres deep (Vide Fig. 27). These dry up in summer and are cleaned every year after the rains. There are also nine deep wells around and in El-Marj town in which the water level varies considerably. The water also stands at different levels in the four wells in the agricultural station (east of the town) which is due partly to the different amount of water taken from each well; the well with the largest output having the largest core of depression of water surface around it and therefore the greatest lowering of the water level. The depth of the deep wells varies between 15 and 55 m, from the ground to the water, and the water varies between 6 to 18 m. in depth. In the deep well (55 m.) the level of the water usually falls about 3 metres in the summer (between July and September).

The wells in El-Marj appear to tap two water

horizons, an upper one at about 14 m. and a lower at about 44 m. The town of El-Marj at present is supplied by five wells (Vide Fig.28). The quality of water is good and the monthly capacity is as follows:-

Well No.1	755,000 gallons per month			
" No.2	1,000,000	"	"	"
" No.4	600,000	"	"	"
" No.5	543,000	"	"	"
" No.6	217,000	"	"	"

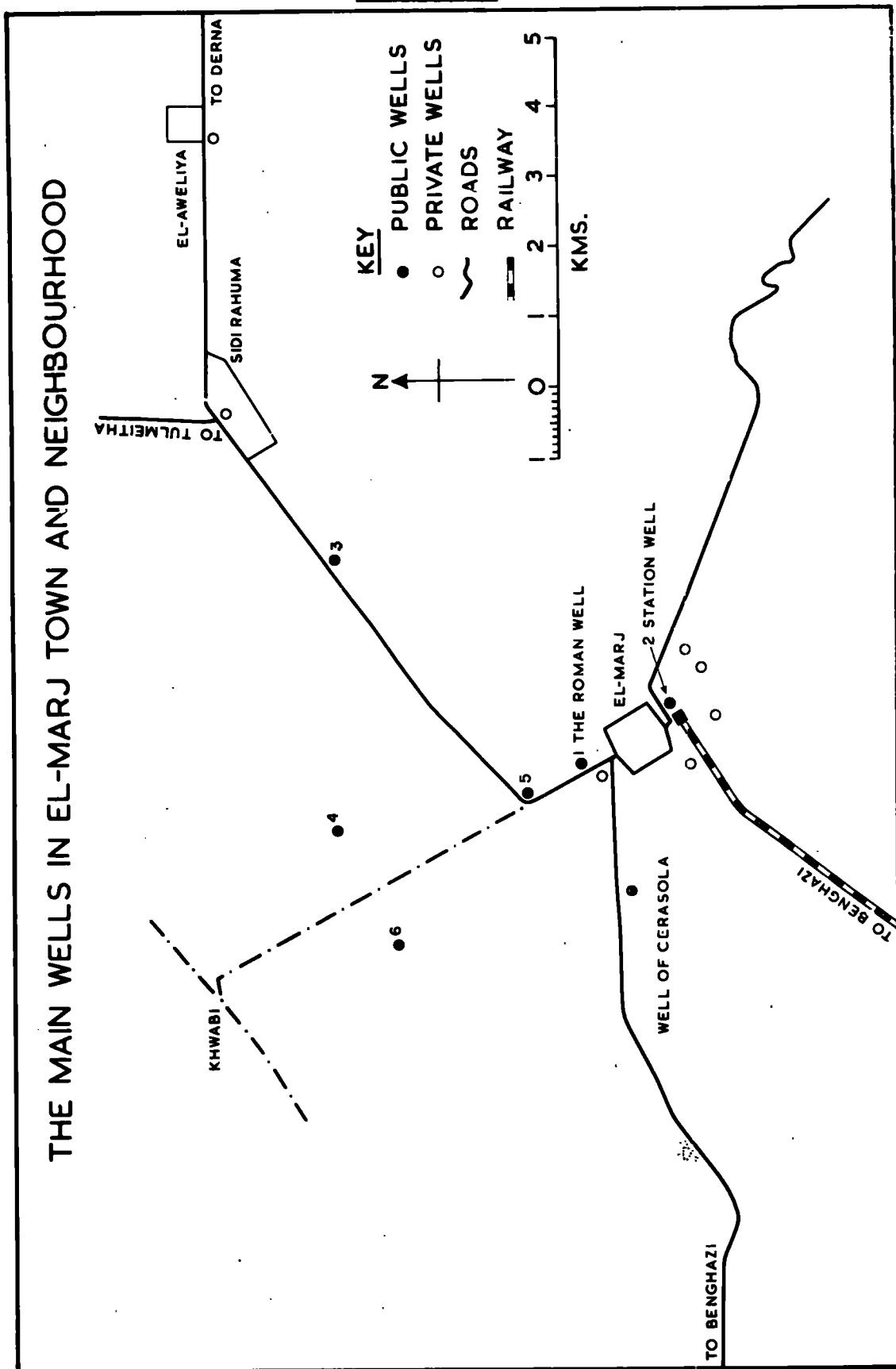
(Source:- Ministry of Public Works - Benghazi).

The water from the wells is collected in the water tower which has a capacity of 80,000 gallons, for distribution to the town. El-Marj is the only centre in the plain with such a municipal distribution system. In addition road tankers carry the water from the town to remote inhabited centres and farm houses which are short of water.

The daily consumption of the town is 240,000 gallons, so that the capacity of the producing wells is entirely inadequate even for the town's needs during the summer.

However, as far as El-Marj Plain is concerned the highest water level occurs about halfway between El-Marj and Sidi Mahius where, along a line running north-west from the foot of the second escarpment, the level of the surface underground water is more than 305 m. above sea-level. From there it slopes away to the north east (270 m. at El-Marj)

Figure 28



and to the south west (290 m at Sidi Mahius and 250 m. at El-Abiar). (7) Marchetti⁽⁸⁾ gives a geological section along the line Tocra-Jardas El-Abid (which coincides with the line half way between El-Marj and Sidi Mahius, where the underground water is highest) and shows that the Eocene beds beneath the Plain are folded so as to form a depression near the foot of the second escarpment along which the underground water flows away to the north east and south west (Vide Fig. 13). New test wells have been drilled by U.S.O.M.⁽⁹⁾ (See Appendix II).

The Eocene Horizon:-

This horizon yields a small group of springs east of Tulmeitha (Vide Fig. 27). These springs are Ain Brur (270 m. above sea-level), 13 kms. east of Tulmeitha, Ain El-Meleca (100 m.) 18 kms. east, and Ain Habbun (70 m.) 21 kms. east of Tulmeitha. The level of the horizon occurring in this locality decreases from south west towards north east, and forms a small spring-bearing horizon restricted to this district.⁽¹⁰⁾

The discharge at Ain Brur is given as "small", that of Ain El-Meleca in Wadi Gelugh as "abundant", and that of Ain Habbun in Wadi Habbun as 17, 600 gallons per day,⁽¹¹⁾ the water from the last spring stagnating in the bed of the wadi. This spring probably fed the Roman aqueduct to Tulmeitha, remains of which can still be seen.

Cretaceous Horizon:-

It has already been pointed out in the chapter on geology that the area between Tocra-Tulmeitha and Jardas El-Abid is affected by tectonic disturbances (Vide Fig.12). The Cretaceous rocks between Tocra and Tulmeitha are affected by an anticlinal fold, in which the limb towards the sea dips decidedly with considerable angles whilst the inland limb dips gently so that the tectonic features approximates to a flexure.⁽¹²⁾ However, the Cretaceous rocks, both in the coastal and on the Jebel in Jardas El-Abid (Vide Fig.11) are to a considerable extent made up of marly rock types and as such are only slightly permeable. In this respect it may be noted too that true marls are found particularly frequently in the two Cretaceous inliers of the Jebel (Jardas El-Abid and El-Magahir) where they alternate with types of different hydrological behaviour, such as compact limestones.

The Cretaceous water-table occurs in the coastal plain between Tulmeitha and Tocra, and inland in Jardas El-Abid

Around Tocra there are over forty shallow wells of more or less saline water, from three to five metres deep with half to one metre of water. The total yield is about 28,400 gallons per day, but the best of them gives only 6600 gallons per day. The well south of the village drilled in 1960 is 37 m. deep with a water of 19 m. and a windmill and a pump are installed.

Most of the wells in Tobra area are private and those outside the village are used usually to irrigate the gardens. There is no municipal distribution of water. The well south of the village is used at present for livestock needs for which a fee is payable, whilst the inhabitants buy the water for their own consumption at about two piastres per litre.

Near Tulmeitha there are about 20 shallow wells in which the water is saline but drinkable by the local inhabitants, the average depth of which is four metres, two to the surface of the water with two metres of water. One well 3 Kms. west of the village at Sidi Abdalla is 18 m. deep with 9 metres of drinkable water. The water is driven by a windmill and a pump, and collects the water into a water tower for distribution to the inhabitants of the village.

The wells in the area between Tulmeitha and Tobra are privately owned and are used for irrigation in the gardens.

In Jardas El-Abid a well seven metres deep yields about 4000 gallons per day and is used for human consumption in the village.

These are the main inhabited villages which have well-water, also others using the cisterns which collect rainwater.

However, the shortage of water in the western part of the Jebel Akhdar forced man, since early Greek and Roman colonisation, to take advantage of every source available, so cisterns and aqueducts were built on the Jebel. The

development in the Jebel and the growth of population and improvement in living standards make the utilization of some of the copious springs of the eastern Jebel inevitable. The Italians worked on a scheme for tapping Ain Mara springs for distribution of water in all of the whole villages along the north road of the Jebel, but the breakout of the second War brought this scheme to an end, (see Appendix 2). The Libyan Government in 1962 put in action a similar scheme, utilizing another source, the Ain Debussia, to bring water from the latter spring to El-Marj and all the villages and the farm houses along or near the route of the pipeline. Since the significance of these schemes is so great on the economic and social life of the region, they will be dealt with in more detail later.

(13)
Professor Addison believes that the efforts to complete the Ain Mara water system as originally planned would be expanded more profitably in direct irrigation works, as for example in Syria or the Lebanon. However, it is important, first of all to provide water for the needs of the inhabitants of the Jebel and the livestock.

The water of Ain Mara is at present devoted to irrigating the small gardens in the wadi while the rest of the water which flows beyond the agricultural zone stagnates in the wadi bed and creates marches favourable to Malaria carriers. Since drinking water will be available for most of the Jebel from the Ain Debussia-El-Marj scheme, the water of these springs

could be tapped and diverted to meet the local needs and to be used for irrigation in the agricultural extension in the eastern Jebel Akhdar.

Debussia-El-Marj Water Supply Scheme:-

Water is abstracted from Ain Debussia, a perennial spring of good quality which issues at the foot of Wadi Seghi. Gauging of the spring over the last few years varied between 3.2 and 12 million gallons per day according to the time of the year. Normally the water is clear and sparkling but after heavy rainfall it becomes turbid due to disturbances of the silt in the limestone fissures. A concrete well has been constructed into which the water from the spring can be diverted to the treatment works at the top of the wadi escarpment (Vide Plate 6a).

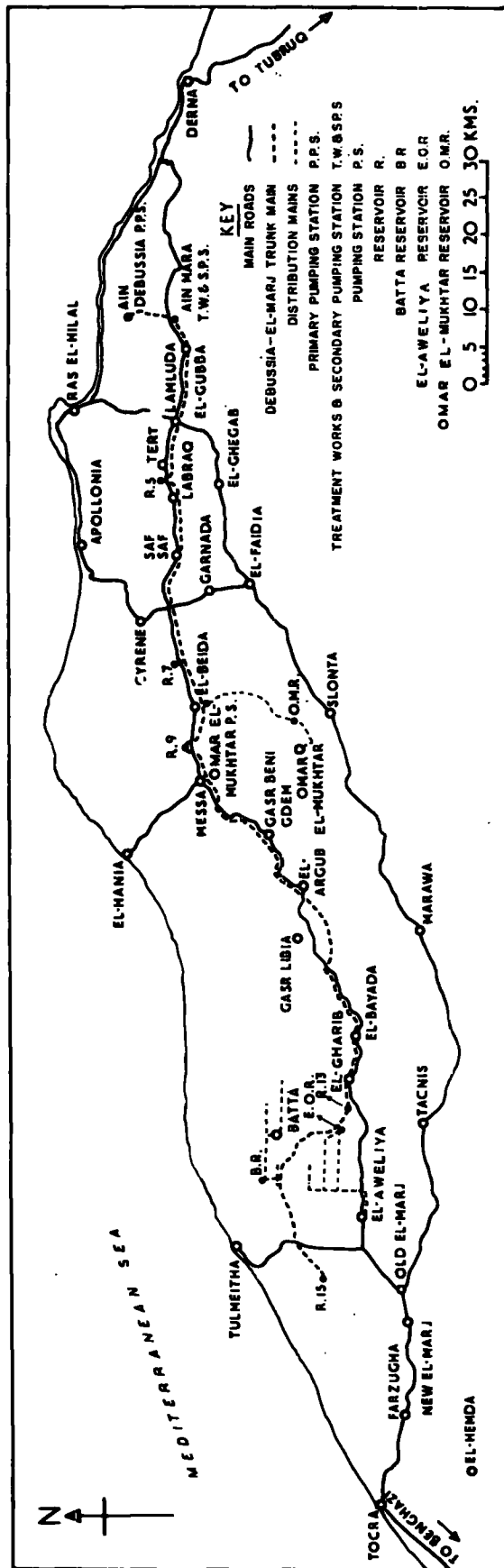
The water reaching these works is dosed with alumina and passed through a battery of six pressure filters and is then sterilised by chlorine before entering the storage tank.

Pumps take water from the tank and deliver it through a 10" main which follows the line of Debussia Access road as far as its junction with the El-Marj-Derna road where a connection has been made to the main laid by the Italians. The water is then passed through this main into a one million gallon capacity service reservoir near Ferrara referred to as Station 5 reservoir (Vide Fig. 29). It will then gravitate all the way to El-Marj.

The main pipeline is about 166 Kms. in length and

Figure 29

THE DEBUSSIA-EL-MARJ WATER SUPPLY SCHEME GENERAL PLAN OF PIPELINE ROUTES



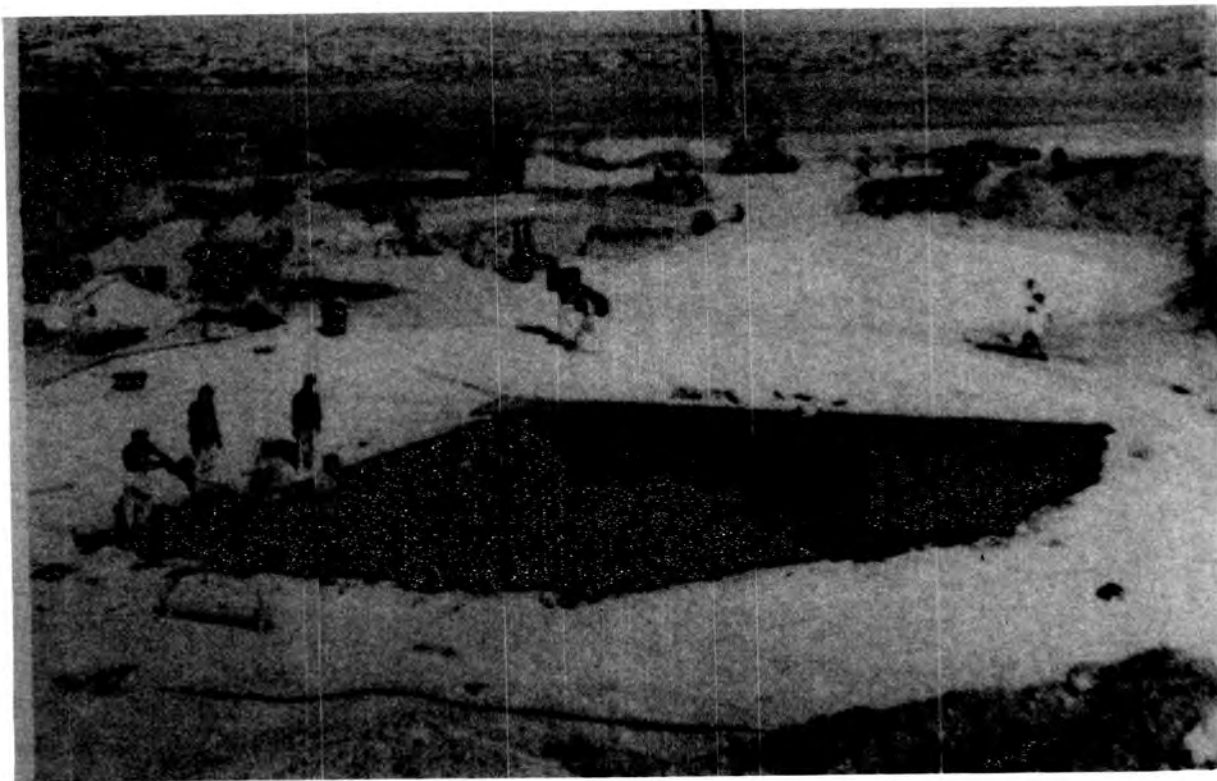


Plate 6 (A) - The Debussia - El-Marj Water Supply scheme:
treatment works on the filtered water tank No.1

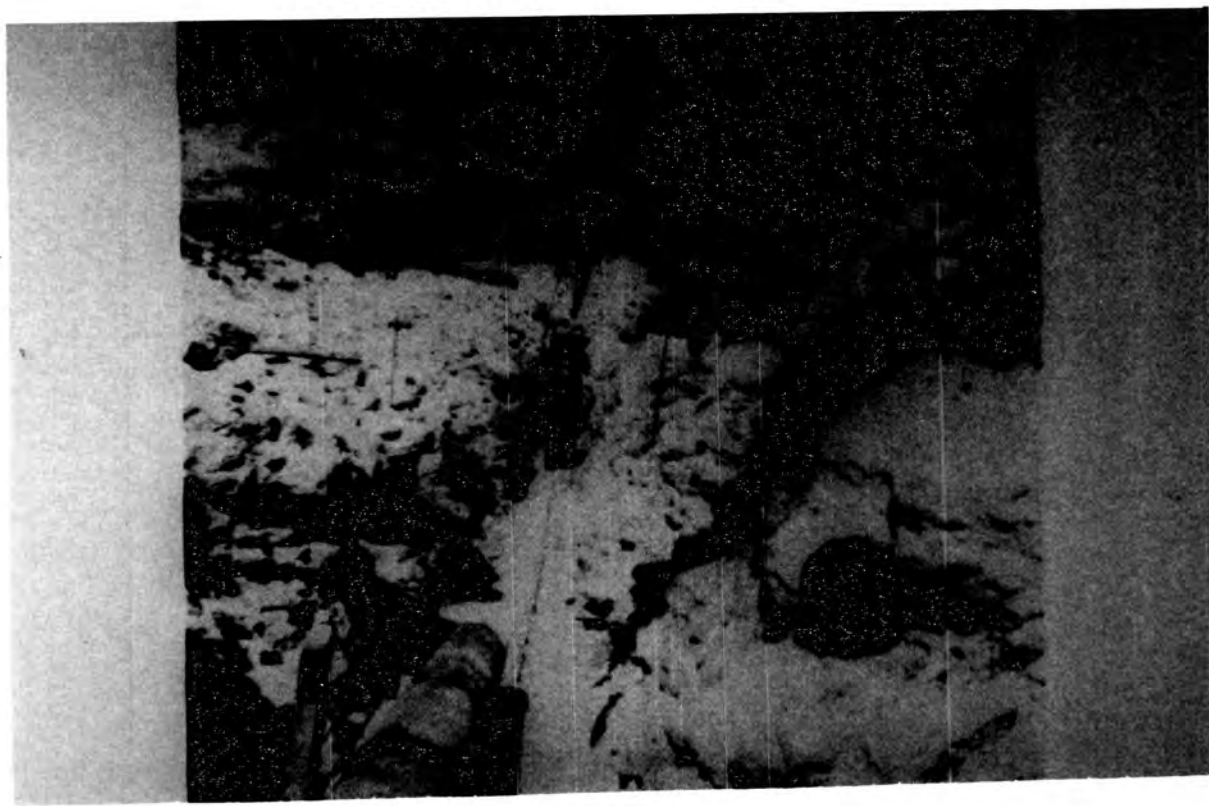


Plate 6 (B) - The Debussia - El-Marj Water Supply Scheme:
pipelaying in Wadi-El-Kuf.

the diameter of the main is $10\frac{3}{4}$ to 22". It rises up the steep wadi face from Ain Debussia, and encounters the main El-Marj-Derna road near El-Gubba. It then follows the main north road westwards, striking south of El-Beida plunging into wadi El-Kuf (Vide Plate 6b), and meandering along narrow wooded wadis until it emerges in more open country near El-Bayada. Beyond this point, the pipeline leaves the main road, descends into El-Marj Plain and follows the ridge bounding the northern extremity of the plain. Its long journey terminates at a reservoir to be constructed 14 Kms. north of El-Marj. A network of distribution mains is El-Marj Plain between El-Aweliya and Batta, and in the villages to be supplied, the total length of which is about 130 Kms. and the diameter is $3\frac{1}{2}$ to $8\frac{5}{8}$ ".

On the 27th September 1962, the contract was signed by the Government and Mannesmann of West Germany, for construction of the water supply scheme for abstracting 3.5 m.g.d. from Ain Debussia and distributing the water to the towns of El-Marj and El-Beida, and to villages, farm houses and watering points, (Vide Fig. 29). The scope of the work was amended on the 31st May, 1963, when the Government decided to route the main along the north road instead of the south road to generate supplies to El-Beida and El-Marj. (14)

The contract completion date is the 27th March 1966 and the value of the contract is £L.7,169,000.

The use of water is restricted to human consumption and watering of livestock in order to ensure equable

distribution over the large area which it is intended to serve, as shown in Figure No.29. Furthermore, the cost of pumping and piping the water would prohibit its use for general irrigation. The earthquake which destroyed most of the present town of El-Marj changed the planned route since the water from Debussia will be diverted to the new town.

As pointed out on page 141 the present El-Marj receives water from a number of boreholes near the town, but the total yield is entirely inadequate even for the town's current needs during the summer months.

When the new town is built (4 kilometres west of the present town) to modern standards, the water requirement will undoubtedly increase considerably, and 1.0 m.g.d. is allowed from the Debussia scheme. To bring water to the new town, a pipeline approximately 14 Kms. long, will have to be constructed, from the present termination point.

However, as far as the areas to be supplied are concerned, the planned quantities of supply are as follows:- (15)

	<u>Supply</u> g.p.d.
1. El-Beida	1,000,000
2. Garnada and El-Faidia	350,000
3. Messa	250,000
4. El-Bayada	300,000
5. El-Marj	1,000,000
6. Unallocated Reserves	100,000

These figures for distribution are based on the number of population and animals. The details for El-Marj Plain are as follows:-

			g.p.d.
Humans	23,000 @ 25 g.p.d.	=	575,000
Sheep and goats	150,000 @ $1\frac{1}{4}$ g.p.d.	=	187,500
Cattle	11,200 @ 10 g.p.d.	=	112,000
Camels	4,500 @ 10 g.p.d.	=	45,000
Asses and horses	8,000 @ 10 g.p.d.	=	80,000
Local reserve	allow		200,500
	Total		1,200,000
	less existing supplies		200,000
			1,000,000

The population figures (human) and animals for Mudiria of El-Marj include Farzugha, a supply to which is not considered in the present scheme. The trunk main has been so sited that at reservoir No.15, 1.4 m.g.d. are available for use. Of this 1.0 m.g.d. is allocated to El-Marj Plain, but the remainder will be available for Farzugha and El-Hemda villages.⁽¹⁶⁾ The decision whether to extend the supply to these areas will depend largely on the Government plans for their development. However, the agricultural potentialities are high and large numbers of dwellings exist.

Supplies in future to the villages more remote from the trunk main will be dependent on the demand of water in the areas previously mentioned. Such villages are:- Tacnis, Tulmeitha, Tobra, Marawa, Apollonia, Ras El-Hilal, El-Hania,

and El-Gheghab.

Considerable thought has been given to the problem of distribution from both the trunk line and the intermediate reservoirs and the system of distribution mains and watering points would bring water within two or three kilometres of most inhabitants living on or near the pipeline route. It is further proposed to instal watering points along the trunk main and in the main distribution areas. In general it is suggested that the watering point will take the form of an elevated break pressure tank of about 2,000 gallons capacity feeding water through for animals, a standpipe and possibly an elevated stand post for the supply of water carrying vehicles. There will be 50 watering points along the route. It is estimated that the cost will be some £10,200 per 1000 gallons. The number of the Libyan employees engaged on construction varies considerably but the maximum number is about 650. It is expected that a staff of between 60 and 90 employees will be necessary for the operation and maintenance of the scheme.

The work on the scheme is divided into three stages; Stage I covers those works to be completed by March 1966 as has been pointed out earlier; Stage II covers those works which should be constructed in the years following the completion of the Mannesmann contract and it includes the extension and improvement of existing distribution and new systems constructed in Stage I. It includes also the construction of a new distribution system for El-Marj and El-Beida; Stage III covers

works that may be undertaken in the future as circumstances dictate and as funds permit. It includes in the first instance the extension of the scheme to include Farzugha and El-Hemda, and secondly the villages more remote from the trunk main such as Tobra. The scheme is designed to provide water for Farzugha and El-Hemda. The period of Stage I is $3\frac{3}{4}$ years and the second $2\frac{1}{2}$ years.

To summarise, the underground water in El-Marj Plain and the adjacent areas is contained chiefly in fractures, bedding planes and solution openings in the limestone country rock. The upper limit of this reservoir is marked by a water table which generally lies within 40m. of the land surface in the coastal plain, but is 100 m. or more below the surface of most of the Jebel. The ground water reservoir is replenished chiefly by infiltration from surface run-off in wadis and to a lesser extent by direct infiltration of rainfall. The ground water moves north and north west towards the Mediterranean Sea and south towards the interior desert from a ground-water divide near the crest of Jebel Akhdar and discharge of this ground-water takes place as submarine outflow, spring flow, evaporation, and withdrawals from wells.

The drafts from wells in the Jebel are generally smaller than those in the coastal plain, owing to the greater depths to reach the water and to the consequent difficulty and expense lifting the water to the land surface. In the Jebel

the gross draft from existing wells may be no more than a few thousand cubic metres per day.

With respect to irrigation, the water in wells is too deep for economic pumping, except on the coastal plain on a moderate scale. Even in the coastal plain, pumping from wells located within a few kilometres of the shoreline could lead, with time, to salt-water contamination in areas of withdrawal.

Most of the villages in El-Marj Plain, and on the Jebel as a whole, have traditionally suffered from severe water shortage in the summer season, and it has often been necessary to transport water by road tankers, over distances of up to 40 or 50 Kms. at great expense.

The Debussia-El-Marj water supply scheme, currently under construction for distributing water to the villages and farm houses between El-Gubba and El-Marj is an ambitious undertaking designed to utilise the source at Ain Debussia as fully as possible, much of which at present runs to waste.

The construction of the scheme is evidence of an appreciation of the vital importance of water in development projects, particularly for agricultural development of the potentially fertile El-Marj Plain and Jebel Akhdar. It is also a positive step towards the resettlement of the nomads and semi-nomads in the Jebel.

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CHAPTER VI

SOILS

Soils of El-Marj Plain show a diversity of origin, properties, and land use capabilities which is perhaps best explained by reference to the factors of soil formation. Following the initial work of Dakuchaieve (1898)⁽¹⁾ and Jenny (1941),⁽²⁾ it is convenient to consider this diversity in (1) climate, (2) vegetation, (3) parent material or parent rocks (4) topography, (5) time and (6) human influences. Within El-Marj Plain it soon became apparent that climate and parent material are perhaps the dominant determinant of the soil character. The climatic situation, with its strongly Mediterranean regime has already been pointed out in detail in Chapter III, and the solid geology of the region with its emphasis on the occurrence of tertiary limestone has been discussed in Chapter II.

This super-imposition of Mediterranean climate on calcareous parent material has dominated the processes of soil formation, and by far the most important soil type which is found in El-Marj Plain and on the surrounding scarps and the upland areas is the classical Terra Rossa. Much has been written about this soil and its distribution throughout the whole of the Mediterranean region, but relatively little work has been published on its Libyan habitat. The reconnaissance observation of Ferrara (1933)⁽³⁾ and Principi⁽⁴⁾ (1936 and 1947)

are useful, as are parallel findings of Reifenberg⁽⁵⁾ in Palestine, but that research carried out on this soil group in North Africa, would seem to exist in unpublished form.

The original work of Reifenberg on the Terra Rossa soil is still the standard reference for the properties and definition of this soil type, and it seems convenient to consider here some of the main points which are contained within Reifenberg's original concept. For him:

"Terra Rossa develops on limestone under the conditions of the Mediterranean climate. In comparison with its parent material, the limestone, it has been greatly enriched in sesquioxides and in silica. In comparison with the soils of humid climate it contains large quantities of salt of the Alkalies and alkaline earths. The high iron content together with low humus content are responsible for the red colour and which often is brilliant. They are mostly soils with an alkaline reaction and ferruginous concretions."⁽⁶⁾

This view of Reifenberg is in many ways the most composed and impressive statement on the origin and nature of Terra Rossa which has been attempted by any pedologist. Certainly the thesis that Terra Rossa is a contemporary phenomenon resulting from the interplay of a Mediterranean climate regime and a calcareous parent material is widely held in soil science circles. However, whilst a discussion of the

pedological controversy surrounding Terra Rossa is beyond the scope of this present work, it should also be noted that Kubiena (1953) and others would regard Terra Rossa as a fossil feature found under more humid sub-tropical conditions and therefore essentially a soil parent material rather than a modern soil.

The work presented in this chapter does not aim at presenting any definite origin of this soil and its association, but rather to study specific Terra Rossa profiles in Cyrenaica and to analyse particularly their agricultural properties.

Detailed soil analysis: in order to supplement the general accounts of the soil types and their distribution within El-Marj Plain and the surroundings it was decided to carry out a more detailed analysis of the soils of the area using standard field and laboratory investigation techniques. A field survey of the soils was carried out during the summers of 1962 and '63 and a reconnaissance was made of natural soil sections and soils occurring in the main agricultural areas. From this reconnaissance survey it was possible to decide upon the main soil types occurring in the plain and also to locate eleven soil profile pits which would give a representative picture of the pedological pattern.

Each of these pits was described in the field and each was sampled at two main depths, i.e. at the surface and at a depth of 25 cm. The samples were analysed at the Sidi Mesri Experimental Station. Details

of the chemical analyses are given in the appendix No.III, Table 1. The main site characteristics of the soil profiles are also presented in Table 19. A schematic classification of the soils is given in Table 2Q, and the location of soil pits is further shown on figure No.30.

Profile 1 - is a good example of a relatively thin terra fusca which has developed directly from the underlying Lower Eocene limestone beds. The soil is quite thin, passing into parent rock at 50 cms., and is one of the stoniest profiles examined due to high content of limestone fragments from the parent rock. The mechanical analysis of the samples show a high content of sand and also of clay, whilst the silt fraction is relatively low. The soil is dominantly a sandy clay with a very slight increase of the sand fraction with depth.

The figures for the total carbonates reflect the large proportion of limestone fragments in the soil material. The figures for the surface horizons is 10% higher than that at 25 cm. which would seem to suggest movement of lime towards the surface and some concentration there. The Ph. figures of 6.5 and 7.6 respectively were in fact the highest recorded in the whole region. The figures for the total acid soluble material again show the high lime content and were the highest over the whole survey area. The conductivity of the soils too, were amongst the highest recorded. These figures again show a tendency for the soil solution to move upwards to the surface.

TABLE 19: Locations of the Soils Sites

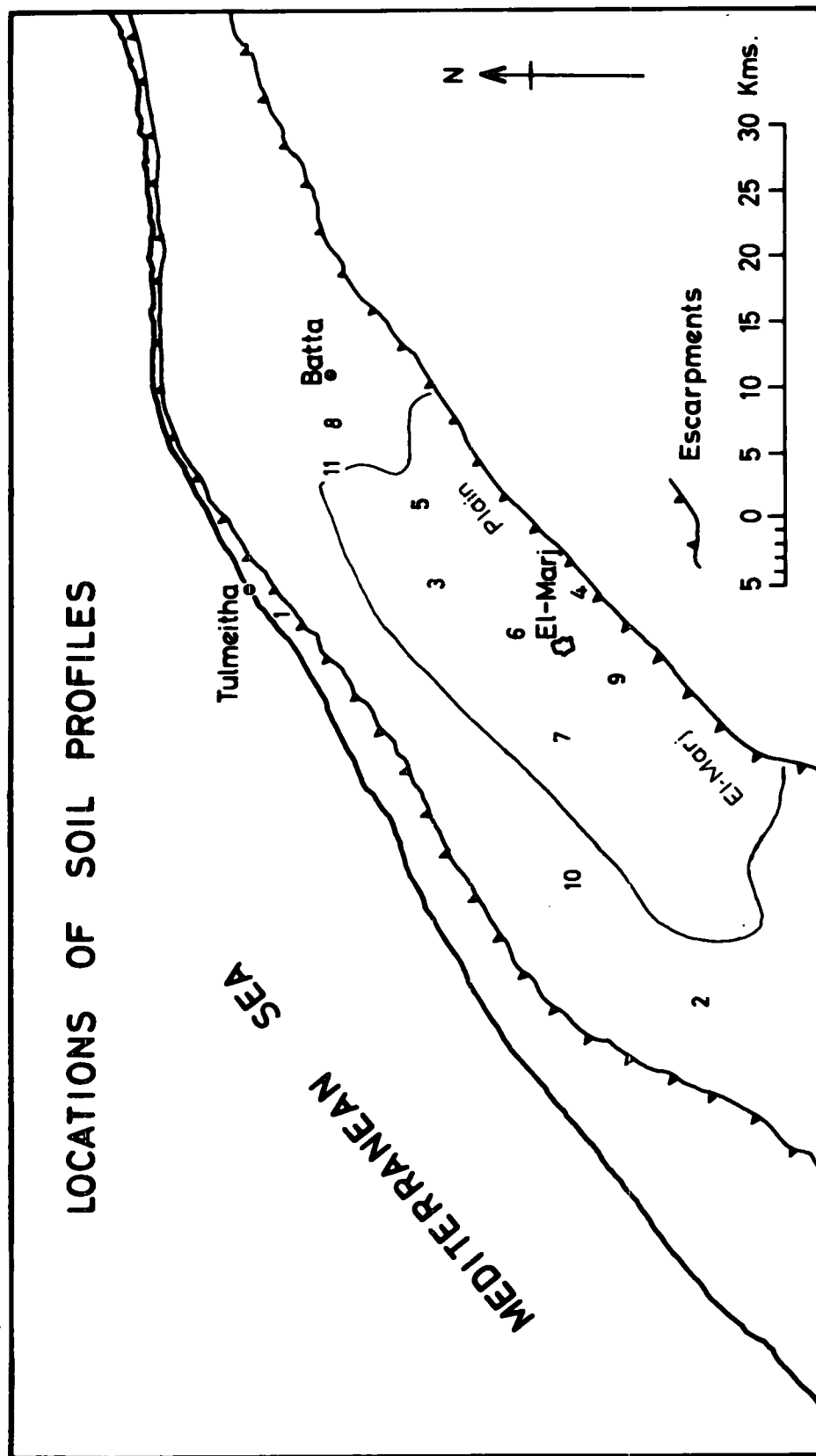
Profile No.	Situation	Grid Ref.	Height in metres	Parent Rock	Topographic situation	Land Use
1	3 kms.S.W. of Tulmeitha	400/750	5	Lower Eocene Limestone	Flat coastal Plain	Dry farming barley
2	South of the village of El-Hemda	100/450	326	Middle Eocene Limestone	Level	Dry farming wheat
3	3 kms.N.of Sidi Rahuma	275/760	280	Middle Eocene Limestone	Gentle southerly slope	Dry farming wheat
4	4 kms.S.E. of El-Marj	185/755	295	Middle Eocene Limestone	Gentle northerly slope	Dry farming wheat
5	14 kms.N.E. of El-Marj	350/800	350	Middle Eocene Limestone	Gentle south-westerly slope	Dry farming wheat
6	El-Ghariq Lake	230/740	278	Middle Eocene Limestone	Flat	Seasonal flooding
7	7 kms.W.of El-Marj	195/645	340	Middle Eocene Limestone	Gentle easterly slope	Dry farming wheat
8	3 kms.W.of Batta	370/885	380	Wadi alluvium over Middle Eocene Limestone	Wadi bottom	Dry farming barley
9	Zorda Exp. Station	165/705	310	Middle Eocene Limestone	Flat	Dry farming wheat
10	South of Farzugha	190/540	333	Middle Eocene Limestone	Flat	Dry farming wheat
11	8kms.W.of Batta	365/840	400	Wadi Alluvium over M.Eocene	Wadi bottom	Uncultivated scrub

Table B

TABLE 20: Classification of the soils

Parent Material	Profile Drainage	Major Soil Type	Profile Number
Terra Rossa Material over Limestone	Free	i) Red Terra Rossa soils-deep phase ii) Red Terra Rossa soils-shallow phase iii) Dark Red Terra Rossa soils iv) Terra Fusca soils	9,4,3,2 10 7,5 1
	Impeded	v) Hydromorphic Saline soils	6
Wadi Alluvium one limestone	Free	vi) Yellowish Brown Alluvium Soils vii) Dark Brown Alluvium Soils	8 11

Figure 30



The exchangeable cation data show that the cationic exchange capacity is relatively low but is dominated by calcium and magnesium. The figures for both sodium and potassium are much lower. The figures for available nutrient show that nitrogen is extremely low and likely to be a major obstacle to adequate plant growth. The figures for phosphate and potash too are low and again would be likely to prove limiting in any intensive land use.

Profile 2 - represents a well developed red Terra Rossa soil 2 metres deep over Middle Eocene limestone. Its texture is similar to profile one but figures for soil carbonates fail to show any accumulation of lime and profile. This would seem to suggest that soil drainage has been adequate to leech out much of the calcium material from which the soil was ultimately derived. Ph. figures show that the soil is only slightly alkine. The figures for the total analyses show marked accumulation of iron and aluminium in the soil. This is as one would expect from Terra Rossa. The conductivity of the profile is similar to Profile 1, again showing a slight accumulation of salt. The cation exchange capacity is relatively high and due probably to the higher content of iron and aluminium oxides. Calcium and magnesium again dominate the exchange complex.

The data for the nutrient elements of this Terra Rossa present some interesting contrast with Profile 1.

Figures for total nitrogen again show the very deficient content of this important plant food. This is quite characteristic for the whole region. The figures for phosphate, however, are extremely low and point to the fact that many of these soils do not contain adequate phosphorus. This is no doubt a reflection of the long period of chemical leeching and degradation which the soil has undergone. The relatively low figures for the acid soluble material would seem to support this view.

Profile 3 - has been classified into the same soil grouping as Profile 2, namely Red Terra Rossa soil of a deep phase and indeed the analytical figures of this soil show many resemblances. From a point of view of texture this profile is slightly heavier, being classed as a clay soil rather than a sandy clay. The figures for clay content are some 5% higher than Profile 2 and the sand percentage is correspondingly lower. The silt percentages are still the same. The soil reaction is slightly lower than Profile 2, and in fact the surface shows slight salinity. This may in fact be due to agricultural practices; at 25 cm. in fact the Ph. rise to 7.2 which corresponds to the general Ph. level of the Terra Rossa material.

Rather surprisingly the figures for the cation exchange capacity are amongst some of the lowest recorded in the area. This may be due to a lack of organic matter or to the type of clay mineral involved. Calcium and magnesium are

again the dominant ions and this is reflected in the figures for soil conductivity, which vary from 1.10 millimhos/cm. at the surface to 0.75 millimhos/cm. at 25 cm. depth. This points to a slight seasonal upward movement of soluble salt. The carbonate figures show an almost complete removal of lime as in Profile 2, with again a slight increase at the surface. The figures for available nutrients are amongst some of the lowest recorded in the survey. Nitrogen varies from 0.10% at the surface to 0.12% at 25 cm.; this seems to be a direct result of the poor organic matter status of this profile. The figures for phosphate are extremely low and once again this plant food would seem to be a limiting factor in the plant growth. The figures for available potash are very low too, in spite of the fact the total analysis shows that potash is quite high in the mineral function evidently much of the potash in a form which is not available to the plant root.

Profile 4 - is similarly classed as deep Terra Rossa soil but is much similar to Profile 2 rather than to Profile 3. The general texture is on the transitional boundary between sandy clay and sandy clay loam, mainly resulting from slight increase in the sand content. The clay percentages is 29.6 at the surface falling to 28.0 at 25 cm. The data for the cationic exchange capacity is also similar to Profile 2 ranging from 24.12 m.l/100 gms. of the soil at the surface to 26.75 m. l/100 gms. at 25 cm. Calcium and magnesium are

again the dominant cations on the exchange complex. The Ph. varies from 7.45 at the surface to 7.20 at 25 cm. which is again similar to Profile 2, and the Profile shows a corresponding lack of total carbonates. Figures for available nitrogen show an increase on those for Profile 3, and the available potash is also much higher. Phosphate, however, is still extremely low.

A brief comparison of Profiles 2, 3 and 4, all of which are designated as deep red Terra Rossa soil, shows that there is some analytical variation within this general grouping. This is only to be expected when one considers differences of situation and soil history which these sites probably have undergone. This particular aspect will be treated more fully in the next section.

Profile 5 - represents slight difference from the last three profiles in that it has been designated as a dark red Terra Rossa soil largely on the basis of a field appearance. A study of the analytical data, however, fails to reveal any real significant contrast. The only figure which would seem to be important in this respect is that for the moisture content. The dark red Terra Rossa has a moisture percentage of over 5 where as a red Terra Rossa has generally figures between 2 and 3. The texture of this soil shows a difference between the surface and 25 cm. The surface layer is a sandy clay whereas a little lower down the texture changes to

sandy clay loam/sandy loam. This is mainly due to decreasing clay percentages from 29.4 to 20 and an increase in sand function from 56.4 to 72.2. The figures for silt function show a very striking decrease with depth dropping 14.2% at the surface to 7.4% at 25 cm. This decrease of silt and clay function within such a short distance would seem to suggest that the upper horizons are in fact receiving finer material which is being washed in from surrounding slopes.

The Ph. of this soil and the total carbonates are very similar to Profile 3, as also the figures for cationic exchange capacity. Calcium and magnesium are again the dominant ions, and the figures for conductivity of the soil are very low despite this high moisture content. Figures for available nutrients show the same low values, although the availability of phosphate is slightly higher than the previous three profiles.

Profile 6 - is an extremely interesting profile as it is the only profile study which show the effects of impeded drainage in the soil profile. The profile pit was located on the northern edge of El-Ghariq depression which is an area of accumulation of moisture from surrounding areas. El-Ghariq depression is in fact an intermittent lake each winter and usually remained flooded until it is dissipated by evaporation in late May. The dominant feature of the soils therefore is extremely water logged conditions for much of

the year. The high water table thus produced has very detrimental effects on plant growth.

The mechanical analysis shows that the soils may be classified as sandy clay which is very important from a point of view of soil permeability. The soils are relatively impermeable, a factor which makes even worse the effects of a large seasonal influx of moisture. Despite the poor drainage, however, alkalinity has not developed and the Ph. is only 7.1. The figures for total carbonate also show no accumulation of lime. By far the most interesting analytical figure is that which refers to soil salinity. The figure for the conductivity of the soil reaches the very high level of 18.5 millimhos/cm. at the surface but it drops quickly to 3.25 millimhos/cm. at 50 cm. The figures for cation exchange capacity similarly reflect the saline conditions of this soil. The percentage of sodium on exchange complex does in fact exceed the figure for calcium and magnesium combined and would seem to suggest that there is a very high sodium hazard in this soil. This is further reinforced by the figure of the Sodium Absorption Ration which is 12.32 at the surface. The fact that alkalinity has not developed under the high sodium figure may, in fact, be due to the high iron content of the soil. The figures for available nutrients show the usual lack of nitrogen and phosphate but it is noticeable that the figure for available

potash is extremely high. In fact the figures of 1067 p.p.m. of potash is more than double the figure recorded in the other profiles. This is almost certainly due to the fact that potassium is being washed in the area by seepage water.

The saline nature of this profile appears very puzzling when compared to the good crop yields which this area supports (Vide Chapter VIII). Whether the salinity is closely restricted to the surface and hence does not affect the main root zone, or whether the soluble salts are of a nature which does not inhibit plant growth is a question which needs further investigation.

Profile 7 is another example of a dark red Terra Rossa soil and therefore it may be convenient to discuss its analytical data in comparison with that of Profile 5 at the village of Batta. From a point of view of texture Profile 7 represents a clay soil rather than sandy clay. The figures for clay at the surface and at 25 cm., 35.4% and 33.0%

respectively. This relatively heavy texture is only exceeded by red Terra Rossa soil at Profile 9. It is also worth noting that the silt function of this soil is quite high, reaching a figure of 20.6% at 25 cm. It is also noticeable that this profile is very slightly acidic showing Ph.s which never rise above 6.9. The saturation percentage is also higher than profiles considered previously, a fact which is resultant upon the finer texture of the soil. The figures for soil carbonates are again quite low.

The figures for cationic exchange capacity range from 20.5 m/100 gms. at the surface to 24.5 m. 1/100 gms. at 25 cm. Calcium and magnesium are again the dominant ions, and this fact together with the low figures of soil conductivity would seem to suggest that sodium is easily removed from the soil profile.

From the point of view of

total analysis iron and aluminium are again dominant. The data for the available nutrients show that nitrogen is only sparingly present whereas phosphate was much more abundant than in any other profile studies. This is probably due to the richness of the soil in phosphate bearing minerals rather than to any addition by fertilisation. The figures for potash are average for the region.

Profile 8 - is a soil with a completely different pedological history, compared with those profiles described earlier. It represents essentially an alluvial soil which is developed in the alluvium of a wadi bottom and it has been designated as yellowish brown alluvial soil on account of its dominant colour.

The analytical data shows several interesting comparisons compared with Terra Rossa soils. This is by far the lightest soil according to texture which was met in the field study. The sand function is as high as 67% at the surface and 66.4% at 25 cms., thus giving the designation of sandy loam. The figures for total carbonate are also high being 30% at the surface and 34% at 25 cms. The fact that these high figures are found in such light textured soil would seem to indicate that there is quite a large influx of lime from the surrounding Jebel. The Ph. is still slightly alkaline at 7.3. Rather surprisingly the figures for cationic exchange capacity are the highest so far met in the area, being 42.25 m.l/100 grms. at the surface and 38.5 m.l/100 grms.

at 25 cms. This is probably due to the slightly higher organic matter status of this soil. Calcium and magnesium dominate the exchange complex much more than in the Terra Rossa soils and this is again reflective in the very low figures for the soil conductivity.

From the point of view of plant food elements the figures for total nitrogen are the highest recorded during the investigation. It is still low however, being 0.24% at surface and 0.12% at 25 cms. The figures for phosphate are higher than average, but those for potash are relatively low. This is rather surprising on account of the influx of moisture which must occur.

Profile 9 is the fourth example of a deep red Terra Rossa soil and shows many similarities to those previously considered. The soil is sandy clay in texture and in its upper horizon as with other Terra Rossa is almost completely decalcified with a Ph. 7.4. The data for the cation exchange capacity is also very similar to Profile 2, and again calcium and magnesium are by far the dominant ions on the complex. Indeed the conductivity of this soil shows that it has the lowest content of salts of all the red Terra Rossa. The conductivity 0.77 millimhos/cm. at the surface and 0.63 millimhos at 25 cm. The total chemical analysis again shows the importance of iron and aluminium in the soil. From a point of view of available nutrients the figures 0.2 shows the striking deficiency in nitrogen and phosphate already

referred to, but the potash status is quite high for a Terra Rossa soil. This is probably due to the relatively high content of potassium bearing minerals in the sand fraction.

Profile 10 is the only example for which analytical data has been gained of the shallow phase of the red Terra Rossa group. It consists of one metre of Terra Rossa material which has been accumulated on the Middle Eocene limestone. Again the soil texture can be classed as sandy clay and again the soil material has been relatively declassified. The Ph. of both the surface and 25 cms. is 7.1. Rather interestingly this profile shows a higher saturation percentage. The cation exchange values are similar to those deep Terra Rossas. Calcium and magnesium are again the dominant ions. The conductivity of the soil is 0.84 millimhos/cm. at the surface and 0.69 millimhos/cm. at 25 cm. The sodium absorption ratio is again quite low.

From a point of view of available nutrients, a similar picture is given compared to the Terra Rossa soils. Nitrogen and phosphate are low and available potash is average. It seems therefore from this examination of these chemical analyses that within the top 25 cm. there is very little significant chemical distinction which can be made between the deep and the shallow phases of the Terra Rossa group. It is likely that differences would occur at depth, but unfortunately no analytical data is available.

Profile 11 is an example of dark brown alluvium soil which is developed in a wadi bottom 8 kms. west of Batta. It is a sandy clay at the surface in texture and a clay at 25 cms. and it is likely that this profile shows a wide textural heterogeneity. It is noticeably true too that the silt function shows quite startling variations in the top 25 cms., being 12% at the surface and 24% lower down. It is also interesting that this profile has lost all its lime content, a very interesting contrast with the alluvial soil of Profile 8. The Ph. however is still slightly alkaline.

Calcium and magnesium are again the dominant ions on the exchange complex, and it is noticeable that this profile shows the lowest conductivity so far examined; these are 0.62 and 0.85 millimhos/cm. at the surface and 25 cm. respectively.

The most interesting aspect of the analytical data, however, is that which refers to the available nutrient status. It is worth noting that this is the only profile which was not taken from a cultivated area and it is the profile which shows the most complete and serious deficiency in plant food. At the surface there were recorded 0.095% nitrogen, 2.7 ppm for phosphate and 187 ppm of potash, at 25 cms. the figures were 0.084% nitrogen, 3.9 ppm phosphate and 121 ppm of potash. These figures illustrate the extreme poverty of the soil as a medium for plant growth.

Soil-Land Use Relationships

From a point of view of agricultural potential indicated by a soil profile and soil analytical data, a number of characteristic properties of the soils can be listed and a brief statement made on their effects on plant growth. From a point of view of the physical properties of the soils it has been already noted that the soils in Cyrenaica have a moderately heavy texture varying from a range of clay, sandy clay, and sandy clay loam. The clay contents are fairly high, i.e. up to 36% of the total mineral function, but these relatively high figures are generally adequately balanced by a much higher sand content. Thus, the textures of the soils are relatively good from the agricultural point of view, and under favoured methods of cultivation would be able to support quite intensive land use.

In addition with these moderately high contents and given the relatively high contents of aluminium and iron content, the structure of the soil also has inherent favourable qualities. However, under the prevailing intense Mediterranean climate there is a strong tendency for extremely hard and compact structures to form during the intense period of dessication. The high content of colloids and sesquioxides is likely to be highly affected by the climate regime during the wet absorbent season and the soils are likely to be absorbent in moisture and very sticky whilst during the summer drought they tend to break up into extremely hard clods and

soil pans with very obvious signs of soil cracking. With this annual unfavourable change in soil structural characteristics it can be imagined that the problems posed for soil practices are very great. In particular the nature and timing of ploughing operation is critical for the production of a proper seed bed. If the land is worked when the moisture content is high the ground is likely to be compressed and there will be a tendency for large clods to be formed. On the other hand it is mechanically impossible to plough many of these soils during the dry season when the soil is compact and extremely indurated. Working the land at this time of the year only produces very strong blocky units of an irregular size. The important point to emphasise here is that under the prevailing climatic regimes the soil structures are extremely unfavourable to agricultural management, and under the prevailing agricultural technique there is always a strong tendency towards a structural degradation. This unfortunate condition as regards physical fertility is very widespread in the arid zones of the Middle East and deserves much more attention in soil conservation.

One point that has to be remembered in this region as in most of the Middle East is that most soils have been utilised for millennia and the processes of degradation, especially those associated with the reduction of organic matter and the consequent effect on soil structure and texture,

have had extreme results. It is, therefore, more difficult to discover suitable tillage techniques and cultivation periods than in apparently analagous regions of, for instance, North America where conservation techniques are being applied at a much earlier stage in degradation.

The behaviour of moisture in the soils is, of course, of major importance in climatically marginal areas like Cyrenaica, but unfortunately very little data is available to give an accurate quantitative picture of the soil moisture situation in the area under study although the work of Micheli in Benghazi Plain does provide some preliminary statement to be made. The hydrological cycle is perhaps one of the major fields of investigation which should be carried out in the future in Cyrenaica.

However, from field observation and simple laboratory tests it is possible to outline the major feature of the soil moisture regime in the area. Undoubtedly a high percentage of the rainfall on Cyrenaica does not penetrate into the soil and forms quite a substantial surface run-off. Similarly moisture which enters the soil does not penetrate very deeply on account of impemeable layers and is readily lost by high evaporation in the summer.

From a physical point of view the soils under study have a very high capacity for absorbing moisture and in fact the saturation percentages are quite high ranging from 34 to 59.2%. Ultimately this means that the wilting percentages

too are quite high, and in fact Micheli⁽⁸⁾ estimates that water in the soil becomes unavailable at a percentage moisture of 8.5%. This is very high percentage and points to the fact that much of the moisture in the soil is unavailable for plant growth.

In addition to the basic problem of the availability of moisture for plant growth, the water regime of the soils also presents problems in the realm of soil structure and land management. The fact that some of the semi-arid areas do provide such great difficulties in the maintenance of good soil structure is a very well known theme and one which is receiving a very great attention at the present time. Aubert⁽⁹⁾ has underlined the advances and also the work to be done in this field.

From a point of view of chemical fertility of the soils, in particular the ability of the soils to provide necessary nutrients for plant growth, the picture is more straight-forward. The overwhelming fact which must be borne in mind in this regard is the extremely low organic matter in the soils. The organic function at the surface ranges from 0.95% organic matter in profile 11 to 2.4% in profile 8. In addition to the unfavourable effects on soil structure which these low figures here indicate, the main effect of this is the inability of the soils to provide enough nitrogen for intensive plant growth. This is a very common problem in

semi-arid lands and points to the need for improved management practices with greater emphasis on chemical fertilization and the introduction of a leguminous crop in the farming rotation.

The laboratory analysis of available nutrients also indicates that phosphate is poorly available for plant growth. The figures for available phosphate are consistently less than 15 ppm except for Profile 1, 7 and 8 where larger amounts were recorded. The fact that phosphate is so unavailable is most probably related to the high content of iron and aluminium in the soils. With a high content of iron, aluminium oxides, much of the phosphate will be fixed into unavailable iron and aluminium phosphate. The fact that Profile 1 has a higher phosphate status can probably be explained in terms of its lower content of ses quioxides, but the relatively high phosphate in profiles 7 and 8 are more difficult to explain. In the absence of any addition of fertilizers by farmers it is probably related to the minerological make up of the soils. Unfortunately this could not be verified by the laboratory analysis.

To summarise the fertility aspect of the soils under study it may be pointed out that such basic limitations as soil depth and stoniness which are often found in the Middle East do not present a serious problem in the El-Marj Plain. The Terra Rossa soils are quite deep and provide an adequate

rooting medium for plants and the limitations found are much more related to the system of management. In particular such physical characteristics as soil moisture regime and the soil structure conditions point to the need for careful and adequately planned management system, whilst the lack of the organic matter nitrogen and phosphate in the soil can again be remedied by rational management practices. There is no pedological reason to suppose that under a good management system the soils of El-Marj Plain should not prove particularly fertile.

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PART TWO

CHAPTER VII

Historical Background (Through Land Use)

The purpose of this introduction is to point out the main historical events that took place in Cyrenaica and how the people regarded the land. The early history is derived mainly from the Egyptian records up to 935 B.C., the date of the Libyan invasion into Egypt. These records show that the Libyans were aggressive, unsettled and in a state of flux. Before the invasion of Egypt the Libyans continued to drift gradually eastwards into the Nile Delta, attracted by the rich Nile Valley. After this date, from 1,000 B.C. to the Arab conquest, the main sources of the Libyan history are Greek and Roman records.

Greek Period: The story of the founding of Cyrene by a colony of Greek immigrants from the island of Thera (modern Santerin), has been handed down to us as a mixture of legend and historical tradition. The date usually assigned to this event is 631 B.C. It seems that towards the middle of the seventh century B.C. a crises due to over population arose in the small Aegean island, and a seven year period of drought caused such distress that forced emigration seemed the only solution. They founded the first settlement on a small island called Platea in the Gulf of Bomba. They then moved their settlement to the main land and a more favourable site called Aziris, between Bomba and Derna. Here they remained for six years then they moved to the future site of Cyrene.

What attracted the Greek colonists to Cyrenaica and made possible its subsequent urban development was a combination of factors, the most important being that Libyans were friendly and also the environment, climate, soils and flora were typically Mediterranean.

The brothers of the Cyrenean king Arcesilaus II, Perseus, Zacynthus, Arestomedon and Lycus withdrew from Cyrene and moved westwards with their adherents to Barca (modern El-Marj). This town they are said, by Herodotus,⁽³⁾ to have founded, but from its non-Greek name and the circumstances of the story of secession, it seems almost to have been of native origin ante-dating the arrival of the Greeks.⁽⁴⁾ It is important to note, however, that Barca soon flourished in spite of tension between it and Cyrene, and having friendly relations with the natives, it soon developed a territory of its own, known as Barcaia, with dependent settlements such as Tauchira (modern Tocra) in the coastal plain, and it engaged in the silphium traffic alongside Cyrene.⁽⁵⁾ For its various products, including no doubt grain from the Barca Plain, the inland city needed an export outlet. Along its entire coast line the Barcaian territory offered natural facilities for the creation of such an outlet at only one point, namely at the site where Ptolemais (modern Tulmeitha) was subsequently built, a site equally accessible from Barca and Tauchira. It is likely therefore, that Barca entered upon its commercial enterprise

as early as the last quarter of the sixth century B.C., which is also when the Barcan coinage began.

In the Hellenistic period (322-96 B.C.) the cities and settlements of Cyrenaica came into the orbit of and under some form of control from Ptolemaic Egypt. The harbour of Barca took the royal title, Ptolemais.

A necessary corollary of this conclusion would be that Ptolemais after its foundation replaced the charter member of Barca in the league of the Pentapolis.*

However, while Ptolemais and the rest of Pentapolis flourished, Barca declined, and became a modest country town, probably because the bulk of its citizens had been transferred to Ptolemais. Ptolemais' commerce was in grain and fruits from the adjacent coastal plain and the rich Barca Plain. Ptolemais had good access, if not better than did Cyrene, to the silphium-bearing region and was surrounded by area used for grazing and for growing of olive trees and the production of honey, also timber from the Jebel Akhdar was sold to Egypt.

Roman Period: The Romans obtained formal possession of Cyrenaica in 96 B.C. The first century and a half of Cyrenaica's life as a part of the Roman Empire was mainly an era of peace. The road system of Cyrenaica was improved and milestones were erected along the major routes. But there was little need to cut new roads, since six centuries of Greek

development had already provided a complex network of tracks

* The Pentapolis or the land of the five cities are: Cyrene, Apollonia, Ptolemais, Tauchira and Berenice (modern Benghazi).

which were to remain in use until the Arab conquest. There is, therefore, every reason to believe that the Cyrenaican cities, like other cities of the Roman Empire, shared in that "golden age" of Roman prosperity throughout the Mediterranean. Figure No.31 shows the ancient Greek and Roman farms fortified on the Barca Plain, and indicates intensive exploitation of the agricultural resources, particularly in the area between Barca and Farzughā. The ancient settlement was even more intensive on the high Jebel.

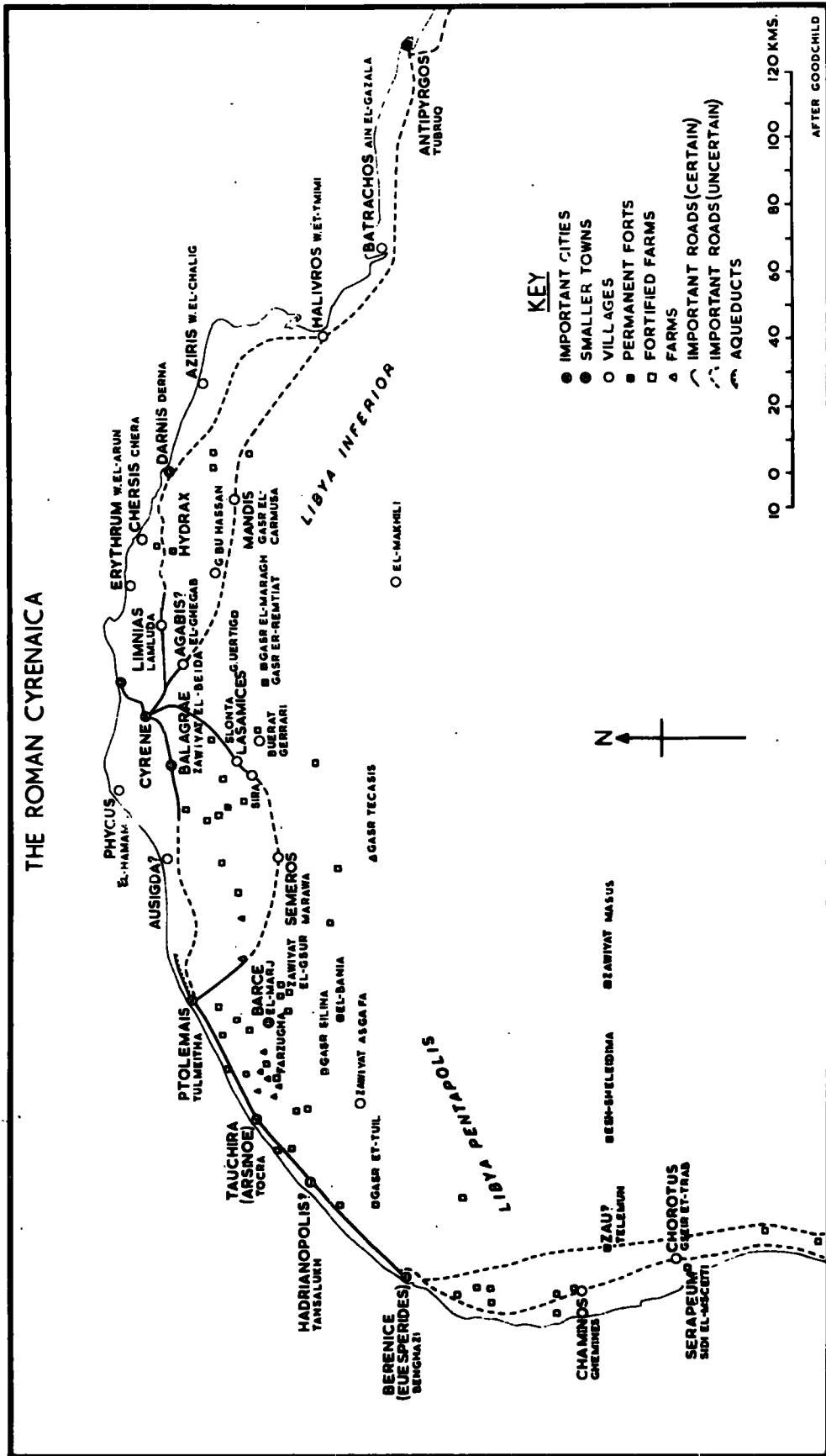
Another feature of this age was the attempt to carry out a detailed survey of the land, for the purpose of determining which belonged to the Roman state and which was private.

The native tribes of the interior became restive once again, as more and more grazing land was being occupied by the settlers.⁽⁶⁾ It is probable that in Cyrenaica as in neighbouring Tripolitania, this period saw the establishment of a half-military and half-peasant type of colonist.

Along the shore of the Eastern Mediterranean, there was a terrific earthquake in 365 A.D. At Cyrene the consequences of this were particularly disastrous. In Ptolemais the earthquake seems to have had less effect.⁽⁷⁾

However, from A.D. 390 onwards, the Pentapolis was increasingly exposed to the incursions of the Austuriani, a

Figure 31



AFTER GOODCHILD

nomadic tribe whose original seat probably lay in the hinterland of the Sirtic Gulf. After ravaging Tripolitania these invaders turned their attention to Cyrenaica. The forces of the Roman state were too weak to resist their attacks. The open villas* of the Cyrenaican Jebel had become small fortresses. Many historians had assumed that after the tribes attacked, life in the Pentapolis was extinguished even in the fifth century A.D. but the ancient monuments do not confirm this view. Although the cities declined in size the countryside maintained a notable vigour of life for two centuries more. On the Jebel between Ain Mara and Wadi El-Kuf, the innumerable ancient villages containing Christian churches were used long after 390 A.D. (8)

Ptolemais was, at one period, completely depopulated in consequence of the aquaduct breaking down: its inhabitants probably drifted back to Barca which thus began to recover from the decline that had started under Ptolemais. However, as the power of the Romans declined, only the cities and forts remained in their grasp. The rest of the Jebel and the desert passed into a form of autonomy. At this period the Berber people known as Luata tribe, was found in Barca, around Ptolemais, and around Tripoli. They were sedentary and had continued the cultivation of the lands first farmed by the early Greek immigrants. (9)

* The villa is a rural residence with a garden or a farm attached and equipped with baths, mosaic and other appurtenances of fully developed Roman life.

The Arab Conquest: In A.D. 635 the Arabs swept through the Levant and later overran Egypt. In 643 the Arabs moved westward in Libya meeting but a feeble resistance. After a siege Barca made a treaty of peace.

The characteristics of the land were admired by the Arabs and this encouraged them to build up Barca as a productive and prosperous "springboard" for their future campaigns in the Maghreb, giving its name, "Barqa" in Arabic, to the whole of Cyrenaica. The main line overland communications between Egypt and the Maghreb passed to the south of Barca, along the caravan track that joins Tubruq, El-Makhili, Masus and Ajedabia. The coastal track between Sirte and Barca was long and wearisome.

The Hilalian Invasion: When the western Arab lands of the Maghreb revolted against Cairo in 1046, the Egyptian Government sent the tribesmen of the Bani Hilal and Bani Sulaim. They were rugged uncultured warriors. Most modern historians agreed that it was the Hilalian invasion which ended sedentary life in Cyrenaica, although the process of decay was drawn out over a century or more. Comparing descriptions of Cyrenaica written by El-Bakri about 1060 A.D. and by Edrisi a century later, we can trace the gradual disintegration of the economy which Greeks, Romans and Byzantines had built up, and the early Arabs had conscientiously preserved and

developed.*

In El-Bakri's days, El-Marj was a flourishing city with a busy market and an abundance of commodities at low prices. Livestock was plentiful in its pastures and wool and honey were exported to Egypt. There grew an abundant variety of fruits.⁽¹¹⁾ Edrisi recorded that Barca's inhabitants were few and its market little frequented, and mentions that it was prosperous in the past.⁽¹²⁾

It is not difficult to understand how the economy of Cyrenaica was undermined in the century following 1048. The industrious peaceful population, which gained the admiration of Amr ibn El-Asi, the Arab general who conquered four centuries earlier, could not hope to resist the mass migration of tough desert warriors from the Arabian peninsula. Nomadism is contagious: it brings uncontrolled herds into planted areas, and converts the planters into more nomads.

* The United Nations' report on agriculture of Libya,⁽¹⁰⁾ blames the first Arabs for the decline of the economy of the country. It states: "In the 7th century A.D. Arabs overran the country and united the whole of North Africa, Arabia to Spain; Christianity gave place to Islam. When Rome fell, security and protection ceased and static agriculture was doomed in all but those thickly populated areas which could be defended. From this period dates the decay of a civilisation which lasted about 1,000 years. The outlying regions reverted to the nomads and to shifting cereal cultivation....etc." In the light of reliable historical information, this statement is prejudiced and lacking in historical evidence.

When the Libyan nomads had invaded Cyrenaica in 390 A.D. there was at least a regular army and a home guard armed to resist them. The Barcaians of the 11th century A.D. had no defence, and the herds of goats of the invaders destroyed many of the gardens and orchards. When people cannot fight a situation they tend to accept it and adjust their way of life to it. Thus the Arab-Berber sedentary population, after endless vicissitudes not recorded by history, found themselves inextricably merged into a purely nomadic society, divided into units derived mainly from the tribal pattern of the Hilalian invaders as will be discussed in Chapter 9 on the tribal structure. Except in the cases of Aujila, all traces of Berber culture had died out long before the modern times; but the solid qualities of this race are still present in the modern inhabitants of Cyrenaica together with the Arab genius which shone so brightly in the first four centuries after the Hejra.

The Arab historians gave only bare hints of what happened in Cyrenaica after the Hilalian invasion. At the downfall of the Mamluk dynasty in Egypt in 1517, Cyrenaica went with that country to the Turks and its history under Ottoman rule from the sixteenth to nineteenth century is almost entirely blank. The Bedouin were little affected by the Turkish rule. Those nearest to the coastal towns were undoubtedly compelled to pay taxes from time to time.

In 1711 a rebellion at Tripoli against the Sultan's authority led to the emergence of a local dynasty, the Caramanlis, who for a time exercised control over Cyrenaica also. Generally however, it may be said that Cyrenaica has no history other than Bedouin traditions of inter-tribal wars, from 1051 to 1835, in which year the Turks regained control of Libya from the Caramanlis. On their return they instituted a more systematic administration than had been exercised during their earlier occupation.

In this period the Sanusia Order gained the confidence of the Bedouins and many zawiyas (lodges) were established (Vide Chapter IX). The Ottoman period was completely lacking in many economic and social developments except in the main towns of Tripoli, Benghazi and Derna. The Turks may be considered simply to have been tax-collectors.

The Italian Colonisation:

In 1911, Italy declared war on Turkey. The Italians landed in Libya while the Turks withdrew inland. When Turkey had ceded Libya to Italy by the Treaty of Lausanne (1912), the Libyans organised themselves and continued their resistance. For the first two years the Italians controlled only the coastal towns. In April 1913 the Italians occupied El-Marj while the rest of the Jebel and the interior remained in the hands of the Libyans. The resistance ceased in 1932 with the death of Omar El-Mukhtar, leader of the resistance. The

Libyan-Italian wars broke the people of the country and dislocated their country. The population of the Jebel was probably reduced by half to two-thirds by death and emigration between 1911-32⁽¹³⁾. Losses in livestock are difficult to estimate but they were certainly numerous.

During the first period of colonisation, the Italians ceased to regard Libya merely in the light of an overseas possession. Even before the pacification of the country was complete its future role as the subject of intensive immigration of Italian nationals who could find social and economic security in a state-protected agrarian programme of "demographic colonisation", was decided.

It was well known to the Italians that only a small portion of Cyrenaica, part of the plateau, was suitable for European colonisation. Many Italians were sceptical about the advantages of the country for colonial settlement. The Anglo-Jewish commission of 1908 expressed the opinion that Cyrenaica could not take more than 300,000 colonists in addition to the existing population.⁽¹⁴⁾ Although there was much disagreement about the saturation point, most Italian writers accepted that political control and colonisation must go hand in hand.

The first step in the Italian colonisation phase was the acquisition of land. In 1913 the Ufficio Fondiario (Land Registry Office) had been founded in Benghazi, and in

1922 branches were set up in El-Marj and Cyrene. The office engaged itself in the acquisition of suitable lands for the Italian colonisation. The following table shows the activity of the Ufficio Fondiario up to 1931.

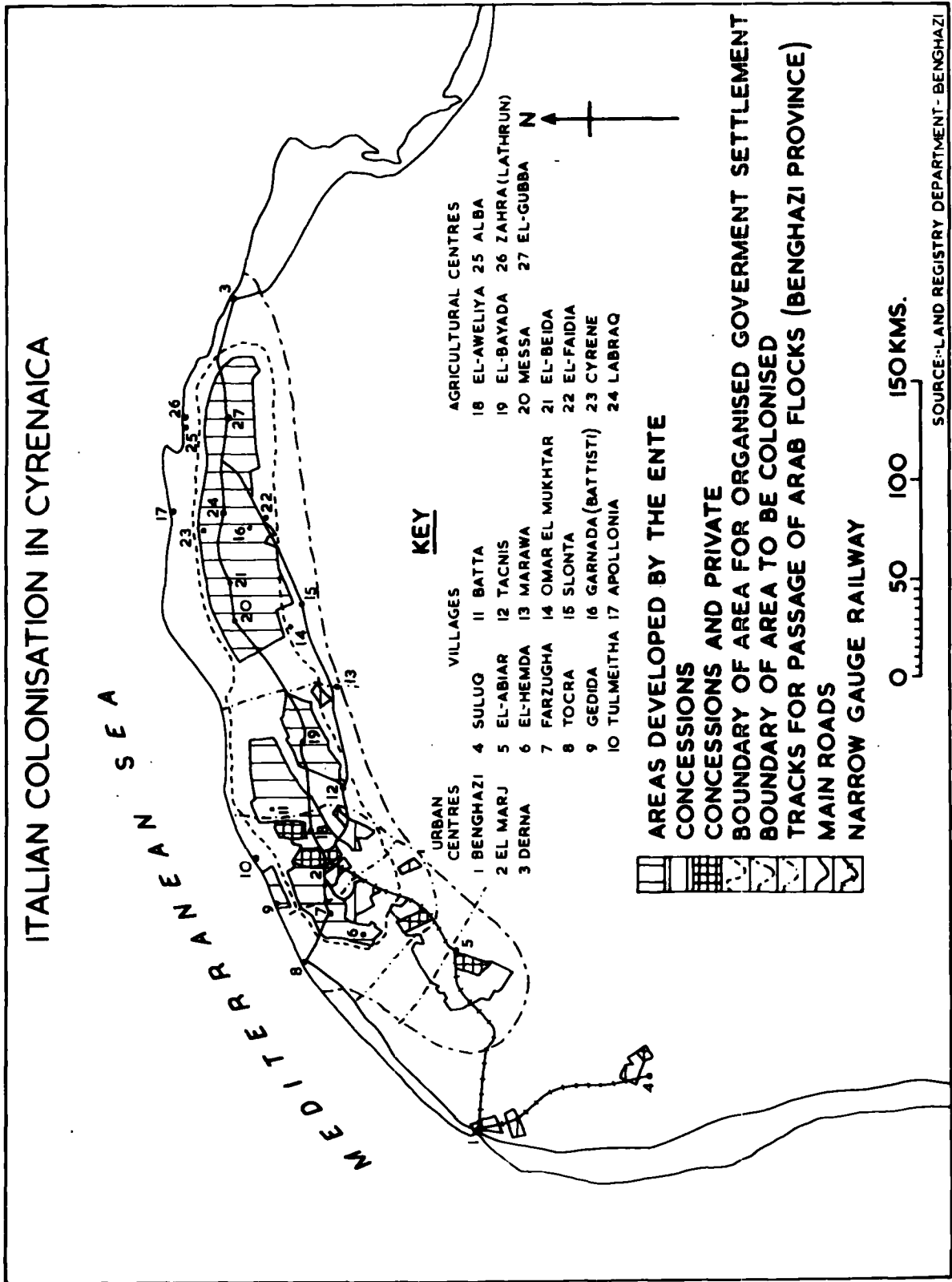
TABLE 21. Activities for colonisation purposes of Ufficio Fondiario up to 1931, areas in hectares.

	Lands bought for colonisation.	Lands domained by nature	Confiscated from rebels	Confiscated from Zawiyas
1922-26	4,070	2,915	500	-
1927-29	39,371	4,762	5,300	-
1930-31	-	1,167	200	62,225
Total	43,441	8,844	6,000	62,225

Source: Weir, D.H. "Italian Colonisation" Handbook of Cyrenaica, Part XI, 1943-47, p.6.

In the early years of colonisation, the method of settlement followed somewhat the lines of the old feudal system. Large concessions of land were made to individuals in return for agreements to make improvements and settle an agreed number of nationals on the land, i.e. Marzotti, Yungi, and Icle, and other private farms (Vide Fig.32). The settlers on these land concessions were to be tenants. From three to ten families were settled on each of the land concessions. By this effort of colonisation, land was acquired by the state, sometimes through purchase and at other times through expropriation. In either event it resulted in the removal of

Figure 32



Arab population from the better areas to the more marginal areas less suitable for colonisation purposes. After some years this was found to be an unsatisfactory method and was not resettling the families as rapidly as desired.

In 1932 a corporation called Ente per Colonizzazione della Cirenaica was founded. The Ente began by developing the areas around Cyrene, El-Beida, and 5,500 hectares in the neighbourhood of El-Marj. The Ente started to establish agricultural centres, Beda Littoria (El-Beida), and Luigi di Savoia (Labraq) in 1933, Luigi Razza (Messa) and Giovanni Berta (El-Gubba) in 1934, and Maddalena (ElAweliya) in 1936. By 1937 there were over 700 colonist families in Cyrenaica. The colonisation, until this date, was not as rapid as the Fascist regime had planned. The pace was forced in 1938 by State-directed immigration in mass. The unit of this demographic colonisation was the family, so that each farm would be a self-contained economic unit run on its own labour and enough livestock being kept for domestic needs. In the Ente settlement farmers were paid a living wage for the first two years, returning all their produce; and in subsequent years development expenses were borne by the Ente and the produce divided equally with the farmers. The value of the crop received was put to the farmer's credit, and he was supposed at a later stage to sell his whole crop and repay his debt at 2 per cent interest, becoming finally the owner of his holding.

The farms had been prepared in advance. The house was also built and furnished (Vide plate 7a). The farm was part of a village and attached to a centre consisting of a clinic, a granary, a school, a Fascist club, administrative offices and a church.

In 1938, 20,000 colonists came to Libya, and those who arrived at Cyrenaica were to occupy farms in Baracca (Farzughā), Oberdan (Batta), D'Annunzio (El-Bayada), and Battisti. In 1939 the second wave of demographic colonisation composed of 20,000 colonists arrived, but it seems only half of this figure arrived at Cyrenaica to occupy the farms of Filzi (El-Hemda), Sauro and Mameli. However, by the end of 1940 the total figure of the colonists was about 2206 families comprising 15,014 colonists and about 2,077 farm houses. The following table shows the number of the colonist families and houses up to 1940 in the Ente settlements, private land concessions and at the I.C.L.E.

TABLE 22: Colonist houses and families in Cyrenaica(1940)

	Colonist houses	Colonist Families	Colonists
Private concessions	264	466	1,524
Ente	1,759	1,686	13,220
I.C.L.E.	54	54	270
Total	2,077	2,206	15,014

Source: Istituto Agricolo Coloniale "La Colonizzazione della Cirenaica" Rome 1947, p.20.



Plate 7 (A) - An Ente farm house. Note the newly planted olive trees on the left and the tent and a plot of cultivated vegetables on the right.

The detailed figures for El-Marj Plain and the adjacent areas by each village are as follows:

TABLE 23: Colonist houses and families in El-Marj Plain and the adjacent areas for the period 1937-1940

Agricultural centre	Colonist houses		Present colonists	
	in 1937	in 1940	in 1937	in 1940
Maddalena (El-Aweliya)	52	159	49	) 1,517
Sauro		39		
Baracca (Farzugha)		295		) 3,127
Filzi (El-Hemda)		120		
D'Annunzio (El-Bayado)		75		515
Oberdan (Batta)		338		
Total	52	1,026	49	7,724

Source: "La Colonizzazione della Cirenaica"
op.cit.p.62

The total number of families in the above mentioned agricultural centres is 996.

The colonisation activities on the Jebel included the areas between Farzugha and El-Abiar in the west and Ain Mara (24 Kms. south west of Derna) in the east. On the coastal plain, small areas south of Benghazi and north of Suluq were also developed (Vide Fig. 32).

The Italian plans for agricultural production were concentrated mainly on wheat, grape vines, olive trees, almond

trees, and other fruit crops. The size of the farm varied from one area to another depending on the quality of the land and the amount of rainfall. The usual farm size in El-Marj Plain was 25 hectares while on the high Jebel, which has less rainfall, the farm size was 70 hectares. In 1937 there were 62 tractors, 110 tractor ploughs, and 25 seed drills; the number probably increased until 1940.

The Italian demographic colonisation required large investments both direct and indirect. The static settlements were part of a modern market economy and depended upon previous investments in roads, ports, communications, hydraulic works and railways. The Jebel was served by a highway between Derna and Benghazi, and a railway constructed between Benghazi and both El-Marj and Suluq.

The Italians planted colonists of metropolitans on extensive stretches of tribal land, which was expropriated either without, or with very inadequate compensation. All that was left to the Arabs on the Jebel Akhdar was the narrow coastal plain, the more rugged parts of the upper terrace which would not yield to Italian methods of cultivation, and the bleak southern slopes of the Jebel, and the desert beyond. The intention was to exclude the Arabs on the Jebel altogether in the near future, although it was recognised that the Bedouin must move north-south to pasture their flocks and cultivate passages for transport of the stock across the reserved area which had already been marked out and staging points fixed

(Vide Fig.32). The Italian plans aimed to destroy the Bedouin way of life.

The total investments of the Italian Government for development in Cyrenaica during the whole period of the Italian administration are estimated at 534 million lire; those of the Ente at 159 million, and those of the private concessions at 718 million lire.* In 1940, about 80,000 ha. were actually developed by the Italians. The cost of developing a hectare in the private colonisation was 6,000 lire, and in the zone between Sidi Mahius and Sleaia it cost 4,000 lire per hectare. The total developed area of the private and the land concessions in El-Marj Plain was about 13,000 hectares, and in Sidi Mahius-El-Abiar, 3,800 hectares. The Ente developed 60,500 hectares in the whole Jebel and the coastal plain; about half this figure was in El-Marj, El-Bayada, and Tacnis. The cost of the development of each hectare was estimated at 10,000 lire.⁽¹⁵⁾ The total number of houses built by the Ente was 2,077 of which 670 were in the Marj area, 339 in Batta, 76 in El-Bayada, 50 at Tulmeitha and 10 at Tacnis (Vide Fig. 38).

The Italians planted olive trees, almond trees, grape vines and other fruit trees. They also repaired the cisterns and drilled wells, particularly in the coastal plain and around Benghazi.

In 1938, Libya was incorporated into the Kingdom of Italy, and the Libyans were offered "Special Italian

* Equivalent to U.S.dollars, 63 million dollars, UK. £22,500,000

Citizenship". Further, to compensate the Libyans for the general distress caused by the mass Italian immigration and the subsequent confiscation of their lands, Italians planned to fulfil a development programme. This took the form of establishing new agricultural centres for Muslims. They differed a little from the metropolitan centres in that their scope was more limited, the lands were less attractive agriculturally and the financial backing was modified. However they were part of the Ente programme. These centres were filled with the old Libyan Army divisions and their families. These centres were Nuova (Gedida) west of Tulmeitha, Fiorite (Zahra) and Alba (Ras El-Hilal). Up to the Italian evacuation all the farms were in primary states.

The occupation by the allied forces of Cyrenaica and Tripolitania brought the Italian experiment to an end. To judge the Italian experiment from an economic point of view is difficult since most of the new immigrants were in the first stage of development, whilst many old settlers said they owned the farms and fulfilled the Ente conditions. However, while there is little doubt as to the technical advance represented by the Italian farming programme, its future remained in doubt. It was conceived as a first step in a long programme of development, it was supposed to offer an outlet for the surplus Italian population, and was intended to supply the local needs of Italianized towns, and to provide an exportable surplus for the Italian market.

In January 1943, the British forces occupied Cyrenaica. The Libyans in exile in Egypt formed the Sanusi Army and fought with the British. A Military Administration was formed and governed Cyrenaica and Tripolitania. This period was a transitional one until a settlement could be reached for the future of the whole of Libya. This period was characterised by opening many opportunities for Libyans particularly in education. The Italians limited the education to a very small scale. The lack of trainees and educated Libyans was a major problem propagated by Fascist rule.

The British Administration in Cyrenaica between 1943 and 1950 ran the Ente farms on a programme called 'The Wheat Scheme'. It will be dealt with in the section on agriculture.

In 1949, the United National passed a resolution that Libya with its three provinces, Cyrenaica, Tripolitania and Fezzan was to be an independent country not later than January 1952. In December 1951, the new independent United Kingdom of Libya was established on a federal system, but in 1962, the whole country was unified in the Kingdom of Libya.

After the Italian evacuation the Bedouin of the Jebel Akhdar returned to their land and occupied the former Ente farms and houses. The property status of the Ente farms transferred to the Libyan Government. The private land concessions remained the property of their Italian proprietors.

The concessions were rented through the Italian representatives. However, at present many Italians have sold their farms since hope faded for any Italian resettlement. The present situation will be dealt with in the section on land tenure.

The Libyan Government set up the 'National Agricultural Settlement Authority' to develop the former Ente farms and to settle the Bedouin of the Jebel. An examination of this attempt will be discussed in the section on agriculture.

To conclude, the long history of this country shows that it was subjected to invasion after invasion. The prosperity of the country depended on the invaders' outlook. Greek, Roman and early Arab periods were characterised by productivity and prosperity for Cyrenaica as has been recorded. The Bani Hilal invasion and the Turkish rule was a blow to the prosperity of the country. The Italians who planned for demographic colonisation failed to gain the trust of the Libyans since the development was intended to serve only the Italian nationals.

However, the Italian colonisation revealed the fact that the country, with effort and mechanized agricultural methods, can support more population.

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CHAPTER VIII

Land Use

Introduction

A very large percentage of Libya is a barren desert with vast expanse of shifting sand dunes. The agriculturally productive lands are limited to northern Tripolitania, northern Cyrenaica and a few small oases scattered irregularly throughout the south of Tripolitania, the south of Cyrenaica and in Fezzan.

The 1960 census of agriculture of Libya⁽¹⁾ indicates that the total agricultural holding in Libya is 3,888,000 hectares of which 2,375,000 hectares is arable* land, 134,357 ha. is land under permanent crops i.e. fruit trees, nuts and vines, 1,135,750 ha. is permanent meadows and pasture, 63,274 ha. is wood or forest land, and 160,273 ha. is other land, buildings, roads and wasteland. In Cyrenaica the total land holding is 827,000 hectares of which 742,000 hectares is arable land, 8346 ha. is land under permanent crops, 14,766 ha. is permanent meadows and pasture, 28,901 ha. is wood or forest land and 13,299 ha. is all other lands.

However, traditionally the Bedouin of Cyrenaica have been pastoralists first, and cultivators second. For centuries the nomadic way of life has prevailed over most of the country except for the coastal towns, and it has been argued that this manner of living is well adapted to the

* For precise definition of classification, see Appendix IV.

physical conditions⁽²⁾. But while the Bedouin society has shown a great capacity for survival, neither its values nor its organisation equip it to take advantage of the opportunities for economic advance opened up by the revolution in technology which has taken place during the last 150 years. There are already signs that nomadism in Libya is gradually giving way to settled farming, and this trend must be encouraged if there is to be any hope of major progress in agriculture.

For all the drawbacks of arid soils and fluctuation of rainfall, it is believed that Libya has the physical resources needed to develop a moderately prosperous settled agriculture. Moreover, these appear to be the only natural resources in Libya currently capable (lacking rapid industrial expansion) of providing a livelihood for the majority of the existing population, and for the additional members to be expected as the population grows. Oil production has already become more important as a source of income, but hardly as a means of employment. Indeed, it would be unwise to rely on the oil industry providing direct employment for more than 15,000 - 20,000 workers for Libya⁽³⁾, against the 280,000 who are now engaged in agriculture and animal husbandry.

The physical potentialities of Libyan agriculture are demonstrated by what was achieved in Greek and Roman times through the methodical organisation of the country's limited supplies of water (as seen in Chapter IV). There is

evidence that settled farming was then well established in Cyrenaica supporting a larger population than at present. Olives and cereals appear to have been the principal crops, and many farms kept livestock as well, including cattle. Soil erosion in the intervening centuries has resulted in the destruction of much good agricultural land. But where capital, organisational ability and technical knowledge are available, it has been shown that farming in Cyrenaica can still be made to pay well today. The excellent results achieved by the State agricultural experimental stations (e.g. Zorda, Fuehat, El-Belang and Derna in Cyrenaica, and Sidi Mesri in Tripolitania) leave no doubt that physical conditions in Cyrenaica and Libya as a whole, are well suited to the production of a wide variety of crops and that in some of these crops Libya has a special advantage over most others catering to the European market. Many vegetables can be grown in Libya (for instance tomatoes in Jalu oases) during the winter months when they are scarce in Europe.

In the Jebel Akhdar there are a few large commercial farms employing hired labour and equipped with tractors and other machinery. Some of these farms are owned by Italians but are now run by Libyans. The farms produce cereals, grapes, almonds and olives. The former Ente farms occupied at present by the Libyans do not produce the quantity they did during the period of Italian colonisation because of the lack of suitable farmers of capital and organisation. The success of the large farms is in striking contrast to the

picture of poverty, waste and frustration presented by the typical small farmer who uses primitive tools and methods to scratch a miserable living from the land. Ignorant as he is of modern farming techniques, and with little capital at his disposal, his position is made more precarious by insecurity of land tenure and the vicissitudes of climate. The quality of his produce is generally poor. He is seldom able to obtain credit, and a bad drought or a G^hibli can ruin practically his whole crop. He usually goes to the Barr (Es-Serual region) for shifting cultivation, and after the autumn rains he ploughs as much as he can to ensure sufficient income and security for bad years. Some of the real nomads - who are very few - in the south of the Jebel practice shifting cultivation for their main source of income.

However, agriculture in Tripolitania is more advanced and productive than in Cyrenaica since the majority of of the population are settled and have practiced agriculture for centuries. In Cyrenaica, particularly in the Jebel Akhdar, the Bedouin way of life is not yet fully adapted to a settled existence.

The agriculturally productive areas of Libya are concentrated on the Gefara Plain and the coastal zone of Tripolitania and in the Jebel and the coastal plain in Cyrenaica. The Jebel Akhdar has more favoured conditions for agriculture than the other regions of Cyrenaica where water is the most serious physical limiting factor. On the

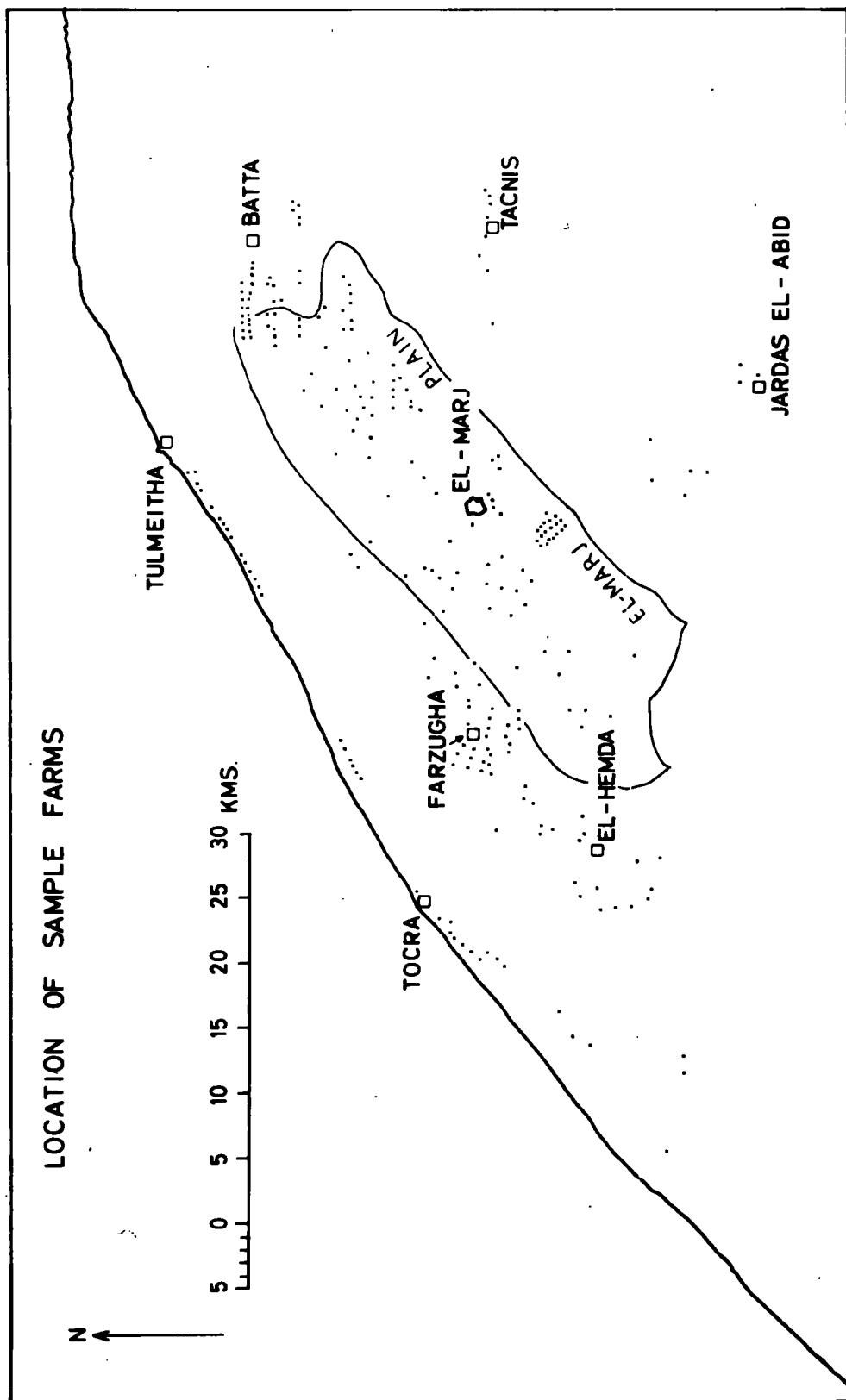
Jebel itself the land is rugged and dissected by numerous wadis which make the full use of land with machinery rather difficult. The most extensive fertile plain of the whole of northern Cyrenaica is El-Marj Plain which offers the greatest scope for agricultural development.

Field Investigation

The absence of adequate data on the farm economy and social aspects made it necessary to collect material by questionnaires, especially with regard to farm economy, that is cost factors, utilization of production, production methods and movement of the Bedouin. The social questionnaires were concerned with the residence of the Bedouin whether this be a house or a tent; also the means of transport, health, education and income. A copy of the questionnaires put to the Bedouin outside the urban centre of El-Marj is in appendix IV.

It was intended first to cover the whole number of Ente and private farms, but with the similarity of the farming types and social structures, it was decided to restrict the questionnaires to sample number (Vide Fig.No33). The total number of agricultural units investigated in El-Marj Plain and the adjacent areas were 249 out of 1591 agricultural units (16 per cent). In the Mutasarrifia of El-Marj the Ente farms investigated were 194 out of a total of 1145 farms (17 per cent), 30 private farms out of a total of 391 (8 per cent) and 25 tribal agricultural holdings

Figure 33



covering one tribal agricultural unit out of 54 units in the Mutasarrifia of El-Marj (2 per cent)*. The private farms questioned include the suani (irrigated gardens) on the coastal plain.

Three farms (2 Ente and one private) were investigated in greater details in order to produce a typical land use map of the farms in El-Marj Plain.

The investigations in each area were carried out during the fieldwork period 1962-1963; the farm economy was covered during 1960 and 1963.

The farms were chosen to represent various types in each area.

The study of agriculture in this region will deal with land tenure, sedentary agriculture, shifting cultivation and nomadism. To show the significance of El-Marj Plain and its potentialities a comparison with the surrounding regions and others in Cyrenaica will be undertaken.

Land Tenure

The tribal system of land ownership prevails over much of Cyrenaica, except in the Italian concession areas and the former Ente settlement zones. Under this system the different members of a tribe or Qabila use the same piece of

* In 1959 survey (Agricultural Statistics of Cyrenaica 1959), the tribes were subdivided into tribal units and each of these units (rather than individual members) was considered to constitute an agricultural "holder" and the area which is used wholly or partly for agricultural production and is operated by the tribal unit as agricultural "holding"

Source:-Agricultural Statistics for Cyrenaica 1959^{Benghazi, 1960, p.10.}

land for grazing their animals or cutting fire wood, and though the individual may be allowed to cultivate part of the land for his own use, he is not free to sell it or to mortgage it for credit, and he may always be asked to vacate it by the head (Shaikh) of the tribe.

The tribal land in Cyrenaica manifests all the weakness inherent in communal ownership. Large tracts in zones of high rainfall which are well suited to the cultivation of crops, are used instead for grazing and have often been overgrazed to the point where the most palatable grasses have been replaced by unpalatable shrubs or bare ground. On the grass lands, which are rarely improved, yields are low. Afforestation and soil conservation practices are neglected. Over-exploitation of the soil leads to the denudation of vegetation cover, which causes soil erosion and loss of fertility until finally the land is abandoned and its occupants move elsewhere. The most important types of property in land in Libya inherited from the Ottoman law were as follows:-

- (a) Mulk, or land belonging to individuals, are private property.
- (b) Miri or Amiri: State property.
- (c) Metrouk Lands: Public utility or pasture lands. The tribal lands fell under this category.
- (d) Waqf Lands: Mortmain property (private or public)*
- (e) Mawat Lands: or dead lands.

*Private Waqf is the land given to certain bodies i.e. mosques or zawiyas. Public or general Waqf is the land endowed for public use.

The most important fact is that most of the agricultural land of the country is for practical purposes in the lands of the tribes, except for Italian concessions and small garden lands.

Land ownership in Cyrenaica is as follows** (in hectares)

1. The State lands of Cyrenaica (including <u>Ente</u> , <u>Icle</u> and most of the Italian concessions which reverted to the State since ownership conditions (vide Ialo-Libyan treaty, 1958) were not observed	152,427
2. The agricultural land held in concessions and private properties by Italians	7,263
3. to (2) above could be added an estimate of 2000 hectares for the small areas of private property (not mentioned in the Italian Annuario 1940-41)	2,000
4. Other lands including tribal lands	4,000,000
5. Privately owned lands not registered (very approximate)	40,000
	4,201,690

The table given above shows that over nine-tenths of the land is held under tribal ownership. From time immemorial these lands have been under occupation by their respective tribes, and are generally used for grazing and cereal cultivation.

When the Italians occupied Libya and required lands for colonisation purposes, they became involved in the question

* Source:- Land Registry Dept., Benghazi & A.I. Qureshi (1955) "Report on the Systems of Land Rights and Taxation in Cyrenaica". LIB/TA United Nation p.5.

of ownership of tribal lands, but were unable to find a satisfactory solution and no practical decision was taken, though in fact the Italian regime on one pretext or another, either by promising some compensation and often without paying it, did reserve a large part of the comparatively better agricultural lands, originally belonging to the tribes of the Jebel and to a lesser extent to the tribes of the coastal plain, for settlement purposes.

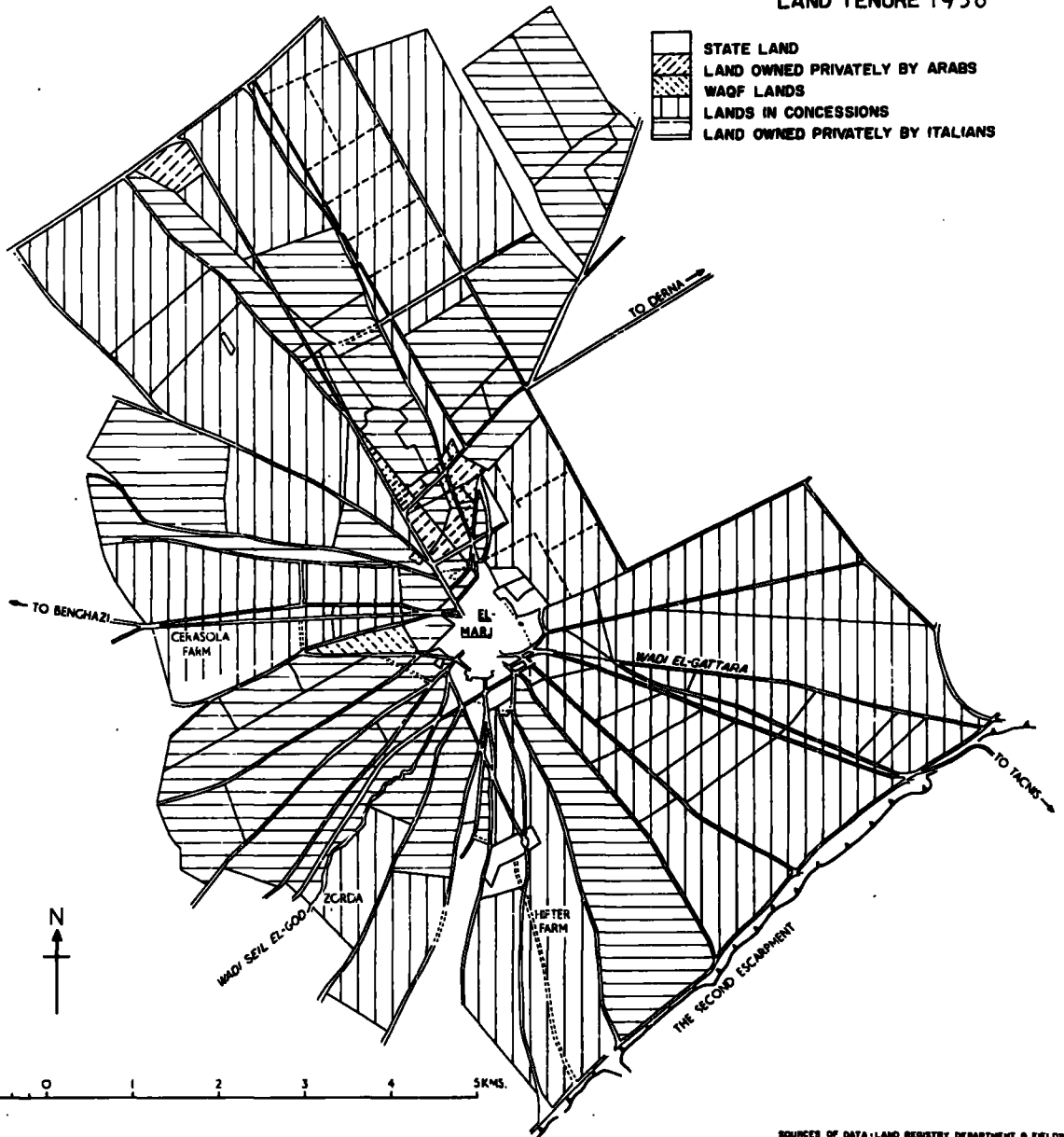
However, according to "Servizio Studi" map (1931), the total area for organised government settlement was 300,000 ha., while the area to be colonised in future was 890,000 ha. (Vide Fig.No.32). By 1940 the Ente held in northern Cyrenaica 102,778 ha., of which 60,581 ha. was actually developed. The private concessions were granted 35,056 ha. (15,980 ha. developed), and the Icle operated on an area of 5746 ha. (3221 ha. developed) north east of El-Marj.

At present all the Ente lands have reverted to the Libyan Government as also have most of the private concessions and Icle areas where conditions of colonisation were not observed. Because of confusion over the future of these lands, some of which are claimed by the tribes, and because no official data is available it was possible to work out the status of the land rights in El-Marj Plain only with the cooperation of the Land Registry Department in Benghazi and by the author's fieldwork. Four illustrations are produced

Figure 34

EL MARJ AREA:
LAND TENURE 1938

- STATE LAND
- LAND OWNED PRIVATELY BY ARABS
- WAQF LANDS
- LANDS IN CONCESSIONS
- LAND OWNED PRIVATELY BY ITALIANS



SOURCES OF DATA - LAND REGISTRY DEPARTMENT & FIELDWORK

to show the land status in 1938 (during Italian rule) and 1964 (12 years after the Libyan Government took over).

Figure No.34 shows the land holding in El-Marj area around the town of El-Marj where the Italian Government granted concessions for private colonisation and the land was either bought or confiscated from the Waqf (private Waqf of Sanusia Zawiyas). The figures (in hectares) for land holdings at that time (1938) were as follows:-

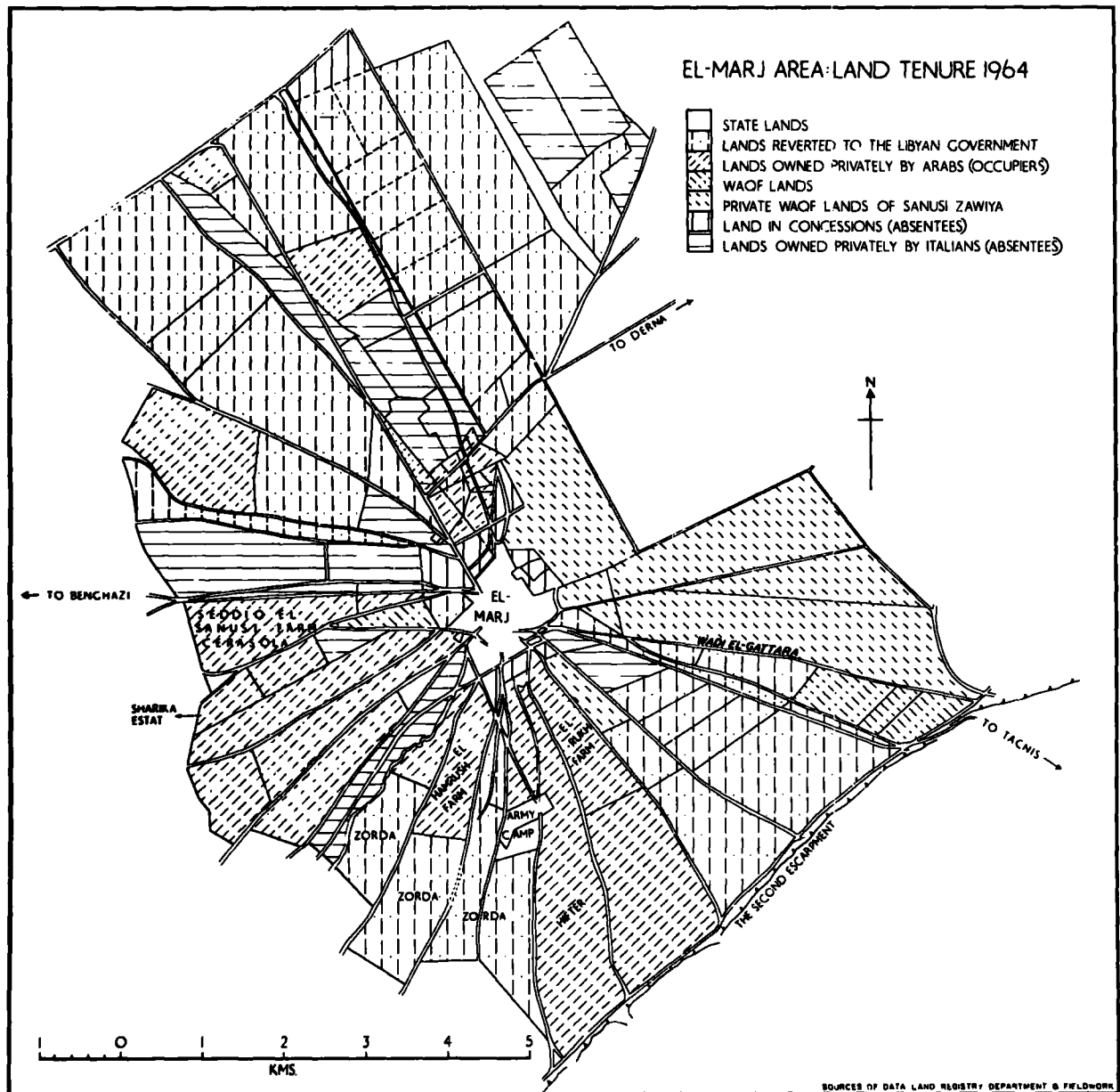
Table 24:- Land holdings in El-Marj Area in 1938

<u>Concessions</u>	<u>Private Italian</u>	<u>Private Arab</u>	<u>Waqf</u>	<u>Total</u>
5123	2361	78	43	7605

After the evacuation of the Italians from Cyrenaica all the Italian proprietors left the country. Where the conditions were not observed in the concessions the land was claimed by the Libyan Government, while private individual property remained in holder's hands. However, all Waqf land was recovered. The Italian Diplomatic mission looks after residual Italian private property while Libyans occupying these farms are considered as rent-paying tenants. Many Libyans bought Italian property since the landlords had no hope of returning to Cyrenaica.

Figure No.35 shows the present (1964) situation in holdings in El-Marj area, where the holdings can be classified

Figure 35



as follows:-

Table 25:- Land holdings in El-Marj Area in 1964.

<u>Concessions & Italian</u> <u>Private</u>	<u>Reverted to the</u> <u>Lib.Government</u>	<u>Private</u> <u>Arab</u>	<u>Waqf</u>	<u>Total</u>
1202	3028	2184	1191	7605

The lands returned to the Libyan Government are rented to the farmers for cereal cultivation.

Figure No.36 illustrates the land status in 1938 in El-Marj Plain. It is noticeable that most of the concessions granted by the Italian Government are concentrated in El-Marj Plain where are located about 21,900 ha. out of the 35,056 granted in the whole of northern Cyrenaica. The main concessions in El-Marj Plain are Marzotti (6800 ha. plus a pastoral area about 7100 ha. on the high Jebel), Ic1e (3600 ha) and Yungi (1200 ha. plus 9400 ha. as pastoral zone). The Ente lands occupy the rest of El-Marj Plain. Land ownership in 1938 was distributed as follows:-

Table 26:- Distribution of some types of Land ownership in El-Marj Plain in 1938

<u>Concessions(inc.Ic1e)</u>	<u>Private</u> <u>Italian</u>	<u>Private</u> <u>Arab</u>	<u>Waqf</u>	<u>Ente</u>	<u>Total</u>
21,900*	6,900	400	500	8400	38,100

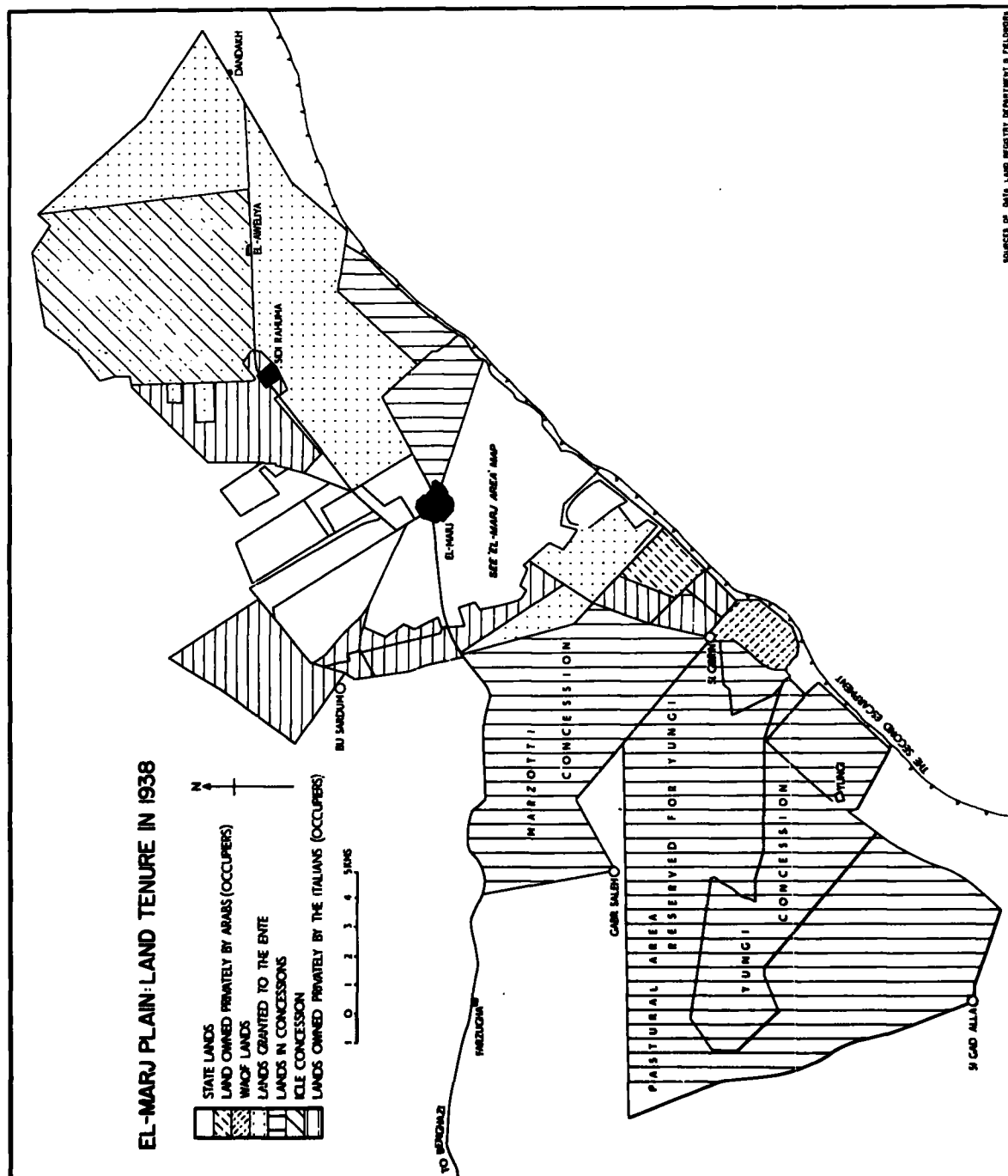
(The figures of the Ente lands refer only to the area shown in the figure).

Most of the concessions have reverted to the Libyan Government except for the cultivated lands of Yungi

(1200 ha) and Ic1e (1600 ha). While Marzotti's land all

* Excluding Marzotti's pastoral zone on the high Jebel

Figure 36



reverted to the Libyan Government contractual conditions of concessions were not observed. It is worth mentioning that during the Italian rule both Yungi and Marzotti included a zone around the cultivated area for pasture and these lands have reverted to the Libyan Government.

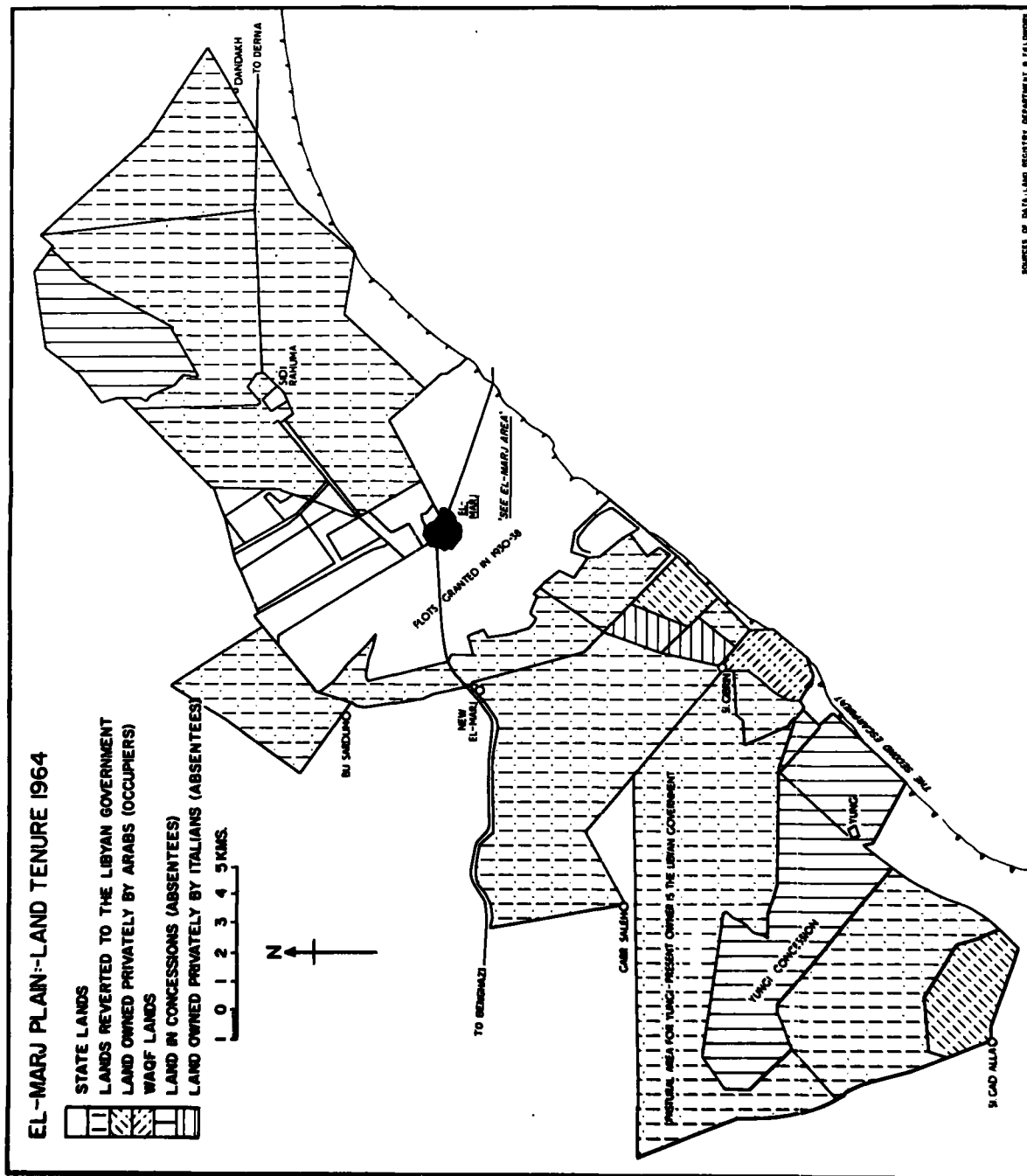
Most of the farms in the north of El-Marj previously owned by metropolitan Italians, the Ente's strip west of El-Marj and the farms at the east, all naturally returned to the Libyan Government. Figure No.37 shows the present land rights in El-Marj Plain with special reference to the concessions. Most of the Ente farms are situated on the areas surrounding the concessions (Vide Fig.38). The total area that reverted to the Libyan Government, is shown in Figure No.37 is about 33,000 ha. (including 8400 ha. of Ente lands shown in Fig. No.37) though 3300 ha. is still held by Italians (concessions and private), 1300 ha. owned privately by the Arabs and 500 ha. of the Waqf land, as shown in the Table below (in hectares):-

Table 27:- Distribution of Some types of land ownership in El-Marj Plain in 1964

<u>Concessions</u>	<u>Private Italian</u>	<u>Private Arab</u>	<u>Waqf</u>	<u>Returned to Lib. Gov.</u>	<u>Total</u>
2800	500	1300	500	33,000	38,100

It must be added that the total area of the Ente farms is approximately 30,000 ha. in El-Marj Plain (Vide Fig. 37) Ente land shown in Figure 38 includes only those where Ente actually built farms and farm houses with fences

Figure 37



and where such farms were actually occupied by colonists. As pointed out earlier, these farms at present belong to the Libyan Government, while in the rest of the land which was not developed by Ente, the Libyan Government recognises the ownership rights of the tribes.

Some 35 per cent of the total area of land holding in Libya (3,888,000 ha.) was under tribal tenure. In Cyrenaica 39 per cent of holdings and 37 per cent of land area is worked by individual holders and 30 per cent of holdings and 47 per cent of the area is under tribal land⁽⁴⁾. The following table gives the number and area of holdings, by type of land tenure in the Mudiria and the Mutasarrifia of El-Marj in relation to Cyrenaica and Libya.

Table 28:- Number and Area of holdings* by types of land tenure in the Mudiria and the Mutasarrifia of El-Marj, Cyrenaica and Libya. (in hectares)

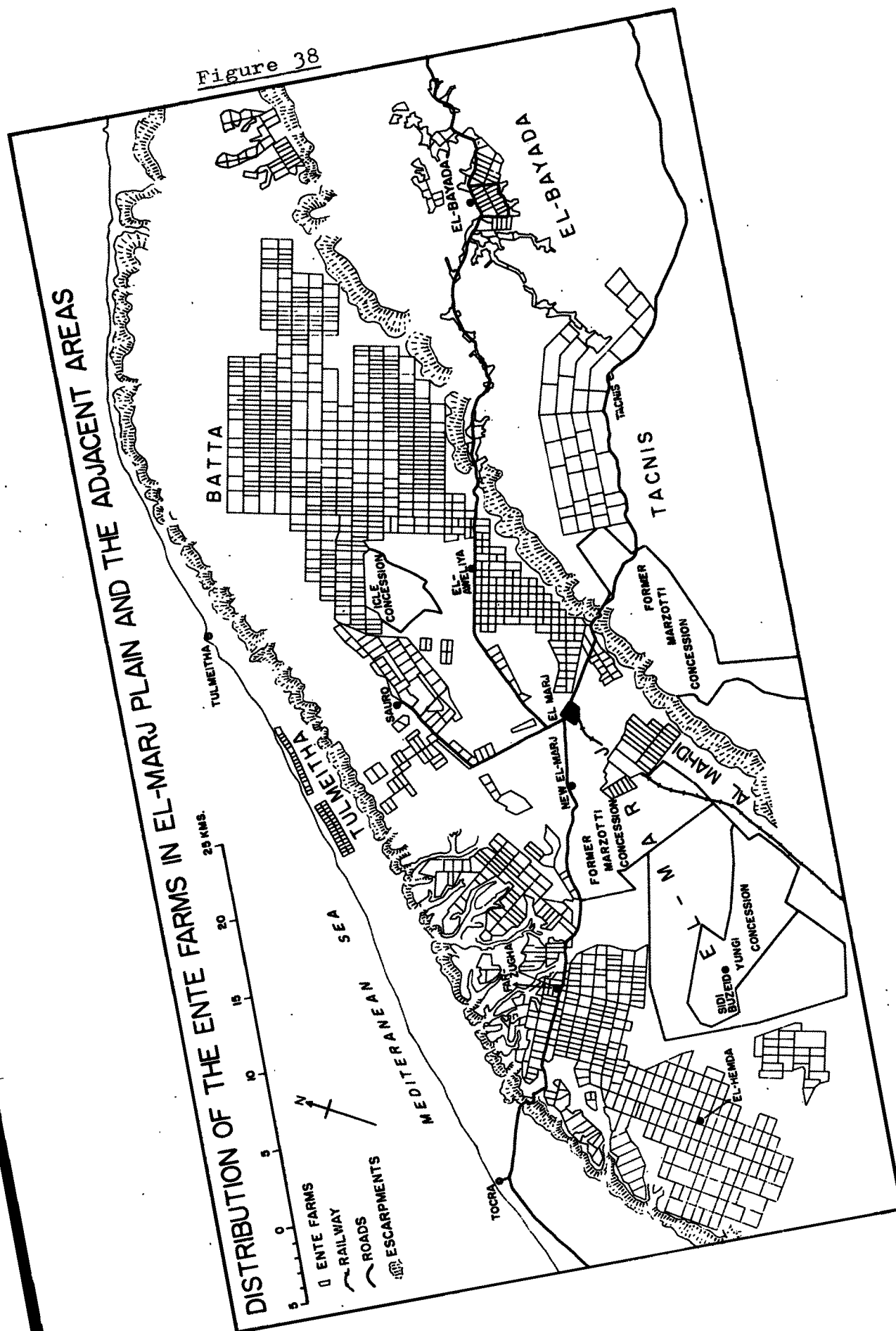
Region	Total holdings		Owned by the holder		Rented from others		Under tribal tenure		Under other single tenure	
	No.	Area	No.	Area	No.	Area	No.	Area	No.	Area
Mudiria of El-Marj	2629	66839	763	27196	1167	24904	684	14139	90	615
Mutasarrifia of El-Marj	7085	224669	3049	108855	1861	399550	2441	75002	145	1270
Cyrenaica	29719	807074	11668	300186	31755	9277	11837	382297	2979	65233
Libya	14 5518	3868728	110 387	2282144	1120713	10132	44383	13680 22	6966	87379

Source:- 1960 Census of Agriculture.

The table indicates that more than one quarter of the holdings

* For precise definition of classification, see appendix IV.

Figure 38



in the Mudiria of El-Marj and more than one third in the Mutasarrifia of El-Marj are under tribal tenure, and one third and slightly less than half by owner-occupiers respectively. It is clear from the previous figures that at most half of the agricultural land in the Mudiria of El-Marj* belong to the state (including, of course, tribal lands).

II. SEDENTARY AGRICULTURE

The natural conditions bearing on agricultural production in El-Marj Plain are a quickly hardening type of Terra Rossa soil of varying richness which is difficult to work, and a scanty precipitation which varies considerably as to quantity and season from year to year (Vide Chapter III). In consequence, all agricultural production is subject to a considerable risk with regard to yields. The main crops in the Ente farms are wheat and barley, chickpeas, broad beans, oats and fenugreek are grown in small quantities. As regards the growing of fruit trees, good stocks of peach, fig, pear, apple olive and almond trees still exist on the Ente farms. In a number of privately-owned farms there are high yields of olives, almonds and vines. The amount of vegetable growing, apart from potatoes, tomatoes and melon in El-Ghariq, is negligible.

In the present section we will deal with the Ente farm, farm house, labour, cereal crops, tree crops, vegetables, yield production cost, marketing problems and development.

It has already been pointed out earlier that the agricultural holdings belong to the State, tribe or are privately owned. The following table gives the number of

* The Mudiria of El-Marj covers most of El-Marj Plain.

areas of the Ente and private farms in the Mudiria and the Mutasarrifia of El-Marj (5)

Table 29:- Number and areas of the Ente and private farms in the Mudiria and the Mutasarrifia of El-Marj (in hectares)

Division	Ente	Private	Total
Mudiria of El-Marj			
No. of farms	670	40	710
Area of farms	17958	5049	23007
Mutasarrifia of El-Marj			
No. of farms	1165	218	1383
Area of farms	31957	5495	37452

(Mutasarrifia's figures include those of the Mudiria of El-Marj)

The table indicates that in the Mudiria of El-Marj the Ente farms represent 94 per cent of the sedentary agricultural holdings, while the private farms account for only 6 per cent. In the Mutasarrifia of El-Marj, the Ente farms constitute 84 per cent of the sedentary agricultural holdings and the privately owned farms 16 per cent.

Ente Farms:- The average size of the Ente farm holdings in El-Marj Plain is 25 ha. for dry farming, but in a few cases the farm size may exceed 30 ha. and in exceptional conditions 60 ha. The larger farms (more than 25 ha) occur in areas where some of the land is stony and may be used only as pasture for grazing. However, the Ente farm land in most of

the cases, is a plot of land all in a piece, or, in any case, located near the farm house, but the utilized tribal land belonging to Ente tenants may be located at a distance of 20 Kms. or more.

The Ente farms are currently rented to Bedouin. The farms on the main North and South Roads are rented at £L.3 per annum, while the farms away from the main roads are rented at £L.1.75 per annum. Most of these latter farm houses are in a bad condition, but where they have been repaired by the Government the rent has been raised by the State Property Department to £L.3. The rent of the Ente farms on the coastal plain west of Tulmeitha is £L.0.60 per annum since they are smaller than those on El-Marj Plain.

The contract of tenancy states that "the tenant shall cultivate the land as a good farmer pruning and cleaning the vineyards and orchards and carrying out all reasonable instruction given to him by the landlord (the Government) and the Director of Agriculture and shall live on the premises all the year". This is to encourage Bedouin in farming and in the process of sedentarisation. The contract is valid for one year, at the end of which it is deemed to be renewed for another year, unless notice to quit has been given. The contract stipulates that unsatisfactory farmers may be evicted, but this stipulation has not been used in recent years. It is contractually arranged that in case of notice being given, the farmer receives no kind of indemnification for permanent

improvements he may have realized such as planting of fruit trees, terracing, dams and fences. Lack of security has resulted in tenants' neglect of farms, which in most cases have become overrun by maquis scrub. Even more important the Bedouin living on the farms believe that the Ente land to be their Watan (home) property and the rent they pay to be a rent for the farm house.

In many cases the farmer who is a tenant of an Ente farm, utilizes only part of the Ente land belonging to his farm house, because neighbouring farmers claim other parts of his farm land as being their property which they originally owned before Ente farms were established and which they utilize accordingly.

It is a curious fact that in several cases portions of Ente farm land have been leased twice, firstly, as part of the Ente farm as a whole, to the registered Ente Farmer and secondly as a single lot to another farmer.

The disputes on the Ente farm land boundaries arise during ploughing the land and during the summer for water in cisterns. These disputes retard the cultivation of tree crops since there are no safeguarding fences. In El-Hemda-Farzugha area, there are 22 farms where the farmers are in dispute of their farm land. Disputes are not frequent in El-Marj area and Batta where the farm boundaries are more permanently marked, particularly in the flat area of El-Marj.

If the Government carries out any development for resettlement thereby requiring eviction of some unqualified tenants the Bedouin attitude to land (as their Watan) will cause considerable difficulty.

It is unquestionable that tribal customs and convention are deeply rooted in the Bedouin of Cyrenaica, and that any proposals for changing the present situation will inevitably meet with considerable resistance.

However, the Libyan Government, through the new National Agricultural Settlement Authority is aware of the problem and is starting its activities with a select development of demonstration farms in the Ente areas with a view to later development of tribal lands in such a way as to avoid any clash with the tribes. The development of the Ente farms by N.A.S.A. will start on farms where there are no disputes on, concerning boundaries.

Ente farmers who settled in the present generation lack agricultural tradition and skill. Even more some of them also practice animal husbandry and work in the local administrative offices, or are merchants. Since the Italians left the farms, and particularly since their occupation by the Bedouin, the total surface area of farm land cultivated has declined considerably. In El-Hemda-Farzugha area and Batta, for example, some farmers cultivate only an average of between 5 - 15 ha. of the total area of the farm (25 ha.). The rest as a result of neglect has been occupied by maquis and is in need of cleaning.

The tribes within their respective territories maintain themselves by virtue of traditional communal land ownership. The tribes occupy Ente farms which are considered as the best lands on the Jebel. Any future development must take into consideration that no tribe and even individual can be evicted and that development must be achieved by use of the present occupiers.

The Ente farm houses contain three rooms, a hall and store, and a stable in the back of the house (Vide Plate 7a). They are in a poor state at present particularly those in El-Hemda, Farzugha, north of El-Marj and Batta (Vide Plate 8a). The condition of the houses became worse after the earthquake which hit El-Marj area in 1963. It is estimated that about 50 per cent of the Ente houses in El-Hemda and 30 per cent in Farzugha are without doors and windows. About 90 per cent of the Ente farmers do not live during the winter in the house and they use tents because most of the roofs are not rain-proof any more. Meanwhile 10 per cent of the houses are in good condition and occupied all the year round. During the summer about 10 per cent of the farmers who occupy Ente houses live in the houses to use the water collected in the cisterns. The farmers claim that even the cisterns attached to the houses are cracked and need

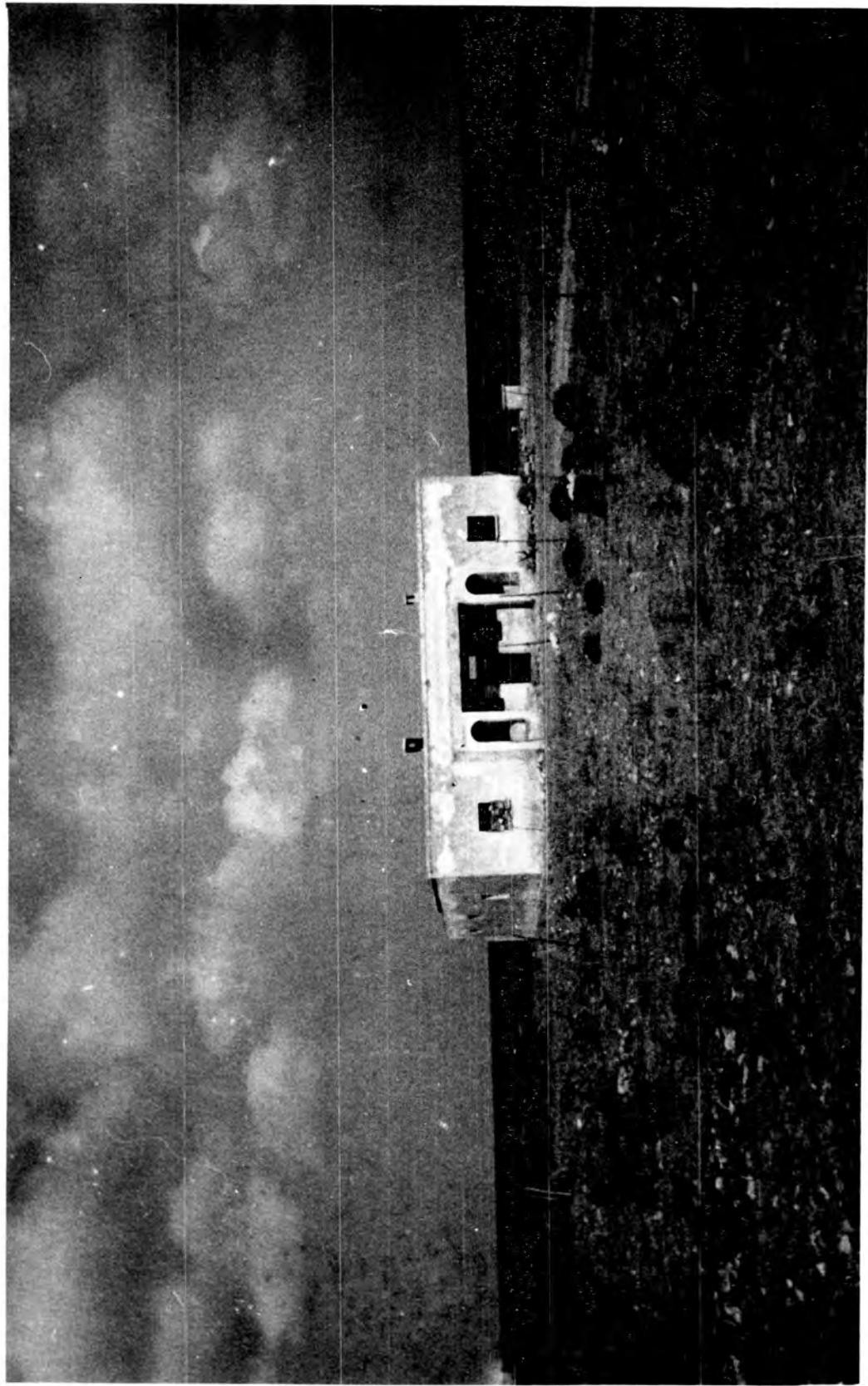


Plate 8 (A) - An Ente farm house in a poor state south of Farzughah. Note the cistern on the right and the maquis vegetation which is occupying almost all the farm land.

repairing. Rain water cisterns, meant to collect the run-off from the roofs, will remain empty where the roofs are broken down or damaged which in turn, endangers the supply of drinking water for humans and animals.

However, most of the houses in El-Hemda and Farzugha are used as grain-storage and stables. The houses have fallen into this state probably because the farmers in the Ente farms considered themselves to be tenants, and maintenance of the premises is incumbent upon the lessor. In the course of recent years only isolated repairs in relation to the total Ente farm houses on the Jebel have been carried out and most of the houses repaired were in the eastern part of the Jebel. In addition to that, the lack of long lease security for the Ente farmers encourages them to avoid any repair of the houses.

The National Agricultural Settlement Authority started its activity in 1964 by taking over from the Ministry of Agriculture in repairing all the Ente farm-houses in Farzugha at a cost of £L.1800 per unit. The improvements completed were new roof, pipes to collect the run-off, repairing the cisterns and fencing the farm. We will refer to the N.A.S.A. activities in the sub-title on the developments.

Icle Farm Houses:- consist of one or two floors, contain two rooms, a hall, storage and a stable. The houses are often in poor condition, particularly in the Icle land situated in the north east of El-Marj, the area which was badly damaged by the earthquake. The majority of the occupiers of these farm houses are semi-nomads who migrate to the south in November for ploughing and return to the Icle land in summer for pasture and watering.

It must be noted here that there are no productive tree crops at present on the Ente and Icle farms. The young trees planted in recent years may start producing in the next few years but the trees planted in some Ente farms by the Italians died because of neglect. In Farzughah-El-Hemda area no trees were planted by the Italians since the settlement programme was interrupted by the outbreak of the Second World War.

Private Farms:- These farms are located south and west of El-Marj. They are better managed and almost all the local tree crop products come from these farms. Some of these lands were granted by the Italian Government before Ente colonisation began, hence most of the established trees cultivated by the Italians recovered. The Bedouin did not occupy these farms since they were private. The well-off

Arabs of El-Marj bought or rented these farms from the Italians. The private farms are comparable to those farms in Tripolitania from the point of view of farming-skill and mechanisation. The total area of the private farms around El-Marj is rather small if compared with other lands in El-Marj Plain.

Government Land on Lease:- To increase their operating area many Ente farmers and private farmers have taken on lease from the Government additional land, most of which adjoins their farms, and is either land ready for utilisation as north east of El-Marj or is bush land which they themselves clear and cultivate as in Silina area around Yungi concession and on the high Jebel south of El-Marj. The rent for the bush land is usually 35 piastres (£L.0.35) per hectare per annum. The cheap rate is considered as an incentive by the Government for an increase in the area of cultivated land; especially where reclamation of formerly cultivated land takes place.

Labour:- The scarcity of labour is one of the problems facing Cyrenaican agriculture. There are many types of worker: The farmer sometimes hires a worker for ploughing the land on the Jebel or in the Barr(in Es-Serual region south of the Jebel). The worker, called Makarwi (hired) gets £L.12 per month and works for about two months

depending on how large the area to be ploughed*.

The other type of worker is called Rabba'a (quarter). The Rabba'a, in contract with the landlord, ploughs the land and harvests the crops, and gets a quarter of the harvest crop plus Shamma (gift) which is usually £L.10 for the whole period. The Rabba'a is obliged not to leave before the harvest is completed. The normal rate is 35 piastres per working day, though the worker's output is low in view of primitive working methods. At 33 working hours for tilling, cultivating, harvesting and threshing per hectare of grain land, the cost of labour per hectare of cultivated land is £L.8, that is 23 times of the cost of land rent. In 1959, the usual daily wage was 25 piastres, in 1960 35 and in 1964 the Government fixed the minimum daily wage of the worker as 50 piastres (10/-). It may be added that all able members of the farming family work in the field when required.

In spite of the growing resources of the Department of Agriculture Machinery, it cannot fulfil the farmers demands for services. Farmers register their requests for tractors at the Agricultural Guidance Office which represents the Ministry of Agriculture in the mudiria. The Agricultural Guidance Office sends the application to the head office in El-Marj. At the time of ploughing or harvest, the Department sends two tractors to each mudiria namely El-Marj, Farzughah and Batta. The tractors do not work on El-Hemda farms as the topography of the area makes it a difficult task. The tractors

* The farmers claim that the Makarwi ten years ago got only £1.3.4 per month, but with oil discoveries, he became scarce and expensive

work on four farms every day at the rate of £L.150 per hectare for ploughing £L.2.50 for ploughing and seeding and £L.2 for harvesting and threshing. As the number of machines is insufficient and the cost is high the majority of farmers depend on family and hired workers. The comparative cost for animal labour in £/hectare is as follows:-

1 man, 1 horse with wooden or nail plough	
5 men's working days at 35 piastres	
+ 10 piastres food	2,25
5 days forage for drought animals	
at 10 piastres	0,50
	2,75

There are also co-operative societies and private owner tractors who hire machines to the farmers. The average tractor costs as given in interview by private tractor owners in El-Marj were as follows:-

Labour cost in £/ha.

Caterpillar deep ploughing	4 - 5
12.15 cms. deep ploughing	1 - 1.5
Disc Harrows	1
Three disc plough	3
Disc Harrow	1

For the operation of a combine harvester, farmers pay the same percentage of the threshing yields as is paid to farm workers who reap by sickle and thresh under horse's hooves. However, because of increasing scarcity of labour, harvesting by manual work will become more expensive

than the employment of a combine harvester.

The rush periods involving labour to a large extent in most of the Ente farms, are harvesting of grain (maximum amount of manual labour work) and the sowing time (maximum amount of drought or traction work).

The farmers claim that the Agricultural Department machinery is usually used by influential people who have large pieces of land requiring the use of tractors for a long time. This complaint was expressed by the administrative personnel of the Department. This practice is common in under-developed countries.

Capital:- Many Ente farmers operate on a credit basis. The most frequently used forms are the commodity account at the local merchant's settled on the sale of grain, at a low price, before harvesting. Information given by farmers discloses rates of interest between 10 and 20% for credits from local merchants which, however, are not rigidly termed, terms being granted up to one year as compared with the 6% interest charged by the National Agricultural Bank over 6 months. Since the latter credits are given for a 6 months term only, they are adequate only to bridge over the period before harvesting or to cover current production expenses as, for instance, the additional purchase of seed or the payment of day-workers (tractors). Many farmers even prefer expensive unorganised credit, since in a year of crop failure merchants are ready to wait for repayment, whereas to repay the bank,

it is often necessary to sell cattle.

The type of National Agricultural Bank credit is not encouraging for the extension of tree cultivation since orchard trees take several years to produce.

The Ente farmer is a tenant, and cannot normally offer securities to the Agricultural Bank for long-term loans and thus has recourse to traditional credit sources. The farmers on the private farms in El-Marj Plain do not seem to face such difficulties since most of them are rather better off than the Ente farmers and most of them (the private farmers) can offer security in the form of land or tree crops.

Type of farming:- Dry farming is practiced in the whole of El-Marj Plain and irrigation is not used except on a few hectares in the Experimental Station and two private farms (Hifter and Cerasola farms). The two farmers reported irrigation of eight hectares altogether. They use a pump diesel motor though the pump in Hifter farm is lying idle because of lack of maintenance. Both farms own their own wells. Irrigation on the Ente farms is restricted to irrigation of newly planted trees since water from cisterns is used for domestic supply and watering animals. On the coastal plain where the water is near the surface, irrigation is employed on many Ente farms and for suani* grown crops.

* Suani:sing.Sania is the Libyan term for a small irrigated garden varying in size from 1.5 ha. to 6 ha.

Ploughing:- This is currently being done with ploughs of different types according to whether animals or machine tractor are being used. Many farmers on the Ente farms and most of the tribes people use the local wooden nail plough, which is a small iron plough pulled by a horse. In regard to the private farms which have tractors at their disposal, the following method is follows: in the spring and summer; fallow land is deeply-ploughed, beginning after the completion of sowing and before harvesting the cereal crops. This prevents the weeds from running to seed. Most of the Ente farmers do not harrow the fallow land during the summer or spring.

Seeding:- Sowing the seed is very important in El-Marj Plain, for when sowing is done early and satisfactorily, it can influence greatly the resultant harvest. Sowing by hand is done mostly by the Ente and tribal farmers, who scatter the seed on ground which has not been cultivated, and then cover it by the means of a simple plough.

The private farmers utilize mechanical seed drills which have many advantages such as economy in the quantity of seed required, uniformity in the rate of seeding and in depth of sowing, minimising the losses caused by birds and making it possible to do weeding between the rows.

The farmers sow in the period between the first rain in October - November to as late as early February.

The results obtained from the Zorda Experimental

Station show that the highest yield is obtained from cereals sown between the beginning and the end of November, and the lowest yield was from wheat sown in mid-February. (6)

The quantity of seed per hectare varies from one zone to another. On El-Marj Plain 40 kilos per hectare may be used. In the Barr there are many cases where the cultivator sows only 15 to 20 kilos of seed per hectare. This may be explained by the fact that shifting cultivation in Barr is risky since the rainfall is very low and varies in quantity and the place from year to year. The following table gives the quantity of seed in El-Marj Plain for different crops:-

Table 30:- Seed quantities in El-Marj Plain

Crop	Seed quantity Kg/hectare	Note
Wheat	40	The local custom, <u>Ente</u> farms.
	60-70	Mechanised private farms
Barley	30	The local custom, <u>Ente</u> farms
	50-60	Mechanised private farms
Common oats for hay	40-50	Most frequent <u>Ente</u> farms
	70+	Maximum, <u>Ente</u> farms and private farms.
Chickpeas	30-35	Most frequent, <u>Ente</u> farms
	50	Maximum, <u>Ente</u> farms
	100	Mechanised private farms
Garden peas	30-40	Most frequent <u>Ente</u> farms
	100	Mechanised private farms
Fenugreek	30-35	-

The table shows that private farms apply a greater quantity of seed.

Accurate tests made at Zorda Station and in several Ente farms have shown higher yields are achieved by the following factors:-

1. Drill sowing instead of the locally employed broadcast sowing.
2. Increasing the quantities of seed of wheat from 60 to 70 kgms. per hectare instead of thin spread sowing of around 50 kg. per hectare, as it is the custom in the most of the Ente farms and tribal land.
3. Avoiding delayed sowing after mid-January, but maintaining the sowing period of November to January in order to reduce the risk of bad crops, since in years of ample rain or heavy spring rains, winter drilled cereals give the better yields.

Rotation:- In the present agricultural system rotations are important and frequently it is the introduction of suitable rotations that will most improve and increas yield. The choice plants for rotating is resiricted in Cyrenaica more than in more temperate countries, because farming has to be done during the winter in the period of rainfall, and this imposes a measure of restraint on the number of crop varieties that may be cultivated, especially since the rainfall is low, and in a season of poor rains the crops may fail completely. The farmers on El-Marj Plain do not pay much attention to rotation in their system of farming. Farming here is generally of the non-irrigated type, where wheat is grown in the suitable soils in areas of greater rainfall, and barley on the marginal land or in the lower rainfall areas. Of the total farms investigated, only 35% of the farmers in El-Marj Plain and the adjacent areas

practice a two year fallow rotation. Of those in El-Marj Plain 40% of the private farms and 20% of the Ente farms follow a two-year rotation, 50% in Farzugh, 40% in El-Hemda, 43% in Tulmeitha, 40% in Batta, 20% in Tacnis and none in Jardas El-Abid. Practically no fallow rotation practiced on the tribal lands. The farm land is usually divided into two, one-half cultivated under cereals, mainly wheat while the rest is left idle for the whole year, to be cultivated next year. Some farms in El-Marj Plain cultivate oats or legumes in one half of the farm instead of fallowing, but well-off farmers who can afford the cash cost of utilizing all the land each year are very few indeed. Almost all the farmers who do not use an alternate fallow system claim that this is necessary because of the shortage of land and the invasion most of the farm land has by maquis scrub. Some farmers leave half of their farm land in fallow for a year, since, they claim, they are short of seed.

However, nearly all the Ente farmers confirm the fact that the better cereal crops are attained after growing legumes. Unfortunately, in the most of the Ente farms legumes are grown only to such a small extent as to be quite insufficient to enable a regular true rotation of crops. Broad beans and chick peas leave even the heaviest type of Terra Rossa soil loose and fermented.

The results obtained from experiments in Zorda Station suggest that a four year true rotation is most suitable.

Under this system, land is divided into four parcels; in the first year crops cultivated are legumes, wheat, oats and linseed on each of the four parcels respectively. In the second year, wheat is cultivated on the land occupied by legumes, oats to replace wheat, linseed instead of oats, and legumes to replace linseed; and so the cycle of crops is continued until the end of the four year when the cycle is completed.

Thus in addition to getting good profits from the cereal (wheat) one will also get forage necessary for animals, and legumes which can be used for human consumption (and there is always the possibility of selling some part of the legume crop on the local market) although there is at present no substantial demand.

Rainfall and Crops:- The region extending from north of El-Abiar to Batta receives an annual average between 300 and 500 mm. (Vide Fig.No.18). As almost all the cultivation is non-irrigated, yields depend upon a rainfall which fluctuates from one year to another, and varies in quantity from area to area. The wet season September - March corresponds to the effective agricultural year. If the early autumn rains come too soon they may do harm because it often happens that such rains are followed by a long period of fine weather. If the farmer has sown his seed prematurely some damage may result despite the fact that young seedlings have a considerable

resistance to drought. The March rainfall is also very important for maturing the crops and if it fails, this means the failure of the crop.

The fluctuation of rainfall from one year to another is reflected in the unstable quantities of cereals produced. The year with heavy and well distributed rainfall over the seasons means ample production and wealth from the cereal livestock farmers. Years of less rainfall or of complete drought means the complete failure of the crop and starvation of animals. The effects of the rainfall will be discussed in later paragraphs. It is a fact that El-Marj Plain and the Jebel as a whole is more fortunate in this respect than other parts of Cyrenaica since even when there is severe drought in the country, the Jebel enjoys some rainfall though much below average.

Fertilisers and Manures:- The soils of El-Marj Plain being generally fertile as regards plant nutrients (compared with the rest of Cyrenaica and those of Tripolitania) results in El-Marj farmers obtaining relatively high yields without using any manure, particularly since production of crops depends more on the amount and distribution of rainfall than on the amount of nutritive elements in the soil; (This does not mean that manures and fertilisers are of no importance whatever). In El-Marj Plain, which has a reasonably certain and adequate rainfall, the use of fertilisers tends to

increase the production of crops, but virtually no farmers use fertiliser or manure in their farming operation. The results obtained from experiments in the Zorda Station show phosphate fertilisers are the most suitable for Cyrenaica as most of the soils are deficient in phosphorous, and they are of special importance in soils which have little nitrogen.

Cropping Practices and Output

1. Methods of cultivation

Wheat has undoubtedly been cultivated in Cyrenaica for a very long time, although the cultural tradition is not continuous and available evidence tends to show that methods of cultivation used in Greek and Roman times were superior to those now generally used in the area today.

At the present time, most ploughing is done with a small, light plough that is capable of only superficial work, while use of manures, fertilisers and insecticides is almost totally absent from farming practice in the area. Mechanised agriculture is confined to private farms or areas leased from the government and worked by contractors (mainly in the area south west of El-Marj Plain).

Official statistics concerning cereal yields are both incomplete and, generally, inaccurate. Normally, farmers calculate productivity in terms of seed multiplication rather than in return per unit of surface area cultivated. Hence, in the following paragraphs it will be necessary to refer to yields in both measures.

Local methods of harvesting cereals make the process costly and lengthy even where partnership arrangements or outside labour are introduced. The duration of the harvest is so long that even on the coastal plain where crops mature early, harvesting is often continued well into July or

sometimes August with a consequent loss of grain from the scattering of ears and the ravages of birds. The position is aggravated by a severe shortage of labour to the extent that in 1960/61 crops were left unharvested for want of labour. It is estimated that as a result of local differences in climate that the cereal harvest may be taken up to 20 days earlier on the coastal plain than in the uplands to the immediate south. Mechanisation of harvest operations, even if machinery were generally available, would not be possible throughout the region since most fields are broken up by clumps of scrub and occasionally the wheat crop is found interspersed with small shrubs (Vide Plate No.5a). At present, where private operators or co-operatives own or rent machinery, the entire harvest process is mechanised (Vide Plate No.9a). Over much of El-Marj Plain, however, harvesting and threshing are carried out manually, reaping by sickle, being employed for cutting the crop and animal trampling and hand winnowing being used for later operations (Vide Plate No.9b).

Local systems of grain storage are primitive, the main storage for grains being holes dug out in the ground, which filled with wheat or barley, are then covered with straw and earth and called Caf. Up to 1961, producers of large quantities of grain used rent space in the El-Marj silos, where some 27 small rooms of 400 quintals capacity were available. The silos are now used by the government for the



Plate 9 (A) - Mechanised farm north of El-Marj using combine harvester with the constrast with plate 9 (B).

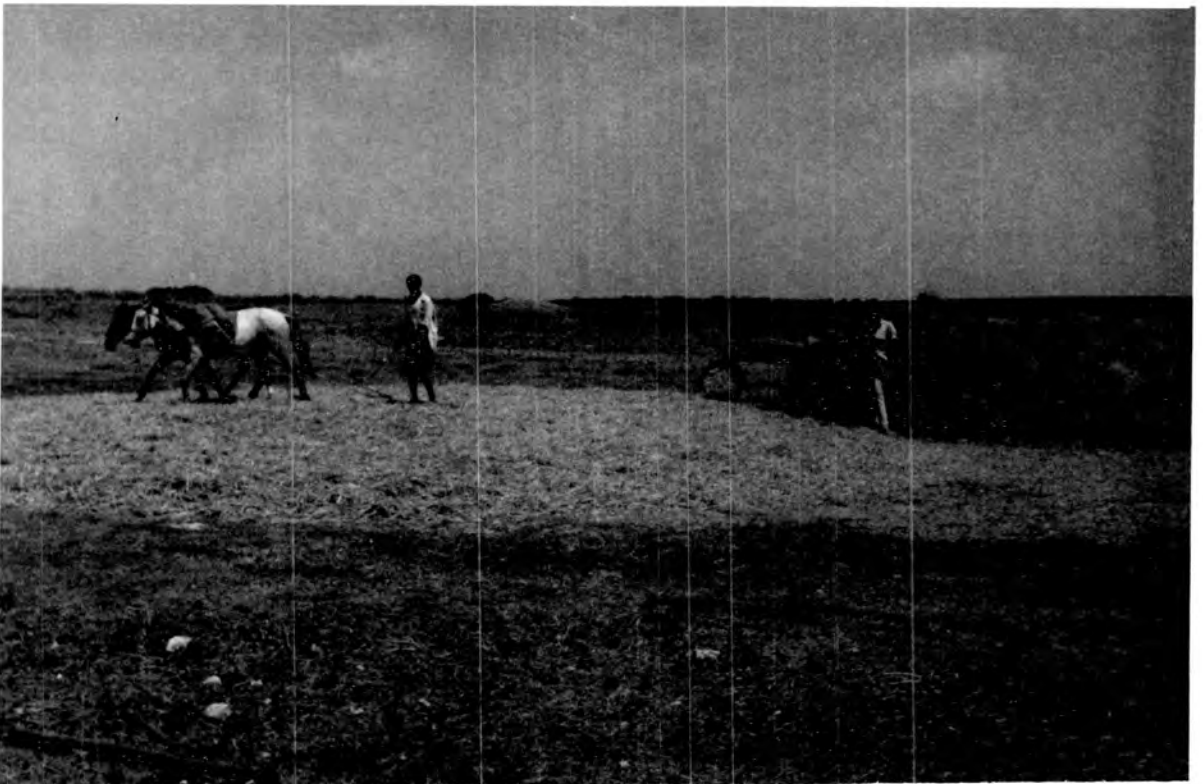


Plate 9 (B) - A farm using manual labour who reap by sickle and thresh under horse's hooves.

storage of grain purchased on its own account.

2. Land utilisation in El-Marj Plain.

Agricultural production in El-Marj Plain is primarily based on dry farming, with only fourteen hectares irrigated throughout the area. Along the coast, irrigated crops can be found in the suani of Tulmeitha and Tobra but extension of the area is limited by the presence of brackish water.

El-Marj Plain represents the best potential area for cereal cultivation in Cyrenaica and, indeed, in Libya as a whole*. Total utilised land and its distribution in the Mudirias of the Mutasarrifia of El-Marj is shown in Table 31.

* The name El-Marj means meadow, a significant indication of its prestige in critical Bedouin eyes.

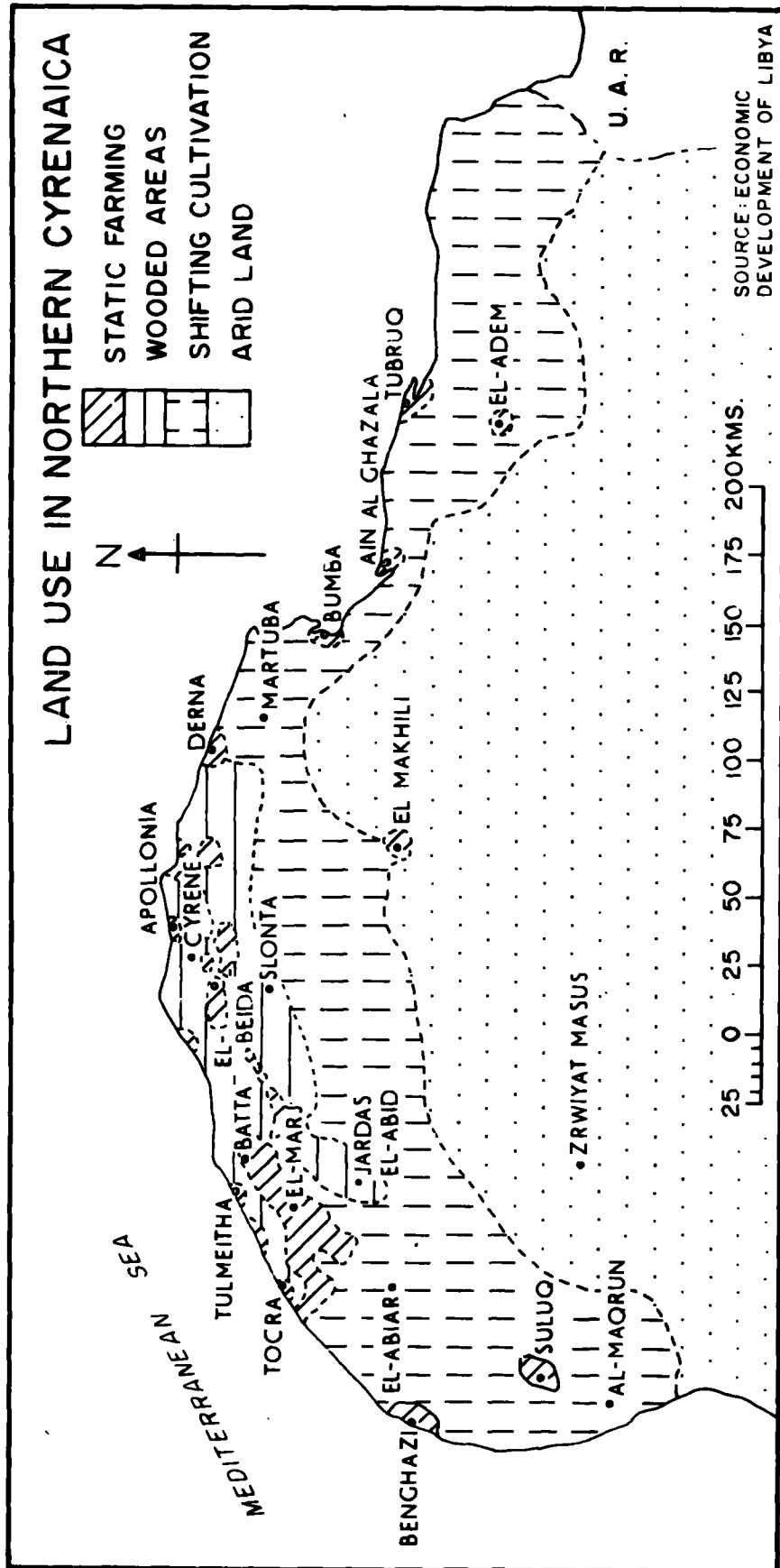
TABLE 31

Table 31:- Utilised land in the Mutasarrifia of
El-Marj by mudiria (1960) in hectares.

Mudiria	Arable Land	Land under permanent crops	Permanent Meadows and pastures	Total utilised Land
El-Marj	58117	1374	3973	63464
Tulmeitha	25927	35	25	25987
El-Bayada	27239	13	-	27252
Tacnis	33754	12	8352	42118
Jardas	47989	12	1695	49696
El-Abid				
Total				
Mutasa- rrifia	193026	1446	14045	208517

Source:- 1960 Census of Agriculture
 (The figures of the Mudiria of El-Marj apply to most of El-Marj Plain, except in the west where they include the crest region, and those of Batta which were included in the Mudiria of Tulmeitha until 1962).

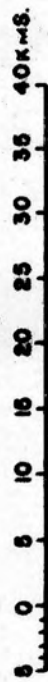
A conservative estimate of total cultivated land in El-Marj Plain may be made at 28,000 ha., though it must be borne in mind that recent adjustments in district boundaries make this figure difficult to confirm. In fact, utilisation of El-Marj Plain for cultivation on a large-scale was introduced in recent times by the Italian colonial administration through the Ente per le colonizzazione della Libia, under which cereal growing was undertaken. This



latter scheme was discontinued during the Second World War and has never been successfully revived. Beginning in 1943, Bedouin groups moved back into the Ente farm areas from which they had been expelled during the Italian occupation. At the present time, El-Marj Plain is the largest single area of sedentary agriculture in the province (Vide Figure No.39).

Figure No.40 illustrates the general pattern of land use in El-Marj Plain and its adjacent areas. Those areas between the foot of the second escarpment (south of El-Marj) and the crest of the first escarpment are intensively cultivated, mainly under wheat. Tree crops are concentrated in the private farms south and west of El-Marj town, while vegetable growing is important as a summer crop in the El-Ghariq in years of winter floods. The main belt of cultivation lies between Batta in the north-east, Sleaia in the southwest and Bacur in the west and runs to a point some 8 kms. east of El-Marj town. In effect, the belt follows the topographical features, taking in most of the level surface of the plain. From the data in Figure No.38 as against data presented in Figure No.40, it may be seen that as a result of chronic maquis scrub invasion over the former Italian estates, the surface area used for arable farming has declined considerably. The irregular scattered parcels of cultivated land on the fringes of the Plain are under tribal occupation, while areas of shifting cultivation lie in the zone south of Tacnis and Jardas El-Abid, extending south as far as Es-Serual region.

PHYSIOGRAPHIC REGIONS OF EL-MARJ PLAIN AND THE ADJACENT AREAS



SEA

MEDITERRANEAN

SAHEL

CREST

REGION

EL-MARJ

PLAIN

EL-ESTATA

EL-LAULAB
-EL-KUF
REGION

JEBEL

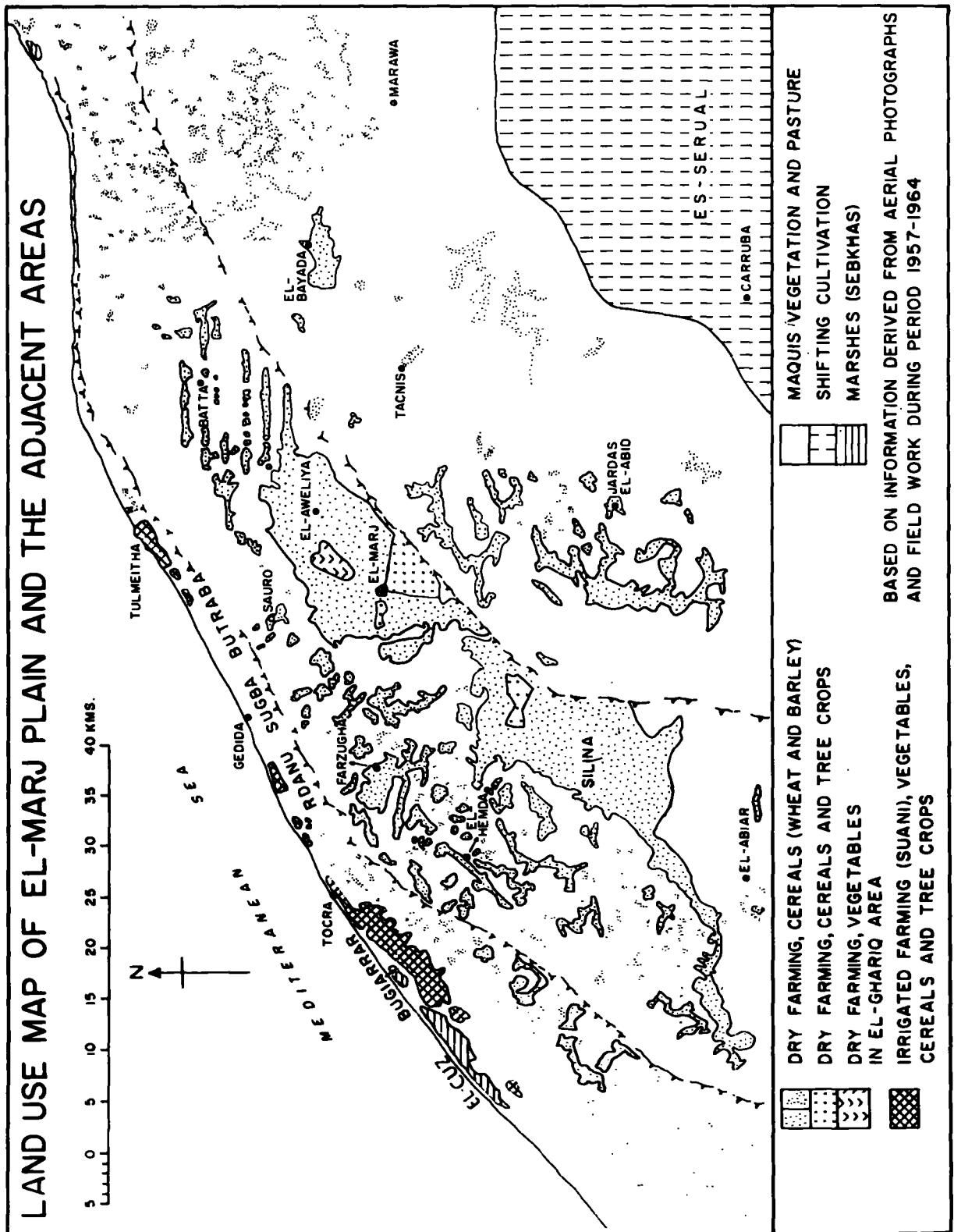
HIGH

TAWO AZZA

SILINA

EL-ABIAR

Figure 40



The total cultivated area in the Mutasarrifia of El-Marj is 80,743 ha. Most of the cultivated area is occupied by cereal (wheat and barley), whilst only a small portion is devoted to tree crops and field crops and vegetables, as shown in Table 31A.

TABLE 31A.

Table 31A:- Total cultivated land by types of crops in the Mutasarrifia of El-Marj by Mudiria, in relation to Cyrenaica in 1960 (in ha.)

Mudiria	Cereals	% to the total cultivated area	Permanent crops	%	Field crops & vegetables	%	Total cultivated area	%
El-Marj	31743	95.8	1374	4.1	12	0.1	33129	100.0
Tulmeitha	13417	99.5	35	0.2	39	0.3	13491	100.0
El-Bayada	9503	99.3	13	0.1	55	0.6	9571	100.0
Tacnis	10464	99.9	12	0.1	-	-	10476	100.0
Jardas	14064	99.9	12	0.1	-	-	14076	100.0
Total Mutaria of El-Marj	79191	98.1	1446	1.8	106	0.1	80743	100.0
Cyrenaica	286809	94.9	8346	2.8	6940	2.3	302095	100.0

Source:- 1960 Census of Agriculture.

As noted earlier (Vide Chapter V, Water Resources), El-Ghariq area, the lowest point in El-Marj Plain, is flooded on average once in every four or five years. Since there is no advance intelligence of whether or not the wet season will be accompanied by flooding, most farmers undertake annual grain

cultivation since, in the absence of floods, crops in El-Ghariq yield exceedingly well, even in dry years, since the soil moisture content is invariably high. At times of flood, particularly when the water recedes slowly, the grain crop is destroyed. The better farmers compensate for this loss by planting vegetables on the land left as the water recedes, with tomatoes and melons as main crops. Occasionally, additional supplies of vegetables made available from El-Ghariq in years of plenty lead to over-supply and a breakdown in prices.

3. Cereal production in El-Marj Plain

Hard wheat dominates production in El-Marj Plain, and only a few quintals of soft wheat have been produced in recent years. Hard wheat offers producers many advantages - it is resistant to the effects of the Ghibli and is otherwise well adapted to local climatic conditions particularly in its ability to be sown successfully over the long period October/January. At the same time, it is easily stored without undue risk of deterioration, and additionally has a ready and profitable market. The principal varieties of local wheat are Maghrabia and Mahmudi, while an Italian introduction, Florence-Auroia, is also popular.

Distribution

Barley is the basic crop in Libyan agriculture, but in El-Marj Plain a considerable proportion of land is given to wheat. Although barley constitutes the

basic element in the Libyan diet, in the last decade there has been an increasing trend towards wheat cultivation as demand for wheat flour has grown particularly in urban centres. Oats cultivation at present does not exceed ten ha. in El-Marj Plain, although in Italian times some 100 ha. were cultivated. Cereals occupy 94.9 per cent of the total cultivated land in Cyrenaica (1960), 98.1 per cent in the Mutasarrifia of El-Marj, 95.8 per cent in the Mudiria of El-Marj and more than 99 per cent in the Mudirias of Tulmeitha, Tacnis, Jardas and El-Bayada (Vide Table 31A). Cereal cultivation occupies about 41 per cent of the total arable land in the Mutasarrifia of El-Marj, about 55 per cent in the Mudiria of El-Marj, 52 per cent in the Mudiria of Tulmeitha, 35 in El-Bayada, 31 per cent in Tacnis and 29 in Jardas El-Abid (Vide Table 32).

Table 32:- Area of cereal cultivation in the Mutasarrifia of El-Marj by Mudiria, in relation to Cyrenaica (1960) in ha.

Division	Wheat	Barley	Total area of cereals	% of cereals to the arable land
Mud.of El-Marj	7915	13827	31742	55
Mud.of Tulmeitha	2740	10677	13417	52
Mud.of El-Bayada	4043	5460	9503	35
Mud.of Tacnis	4411	6053	10464	31
Mud.of Jardas	5284	8780	14064	29
Mut.of El-Marj	34393	44797	79190	41
Cyrenaica	88948	197496	286444	39

Source:- 1960 census of Agriculture

Production

Rainfall is the determining factor in the success or failure of crops in the area, with variations in cereal production corresponding closely with the geographical distribution of rainfall. In the year 1959, for example, while the wheat crop failed entirely in Ajedabia, Benghazi and Tubruq, seed multiplication stood at 3.3 fold in El-Marj. For barley yields, much the same position was reported, with low returns in Ajedabia and Benghazi but with a multiple of 2.9 in El-Marj. The 1959 crop performance also exemplifies the fact that even in drought years El-Marj Plain and the Jebel as a whole enjoys more favourable conditions. Wheat and barley production for the period 1954/1960 in the Mutasarrifia of El-Marj in relation to Cyrenaica is shown in Table 33.

Table 33:- Wheat and Barley production for the Mutasarrifia of El-Marj in relation to Cyrenaica for the period 1954 - 1960 (in quintals).

Year	Crop	Cyrenaica qtls.	Mutasarrifia of El-Marj	
			qtls.	% to total Cyrenaica
1960	Total	442180	118838	27
	Wheat	127014	50672	40
	Barley	315166	68166	22
1959	Total	176070	96490	55
	Wheat	90640	58620	65
	Barley	85430	37870	44

Table 33 (Cont)

Year	Crop	Cyrenaica qtl.	Mutasarrifia of El-Marj	
			qtl.	%
1958	Total	367090	144700	39
	Wheat	135920	65790	48
	Barley	231170	78910	34
1957	Total	462560	91700	20
	Wheat	213430	50500	24
	Barley	249130	41200	17
1956	Total	266000	60000	23
	Wheat	84000	30000	36
	Barley	182000	30000	17
1955	Total	357000	72000	20
	Wheat	107000	37000	35
	Barley	250000	35000	14
1954	Total	320800	72000	22
	Wheat	94700	37000	39
	Barley	226100	35000	16

Source:- Agriculture Statistics in Cyrenaica
1959, and 1960 Census of Agriculture.

The data in the table shows clearly the fluctuations in the quantities produced from one year to the next. Drought years fell in 1954, 1955, 1956 and 1957 while above average years were recorded in 1958, 1959 and 1960.

The importance of cereal production on tribal lands is illustrated in Table 34.

Table 34:- Cereāal Production for the Mudirias of Mutas, of El-Marj by settled and tribal agriculture in 1960 (in qtls.)

Division	All tenure forms		Tribal tenure	
	Wheat	Barley	Wheat	Barley
Mud. of El-Marj	29097	18451	8506	5609
Mud. of Tulmeitha	7405	20321	4425	14743
Mud. of El-Bayada	5985	13639	564	1242
Mud. of Tacnis	3331	6102	1111	2163
Mud. of Jardas	4854	9653	2258	4968
Total Mutasarrifia of El-Marj	50672	68166	16864	28725

Source:- 1960 Census of Agriculture.

The table indicates that of the total cereal cultivation in the Mutasarrifia of El-Marj, the major portion (62 per cent) still supplied by Ente and private farms, with some 38 per cent is accounted for by production on tribal lands. It is also apparent from the table, that, with the exception of the Mudiria El-Marj, cereal production on tribal lands is biased towards barley rather than wheat. Wheat grown on tribal lands is usually marketed as a cash crop.

The supply of cereals in El-Marj (Mutasarrifia) in 1960 came from the following mudirias:- 40 per cent from Mudiria of El-Marj, 23 per cent from Tulmeitha, 17 per cent from El-Bayada, 8 per cent from Tacnis and 12 per cent from Jardas El-Abid.

Yields

Detailed comparison of cereal yields in the years 1959/60 (a drought year) and 1960/61* (a good rainfall year) may be seen in Table 35. Yields in 1960/61 were almost double those in 1959/60, while in the same year the most frequent yield and highest maximum yields were reported.

Table 35:- Yields of Wheat and barley in 1959-60 and 1960-61 in the Mutasarrifia of El-Marj

Wheat (seed quantity 40 Kg./ha. Dry land	1959-60		1960-61	
	Seed Multipl- ication	area out- put qtl./ha.	Seed Multipl- ication	area out- put qtl./ha.
Most frequent yield	3-5	1,2-2	8-10	3,2-4
Maximum yield	8-10	3,2-4	12-14	4,8-5,6
Small yield	1-2	0,4-0,8	6	2,4
Inundation land				
Good yield in El- Ghariq area	12-14	4,8-5,6	-	-
Maximum yield in El-Ghariq area	36	14,4	-	-
<u>Barley</u> (seed quantity 30 Kg./ha. Dry land				
Most frequent yield	4-5	1,2-1,5	3-5	0,9-1,5
Maximum yield	8-12	2,4-3,6	10	3
Small yield	1-2	0,3-0,6	12-15	3,6-4,5
Inundation land				
Good yield in El- Ghariq area	8-12	2,4-3,6	20	6
Maximum yield in El-Ghariq area	16	4,8	25-30	7,5-9

* Data based on samples from field work questionnaires;
and official sources.

El-Ghariq area recorded a seed multiplication in 1959/60 three times that achieved elsewhere for reasons outlined earlier in the present section. The maximum seed multiplication reported at El-Ghariq in a drought year is 36-fold as against an average of 6 to 8-fold for the Mutasarrifia as a whole.

Regional details of yields and production of cereals in 1959/60 for the Mutasarrifia of El-Marj are given in Table 36. This table indicates that there were considerable variations in wheat yields in the various districts.

Division	Total Cereals			Wheat			Barley		
	Area sown	Production	Yield /ha.	Area sown	Production	Yield /ha.	Area sown	Production	Yield /ha.
Mud.of El-Marj	31742	47548	1,50	17915	29097	1,62	13827	18451	1,33
Mud.of Tulmeitha	13417	27727	2,07	2740	7405	2,70	10677	20321	1,90
Mud.of El-Bayada	9503	19624	2,07	4043	5985	1,48	5460	13639	2,50
Mud.of Tacnis	10464	9433	0,90	4411	3331	0,76	6053	6102	1,01
Mud.of Jardas	14064	14507	1,03	5284	4854	0,92	8780	9653	1,10
Total Mutasarrifia	79190	118839	1,50	34393	50672	1,47	44797	68166	1,52
Cyrenaica	286444	442180	1,54	88948	127014	1,43	197496	315166	1,60

Table 36:- Cereal production and yield per hectare in the Mutasarrifia of El-Marj by Mudiria in 1960 (in qtls. and hectares).

Source:- 1960 Census of Agriculture.

The lowest wheat yields were recorded in Tacnis and Jardas El-Abid, where rainfall was insufficient for cropping in the agricultural year 1959/60, and, in fact, the average rainfall in these districts is always less than in El-Marj Plain (Vide Chapter III). Barley yields were also low in Tacnis and Jardas El-Abid compared with results achieved elsewhere. Unfortunately, official statistics for 1960/61 are not available but the yield results for that year have been extracted from the questionnaire survey undertaken by the author. To give a comparison of yields from dryland production and irrigated production the figures in Table 36 may be contrasted with figures from Tripolitania in the same year when yields from irrigated land are reported to be 7.9 quintals per hectare for wheat and 6.66 quintals per hectare for barley. (7)

Cereal yields in Libya as a whole are very low compared to other neighbouring countries (Vide Table 37) and must rank amongst the lowest in the world.

Table 37:- Average yields of wheat and barley in Libya and some neighbouring countries

Country	Wheat average yield qtls/ha.	Barley average yield qtls/ha.
Morocco	5.6	6.2
Algeria	6.3	5.9
Tunisia	4.0	3.9
U.A.R.(irrigated)	23.2	23.7
Libya	1.7	1.6
Africa	7.1	5.4

Source:- Agriculture of Libya and its Development
(1964)

Nonetheless, the favoured El-Marj Plain is still able to produce adequate cereals to meet local demand and in good years the area exports its surplus to Tripolitania, Figures supplied by the Silos Office in El-Marj town show that government wheat purchases in 1960/61 and 1962/63 were 19,000 and 44,808 quintals respectively. Since 1960/61 the government has been actively encouraging wheat growing, offering a guaranteed £4.20 per quintal and giving priority in use of machinery to those who regularly sell cereals to it. Such purchases are used to provide seed under government distribution schemes and to aid the stock-piling of cereal reserves for use in drought years.

Table 38:- The Production, Imports, Exports and Consumption of wheat in Libya 1954 - 1961 (in quintals).

Year	Production	Import	Export	Consumption
1954	152,700	+176,850	-	329,550
1955	138,000	+ 9,100	-	147,100
1956	133,000	+ 7,020	-	140,020
1957	447,430	no data	-	447,430
1958	263,920	-	-37,370	226,550
1959	230,640	+47,850	-	278,490
1960	334,895	+ 870	-	335,765
1961	299,992	+138,520	-	438,512

Source:- Agriculture of Libya and its Development (1964).

The figures in Table 38 indicate that both domestic production and imports of wheat are increasing, though in the last three years, imports have increased much more rapidly than home production. In 1961, domestic production accounted for only 68 per cent of wheat consumed in Libya, where as in 1955 some 94 per cent and in 1954, 45 per cent was locally produced.

Table 39:- The production, imports, exports and consumption of barley in Libya 1954 - 1961 (in qtls.)

Year	Production	Imports	Exports	Consumption
1954	612,100	+30,500	-	642,600
1955	561,000	+32,100	-	593,100
1956	493,000	+33,970	-	526,970
1957	1,100,130	no data	-	1,100,130
1958	612,170	-	-3,200	608,970
1959	503,430	-	-2,000	501,430
1960	1,167,901	+1,420	-	1,169,321
1961	732,059	+33,410	-	765,469

Source:- Agriculture of Libya and its Development (1964)

Barley production in recent years has fluctuated considerably, with no clear trends emerging (Vide Table 39). By and large, domestic production suffices to cater for local demand in most years, with small quantities available for export in good years and the need for minor imports in years of drought. The relative importance of barley and wheat is

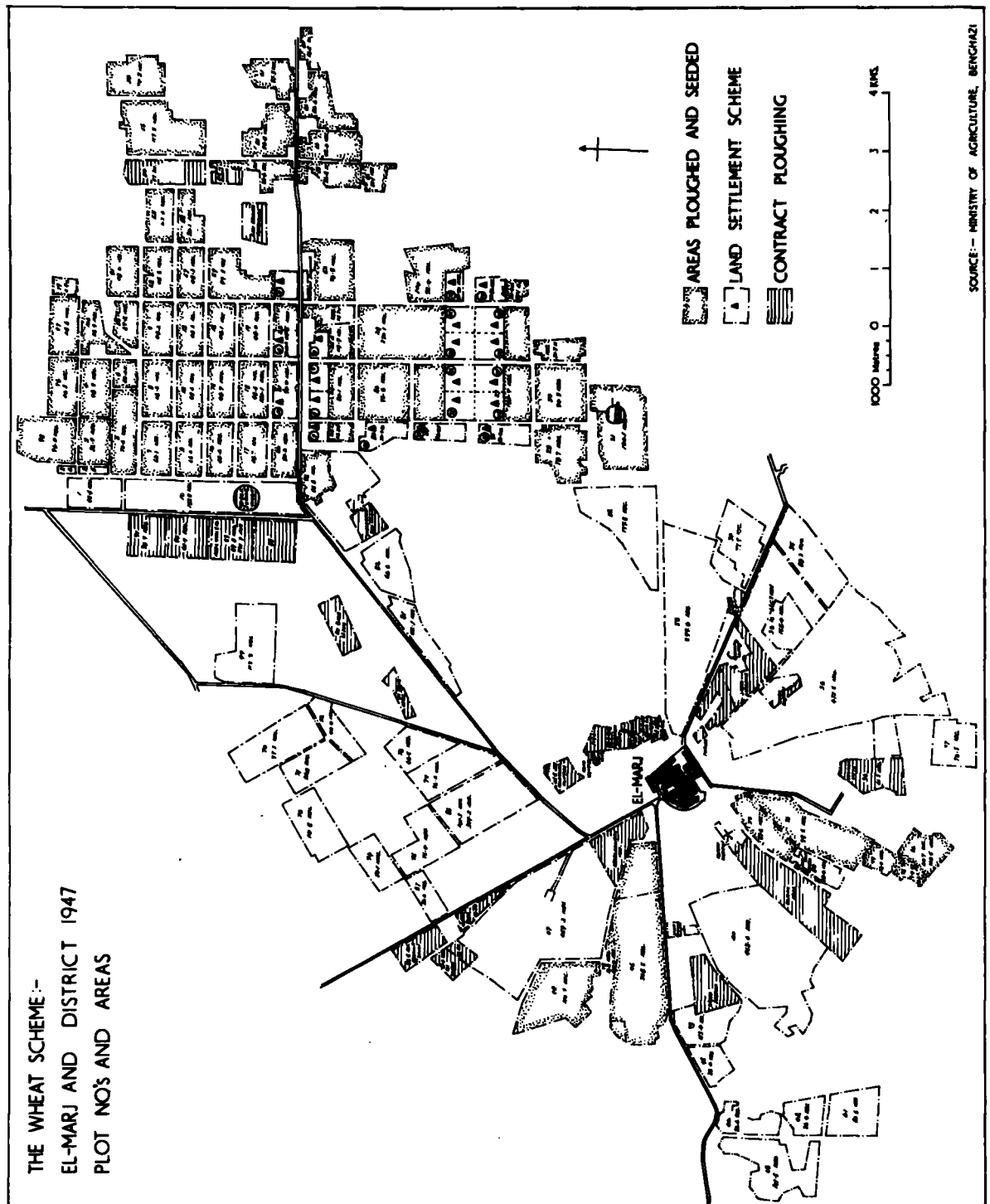
changing as a rise in the standard of living leads to an increasing preference for wheat flour, with barley more and more used for animal feed. In El-Marj, local production of wheat is more than adequate to cover local needs, while, for the country as a whole imports are necessary in most years. The particular adaptation of the El-Marj region to wheat cultivation gave rise to the well-known cereal scheme in the area during the last war.

The MESC wheat scheme.

The Barce (as it then was) Wheat Scheme was launched by the British Military Administration of Libya (B.M.A.) in 1943 immediately after the Italian withdrawal from the province. The aim of the project was designed to make the area self-sufficient in grains for the war period so that the Allied advance into new territory would not throw further strain on the Middle East Supply Centre. The area encompassed by the scheme included the Mudiria of El-Marj (east El-Estatā, west to Marzotti farm some six kilometres west of El-Marj) to Sidi Said in the north and the foot of the second escarpment in the south, giving a total area of 20,000 ha. (Vide Fig. 41).

The cultivated area was divided into two sections and used for a two-year rotation of wheat-fallow. Since the scheme was operated under war-time conditions, the existing Italian machinery was overhauled and re-used, remaining in service until 1945/46 (an interim attempt to introduce new

Figure 41



machinery failed since the type of tractor was too heavy for the soils of the area). From 1946, 50 caterpillar tractors were successfully utilised on the scheme. The task of ploughing the cultivated area began in late October and continued into January, while harvesting occupied the months of July and August. Cultivation was managed in 25-75 ha. plots. The harvested grain was transported to El-Marj silos before eventual dispatch to the flour mill and sale to merchants. Production from the scheme is reported to have been about 75,000-80,000 quintals per year, using a total labour force of 275.

Bedouin who had occupied farmhouses on the evacuation of the Italian settlers remained in occupation, but were required to move their flocks away from the cultivated area in February and were not allowed to return until the completion of the harvest, although they were allowed to cultivate unutilised areas on the periphery of the scheme for their own field crops. Attempts during the B.M.A. period to settle Bedouin on the ex-Italian farms largely failed, mainly as a result of the technical inability of the Bedouin in arable farming.

The scheme ended in 1950/51 after the withdrawal of the British, though closure was brought on as much by the incidence of a total crop failure due to severe Ghibli wind conditions as the actual withdrawal of expatriate personnel.

4. Cultivation of other field crops

Cultivation of other field crops in El-Marj Plain, compared to cereals, is a minor activity, with no more than 476 ha. involved, mainly in the Ente farm and suani areas. Chickpea is an important crop in Libya as a whole, being used as a garnishing on most local dishes. Its cultivation, though extremely limited in El-Marj Plain, is increasing in the eastern Jebel Akhdar. According to the 1960 Census of Agriculture, 18 ha. of the crop was grown in the Mudiria of El-Marj. Chickpea is normally sown in February and harvested in July, with much of the crop finding its way to market. Broad bean cultivation in El-Marj is also limited (six hectares sown in 1960), with much of the present production confined to the Mudiria of El-Bayada. Small areas of fenugreek (hilba Ar.) are cultivated, mainly in the El-Ghariq region and on several private farms. The following table shows the yields of leguminous crops in the Mutasarrifia of El-Marj. It emerges clearly from Table 40 that drought conditions (1959/60) have only a slight inhibiting effect on the leguminous crops.

Table 40:- Yields of Chickpeas, Broadbeans and Fenugreek in the Mutasarria of El-Marj.

	1959-1960		1960-1961	
	Seed Multi- plication	Area Output qtl/ha	Seed Multi- plication	Area Output qtl/ha.
<u>Yield of Chickpeas</u> (seed quantity 35 Kgs/ha)				
Most frequent yield	6-8	2,1-2,8	6	2,1
Maximum yield	14-20	4,9-7	8-12	2,8-4,2
Small yield			1	0,35
<u>Yield of broad beans</u> (seed quantity 50 Kgs/ha)				
Most frequent yield	10-13	5-6,5	16	8
Maximum yield	17-20	8,5-10	33	16,5
Small yield	2-6	1-3	2-5	1-2
<u>Yield of Fenugreek</u> (seed quantity 40 Kgs/ha)				
Most frequent yield	10-12	3,5-4,2	10	3,5
Maximum yield	15-20	5,3-7	20-30	7-10,5
Small yield	2-4	0,7-1,4	4	1,4

Based on samples from fieldwork, questionnaires
and official sources.

Official statistics for leguminous crop production in 1960, covering only broad bean and chickpea cultivation, are summarised in Table 41.

Table 41:- Areas sown and production of chickpeas and Broad beans in the Mutasarrifia of El-Marj by Mudirias (1960), (area in ha., and production in quintals).

Division	Chickpeas		Broad beans		Total Area	Total Prod.
	Area	Production	Area	Production		
Mud.of El-Marj	18	14	-	3	18	17
Mud.of Tulmeitha	3	2	-	-	3	2
Mud.of El-Bayada	6	29	6	12	12	41
Mud.of Tacnis	-	-	-	-	-	-
Mud.of Jardas	-	-	-	-	-	-
Total Mutasarrifia	27	45	6	15	33	60

Source:- 1960 Census of Agriculture.

5. Garden crops

Commercial horticulture is practiced only over small areas in El-Marj, and indeed throughout the province, since consuming centres are small and limited to El-Marj, Benghazi and El-Beida. Transport problems figure prominently amongst the reasons given by farmers for their reluctance to attempt vegetable cultivation for the urban markets. A further problem arises from the lack of adequate and secure water supplies for irrigation in spite of the suitability of other physical conditions for vegetable cultivation. Amongst the

many vegetable crops which give excellent returns in El-Marj are winter and summer potatoes, dry onions, dry garlic, tomatoes, red, green and sweet peppers, water melons, melons, pumpkins, cucumbers, cabbage cauliflowers, green beans and green onions, though undoubtedly the tomatoes and melons excel all other crops. However, without a great improvement in communications and a reform of the marketing system, vegetable production in the area will remain largely for local consumption.

The limited scale of production of vegetable crops in the Mutasarrifia of El-Marj is clearly indicated in Table 42.

Table 42:- Production of garden crops in the Mutasarrifia of El-Marj by Mudirias (1960), in qtls.

Crops	El-Marj	Tul-meitha	El-Bay-ada	Tacnis	Jardas El-Abid	Mutasarrifia of El-Marj	
						Area(Ha)	Prod.
Tomatoes	814	71	152	-	-	} 95	963
Melons	21	18	136	-	-		
Water Melons	22	123	106	-	-		
Winter Potatoes	1	-	126	-	-	7	127
Summer Potatoes	+	18	-	-	-	1	18
Dry Onions	11	70	119	-	-	10	200
Dry Garlic	1	-	1	-	-	1	2
Pumpkins	13	6	19	-	-		

Source:- 1960. Census of Agriculture.

6. Arboriculture

The most important limiting factor governing the extent of, and success in, arboriculture in Cyrenaica is the low and fluctuating nature of rainfall in the area. Best adapted to local conditions are the olive and the almond tree which have taken well to the stony but deep soils of El-Marj Plain, while the vine too has proved useful and resilient. Of almost equal importance as a restraint on the spread of orcharding in the area is the fact that the local Arab (for the most part Bedouin) population is almost totally ignorant of techniques involved and, worse, has not yet learnt that orcharding and herding are mutually exclusive.⁽⁸⁾ The Italian plantations, with few exceptions, have been ruined by animal grazing over the past twenty-two years (almond trees in Cerasola farm), a destruction aided by neglect. Even on the more progressive of Arab Ente farms on the Plain, extension of the planted area is inhibited by insecurity of tenure and the lack of adequate water supplies for irrigation for the newly planted seedlings. Much of the Ente-farm area has been invaded by maquis scrub since the original clearances were undertaken by the Italian colonial administration, hence Arab farmers would be faced with the expensive task of clearing the land before new plantations could be established. As always in orcharding, the long maturing period between planting and fructification, which can often extend to a period of five or six years, is a further dis-incentive for the small farmer, especially in view of the limited credit facilities

available.

Environmental and cultural factors exert a strong pressure against a rapid and successful plantations policy in El-Marj Plain, but, with the existence of residual areas under Italian plantations and a determined policy in favour of orcharding followed by the Ministry of Agriculture, some progress is being made. The distribution of plantations is illustrated in Figure 40. Italian orchards specialised in particular tree cultures, though occasionally combinations of olive/almond, almond/vine and olive/vine were also planted, the former being most common. Inter-cultivation of tree rows is unusual, since land is not scarce on the private farms and large areas of open land are available for cereal cultivation. The predominant spacing for olive trees is 10 metres by 10 metres. As has been indicated earlier, the remaining Italian plantations are in poor condition and give only a poor production of fruit, a situation aggravated in the case of Yungi farm by old trees and the low rainfall. From data returned in the questionnaire survey, it was apparent that operators on large farms preferred cereal monoculture to joint orcharding and cereal cultivation, since they felt that orcharding was too demanding on limited supplies of labour and brought only a modest return against good profits made on cereals. Yet, during the Italian occupation, Yungi farm succeeded in attaining a profitable level of production in spite of poor

rainfall in its concession area. It is noteworthy that the Italians used superior irrigation practices to those at present employed in El-Marj and also had greater water supplies at their disposal.

Currently, good crops of grapes are taken at Cerasola farm (El-Sanusi) with the grapes sold to El-Beida wine factory and pressed on the farm itself. Almond plantations on the farm are everywhere poor for reasons outlined earlier. On the Hifter farm, in contrast to all other farms, fruit trees have been maintained in good condition by use of irrigation from a private well and careful cultivation. The area south of El-Marj town is occupied mainly by orchards (Vide Plate 10a) though the condition of trees is poor through chronic neglect. Vines, followed by olives are the most widely-cultivated and best maintained trees in the area since in good rainfall years they give a handsome return.

Throughout the Ente farm area, trees are sparsely planted since Italian orcharding activity did not spread to this area until 1937 and was incomplete on the outbreak of war. The Ente, more than any other area, has suffered badly through neglect and few of the Italian plantings have survived. The Icile began planting in 1939 and thus achieved less in this respect than Ente, while the concession has since been occupied by a tribe whose interests are exclusively pastoral

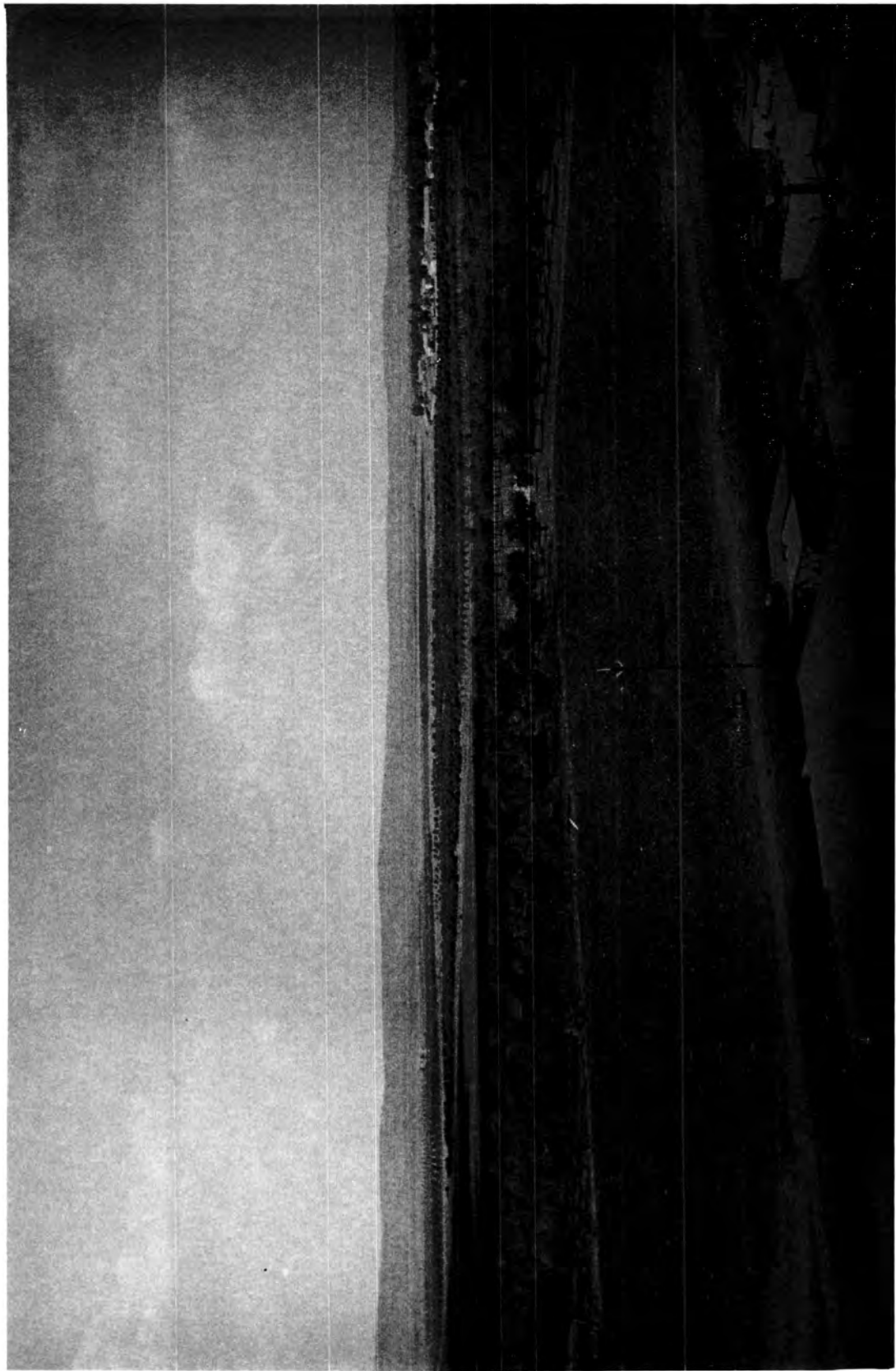


Plate 10 (A) - Tree plantations in the private farms south of El-Marj town. The second escarpment is in the background.

(with a limited concern with cereal culture). The following table shows the results of private concession, Ente and Icle orcharding activities in Cyrenaica up to 1940:-

Table 43:- Area and number of trees in private concessions, Ente and Icle in Cyrenaica up to 1940

Kind of trees	Private concessions		Ente		Icle		Total	
	ha.	No.	ha.	No.	ha.	No.	ha.	No.
Olives in compact plantations	2204	71860	2323	58075	335	13392	4862	143327
Almonds in compact plantations	770	85888	469	46876	67	4704	1306	137468
Vines in compact plantations	800	325650	806	2620871	27	67500	1633	3014021
Plantations other fruit trees	19	21390	387	154640	-	-	406	176030
Olive/ almond trees)	268	8711	994	29054	-	-	1262	37765
		25816		35006				60822
Vines/ olive trees)	96	65040	53	184840	-	-	149	249880
		3313		2340				5653
Vines/ almond trees)	4	13940	-	-	-	-	4	13940
		920		-				920
Along road sides olives and almonds	-	-	-	10068	-	-	-	10068
	-	-	-	9517	-	-	-	9517
Total	4161	622528	5032	3151287	429	85596	9622	3859411

Source:- "La Colonizzazione della Cirenaica", 1947, p.19.

The geographical distribution of plantations in El-Marj Plain and the adjacent areas is illustrated in Table 44,

where it can be seen that planting had reached an advanced stage in the central Jebel and had actually begun in the El-Marj area.

Table 44:- Number and areas of fruit trees planted by Ente in the Agricultural villages in El-Marj Plain and the adjacent areas up to 1940.

Village	Olives		Almonds		Vines		Other fruit trees		Total	
	Ha.	No.	Ha.	No.	Ha.	No.	Ha.	No.	Ha.	No.
Maddalena (El-Aweliya)	158	395	6	585	46	150630	41	16560	251	168170
Sduro	-	925	-	-	-	-	-	-	-	925
Oberdan (Batta)	-	8325	-	-	-	232070	79	31600	79	271995
Baracca (Farzugha)	-	7125	-	-	-	163440	25	10000	25	180565
Filzi (El-Hemda)	-	2825	-	-	-	-	-	-	-	2825
Total	158	19595	6	585	46	546140	145	58160	355	624480

Source:- La Colonizzazione della Cirenaica

The new orcharding policy

In the post-war period a renewed attempt has been launched to spread the area of orcharding in El-Marj Plain. As from 1956, the Department of Agriculture in the Provincial Government of Cyrenaica organised planting of fruit trees in the Ente farm area, with at least half a hectare being planted on each farm affected, By 1962, all Ente farms had some fruit trees in their garden plots. The tree planting

scheme operated on a voluntary basis whereby farmers interested in orcharding applied to the Agricultural Guidance Department for particular varieties of trees for planting on their farms. The Department of Agriculture provided a demonstration of planting technique and after-care for each applicant. In the early phases of the scheme, up to six hectares were planted on each farm, but latterly, following an increase in demand, it has been found more efficient to grant saplings for only one hectare or even half a hectare, especially since the Bedouin farmers can cope successfully only with a small area of this kind. The Department of Agriculture provided each applicant, free of charge, with 50 almond, 50 olive and other assorted tree varieties for planting on a hectare plot. Each half hectare was set with either 22 olives or 50 almonds. Whenever possible, cuttings were planted in the rainy season or otherwise instructions were given on amounts and frequency of irrigation to be employed in the plantations.

The tree planting scheme was reinforced by a Department of Agriculture subsidy which provides that if the first year's half hectare plantation is 85 per cent successful, the farmer receives a £20 grant, with subsequent years' operations subsidised by a bonus payment of £10 in the second year where he is 90 per cent successful and a further £10 in the third year where he is 100 per cent successful. In the case of vine cultivation,

bonuses of £40 in the first place with £10 for three years following are paid for the increasing degree of success achieved.

Olive cultivation

There are no indigenous types of olive in Cyrenaica. Italian plantations were mainly of Italian and Tunisian varieties, which are characterised by small fruits. Wild olive trees in the El-Gharib area in the east of El-Marj Plain have proved to bear good quality fruit after having been top-worked, producing commercial quantities of fruit in the fourth or sixth year after top-work.

The growth of the cultivated olive in El-Marj Plain is slow - trees planted eighteen years ago at the Zorda Experimental Station have reached only five metres in height and have a foliage diameter of five metres. Commercial production of fruit was not recorded until the tenth year, after which production ran at about 35-40 kilos per tree. On the coastal plain, where irrigation is practiced, production per tree is normally about 70 kilos, whilst average production per tree in the Plain itself is 10-25 kilos. It must be remembered that production from the Plain varies considerably depending on the rainfall characteristics of any given year, the degree of pest infestation and the labour available for harvesting.

Table 45:- Production and number of olive trees in the Mutasarrifia of El-Marj by Mudirias, in the Ente and private farms, 1958 - 1959 (in quintals)

Mudiria	Ente Farms		Private Farms		Total	
	No.	Prod.	No.	Prod.	No.	Prod.
El-Marj	13033	-	20894	876	33927	876
Tulmeitha	1705	-	165	-	1870	-
El-Bayada	209	-	-	-	209	-
Tacnis	-	-	-	-	-	-
Jardas El-Abid	-	-	-	-	-	-
Total Mut- asarrifia of El-Marj	14947	-	21059	876	36006	876

Source:- Agricultural Statistics for Cyrenaica, 1959.

The geographical distribution of olive trees is shown in Table 45, from which it can be seen that 94.2 per cent of trees are located in the Mudiria of El-Marj, with minor quantities found in Tulmeitha and El-Bayada. The figures in Table 46 illustrate the pre-eminence of the compact plantations in total olive trees (accounting for 73.4 per cent of total in 1960). Of total production some 24 per cent are used for oil and 76 per cent for table use.

Although olive oil is the main edible oil used in the local diet, local supplies are inadequate to cater

Table 46:- Area, Number and Production of olive trees in the Mutasarrifia of El-Marj (1960).

	Area of compact plant-ations ha.	Number of trees (in hundreds)			Production qtls.
		In compact plant-ations	Scattered	Total	
Olives for table use	433	226	29	255	758
Olives for oil	160	152	108	260	236
Total	593	378	137	515	994

Source:- 1960 Census of Agriculture.

for demand and imports are necessary with Tripolitania, Tunisia, Spain and Holland being the main suppliers. Table olives are imported from Greece. The value of imports of olive oil into Libya is summarised in Table 47, for the period 1956-61, where it may also be seen that there is a strong tendency for imports to be on the increase. Libyan oil is exported to Italy after being pressed and then re-imported after being refined. Steps are now being taken to cut-out the need for re-import with the establishment of small refineries in Tripolitania. The government of Libya has also introduced a stabilisation scheme for olive producers under which the government will purchase Libyan oil in good years and store it for supply in years of poor production.

Production of olive oil in El-Marj for the period

Table 47:- The values of the imports and exports of olive oil in Libya for the period 1956 - 62.

Year	Export (£L.)	Import (£L.)
1956	61,311	-
1957	1170,628	9632
1958	447,053	11,924
1959	156,907	7,962
1960	152,551	24
1961	325,597	368,918
1962	280,363	776,612

Source:- Agriculture of Libya and its Development, 1960.

1955/60 is shown in Table 48. The main presses were sited at El-Marj, where there was a capacity of 26 quintals a

Table 48:- Olive Oil production in the Mutasarrifia of El-Marj in relation to Cyrenaica for the period 1955-60 in qtls.

Year	El-Marj	Cyrenaica	% of El-Marj to Cyrenaica
1955	168	321	52
1956	112	187	60
1957	153	221	69
1958	122	309	40
1959	212	949	22
1960	154	469	33

Source:- Agricultural Statistics for Cyrenaica, 1954-1958, 1959 & 1960 Census of Agriculture.

day and El-Beida, though as a result of damage to the installation at El-Marj during the 1963 earthquake, only the latter press is currently servicing the area.

Almond cultivation

All the almond trees cultivated in El-Marj Plain were imported during the Italian period, with the main variety being the Kasanti from Tunisia, which has adapted well to the stony soils of the area. In fact, most of the almond trees in El-Marj area have been grown from seed, and even without grafting have yielded excellent quantities of fruit. The Kasanti is a late-flowering variety and it is thus ideal for the Jebel areas where late frosts are to be feared. Most of the almond plantations are found in the private farm area around El-Marj town and in the south west at Yungi (Vide Fig.40).

Table 49:- Area, number and production of almond trees in the Mutasarrifia of El-Marj (1960)

	Area of compact plantations (ha.)	Number of Trees (in hundreds)			Production (qtls.)
		in compact plantations	Scattered	Total	
Almonds	537	316	77	393	6260

Source:- 1960 Census of Agriculture

Most almond trees are in compact plantations (80 per cent) where some 46 per cent of trees are fruit

bearing. Scattered trees are only 20 per cent productive. Yields from almond trees in 1961 were everywhere low as a result of the occurrence of the Ghibli and infestation of trees by a black, wasp-like almond fly. In 1960 the most frequent yield was 5-10 kilos per tree and the maximum yield 17 kilos per tree in El-Marj Plain. Almonds are a useful crop in the area since from the point of view of farm organisation, pruning may be done to suit the farmer's convenience and harvesting is not necessary until after the wheat harvest has been completed. Though there are currently only small areas planted to almond cultivation, trees put down under the Ministry of Agriculture orcharding scheme will be producing in about six years' time and should make a substantial contribution to total production. For a major increase in almond production, it appears that far more attention than is given at present must be paid to protection of orchards against wind effects, insect infestation and general neglect. It is also apparent that many of the older trees need replacing, since the combined effects of neglect and age have reduced their bearing capacity considerably - many of the trees are now 25-30 years old.

Viticulture

The El-Marj area had an established tradition of vine cultivation before the advent of the Italians, though production of grapes were intended exclusively for fresh consumption. At the present time, Arab areas of cultivation

cater for both table grape and wine production, religious objections to wine consumption apparently not bearing adversely on levels of production. Another introduction by the Italians was the technique of viticulture under dry farming, which has been maintained by the Arab operators in addition to the irrigated climbing grape, normally found in the courtyards of local houses or on trellises over the house tops.

The main varieties of vine cultivated before the coming of the Italians were Zaghera, a dark grape with a good flavour and appearance, the Turki, El-Amuri and Barliari, the latter, having a white grape and maturing early, gives a good yield and produces a lot of juice. Numerous varieties of vine were introduced by the Italians, but the most prolific yielding and best adapted varieties are the Nerello Mascellese from Sicily, the Alicante Pramcje and Garigman from the Maghreb. No doubt the cultivation of vines for raising production would be possible in the area, through the depressed state of the international market would be a severe limiting factor here.

Yield data for vines is scanty, but it appears that the most frequent yield in 1960 varied between 50-70 quintals per hectare and in 1961 between 80-120 quintals per hectare, the difference to be accounted for by the fact that severe Ghibli winds affected the area in 1960. Virtually all production of grapes in El-Marj Plain comes from the private

farming areas, though an increasing quantity of grapes for wine making and a continuing quantity of kitchen garden table grapes are supplied by other farming areas. The distribution and variety of vines in El-Marj Plain is shown in Table 50.

Table 50:- Area, number and production of vines in the Mutasarrifia of El-Marj in relation to Cyrenaica (1960).

	Area of compact plantations (ha.)	Number of vines in hundreds			Production (qtls)
		In compact plantations	scattered	total	
Grapes for table use	41	327	43	370	1029
Grapes for wine	105	348	33	381	10393
Total grapes	146	675	76	751	11422
Total grapes Cyrenaica	1701	10494	1189	11683	38657

Source:- 1960 Census of Agriculture

Some 76 per cent of vines are productive and of this total some 51 per cent are used for wine making, the residue being consumed fresh, though the relative importance of fresh grape production is greater in the areas outside the private farms. In Cyrenaica as a whole, El-Marj is not an important vine growing district, accounting for only 6.5 per cent of provincial vines, a situation arising mainly from the fact that under Italian planting policy intensive viticulture began first in the Jebel and only later spread to El-Marj. Despite

the low figures for vines in the Mutasarrifia of El-Marj, the production is 29.5 per cent of the total Cyrenaican production. This is due to the fact that vines planted by the Italians in the private farms and concessions have been looked after by the new occupiers. Wine production in El-Marj for the period 1957-59 is shown in Table 51.

Table 51:- Wine production in the Mutasarrifia of El-Marj and Cyrenaica for the period 1957 - 1959 (in tons)

Year	El-Marj	Cyrenaica
1957	40	1058
1958	79	1079
1959	41	985

Source:- Agricultural Statistics for Cyrenaica 1954 - 1959

Other fruits

Fruits other than the olive, almond and grape are cultivated in El-Marj (Vide Table 52), especially in the private concessions areas and kitchen gardens of Ente farms. None, however, have commercial importance.

Land Use Samples

7. Land use in El-Marj

Following the preceding discussion of cropping and crops in El-Marj, it will be instructive to examine

Table 52:- Number and production of fruit trees in the Mutasarrifia of El-Marj (1960)

Kind of tree	Number of trees (in hundreds)	Production (qtls)
Peaches	57	84
Pears	32	60
Figs	21	315
Apples	15	14
Plums	10	18
Apricots	7	14
Citrus	3	28
Pomegranates	3	95
Oranges	3	20
Lemons	1	5
Tangerines	1	3
Dates	15	411
Other fruit trees	9	6
Total	177	1073

samples of land use in both Ente and private farm areas. Unfortunately, data for the private farms are incomplete since farmers were reluctant to impart any information relating to their income, but a general survey for this type of farm may be given nonetheless.

(i) Ente Farms

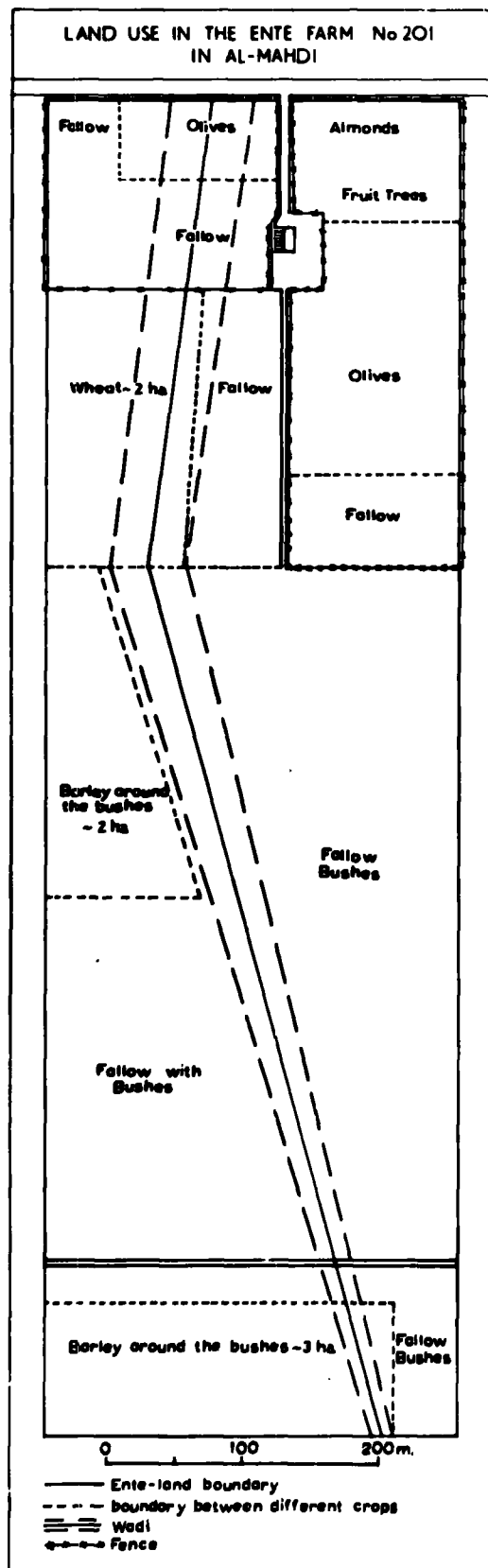
a. Farm No.201

This is an Ente farm situated about six kilometres south west of El-Marj and covering an area of 30 ha. (Vide Fig.42) Land use on the farm in 1961/62 was as follows:

5.0	ha.	barley	}	-- 24% grains
2.0	ha.	wheat		
12.0	ha.	<u>bushes</u> (Maquis)	}	-- 62% fallow
3.0	ha.	wadi and fallow		
3.5	ha.	fallow without bushes		
4.0	ha.	fruit trees	)	-- 14% fruit trees
29.5	ha.	<u>Arable</u>		
0.5	ha.	road and farmstead		

The barley and fallow land are interspersed amongst bushes and cultivation of the land undertaken with an iron plough. Barley is, of course, a dryland crop and thus production depends largely on the vagaries of the weather. Farm labour is provided by the farmer himself and his brother together with two women who are called upon only at peaks of labour shortage - at harvesting, hoeing and fruit gathering time. The family is not concerned entirely with on-farm employment and have interests elsewhere. Tractive power on the farm is provided by two horses, by which limited means only ten hectares can be ploughed in the traditional ploughing period December 1st to February 15th. There are two donkeys on the farm used for transport. The farmer formerly had two cows, but these were sold in the 1959/60-drought year when he

Figure 42

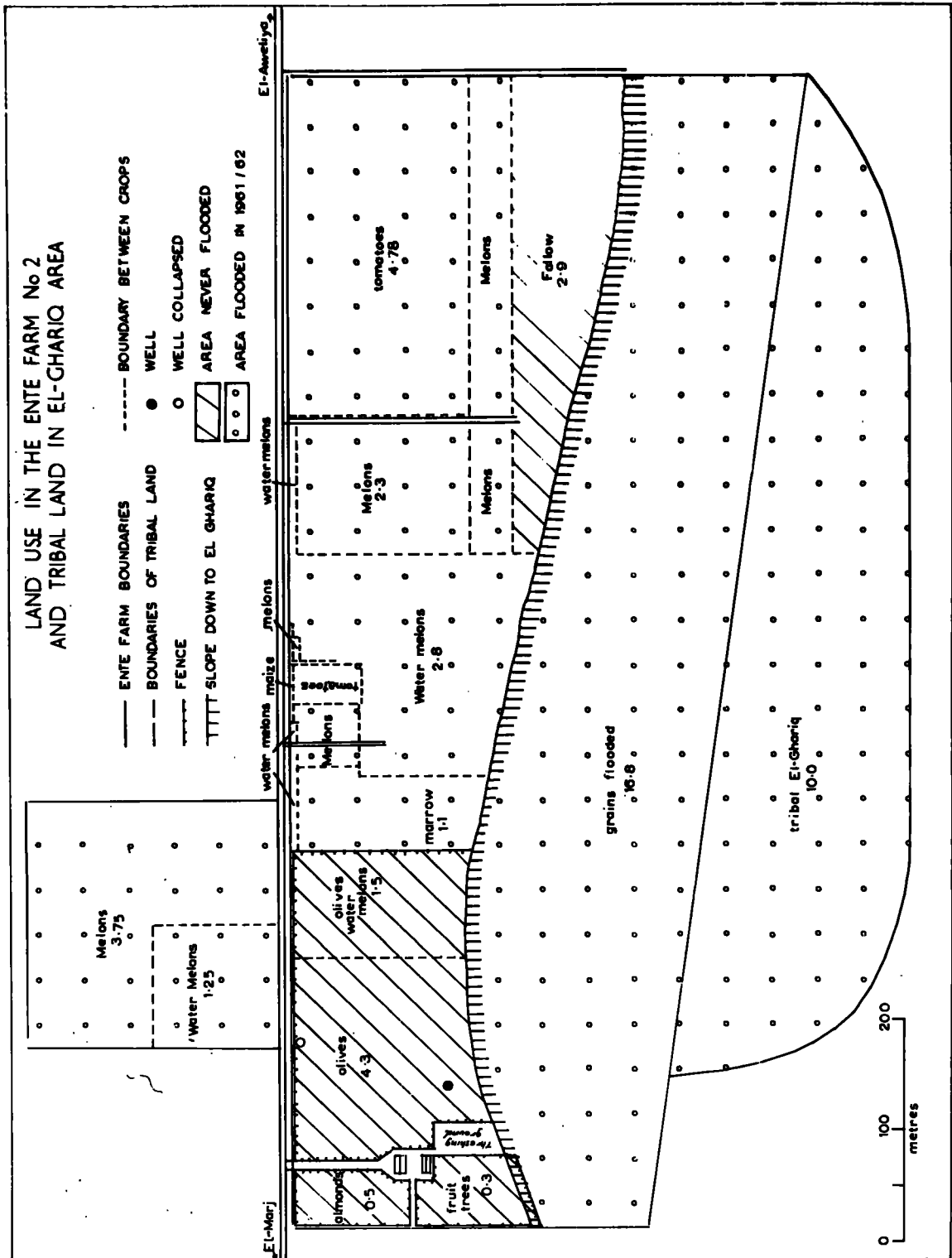


also lost 20 goats as a result of scarcity of pasture. The farmer claimed that financial losses were sustained in 1959/60 as a consequence of drought which hit him particularly hard because of the large area of bush infestation, fallow land and non-productive orchard land with the farm boundaries. It may also be noted that the farmer in question had only a small livestock holding and was unable to make good his losses by sale of livestock. From the relatively small area cultivated under cereals, the farmer had at his disposal only a very limited quantity of grain for sale and seed purposes in the drought years. The position of the farmer is made difficult by the fact that, with only two horses and rather primitive equipment, he is unable to extend the utilised area of the farm by reclaiming maquis-infested land or by cultivating the wadi bed and its environs for vegetables when flood conditions make this feasible. Without assistance through credit and extension services, it is hard to see how this farmer can lift himself from his present level.

Farm No.2

This is also an Ente farm at the edge of the El-Ghariat lake, and about 3 kms. north east of El-Marj. The farm covers an area of 39 ha. and the land use on the farm in 1961-62 (Vide Fig.No.43) was as follows:-

Figure 43



16.8	Grains	43%
12.2	Vegetables	31%
6.6	Fruit trees	18%
2.9	Fallow	7%
38.5	Arable	
0.5	farmstead and threading ground	1%

The figures in the above table reflect the fact that in 1961-62, the area cultivated under grain was flooded and the crop largely destroyed. Vegetable growing included melons, water-melons, tomatoes and beans. The tree crops confined to half a hectare of almonds, 5.5 ha. olives and about third of a hectare of other fruit trees. An area of 3 ha. lies fallow every year due to lack of labour and traction power. The farmer manages another Ente farm in Sauro north of El-Marj, 10 ha. in the tribal El-Ghariq area south of the farm house, and another 15 ha. tribal land, and 5 ha. of the farmer's own property both about 2 kms. north of the farm house, considered as absolutely safe from flooding. The farmer's son works in El-Marj power station. The farmer has a considerable number of livestock: 2 horses, 3 camels, 8 cattle, 100 goats and one donkey. The horses and camels are used for ploughing with a local nail plough (Vide plate 11a).

The farmer employs one permanent labourer. Two women from the family can help during the crop and with the



Plate 11 (A) - El-Ghariat area - ploughing with a wooden plough for summer vegetable crop after the flood water had ceased.

vegetables. After floods of 1962, the farmer associated with two others and formed a "company" for extensive vegetable cultivation. Each of them made labour available for vegetable cultivation, and the net profit was divided by three.

Figure No.43 shows the area in the Ente farm and the tribal land managed by the same farmer which was flooded in 1961-62.

In El-Ghariq area, the level of the underground water is higher than other points in El-Marj Plain, therefore, in dry years, though there might be crop failure in other areas, a good cereal yield can usually be harvested in El-Ghariq.

There are two wells in the area, one is 9 m. deep which is still open and gives water even in the summers of drought years, but the other well on the main road collapsed during the floods of 1962.

According to the farmer's statement the total expenditure for the years 1960-61, and 1961-62 were £L.332 and £L.936 respectively; the total receipts for the mentioned years £L.1069 and £L.1456, and this brings "net" farm income of £L.737 in 1960-61 and £L.521 in 1961-62. It may be noted here that gross income and expenditure are alone considered by the farmer. The main difficulties facing the farmer are the risk of El-Ghariq floods and lack of traction power. The lack of traction power and labour can be overcome only by

mechanisation.

II. Private Farms

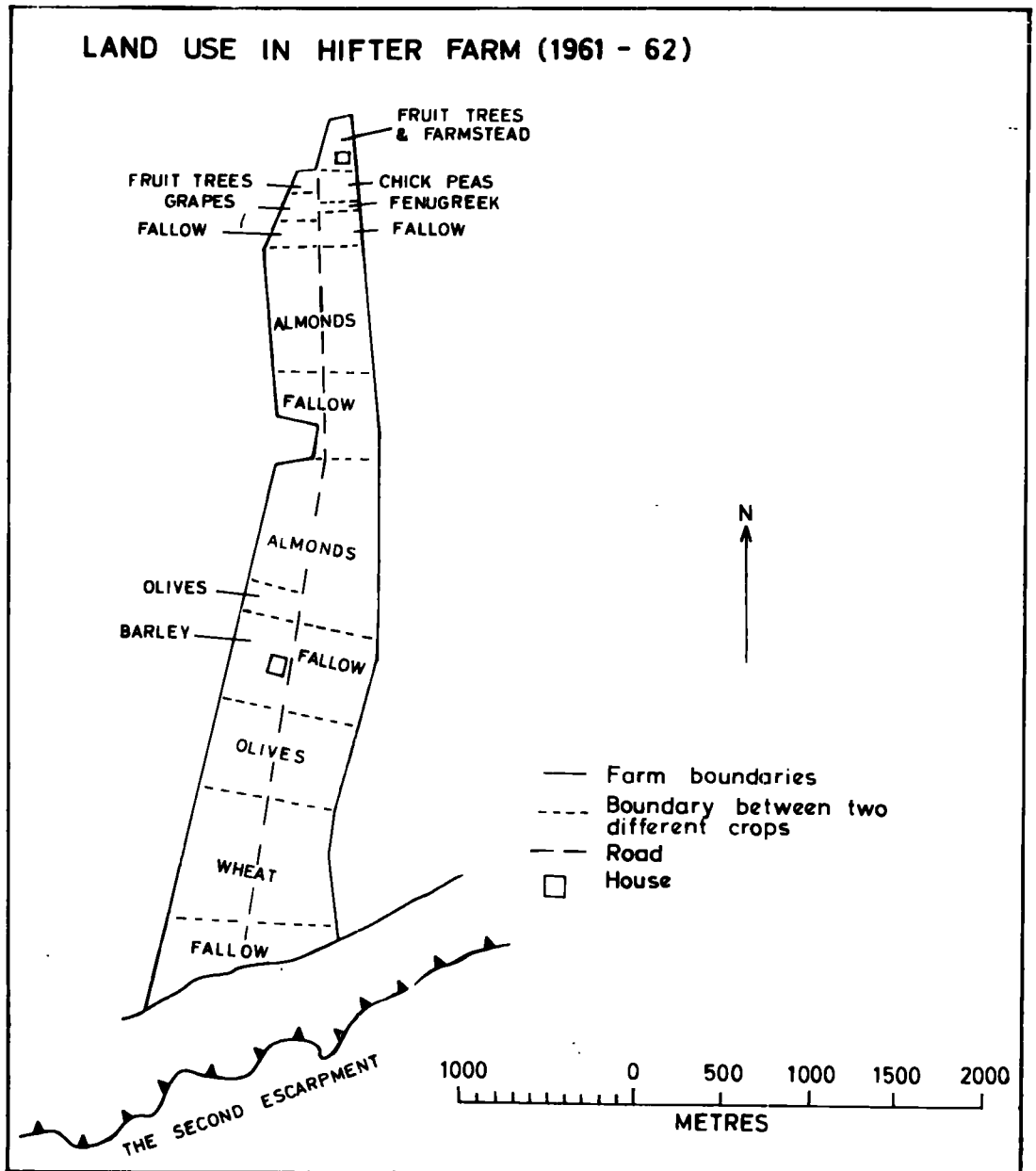
Hifter farm

Figure No.44 represents a private farm, situated south of the El-Marj railway station and extends southwards for about 3 kms. to the foot of the second escarpment. The farm covers an area of 299 ha., and the land use on the farm in 1961-62 was as follows:-

65 ha. wheat	}	31.6% grains
25 ha. barley		
4 ha. chickpeas		
0.5 ha. fenugreek		
86 ha. fallow		28.8% fallow
114 ha. fruit trees		38.1% fruit trees
3 ha. vines		1.0% vines
297.5 ha. Arable		99.5%
1.5 ha. (Approx.) farmstead.		0.5% farmstead.

The farmer rents an extra 200 ha. at 35 piastres per hectare north of El-Marj in the Ecle concession for wheat cultivation. On the farm there are 9000 olive trees and 1500 almond trees. The farmer possesses a caterpillar tractor, and a well with electric pump of 8 horse power. The depth of the well to the water is 50 m. and 8m. of water. The motor pump is lying idle because of lack of maintenance. The well was used to irrigate about 6 ha. of fruit trees. The

Figure 44



farmer has a landrover. The number of livestock on the farm is 200 head of sheep, 10 cows and 5 horses. The sheep are kept in Sidi Salim 8 kms. south of El-Marj Plain on the high Jebel. The shepherd is from the El-Abid tribe and he is paid 10 piastres per head in the period of October-April, and by a tenth of the new lambs in the period of May-September. The sheep are kept all the year around on the high Jebel.

There are three Ghafirs (guards) on the farm as permanent labour, whilst the farmer employs male and female labour for harvesting of olives and almonds at a rate of 50 piastres per day. According to the farmer's statement a third of the olive harvest was unmarketed in the season 1961-62, because there was insufficient labour to complete the harvest before the fruit spoilt. Income from the farm was highly variable, according to the farmer, though the worst effect on production had been felt in the five years of successive drought (1955-56, 1956-57, 1957-58, 1958-59 and 1959-60). Production of the farm except of livestock was as follows in the years 1960-61, 1961-62 and 1962-63.

Yields of grains per hectare are high since the farmer uses a tractor for tilling and harrowing, which together give good tilling conditions and follows a two-year fallow rotation. Output from the vineyards is high, with production channelled to El-Beida wine factory. Other fruits do not yield so well since the trees are old and neglected.

Table 53:- Production, area and yields of crops for Hifter Farm in 1960-61, 61-62 and 62-63

	1960-61			1961-62			1962-63		
	Prod.	Area	Out put	Prod.	Area	Out put	Prod.	Area	Out put
	qtls.	ha.	qtl/ha	qtls.	ha.	qtl/ha	qtls.	ha.	qtl/ha
Wheat	400	65	6.2	300	65	6.2	500	65	7.7
Barley	-	-	-	120	25	5.8	-	-	-
Chick-peas	-	-	-	30	4	7.5			
Fenu-greek	-	-	-	30	0.5	30			
Wheat cultivated on land on lease	-	-	-	-	-	-	800	200	4
<u>Fruit trees and vines</u>									
			Kg./ha.			Kg./ha.			Kg./ha.
Almonds	12	1.0	0.1	crop failed because of the almonds fly attack			30		0.2
Olives	30		0.03	No production			900		1
Vines	200		66.7	200		66.7	-		-

At the present, no vegetable production is possible since the motor pump in the well is out of action, though in previous years vegetables have been marketed in El-Marj or Benghazi.

This farm is probably the best managed farm in El-Marj Plain and, though the farmer decided not to give details of his income and expenditure, it appears likely that good profits are made in most years.

The Cerasola Farm (Sanusi farm at present):- The

farm is situated about 2 kms. west of El-Marj, and covering an area of 380 ha. (Vide Fig. No.35). The farmer possesses another piece of land (120 ha.) north of the farm. On this farm there are 2000 almond trees, 400 vines and another 1000 trees of olives, oranges and lemons. The area cultivated under wheat is 100 ha. in 1961-62 with productions standing at 600 qtls., and 200 ha. in 1962-63 giving 900 qtls. Despite the existence of a well and wind pump only 2 ha. are cultivated for tomatoes, onions, parsley, lettuce and cabbage, which are sold always in the local market. The farmer has 100 head of sheep and 40 cows. The sheep pasture on the Jebel during the period of October-April and return to the farm in the summer when they need watering. At this period the sheep and cows stay on the farm to rear on the fallow land, and sometimes on the almond trees (Vide Plate 12a).

The farm is badly managed, particularly since the earthquake which occurred in El-Marj on February 1963 when the occupying family left for Benghazi to live there permanently. At present the fruit trees are untended and the farm manager (the son's owner) concentrates on cereal crops, which are cultivated by tractor on both sections of the farm under an alternate year fallow system. The main source of the farmer's income comes, of course, from cereal and vegetable sales.

Yungi Concession:- This concession is situated about 20 kms. south west of the town of El-Marj, the total area of it is about 1200 ha. (Vide Fig. No. 36) on which there are 60,000



Plate 12 (A) ← Cow herd grazing among the almond trees in the Cerasola (Sanusi) farm west of El-Marj town.

almond trees, with an approximate production of 1000 qtls., 3,000 olive trees and 400 vines. The total area cultivated under wheat was 400 ha. in 1961-62 with production of 700 qtls. and 400 ha. in 1962-63 and the production was 1,900 qtls. The farmer uses a two-year fallow rotation on the arable area which is also designed to include chickpeas and oats. The farmer owns a tractor and employs 15 men permanently supplemented by temporary labour in the season of harvesting cereal and fruit trees. The farmer owns 300 head of sheep and 300 cows, which are grazed in the area around the farm granted to Yungi by the Italian Government and returned to the Libyan Government after the evacuation of the Italians. Livestock is watered in the summer from wells on the farm.

Orcharding on the farm is decreasing in importance as the established plantations decline through neglect and renewal is avoided. The current owner asserts that he has neither the resources for, nor interest in, orcharding expansion, despite the demonstrated success of fruit tree cultivation in the Italian period of occupation. The real reasons for the failure of the Arab owner to undertake orcharding activities is probably to be found in his lack of managerial and technical skill and the fact that at least some profit can be made from the less demanding cultivation of cereals, and his insecurity in tenancy of the farm.

It is convenient to add here a few lines concerning the farming on the coastal plain. On the coastal plain west of Tulmeitha as far as Bu Traba, there are 50 Ente farms and 176 privately owned suani. The size of the Ente farms is 10 ha. and the area of suani in this area is between 3-5 ha. There are another 175 suani along the coastal plain in Segba, Erdanu and around Tocra and south.

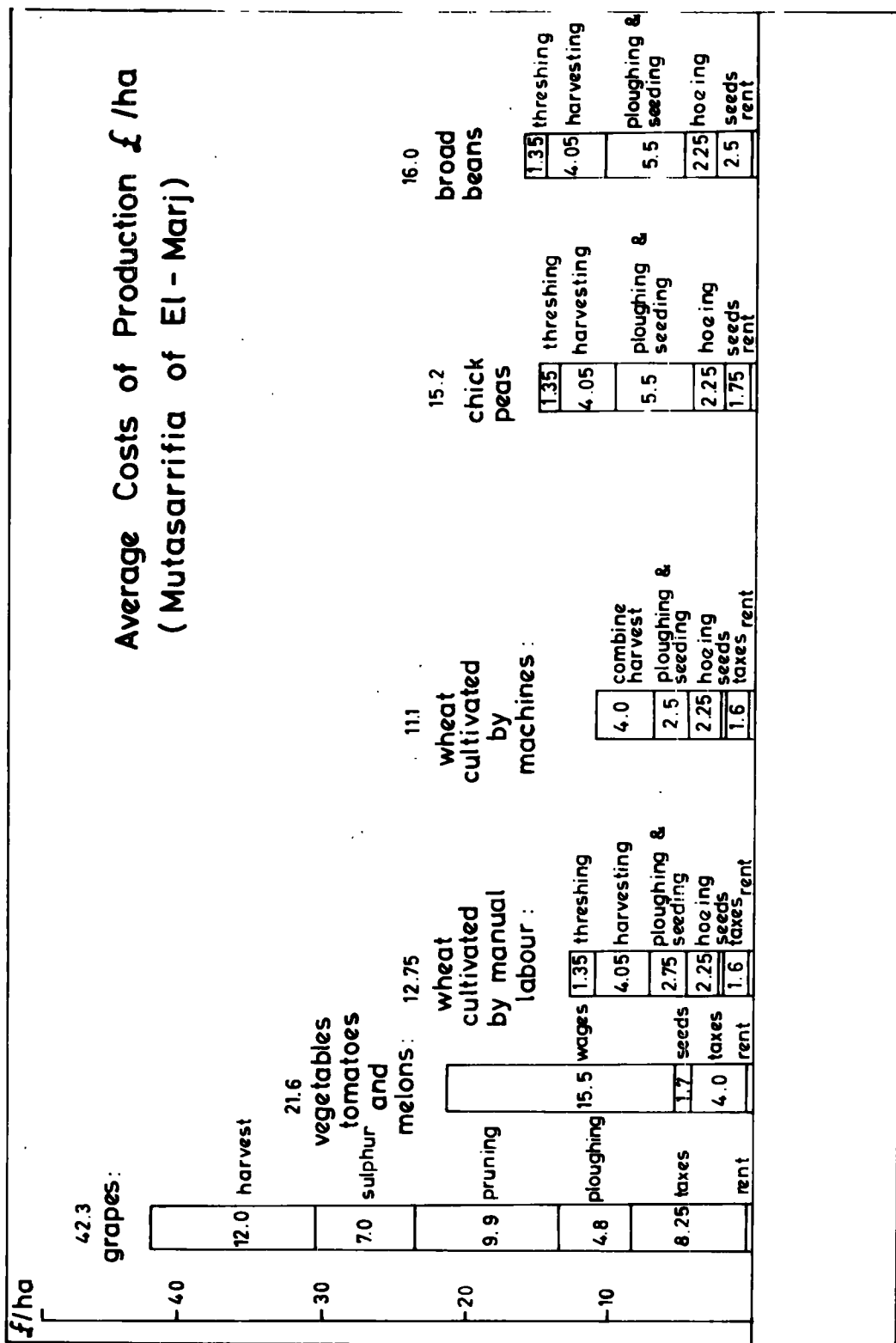
The Ente farms west of Tulmeitha grow vegetables, vines and cereals under irrigation, although in the same zone private farms utilize irrigated land (suani) only for vegetables and cultivate dry land cereals on tribal areas nearby. The coastal plain receives an annual average between 300-350 mm. of rain which is lower than El-Marj Plain. Irrigation is necessary for vegetable growing, water being drawn from wells by means of dalú* pulled by animals and it is noteworthy that the area of irrigation is restricted not by scarcity of water, but by the low draining capacity of the animal-powered dalu. Many farmers (100) in Tocra area have already installed diesel pumps in wells, though the risk increasing the salinity of aquifers tapped by the wells, has become a serious consideration in recent years. Most of the farmers on the coastal plain get a higher income than those of the Ente farms on El-Marj Plain as a result of concentration on irrigated vegetables and vines.

* Dalu is a skin bag, has an ingenious spout which dumps the water when it reaches the top of the left and closes when it is being raised from the bottom of the well.

8. Cost of Production:- In as much as the cultivator on the tribal land has an unlimited acreage of land at his disposal, and uses family labour to grow grain only for home consumption, (there was in the past no other possibility of productive work for the member of his family), the scarcest and most expensive factor of production in this near-subsistence agriculture is the multiple of seed.

In the case of the settled Ente and private farmers on the other hand, it is the cost of labour which ranks by far as the largest factor of production cost, and expenditure for seed is only a minor item in the factor of production cost. In consequence, yield should be related to the most expensive factor of production i.e. labour. As it is impossible, however to find out for the individual farm an accurate figure of expenditure of labour in relation to the individual products calculation on that basis is not feasible. On the other hand, the expenditure of labour runs somewhat parallel to the size of the area cultivated and the latter can be ascertained more easily and accurately. In a calculation relating yields to the cultivated area, therefore, the main factor of production cost is, in fact, labour. In all the studies made, cost of labour covers the largest part by far of the total cost (Vide Fig.No.45). Figures given represent averages of information obtained by survey, interview and from official sources. For field crops, labour cost is £L.13.15. per hectare for chickpeas and broad-beans

Figure 45



from total cost of production of £L.15.2. and £L.16.0. respectively (86.5% and 82.2%). For wheat cultivated by machines the cost of labour is £L.8.75 per hectare (78.8%), whilst when manual labour is used the cost is £L.10.40 per hectare (81.6%). The average cost of labour for vines is £L.26.70. per hectare (63.1%); while for vegetables is £L.15.5. per hectare (71.8%). The rather lower proportion of cost expended on labour with the last two crops is a result of a larger proportion of taxation element.

Expenditure for seed and rent is relatively low except in the cases of broad-beans and chickpeas where the cost of production for seed is £L.2.5. (15.6%) and £L.1.75 (11.5%) respectively. However, the production cost for seed in the other crops is £L.0.40 (3.6%) for wheat cultivated by machines, £L.0.40 (3.1%) for wheat cultivated by manual labour, and £L.1.7 (7.9%) for vegetables.

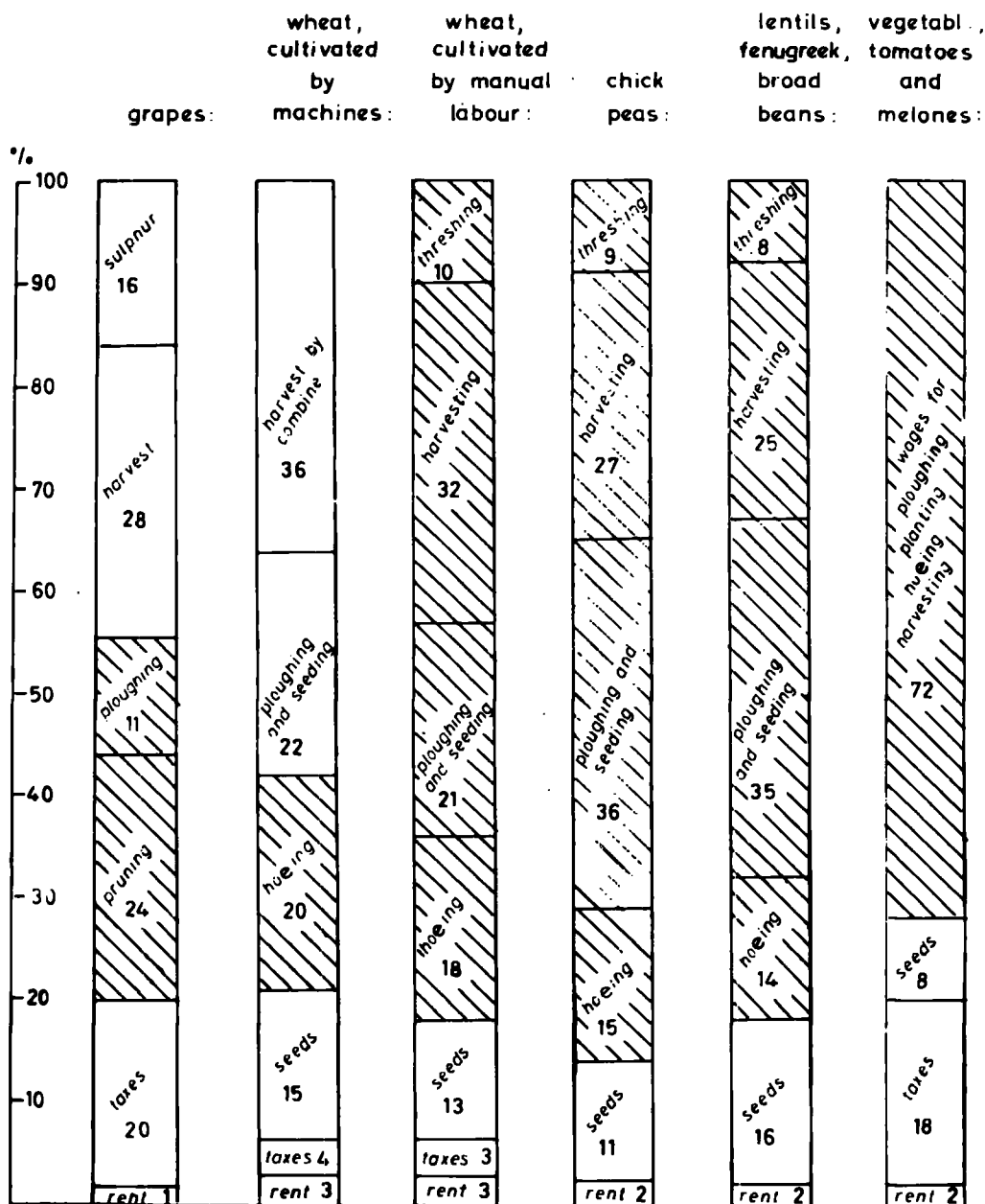
Expenditure for rent is £L.0.30 for chickpeas (2.0%), £L.0.35 for broadbeans (2.2%), wheat cultivated by machines (3.2%), wheat cultivated by manual labour (2.8%) and vines (0.9%); whilst it is £L.0.40 for vegetables (1.8%). Taxes on vines, vegetables, wheat cultivated by machines and wheat cultivated by manual labour are £L.8.25 (19.5%), £L.4.0 (18.5%), 1.6 (14.4%), and £L.1.6 (12.5%) respectively. (Vide Fig.No.46.)

The situation as described is symptomatic of a transition stage between subsistence and commercial farming.

Figure 46

Different Factors of Cost of Production in % of the Total Cost of Production in Mutasarrifia of El - Marj.

cash expenses	65	80	19	13	18	%
family labour	35	20	81	87	82	%

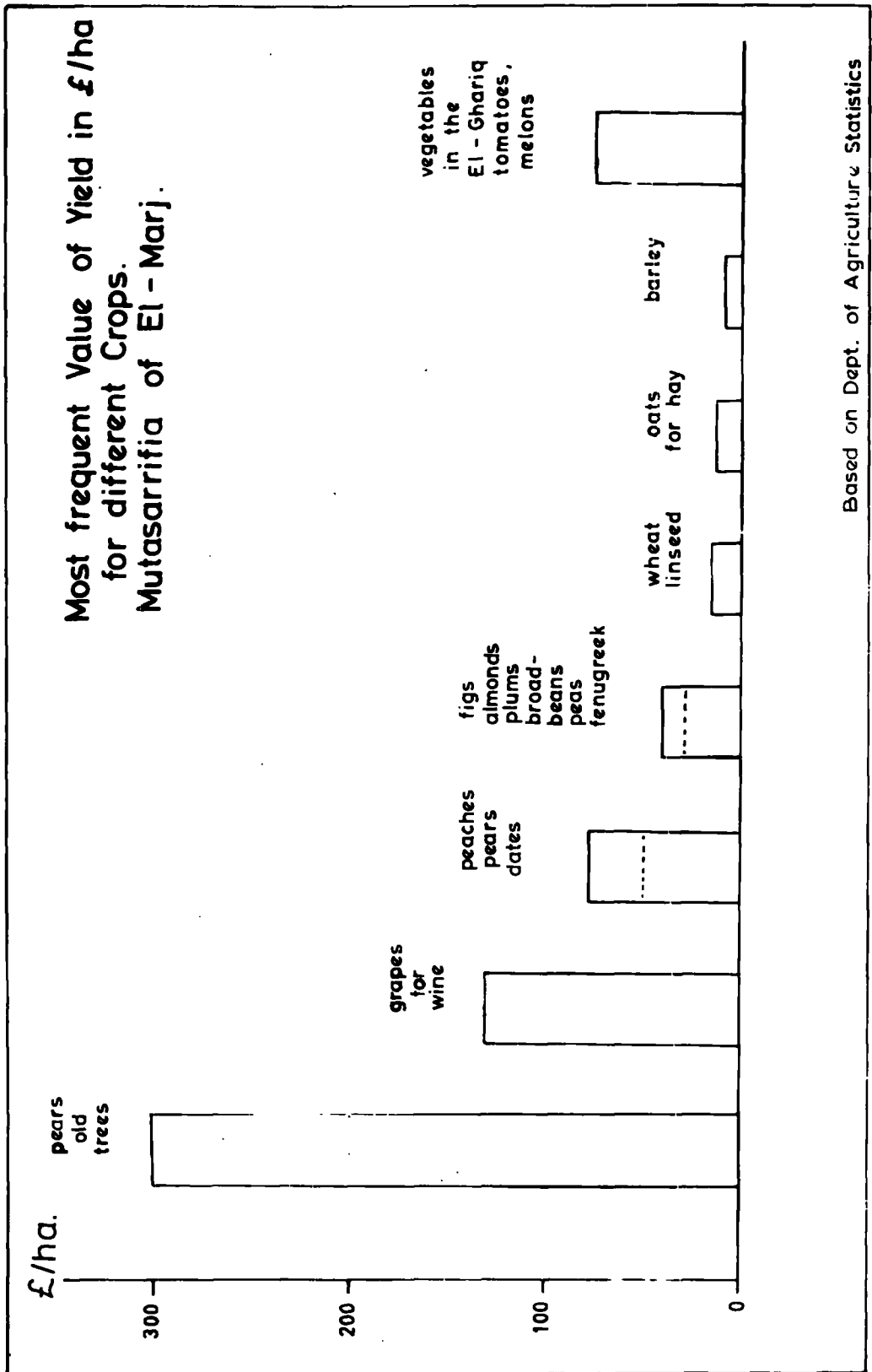


As noted by Clark and Haswell⁽⁹⁾ and elsewhere in this study, uncosted labour in subsistence farming is used extravagantly. When, as in Cyrenaica today, returns on labour, hired or family, become compared with costed wages in other employment or as an element in imported foodstuffs then the low productivity and inefficiency of most Cyrenaican farming becomes obvious. Statistically the result is the high and uneconomic proportion of costs expended on labour and the absence of difference between crop demands in this respect.

9. Gross Income:- The gross income is calculated by multiplying the gross yield per surface unit by the selling price obtained per unit of produce (quantity x prices). The calculation is based on the most frequently occurring yields of the normal year 1961-62 and the most frequent prices ruling of the most important cultivated crops (Vide Fig. No.47). The figures indicate barley ranks lowest (£L.8/ha.). Vegetables grown without irrigation i.e. tomatoes and melons promise higher incomes (£L.75/ha.) than wheat (£L.16/ha.). Grapes grown for wine earns also a high income (£L.130/ha.). Figs, almonds, plums, broad-beans, peas and fenugreek each earn between £L.40-30/ha. Peaches and pears earn a modest gross income varying between £L.50-80/ha. However, pears from old trees earn the highest gross income among all the crops (£L.300/ha.).

10. Gross Profits:- Gross profits will be regarded here as the surplus income left after deduction of cost of production.

Figure 47



During the bad crop year of 1959-60 losses were sustained in activities concerning nearly all field crops, i.e. average production cost in each instance was higher than the average gross income. In most years high gross profits are earned with legumes, good wheat crops giving in middling profits, with barley earning small returns. If the farmer, in the face of an adverse balance, is at all in a position to continue, this is due to the fact that he does not itemize his own work as a factor of cost, i.e. net profit is hardly ever computed. These considerations lead to the conclusion that barley growing in farms operated by hired labour result in real net financial losses and in falling living standards and reliance on pastoral livestock as a hidden reserve.

11. Selling:- For most of the farmers, markets for their produce are insecure except for those farmers in the vicinity of the El-Marj town who are in a position to transport produce by their own means. Conditions are worst for El-Hemda and Tulmeitha since these two villages are remote from the main market centres. Generally speaking, the farmers cannot obtain good prices for their produce in the small local market, prices fall considerably during the harvest period, and transport to better priced markets is so expensive as to preclude better profits. The private farmers are in a better position since most of them have their own transport.

The sale of vine grapes and wheat may be considered as normal. Vine grapes are purchased at a guaranteed fixed price by the wine press in El-Beida. The transport from the farms to the press is organised, but even in this case farmers complain of heavy losses of quantity in consequence of delays in transport. In 1961, the Government began the regular purchase of wheat at a guaranteed fixed price of £L.4 per quintal of hard wheat. Produce entering markets is normally liable to municipal taxation.

12. The Most Important Yield Endangering Factors:- Besides droughts which in this region of unreliable precipitation of El-Marj Plain, are a danger, more or less, to all crops, there are several other dangers liable to cause great losses.

A. Ghibli Winds:- The Ghibli causes total damage, particularly to almonds and peaches. Strong winds shake off the pears and apples before they are ripe; and unripe wind-falls are naturally difficult to sell. Most fruit tree plantations need protection on their Ghibli side (south and south east). But none the less the humidity factor will not be safeguarded even if windbreakers are constructed.

B. Damage by hares:- Near larger areas of bush, that is, particularly in the border areas of El-Marj Plain, very high losses occur by hares eating newly planted fruit stock. Among the legumes, chickpeas are particularly endangered by hares, offering green feed at a time when the hare feed becomes scarce. The legumes and vegetables could be

protected by means of wire netting or stone walls.

C. Mildew:- In 1962, considerable damage by mildew was observed on melons and pumpkins in the El-Ghariq area. Spreading powdered sulphur, as efficient farmers do to destroy mildew on vines, would probably be sufficient to solve the problems.

D. Flooding:- The farmers in El-Marj Plain expect their fields in the El-Ghariq area to be flooded every 4 to 5 years, this being the lowest point in El-Marj Plain (Vide Chapter I, and Fig. No.6).

About every 20 years, there is a flood of larger extent. In the year 1961-62 an unusually heavy flood occurred which left wide areas, even north of El-Aweliya highway, covered by water for several months (Vide plate No.13a). In 1962, the water remained in the middle of the El-Ghariq area during the whole summer, even at the beginning of the subsequent wet season of 1962-63 the ground was saturated by water and could absorb only a little of the new precipitation, in consequence, the El-Ghariq area was flooded again in the wet season 1962-63, after the first heavy rainfall. Part of the Ente farm country, which is located adjacent to El-Ghariq, is flooded even by minor El-Ghariq floods which occur every 4 to 5 years. These Ente farmers use additional tribal land in the El-Ghariq area. It has been pointed out earlier, that chickpeas and potatoes seem suitable as spring crops instead of grains in El-Ghariq.

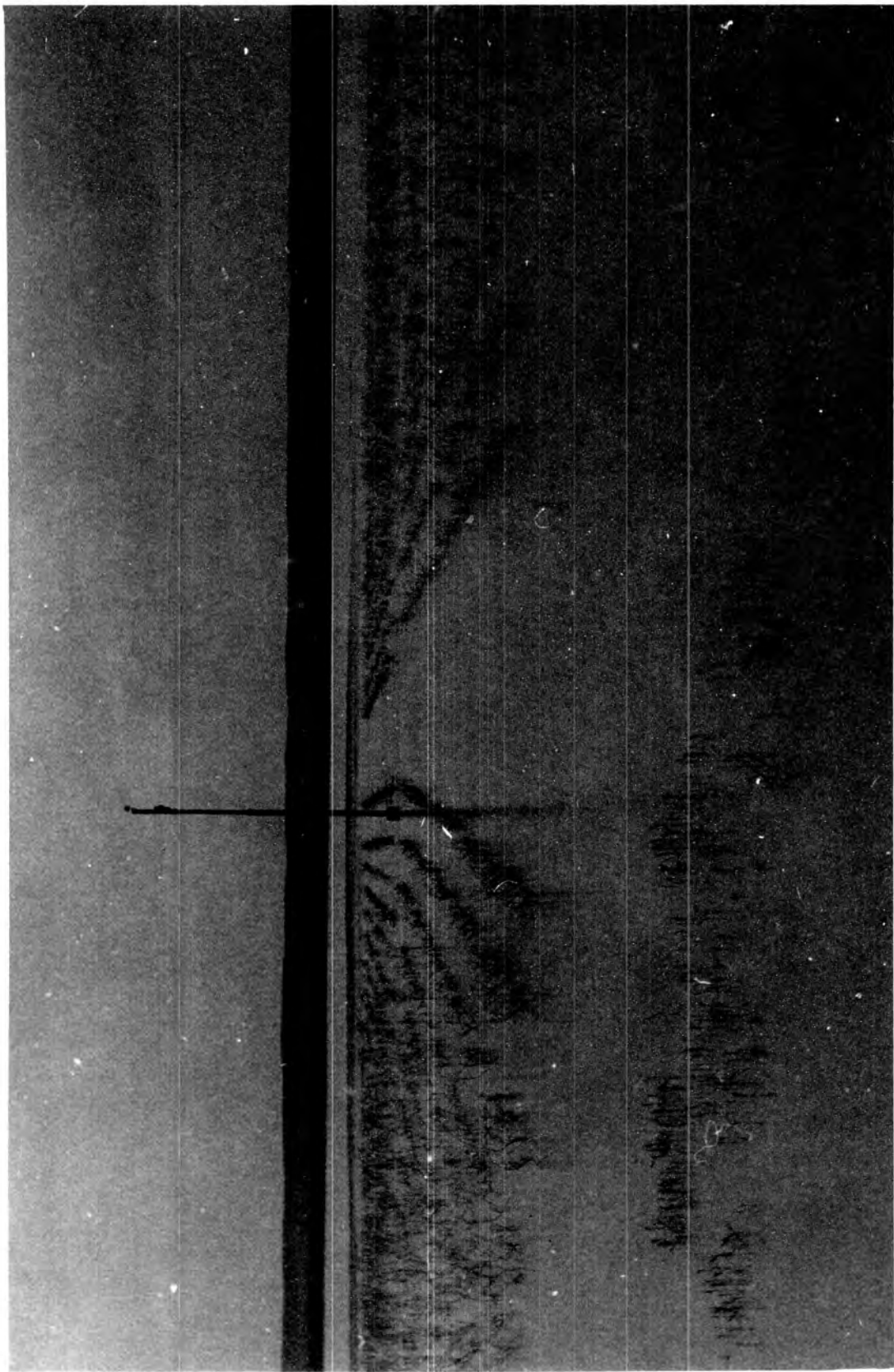


Plate 13 (A) - El-Ghariq area flooded during the winter season 1962 - 63.

Thus profitable summer crops compensate for the grain crops destroyed by winter floods.

E. Pests:- Olive fly causes considerable damage, and almond too is at times affected by diseases. Even more, when the newly planted stock of fruit trees becomes productive, the importance of pests and diseases of fruit stock will be increasingly apparent. With fruit stock, pruning as well as pest control will have to be adopted in the Ente farms in the course of intensifying farming.

13. Machinery:- The Department of Agricultural Machinery was established in El-Marj as a centre for the machines to be used by the Department and for hiring to the farmers in the whole Jebel. The following table shows the amount and kind of agricultural machinery in Cyrenaica for the period 1958-62.

Table 54:- Amount and kind of agricultural machinery in Cyrenaica for the period 1958-62.

Wheel tractors	60
Crawler or track lying tractors	62
Garden or horticultural tractors	10
Combined harvester-threshers	31
Milking machines	1

Source:- Department of Agricultural Machinery - El-Marj.

Department machines tilled a total of 12,425 ha. in the Jebel during the period from April 1961- March 1962, and

10,100 ha. from April 1962 - December 1962, of which about 7,000 ha. were tilled in the Mutasarrifia of El-Marj. The following table shows the number of the holdings using each type of power in the Mutasarrifia of El-Marj by mudiria for 1960.

Table 55:- Use of power in the Mutasarrifia of El-Marj by mudiria (1960)

	Total No. of holdings	only human power	only human and mechanical power	only human and animal power	human, mechanical and animal power	Internal com- bustion motors	Wind mills	Electric motors
El-Marj	2629	192	2309	80	48	4		
Tulmeitha	1224	22	1162	27	13	—	1	2
El-Bayada	1339	-	1339	-	-	-	-	-
Tacnis	619	28	590	-	1	-	-	-
Jardas	1274	268	1004	-	2	-	-	-
Total Mutas. of El- Marj	7085	510	6404	107	64	4	1	2

Source:- 1960 Census of Agriculture.

As can be noted from the table in the Mutasarrifia of El-Marj 7% of the total holdings are worked by manual labour, 90% by human and mechanical power. In the Mudiria of El-Marj 88% of the total holdings are also operated by human and mechanical power. Most of the farmers plough with a hired tractor and use manual labour for harvesting. However, barley

farmers prefer manual work in spite of high cost because a combine harvester does not fully reap the very short-stalked barley.

14. Co-operative Societies:- As the individual farmers are short of capital and small acreage to adequately utilise a small-sized combine harvester, a number of farmers have combined in various pseudo-cooperative societies to purchase medium size machines. The tractor is used jointly by the members of the society, and may be hired to other farmers at a fixed rate. As has already been mentioned before, there are a number of tractors (between 250-300) on the Jebel, belonging either to private or for co-operative societies. There are five co-operative societies in El-Marj Plain: El-Aweliya, Es-Sferi, Sidi Mahius, Silina and Farzugha, each of these societies has its own tractor. The Department of Agricultural Machinery subsidises these societies, and in 1962 the Department imported 10 wheel tractors and distributed them to the societies at half-price. The societies are concerned with provision of tractors and its activities do not include marketing.

The most urgent requirements is the growth of co-operative marketing societies. The farmers, particularly fruit and vegetable growers, are often at the mercy of the merchants when they produce on a small or medium scale. It is only a large co-operative society with a well-organised system of marketing and delivery that can hope to defend its

members' interests.

The need for tractors which first gave rise to the erection of co-operative societies has established a precedent for further co-operation in transport and marketing.

15. Farm Population:- The figures of the farm population must be viewed with suspicion.

The farm population in the Mutasarrifia of El-Marj in 1960 was 39,930 persons of whom 19,723 were male and 20,207 were female. 17,371 were under 15 years and 22,559 were 15 years and older. Of 22,559 persons of 15 years and more 84.4 per cent - 88.8 per cent of the men and 79.3 per cent of the women - reported an agricultural occupation. The following table gives the farm population by age and sex in the Mutasarrifia of El-Marj by mudiria (1960).

Table 56:- Farm population by age and sex in the Mutasarrifia of El-Marj by mudiria (1960)

Mudiria	Total Population	Persons under 15 years	Persons of 15 years and more whose occupation is agriculture		
			Total	Male	Female
El-Marj	14924	6319	7822	4070	3752
Tulmeitha	6418	2719	2943	1732	1211
El-Bayada	7082	3188	3070	1746	1324
Tacnis	4007	1745	1746	983	763
Jardas	7499	3400	3448	1837	1611
El-Abid					
Total Mutasarrifia	39930	17371	19029	10368	8661

Source:- 1960 Census of Agriculture.

The table shows that 91 per cent of the persons of 15 years and more are engaged in farming in the Mudiria of El-Marj, 80 per cent in Tulmeitha, 79 per cent in El-Bayada, 77 per cent in Tacnis and 84 per cent in Jardas El-Abid. The percentage of the Mudiria of El-Marj is suspected since the figures of the mudiria definitely include the population of the urban centre of El-Marj. It is not possible to compare the active agricultural population to the total active population of the Mutasarrifia of El-Marj since there are no such figures for the Mutasarrifia in the 1954 census of population. The total active agricultural population in Libya is 71.6 per cent of the total active population. Again this figure must be viewed with suspicion.

To compare Libya with some neighbouring countries, the percentage of the active agricultural population to total active population is 75 per cent in Morocco, 71 per cent in Algeria, 68 per cent in Tunisia and 64 per cent in the United Arab Republic.⁽¹⁰⁾ More than seven-tenths of the total active population in Libya is engaged in agriculture. Taking into account that Libya is not an exporter of agricultural products, but also imports indigenous products, this indicates that the active agricultural labour-force cannot produce a surplus over and above its own statistical requirements. This indicates also that agriculture in Libya cannot at present even produce sufficient income for the people who are engaged in agriculture.

There are two agricultural experimental stations in El-Marj Plain. The first is the Zorda station situated south west of the town of El-Marj. Experiments are carried out in this station which provide farmers with improved and selected seeds.

The second experimental station situated east of the town of El-Marj is used for the production of fruit trees and some vegetables.

The El-Aweliya Agricultural School. This school was established in 1952 to provide the Department of Agriculture with qualified personnel for agricultural guidance, and also to provide the country with trained farmers, should the graduated students work their own farms. However, the school has failed so far to provide the country with well-trained farmers, since almost all the graduates have taken administrative jobs, thus defeating the school's purpose. The school was closed in 1963 after the earthquake occurred in El-Marj, and the students were transferred to Tripoli Agricultural school.

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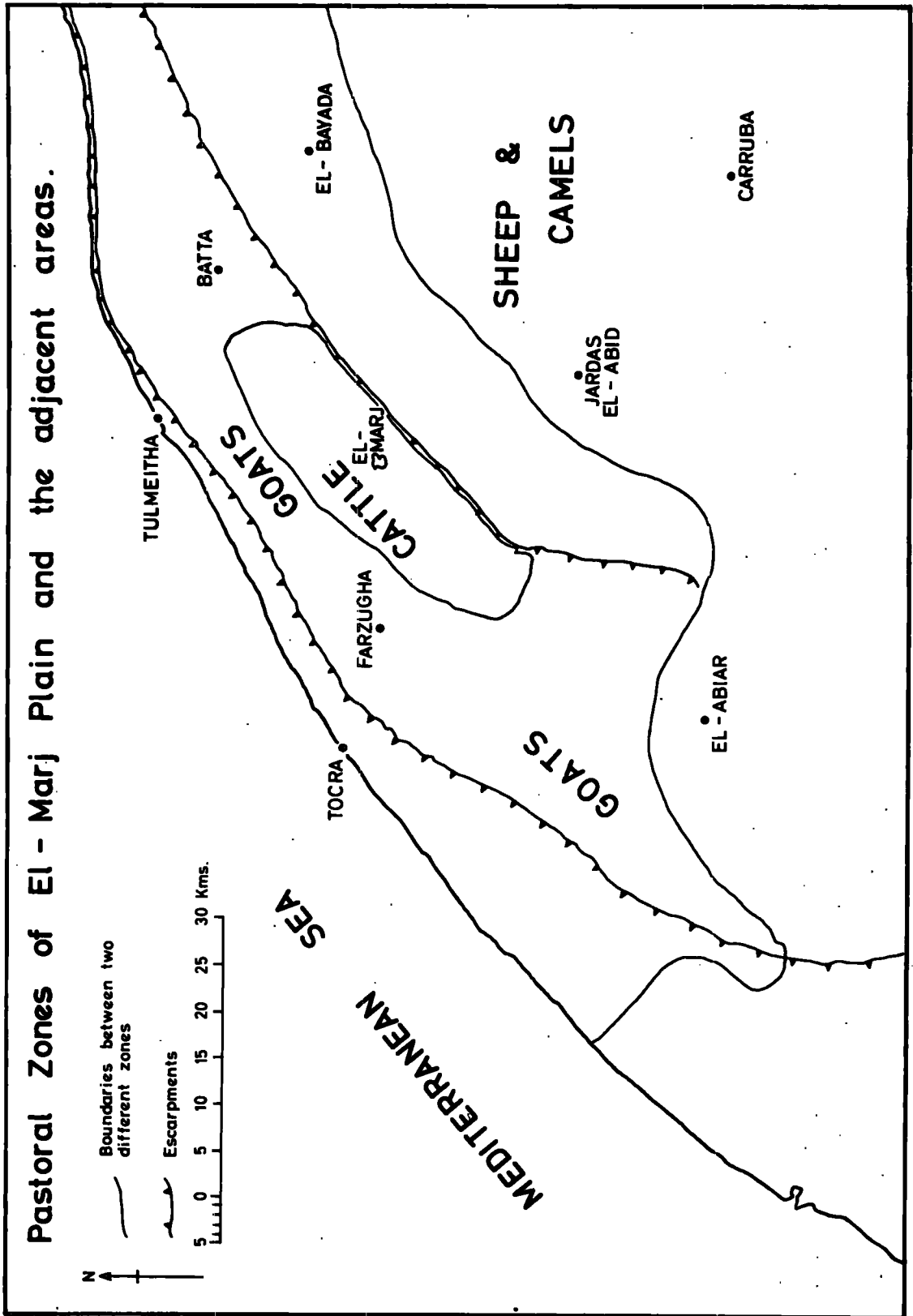
LIVESTOCK:-

In the economic system of Cyrenaica, livestock products have so far been one of the most important elements and probably will remain so. Pastoralism has always been much esteemed by the people of the Jebel and from this activity they derive sometimes a better income than they can get from crops. The Bedouin say "Hail El-Bawadi Al-Hiwanat" (The strength of the Bedouin is the animals).

The traditional practice is to graze goats and cattle on the Jebel, reserving sheep for the drier zones, while the camels are raised in the very dry districts (Vide Fig. No. 48). No comparative tests have been made to ascertain the yield of forage per hectare from the pastures in the different zones, but it is known that in the best years and in the best zones, there is available about 10 to 15 quintals of dry forage per hectare. (11)

In the whole of North Africa the climate has a great influence on the growth of pasture, and in some years, pasture can be very scarce or even completely destroyed, and this is reflected in the high periodic death rate of the animals. The farmers in El-Marj Plain do not put aside in good years a reserve of fodder to be used in the bad years. This neglect leads them to long migrations in search of forage, and selling the animals at ridiculously low prices. Planning for reserve fodder supplies is necessary for the livestock on the farms and particularly for the work animals and for those

Figure 48



reared for meat or for the production of milk.

Livestock must sometimes travel long distances to watering places. Sheep can go for three days without water, cattle for two days, and camels for up to 15 days. It is certain that the general condition of animals would improve if they were able to get water at more frequent intervals and without having to travel so far for it.

However, despite the existence of a large number of wells and cisterns in El-Marj Plain, in bad years the quantity of water is insufficient to meet human and animals' needs. The new El-Debussia-El-Marj water supply project will provide about 50 watering points for animals along the water pipeline route to El-Marj. There is also a need to improve the wells and cisterns built in the Greek and Roman times.

The species of livestock kept by the inhabitants are few, and the breeders are fewer. In fact there is only one breed of each kind of domestic animal. This may be attributed either to the absence of introductions into the local breeds, or to the complete assimilation of the introductions into the local breeds. It may be said that the breeds which exist are a precious result of centuries of adaptation, and this naturally gives them a high value.

The settled farmers who possess a large number of livestock usually over one hundred head per farmer, hire shepherds to pasture the animals on the high Jebel south of El-

Marj Plain. If the flock consists of only sheep the shepherd grazes the animals during the six months October-March around Tacnis and in El-Abiar area. At this period sheep derive all their water requirements from the herbage. In the period of April-September, the flocks return to El-Marj Plain for watering and pasture on the fallow lands. If the owner is well-off he buys the water in the Jebel cisterns for the latter period so the sheep drink from them and stay on the high Jebel throughout the year. The price of the cistern varies from one year to another, according to rainfall; in the years with abundant rain the price of the cistern is about £L.100, and in the drought years the price may exceed £L.150 for watering the animals for the summer period, (April-September).

The goats and cattle stay in El-May Plain and pasture in the vicinity of the farm. Farmers who own less than one hundred head (per farmer), leave a member of the family - usually the farmer's son - in charge of the flock. The farmers with few livestock sometimes join together to hire one shepherd. The shepherd in most of the cases is from Tripolitania since the Bedouin consider such a job inferior work. The shepherd's wage varies from one period to another. In the winter months (October-March) the shepherd is paid in most cases £L.14 per month; while in the summer period he is paid £L.14 per month plus one in ten of the new lambs (the tithe), or in some cases during this latter period he is

paid £L.1 per head plus the tithe. If the flock includes goats, he is given the tithe of the old goats. The shepherd's wage is higher in summer because of the scarcity of grass and he has to travel longer distances with the flock, but in winter the grass is abundant and there is no serious watering problem.

Most of the animal raising activities in El-Marj Plain, therefore, take place outside of the farms on jointly utilized tribal land. The farmer's stock of animals is his capital and safety reserve for drought years. After bad crops, the lack of income from grain is compensated by an increase of animal sales, as for instance in the drought year of 1959-60, when the larger part of the cash income of most of El-Marj Plain farmers was obtained by animal sales.

The most important branch of animal farming in El-Marj Plain is the keeping of goats, next in importance is the keeping of wandering sheep and finally cattle. Each farmer possesses one or a few horses or camels for drought animals and donkeys for carrying loads. The following table gives the number of livestock in Cyrenaica and the Mutasarrifia of El-Marj by Mudiria (1960).

Goats:- The goats are raised in a considerable number in the Mutasarrifia of El-Marj, and their figures exceed those of sheep. The percentage of goats to the total number of goats and sheep together is 64 per cent. The goats are kept on the fringes of the Plain in the forest where they are raised

Table 57:- Number of livestock in Cyrenaica and the Mutasarrifia of El-Marj by Mudiria (1960)

	Cyrenaica	Mutasarrifia of El-Marj	Mudiria of El-Marj	Mudiria of Tul-meitha	Mudiria of El-Bayada	Mudiria of Tacnis	Mudiria of Jardas El-Abid
Goats	482880	165351	39740	30250	30895	26704	37762
Sheep	453569	109848	34019	7210	9114	28981	30524
Cattle	27137	13302	8287	2497	1615	322	581
Camels	46540	4811	1247	517	388	1663	996
Horses	16776	7203	2673	808	1363	1002	1357
Donkeys	35492	8712	2616	1173	1758	1288	1877

Source:- 1960 Census of Agriculture.

on the hills and sloping lands (Vide Fig. No.48). The goat prefers browsing on shrubs and trees, while sheep prefer the open herbage land.

The goat is considered the greatest enemy to the forest, afforestation and agriculture. Because of their high number they cause enormous damage to the economic life of the region. The traditional attitude of the Bedouin is, however, that the Jebel is useless without goats, and the goat is useless without the Jebel.

However desirable it may seem to be, with regard to forestry and the prevention of erosion, the farmers cannot be made to reduce their number of goats because of personal economic risks involved during drought years.

The Bedouin get milk from the goat for their diet, hair for their tents and skins for storage bags. The goat is the main source of meat on the Jébel, while the sheep is the main source in the towns.

Sheep:- The sheep in Cyrenaica are a type of Berber sheep with a fat tail, the type which is bred throughout North Africa. It is not a large sheep, the height being 60 to 63 cms. and the average male weight is 75 kgs. and the female 55 kgs. The sheep are kept mostly in the steppe for grazing (Vide Fig. No. 48). The wooded areas are not suitable for sheep. The sheep are important to the local people as they provide the choicest meat, milk and wool. The Bedouin use the milk either fresh or as saman*. From wool they make the roof of the tent, carpets and baracans.

Cattle:- The cattle are of the same general breed as can be found in all North Africa, small, short-horned and light in colour. The local cattle are bred for meat and milk and rarely used for work purposes. As can be seen from Table 57 the number of cattle in the Mutasarrifia of El-Marj (of which 62 per cent in the Mudiria of El-Marj) is 49 per cent of the total in Cyrenaica. The high percentage of cattle kept in El-Marj Plain is a further indication of the relatively high agricultural potential of the unimproved pasture. No transhumance is practised and animals remain in the vicinity of the farms (Vide Fig.No.48). Any extension of cattle breeding will

probably help to tie the Bedouin down to the land.

* Saman is melted butter which is left to cool and then stored in goat skins.

The following table shows the relation between the number of cattle, the population and the area of arable land in the Mutasarrifia of El-Marj, Cyrenaica and Libya.

Table 58:- The relation between the number of cattle, the number of population and the area of arable land in the Mutasarrifia of El-Marj, Cyrenaica and Libya.

	Arable land (ha.)	Total population (1964)	Number of cattle (1960)	Head of cattle/ ha. of Arable land	Head of cattle/ one inhabitant
Mutasarrifia of El-Marj	193026	29222	13302	0.07	0.46
Cyrenaica	751763	451469	27137	0.04	0.06
Libya	2375074	1559399	111411	0.05	0.07

Source:- Population Census Primary Results 1964 and 1960 Census of Agriculture.

As can be seen from the table, the Mutasarrifia of El-Marj has the highest ratio of cattle, considered either per hectare of arable land or per inhabitant.

The relative position of Libya compared with the neighbouring countries is illustrated by the following table.

Table 59:- The relation between the number of cattle, the number of population and the area of of arable land in the North African countries

Country	Arable land (ha.)000	Total popul- ation in 000	Number of cattle 000	Head of cattle/lha. of arable land	Head of cattle/one inhab- itant
Libya	2375	1559	111	0.05	0.07
U.A.R.	2610	25929	1390	0.50	0.05
Tunisia	4912	4168	604	0.12	0.14
Algeria	6819	11020	645	0.09	0.05
Morocco	8564	11626	2560	0.30	0.22

Source:- Agriculture of Libya and its development, Tripoli.

(c.f. Europe where the ratio of cattle to human population is 0.3:1 or 3 times the Libyan density).

As far as beef consumption is concerned, Libya is not self-supporting and cattle are an important item in the imports. This contrasts with the last century when, for example, Della Cella who travelled through Cyrenaica in 1817, reported having seen large herds of cattle around El-Abiar which were being profitably exported to Malta.⁽¹²⁾

Camels:- The camel is represented by the Dromedary in Cyrenaica, the type with the single hump. The camel is not now so important in transport except for the Salatna sub-tribe (of the el-Urfa tribe) who use the camel during their journey to the south of Tacnis for cultivation. In El-Marj Plain the

camel is used mainly for ploughing. As can be noted from Table 57 in the Mutasarrifia of El-Marj there is only 10 per cent of the total camels in Cyrenaica. Most of the camels in the Mutasarrifia are in El-Marj Plain, or the steppe zones of Tacnis and Jardas El-Abid. In the last two zones the camel is used as a means of transport to the south, for shifting cultivation and for ploughing.

Camel meat and milk are used by the Libyans, the hides are for leather and the hair in textiles.

The number of sheep, goats, cattle and camels fluctuate from one year to another according to quantity of rainfall and the gross available livestock, as shown in the table below for the period 1954-60

Table 60:- Number of livestock in the Mutasarrifia of El-Marj for 1954 - 60.

	1960	1959	1958	1957	1956	1955	1954
Sheep	109848	99330	182000	70000	100000	136000	105000
Goats	165351	126987	200000	135000	155000	180000	162000
Cattle	13302	13854	27000	13000	14000	20000	20000
Camels	4811	5407	10000	7000	7000	7000	4000

Source:- 1960 Census of Agriculture and Agricultural statistics for Cyrenaica 1954-59.

The figures for 1958 are higher than those of 1959 and 1960, since the last two years were characterised by low rainfall. The following table gives the number of sheep, goats and cattle exported from Cyrenaica to U.A.R. and Malta in 1960.

Table 61:- Number of sheep, goats and cattle exported from Cyrenaica to U.A.R. and Malta.

	To. U.A.R.	To Malta	Total
Sheep	18288,	-	18288
Goats	1522	-	1522
Cattle	1719	1693	3412

Source:- General Statistics of Cyrenaica
1960 - Benghazi.

In addition to the main livestock mentioned, there are also horses which are now used almost entirely for work in contrast to traditional use for hawking and hunting and when they were a sign of wealth and social position. Other working animals are donkeys which exist in considerable number and are used for transporting the products from the farms near the town of El-Marj to the market. Mules are very few, though they prove to be very useful. Poultry, are represented in the rather small local hen. The food given to the poultry is very poor, for it is believed that they can live on seeds of crops lying on the ground, natural vegetation and larvae of insects. An increase of poultry could contribute considerably to the farm income in the sale of eggs and fresh meat.

Livestock Products:-

Meat is an important element in the diet of the Libyan people, goat meat on the Jebel and lamb in the towns and the coastal plain, while beef and camel meat occupy the third and fourth places respectively everywhere in Libya. The following table gives the number of animals killed, and meat production per cent in the Mutasarrifia of El-Marj for the period 1955-1959 and 1963.

Table 62:- Number of animals killed, meat production and per caput in the Mutasarrifia of El-Marj for the period 1955-1959 and 1963

Year	Number of animals killed				Meat Production	
	Sheep	Goats	Cattle	Camels	Tons	Per caput (Kg.)
1955	8728	10013	52	14	229	6.3
1956	8644	10693	75	15	236	6.5
1957	8045	10395	209	78	245	6.7
1958	10066	9788	119	44	255	7.0
1959	9977	114220	247	86	277	7.6
1963	14295	11777	436	148	434	11.0

Source:- Agricultural Statistics 1954-1959 and 1963.

There are no figures available for the years 1960, 1961 and 1962. The table in particular shows a considerable increase between 1959 and 1963 derived from all kinds of animals, this being a result of rising standards of living. The animals slaughtered in El-Marj town are under the supervision of the

municipality at the slaughter house. Animals killed in the field by the Bedouin are for social occasions, i.e. for guests or in the Eid El-Adha (the sacrifice festival) and almost every family kills at least one animal per years.

Wool Production:- The quality of wool is inferior. It is short, course and dirty. When it is washed, the weight is reduced to about 33% of the original. The local sheep yield chiefly carpet-type wool, and minor quantities of semi-improved medium and coarse wools. The wools are predominantly white with about 15% of natural coloured wools in black, grey and various shades of brown.

Wool shearing on the Jebel is mainly in mid-May. Sheep and goats are sheared with small hand-made steel scissors, manufactured by local blacksmiths. Shearing a large flock might take up to ten days, and the help of a number of men is required. Sheep shearing is one of the very few occasions when a number of men perform a task together and ceremonies follow.

Only about 25% of the total wool and goat hair produced in Cyrenaica in 1960 was exported. The remaining 75% was consumed by local handicraft and small industries in Libya, for manufacture of barracans, blankets and various types of carpets and rugs. The following table shows the wool production in the Mutasarrifia of El-Marj in 1960, by mudiria (in quintals).

Table 63:- Wool production in the Mutasarrifia of El-Marj in 1960 by mudiria (in quintals).

	Mut. of El-Marj	Mud. of El-Marj	Mud. of Tulmeitha	Mud. of El-Bay- ada	Mud. of Tacnis	Mud. of Jardas El- Abid
Wool greasy basis	2932	756	139	295	934	808
Clean yield	879.60	226.80	41.70	88.50	280.20	242.40

Source:- 1960 Census of Agriculture.

The Mutasarrifia of El-Marj produces 27% of the total wool produced om Cyrenaica and most of this comes from El-Marj Plain and the steppe zone of Tacnis and Jardas.

In 1960 Cyrenaica exported 2325 metric tons of wool, this being 25% of the total production. The wool is exported mainly to Italy and a small proportion to the United Kingdom. It is exported unwashed.

Goat's hair is used in manufacturing rugs. In 1960, 621 quintals were produced in the Mutasarrifia of El-Marj. In the same year 281 quintals of camel's hair were produced.

Hides and skins:- The curing of hides and skins takes place either in the slaughter house in El-Marj or in the field. The field method is inefficient and is apt to produce hides and skins which putrefy during storage, thus developing holes when tanned. Skins from slaught houses are usually cured within a few hours of slaughter. There is no tannery in El-

Marj and the hides and skins are usually transported to Benghazi. Cyrenaica exported 472 metric tons of hides and skins to Italy and Lebanon in 1960. Other animal products are milk, eggs and honey. In 1960, 143700 litres of milk, 31192 eggs, and 20 quintals of honey were produced in the Mutasarrifia of El-Marj.

The low productivity of the animal farming is due mainly to bad feed and inadequate attention paid to breeding. The Government Breeding Station at Marzotti, 6 kms. west of El-Marj, is engaged in improving the local stock of bulls, horses and donkeys by importing certain types of animals for breeding. The new breeds are made available for farmers to improve their livestock breeds. The local sheep is characterised by low water consumption, and no success can be expected from introducing other breeds which need water in larger quantity.

III. SHIFTING CULTIVATION

It has been pointed out throughout the study that the farmers on El-Marj Plain are sedentary, and that settled agriculture predominates throughout the Plain. The cultivated lands are distinctly grouped in private, Governmental or tribal control. There is no communal use. The wells and cisterns are also mostly privately owned. Each tribe and tribal group know their lands and the boundaries are well defined.

The private and the Ente farmers are settled on permanent farm land, while other tribal members who live on

tribal land have known areas for cultivation each year. All land cleared of scrub and maquis is already cultivated to meet the needs of the tribal group. No shifting agriculture as such is practised in El-Marj Plain, but is relevant to this study because a few of the Bedouin, who live in tents on the Jebel, do move every year to the Barr (Es-Serual region) for cereal cultivation. The word Barr (wilderness) is a term used in Libya for shifting cultivation. The Barr to the Bedouin of the Jebel Akhdar is areas south of Tacnis and Jardas, i.e. the southern slopes of the Jebel and the whole of Es-Serual and Balte regions (Vide Fig.No.40). However, boundaries of the tribes of the Jebel extend southwards as far as Tariq Aziza route; south of this route there is no strict ownership in land and a man can plough where he pleases, but there is strict ownership in wells. South of Tacnis and Jardas and in the Es-Serual and Balte regions the semi-desert climatic conditions prevail and rainfall is extremely erratic with a complete absence every two or three years.

Shifting cultivation in the Barr is practiced by some of the Salatna sub-tribe and few of the tented Bedouin who occupy the Icle concession. These Bedouin keep sheep and so they move with their flocks to the Barr for grazing and cereal cultivation.

Shifting cultivation entails a light scattering of barley seed upon the ground following the first

substantial fall of rain, after the area has been ploughed with a wooden plough. If rain falls in the season, a crop may be expected. Sowing usually occurs over a period of a month, starting in November. The shifting cultivators plough and sow as much as they can, since their wealth for the coming season depends on the harvest. This applies particularly to those who live permanently in the area south of the Jebel.

The farmer who is going to plough in the Barr is usually accompanied by two of the male members of his family or by one worker. Very few of the farms take the whole family with them, for someone must look after the farm house and cultivate areas of the Jebel where the rainfall is more certain. These areas may also be ploughed by the farmer after his return from the Barr.

Farmers who practise shifting cultivation usually stay with their flocks until May. After the Barr harvest the farmer returns to the Jebel with the proceeds, and his flock of sheep which he will water on El-Marj Plain during the summer.

Since the rainfall is erratic the cereal returns differ from year to year. Sometimes they are negligible but in good years, according to Peters, returns of a hundredfold are not uncommon. (13)

IV

Nomadism:- Nomads

True nomadism is very rare in Cyrenaica but is still to be found between Zawiyat Masus and Jalu. Here camel nomads spend the dry summer months camping around wells, near the steppe belt which separates the true desert from the Jebel area; while in the cooler and wetter season they reach the heart of the desert, anywhere between Egypt, Fezzan and the Sudan. Some of the El-Abid tribe and their client Marabtin of El-Masamir are nomads wandering in the south of the Jebel.

Semi-Nomads:- They are numerous. They start their movement from El-Marj Plain and the high Jebel in November after cereals have been sown on the Jebel, or part of the group may take the animals south while the rest finish the ploughing. Most of these semi-nomads return to the plateau in Marj, when the water becomes scarce, but some (those of the El-Abid tribe) including some of the most powerful elements, remain in the south of the Jebel permanently. Included in this category are a large number of the Salatna sub-tribe* (of the El-Urfa tribe) - about 54 families - who occupy the Icle concession and a few groups - 10 families - of the Dursa tribe at Batt*, who make the movement to the south for cereal cultivation and pasture. The Salatna sub-tribe live either in tents, in the Icle houses or in the Ente farms.

* Soutr :- Mudiria of Batta office.

The Ente farm occupiers pay frequent visits to the farm. For example, a farmer from the Dursa tribe who lives in an Ente farmhouse No.308 in the south west of the Mudiria of Batta, moves to south of Tacnis in mid-November to pasture his flock at 125 head of sheep. The farmer returns to his farm twice per month and stays on the farm for a week to check on the farm and the house. He buys his necessities from El-Marj and then returns to the Barr. Some of the Salatna sub-tribe move for a short distance to the Ghaba (the forest) with their goats northwards at the crest of the first escarpment. They return in April to their usual residence.

The Marabtin Aulad Al-Shaikh, whose territory is at Sidi Bu Zeid, are semi-nomads, and move southward for a short distance to the area round El-Abiar. As confirmed by Evans-Pritchard⁽¹⁴⁾ there are many advantages in this transhumance. The autumn flush of grass comes early south of the Jebel, and grazing is of relatively good quality. On the other hand, the grasses of the Jebel and its southern slopes are still green when the desert grasses, except in especially favoured depressions, are withered. By their annual oscillation the Bedouin thus give their animals the best grazing at all seasons of the year. Sheep mostly lamb around November, which is the month in which new grasses spring up in the Barr, so the move southwards gives the sheep the richest grazing at a time when they need it most, and the warmer conditions prevailing in the south suit the lambs.

Settled Population:-

The Bedouin as a whole, on the Jebel are not forced to indulge in full scale transhumance. The climatic conditions, vegetation, physical environment are more favourable for settled land use than for mobility. The rainfall is higher than in the south or any other region in Cyrenaica and when the Bedouin of the Jebel talk about rainfall, the question is whether there is much or little, while further south the question is whether there will be any rain at all. The pasture for the Bedouin of the Jebel is available all the year around, while in the south of the Jebel where nomadism exists, the grass withers in the summer except for a few shrubs in the wadis. The wells and cisterns existing in a large number on the Jebel further diminish the necessity for long-range movement.

The dissection of the Jebel by deep north-south aligned wadis is a further hindrance to movement; while the Plain of El-Marj, relatively small, and occupied almost to capacity by sedentary farmers, does not now fit into any transhumant association of regions.

It is significant therefore that the Bedouin of the Jebel are almost entirely goat and cow herders - "The cow and goat do not wander but the camel is always moving," is the way it is put by the Bedouin. Almost all the few camels found in El-Marj belong to one sub-tribe, the Salatna, who exceptionally, still migrate seasonally to the south. The cows spend most of their time in the vicinity of the settled farms

and the goats for the most part browse in the adjacent scrub-forests. The sedentary Bedouin themselves, particularly those with fruit trees, believe strongly that possession is nine-tenths of the law and feel less secure of their property if they move away; the few who go to the Barr send the young people of the family to plough there while the rest of the family remains in the farm house. If the whole family moves to the Barr, then they pay frequent visits to the house almost every two weeks to ensure that their property is safe. If any Bedouin in the Ente farms is asked whether he moves to the south for pasture or cereal cultivation, he is apt to immediately deny that he moves, lest this should damage his legal status on the farm. The contract of the Ente farm lease contains a condition that the farmer must stay on the farm all the year around. From observation it does appear that almost all the Bedouin in the Ente farms are sedentary. The Bedouin, who live in tents and cultivate the tribal land, move only twice or three times annually, and very often only to rid themselves of the fleas which become an intolerable nuisance, even to the Bedouin in summer, where a camp has remained in one place over a period of months. The Bedouin who live in tents in the north east of Batta on the edge of El-Marj Plain and in El-Hemda, and its northward facing slope, do, in fact, make a seasonal move, but this is not to pasture or watering points like the nomads of the south of the Jebel, but into wadis and back on to the hills. In winter, the Jebel becomes bitterly cold, and hailstorms are frequent. At this time of

the year shelter from the cold winds, and driving rains is to be found down in the deep wadis. During October, the camps begin to move off the Jebel, until by the end of the month, there are few camps that are not in the wadis. By April, the Bedouin come out of the wadis again up on the hills where the sea breezes relieve the hot conditions which prevail. By this time the narrow wadis become hot, and few people live in them in the summer. This fact can be noticed when travelling on the Jebel during winter when a Bedouin tent is spotted only occasionally, while in the summer, the tents are noticeable everywhere on the Jebel.

According to De Agostini, the nomads numbered 35,000(9 per cent of the population of Cyrenaica) in 1922. In the 1931 census, none were enumerated as nomads, and in 1936 none were enumerated in the district of El-Marj. In 1954 there were 8335 nomads in the Mutasarrifia of El-Marj being 22.9 per cent of the total population of the Mutasarrifia.

For the semi-nomads, De Agostini in 1922, estimated 700 persons of the El-Urfa tribe being 8.1 per cent of the tribe, 450 in the El-Abid tribe (7.0 per cent) and 4950 in El-Auaqir (22.0 per cent). In 1931 census, 1.7 per cent of the population of the district of El-Marj, and 19.6 per cent of the total population of Cyrenaica were semi-nomads. In the 1936 census, none were enumerated as semi-nomads in the district of El-Marj, while for Cyrenaica they made up 25.6 per cent of the total population. The 1954 census showed 33 per cent of the

Mutasarrifia of El-Marj and 32 per cent of the population of Cyrenaica were semi-nomads. The high percentage of the nomads and semi-nomads in 1954 may be explained thus: first, after the Italian evacuation of Cyrenaica all the tribes of the Jebel returned to their tribal homelands, and at the present day the Bedouin have freedom of movement between the Jebel and the south of it. Secondly, it is due to the constant mobility of the nomads and their wanderings in areas not easily accessible to the enumerators. Thirdly, there have been changes in the application of the terms "nomads, "semi-nomads" and "stabili". De Agostini defines what he called "stabili" as people with normal residence in a determined locality within which the tents are pitched here and there for watering and other reasons, and with periodic movements for sowing and pasturing, even though some days away from their usual seat.⁽¹⁵⁾ Ahlman⁽¹⁶⁾ prefers to call them semi-sedentary (quasi sedentaire) since they are not really stable in the narrow sense of the word, but support themselves by mixed grazing and agriculture. The 1954 census, defines the "settled population" as that comprising members of household with a fixed place of residence during the major part of the year from which they do not move except occasionally or during the season of cultivation, harvesting or grazing⁽¹⁷⁾.

However, in the 1954 census 15,700 were enumerated in the Mutasarrifia of El-Marj as settled, 12368 as semi-nomads, and 8335 as nomads. The following table shows the relative

strength of each of the groups of settled, semi-nomads and the nomads in relation to the total population of Libya, Cyrenaica and the Mutasarrifia of El-Marj in 1954.

Table 64:- Settled population, semi-nomads and nomads and percentage to total population in Libya, Cyrenaica and the Mutasarrifia of El-Marj in 1954.

	By Household			Per Persons		
	Settled	Semi-nomads	Nomads	Settled	Semi-nomads	Nomads
Libya	74	18	8	74	18	8
Cyrenaica	56	32	12	55	33	12
Mutasarrifia of El-Marj	44	33	23	43	34	23

Source:- General population Census 1954.

Many of those classified as semi-nomads are actually more agricultural than pastoral in their way of life; and although the Bedouin, in general, are inclined in attitude to be pastoralists first and cultivators afterwards, most of them plough, as pointed out earlier, and most of them have retained, "the shelter of their ancestors", the tent. These people are little attached to the soil, in other words they are semi-nomadic cultivators who still retain important pastoral interests. The site of the tent does not necessarily signify nomadism proper, for it is sometimes suited to other modes of life.

The Agricultural Development and Settlement Scheme

In the preceding discussion, we have dealt with the background to, and the present position of, the agricultural sector in El-Marj Plain. It has been shown that crop yields and levels of production are low and fluctuating. The shortage of farm labour, and particularly skilled farm labour has been indicated as a factor of considerable importance in inhibiting agricultural development in the area. At the same time, it has been made apparent that the absolute deterioration in the fabric of, and the decline in, the area cultivated in the Italian colonial settlements gives cause for concern. In this situation, it is increasingly being asked "what can be done to improve conditions?"

Italian experience

The Italian experience in demographic settlement in Libya is instructive, though it must be remembered, that the efforts to induce mass peasant settlement began under rather rarified political conditions and ended abruptly, before completion, as a result of war. Furthermore, the agricultural development of Cyrenaica under the Italian colonial regime was intended to serve Italian interests to the exclusion of local groups. There was no community of interest between Italian peasant and the Bedouin, and thus no continuity of agricultural exploitation of the area. Quite apart from the

fabric of the Italian estates and the infrastructure of roads and villages which remain as a legacy to the modern state of Libya, the Italian experiment was valuable in demonstrating clearly, that under good management and utilising advanced techniques of exploitation, the area can be made to produce valuable tree and field crops and can support a rural community at a relatively high standard of living.

Incentives for re-development

Since independence, the government of Libya has devoted its energies to the provision of support services for agriculture in the area, hoping thereby to hasten the move of Bedouin from herding to sedentary agriculture. The government has maintained the ex-Italian experimental stations in order to continue improvements to livestock and seed varieties, and has established an Agricultural Guidance department for each mudiria to implement an agricultural extension service for farmers. Amongst the many established services available to farmers are distribution of selected seeds, hire of agricultural machinery, and the orcharding extension programme. However, while these schemes have helped farmers in the area, they have not succeeded in overcoming the major problem of rehabilitating the ex-Italian estates and the creation of a sedentary agricultural population. As we have pointed out earlier, most of the arable and orchard areas have been neglected since the Italian evacuation and are likely to remain so for as long as the Bedouin tribes of the area retain their

essentially herding economy.

IBRD proposals

The first major proposal for the rehabilitation of the Italian farming areas come from the International Bank for Reconstruction and Development, an economic survey mission from which visits were made to Libya in 1958 and 1959. The mission pointed out that 'the small farmers in Cyrenaica are amongst the poorest and most backward section of the Libyan population, and very little has been done to help them improve their position'.⁽¹⁸⁾ The mission recommended that a wheat scheme should be instituted in El-Marj Plain, with barley, legumes and grass as supporting crops. The mission report envisaged the task of developing the area would be undertaken by an independent board, whose first and most important job would be to reclaim the ex-Italian estates.⁽¹⁹⁾ In fact, the mission's proposals were not new in themselves, but reflected the thinking of Libyan and ex-patriate staff in the agricultural and extension services in the province. However, proposals of this kind from the International Bank had the supreme virtue of being impartial; previous suggestions to this same end had been quashed as a result of the provincial government's fears that any attempt to reorganise the Italian settlements would inevitably lead to a clash with the tribal groups occupying them. Most of the personnel in the provincial government relied for their position on support from tribal groups and were thus reluctant

to interfere in any way with tribal areas. In the period before 1962, the government was in a difficult financial position, since there was a persistent budget deficit made up only by British and American aid and payment for military bases. Large-scale development schemes were effectively outside the means of the country, and the El-Marj area, like many others, was left to its own devices. From 1962, oil revenues became available to the Libyan government, and, with 70 per cent of revenues earmarked for development financing, it became possible to think seriously about the development of the agricultural potential of the country. To this end, the National Agricultural Settlement Authority (N.A.S.A.) was established by Royal Decree in June 11, 1963.

The Royal Decree provided that N.A.S.A. should redevelop the ex-Italian estates throughout the country and also prepare schemes for new settlements for other areas. The ultimate aim of the Authority was to bring all fallow and under-utilised lands into agricultural use for sedentary farming. It falls to N.A.S.A. to encourage sedentary farming by development of co-operatives and rural education. Under the decree of June 1963, N.A.S.A. will distribute lands on the Italian estates to farmers willing to reclaim and improve the holding granted to them under the following terms:-

1. the N.A.S.A. will subsidise the beneficiaries for an initial period while the farmer settles in and prepares the farm for cultivation.

2. the N.A.S.A. reserves the right to supervise the farmers and to undertake all works necessary for agricultural development within the farm area.
3. the N.A.S.A. will ensure that farmers taking land under the scheme will complete all tasks on the farm required by their contract and may expel those who do not attain the minimum standards set. The farmer is obliged to carry out the work which is required to realise the individual development farm plan as proposed to him, further to follow the advice and instructions of N.A.S.A. and its expert executives.
4. agricultural co-operatives are to be formed in each area in convenient units, and the beneficiaries and the farmers have to join.
5. At the end of the initial period, the N.A.S.A. will evaluate the work completed by the farmers and recommend whether or not they shall be given ownership rights. The price of the unit and the method of repayment is also to be determined by the Authority.

The policy to be applied to the fallow lands (outside the Italian settlement areas) was outlined in a detailed White Paper which accompanied the June 1963 Decree establishing N.A.S.A. The White Paper indicates that development will take place where soil fertility, water availability, and clearly established land rights make this

possible and commercially feasible. The Paper places as much emphasis on the improvement of production methods in the reclaimed lands as on the scale of operations to be undertaken. The hope is expressed that by means of the work implemented by N.A.S.A. the rural-urban drift will be stemmed and possibly ex-farmers tempted back from the towns to the countryside. The operations of N.A.S.A. will be independent from the established governmental departments and should thus be unimpeded by slow bureaucratic processes and political influence.

Undoubtedly, the major problem to be faced by N.A.S.A. is that arising from the existence of sedentary and nomadic groups within the same area and particularly the fact that, for the most part, the estates in Cyrenaica are currently occupied by Bedouin groups who claim that the land (though not the farmhouse) is theirs by right. In the first place, N.A.S.A. will try to avoid a direct clash with the tribal groups over the land ownership issue by beginning operations on lands where the land title is not in dispute, i.e. on the lands taken over by the Libyan government from the Italians under the Italo-Libyan Treaty of 1958.

Candidates for farms made available by N.A.S.A. will be selected from amongst applicants who have some farming experience, are physically fit and of good character. Nonetheless, it can be seen that in the absence of a pool of skilled farming families and with the strong economic incentive for movement to the towns, considerable difficulties will have

to be faced in the recruitment of operators for the scheme.

The Board of N.A.S.A. will be headed by a qualified Libyan with agricultural experience and will include representatives from the Ministry of Agriculture, Ministry of Development and Planning, Ministry of Finance, Ministry of Communications, Ministry of Labour and Social Affairs and the Ministry of Public Works. Private interests will be represented by four members of the Board who undertake agriculture on their own account. Under the Board itself, an executive committee will be established for managing the settlement scheme and organising the administration of estates. Work under the scheme began in January 1964 after the opening of N.A.S.A. headquarters in Tripoli.

In El-Marj Plain the effects of the new scheme are already apparent. It has already been mentioned in the beginning of the section that some 300 houses on the former Ente estates of Farzugha were repaired in the first year of operation at a cost of £1,800 per unit. Three sample farms are being developed in the current year in the Mutasarrifia of El-Marj, at Farzugha, El-Aweliya and El-Bayada. On each of the development farms reclaimed by N.A.S.A., fifteen hectares were ploughed in 1964/65, while in the previous year two quintals of wheat and one quintal of barley was distributed free to help the occupants through the initial settling-in period. Each of the development farms will be planted with one or two hectares of fruit trees. Meanwhile,

a programme for survey and provision of water resources of agriculture has been instituted, in the first place, through commercial engineering companies working for N.A.S.A. This programme will include projects for the interception and storage of surface waters in El-Marj Plain, mainly at El-Ghariq, for utilisation in farming enterprises in the area. It is planned that several deep wells will be drilled in the Plain in the near future, mainly for agricultural purposes.

Development Farms:-

The elaboration of individual development farm plans and their realisation cannot be begun simultaneously for all the Ente farms, rather, they will be developed step by step. N.A.S.A. will select the most capable farmer in each area, one who on his own initiative has made improvements and is ready for further hard work in developing his farm. In addition, natural conditions of the farm should be favourable to development. An intensified programme will be carried out by N.A.S.A. A development farm worker will teach, and work with the farmer and his helpers, training them in the handling and operation of new equipment, in the use of new methods, etc. The development farm will be the starting point. The farmers of the vicinity who, during the early stages of the development farm, show particular interest in new methods, and who are especially suited for co-operation, will have their farms equipped accordingly and development will begin with the

assistance of the Development Farm worker.

N.A.S.A. field programme

The N.A.S.A. programme for development of the Ente farms will rest on the two-fold aim, of reconstruction and repair of the fabric of the estates, and on the provision of a new farming structure. Most of the Italian farmhouses have been left in disrepair since funds were scarce and no firm policy for their eventual use had ever been proposed. It will be the main task of N.A.S.A. to set as many of the ex-Italian farmhouses in order as possible by putting on new roofs and windows and repairing the water cisterns attached to each unit. Once the farmhouses have been completely restored, N.A.S.A. will be able to make firm promises to its potential entrants of particular farms in good condition and thus offer a powerful incentive for farmers to remain, or return to the land.

Repair of farmhouses represents the easiest phase of operations for N.A.S.A. More important will be the creation of a progressive agriculture through new methods and farming organisation. To this end, N.A.S.A. will provide equipment, credit, and training facilities for selected development farms. At the same time, a general co-operative organisation will be brought into being under whose auspices machinery, selected seed, cheap fertiliser, and credit facilities will be made available to farmers in general. The over-all extension unit under the direct control of N.A.S.A. will be the development

centre, which will be comprised of ten selected farms worked by the most promising of the new settlers and scattered more or less at random throughout the farming area. Each machinery co-operative will be allocated equipment on the basis of one tractor for every ten farms and one combine harvester for each twenty farms.

Tenurial aspects

At present it is envisaged that the reclaimed farm units will not be sold immediately to the occupying farmers. Most farmers would not be able to finance their business and pay off a large mortgage to N.A.S.A. Current policy favours the use of a long-term lease for settlers who operate under N.A.S.A. auspices, though in the first place a three-year probationary period is required, at the end of which unco-operative or inefficient farmers would be removed from the scheme. Successful farmers will be transferred to a thirty years hereditary lease, which may be terminated only after fifteen years' occupation on one year's notification on either side. This fifteen year proviso in the lease is presumably to allow the Authority to remove poor tenants or to readjust farm sizes and boundaries if the necessity arises. Farmers removed from the scheme will be compensated for all improvements effected. Similarly, farmers must remain in occupation of their farms for at least fifteen years, a stipulation which should help stabilise land holding on the scheme but which might prove difficult to enforce. On

expiration of the thirty-years' lease, the cultivating farmer is given an option on the purchase of his farm, with the accumulated rents paid deducted from the price of the unit.

It is expected that these arrangements will give a number of positive advantages to both N.A.S.A. and the tenants. Amongst the more important of the provisions regarding contracts of tenancy and ownership is that no farm may be split up and sold in parcels, though after purchase, it may be sold as an integral unit. Since the farms will not be available for purchase (for thirty years) N.A.S.A. feels that opposition from tribes claiming ownership to the territory will be minimal and that after thirty years, the tribal position will have changed so much as to render the alienation of the land purely a technical matter. At the present time, N.A.S.A. is avoiding any direct clash with tribal interests since any outright opposition from the tribes would deter farmers from participating in the scheme. The large degree of security of tenure and the generous terms of occupation, will mean that most farmers will soon establish themselves and be in a position to raise credit for farm improvements outside N.A.S.A. institutions should this be necessary.

Each contract requires tenants to observe the terms of the development plan drawn up by N.A.S.A. for every farm. In return N.A.S.A. guarantees to aid the tenant in all

farming organisation and field operations which might be necessary. During the first two years of the contract, the farms are to be reclaimed and equipped preparatory to the beginning of commercial farming. In this period, N.A.S.A. will provide all necessary equipment and machinery, livestock and stores for the farmer. Machinery repair shops will be established in El-Marj and El-Beida, and a marketing organisation will be set up under N.A.S.A. control for use by farmers within the scheme. On the farming area itself, the scrub will be cleared and the land levelled by a central work team. Credit for these operations will be provided by the State through N.A.S.A. Farmers will repay their accumulated debt beginning in the fifth year of occupation at a rate of three or four per cent over fifteen or twenty years. Meanwhile, all costs incurred for the repair of farmhouses and cisterns will be paid for by N.A.S.A. as the lessor.

Development activity has already begun in El-Marj and there are signs even at this early stage that N.A.S.A. is making excellent progress. It is also apparent that the task of promoting sedentary agriculture lies much more within the bounds of possibility at the present time than previously (e.g. during the British Military Administration period). Since earlier attempts at Bedouin re-settlement, many of the tribal groups have voluntarily taken to the sedentary life and have taken up cultivation on El-Marj Plain. In the current mood of change, and with the backing of substantial

State Finance it may be expected that many of the erstwhile insoluble problems will be overcome.

A comparison here with the Ente contract and task is of interest. The Ente contract in the pre-war era is outlined in Chapter VII. The Italian colonists were wage-earning. Ente faced three main problems. The first was the practical problem of acquisition of suitable land. The second was the transformation of that land for agricultural settlement on an economic basis. The third problem to which due thought had been given was that of the native population. The Ente activities resulted in driving out the Bedouin from their homeland.

The N.A.S.A.'s activities will be concentrated on Libyan nationals only, and the beneficiaries in a certain area will be from the tribe which occupies that area. As the development will start on legally held State lands, and will avoid any removal of the present farmers, the settlement scheme will not be met with any resistance from the tribes.

Nomad re-settlement

Nomad re-settlement must be seen primarily as a social and human problem which can be resolved only with patience and perseverance. On the Jebel, the major task will be converting pastoral nomads into settled farmers. This will represent a new approach to agricultural development, since all previous sedentary agricultural life in the area was introduced from the outside and practiced by

aliens. Each invasion was inevitably followed by a return of the Bedouin and the elimination of sedentary pursuits.

It is realised in present-day Libya that successful settlers are not created by the issuance of title deeds. It is intended to implement a broadly-based programme aimed at the creation of new ideals and attitudes. In the first place, N.A.S.A. will attempt to reconcile the requirements of pastoral activity with those of agriculture and the conservation of forest resources. In this connection, the importance of Cyrenaican animal husbandry, the special attitudes and skillfulness of its people for pastoral activities should be kept in mind; and likewise, the importance of forest resources must not be underestimated⁽²⁰⁾. But since there is no detailed knowledge of, or programme for, re-settlement in Cyrenaica, it is difficult to go any further in assuming solutions. At present, and probably for some time to come, the major effort will be concentrated in Tripolitania, where the population is largely sedentary and agriculture already well developed. In Cyrenaica, development will come more slowly, beginning, as we have seen, with the rehabilitation of the ex-Ente estates.

The significant problems to be foreseen in the re-settlement of El-Marj have been outlined earlier. It should be added that, as in most pastoral communities, the herder of Cyrenaica considers himself superior to the tilling peasant and city dweller. It is obvious, but very important

to remember that the Bedouin, of all people, offer the poorest qualifications as farmers, yet experience in similar areas (particularly adjacent parts of Egypt) shows that Bedouin prove most adept farmers and are quick to accept modern methods of farming since they have no vested interest to hang on to and protect. The introduction of non-tribal people into the sedentary areas cannot in any case be considered seriously, as such a move would certainly raise local Bedouin opposition. Possibly the most serious problem which will arise for N.A.S.A. will be the lack of adequate Libyan administrative and extension staff to support the scheme. For a while expatriate experts will be needed, with all the attendant disadvantages associated with lack of local language and knowledge of human and social conditions.

Fortunately, full nomadism is very rare in Cyrenaica and is confined mainly to the area south of the Jebel. In El-Marj Plain the vast majority of Bedouin are sedentary, with only minor groups migrating to the south to cultivate the Barr or graze their animals. Since lands suitable for sedentary agriculture are available on a large-scale, it will be possible to cater for the settlement of most of the present and future population in the area. Even the fully nomadic groups will tend to become less mobile as the government programme for provision of watering places gets under way in 1966 and the need for movement to seasonal water holes declines.

A limiting factor on the rate of settlement will be the speed at which tribal authority and control of lands decreases. Thus, it will be in the interests of the State to accelerate de-tribalisation, though only where the losses of production from herding are compensated for by increases in the value of output from the sedentary sector. Libya is, in fact, favoured in this respect since its policy for eliminating nomadism arises only from economic motives and is based on the belief that a better standard of living for the peoples of Cyrenaica can be achieved solely by this means. Political malice and fear are not present in the situation in contrast with other areas in the Middle East such as Iran and Jordan.

Conclusion

We have seen then, that Cyrenaica presents human contrasts between settled and nomadic communities and physical contrasts between mountain and plain, arid desert and well-watered, fertile areas. Within this complex, El-Marj Plain is a region of predominantly sedentary population cultivating a fertile soil favoured with a good average rainfall.

There are three important areas of cultivation in El-Marj Plain - the Ente estates, the large private farms and the tribal lands. The ex-Italian Ente estates are now settled by Bedouin, who, lacking capital and skill, maintain themselves precariously and rely for much of their income on livestock sales. Although considerably below the pre-War level of

Italian cultivation, the private farms are much better run and employ much more advanced techniques of cultivation than the Ente areas. On the tribal lands each family farms for subsistence, with heavy reliance upon livestock for supplementary foods. In good years, however, tribal areas supply appreciable quantities of cereals and livestock products to the urban markets in the area. Of all areas, the Ente lands offer the best prospects for future sedentary agricultural development.

Under the prevailing forms of agriculture exploitation, natural limiting factors bear strongly on the activities of most farmers. Water is scarce throughout the area and may be procured only at great expense. Lacking capital, security of tenure, and access to credit sources, with which to exploit water resources, the farmer is at the mercy of a variable rainfall regime. In years of poor rainfall, and total drought may affect the area during three or more successive years, field and livestock production falls to negligible proportions. The nomadic population, too, suffers badly in these periods when water and grazing no longer suffices to keep animals alive.

Livestock is usually grazed outside the main farm area on the open tribal lands. There are distinct specialist grazing lands, corresponding to the various physical and vegetational zones of the area. Cattle tend to predominate on the treeless El-Marj Plain, while goats are grazed on the

crest of the escarpment and in the forest. Sheep are kept in ~~large~~ numbers on the high Jebel south of El-Marj and on the steppes of the southern slopes of the Jebel.

Transhumance and nomadism are giving way increasingly to sedentary farming interests. Tree crops are taken from the private farm areas, though, with the current government programme for the extension of orcharding, the Ente estates are now being planned with fruit trees. The major problems met in the programme have been the lack of skill and resources amongst the Bedouin for maintaining the newly planted trees. Their indifference to orcharding is reinforced by insecurity of tenure; naturally, they are unwilling to undertake long-term improvements on land which might well be taken from them. Pre-occupation with livestock herding also militates against successful orcharding activity.

The main crops are barley and wheat, followed by olives, almonds and vines. Vegetables are grown in the area on only a small scale. Livestock production in the area probably accounts for a greater value than crop production in most years.

In the period 1952-62, Cyrenaican agriculture remained depressed and only slowly developing. Aid to the sector was occasional and patchy, mainly deriving from the activities of the experimental stations, the U.N. agencies and the United States Point Four Missions. The proven

agricultural potential of the area was thought to be of only academic interest in the face of Bedouin occupation of the most promising development areas. In any case, the government of Libya was unable, either through mobilisation of internal resources or foreign loans, to secure adequate capital to undertake the costly and prolonged task of rebuilding the Italian estates and resettling the Bedouin tribes.

The position changed entirely after 1962 with the promise of a large oil income for the immediate future. With no less than 70 per cent of future oil revenues allocated to the development sector, it was possible to revive Libyan hopes of a reconstituted sedentary agricultural zone in Cyrenaica. To this end the National Agricultural Settlement Authority was created and charged with restoration of the ex-Italian estates and the promotion of a progressive, modern agriculture. For El-Marj Plain, N.A.S.A. activities will mean a determined attempt to complete settlement of the Bedouin population and their integration into an arable farming economy and a sedentary rural society. This will not be an easy task since livestock ownership is deeply rooted in Bedouin culture, being the basis of their traditional social and economic well-being. However, the highly favourable terms offered by the N.A.S.A. scheme for re-settlement taken along with a powerful internal trend towards sedentary life appears to give grounds for optimism. As we

have outlined earlier, intensive and broad attention to all aspects of farming economy under the plan for development should assure the scheme of success.

Tenurial problems do exist in Cyrenaica and land ownership rights are still confused. Nonetheless, the area is not affected by the inhibiting institutional obstacles which be-devil agricultural development in most countries of the Middle East. Within Cyrenaica there is no entrenched land owning class and no depressed class of dependent share-croppers. Agricultural land is available in abundance relative to the small population currently occupying the area. While every major country of the Middle East is fighting an apparently losing battle against either rural over-population or the vested interest of 'feudal' land owning groups, Cyrenaica must face only the limited problems arising from nomadic re-settlement, and even here, there are important mitigating factors present.

We have shown that Cyrenaican agriculture is in the throes of far-reaching change and that the rate of social change and economic development is fast increasing under the impact of the new N.A.S.A. scheme. Increasing productivity should enable the area to become entirely self-sufficient in food-stuffs; and, in the future, become a net exporter of agricultural products both to adjacent provinces and foreign markets. Libya is favourably placed geographically to exploit the possibilities offered by the high consuming markets of

Western Europe, since it is not only located near those markets, but also possesses a climate that permits its products to reach maturity earlier than in any other country in the Mediterranean area.

However, it would be wrong to over-emphasise the export potential. The essential justification for the development of domestic agriculture will lie in import replacement and the establishment of a sound economic base on which to operate, should oil income fall away for any reasons. It is desperately important for Libya to place its agriculture on a sound footing lest the sector fall away to insignificance and the country become reliant solely upon imported foodstuffs. The examples of Kuwait and Saudi Arabia, where vegetables are now brought in by air from as far away as the Levant and Afghanistan, should serve as a fair warning in this respect.

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PART THREE

THE PEOPLE

CHAPTER IX

Background of Social Organisation

The social and economic geography of our region is to a very large extent affected by two main aspects of social organisation.

In the first place the tribal and quasi-tribal grouping of peoples is still very strong. Since these groupings are very largely geneological in origin, a brief examination of the ethnic elements is logical. Since the functional sub-divisions of the tribes are also of major importance, particularly with the declining, but still powerful, authority of the shaikhs, an outline of tribal structure and way of life provides additional insight into the proceeding discussion on agriculture and economic matters. The fragmentation of groups must also be emphasised.

The second major fact is that, in association with the survival of tribal organisation, is the survival of the ethos of pastoralism. Without a recognition of this, the history of the Italian settlement and development schemes and the present economic characteristics of El-Marj Plain cannot be understood.

The racial elements of Cyrenaica reflect the successive invasions to the country in the last five millennia

as shown in Chapter VII. The basic elements in the racial structure are the Berbers or the arabized Berber and the Arabs. The Berbers who lived in Cyrenaica a long time before the Arab conquest descended from the Berber Madghis, one of the two Berber stocks: Madghis and El-Baranes.⁽¹⁾ The tribes who descended from the latter stock are still represented in Tripolitania and Fezzan. The Madghis were represented by the Luata tribe in Cyrenaica before the Arabs overrun the country. The Luata descendants live at present in the east of Tripolitania and some are scattered throughout Cyrenaica. De Agostini states that the Salatna primary section of the El-Urfa tribe in El-Marj Plain, and also that the Abaidat tribe, who occupy the eastern part of the Jebel Akhdar, probably descended from Luata.⁽²⁾ The Salatna, as will be shown later in this chapter, claim to be of Sa'adi, of pure Arab stock. The true Berber culture died out in northern Cyrenaica except in the oases of Aujila.

The Arab invasions to Cyrenaica came in two waves, the first came directly from Arabia, shortly after the death of Prophet Muhammed, and brought families of aristocratic Arabs from the Hejaz and Yemen. The Arabs came mostly without wives and married Berber women. Although they converted much of the country to Islam, they did not force the Berbers to accept the Arabic speech, which was confined at that time to the cities, and outposts.

In the eleventh century came the second Arab invasion of much greater volume and importance. This was the invasion of Bani Hilal and Bani Sulaim. They came originally from Najd in Arabia. They are of Mudarid stock, Bani Sulaim being the senior branch. The Bani Hilal passed westwards into Tripolitania and Tunisia, where many Bedouin tribes claim descent from them today. The Bani Sulaim mostly settled in Cyrenaica. At present the descendants of Bani Sulaim are called Sa'adi after Sa'ada of Bani Sulaim their ancestress. They are those nine tribes who hold the country by virtue of conquest. The Abaidat, the Hasa, the Ailat Fayid, the Bara'asa (Aulad Hamad), the Dursa, the El-Abid, the El-Urfa, the El-Auaqir, and the Magharba.

Therefore at this stage, the population are the descendants of the first Arabs, who mixed with Berber blood, and the Sa'adi tribes. Here, the Arabs of Cyrenaica are distinguished between the Sa'adi and Marabtin. The Sa'adi consider themselves as noble tribes and the Marabtin as their clients.

As far as this study is concerned, apart from the Marabtin and Sa'adi, there are negroes who live in El-Marj town. The Jewish and the Italian communities are no longer in existence in El-Marj Plain.

The Marabtin: The origin of the Marabtin is a matter of dispute. There are those who claim that these clients are the descendants of the original Arab invaders, much mixed with Berber blood. (3) De Agostini favours the view that they are

the original Berber stock who have been reduced to the position of clients by their Arab conquerers, and consider the Marabtin as Arab-Berber.⁽⁴⁾ The word Marabtin derived either from a) Ribat "horseline", or garrison where those first volunteers stay or, b) - the Marabit, the holy man and his descendants are also called Marabtin. However, it is probable that the Marabtin are the descendants of the first Arabs who mixed with Berbers.

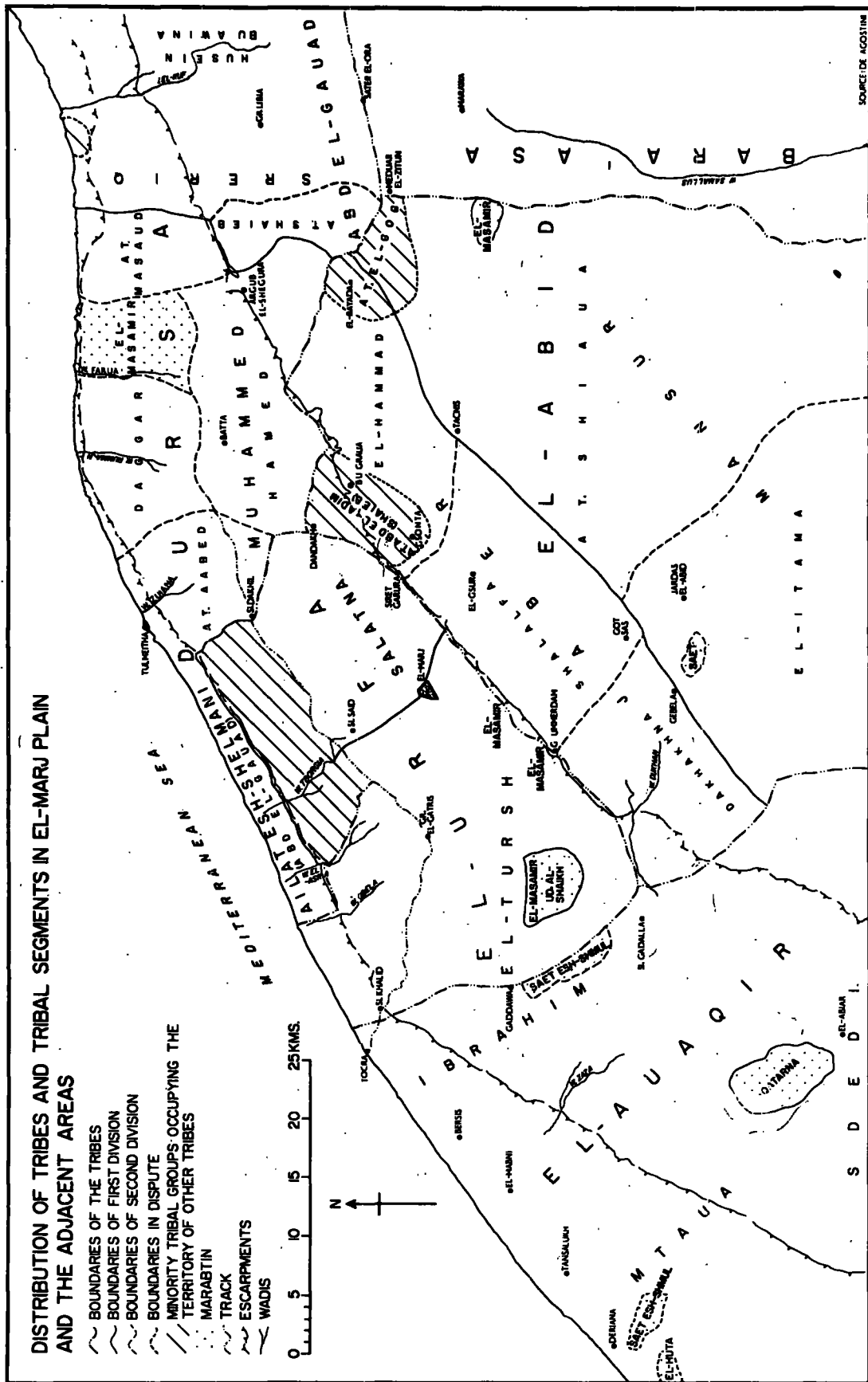
As far as the Sa'adi tribes are concerned, the Marabtin are not Sa'adi, and both accept the status implications of this relationship without question. They are of noble line, and the Marabtin are not. Any one who cannot in some way or other claim this nobility is regarded as a client. The holy men from the west, Morocco, Algeria, Tunisia, and Tripolitania on their way to or from holy places of Islam in Arabia, often settled or died in Cyrenaica, their tombs became shrines and their children called Marabtin. This move of the pious men to the east began in the middle of the thirteenth century and has lasted to the present day. Equally those who have migrated from Tripolitania to Cyrenaica during prolonged droughts are to the Sa'adi of Cyrenaica, also Marabtin, quite irrespective of whether they are Berber or of true Arab stock. The word, as they use it has the meaning of status.

The Marabtin tribes own neither land nor water and

they use these facilities by grace of the Sa'adi tribes. Each of the nine Sa'adi tribes has as clients groups from several Marabtin tribes. So, for example, the Marabtin El-Masamir tribe exists as groups, each of which has client allegiance to the Sa'adi tribes of El-Urfa, Dursa and El-Abid. Even these Marabtin groups are in turn sub-divided by allegiance to sections within each Sa'adi tribe.

In some cases, it is true, the Marabtin have gathered together as tribes, and have been established in one area for such a long time that they now have come to regard the area as their watan (homeland). The Qatarna occupying an area to the north west of El-Abiar, have come to own the land by various dealings with the Italian administration. They have bought several cisterns, thus giving themselves a guarantee of water (Vide Fig.No.49). The El-Tursh section of the El-Urfa tribe have granted an area to the Marabtin of Aulad Al-Shaikh, at Sidi Bu Zeid and they consider it their own land.

The Sa'adi consider their clients as Khut (brothers) and they protect and defend them when any one of them claim sanctuary. Savarese says that their status in Turkish times lay between that of clients of ancient Roman law and that of serfs of the glebe in western Europe in the Middle Ages.⁽⁵⁾ The Sanusia did much to lessen the differences in status between free and client tribes in Cyrenaica.



In the ordinary daily life it would be impossible to distinguish between the Marabtin and Sa'adi.

The Marabtin tribes are of two main classes. There are Marabtin Sadqan (clients of fee) and Marabtin Bi, il Baraka (those of blessing). The Marabtin Sadqan are further divided into various categories, the Marabtin Al-Asa (stick) and the Marabtin Al-Zibal (manure). Those of the stick and manure are not referred to nowadays. The form of fee paid by the Marabtin Sadqan was in a form to assist materially the Sa'adi, e.g. payments to shepherds, or to strangers helping with the harvest. It included also help in blood money when required and to pay taxes imposed on the tribes by the Turkish central government. In this again the Marabtin were of great assistance, and seem to have paid the bulk of the tax required of the group to which they were attached. Fees then, in the sense of direct regular payment, were never made.⁽⁶⁾ Today, although Marabtin in theory live on Sa'adi land, they do in fact live independently and pay no fee to the owners of the land.

The Marabtin Bi il Baraka are often claimed to be Sharifs (descendent from the Prophet Muhammed) or from saints who came from the west, Morocco, Algeria, Tunisia and Tripolitania. The Marabtin Bi il Baraka live among the Sa'adi as equals in virtue of the prestige they derived from their holy men or supposed holy men ancestors. The Sa'adi think that these Marabtin possess a Baraka (the

blessing of God), and some of them have a great Baraka like the Sanusi family. The Marabtin Bi il Baraka, shelter the weak, succour the sick, and exert their influence in making peace between the tribes. They also write charms (Hijab) for different purposes for women. The Marabtin Aulad Al-Shaikh who are attached to the El-Urfa tribe are considered particularly good, and so are El-Masamir. As has been pointed out earlier in this chapter the El-Tursh section of El-Urfa tribe granted an area to Aulad Al-Shaikh in Sidi Bu Zeid, and they move freely between their land and the El-Abiar. The relation between El-Urfa and Aulad Al-Shaikh tribes is strengthened through inter-marriage between the two tribes.

The Sa'adi: They are probably as pure an Arab stock as can be found outside Arabia. De Agostini classifies most of the Marabtin and those of doubtful geneological descent of the Sa'adi as Arab-Berber. For instance, De Agostini states that the Salatna, one of the two primary sections of El-Urfa tribe, are similar in their physical features to the inhabitants of Taurgha in Tripolitania, who descended from Berber origin, while among the Salatna tribe who live in Taurgha there still survives the name of the ancient Berber Luata tribe. De Agostini concludes that the Salatna of the El-Urfa are of Berber origin mixed with other elements.⁽⁷⁾ However, whether or not the Salatna have Berber origin, the historical geneology of the El-Urfa tribe maintains that both El-Tursh and Salatna descended from one ancestor. Until the matter is

studied scientifically and further results obtained, we will consider the Salatna as a Sa'adi. However, the Bedouin of Cyrenaica are Arabs. They conquered the country and settled in it and mixed with indigenous Berbers as is evident in their physical features today, but ethnically the Bedouin are more Arabian than the people of Egypt, Tripolitania and the Sudan.

Negroes: In El-Marj Plain they are the remnants of the slaves. At some time during the late Pleistocene or during the periods of the post-pluvial climatic changes, negroes had moved north in the Sahara to occupy the mountain of northern Sahara.⁽⁸⁾ Kufra was a negro oasis until the Arabs took it. With the camel the white men moved down into the Sahara enslaving scattered groups of local negroes. Most of the slave trading was carried on in the Arab times. After the prohibition of slavery, the liberated slaves gathered in scattered isolated oases in Taurgha in Tripolitania or formed a separate shanty quarter in El-Marj town and Benghazi City. The remnants of the negroes in El-Marj town occupy the north eastern part of the town in the Sudan quarter.

The Tribal Structure: The term Bedouin is used throughout the study to include those who live in the former Ente farms and tents on the Jebel. The English word Bedouin has passed into the European languages with the significance of "nomads". The Bedouin in El-Marj Plain in spite of the fact that most of them settled in the former Ente farm houses, still consider themselves as Bawadi to distinguish them from the Hadur,

town dwellers.

The Bedouin way of life on the Jebel is a response to the physical environment. It has already been pointed out in the section on nomadism (Vide Chapter VIII) that the rainfall is abundant compared with other parts of Cyrenaica; vegetation and fertile soils have removed the necessity for continual movement.

Nevertheless the Bedouin of Cyrenaica are pastoralists organised in tribes and retaining their traditions from their Arabian past. Some writers believe that when the Bedouin came to Cyrenaica, the geographical conditions which they found encouraged them to become pastoralists and organise themselves on a tribal basis. (9) This is to some extent supported by the fact that where people of low technological development are found inhabiting areas marked by rainfall seasonality there is often pastoralism and a segmentary system as for instance in the case of the Nuer of the Sudan. Others see that geographical determinism is not ultimately responsible but that the history of the tribes who practiced pastoralism for centuries is the third factor between the man and his environment.

I believe that the determinist argument is not valid. The Bedouin with their deep rooted traditions arrived with pastoralism. The country was subject to invasion after invasion and no practical step was taken to introduce new

methods of technology, and so the culture remained a practicing pastoralism with some cereal cultivation. Most of the Bedouin of the Jebel settled in the former Ente farms in the present generation. They are realising the advantages of the advanced technology and new methods are already replacing the ancient ones. However, they still believe that livestock is as important as settled farming and as noted earlier in Chapter VIII, their cultural experience, as in the case of the Turks, is still dominant. Although the Bedouin way of life is already changing it will take time to change a way of life natural to them for centuries.

The tribe or qabiba is an association of people inhabiting a common watan (territory), with its own water resources and arable land. The tribe is divided into primary divisions or sub-tribe - generally two or three, which own well-defined portions of the tribal territory, in most cases running in strips unbroken by intrusive elements. These primary divisions are of the same pattern as the tribe of which they form a part. The primary divisions are divided into secondary, and secondary into tertiary and so on. Each of these smaller divisions is a replica of the larger ones and has the same preferential, exclusive rights in its land, and special markings within the tribal band. The members of each division consider that they are descended from a common ancestor who, in his turn, descended from the ancestor of the larger division of which they form a section. The relationship

between the various tribes and their sections are translated into geneological idiom and to a considerable extent is a clan relationship. The Bedouin of Cyrenaica call their sections Aila, while the smaller lineage or extended family is called Beit (pl. Biyut).

The sections of one tribe may move into another section's land of the same tribe if they have not sufficient grazing. The move takes place after consultation with the shaikhs and distinguished people of the two sections, and usually a section permits the use of pasture by the other section. This is because in an event of future shortage of pasture in the section those who allow others to use their pasture, expect the same pasturing privileges. This type of movement for grazing livestock is not frequent in El-Marj Plain since pasturage is relatively plentiful in the whole area.

The boundaries between the tribes are blurred by kinship and the existence of the Marabtin. These Marabtin serve as buffers between the noble tribes. The Marabtin occupy the disputant territory and without them in such a strategic position the fear of tribal wars would be greatly increased. For instance, the ~~El~~ Masamir occupy an area between El-Urfa and El-Abid, and the Saet Es-Shmul have a strip between the ~~El~~ Auaqir and El-Urfa (Vide Fig.49).

Boundary disputes were nevertheless frequent in the past. At present the boundaries between the tribes

seem settled, despite the claim of El-Urfa tribe to the area between W.Gebela and W. Rumman, occupied today by the Dursa tribe. The El-Abid tribe claim also that their territory extends eastwards to W. Samallus (Vide Fig.49). We will discuss the tribal boundaries later in this chapter.

The nomads and seminomads in Cyrenaica live in tents. The tent is called Beit Sha'ar (hair house), or simply Beit. There are two types of tents. The type of tent used for winter (Beit Shta - winter house), the covering is composed of strips of coarse cloth woven from black goat's hair (Vide Plate 14a). The summer tent (Beit Saif) is made from rags of old cloths, since the summer is dry and there is no need for heavy covering. The Bedouin consider the tent healthier than living in a haush (house); and some Bedouin who have Ente farm houses prefer to live in their tents. Further, most of the Ente houses are in a poor condition and need repairing, particularly after the earthquake in 1963 and consequently most of the Bedouin converted to living in tents.

The Bedouin camp or Naja'a is hidden in the forest or the wadis. The naja'a is composed of three to ten tents. During the spring and harvest the number of tents in the naja'a may reach twenty or thirty tents since the Bedouin gather in larger numbers for grazing together and to cooperate in the harvest. At this time of the year there is no animal

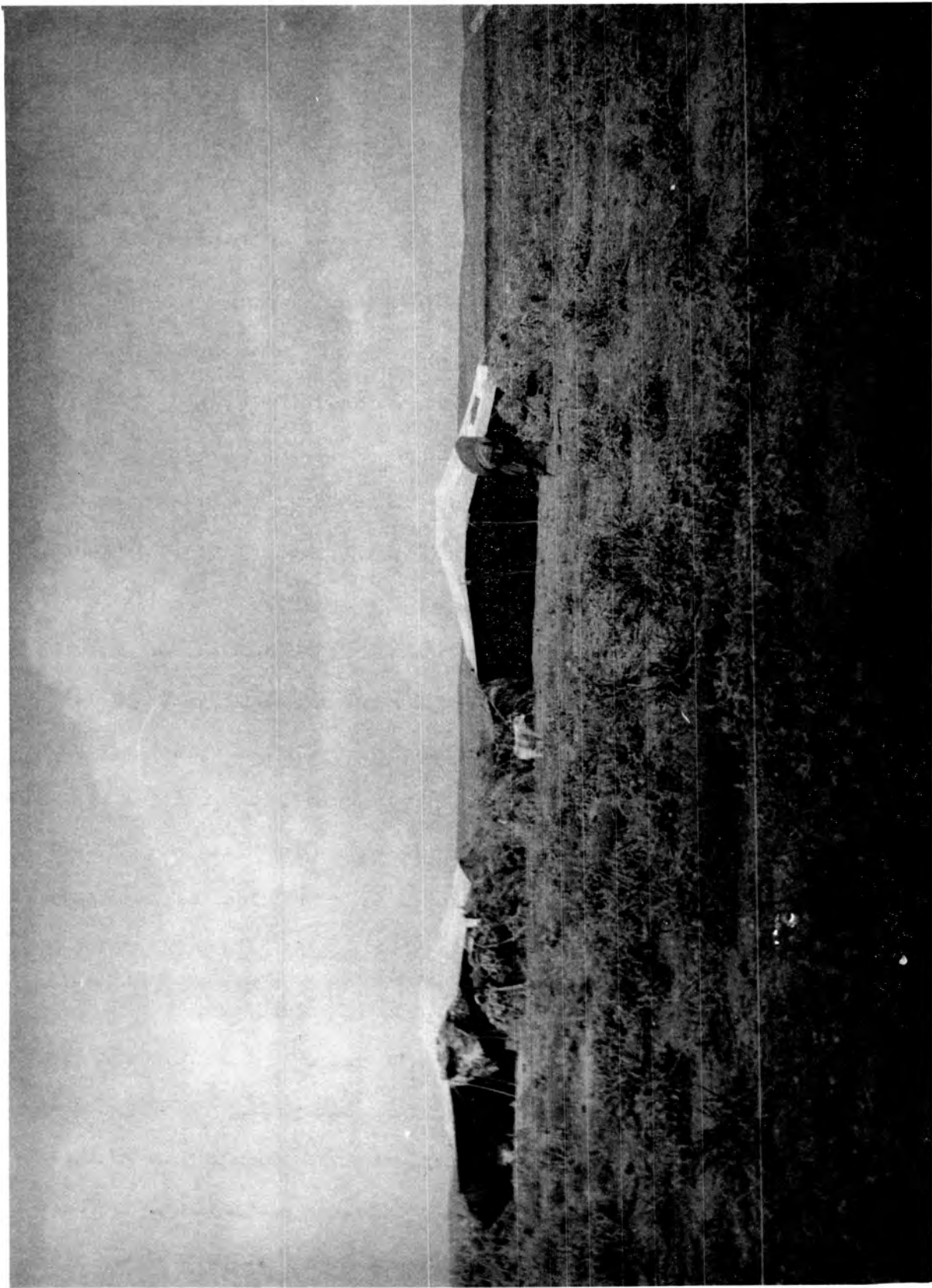


Plate 14 (A) - Type of settlement. A Bedouin tent •Beit Shta'a (winter house).

mating problem and pasture is abundant. In the summer the number of tents in concentrations decreases and the nomads and semi-nomads camp near the watering points, i.e. wells and cisterns.

Grains, milk and saman (melted butter) are the main diet of the Bedouin. Meat is eaten occasionally and also vegetables. In the last few years, new varieties of foods in the Bedouin diet were introduced as contact with urban centres increased and money has become more available after oil discoveries.

The Bedouin of El-Marj Plain get their necessities (tea, sugar and clothes) from El-Marj Town, where they shop weekly. However, in addition to the weekly markets in some villages, a few shops have opened in the agricultural centres to meet the Bedouin daily needs (such as cigarettes, vegetables and macaroni etc.). The rise in the standard of living in the coastal towns and in El-Marj Town is bound to inflate prices of food and clothing, and the slightest rise is fatal to the economy of the Bedouin, who cannot cope with economic and social changes at the rate occurring in the urban centres. Each tribe has its own market, El-Urfa has El-Marj Town, Tacnis, El-Abid, Messa, Dursa, and El-Auaqir, Benghazi, El-Abiar and Suluq.

The women and girls live protected lives. They are confined to the family compound. However, the position

of women is important since the gradual evolution from clans reckoned their descent through their mothers. The Bedouin considers the relatives of his mother as Dana Khwal (descendants of mothers brothers). For instance the Aulad El-Aama section of the El-Urfa tribe consider the Shiaua section of the El-Abid tribe as their brothers, through relationship of the second marriage of Aulad El-Aama's mother to Mansur founder of one of the two primary sections of El-Abid.

The Bedouin woman even after marriage believes that she still belongs to her father's family who defend her. The women weave the wool, make rags for the tent, and prepare the saman from the milk. The family ties are close and the system of the extended family prevails.

The boys graze the livestock in the surrounding pasture near the tent or the Ente farm house. Most of the Bedouin children at present go to school, therefore some of the mobile sections of the Bedouin tribes are bound to settle in one place during the school year. However, the boys who leave the school usually do not return to graze the livestock, but they look for a 'white collar job' in El-Marj, or Benghazi where the need for their services is limited. The booming towns of Benghazi, Ajedabia and El-Beida attract the people from the Jebel. The men who migrate to towns keep in touch with their tribe and send money to their families.

These persons still consider themselves as members of their tribes. The tribal members in the towns refer to themselves as Urfi or Abidi (of El-Urfa or El-Abid tribes); but the traditional solidarity by this time has started to loose its significance.

The solidarity of the members of the same tribe is strong. The Beit of a section of a tribe contribute as a whole towards the payment of blood-money (diya) when a member of their family kills a member of another. The matter of feud is discussed by a Majilis Sulh (peace meeting) which includes the shaikhs and the distinguished personalities of the two biyut involved and the mudir of the mudiria (sub-district). The matter is usually solved by a sum of money to be paid to the victim's family. This sum varies according to the social status of the victim, but often varies between £L.300 and £500. This proceeding takes place if both sides involved were Sa'adi (noble tribes). If the killer was Marabat (of Marabtin), the Sa'adi family claims that two Marabtin must be killed and no blood-money accepted from a Marabit. Again if the victim was a Marabit and the killer of Sa'adi tribe, they claim also that only half of the blood-money must be paid. However, this peace meeting and paying the blood-money (diya) takes place even if the court passes a sentence on the killer. It is the belief of the Bedouin that the murderer's family must pay the blood-money or the killer or a member of his family will be killed.

Every section of a tribe has its own Shaikh, chosen

for his age and wisdom or for his powers, though the position of the shaikh traditionally and theoretically is inherited. The oldest son of the shaikh should succeed him, but this is not always the case. If the section is not satisfied with its shaikh in representing it, another person with personality and wealth may replace him. The power of the shaikh, therefore, depends on his wealth and on his ability to reason with other tribesmen. His wealth is necessary to maintain the reputation of the section for hospitality. The shaikh has considerable power and he uses it to conduct and negotiate for peace or war. As a mediator in a dispute, an agreement is concluded in the presence of the shaikh, and he reduces the blood-money or the bride wealth.

The Bedouin respect their shaikh as an old wise man who knows about the affairs of the tribe. They listen to the shaikh and trust his judgment but it is not always accepted. The shaikh expresses his judgment but has no means to enforce it.

In the absence of any hierarchy of shaikh power above the tertiary level, all matters affecting the tribe or the secondary groupings can only be dealt with by the shaikh of the tertiary level in "conference". Agreement can be arrived at by mutual consent but cannot be imposed from above. Peters records that an attempt was made by the British Military Administration in 1948 to appoint a shaikh for each of the nine tribes of northern Cyrenaica. The attempt succeeded only with the El-Abaidat and El-Auaqir tribes. (10)

The authority of the traditional shaikh position was undermined by the Italian policies, first of recognising and paying salaries to so many shaikhs of little importance particularly after many leading shakhly families moved to Egypt during the Libyan-Italian wars. The position of the shaikh has never been the same. Nevertheless the absence of any traditional authority higher than the shaikh does lead to problems of negotiation in socio-economic sections.

El-Marj Plain is dotted with white domes of holy men shrines. These are the saints or Marabit (marabut) toms. Each section of a tribe has its own Marabit where each year the section gather at the shrine for celebrations. It is an annual occasion where the members of the section gather and sacrifice goats or sheep usually slaughtered for the honour of the Marabit. The most famous Marabits in El-Marj Plain are Sidi Rahuma whose tomb in the El-Farashha section territory of the Salatna primary section, and Sidi Bu Zeid of Aulad Al-Shaikh in El-Tursh territory.

The internal immigration, before the discovery of oil and the earthquake, was from the rural areas into El-Marj Town, for these people wanted jobs in the government departments of the town. From personal observation it can be said that most of the people who moved into the town were from Tulmeitha, Tacnis and Jardas El-Abid areas mostly during the drought years. These people do not usually return to their original territory, but dwell in the shanties around

the town.

Many Tripolitanians came to the town of El-Marj to work as labourers or to run businesses and shops. However, after discovery of oil in 1959 the movement of population began from El-Marj Plain to Benghazi and the oil fields in the Sirte region. The men who migrated were still in touch with members of their section and sent money to their families. But as soon as a man saves enough money and gets a house, he sends for his family to join him. The members who migrated still consider themselves as members of their tribe, and the individual calls himself a Urfi or Abidi (of the El-Urfa or El-Abid tribes). However, despite this link with the tribe, the significance of tribal solidarity starts to lose its importance to him in the towns.

The influence of the nomads on the sedentary agriculture is negligible. The law and the traditions of tribal solidarity strictly prohibit invasion of the cultivated plots by herds. Complaints of crop damage by herds are settled by the Mudir of the Mudiria, and the police, and the intruders are forced to compensate plot owners for all damage done by the animals. The Bedouin of the Jebel are both pastoralists and cultivators, even those who settled still bear in their hearts the spirit of pastoralists. Therefore, a conflict between the nomads and the cultivators does not exist on the Jebel, as the Bedouin consider themselves as Bawadi and there are no Fallahin (peasants) among them. There are no recorded cases of intended damage

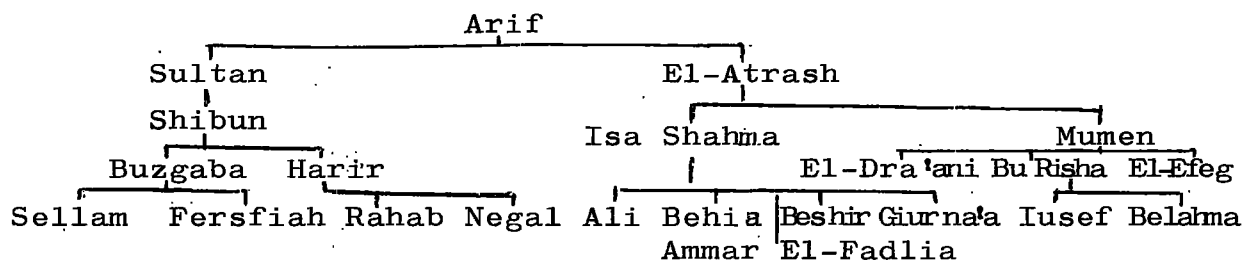
to cultivated crops on a large scale. However, the introduction of machinery to cereal cultivation brought new attitudes towards farming and many Bedouin decided to settle rather than turn again to the nomadic life.

The Tribal Structure: The Sa'adi tribes are divided into two main branches: Jibarna and Harabi. The Jibarna tribes are: El-Urfa, El-Abid, El-Auaqir and Magharba. Whilst the Harabi tribes are Dursa, Bara'asa Ailat Fayid, Hasa and El-Abaidat.

As far as this area of study is concerned, we will deal in detail with the El-Urfa tribe, and the general divisions of the El-Abid, Dursa and El-Auaqir tribes.

El-Urfa: The El-Urfa tribe is said to be descended from Arif. The tribe is divided into two primary or first sections (or sub-tribes), the Salatna (descendants of Sultan son of Arif) and El-Tursh (of El-Atrash). According to De Agostini, the geneological table of El-Urfa is as follows: (11)

Table 65:- Geneological Table of the El-Urfa Tribe



The Marabtin groups are clients of the El-Urfa and are mixed with the tribe through marriage. However, there are no Marabtin Sadqan among the El-Urfa tribe. Other groups

attached to the El-Urfa are families from other Cyrenaican tribes or Tripolitania. Most of the latter groups live in the urban centre of El-Marj.

The El-Urfa tribe occupies most of El-Marj Plain, from Sidi Dakhil and Dandakh in the east and extends to the north-west from Sidi Dakhil along the route of Tariq El-Hammar and reaches the sea between Wadi Gebela and Sidi Khalid (Vide Fig.49). The El-Urfa claim the whole area between W. Gebela and W. Sha'aba (occupied at present by Ailat Esh-Shelmani section (of the Dursa tribe). The El-Urfa claim the area extending eastwards to W. Rumman inhabited today by the Dursa tribe. However, Esh-Shelmani after fighting with Sreriq (a primary section of Dursa) left their original territory west of W. El-Kuf and settled afterwards in the area between W. Gebela and W. Sha'aba. The El-Urfa claim that the Esh-Shelmani section settled in their present territory 240 years ago and had paid certain amounts of cereals and much livestock as a fee for settling in the area. According to the El-Urfa shaikhs Esh-Shelmani ceased paying the fees just after the Italian occupation. The Italian administration settled the dispute by promising to pay compensation to the El-Urfa and Esh-Shelmani section remained in the territory occupied. However, today the El-Urfa still claim the area between Tariq El-Hammar and the first escarpment, as the agreement does not include this area to be inhabited by the Esh-Shelmani section.

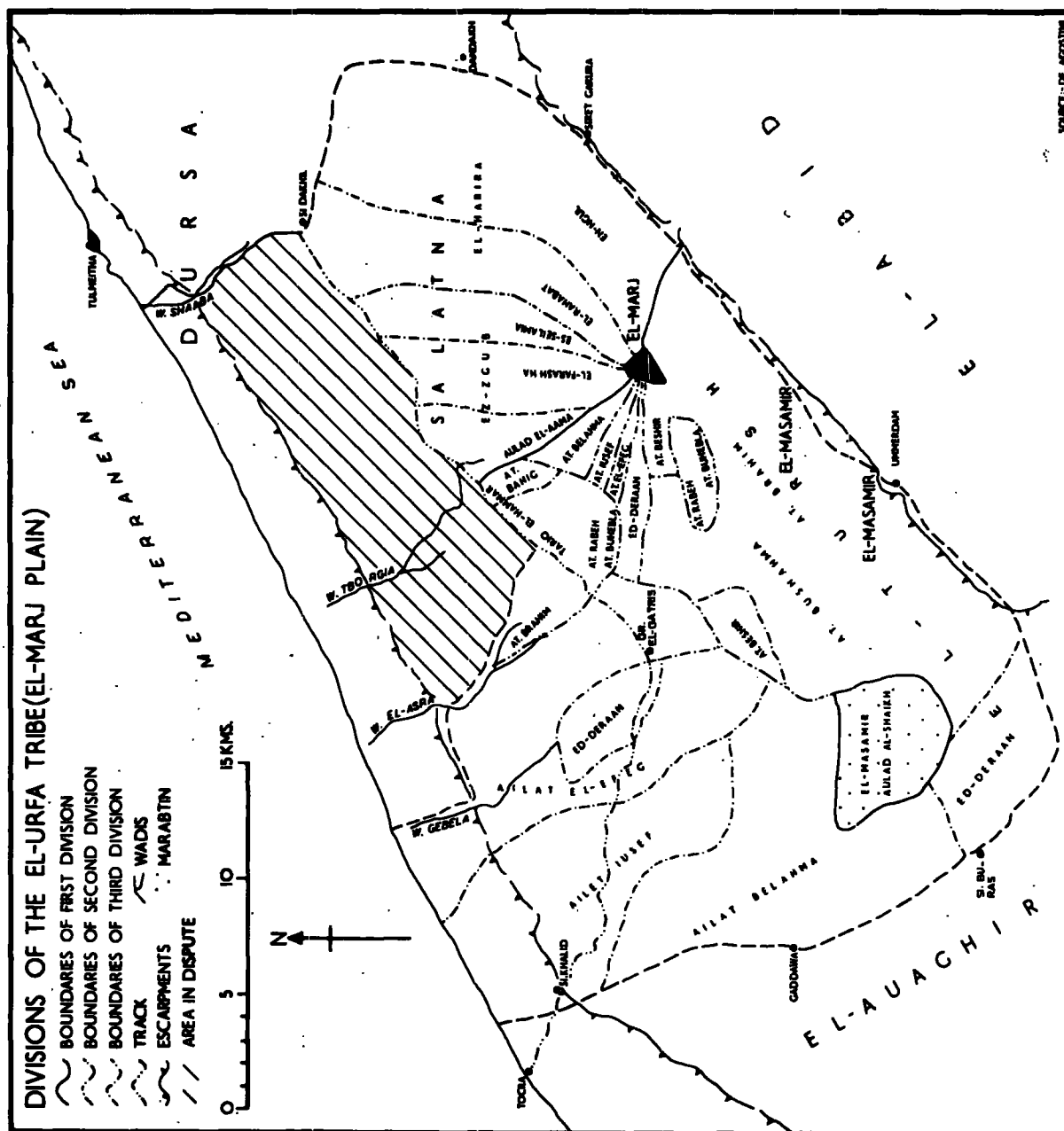
The southern boundary of the El-Urfa tribe with the El-Abid tribe extends along the second escarpment west of Sidi Bu Ras and runs northwards across Gaddawa to three kilometres west of Tobra (Vide Fig. 49). The boundary between the two first divisions of the El-Urfa tribe is a line from the second escarpment and extends along the main road to El-Marj-Tacnis, and runs across the town of El-Marj and finally to W. Torgia. The territory, therefore, is divided into two areas: north east for Salatna and south west for El-Tursh.

The two first divisions of El-Urfa resisted the Italian occupation, and suffered heavy losses particularly Salatna who were the stronger and the most influential section of the El-Urfa tribe. Both the primary sections follow the Sanusia Order and belong to the Zawiyat El-Marj despite some of the El-Tursh section using the Zawiyat of Tobra.

At present the tribe is quiet, and there has been no disputes or fighting in the last century except for their dispute with the Dursa tribe about the area mentioned earlier in this chapter. The El-Urfa tribe in El-Marj Plain is considered sedentary throughout the year except for a few families who move to Sidi Mahius and south of Tacnis for grazing and cereal cultivation.

A. Salatna:- This primary section is divided into two secondary sections, Ez-Zgub and El-Harira (Vide Fig.No.50). The territory is divided among the tertiary sections and

Figure 50



stretches in a fan shape with El-Marj Town as its base.

1. Ez-Zgub:- This section occupies the north western part of the Salatna territory. Ez-Zgub is split up into tertiary divisions: El-Farashha and Es-Seilamia. A third section of Marabtin the Auald El-Aama is attached to El-Farshha but this Marabtin group is considered an independent section with its own land, and it is respected by all the sections of the tribe. Another Marabtin group is Aulad El-Haj who live in the El-Farashha territory.

2. El-Harira:- They occupy the eastern and southern parts of the Salatna territory, and are divided into two tertiary sections: El-Rahabat and En-Ngul.

B. El-Tursh:- Earlier small in number, De Agostini in 1922 recorded that their number was double that of the Salatna. At present (1962) the number of the El-Tursh in the Mudiria of El-Marj alone is 2613 while the Salatna section numbers only 1951*. However, as the figures of other mudirias are not reliable, it is not possible to produce a comprehensive comparison of figures.

From the geneological table No.65 of the El-Urfa it appears that the El-Tursh are divided into two secondary sections: Mumen and Isa Bu Shahma. This does not apply at present to this primary section. In practice the El-Tursh are divided into five secondary divisions; those names are

* Source:- Mudiria of El-Marj Office.

underlined

1. Bu Shahma:- They are divided into three: Ailat Ali, Beshir and Behia. Ailat Ali is the largest tertiary division of El-Farashha and split up into another three divisions: Ailat Brahim, Ailat Rabeh and Ailat Bu Hebla (Vide Fig.50). However, the Bu Shahma section is the most influential one of El-Tursh. Bu Shahma's territory covers most of the south west of El-Marj Plain.

The Marabtin, attached to the Bu Shahma section are two groups of El-Masamir. One occupies a strip between the El-Urfa and the El-Abid tribes, and the other in Sidi Bu Zeid. These Marabtin own no land or water and are semi-nomads.

2. Belahma Section:- They are descendants of Bu Risha of Mumen, and inhabit the western part of the El-Tursh territory, and possess also a stretch of land north of the El-Marj Town.

3. Ailat Iusef:- They are also descendants of Bu Risha from Mumen and occupy the north western part of the El-Tursh territory extending to the sea. This section also occupies a stretch north of El-Marj. There is another group of Ailat Iusef occupying an area south of Gasr El-Gatris.

4. Ed-Dera'an Section:- They descended also from Mumen and occupy three separate areas: the extreme of south west of El-Marj Plain, an area south of Gasr El-Gatris, and a narrow strip north of El-Marj.

5. Ailat El-Efeg:- They descended from the same ancestor of the three previous sections. They inhabit the north west

of the El-Tursh territory north of Tariq El-Hammar. The section also possesses a strip of land north of El-Marj.

However, each section of the El-Tursh section possess a stretch of land which radiates from El-Marj. This is because of the importance of El-Marj Town as a centre of the El-Urfa tribe.

The Marabtin of Aulad Al-Shaikh:- They occupy an area in Sidi Bu Zeid granted to them by El-Tursh (Vide Fig.49). Aulad Al-Shaikh are semi-nomads and they move annually for grazing north of El-Abiar.

There are no reliable statistics concerning the tribal sections since the Libyan Government is reluctant to give data on tribal basis. De Agostini gave the following figures for the two first divisions of the El-Urfa tribe and the client Marabtin in 1922⁽¹²⁾ -

Table 66:- Population Table of the El-Urfa tribe(1922).

	Sa'adi	Marabtin	Total	Notes
Salatna	3000	-	3000	
El-Tursh	5600	700	6300	5700 Arabs of which 100 are Marabtin 3600 Arab-Berber of which 600 are Marabtin Baraka
Total	8600	700	9300	8600 stable 700 semi-nomads

The Dursa Tribe:- This tribe is the third in number among the Harabi tribes. De Agostini considers the Harabi as Arab except those of doubtful origin and some of the Marabtin. (13) The Dursa tribe territory extends from El-Hania in the east, and runs towards the south west to Meduar El-Zitun where the Dursa tribes' territory meets the El-Bara'asa and El-Abid tribes' boundaries. The boundary line then runs north west to include the upper parts of Sidi Dakhil area, and extends to the east to include the coastal plain and the crest of the first escarpment along Tariq El-Hammar to a point 12 kms. east of Tulmeitha. However, the area between the escarpment crest and Tariq El-Hammar is claimed by the El-Urfa tribe.

The Dursa tribe has always been ambitious to expand to neighbouring territories, but was peaceful with the Italians during their war against the Libyans, because they hoped to gain the Italian authorities sympathy in their expansion policy. The Dursa also exploited at that time the strategic position of their territory along the coast for trading with the tribes in the interior. The tribe's centre was El-Hania, but since its destruction during the last World War, they use Messa in the Bara'asa territory.

According to the legend, the tribe descended from Idris, and they are divided into three first divisions.

A. Abd El-Gauad:- This section is the most influential and largest among the Dursa tribe. The section is split up into

four secondary sections:-

1. Bu Awina:- They live in the area east of W. El-Kuf, and attached to them Marabtin Sadqan of Quta'an and Awama.
 2. Sreriq:- They are the most powerful section of the Dursa tribe and inhabit the area extending from the sea to Gasr Libia west of W.El-Kuf (Vide Fig.49). Their client Marabtin are El-Masamir, Hasanna, Sarahna, Alawna and Awama. Most of these clients are Marabtin Sadqan, and only few of Marabtin Baraka.
 3. Esh-Shelmani:- Earlier occupying the strip of land west of W. Giargarummah (El-Kuf), they were driven out to their present territory between the two wadis of Gebela and Sha'aba north of the El-Urfa territory. Esh-Shelmani client Marabtin are El-Masamir and Hasanna.
 4. Shaieb:- Earlier they occupied the area around Argub El-Shegura, but a century and a half ago they moved to El-Estata south of Dandakh.
 5. El-Khshebat:- The smallest section of Bd El-Gauad, and De Agostini classifies them as Arab-Berber. Their territory is the upper part of W.El-Kuf.
- B. Muhammed:- They are called Arab Ed-Dahr (the Arabs of the Jebel). During the Turkish rule they challenged the Ottoman authorities, and were isolated in their rugged mountainous territory. The Muhammed section's clients Marabtin are El-Masamir and El-Aqaiel. This primary section is divided

into four secondary sections:-

1. Hamed:- The most powerful of Muhammed's primary section. Hamed section occupies the area around Batta; and their client Marabtin are El-Masamir and Sarahna.
2. A'abed: The territory's section was between wadis of El-Laulab and Farua, occupied at present by Marabtin El-Masamir. A'abed section was driven out after disputes with Muhammed section, their present territory is between wadis of Sha'aba and Zuaina. A'abed's client Marabtin are El-Masamir (Ailat Zahra) and El-Aqaiel.
3. Masaud:- According to De Agostini their numbers were higher in the past but because of the fighting with the other sections they were reduced to a small number. Masaud's client Marabtin are El-Masamir (Ailat El-Fahas).
4. Ailat Daggar:- This section occupies the area north of Batta and extends to the sea. Their client Marabtin are Ailat Bu Muslim.

C. El-Baraghla:- They are called the eastern Dursa (east of W.El-Kuf) to distinguish them from the two previous primary sections who occupy the area west of W.El-Kuf. El-Baraghla are peaceful and considered by the Dursa other sections as an inferior section. De Agostini gives the following figures for the three first divisions of the Dursa tribe and their client Marabtin in 1922.⁽¹⁴⁾

Table 67:- Population Table of the Dursa
tribe (1922)

Section	Sa'adi	Marabtin	Total	Notes
Abd El-Gauad	11630	1970	13600	of whom 12230 are Arabs
Muhammed	3150	1100	4250	6620 Arab-Berber of whom 740 Marabtin Sadqan and 2600 Marabtin Baraka
El-Baraghla	730	270	1000	
Total	15510	3340	18850	

El-Abid Tribe:-

The origin of the tribe's founder is a matter of dispute. Sevaresh⁽¹⁵⁾ states that El-Abid tribe descended from a negro slave belonging to Jibrin (the founder of Jibarna) and that his son Barguth freed him. De Agostini also records this legend and adds records that the slave (Arabic El-Abd) was bought by Arif (founder of El-Urfa) and was included in his family. However, De Agostini favours the opinion that El-Abid were Marabtin attached to El-Urfa tribe. The brotherly relationship between the two tribes, El-Urfa and El-Abid, is exaggerated particularly in their common solidarity against other tribes.

The territory of the El-Abid tribe extends from Meduar El-Zitun in the east westwards to Dandakh and then along the second escarpment to west of W. Dukhan. The southern boundary extends as far as south of Tariq Aziza

north of Es-Serual region. The El-Abid tribe boundaries are a matter of dispute in the north east (with the Dursa tribe) east (with the Bara'asa) and the west with the El-Auaqir. For example, the El-Abid are hostile to the Dursa tribe in the north east because the El-Gog section and other Sreriq groups occupied parts of the El-Abid tribe's territory in Bu Graua and Gsonta. In the east El-Abid's are trying to extend their territory to W. Samallus, but are resisted by the Bara'asa. Both El-Abid and El-Auaqir tribes are hostile to each other because of boundary disputes.

The El-Abid tribe, because of their mixed origin, are classified as Arab-Berber.⁽¹⁶⁾ The tribe of El-Abid is divided into two primary sections: Mansur and Jaber.

A. Mansur Section: They occupy the eastern and southern parts of the tribe's territory. The section is split into two secondary sections; Ailat Shiaua and El-Itama (Vide Fig. 49). The Shiaua section is the most powerful one in the entire tribe. They are descendants of Sidi Rahuma. Tacnis is the Traditional centre of the Shiaua section. The Shiaua client Marabtin are El-Masamir who are semi-nomads.

El-Itama secondary section descended from Sidi El-Aama. According to the legend the founder of this section had been brought up by Mansur. Therefore Ailat Shiaua, El Iama (of El-Abid) and Aulad El-Aama (of El-Urfa) are relatives. The relationship between the El-Abid and the El-Urfa tribes is reflected in the solidarity of the two tribes.

B. Jaber Section:- Their traditional territory is the north western part of the El-Abid territory, and Jaber is divided into three secondary sections: Dakhakhna, Shalalfa, and Ailat El-Hammad (Vide Fig. 49). The last section moved in the early part of the present century to Shalalfa territory because of the occupation by the Dursa tribe of El-Hammad's territory. The following table was given by De Agostini showing the number of the two primary sections of the El-Abid tribes in 1922. (17)

Table 68:- Population Table of the El-Abid tribe
(1922)

Section	El-Abid	Marabtin	Total	Notes
Mansur	3150	600	3750	Arab-Berber
Jaber	3100	-	3100	450 Marabtin Baraka 150 Marabtin Sadqan
Total	6250	600	6850	6400 Sedentary 450 Semi-nomads

El-Auaqir Tribe:- This tribe is classified as Arab and its territory extends on the whole of the coastal plain from Tobra to north of Ajedabia and includes also the extreme western fringe of the Jebel Akhdar from Bacur to El-Abiar. El-Auaqir favours the coastal plain for the water available from the shallow wells since the part of the Jebel occupied by the tribe is poor in wells and of rugged topography.

The tribe is divided into three primary sections:

Ibrahim in the east, Mtaua in the west and Sdedi in the area between the former two sections (Vide Fig.49).

The client Marabtin of Ibrahim section are Saet Esh-Shmul, Saet Said, El-Huta and El-Masamir. Sdedi's Marabtin are Aulad Al-Sheikh, El-Mahashhash, Quta'an and Auama. The Qatarna Marabtin are considered as independent since they own their land (north-west of El-Abiar). The following table shows the number of El-Auaqir population and their client Marabtin in 1922. (18)

Table 69:- Population table of the El-Auaqir
Tribe (1922)

Section	Auaqir and other tribal sections attached to them in the territory	Marabtin	Total	
Ibrahim	6820	1620	8440	11720 Arabs of whom 1670 are Marabtin.
Mtaua	6350	950	7300	14580 Arab Berber of whom 390 Marabtin Baraka
Sdedi	7990	3770	11760	4280 Marabtin
Total	21160	6340	27500	Sadqan and 1200 Ghoorghli 22050 Sedentary 4950 semi-nomads 500 nomads

The Tribal Wars:- At the beginning of the last century Aulad Ali who lived in western Cyrenaica were compelled to migrate to Egypt by pressure of Harabi with the assistance of the Caramanli rulers of Tripoli. At that time another tribe

called Fawayid occupied the part of the Jebel now occupied by El-Abid, Bara'as and Hasa. The Fawayid were driven out of their country and migrated to Egypt. The Jawazi tribe also migrated to Egypt after wars with El-Auaqir, Magharba and Bara'asa. The Jawazi lived in the territory occupied now mostly by El-Auaqir.

Another two wars took place in 1800 and the last in 1832 was between El-Auaqir and Magharba aided by El-Urfa and El-Abid and the tribes called Arab El-Gharb. The latter were driven out of the eastern littoral of Sirte.

At present the Harabi and Jibarna are in control of all Cyrenaica. Most of the tribes that migrated to Egypt and lived near the Nile Delta were absorbed by the Fellahin (peasant) of lower Egypt. (19)

The Sanusia Order:- In 1843, an Islamic brotherhood, the Sanusia Order established itself among the Bedouin of Cyrenaica. From there its teaching spread into Tripolitania, Fezzan, Egypt and Sudan. The Order was established by the Grand Sanusi Al-Sayyid Muhammad bin Ali El-Mahdi. He was an Algerian scholar who travelled throughout the Maghreb and Arabia. He established his activity centre first in the oasis of Ail-Jaghbug and later at Kufra in the south. The Grand Sanusi chose Cyrenaica as a centre for his mission first because the Bedouin at that time were in a condition of anarchy and needed to be taught the Islam teaching again. Secondly, the Bedouin of Cyrenaica were accustomed to the saints and the Bedouin at

once placed him in the familiar category of Marabtin.

Thirdly, Cyrenaica was relatively safe from the interference of the Turkish administration and other rival sects found in Arabia.

However, the original teaching of the Prophet preached to the Bedouin of his day, and which they accepted, was equally suited to the Bedouin of Cyrenaica, who in all essentials were leading a life like that of the Bedouin of Arabia in the seventh century. The Sanusia Order aims were to restore the original society of the Prophet and to bring the Bedouin by peaceful persuasion to a fuller understanding of the beliefs and morals of Islam.

The Order established lodges (Zawiya) nearly everywhere in Cyrenaica. The Zawiyat of El-Marj was established in 1842. The Grand Sanusi encouraged the settlement on the land. He insisted that the lodges of the Order support themselves by agriculture and stock raising.

The Bedouin accepted the Order and willingly they paid tithe to the Sanusia. At present they consider the Grand Sanusi a great holy man. The Sanusia did much to lessen the differences between the Sa'adi and the Marabtin, and organised the relations between the tribes. The Sanusia family also united all the Bedouins of Cyrenaica against the Italian occupation.

The present Sanusia Order head is Muhammad Idris Al-Sanusi, His Majesty the King of Libya.

Administrative Structure:-

The tribe is the basic unit in the Libyan administrative system. Therefore it seems relevant here to give a short account of the evolution of the administrative system.

During the Turkish rule, Cyrenaica was part of the Vilayet of Tripoli. In 1863 when the Turks regained Libya from the Caramanli, Cyrenaica became Vilayet of Benghazi; but after eight years Cyrenaica was put again under Tripoli Vilayet, and finally separated again in 1872 and became an autonomous Sanjaq directly dependent on Istanbul. It was governed by mutasarraf nominated by, and directly responsible to the Central Government. The country was divided into districts (Qaimaqamia) under a qaimaqam. These districts were further divided into sub-districts under mudir who co-operate with the Shaikhs of the tribe. These districts followed tribal divisions and sub-divisions. The qaimaqamiyat of El-Marj included sub-districts of El-Marj, Slonta and El-Hania. The tribes under the district of El-Marj were El-Urfa, El-Abid, Dursa and Bara'asa. The town of El-Marj was divided into two quarters (Mahalla) and each quarter had a representative called Mukhtar to deal with the administrative affairs of the people of the quarter, while the Iman was concerned with the religious affairs.

The Turkish administration in Cyrenaica was very slapdash by European standards. The Turks were concerned with collecting the taxes through the Shaikhs of the tribes. The taxes collected from the Bedouin were cash on each head of the

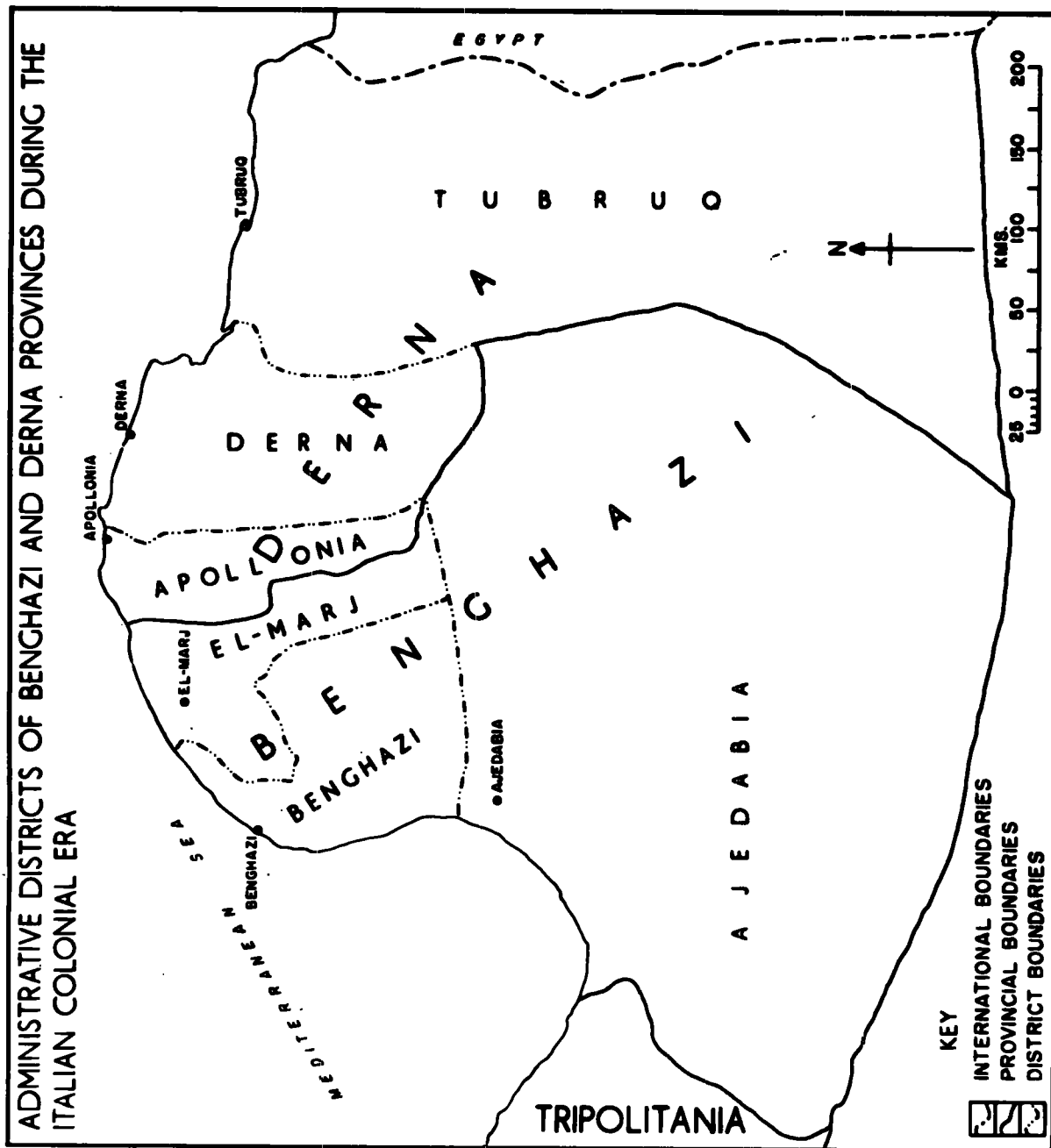
herds and a tenth of the harvest. However, the officials were Turks, and the payment of taxes and the maintenance of peace and communication were the only two functions that Turkish officials bothered themselves with. The revenue collected exceeded the cost of the cheap administration. Nevertheless, the relations between the Bedouin and the Turks seemed satisfactory, largely because of the absence of Turkish interference with tribal and pastoral life, with the indigenous groups left to their devices.

When the 'Young Turks' took over in Turkey in 1908, they introduced the constitution, and delegates from Tripolitania and Cyrenaica were sent to Istanbul. The Turks seemed to start organising the country and to achieve progress for the people. The efforts of the Turks were interrupted by the Italian occupation of the country, and the beginning of the military conflict between the Libyan and the Italians.

When the Italians occupied the whole of Libya, they divided the country into four provinces: Tripoli, Misurata, Benghazi and Derna. El-Marj was a district in Benghazi Province (Vide Fig. No.51). Fezzan and southern Cyrenaica was a military territory.

After independence in 1951, Cyrenaica was divided into seven Mutasarrifias. The Mutasarrifia of El-Marj was further divided into five Mudirias: El-Marj, Tulmeitha, Tacnis, Jardas El-Abid and El-Bayada. Furthermore, in the last seven years the Mutasarrifia of El-Marj split up into ten Mudirias.

Figure 51

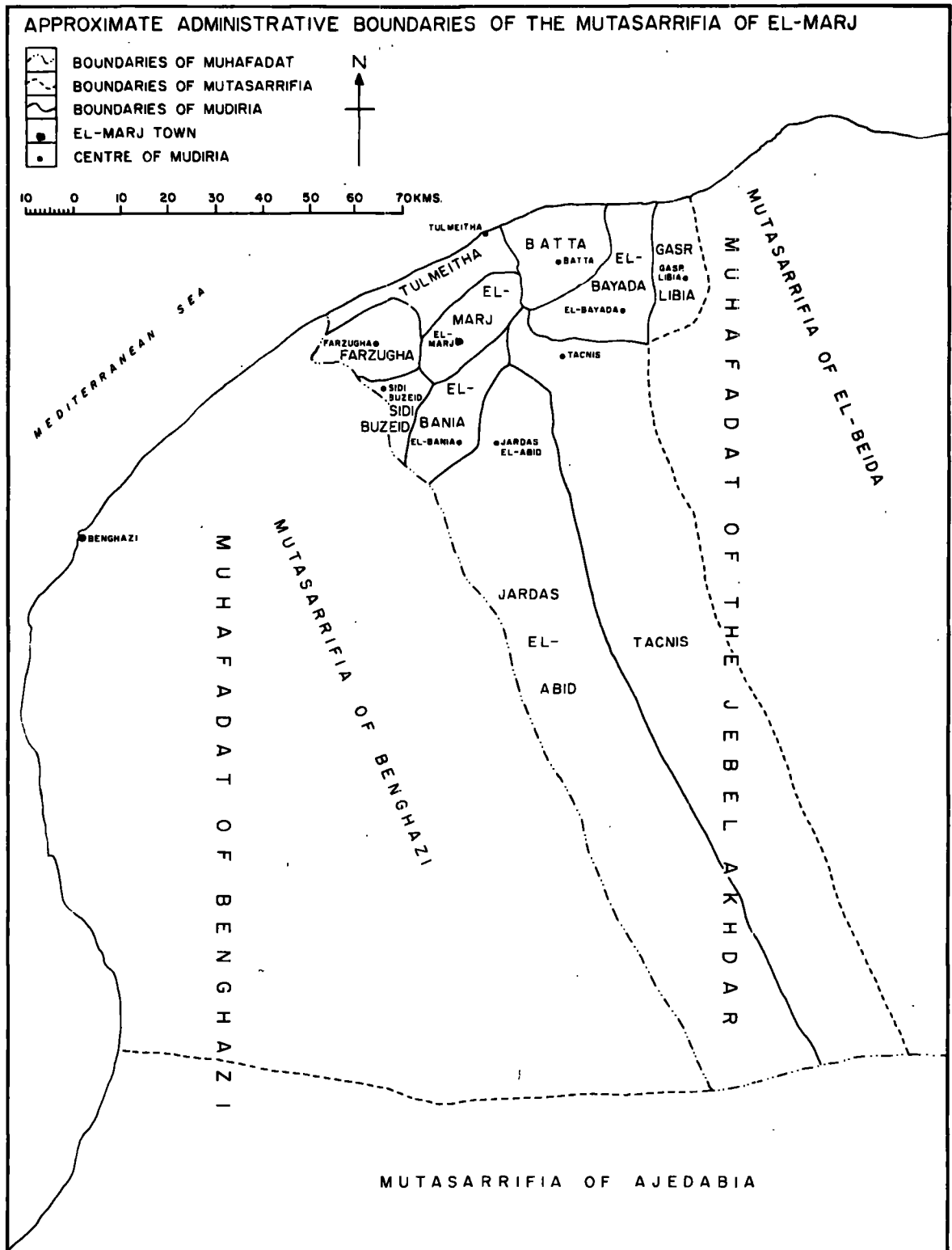


The five new created Mudira are Farzugha, Batta, Gasr Libia, Sidi Bu Zeid and El-Bania (Vide Fig.No.52).

The Mutasarrifia of El-Marj includes the tribes of El-Urfa, El-Abid and the western Dursa. The eastern boundary of the Mutasarrifia runs along the Wadi El-Kuf and southwards extending as far as the desert. The western boundary starts east of Tobra at the point of the boundary between Dursa and El-Auaqir and runs to the southeast along the tribal boundary between El-Urfa and El-Auaqir, then between the latter and El-Abid. These boundaries reflect the fact that the tribe is the unit in the administrative system. Each primary tribal section favours a mudiria for the section. For instance, the Dursa living in Batta on the plateau were administrated from Tulmeitha on the coast in the Dursa territory instead of El-Marj. Another example, the El-Auqir living in El-Hemda, administratively under the Mutasarrifia of Benghazi, while in the agricultural administration they consult El-Marj agricultural department. As the tribal sections insisted on belonging to the Mutasarrifia of their tribe, to overcome the difficulties of administrating areas on the Jebel from Benghazi on the coastal centres, the Government was obliged to turn these areas into separate mudiria.

Therefore the Mudirias and the tribal sections included are as follows: El-Marj for El-Tursh and Salatna, Tulmeitha for Esh-Shelmani, El-Bayada for Masaud and Ailat

Figure 52



Shaieb, Gasr Libia for Sreriq, Batta to include Muhammed (Dursa), Farzugha for El-Tursh, Tacnis and Jardas El-Abid to include Mansur section (of the El-Abid tribe), El-Bania for Jaber section and finally Sidi Bu Zeid to include Aulad Al-Shaikh.

The agricultural statistics presented in the chapter on agriculture were based on the original five mudirias.

It must be added that in 1962, Libya changed from the Federal system to a central government. In 1964, Libya was divided into ten Muhafadat. Each Muhafadat is administrated by Muhafid assisted by a local council. The muhafid is appointed by the Minister of Interior. The Muhafid represents the central ministries in his region and is administratively responsible for the administrative personnel assigned to the region. The Muhafadat is broken into mutasarriefias.. The Muhafadat of the Jebel Akhdar includes the mutasarriefias of El-Marj and El-Beida. This step of administrative reorganisation is a means of de-centralisation. However, the Government is still in the process of reorganisation, and the administrators are faced with the problems of a lack of trained personnel and inadequate facilities.

In the El-Marj region we therefore have a complex situation. Full nomadism has long disappeared even if it ever existed but the sedentarised and semi-sedentarised population is still pastoralist and tribal. Only in very recent times have the needs of modern administration started to affect traditional organisation. Here there is no complete conflict of interest as there is between the State and the Nomad in parts of Western Iran; rather we see the natural responses and changes of tribal and pastoral-hearted peoples to exchange-economy opportunities and an environment which is not completely hostile to sedentary agriculture. At the same time, the Libyan state with its new oil based wealth has the theoretical power and the governmental need to bring old patterns of social organisation and administration into twentieth century forms. As population increases and as deliberate resource development proceeds then a compromise has to be established in this present transition stage between a way of life basically unchanged for about a millenium and the economic possibilities now potentially realisable. At the moment the tribal and sub-tribal structure is both a source of stability during change and also a barrier to change.

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- (12) Ibid. p.231.
- (13) Ibid. p.38.
- (14) Ibid. p. 83.
- (15) Savarese, E., "La terre della Cirenaica" op. cit. p.95.
- (16) De Agostini, p.284.
- (17) Ibid. p.260.
- (18) Ibid. p.313.
- (19) Evans-Pritchard, "The Sanusi of Cyrenaica" op. cit. p.49.

CHAPTER X
POPULATION

Introduction:- Distribution of rainfall is the most important factor in differentiating the zone of habitation from the desert. As true desert conditions prevail in most of Cyrenaica south of the Jebel Akhdar, the country is consequently sparsely populated.

The main sources for population studies of Cyrenaica are four censuses; two carried out during the Italian occupation in 1931 and 1936 and the other two taken in 1954 and 1964. The primary results of the last census have been very recently released. Another source of demographic material is De Agostini's study in 1922, on a tribal basis. The official figures for population must be viewed with suspicion since they are often only vague estimates and the vital statistics in the rural areas started only in 1955. In consequence, any attempt to accurately determine population trends is hazardous.

In the present chapter we will deal with the main demographic factors, literacy, health, standard of living and some of the social problems.

Population Estimates:- The population of Cyrenaica and the surrounding districts under a hunter-gatherer economy can only of course be guessed in the most arbitrary fashion, but a comparison with some contemporary primitive societies (Australian aborigines, Hottentots, and Paiute Indians), suggest that it was likely to have been in the order of 10 sq.km. per man for the plateau, and 26 sq.km. per man for the steppe to the south and along the coast, i.e. a total population of just over 2,000 for the whole Jebel.¹

The sources for the population of Cyrenaica in the second and third millenia B.C. are the Egyptian texts which were exhaustively examined by Oric Bates. Bates concludes from contemporary records that the number of Libyan fighting men and their allies taking part in battles against Merneptah and Rameses III in the thirteenth and twelfth centuries B.C. must have been in the order of 20,000 - 25,000 and 30,000 respectively². It is difficult to believe that the requisite number of the young Libyan fighting men can have been produced by a population of less than, say 100,000. According to Beloch³ the population of Cyrenaica during the Greek and Roman periods was only about 240,000 to 300,000, although in the most flourishing times under the Ptolemies it may have reached half a million⁴.

The early travellers who visited the country in Turkish times have made estimates of the population of Cyrenaica. Heldebrandt records the following estimates⁵.

TABLE 70

Table 70:- Estimates of Population of Cyrenaica
in the 19th Century

Raynaud	1804	50,000	) Jebel Akhdar
Pocho	1827	40,000	
Rohlfs	1869	100,000	
Camperio	1882	246,000	
French Consul in Benghazi	1869	302,000	
British Consul in Benghazi	1894	260,000 - 270,000	
Ayra	1896	150,000 - 200,000	

Helldelbrandt's own conclusion in 1904 was that the population was possibly 200,000. Podretti, in 1901 estimated the population at 200,000.⁶ The Jewish Territorial Organisation expedition in 1909 estimated the population as well over 100,000, but they considered the figure of 200,000 conceivable.⁷ Turkish estimates gave the population as 198,343 excluding Kufra for the same period. Administrative records are suspected and the travellers impressions of the number of population were frequently inaccurate due to nomadic element. For instance, Blundell wrote in 1894 "I do not think that, with the exception of a little village called Merj (ancient Barka) and this place, I have seen fifty inhabitants"⁸. Blundell's statement that the region was almost empty can easily be shown to be absolutely incorrect. He travelled between Benghazi and Cyrene in Autumn, the period during which the Bedouin were, as now, in the Barr for ploughing. As has already been pointed out in Chapter VIII, De Agostini's estimate in 1922, before the worst Italian excesses, was 185,400; of which 54 per cent were stable, 19 per cent semi-nomads, 9 per cent true nomads, 4 per cent permanent oases dwellers, and 14 per cent in the towns.

The British Military Administration estimated a total of 300,000 in 1946, and of 254,309 in 1944. Without any evidence to account for this 14 per cent increase in two years, it is difficult to accept either figure as firm. In any event all estimates are little more than guesses and are not based on a census of the tribes. The British figures were mainly estimated on the nation strength, but since births were not registered compulsorily at that time, and given the Bedouin tendency to add or detract from the members of his family as it suits him, nation

strength can give only an indication of the amount of sugar and tea that is consumed ^tnot of population numbers.

Population Censuses:- The fundamental purpose of the census is to provide essential facts for determining government policy and directing administration. The census of a country is a first step towards the development of a system of vital statistics and to serve as a framework for other socio-economic surveys.

The first census taken in Libya was in 1931. Two schedules were used for the native Libyan, the first to collect information in less details than was required from the Italians, and the second, for collective information on families without identification. The indigenous peoples had only first names and the identification was difficult; also it was not possible to avoid under-enumeration or repeated counting. The time chosen for this census was April, and at this time of the year all the nomads and most of the semi-nomads would be away at their usual bases for harvesting in the Barr. The total de facto population of Cyrenaica according to this census were 160,431.

The 1936 census was taken on a de jure basis. Improvements were introduced with regard to the natives, where the name, father's name and the surname of each person were recorded to establish identity. The cities were divided into sectors, and the rest of the territory into districts. The local authorities supervised the proceedings. As a whole the results were considered more satisfactory than the previous attempts. The total resident population of Cyrenaica according to this census was 165,787 of whom 142,819 were natives and 22,968 Italians.

The third census or the first to be taken under national rule was in 1954. The Libyan Government realized the importance of vital statistics in the scope of the socio-economic development and passed The Statistical Law of 1953. Four advisory committees were set up in the three provinces of Libya and the fourth for the Federal Government concerning such issues as the location and staffing of the Central Census Office. The other three committees related mainly to field enumeration, its organisation, staffing and methodology.

Furthermore, taking into account the seasonal movements of the population, early July to the end of September was chosen as the most propitious period for enumeration. Midnight of 31 July - 1 August, 1954, was adopted as the reference for the actual census count.

Framing of the Census Questionnaires:- First it was considered essential that the completed questionnaires should form the basis for the revival or continuation of the civil registration functions, which had devolved on the district and municipal administration during the Italian occupation. Secondly, contrary to the practice adopted by the Italian administration in the two censuses in 1931 and 1936, only one set of questionnaires was used, therefore there was no distinction between indigenous and alien. Thirdly, information sought was to be restricted as far as possible to major socio-economic attributes. Fourthly, to avoid ambiguity in names and surnames, particularly among the Muslim population, each individual was asked to state personal and family names.

It was arranged to enumerate the town-dwellers and settled areas in two days, whereas for nomads and semi-nomads the enumeration period was extended over two months owing to the vast area to be covered. The 1954 census was the first general population census in Libya affecting the entire population directly. The Italian censuses of 1931 and 1936 did not affect the people generally as the questionnaires were filled in by the Shaikhs of the qabila for all families in the qabila without reference to the latter. Widespread publicity was carried out by the Government to inform the people regarding the aims and objects of the census so as to overcome any doubts and suspicion.

Two major factors handicapped the planning and organisation of the census in general. In the first place, there have been no cadastral surveys in Libya and the maps available at the time of the census were of little avail in locating all areas of habitation, particularly the camping places of nomadic and semi-nomadic tribes. Besides, there were no recognised district or even provincial boundaries and the assistance of the Shaikhs was necessary in following up the nomads and semi-nomads.

The Census Department stated that the census registers contained particulars of more than 99 per cent of the population. However, there were a number of known errors. Firstly, some enumerators appeared to have ignored the obvious corollary that temporary visitors in an area were to be excluded from their registers, and reported instead for inclusion in their usual places of residence. Such errors were not frequent in the settled areas, but in the nomadic tribes the majority of the families appear to have been enumerated and included in the population

of the mudir^{ia} in which they were camping at the time of enumeration. Another source of error derived from the number of babies born during the interval between the midnight of 31 July - 1 August, 1954, and the actual moment of enumeration which was as far away as four months in some of the nomadic areas.

The total de jure population of Libya in 1954 were 1,088,889 of which 291,236 were in Cyrenaica.

The fourth census was in 31 July - 1 August, 1964. It was taken also on de jure basis and on the same lines undertaken in 1954 census except that more details were required from the population and there was a shorter period of enumeration. The 1964 census will give details concerning places of origin and number of physically handicapped. It also required details of house ownership, number of rooms and number of infants born either alive or dead in the year ending 31 July, 1964.

The primary stage of enumeration started ten days before the actual date. During these ten days, the enumerators collected all the details required by the census and then on 31 July - 1 August, 1964, checked on the information given earlier. As transport facilities, surface and air were made available, it was possible to enumerate the whole population, settled nomads and semi-nomads in the fixed date.

The primary results published after two weeks of the actual enumeration gave a total population for the whole of Libya as 1,559,399 of which 451,469 were in Cyrenaica.

There is a degree of over-enumeration in the 1964 census because of two factors. First, since the discovery of oil in 1959, there has been migration from the rural areas to the main cities. Because of this, it seems that many people were counted twice, in their usual residence (the qabila) and again in the cities or where they work. Since the head of the family considers the member of his family who migrated still a member, then many were counted twice. Secondly, for political reasons (for election purposes) many representatives considered those who migrated from their constituencies still in the mudiria and because of this, put pressure on the head of the families concerned, to register them as members of their constituencies. This was particularly important because if a constituency is reduced to having less than 20,000 persons, it is merged with neighbouring constituencies and the representative may lose his seat. This case seemed obvious in the Mutasarrifia of El-Marj as in Libya as a whole.

To summarize, the 1931 census is highly unreliable and the other three are exasperatingly inconsistent and irreconcilable. Further more, De Agostini's estimates were rough and based on a tribal basis, whilst the estimates of the British Military Administration were based only on the amount of food supplied after the war and do not support any study in population trends. In Libya, as in any underdeveloped country, illiteracy, suspicion, widely scattered population and low technology are the main handicaps for any accurate census or statistical data. Also, changing the administrative boundaries and setting up new mudirias all add more difficulties to the confusion in the official statistics.

Population Growth:- Determining the population growth in Cyrenaica is rather difficult since the detailed results of the 1964 census have not been published yet. The following table shows the decrease and increase in the population of Cyrenaica from the Turkish census of 1911 up to 1964 census (total population).

TABLE 71

TABLE 71:- Native Population estimates for Cyrenaica in the period 1911-1964 (excluding Kufra)

<u>Date</u>	<u>Population</u>	<u>Percentage of increase or decrease per year</u>
1911	198,345	
1922	181,750	decrease 0.8
1931	136,215	decrease 2.5
1936	137,426	increase 0.2
1954	281,616	increase 5.5
1964	451,469 *	increase 5.5

As the detailed results of 1964 census have not yet been published, the rate of growth for 1954-1964 was based on total population for both censuses, 1954 and 1964.

The decrease in the population of Cyrenaica in the period 1911-1922 with 0.8 per cent per year, and 2.5 in 1922-1931 was due to the migration of many Cyrenaicans to Egypt and Sudan during the Libyan-Italian war. The increase of 0.2 per cent per year in the period 1931-1936 is very low reflecting a combination of higher mortality, lower fertility and large emigration resulting from the military custody of one-third or more of the population of Cyrenaica in the concentration camps of El-Agheila in 1931-1935.

* 1954-1964 period for total population including Kufra.

The rapid growth of 5.5 per cent per year in the period of 1936-1954 and 1954-1964 stands in marked contrast to the earlier years. The fast growth in the period of 1936-1954 is partly explained by the return of many Cyrenaicans from exile after the Italian evacuation. Hygienic and medical conditions in this period (1936-1954) hardly account for the sudden growth of population (by raising the birth rate and lowering death rate). The continuous fast increase in the period 1954-1964 suggests that it is almost certain that the population of 1964 census were over-enumerated due to many people being counted twice. The annual rate of growth for the whole of Libya was 2.3 per cent in 1931-1936, 2.2 percent in 1936-1954 and 4.3 per cent in 1954-1964 *. The last figure of 4.3 per cent seems rather high, considering the high rate of infant mortality. The international Bank mission estimated the rate of growth for Libya as 1.5 per cent per year but admits that this is on the conservative side. However, one does have to admit that the health services under the present national rule are available and far advanced of those which existed during the Italian colonial era particularly where the natives are concerned.

The growth of the population of Cyrenaica is very fast particularly in the urban centres of Benghazi, Ajedabia and El-Beida and rural areas of the Sahel (the coastal plain), the oases also showed a marked increase in 1954-1964, as shown in Table 72.

* For total population.

TABLE 72

TABLE 72:- Native Population of Cyrenaica, 1936, 1954 and 1964.

	<u>1936</u>	<u>1954*</u>	<u>Percentage Increase</u> <u>1936 - 1954</u>	<u>1964*</u>	<u>Percentage Increase</u> <u>1954 - 1964</u>
Rural Cyrenaica	79,601	161,958	103	220,878	37
The Oases	11,129	12,542	12	18,277	46
Urban Centres	52,089	116,932	124	212,814	81
Total	142,819	291,236	103	451,469	55

The increase in the rural areas in the period 1936-1954 may be explained by the fact that many Cyrenaican Bedouin returned to the Jebel from the southern nomadic areas, while the 1936 census under-enumerated the number of nomads. It may be explained also by the return of many Cyrenaicans from exile. The increase in the urban centres for that period indicates a tendency towards urbanization after the Italian evacuation.

The period 1954-1964 also shows an increase in the three categories. Urban centre increases are mainly due to immigration to Benghazi and Ajedabia, particularly after oil discovery and to El-Beida as an administrative capital for Libya. As can be seen from Table 72, the population of the oases showed a little increase in 1936-1954, but rose by 46 per cent in the period 1954-1964. The fundamental factor in the increase of the oases population are the oil activities in the Sirte basin and south of the Jebel in the oases belt (Marada, Aujila and Jalu). The oases have acted as centres of concentration for the nomads who search for jobs with the exploration groups.

The rural population also showed an increase in the period 1954-1964 but with a lower percentage than in the urban and oases populations.

* Total population.

This is of course the emigration abverse of the urban influx.

The following Table shows the present native population in El-Marj District and Benghazi and Derna Province in 1931 and 1936⁹.

TABLE 73
Present native population in El-Marj District and
Benghazi and Derna Provinces 1931 and 1936

Table 73:-

	<u>Present</u> <u>Population.</u> <u>1931</u>	<u>Present</u> <u>Population.</u> <u>1936</u>	<u>Percentage</u> <u>Annual Increase</u>
District of El-Marj	14,403	21,256	9.5
Provinces of Benghazi and Derna	136,215	137,426	0.2

The increase for the District of El-Marj is very high indeed; the 1931 census seems to have under-enumerated the population. However, an increase in the population of Libya as a whole is noted in 1936. This is probably due to the fact that the Libyan-Italian wars came to an end and many Bedouin returned to their usual residence following the promise of an amnesty in 1933.

Table 74 gives the total population in the Mutasarrifia of El-Marj by mudiria in relation to the Muhafadat of the Jebel Akhdar in 1954 and 1964.

TABLE 74

TABLE 74:- Total Population of the Muhafadat of the Jebel Akhdar by Mutasarrifia and in the Mutasarrifia of El-Marj by mudiria in 1954 and 1964.

	<u>1954</u>	<u>1964</u>	<u>% Annual Increase</u>
Muhafadat of the Jebel	67,397	87,807	3.0
Mutasarrifia of EL-Beida	30,994	47,940	5.5
Mutasarrifia of EL-Marj	36,403	39,867	0.9
El-Marj Town	9,992	10,645	0.7
Mudiria of EL-Marj	8,685	3,387) 7,856	0.9
" " Farzugha	-	2,220)	
" " Si.Buzeid	-	2,249)	
" " Tulmeitha	4,888	2,996)	
" " Batta	-	2,324) 5,320	0.9
" " El-Bayada	4,669	3,626)	
" " Gr.Libia	-	2,143) 5,769	2.4
" " Tacnis	2,382	3,832	6.1
" " Jardas EL-Abid	5,787	5,254)	
" " EL-Bania	-	1,191) 6,445	1.1

Sources:- General Population census 1954, and Primary Results of 1964 Census, Tripoli.

The 1954 census gives the population figures for the original five mudirias, whilst the 1964 census has figures for ten mudirias including the five new ones. The figures for the recently established mudiria show the rate of increase for the whole Mutasarrifia by mudiria.

Table 74 shows an annual increase of 3.0 per cent for the Muhafadat of the Jebel Akhdar. This high rate of increase is a result of the extension in El-Beida which will act as the administrative capital for Libya. The low annual rate of increase for the Mutasarrifia of El-Marj is due to the emigration from the rural surrounding areas of the Mutasarrifia of El-Marj to Benghazi, Ajedabia and El-Beida. The town of El-Marj also shows a low rate of increase of 0.7 per cent per year. This may be explained by the catastrophe of the earthquake that struck El-Marj in 1963. The figures of the municipality of El-Marj for the population in July 1962, were 12,850. If these figures are compared with the population of the town as enumerated by the 1954 census, the result is an annual increase of 3.6 per cent. The official estimates give the whole Mutasarrifia of El-Marj a total population of 40,807 in July 1962. Thus a period of eight years from the 1954 census indicates an annual growth of 1.5 per cent. However, the official estimates, as stated earlier, must be taken with reservations, since they are only an estimate. The figures, in general, reveal that despite the emigration from the rural areas of El-Marj to urban centres outside the region, the town itself was growing.

The rate of growth of 6.1 per cent per annum for Tacnis may be explained either by over-enumeration or that the mudiria has a large nomadic population, and because of their movement into the mudiria may have increased the number of population in 1964.

POPULATION STRUCTURE:-

Sex Ratio:- In Libya males were in excess of females in every district except in Murzuk and Ghat in Fezzan and Kufra in Cyrenaica. The Libyan national average in the 1954 census was for every 1,000 males on an average there was 929 females; whilst in the 1964 census there were 924 females. Cyrenaica had only 910 females for every 1,000 males in 1954, and 957 females to 1,000 males in 1964.

Table 75 gives the number of females to every 1,000 males in Muhafadat of the Jebel and the Mutasarrifia of El-Marj by mudiria in 1954 and 1964. *

TABLE 75

TABLE 75:- Sex-ratio of Population of the Muhafadat of the Jebel and the Mutasarrifia of El-Marj by Mudiria in 1954 and 1964.

	Females to 1,000 males	
	<u>1954</u>	<u>1964</u>
Muhafadat of the Jebel		
Akhdar	936	960
Mutas. of EL-Beida	947	953
Mutas. of EL-Marj	928	970
El-Marj Town	943	992
Mudiria of EL-Marj	956	944
" " Farzugha	-	944
" " Sidi Buzeid	-	1,043
" " Tulmeitha	887	939
" " Batta	-	883
" " EL-Bayada	880	961
" " Gasr Libia	-	984
" " Tacnis	937	922
" " Jardas EL-Abid	932	1,016
" " EL-Bania	-	975

* Including alien population.

Sources:- General Population Census, and Primary Results of 1964 Census.

The figures suggest under-enumeration of women in Tulmeitha and El-Bayada in 1954, and in Batta in 1964. The high ratio of females to males in Sidi Buzeid and in Jardas El-Abid in 1964, may be explained by nomadic wanderings of a large percentage of the population in those particular mudirias, or to the emigration of men to urban centres in search of work.

It is interesting to observe the sex-ratio in different age-groups. Table 76 gives the number of females for every 1,000 males enumerated in the Mutasarrifia of El-Marj in 1954 by 10-year age-groups.

TABLE 76

TABLE 76:- Sex-Ratio by 10-year age-groups in the Mutasarrifia of El-Marj in 1954.

<u>Age Group</u>	<u>Females for every 1,000 males</u>
under 10	1,033
10 - 19	857
20- 29	943
30 - 39	996
40 - 49	919
50 - 59	712
60 and over	864

Source:- General Population Census 1954.

It is hard to explain the disproportionately high sex-ratio amongst children under 10 years of age. In fact, in the age-group 0-5 there was actually an excess of females over males. This may be due to the under-enumeration of boys in this age-group, or a tabulation error. The higher ratio in age-group 30-39 is in part due to war

casualties amongst the male population in World War II. The very low ratio in age-group 50-59 is suspicious and is probably due to tabulation error, whilst for the whole of Libya in this age-group there are 836 females to every 1,000 males. The deficiency of females was much more pronounced in urban areas. In 1954, there were 943 females for every 1,000 males in El-Marj Town, while in Tripoli and Benghazi there were 896 and 823 respectively. This might be expected in view of the migration of male members of the family from rural areas to major towns in search of livelihood. So long as towns continue to grow they are apt to have a diminishing sex-ratio. When this process stops or is arrested and the towns grow mainly by the excess of births over deaths, the sex-ratio tends to change in the opposite direction and towards equality. The general phenomenon of the deficiency of females in relation to males is, however, not easy to explain. It is contrary to observations in Europe and the neighbouring country of Tunisia. At the same time it reinforces the trend evident in the other neighbouring countries, United Arab Republic and Sudan.

The following Table gives the sex-ratio in the Mutasarrifia of El-Marj, Cyrenaica, Libya and other selected countries.

TABLE 77

TABLE 77:- Sex-Ratio in the Mutasarrifia of El-Mari, Cyrenaica, Libya and other selected countries.

		<u>Females to 1,000 Males</u>
Mutsarrifia of El-Marj	(1954)	928
Cyrenaica	(1954)	910
Libya	(1954)	929
Tunisia	(1956)	1,015
United Arab Republic	(1960)	989
Iran	(1956)	965
United Kingdom	(1961)	1,067
United States	(1960)	1,030

Source:- General Population Census, 1954, and
Demographic Year Book, 1962, U.N.

There are large variations in other parts of the World, which are believed to be determined partly by the selective character of migration, if any, and partly by biological considerations.

As far as Libya is concerned, one may find the explanation in the social status of women. The Libyan woman's status is inferior in comparison with other progressive countries. As a result, women do not receive the proper attention particularly in the case of sickness where medical care is usually concentrated on children and the head of the family. The health services are also not available on a large scale and the frequent visits to a medical doctor are a heavy burden on an average Libyan family, whose resources are limited. It is also clear that women are especially exposed to the risk of death when giving birth to children in the care of unqualified midwives.

Age Structure:- The real difficulty encountered in Libya arises from the inability of a large section of the population to make reasonable approximations of their age. Very few Bedouin, particularly nomads, know their own age or the ages of their children over six or seven. The absence of markedly differentiated seasons or the comparative lack of incidents in the desert are quoted amongst the contributory factors towards such ignorance¹⁰. However, as a result of the official authority efforts in 1954 census, only 6 in every 10,000 persons enumerated were returned as of unknown age. The figures for broad age-groups of ten years each (or even broader) are ample for Libya in the present stage of her economy. Table 78 shows the number in each group as percentages of the total number of all ages in the Mutasarrifia of El-Marj, Cyrenaica and Libya in 1954.

TABLE 78

TABLE 78:- Number of citizen persons in each age group as a percentage of the total number of all ages in the Mutasarrifia of El-Marj, Cyrenaica and Libya in 1954.

	Age Group	<u>Mutas of El-Marj</u> % of the total population	<u>Cyrenaica</u> % of the total population	<u>Libya</u> % of the total pop- ulation.
Infants and young children	0-4	14.2	14.2	14.7
Boys and girls	5-14	26.4	25.7	23.7
Young men and women	(15-24	13.6	15.5	16.9
	(25-34	14.0	14.5	14.9
Middle-aged men and women	(35-44	11.0	10.2	9.8
	(45-54	9.5	8.6	8.1
Elder persons	(55-64	5.3	5.0	5.6
	(65 and over	6.0	5.7	6.1

("Unknown" cases are not included in the above figures).

Source: General Population Census, 1954.

In Table 78 the relative size of the varying age-groups is of some significance. With the exception of the 0-4 and over 64 groups, all others are in 10 year slabs. Since age in the less sophisticated communities implies status there is some evidence of over-weighting of the over 64's. Details, concealed in this table, as in the case of the El-Marj population where the 5-9 age group is slightly larger than the 0-4 group, further show that detailed manipulation of these statistics would be dangerous.

The problem of approximate reporting of ages is in many ways the same as found by Richardson in Malta¹¹.

Table 79 shows the juvenile proportion varies between the Mutasarrifia of El-Marj, Cyrenaica and Libya and compare it with Algeria, India, China (Taiwan), some European countries and the United States¹².

TABLE 79

TABLE 79:- Percentages to total population of persons under 15 in the Mutasarrifia of El-Marj, Cyrenaica, Libya and other selected countries.

Mutasarrifia of EL-Marj	(1954)	40.5
Cyrenaica	(1954)	40.0
Libya	(1954)	38.4
Algeria (Muslim population)	1954)	41.9
India	(1951)	38.9
China (Taiwan)	(1955)	44.2
United Kingdom	(1955)	28.3
Italy	(1951)	26.3
France	(1955)	24.4
West Germany	(1955)	21.5
United States	(1956)	30.0

It may be observed that the juvenile proportion is very similar in the Mutasarrifia of El-Marj, Cyrenaica and Libya, and is relatively high as in other developing countries. High juvenile proportion and low percentage of middle-aged and elderly persons are typical of the less developed communities, while the converse is true of the prosperous areas generally.

Marital Status:- According to 1954 census there were 11,413 males and 10,246 females of 15 years of age and above in the Mutasarrifia of El-Marj. Of these 6,958 males and 6,988 females were married. There were 249 males who had two wives, 9 with three wives and 1 with four wives. If we compare these figures carefully we should have had 270 married women more than men, making full allowance for polygamous husbands. Actually, the differences between married men and women above the age of 15 was only 30 in women's favour. The missing 240 married women cannot be located in the same age-group. The explanation may be an enumeration error or some people might have confused a previous marriage ending in divorce or death of the previous wife with polygamy. But also, this maybe partly due to the existence of married foreigners in El-Marj who do not have their families or wives with them.

Table 80 shows the relative proportion of single, married, widowed and divorced men and women above the age of 15 in the Mutasarrifia of El-Marj and Cyrenaica in 1954, each marital group as a per cent of the total population, 15 years and over.

TABLE 80

TABLE 80:- Population, 15 years of age and over by marital status (1954).

<u>Areas and Sex</u>	<u>Marital Status</u>				
	Single	Married	Widowed	Divorced	Unknown
Mutasarrifia of					
El-Marj:- Males	29.7	61.0	3.8	5.3	0.2%
Females	9.2	68.2	16.0	6.2	0.4
Cyrenaica:- Males	34.4	57.2	3.3	4.3	0.8
Females	11.3	65.3	15.9	6.5	1.0

Source:- General Population Census 1954.

It can be noted from the Table that unmarried men constitute 34.4 per cent above 15 years in the whole of Cyrenaica, and 29.7 per cent in El-Marj (of the total male population), against the correspondingly low percentages of 11.3 in Cyrenaica and 9.2 in El-Marj. In the first place there is an overall deficiency of females in the county and secondly, polygamy amongst men adds to the number of married women without a corresponding increase in the number of married men. Of every 1,000 married men in the Mutasarrifia of El-Marj and Cyrenaica 37 and 34 had more than one wife in 1954 respectively. Polygamous husbands are observed among elderly people who tended to get younger wives in their second and later marriages.

Another significant point that emerges from Table 80 is the high proportion of widowed and divorced women in the Mutasarrifia of El-Marj as well as in the whole of Cyrenaica. This may be due to some sort of social handicap suffered by widowed or divorced women in the matter of re-marriage. Also a considerably large number of widows are over 40 at which stage their prospects of re-marriage are rather bleak.

Marriage is almost universal in the Mutasarrifia of El-Marj.

It was observed in the 1954 census that there is a continuous decline in the proportion of married men and women in the older age groups, particularly after the age of 25 in the case of women and 35 in the case of men. The proportions of unmarried men and women 55 years and above are 1.5 per cent and 0.9 per cent respectively. The actual proportion may be even smaller as some of the widows might have been returned as single or unmarried as shown in the Table 81.

TABLE 81

TABLE 81:- Percentages of unmarried persons in each age group in the Mutasarrifia of El-Marj in 1954.

<u>Age-Group</u>	<u>Males</u>	<u>Females</u>
Under 15	100.0	99.9
15-24	89.4	36.1
25-34	32.2	1.7
35-44	7.8	0.7
45-54	2.9	0.5
55 and over	1.5	0.9

Dynamics of Population:- It would indeed have been a fruitful exercise to try to relate the census data for 1954 for the corresponding data gathered during the two previous censuses in 1931 and 1936. The information relating to these two censuses, as pointed out earlier, is scanty, inconsistent and irreconcilable and, therefore, too weak to support an analysis of population trends.

However, if the rate of population increase shown by the 1931, 1936, 1954 and 1964 figures were accurate, it might be regarded as extraordinarily high for Libya. These figures imply a growth of 2.3 per cent per annum for the period of 1931-1936¹³, 2.2 per cent for the period 1936-1954, while the rate of growth was 4.3 per cent per annum in 1954-1964. This growth rate is, by comparison with other countries such as Turkey and Venezuela, too high to be accounted for by natural increase only. The rate of growth in Cyrenaica was 0.2 per cent per annum in 1931-1936¹⁴, 5.5 per cent per annum for 1936-1954, and 5.5 per cent in the period 1954-1964.* The Mutasarrifia of El-Marj in the period of 1954-1964,* shows a rate growth of 0.9 per cent. The unusually low figure of El-Marj may be explained by emigration and the earthquake that struck the area.

The World pattern shows relatively high rates of population growth. Population in the older, more industrialized countries of Western Europe, including Mediterranean Europe is increasing relatively slowly (annual rate between 0.4 - 0.9 in 1953-1957). The less prosperous countries also are found on both sides of the World mean of 1.6 per cent per year, but the majority are characterised by rates of increase higher than the mean. In the Middle East most countries appear to be increasing quite rapidly. Libya had an annual rate of growth of 2.2 per cent in the 1936-1954,** and 4.3 per cent in 1954-1964.

* As the details of the 1964 census have not been published yet and accurate figures of alien population are absent, the rate of growth for 1954-1964 was calculated on the basis of total population of 1954 and 1964.

** For citizen population 1936-1954.

Comparing Libya with some other Middle Eastern countries, Lebanon and Turkey have a rate of increase of 3.0 per cent per year, Syria 3.6 and Egypt 2.2.¹⁵ The increase of the growth rate in these countries reflects substantial declines in death rates in recent decades and particularly since the war as the result of improve sanitation and public health measures.

As the details of the 1964 census have not yet been published it will not be possible to decide on the annual rate of growth. When published, however, the results of the two successive censuses will give a reasonable indication of the annual rate of growth.

Level of Fertility:- A rough measure of the fertility of the Libyan women is furnished by the ratio of children under 5 to women 15-49 years old as enumerated in 1954. This ratio was calculated at 678 children per 1,000 women for the whole of Libya, and 683 and 684 for Cyrenaica and Tripolitania respectively. These figures imply a relatively high birth rate. Pan, in "The Population of Libya" found a ratio of 683 children to 1,000 women enumerated in the 1936 census. He does not accept this ratio as accurate in view of the apparent under-enumeration in the 1936 census of both women and children. According to Pan, it seems more likely that it may be too high because the age distribution suggests greater under-enumeration of women and children of 15-49 as a group. One may conclude that the Libyan women are relatively fertile, even by comparison with those in some nearby countries where the birth-rate is high.¹⁶ The corresponding ratios for other Muslim countries are

550 for Algeria (1936), 702 for the United Arab Republic (1960) and 693 for Turkey (1955). The United Nations estimates for the period 1945-1949 give a birth rate of 43 per 1,000 of Libyan population.¹⁷

Level of Mortality:- The author found it impossible to work on the vital statistics of El-Marj, Cyrenaica or Libya, since the official records are inaccurate, and the Bedouin of the Jebel Akhdar hardly ever register births or deaths except in the municipal areas. However, one may, with care, use the Egyptian life tables for death rates. It seems the Egyptian life tables tend to under-estimate the mortality of the Libyans where the population are less subject to the hygienic influence of western contacts. Data from Tunisia and Algeria might give a better basis for assumptions regarding Libyan mortality; however, existing mortality statistics for the latter countries are much less complete than Egypt. Pan used the Egyptian life table for 1927-1937 as a basis to work out the Libyan death rate according to the 1936 census. He found a rate of about thirty-five deaths annually per 1,000 population. This figure can be taken as a minimum estimate of death-rate of the Libyan citizens.¹⁸ The more recent figures of the Egyptian life table could not be taken as a basis for the present death-rate in Libya because of the continuous advance of hygienic conditions in Egypt. The Egyptian life table for 1954 shows a decrease in the death-rate for the period 1927-1937, for 1954 the death-rate in Egypt was 17.8 per 1,000 population.¹⁹

Size of Households:- According to the 1954 census, in every 100 households enumerated in the Mutasarrifia of El-Marj there were 452 persons; 472 in Cyrenaica, and 453 in the whole of Libya. If we divide the households in the Mutasarrifia of El-Marj by size into four groups- 'small', households with three members each or less, 'medium', households with 4 to 6 members, 'large', households which have 7 to 9 members each and 'very large', households with 10 or more members each, we get the following distribution per every household enumerated, shown separately for the settled and nomadic groups:-

TABLE 82

TABLE 82:- Distribution of Households by size in the Mutasarrifia of El-Marj (1954).

<u>Type of Household</u>	<u>Percent of Households to total Households</u>			
	<u>Total Population</u>	<u>Settled Population</u>	<u>Semi-Nomads</u>	<u>Nomads</u>
Small	38	40	34	36
Medium	43	41	45	46
Large	17	16	19	17
Very Large	2	3	2	1
Total - 100		100	100	100

Source:- General Population Census 1954.

The settled population and nomadic groups show remarkable similarity in this respect. Of the four types, the 'medium' households are the most numerous in each case. The very large households which also include institutional households, orphanages, boarding-houses, hospitals etc., are relatively insignificant. 'Small' households are numerous and together with the 'medium' types constitute nearly four-fifths of the total. The 1954 census indicates that the average size

household in the Mutasarrifia of El-Marj was 4.5 persons; the same figures holds for the whole of Libya.

Distribution of Population:- The distribution of the population in Cyrenaica is controlled by the adequacy of water supply and more recently by oil discoveries, e.g. the Sahel (the coastal plain) around Benghazi and Derma where the plain is wide enough and there is adequate water and Ajedabia where oil has been found, there is 62.2% of the total population of Cyrenaica (1964) (vide Fig.53).

The Jebel Akhdar which worked as a magnet to the population in the past seems poised to lose its attraction by emigration to the urban centres in the Sahel. According to the 1954 census, 28.4 of the population lived on the Jebel, while in 1964 the figure had fallen to 25.4 per cent. Table 83 gives the distribution of population of Cyrenaica by geographical regions in 1954 and 1964.

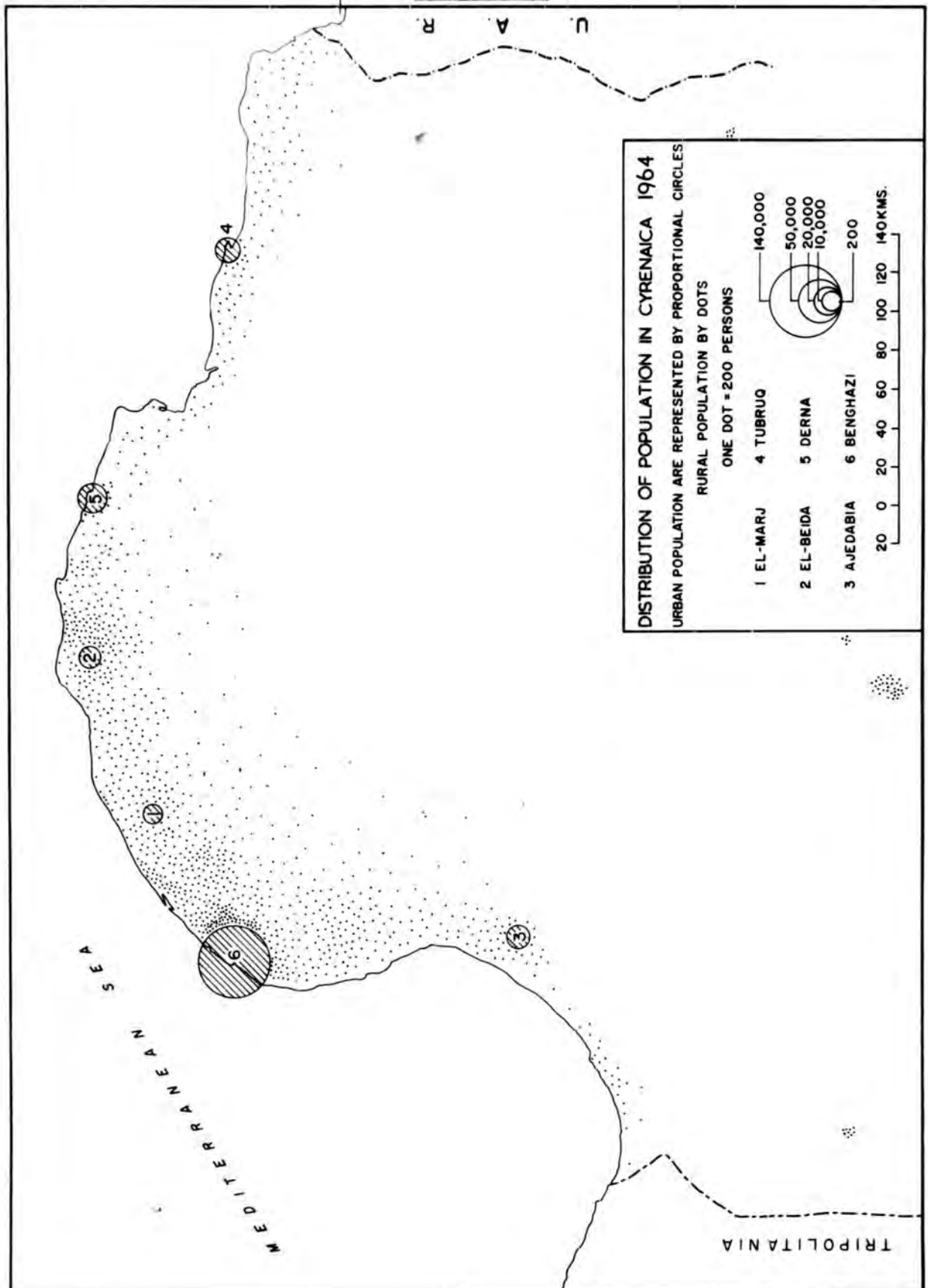
TABLE 83

TABLE 83:- Distribution of Population of Cyrenaica by Geographical Regions in 1954 and 1964

<u>Region</u>	<u>1954</u>		<u>1964</u>	
	<u>Population</u>	<u>%</u>	<u>Population</u>	<u>%</u>
The Sahel	176,159	60.5	280,745	62.2
The Jebel	82,840	28.4	114,744	25.4
Marmarica	19,695	6.8	37,703	8.4
Oases	12,542	4.3	18,277	4.0
Total -	291,236	100.0	451,469	100.0

Sources:- General Population Census 1954, and Primary Results of the 1964 Census.

Figure 53



The change in the distribution can be noted also in Marmarica where there is an increase from 6.8 per cent of the total population in 1954 to 8.4 per cent in 1964. This probably reflects the importance of the strategic position of Tubruq. The Oases showed a slight decrease, and this also may be explained by the emigration to the oil fields. Figure No. 53 shows the distribution of population in 1964. The impact of water supply and oil discoveries on the distribution of population is demonstrated in the concentration in the Sahel and the Jebel.

Ricci's map based on De Agostini's estimates lists towns of more than 10,000 inhabitants as Benghazi and Derna. Those from 1,000 to 2,500 were El-Marj, Cyrene and Apollonia; and those with less than 1,000 inhabitants were Tubruq, Tulmeitha, Tobra and Ajedabia. The total urban population in 1922 was 50,600 (27.8 per cent of the total population)²⁰. In 1954 the total urban population in Cyrenaica was 116,932 (40.0 per cent), and Benghazi alone had 69,718. Towns from 10,000 to 20,000 were Derna and Ajedabia; and those of less than 10,000 were El-Marj and Tubruq. In 1964, Benghazi had 136,641, whilst in Derna are 21,432. Those between 10,000 and 20,000 are Tubruq, Ajedabia, El-Beida and El-Marj. The urban population in 1964 was 47.1 per cent of the total population. This reflects the fast growth of the towns and the trend towards urbanization as a result of economic (Benghazi and Ajedabia) and political (El-Beida) development.

Table 82 gives the distribution of population in the Mutasarrifia of El-Marj by mudiriya in relation to Cyrenaica in percentages in 1954 and 1964.

TABLE 84

TABLE 84:- Distribution of Population of the Mutasarrifia of El-Marj by Mudiria in 1954 and 1964 in percentage

	1954		1964	
	<u>% of Mutas.of El-Marj</u>	<u>% of Total Cyrenaica</u>	<u>% of Mutas.of El-Marj</u>	<u>% of Total Cyrenaica</u>
Mutasarrifia of El-Marj	100.0	12.5	100.0	8.8
El-Marj Town	27.5	3.4	26.7	2.3
Mudiria of El-Marj	23.9	3.0	8.5	0.7
" Farzugha	-	-	5.6	0.5
" Sidi Buzeid	-	-	5.6	0.5
" Tulmeitha	13.4	1.8	7.5	0.7
" Batta	-	-	5.8	0.5
" El-Bayada	12.8	1.6	9.1	0.8
" Gr.Libia	-	-	5.4	0.5
" Tacnis	6.5	0.8	9.6	0.8
" Jardas	15.9	1.9	13.2	1.2
El-Abid				
" El-Bania	-	-	3.0	0.3

Sources:- General Population Census 1954, and Primary Results of the 1964 Census.

The Table shows that more than one-fourth of the population of the Mutasarrifia of El-Marj in 1954 and 1964 were in the town of El-Marj. At the same time 52.2 per cent of the total population of the Mutasarrifia in 1964 were in El-Marj Plain. The coastal plain of the Mutasarrifia has only 7.5 per cent of the total population of the Mutasarrifia, as the coastal plain almost diminishes east of Tulmeitha. 25.8 per cent of the population live on the high Jebel and its southern slopes.

The remaining 14.5 per cent of the population of the Mutasarrifia are distributed on the adjacent areas i.e. the crest of the first escarpment and the upper terrace north east and south west of El-Marj Plain.

The roads which cross the region from east to west and north to south seem to have no effect on the distribution of population. This is probably due to the fact that the population is engaged in cereal cultivation and animal husbandry in the Ente farms and in certain tribal lands which affected the re-distribution of population after the Italian evacuation. The large proportion of population inhabiting El-Marj Plain reflects the importance of the Plain as an important agricultural area.

Density of Population:- Cyrenaica with an area of 855,000 sq.kms, and a total population of 451,469 (in 1964) thus ranks amongst the most sparsely populated areas of the World. The population density is less than one person per square kilometre of area and is among the lowest in the world with the possible exception of the snow-bound Greenland or Bechuanaland in Africa.

Comparing Cyrenaica, with an area more than 5 times of that of Tunisia, has a population only one-ninth of Tunisia (1956). This comparison and the low density of population in the country underlines the fact that the larger part of Cyrenaica is agriculturally unproductive, comprising vast expanses of steppe and desert. As shown earlier, the population is largely concentrated around a small portion of productive land lying mainly in the fertile Sahel and in the better-watered sections of the Jebel Akhdar, and in few scattered cases in the south. The desert in

Figure 54

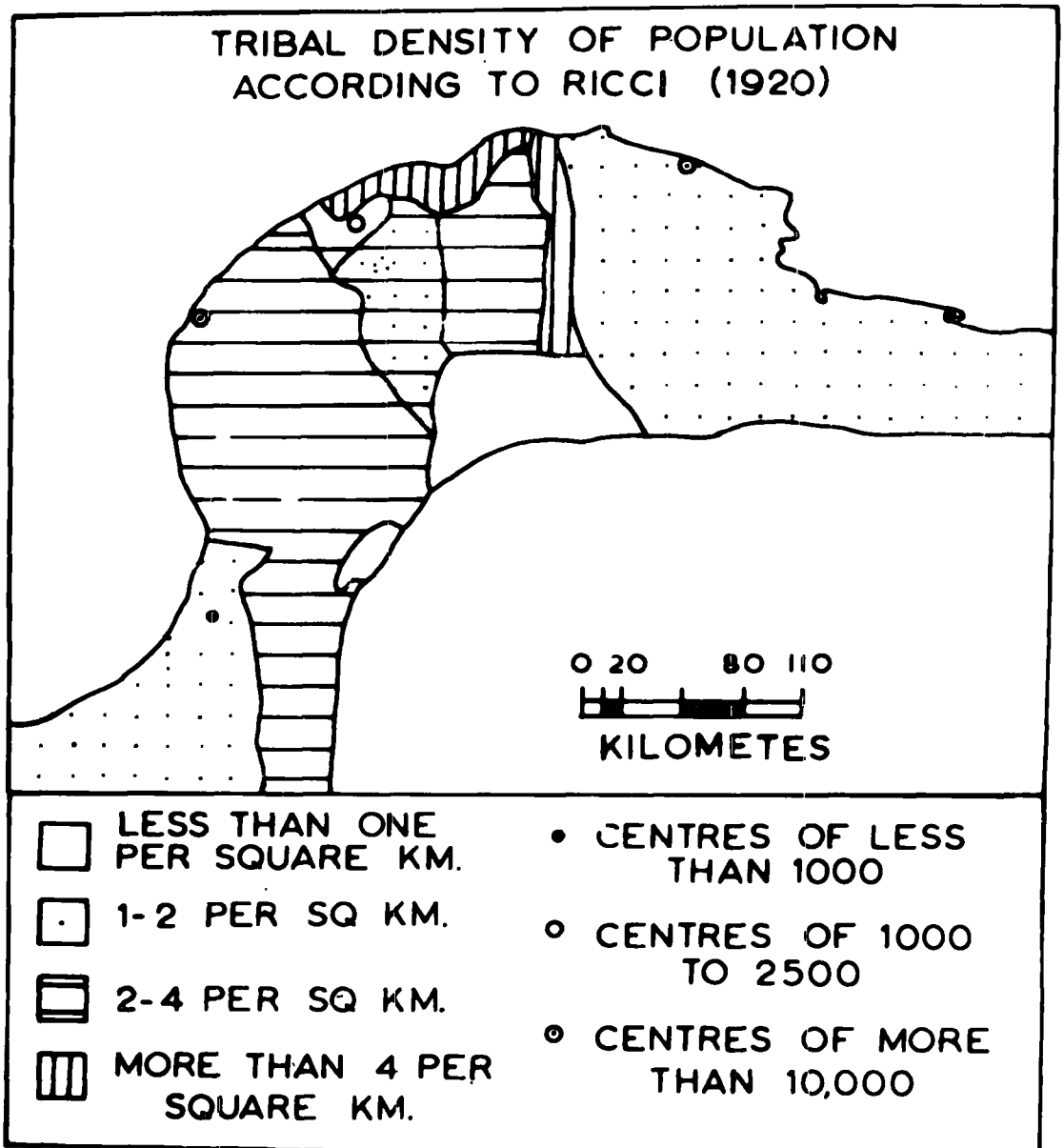
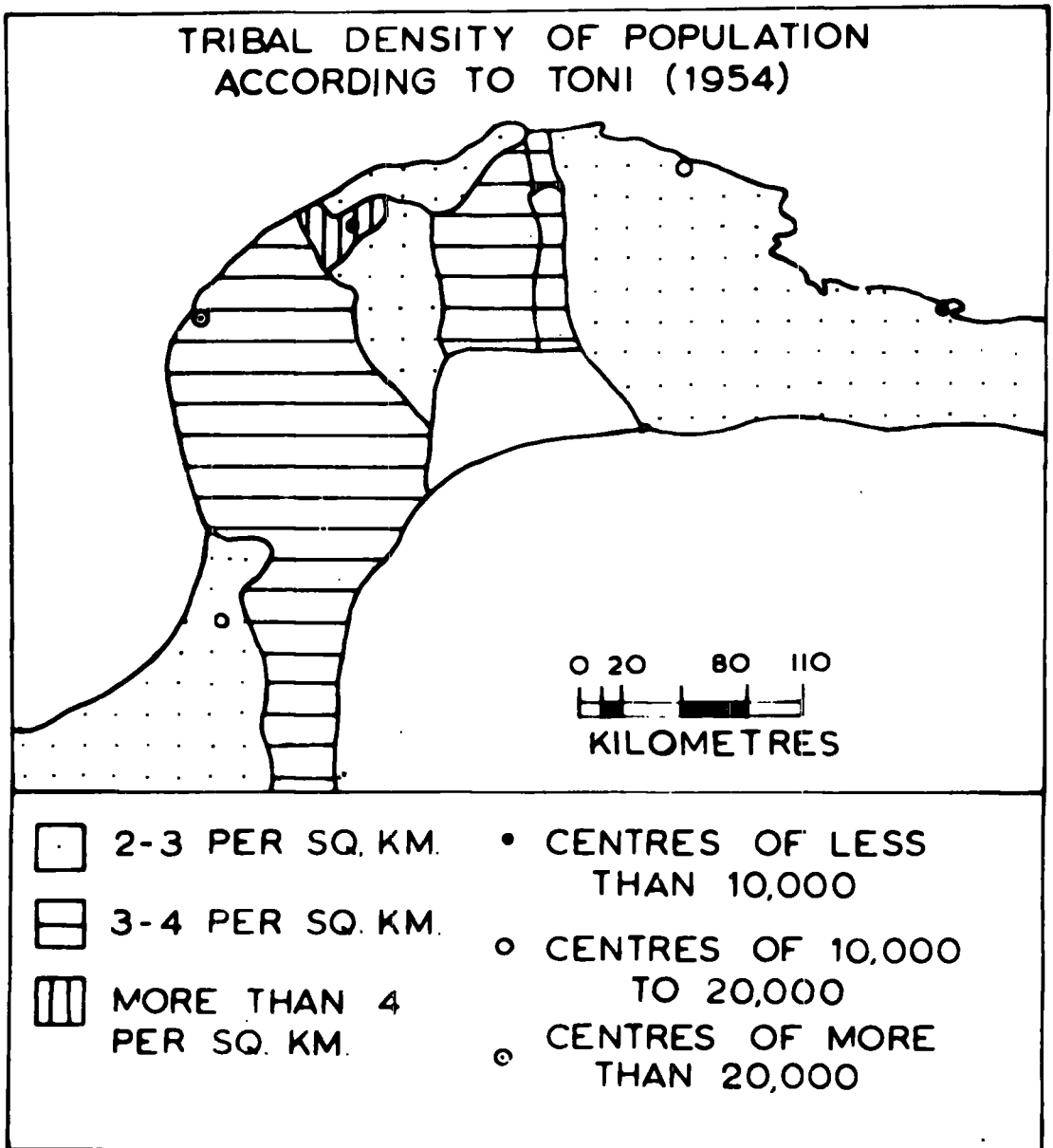


Figure 55



the south comprises three-fourths of Cyrenaica.

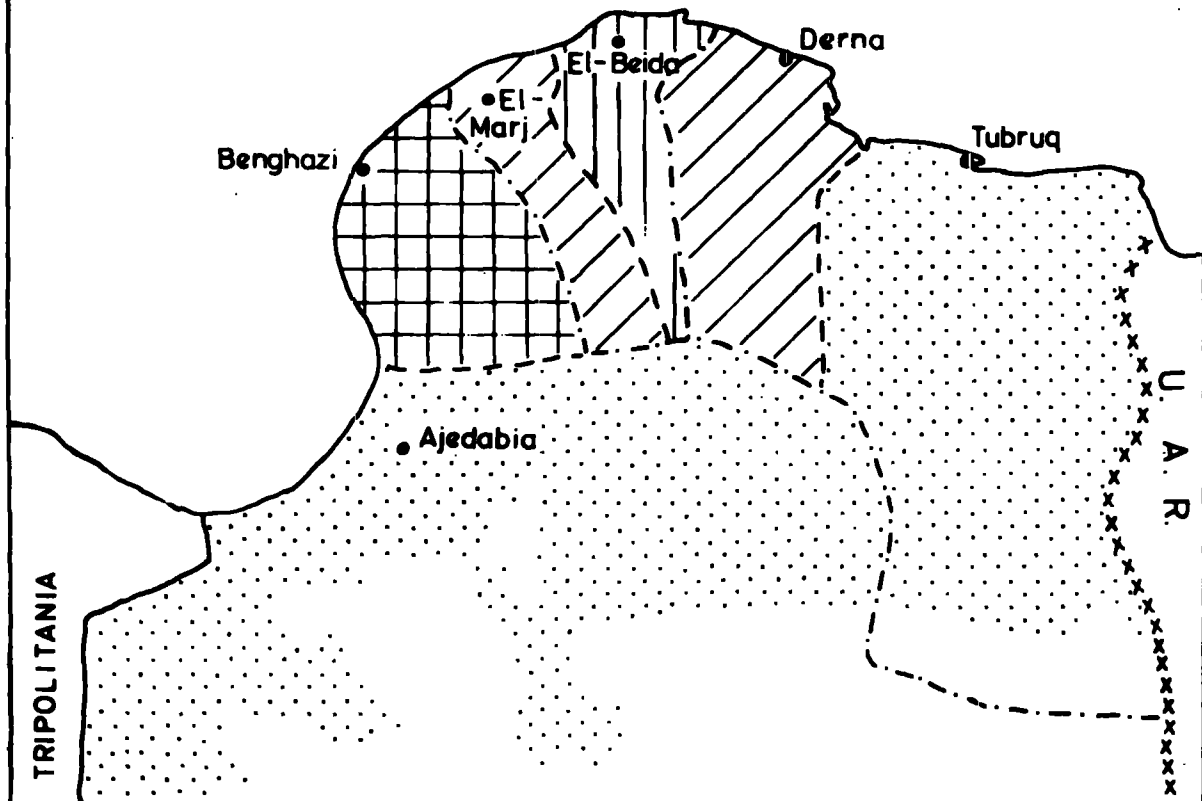
According to the 1936 census, the density in Benghazi Province was 0.83 persons per sq.kms. Ricci's map of the distribution of population which was based on De Agostini's tribal boundary gave a density of 1-2 inhabitants for the EL-Abid, Abaidat and Magharba tribes, 2-4 for the EL-Urfa, EL-Auagir, and Bara'asa tribes, and more than 4 persons per sq.km for the Dursa, Hasa and Ailat Fayid²¹ (vide Figure 54). In the 1954 census the tribal density was 2-3 persons per sq.km for the EL-Abid, Abaidat and Magharba tribes, 3-9 for Ailat Fayid, Bara'asa, Hasa and EL-Auagir, and more than 9 for EL-Urfa²² (vide figure 55).

Figure No. 56 shows the density in the inhabited areas of each Mutasarrifia in Cyrenaica in 1964. Figure 56 shows that the density of population in the Mutasarrifia of Benghazi is from 10-15 persons per sq.km, 10 to 15 in the Mutasarrifia of EL-Beida, 1 to 5 for EL-Marj and Derna, and less than 1 for EL-Ajedabia and Tubruq.

The density in the Mutasarrifia of EL-Marj was 3.3 persons per sq.km in 1954 and 3.6 in 1964. The total area is considered to be 11,000 sq.km. Figure 57 shows the density of the rural population in the Mutasarrifia of EL-Marj by mudiria for the inhabited areas only in 1964. The figure shows that the population density is 10-15 persons per sq.km for the Mudirias of EL-Marj and Sidi Bu Zeid, 5-10 for Batta, Ga'sr Libya, EL-Bayada, Tulmeitha, Farzugha and the northern parts of the Mudirias of Jardas EL-Abid and Tacnis (The Jebel), 1-5 for the Mudiria of EL-Bania and finally less than one for the semi-desert areas of Tacnis and Jardas EL-Abid. However, it must be considered that more than two thirds of the

Figure 56

POPULATION DENSITY IN CYRENAICA (1964) BY
MUTASARRIFIA (Inhabited Areas Only.)



 10 - 15 persons per sq. km.

 5 - 10 " " " "

 1 - 5 " " " "

 Less than 1 " " " "

 Uninhabited area

xxxx International boundary

— Province boundary

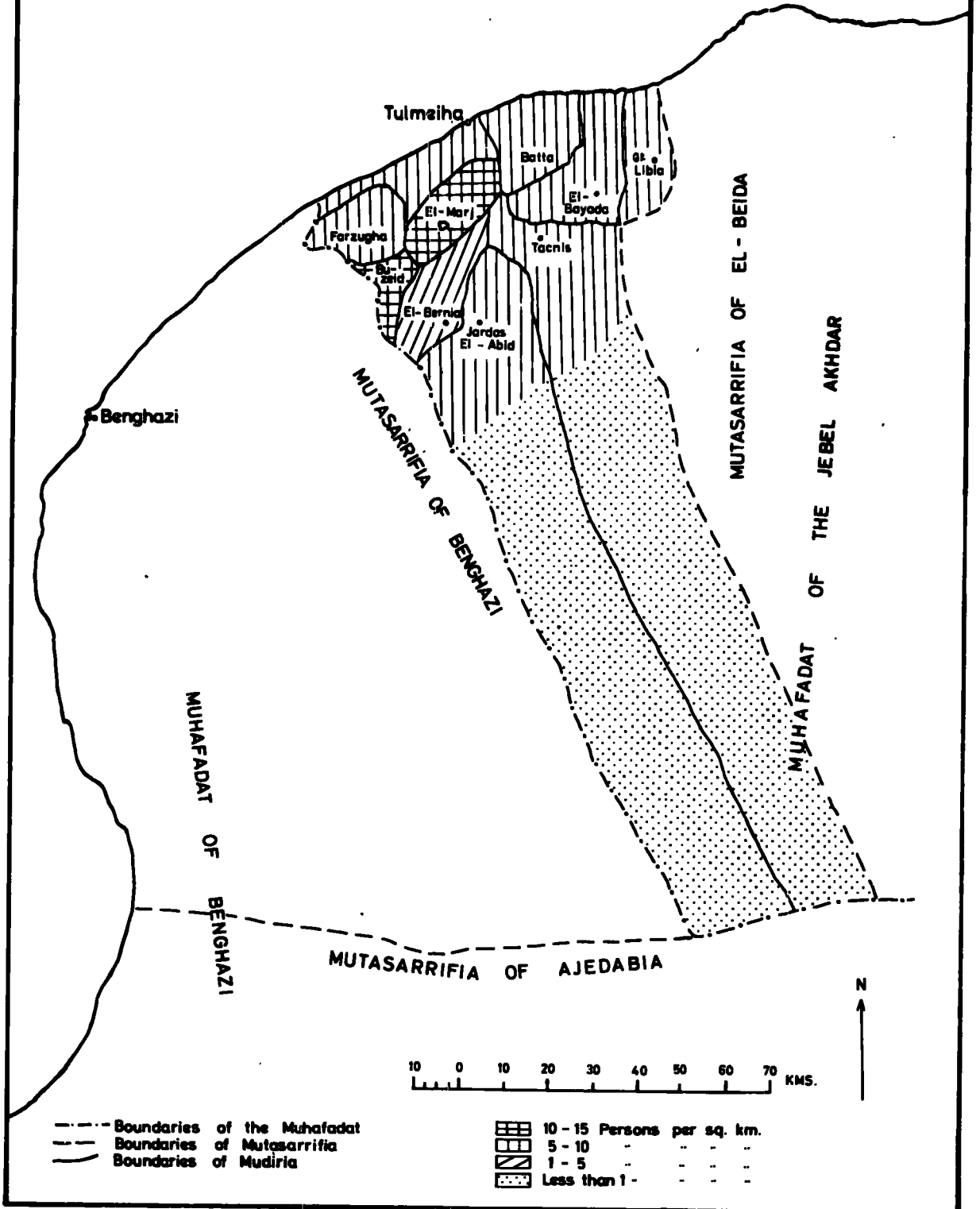
- - - Muhafadat Boundary

- - - Mutasarrifia Boundary

0 50 100 150 200 250 300 350 400 450 500 KMS.

Figure 57

DENSITY OF RURAL POPULATION IN THE MUTASARRIFIA OF EL - MARJ (1964)



Mutasarrifia of El-Marj is steppe zone and semi-desert in the south where the nomads pasture their flocks and cultivate in the winter. The population of the Mutasarrifia is concentrated mainly in El-Marj Plain. The fertile flat Plain with relatively high average of rainfall offers a great potential for agricultural development.

The areas to the south, north and east are rugged and dissected by deep wadis, and as the productive agricultural areas in Libya are very limited, the whole of the Jebel offers great scope for agricultural development and human settlement.

Migration:- Emigration from rural areas is not a new phenomenon. It began during the Italian occupation when some of the best lands were confiscated, and the farmer was left with the choice of becoming a landless farm worker, an unskilled urban labourer, or a shepherd on the barren edges of the desert. Cyrenaicans found employment on the Italian concessions, the estates, with the army, on the roads and other public works. With independence a whole range of new opportunities for employment in Government opened up. More recently it has been the oil companies and the contractors working for them who have furnished the Cyrenaican farmer with the alternative employment he is seeking.

However, despite the emigration from the rural areas of the Mutasarrifia of El-Marj there was also immigration to the town of El-Marj. The town as a marketing centre attracted the small merchants from other areas particularly in the period prior to 1960. This is probably because money became more available after oil discoveries. Table 85 shows the net change due to emigration and immigration in the Mutasarrifia of El-

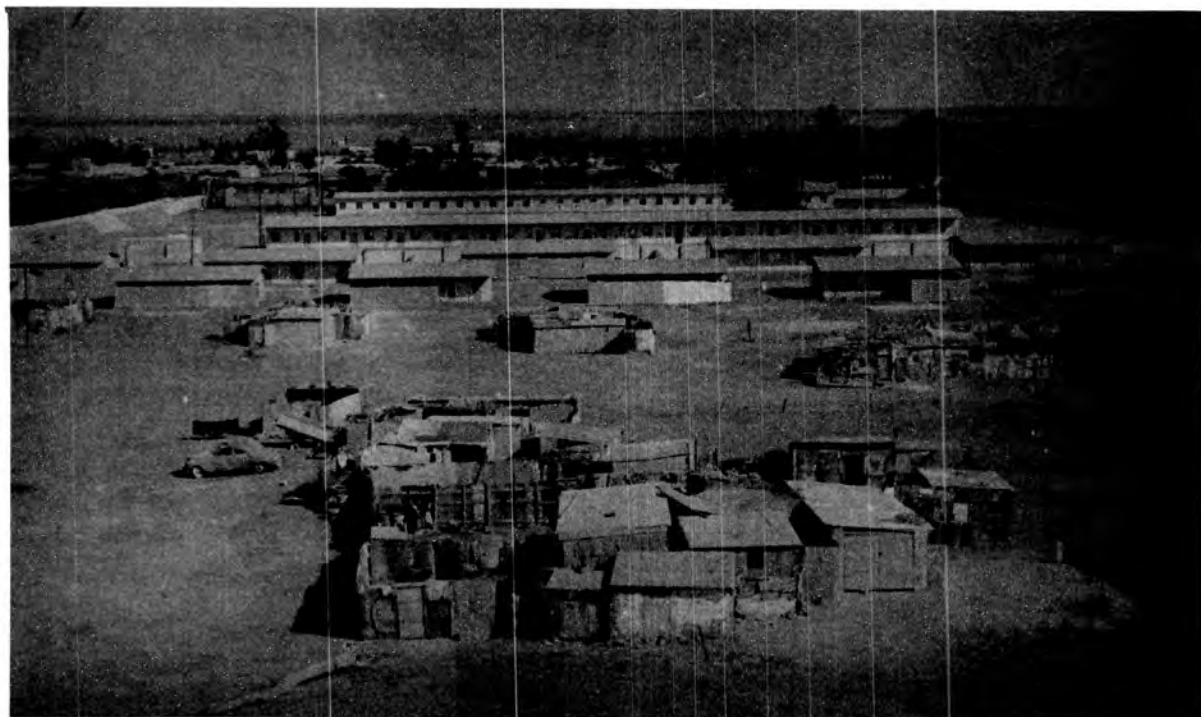


Plate 15 (A) - Pre-fabricated school erected on the football ground south east of El-Marj town after the earthquake 1963. Note the shanties in the foreground.



Plate 15 (B) - Type of settlement: Shanties in Algeria Quarter west of El-Marj town.

The figures in Table 85 are estimates referring to those who are registered in the Mutasarrifia. There are the men who emigrated from the rural areas of El-Marj to Benghazi but still registered in the Mutasarrifia offices. Once they have accumulated enough savings they will build their own houses in Benghazi or Ajedabia to which they will move their families from the rural areas of the Mutasarrifia. Unfortunately the Mutasarrifia records do not show the origin and destination of the migration movement as there are no statistical data regarding population movements within the country.

The Mutasarrifia of El-Marj is the only administrative district witnessing a very low rate of increase in population, comparing with the very fast growth of the Mutasarrifia of Ajedabia and Tubruq, the fast growth of the Mutasarrifia of Benghazi and El-Beida by immigration, and finally with the natural growth of the Mutasarrifia of Derna.

Literacy:- Prior to independence upwards of 90 per cent of Libyans were illiterate. When Libya became independent, the Government being aware of the low level of literacy and the urgent need for skilled manpower made provision for all levels of training. According to the 1954 census, of the total citizen population 5 years of age and over, only 19.9 per cent could read and write in the Mutasarrifia of El-Marj, 14.9 per cent in Cyrenaica and 13.6 per cent in Libya. Taking males and females separately for the Mutasarrifia of El-Marj, the percentage of the literate population is 19.9 and 1.4 respectively. The literacy rate amongst women is dismally low. Table 86 shows the proportion of literate population by 10 year age-groups for both males and females in respect of the Mutasarrifia of El-Marj in 1954.

TABLE 86

Table 86:- Proportion of literate males and females in the
Mutasarrifia of El-Marj by 10 year age-groups
(1954).

<u>Age Group</u>	<u>Percentage of Persons who can read and write</u>	
	<u>Males</u>	<u>Females</u>
5 - 14	27.1	3.0
15 - 24	28.0	1.7
25 - 34	27.2	0.6
35 - 44	18.1	0.2
45 - 54	11.3	0.3
55 - 64	7.9	0.3
65 and over	7.3	0.1

Source:- General Population Census 1954.

The literacy rate is higher in the lower age-groups, and highest-33.5 per cent amongst males and 3.9 per cent amongst females- in the quinquennial age-group 10-14. It is apparent from Table 86 that even primary education was far from universal in 1954; amongst females it had only just begun. The low rate of literacy amongst older age-groups is due to the few opportunities for going to school during the Italian occupation. Today, Article 30 of the Libyan Constitution gives all citizens the right to elementary education, primary school is compulsory and free education is provided at all levels for qualified students.

Despite the increase in the number of teachers and classrooms the Ministry of Education estimates that there were in 1963, places for only 49 per cent of the children of school age in Libya and anticipated that there will be places for no more than 60% of the elementary school age children by 1968.²³ However, the strides in education are considered great in comparison with the situation during the Italian rule.

The spread of education is essential for the economic and social progress, and to enable the projects planned with the oil boom background to be soundly based and developed.

Health:- Equally significant as the great strides in education have been the improvements in the medical and health facilities. An indication of the past state of health is reflected in spot checks made in 1944 which revealed that 7 children out of 10 live births died in the first year of life.

Today health problems continue to deplete the energy of a large percentage of the Cyrenaican population. Trachoma is one of the major diseases. It is estimated that 75 per cent of the total population have, or show signs of having had Trachoma. Contagious diseases and ameba are endemic particularly because of consuming vegetables and other food without proper cleansing. W.H.O. reports that Tuberculosis is increasing. It has been estimated that 17,000 active cases exist in Cyrenaica at any given time.²⁴ These major diseases, the low levels of child and maternal health programmes coupled with generalised malnutrition impede all phases of development.

Before 1963, when the town of El-Marj was hit by the earthquake, there were three hospitals; a civil hospital (with 103 beds) for the town needs, one for chest diseases (T.B.) and one for mental and nervous treatment (104 beds). The last two were serving patients from the whole of Cyrenaica. Beside the main civil hospital in the town, there is a clinic for outside patients, and 12 dispensaries for primary treatment in the mudirias of the Mutasarrifia of El-Marj.

After the earthquake patients with chest diseases were transferred to Tripoli. A large tent hospital was erected at the foot of the second escarpment and the military hospital at El-Marj barracks was put at the disposal of the civilians. These two hospitals are provided with 20 beds each.

This underlines how poorly served is the area from the health point of view. Before the earthquake every 10,000 population in the Mutasarrifia had 27.2 beds whilst after the disaster only 11 beds per 10,000. The average for the whole of Libya is 28 beds for every 10,000 people.

Table 88 gives the number of patients treated, deaths and T.B. cases as recorded in the El-Marj civil hospital in 1962.

TABLE 88

Table 88:- Number of Patients, deaths and T.B. cases in the El-Marj civil hospital in 1962.

Number of patients entered	5,729
Number of patients left	5,497
Number of deaths	10.9
Tuberculosis cases	77
Other diseases	12

Source:- Medical Office - Mutasarrifia of El-Marj.

The number of outpatients to the civil hospital and the health centres in the Mutasarrifia in 1962 was 92,447, and 234,901 new registered patients.

Cyrenaica as a whole suffers a shortage in the medical services. In 1960 there were an average of 14.4 doctors per 100,000 population.

The Libyan Five-Year Plan calls for the building of 61 Mudiria health centres in Libya with 13 rooms each plus quarters for two doctors and a midwife. In addition, three 3-room dispensaries are planned for each mudiria, a total of 183. The centres are to serve as focal points for curative and preventive actions including health education. In order to serve the nomads, health teams using mobile units are to be established. The use of airplanes is planned for cases of individual emergency, epidemic and other catastrophies.

Standard of Living:- The most influential factor is the predominance of agriculture in the economy, 84.4 per cent being thus engaged in the Mutasarrifia of El-Marj. The general standard of living for all occupations is therefore a reflection of this agricultural situation.

According to the Labour Law, the minimum wage for unskilled labour is £L.0.50. In the rural areas the average is in the neighbourhood of £L.0.50 to 0.60 plus meals. The 'Family Budget Survey in Tripoli' shows the income per capita as £L. 63.6. This figure is considered as an average for the whole of Libya as there is no data concerning either the rural families or the other urban centres. However, information collected during fieldwork is helpful. As has already been pointed out in Chapter VIII, a

sample survey was carried out in El-Marj Plain for 249 farmers. The majority of those questioned were suspicious and probably gave false information. (A copy of the questionnaires used for El-Marj Town is reproduced in Appendix IV).

An attempt was made to calculate the income of the rural areas in the Mutasarrifia of El-Marj based on the 1960 census of agriculture, the Statistical Abstracts of Libya 1958-1962 and information from Ministry of Development and Planning. In addition to these three main sources, information collected during the fieldwork was of great help.

According to the Ministry of Development and Planning,^{*} the average productivity per hectare is £L.6.10 for Libya as a whole and £L.5.80 for Cyrenaica. The same source gave a rough estimate of the income of the rural families. These are reproduced together with the results of the fieldwork survey sample of El-Marj Town. It must be borne in mind that these are estimates and give only a general idea of the family income. As far as the Town of El-Marj is concerned 50 sample cases of questionnaires were put to 50 heads of families. The families questioned were chosen to represent workers, civil services, traders and other businessmen. The number of the families questioned represent 2 per cent of the families enumerated in the town in the 1964 census. Table 89 gives the percentage distribution of the rural and El-Marj Town families by income groups based on the above consideration. The classification of the family income group was based on "Family Survey Budget for Tripoli Town 1962"²⁵.

* Personal communications.

TABLE 89:

Table 89:- Percentage Distribution of Rural and El-Marj Town Families by income groups (1964).

<u>Family Income Group</u>	<u>Annual Family Income £ Libyan</u>	<u>% Breakdown of Families</u>	
		<u>Rural</u> *	<u>El-Marj Town</u> **
A) B) C)	Up to 120 121-180 181-360	22 43 19	4 10 30
D) E)	361-540 541-1080	7 5	18 26
F	1081 and over	4	12

Source:- *Ministry of Development and Planning, ** Fieldwork Survey Samples.

The Table shows that 84 per cent of the rural families belong to the low income group and 12 per cent to the middle, while a very low percentage of families belong to the high income group. The figures for El-Marj Town show 44 per cent of families questioned belong to low income groups and the same percentage for the middle income group, whilst 12 per cent belong to the high income group. The rather high percentages of the middle and high income groups in El-Marj may be explained by the fact that most of the population are either merchants or employed in civil services. Another factor is that many traders or administrators also run farms or keep livestock in the areas surrounding the town. Multiple income origins make it necessary to use the findings shown with some caution.

It is not possible to work out the family expenditure in El-Marj town since most of the people live in the refugee camp, shanty-towns and in damaged houses. These dwelling types are supplied with electricity and

water free of charge and no rent is paid. "Tripoli Family Budget Survey" shows that the average monthly consumption expenditure per household was £L.22.2 or £L.26.6 per year. The percentage of the distribution of consumption expenditure was 45.0 per cent for food, 22.2 per cent housing, 13.0 per cent clothing and 19.8 per cent miscellaneous²⁶. Therefore, for El-Marj it will be much different at present since no housing expenditure is paid.

The employment picture in the country is rather vague. In the rural areas there is extensive under-employment which results in a low per capita productivity and makes people move into areas where employment opportunities seem to be greater.

Table 90 gives the occupational pattern for Libya and Cyrenaica for citizens 15 years of age and over, classified by major occupation groups as enumerated in 1954.

TABLE 90

Table:90:- Citizen Population, 15 years of age and over classified by major occupational groups for Libya and Cyrenaica.

<u>Category or occupational Group</u>	<u>Libya</u>	<u>Cyrenaica</u>
Total population, 15 years or over of which	640,744	171,896
persons classified economically inactive	249,604 (38.0)	66,781 (38.8)
Persons not reporting any occupation	72,862 (11.4)	23,069 (13.4)
Persons reporting unidentifiable occupations	19,748 (3.12)	7,101 (4.1)
Farmers and Farm Workers	199,568 (31.2)	46,018 (26.8)
Craftsmen and Factory Operatives	39,226 (6.1)	8,819 (5.1)
Services Workers	18,765 (2.9)	6,570 (3.8)
Detail Traders and Salesmen	14,954 (2.3)	5,166 (3.1)
Manual Workers and Labourers	9,398 (1.4)	2,057 (1.2)
Transport Workers	5,294 (0.8)	2,649 (1.5)
Managers, Administrators and Officials	4,867 (0.8)	1,761 (1.0)
Professional and Technical Workers	3,610 (0.6)	918 (0.5)
Clerical and Office Workers	1,622 (0.3)	586 (0.3)
Mining and Quarry Workers	470 (-)	67 (-)

(Figures in parentheses are percentages of total population).

Source:- General Population Census 1954.

As can be seen from the Table, 38.0 per cent of Libya's citizen population of 15 years of age and over, and 38.8 per cent of Cyrenaica were economically inactive (students and housewives). Of the total population 31.2 per cent of Libya and 26.8 per cent of Cyrenaica were farmers and farm workers. The remainder are craftsmen and factory operatives, service workers, retail traders and salesmen, or persons not reporting any occupation.

The most striking features are the high figure of "economically inactive" or non-productive persons particularly amongst women, the limited dependence on handicrafts and cottage industries and a very low percentage of secondary and tertiary occupations generally. The 1954 census shows that 77 per cent of female population of age 15 years and over and 4 per cent of male population were inactive.

Social Problems:- The first social problem in El-Marj and Libya as a whole is the inferior social position of women, despite running the house and working in the field. The Libyan women get the right to vote in 1964, but this does not hide the misery they live in. The veil, lack of education, prohibition, tradition, all prevent the women sharing in the daily social and economic life and reflect the reactionary attitudes of the old generation. Education of women and providing more opportunities are essential for progress, especially in the fields of health, education and social welfare.

Another problem is the waste of time after sowing and harvesting as many Bedouin are not proper farmers and do not occupy themselves with

farming during the whole cycle of plant growth. These periods between sowing and harvesting and sowing again are spent in gathering in the village or around tea-making. This does in fact represent concealed under-employment; here time has not the value it has in advanced societies.

The third problem is that little responsibility is felt towards the national interest. This narrow outlook makes the individual look for his own interest and expect the governing body to provide everything. This is a real obstacle for the advance of the Bedouin.

This attitude is a consequence of the tribal system which is itself a problem already referred to in Chapter IX. Corruption and nepotism which prevail in many countries in the Middle East are chronic in the Libyan young nation.

The spread of education and creation of a community interest are essential for real progress.

Conclusion:- The population of the Mutasarrifia of El-Marj is 39,867 in 1964, with annual increase of 0.9 per cent. This rate of growth is very low compared with 5.5 per cent per year for Cyrenaica and 4.3 per cent for Libya (1964). The low rate of growth suggests that El-Marj region is decreasing in population. This is mainly due to the earthquake which struck the town of El-Marj in 1963 and has compelled many to emigrate to Benghazi. Another factor is the continuous emigration from the rural areas of the Mutasarrifia to the urban centres particularly after the oil discover.

The ratio of the arable land per head is 4.8 hectares. However, it should be stressed that a considerable part of the arable land is fit

only for pasture or for the kind of optimistic dry cultivation.

By improvement of health conditions, the present high death rate will be reduced. In that event, the rate of growth might rise considerably. The present resources if developed in the proper way probably would support such increase, or so the evidence suggests.

The discovery of oil and the consequent rush of farm labourers to the urban centres are inhibiting to agricultural development, but the revenue from oil means Libya is self-sufficient after 12 years of foreign aid and United Nations spoon-feeding.

The spread of education is an important factor in destroying the tribal organisation and in getting a citizen to say "I am a Libyan" not "I am from tribe so and so". The present inferior status of women will inevitably change through education. It is also essential that the technical and agricultural training schools provide the country with a qualified staff to cope with the proposed economic and social development plans.

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CHAPTER XI

A SETTLEMENTB The impact of oil.A: SETTLEMENT:-

Introduction:- It is hard to apply the usual urban-rural classification to the population of Cyrenaica. The major handicaps are the absence of well-defined administrative or municipal boundaries and the existence of sizeable clusters or agglomerations of population in widely scattered centres which are devoid of any urban characteristics. Even in towns which are served by local bodies, such as a municipality, the rural character is very apparent. It may be possible to apply with some measure of reliability occupational criteria to distinguish a truly urban area. Judged from this angle Benghazi and to lesser extent the district towns Derna and Tubrug would appear to be the only areas of settlement where agriculture and animal husbandry do not constitute the predominant source of livelihood for the population at large¹. However, El-Beida can be added to these urban centres because of the change in its status as the administrative capital of Libya and the existence of large numbers of civil service personnel. EL-Marj can be considered an urban centre in that it possesses several central functions such as administrative facilities, the mosque, wholesaler traders who distribute to the villages, land registry and taxation offices. In all about 57.2 per cent of the total population of the town are not engaged in agriculture or animal husbandry. It also acts as a marketing centre for the western part of the Jebel Akhdar. It can be

assumed that these factors which apply to the present or old El-Marj town will also apply to the new town which is being planned by the Government to replace the present centre which was destroyed by the earthquake in 1963.

Distribution of sedentary population, semi-nomads and nomads and the way of life has already been discussed in Chapter VIII.

The following account is a description of urban and rural settlement. It must be emphasized that it is not an urban study; the main purpose is to show the importance and the function of El-Marj town to surrounding areas.

Housing types:- These exhibit great variety both geographically from town to tent and socially from Bedouin to trader and administrator. These cleavages are reinforced further to-day by the presence of many groups from Tripolitania and in the past the Italians during the colonial era; this is reflected in the existence of Arab houses, Italian farm houses and modern European villas. The census authority in Libya recognises the following dwelling house types:- haush, villas and appartments, Bedouin tents, shanties, caves and collective housing units.

The Haush:- This is the main unit of the urban settlement. In the 1954 census there were 3051 haush which represented 37.9 per cent of the total housing units in the Mutasarrifia of El-Marj, all of which are entirely confined to El-Marj town and Tulmeitha. In form, the haush is a square building, comprising an outer section of rooms which open into internal courtyard in which a climbing vine tree is often planted. Some of

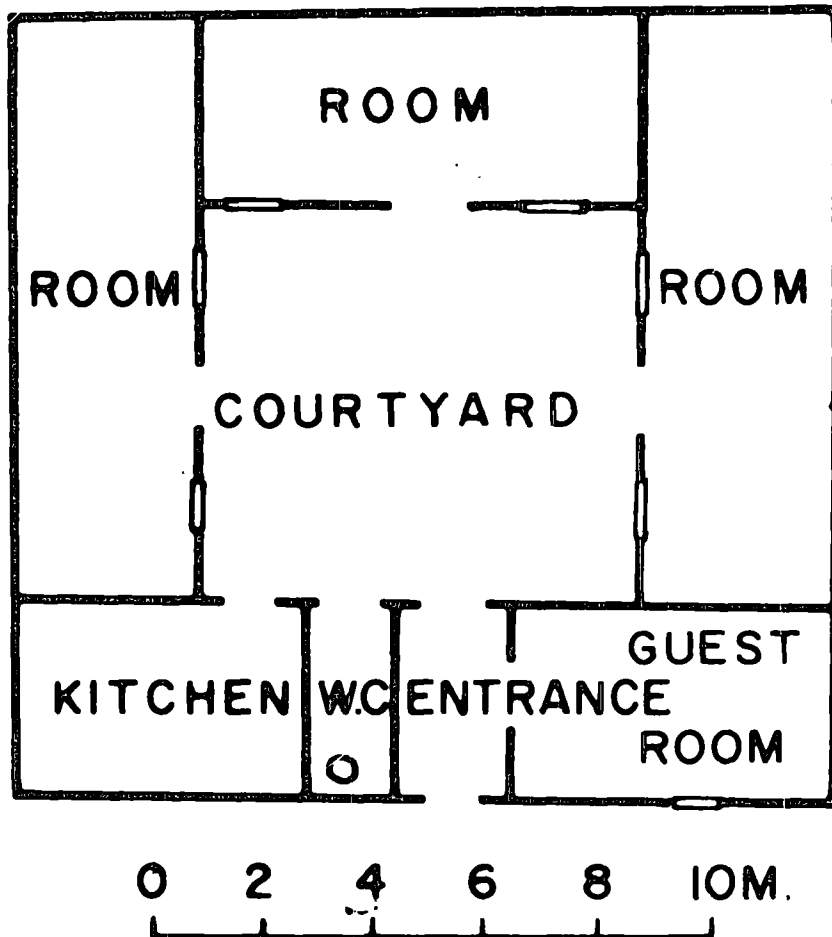
the older haush are isolated from the public spaces by a tall enclosing wall. In the larger haush, the entry to the courtyard is made through a gate, but in most of the building the normal Arabic phrase *sgifa* (corridor) is more applicable. Most haush breakdown into four large rooms, the use of which is more or less fixed by custom but varies with the number of family groups who are resident in it (Vide Fig. No. 58). A wealthy man who owns a complete haush often divides the rooms according to a fixed pattern. In El-Marj town this division is commonly as follows :- One room for each wife, one room for reception of guests and one room for the children, if there is any space left, a further room will be used for a domestic servant.

Owners of haush who are not affluent are likely to divide off the rooms so that each major room may accommodate one family.

It is estimated that about 58 per cent of the dwellings in El-Marj town are constructed with a wall made of rubble stone embedded in mud mortar supporting a roof of wood beams covered with compacted red clay and this gives the houses a reddish appearance. This type of dwelling is found in the Mahalla (quarter) Esh-Sharqia of El-Marj town. The damage to this type of house by the earthquake was extensive, and almost all the victims of it were in this quarter. The second type of building material is the stone and lime-mortar; the houses built with such material total 26 per cent of the dwellings in the town. The houses which fall under this category are built either by individuals or by the Government. The stone walls are load bearing walls supporting mainly concrete or travetti roofs. The houses were damaged by the earthquake but no deaths were reported in this type of

Figure 58

A TYPE OF ARAB HAUSH (HOUSE) IN THE TOWN OF EL-MARJ



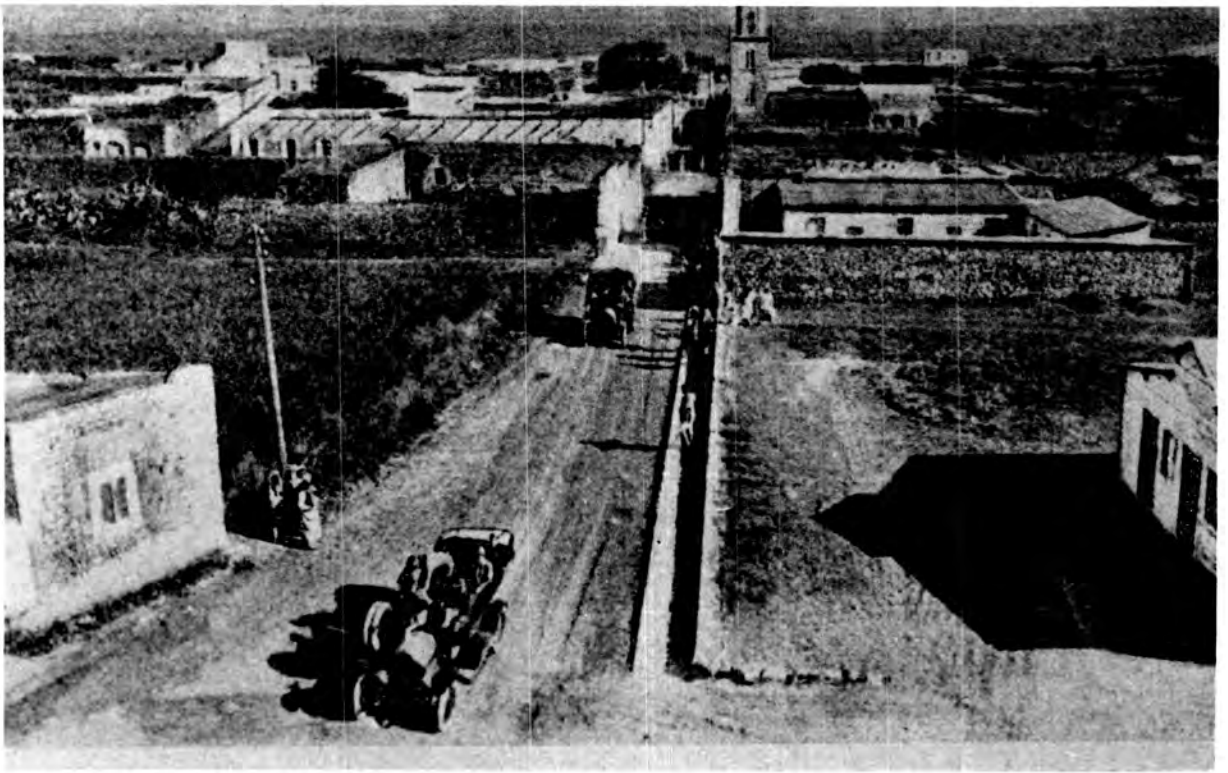


Plate 16 (A) - The main street (Istiqlal Street) in El-Marj Town in 1920 (adopted from Marinelli).



Plate 16 (B) - Istiqlal Street in El-Marj Town (1962).

The older part of the town comprises the buildings on the main street (Istiqlal Street), Mahalla Esh-Sharqia (eastern quarter) and the eastern part of the Mahalla El-Gharlina (the western quarter).

During the Turkish administration, the officials, those associated with administrative employment, and traders were resident in the Mahalla El-Gharbia. The artisans and the Bedouin who settled in the town occupied the Mahalla Esh-Sharqia. The Gasr was the administrative centre, whilst the shops were in the Istiqlal street. The suk (market) is in the southern part of the Mahalla Esh-Sharqia. Both the main shopping street and the suk are property of the waqf and the Sanusia Zawiya. All the buildings prior to the Italian development were one-storey, with inadequate facilities such as tapped water, electricity and hygiene. The lanes are typical of those found in the old part of most towns and cities in the Middle East, they are narrow and there are many cul-de-sacs.

The modern development during the Italian occupation brought changes in the morphology of El-Marj, the principal ones being:-

- a) the construction of public buildings on and near the main square in front of the Gasr.
- b) the construction of villas in the southern part of the town along a new avenue.
- c) the extension of the town westwards by building new houses for the Italian civil services.

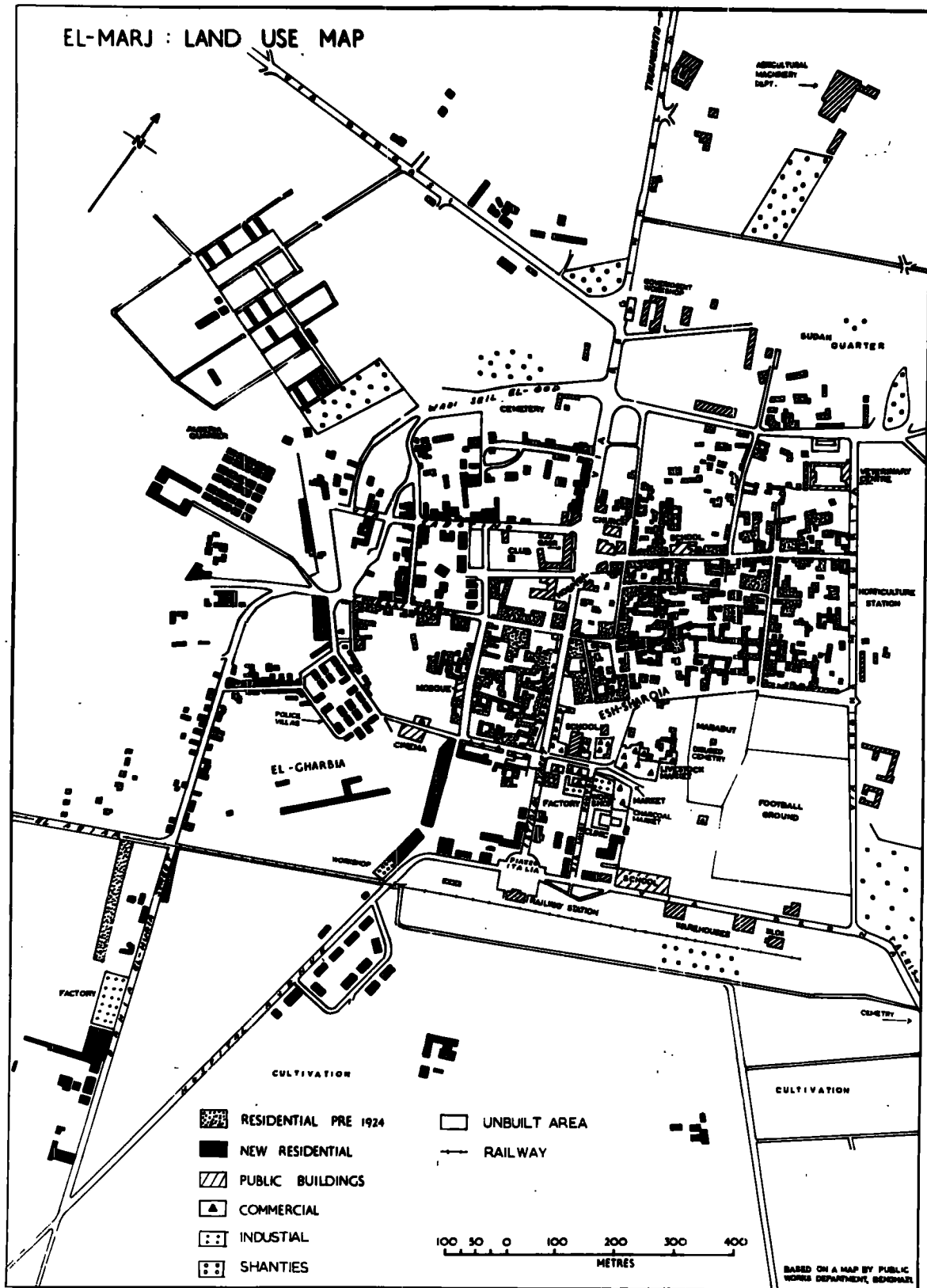
The main square and the Istiqlal street became the administration centre of the town with the municipality, post office, taxation and State Property Department, branches of the National Agricultural Bank, public

library, hospital, church and the Education Department among the principal buildings. There are three mosques and three zawiyas whilst the Mutasarrifia office was in the Gasr.

The Italians planned wider streets than those existing in the old part of the town. The Istiqlal Street is 15 to 20 m. wide, whilst the hospital and Dahia El-Huria streets are 15 m. wide, and extending southwards to the Army Barracks (vide Plate 16B). The extension of the town towards the north east for buildings for public utilities i.e. Government Transport Workshops and the Agricultural Machinery demanded wide streets to cope with the modern traffic. The streets outside the old part of the town are also wide. The town's extension for modern residential housing was towards the west and the south west, the directions being determined by the fact that the slope of the land in the east and north is towards El-Ghariq lake and there is danger of flooding in winter.

The new residential area consists of modern dwellings surrounded by gardens, particularly those villas built by the Italians north, north west and south west of the railway station (Vide Fig. 59). These modern houses are unlike those in the older part of the town, and are invariably provided with electricity, water and adequate toilets. All these residential villas are one-storey and constructed with reinforced concrete space frames. These villas are occupied at present by officials. Almost all the traders and the wealthy people are living in the Mahalla El-Gharbia. Another aspect of the extension of the town towards the west is that many low income earners built the more normal Arab type of house in the south west of the town (Vide Plate 17a).

Figure 59



During the period of Arab unrest 1913-1932, the Italians, for security measures built a large military barracks and provided a hospital. These barracks are occupied at present, by the Libyan Army. The Italian development included also power station, the silos and the water tower in the south east of the town.

The town received fresh impetus after 1935 when the agricultural centres and estates were developed by the Italians. Corresponding with the construction of the estates, some small scale industrial establishments were opened in the town to anticipate the production from the land. Civil amenities, including cafes, cinemas and advanced education facilities were also built during this later phase of colonial administration.

The Italian development activity impinged broadly upon Arab economic life, since labour demand by administration could not be met from the metropolitan country, and in the first place was not intended to be met from this source. The native peoples were increasingly attracted to the urban units as represented in El-Marj. High wages and civil amenities available in the urban centre converted some Bedouin from their traditional dislike of town-life. With this critical change in attitude of some Bedouin and the increasing number of the Arab traders from Misurata and Benghazi, the Arabs became important elements in El-Marj life.

In contrast to the commercial and administrative developments of Benghazi, Derna and El-Beida where European influence is dominant, El-Marj with its indigenous urban pattern is preserved with little modification.

The town of El-Marj developed in the shape of square covering an area



Plate 17 (A) - Type of Arab houses in Dahaia El-Huria Street in Mahalla El-Gharbia, west of El-Marj.



Plate 17 (B) - The suk (market) of El-Marj.

of 1.1 sq. Kms. It is not surprising that the density of population within the old part of the town is twice that within the new part. Indeed the area of the newer part (most of the Mahalla El-Gharbia) is twice that of the old part. The Mahalla Esh-Sharqia in 1964, despite the earthquake, contained half of the population of El-Marj. The density in the Mahalla Esh-Sharqia is 15,330 per sq. Kms. (153.3 per hectare) in 1964. In the Mahalla El-Gharbia, the density is 7120 per sq. Km. (71.2 per hectare). Densities within the town as a whole probably around 9860 per sq. Km. (98.6 per hectare). El-Marj is less congested than many other Libyan towns. The following table gives the total number of population as estimated in 1922 by Mahallas of El-Marj:-

Table 91 :- Estimate of Population of El-Marj town in 1922.

Mahalla	The El-Urfa tribe	Various other tribes	Jews	Total
Esh-Sharqia	440	570	40	1050
El-Gharbia	100	330	60	490
Total	540	900	100	1540

Source:- De Agostini, A., "La Popolazione della Cirenaica" p.436.

The total number of population in 1954 was 5940 in Esh-Sharqia and 4052 in El-Gharbia, while in 1964 was 5517 and 5128 respectively, but by then there were no Italians or Jews left.

Function:- The coming of the Italians and the agricultural colonisation activity brought new life to El-Marj as an administrative centre with available amenities. The shops are of the traditional simple layout. Their main axis is from north to south turning with a right angle to the

east across the heart of the town where the suk is situated (Vide Plate 17B). Before the earthquake Istiqlal street was the main shopping area. Indeed all the houses in El-Marj, except the Army Barracks, are within 500 m. of the main street. There are about 195 shops of which 85 are in a line along both sides of Istiqlal street, and the remainder in the suk street whilst a few are scattered in the other streets of the town especially those selling food-stuff and fuel. Almost all the shops sell a bewildering variety of goods with little in common. Many of these shops sell cloths, tea, sugar, spices, combs, shoes, wallets etc. This mixture in goods is due to the fact that when the Bedouin comes shopping he gets his purchases usually from one shop. Large specialised shops are not known in El-Marj. The municipality records show that there are 220 licences for selling food-stuff, 112 licences for cloths, 90 for vegetables, 42 butchers and 42 for charcoal, wood and kerosene. The high number of licences issued and rather few shops may be explained, as shown earlier, by the owner of one shop obtaining at least two or three licences for selling, for example, foodstuff, cloths and vegetables. There are also pavement traders along the road-side of the suk engaged in selling vegetables produced in El-Ghariat area, or in shoe making and repairing. The latter number about 21 traders, and they deal usually with the Bedouin particularly in making special Bedouin women's shoes which are available in the shops of El-Marj or Benghazi. The other type of pavement traders are 19 (registered) wandering traders with their stalls. Most of them sell cloths, knives, mirrors and wallets.

There are two main suks (markets) one for livestock and the other for charcoal and wood. The Mutasarrifia of El-Marj is an important centre for producing charcoal and wood. The charcoal suk is active and many Benghazi wholesalers buy from El-Marj market for distribution in Benghazi. It is estimated that El-Marj town's consumption of wood before the earthquake was between 8000 and 10,000 quintals annually, used by the local people and the army. At present only 150 quintals per month i.e. 1800 quintals per year of commercial wood are used, since many people use the wood from the destroyed houses or buy from the Bedouin who smuggle the wood illegally. It is noted also that many officials and the wealthy traders now use bottled gas for cooking. The town has ten grain mills which are frequented mostly by the Bedouin from the surrounding area. Contrary to what one might expect, (since El-Marj is the centre of a wheat producing area), there is no specialized grain suk, since most of the farmers sell their production to the silos or in Benghazi. The grain is sold in shops in the main suk street. There are six auctioneers who sell the grain to the wholesalers. Only a few Bedouin sell their production on the local market. There were five wholesalers in the town who are retailers at the same time; after the earthquake only two were left. Despite the existence of 17 import and export licences most of the retail traders deal with Benghazi wholesalers; only the small shop owners and those who buy the goods by credit deal with El-Marj wholesalers. The town's wholesalers also import olive oil from Spain, macaroni and biscuits from Italy and direct from the respective countries. In the last two years licences to import macaroni were withdrawn

in order to encourage the Libyan products. There are 25 second hand clothes and articles traders, where many Bedouin prefer to buy clothes shoes and knives second hand rather than spend money on new articles.

After the earthquake which destroyed many shops, only 19 shops in the main shopping street at present are still used for retailing. Some traders who left, moved to Benghazi or El-Beida, meanwhile the rest of the traders and other interested in commerce erected tin shops in the suk street without licence and there are about 200 functioning at present. The former shop owners built tin huts in front of their shops while the rest occupied the pavement of the suk street or in the open space near the suk (Vide Plate 18A). The objection's of the original traders compelled the municipality to ask these pavement traders to produce licences.

As the town is on the highway junction there are two private mechanic workshops and two car-tyre repairing shops. There is also a large Government transport workshop. Other shopping facilities are two photographic shops, 5 carpenters and another 5 bakers and only ^{the} one established after the earthquake with electricity for baking. There are also six blacksmiths, two shops for electric appliances, 19 for domestic articles, one goldsmith, 11 hairdressers and 13 tailors who are engaged in preparing clothes for the Bedouin. For the whole town only one chemist exists, since most of the Government officials get their medicines free, while a large number of the population especially the Bedouin use the local herbs and plants.

As far as industrial development is concerned, prior to the earthquake

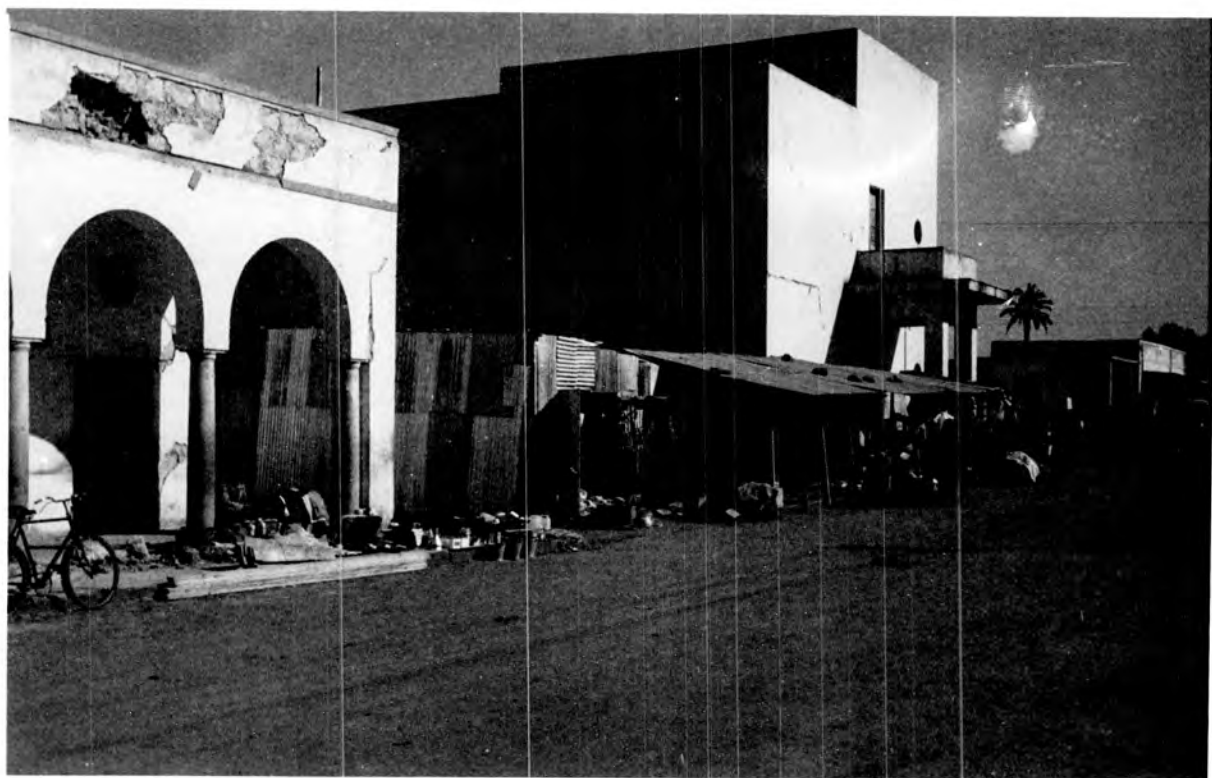


Plate 18 (A) - Pavement traders and tin shops in the suk of El-Marj after the earthquake of 1963.



Plate 18 (B) - Type of an Italian agricultural village:- Farzughah.

only one macaroni and spaghetti factory existed with a capacity of 1000 quintals per month. The factory after a period of one year out of operation due to the earthquake has started to work again. There is a soft drinks factory. These two factories produce only for local consumption. In addition to these factories, there are two small factories producing bricks. There are 12 local contractors and 51 qualified builders in the town. They work in the town and the whole Mutasarrifia particularly in repairing the former Ente houses. There are no other significant industrial activities for the town was established as an administrative, agricultural and marketing centre, not as an industrial centre.

The social facilities are confined to 22 cafes, 2 cinemas (one built after the earthquake), one social and sports club and one bar which is supposed to be for tourists but sells mainly to Muslims even though they are prohibited from taking intoxicating drinks by law in Cyrenaica. The high number of cafes consequently manifest the only social entertainment for the locals and the Bedouin, who come shopping in the town. There are six eating houses, the only hotel being destroyed by the earthquake.

Sphere of Influence:- The town of El-Marj is the only urban centre in the El-Marj plain and the western part of the Jebel Akhdar. The relatively large number of shops and pavement traders concerned with both necessities and luxury appliances which exceed the demands of the actual population of the town indicate the importance of the town in the economic sphere, to the surrounding villages and to the Bedouin. There are very few shops in the villages and the people of the Mudirias of Batta, Farzughah, El-Bayada, Tacnis, Jardas El-Abid and Tūlmeitha use the town for shopping either daily

or weekly. The suks and the shops of El-Marj are open during all the week with a peak on Thursdays and Fridays. The Bedouin from the whole Mutasarrifia sell their wheat production to the silos of El-Marj; and the rest finds its way to the suk of the town. The only Mutasarrifia production to be sold in Benghazi is wool, and it is usually exported abroad. The town is a centre of charcoal, wood and livestock trade and it is cheaper for the Bedouin to sell his livestock in El-Marj rather than transport it to Benghazi since transport costs are high and fees are paid to accommodate the animals in the Benghazi Funduk (market).

Not only does the town owe its significance to its administrative function, but also its growth and morphology has been strikingly influenced by the agricultural development. With its growth bodies such as the Zorda Experimental Research station at Zorda and the Department of the Agricultural Machinery have established themselves in El-Marj. There is a veterinary centre in the east of the town to serve the Mutasarrifia livestock. The recent established H.A.S.S. for agricultural development has taken El-Marj as a centre for the new body's activity.

The town owes a great deal of its importance to the fact that it is a railway terminus and road junction. There are five surface transport agencies in the town, and there are about 70 taxis running daily from El-Marj to Benghazi, El-Beida and the Mutasarrifia villages. Of the total number about 30 are used by the civil servants of the Mutasarrifia and agricultural departments who moved to Benghazi after the earthquake. In addition to these services there are four daily bus servies, two Derna -

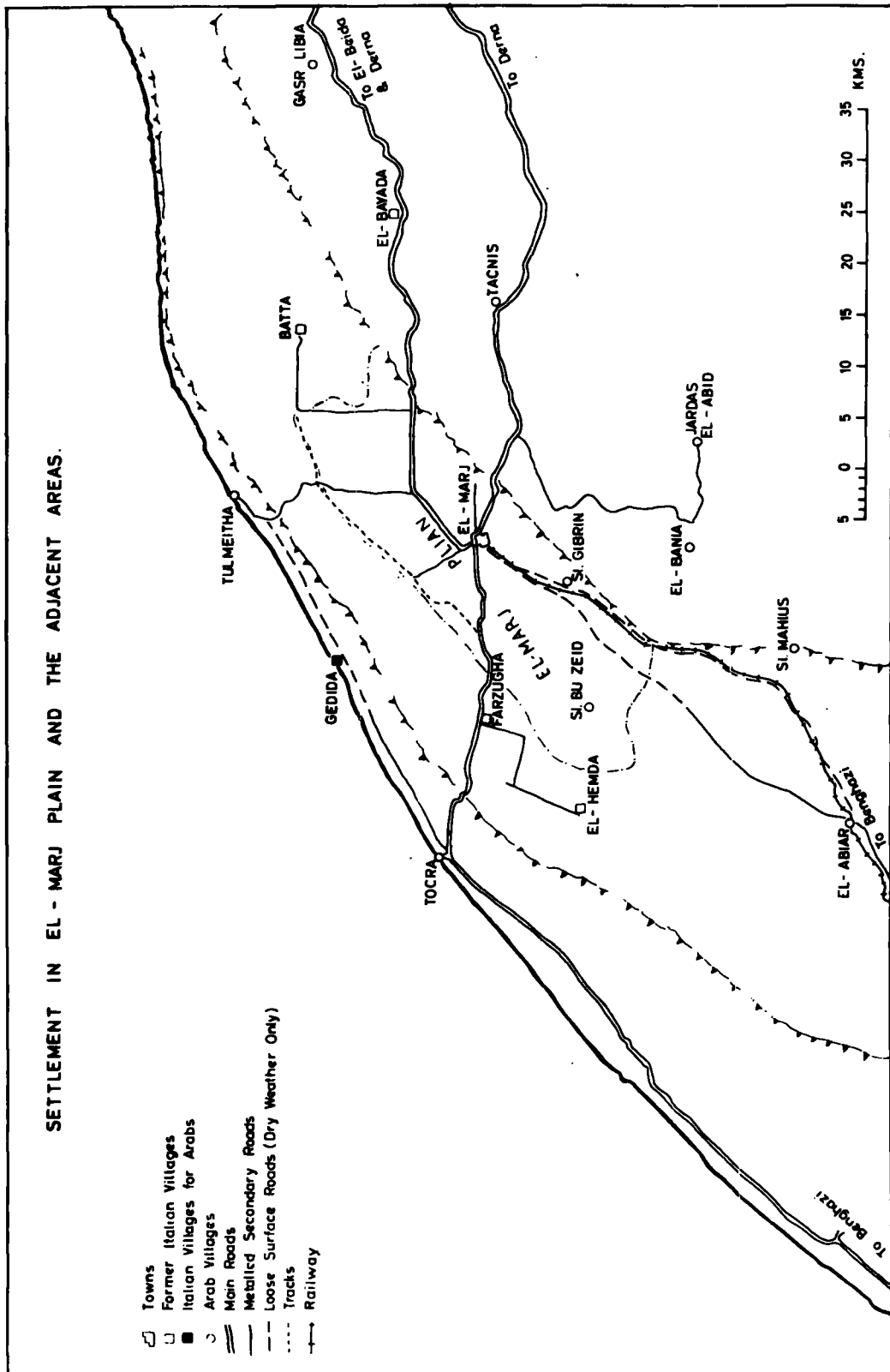
part of the building is converted to a house to accommodate the agricultural adviser of the mudiria. The agricultural office and the health centre are situated in the south of the village. Until summer 1964 the village had no electricity supply, since that date a power generated unit has supplied the village with electricity. The residents of the village use tents at present for accommodation, since most of the houses were damaged by the earthquake.

Farzugha has no market for the Bedouin in the surrounding areas who get their necessities from El-Marj.

Batta:- Is situated in the north east of El-Marj Plain about 29 Kms. of El-Marj town. It is 19 Kms. off the main highway. Figure No. 61 shows the village plan and is typical Italian agricultural centre built by the Ente in 1937. On the main square there are elementary and intermediate schools, mudir office, police station, agricultural and dispensing centres and five shops. The buildings are two- storey while the official residence at the north west is a single storey building. The village is supplied with electricity by a local generator and the water from a recently drilled windmill well. The village of Batta has a market once per week which takes place in the main square and is considered a Dursa tribe centre. This tribe also uses Messa village market in the Bara'asa territory.

Gasr Libia, Tacnis, Jardas El-Abid and Tulmeitha, all are the administrative centres of the mudirias bearing their names. Tulmeitha is an important archeological centre. This village may develop as a tourist and fishing centre.

Figure 62



This is a brief outline of the main villages. The villages are administrative centres and some of them are gathering points of the tribes. The villages never attract the Bedouin to settle and build stone houses. Examples of stone building are numerous on the Jebel but failed to attract the Bedouin to follow and to copy. As can be seen the word village, in its European connotation, can hardly be said to apply to these small centres.

Communications:- The Italian colonial era was characterised by an opening up of northern Cyrenaica by roads and railways to serve colonisation purposes.

Roads:- The most important road is the coastal highway road (1822 total length) links Benghazi, El-Marj with Derna and Tubruq. There is a second link of this road between El-Marj, Tacmis and Lamluda (10 Kms. west of El-Gubba) known as the "south road". The highway is paved throughout its length. It is six metres wide but in practice reduced to about 5.5 metres because of the heavy traffic and lack of maintenance.

In addition to the above mentioned main roads there are local roads which link El-Marj with the coastal and interior centres. A road three metres wide through Wadi Shaaba and the first escarpment links El-Marj with Tulmeitha, its ancient port. A branch off the 'south road' links Jardas El-Abid with Tacmis and El-Marj. Another branch off the coastal highway links El-Hemda with Farzugha and El-Marj. Batta is also connected with the coastal highway and El-Marj with three metres wide road. El-Marj is linked with El-Abiar by a second class road (pista) and about 21 Kms. between El-Abiar-Mletania was already asphalted by mid 1964. The work is in progress on the road to reach the new site of El-Marj having been diverted away from

from the old town.

There are many tracks linking the former Ente farms with the agricultural centres and the villages. The well known Tariq El-Hammar track along the watershed between El-Marj Plain and Mediterranean, links Batta with the main road at a point 6 Kms. west of El-Marj town. A paved branch off the coastal highway north of El-Marj links the town with the track.

Roads are the main communication in the Mutasarrifia of El-Marj. However, the region is still faced with lack of good local roads. This is more significant for such agricultural areas, where the agricultural produce becomes spoiled before it reaches the main markets of El-Marj or Benghazi.

The Five-Year Development Plan (1963 - 68) although providing substantial sums for the expansion and improvement of the road network, does not specify the new roads to be constructed.

Railways:- There is a single track narrow-guage 1.00 m. railway connecting El-Marj with El-Abiar and Benghazi (Vide Fig.62). It was established during the Italian occupation in 1927. The total length of the railway track is 108 Kms. There is only one diesel track for passengers only between El-Marj and Benghazi performing two journies per week, with an average number of 250 passengers per single trip. This figure includes the exchange of passengers using the diesel car between the various stations. Before 1958 there was a steam-engine travelling three times per week with an average number of 1500 passengers per trip.

The railways are completely neglected and run in deficit because of the increasing competition from taxis and buses. When the road of El-Abiar - El-Marj

Figure 63

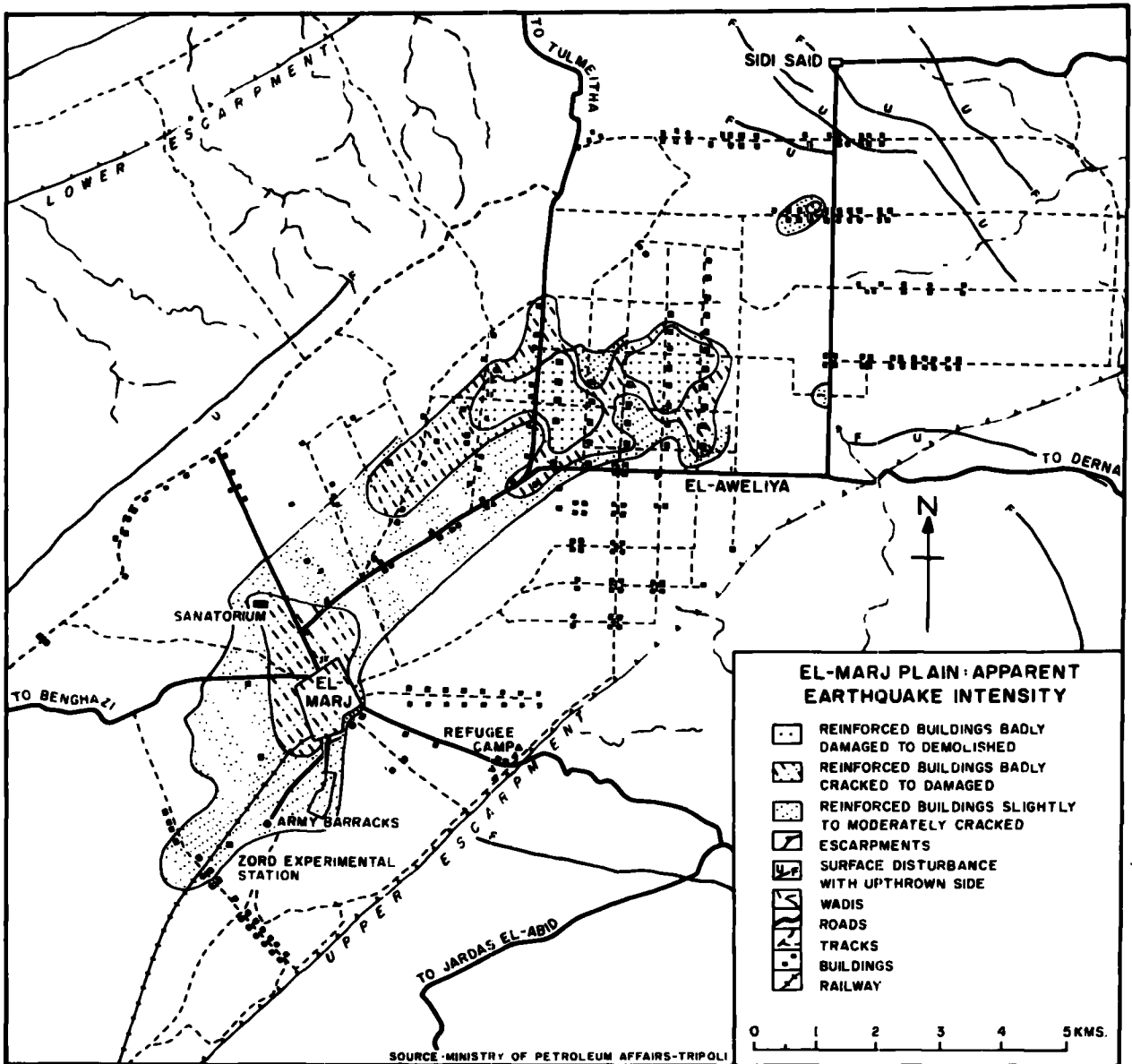




Plate 19 (A) - The refugee camp at the foot of the second escarpment south of El-Marj town. The camp was erected after the earthquake destroyed most of the town.

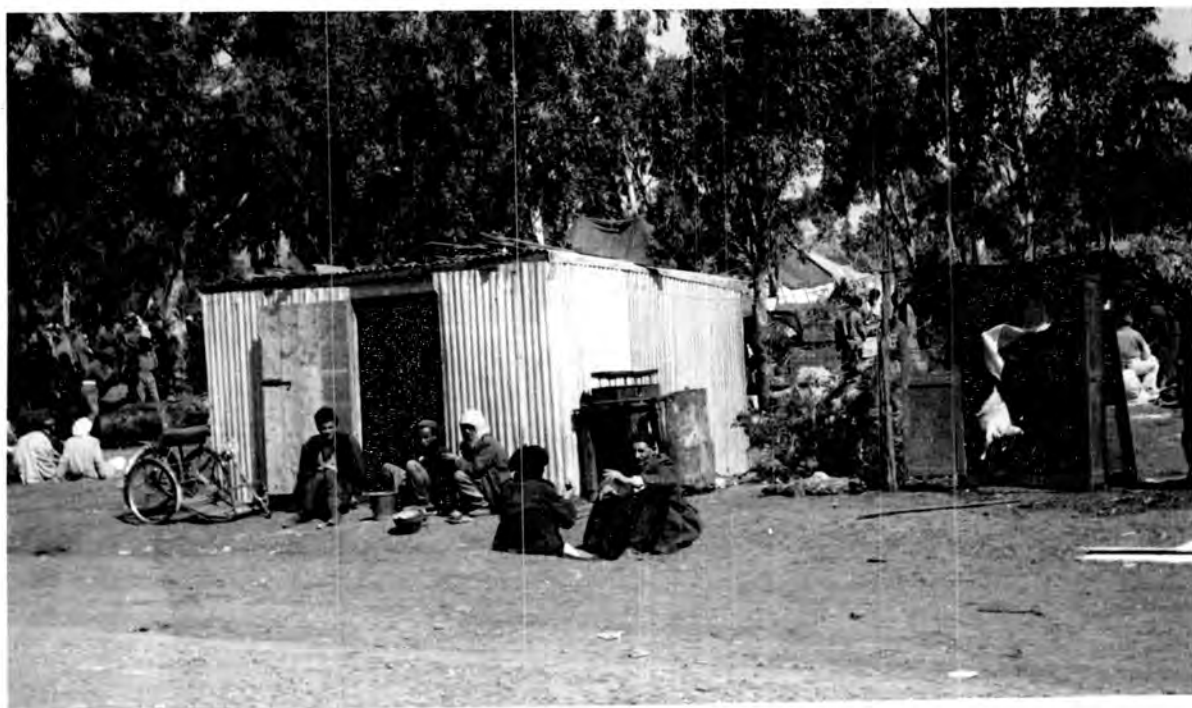
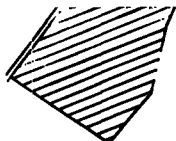


Plate 19 (B) - Temporary tin shops in the refugee camp.

El-Marj water tower. A hospital and school made available at the camp, and many small traders constructed wood huts to function as shops and cafes (vide Plate 19B). A free bus services were made available between the camp and the town.

The situation in the camp was very critical since two or three families were living together in each tent. This arrangement raises a social problem as it conflicts with the accepted traditions of Arab family life, especially the habit of separating the women of the family. Landlords and other wealthy people migrated to Benghazi, El-Beida, Derna and Tubruq. According to the municipality officials, about 3000 persons left the town to the above mentioned towns. The families migrated to Benghazi occupied the newly built houses for the Government Civil servants. A large number of the migrants were families of the Mutasarrifia and agricultural bodies officials who now make a daily journey between Benghazi and El-Marj.

The main devastation took place in the Mahalla Esh-Sharqia the eastern quarter of the town (Vide fig. 64 and Plate 20). As has already been mentioned in this chapter, the construction in most of this quarter is using rubble stone embedded in mud, and consequently suffered the heaviest damage and most of them collapsed, and almost all the deaths occurred in this part of the town (Vide Plates 21d and or 21B). Houses built of sand stone or rubble stone joined in lime-cement or cement mortar suffered considerable damage, i.e. police station and 20 Icle concession houses and six Entefarm houses (Vide Plates 22a). Construction using hollow concrete blocks suffered only moderate damages for instance the



Town Plan: Public Works Dept: Benghazi.

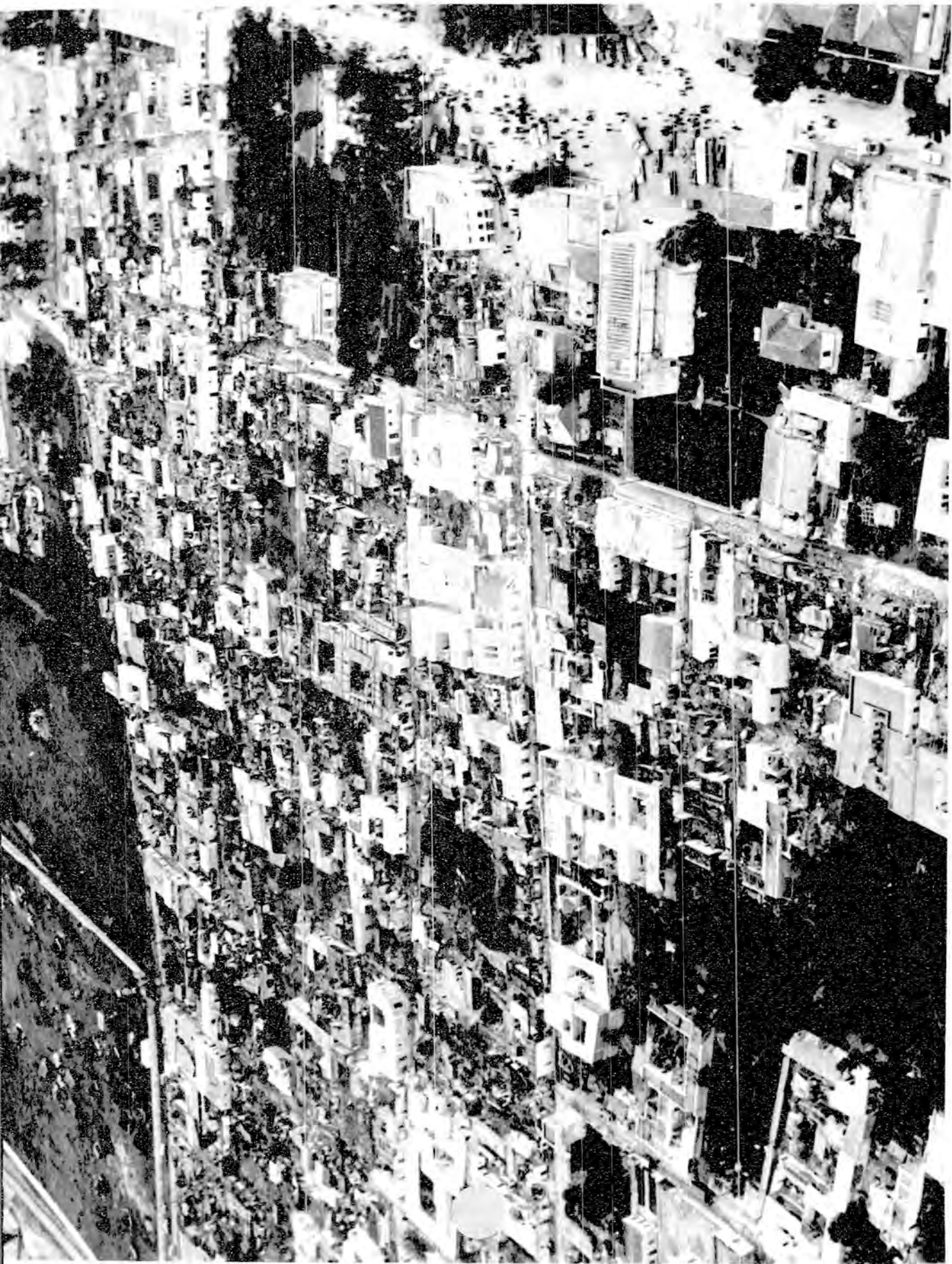




Plate 21 (A) - The heap of rubble stones in Mahallah Esh-Sharqia. The remains of the fallen roof consisting of wooden rafters. Note the houses of rubble stones with Terra Rossa.



Plate 21 (B) - The Gasr built by the Turks in El-Marj Town was damaged beyond repair.

As the winter of 1963-64 was approaching the Government made available 300 pre-fabricated houses in the refugee camp and two schools in the town, an intermediate school in the football ground south east of the town, and elementary one on the site of the demolished Gasr (Vide Plate 23a). The secondary school and the El-Aweliya Agricultural School moved to Benghazi and Tripoli respectively.

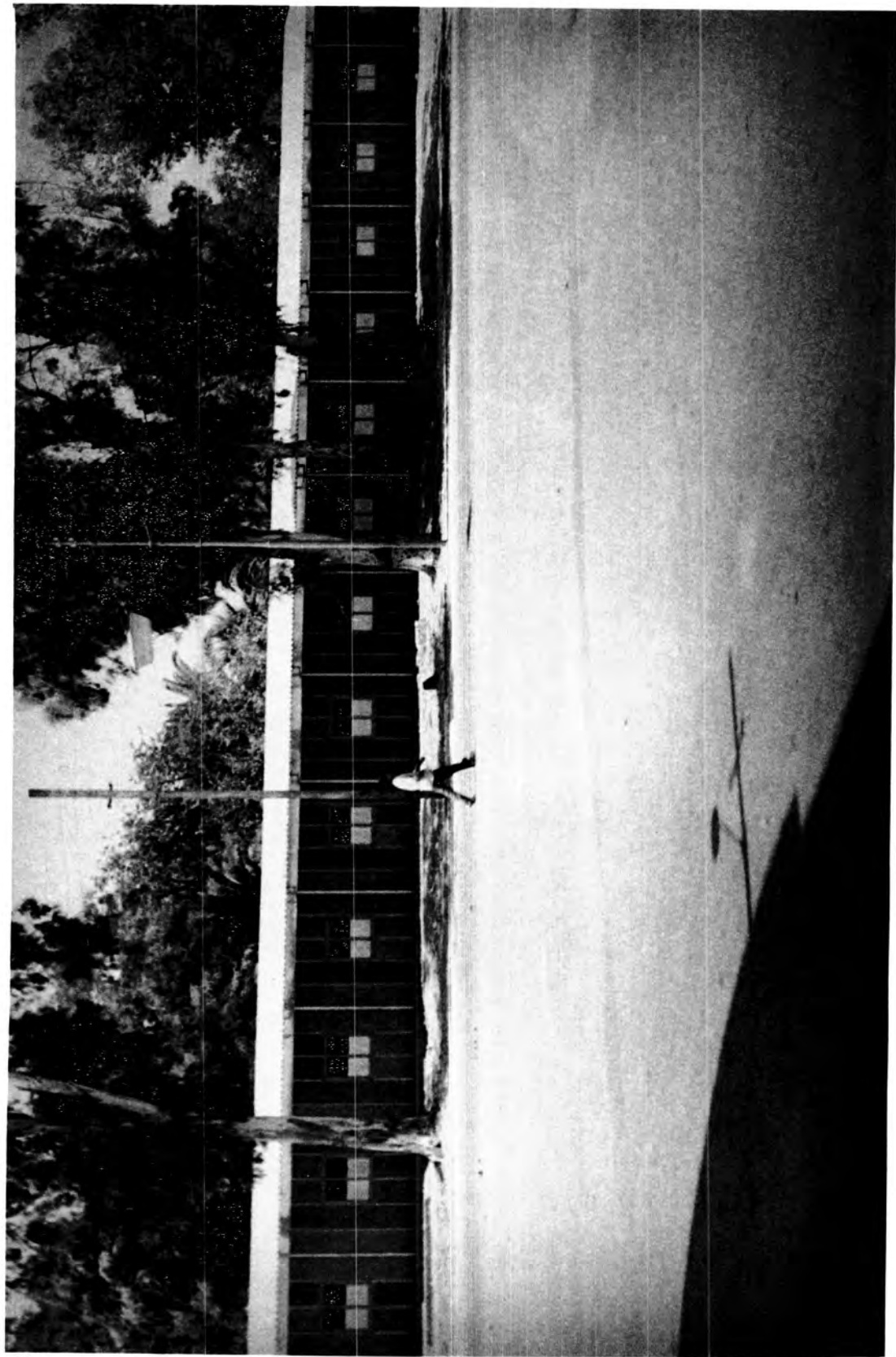


Plate 23 (A) - A pre-fabricated school on the site of the demolished Gasr.

By the beginning of 1964 many families had returned and inhabited their damaged houses especially those of the Mahalla El-Gharbia and residents in the south of the town. Galvanised sheeting was made available at low prices and almost every family built a tin hut in the garden or in front of their houses. People working in the town erected "tin" shanties surrounding the town. Most shops on the main shopping street were damaged and only 18 left functioning.

As the Government provided assistance to the people of El-Marj on a large scale, i.e. free accommodation, foodstuff and jobs for unemployers, the poor people and the tenants seemed to enjoy a better life under these distressed circumstances.

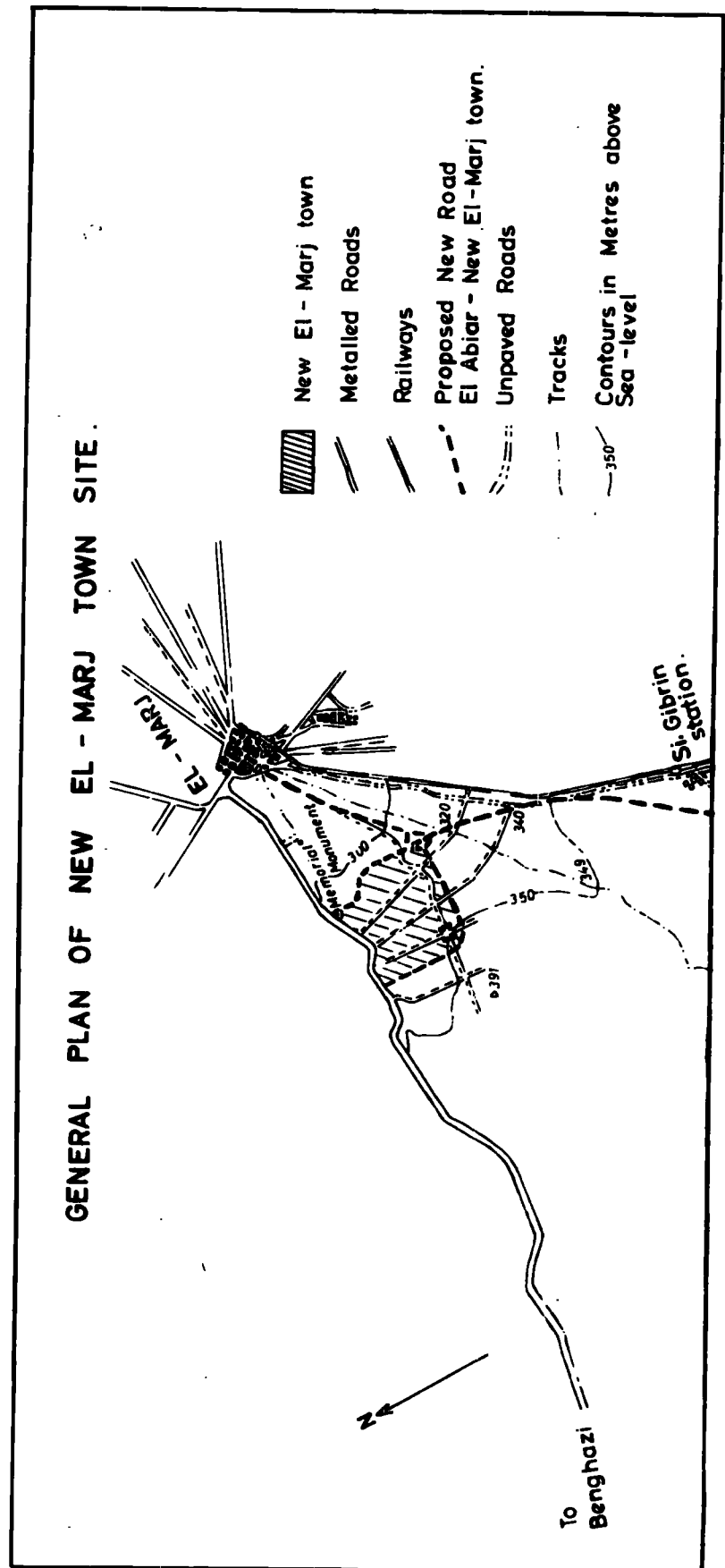
However, the earthquake damaged about 60 per cent of the town buildings and the other residential buildings are no longer habitable and have had to be demolished. So the Government decided to rebuild El-Marj. The question was raised, "is it safe to build the new town on the same site?" The land-owners insisted on the old site, while the poor people and tenants left the decision to the Government. The report published suggests that there are dangerous risks in the deep Terra Rossa under part of El-Marj Plain, and in the longitudinal direction between El-Marj and El-Aweliya (mainly El-Ghariq).⁹ It is also stated in the report prepared by Dr. Karno Minami¹⁰ that "a new site near but at higher elevation than the present town site is preferable from the points of less earthquake hazard. A new town of El-Marj on a new site built on a free plan with modern technique seems preferable to rebuilding on the present site. A modern town may contribute to further

regional development and also promote tourism. Due to the presence of damaged buildings in the present town, implementation of reconstruction on the old site may present practical and legal difficulties and delay reconstruction. From the earthquake engineering point of view, it would be possible technically to rebuild on the present site. However, the dangers from ^Nany future earthquake would be greater than on a better site and construction will be more expensive". In July 1963 a royal degree was issued ordering the establishment of "The Barce Reconstruction Organisation" as an independent body to decide on the location of the new town and supervise the reconstructions.

New El-Marj:-

The organisation (B.R.O.) decided to build the new El-Marj south of the highway, four kilometers west of old El-Marj (Vide Fig. 65). The land, the new town will be built on is state land, and this will avoid any difficulties created either by tribal or private owners. The site of the new town is 300 m. above sea-level on hard ground. General remarks and suggestions made by the B.R.O. regarding the proposed building of the new town are reproduced in appendix V. According to these remarks and suggestions, the new town is to house 20,000 at the beginning with the possibility of extending the town in future to house 30,000 persons according to the progressive requirements of the industrial, commercial and agricultural development of the inhabitants of El-Marj (Barce) and its surrounding areas. The B.R.O will build about 1400 residential one-storey units as compensation to those who lost their homes in the old town. It is

Figure 65



also planned to build 1000 units of new houses designed as "popular houses" consisting of one floor. Another 600 units to be designed as two-storey houses. The area of each residential unit varies between 300 and 900 sq.m.

Taking into consideration that all children of El-Marj and area should go to school, kindergarten, primary, preparatory, secondary and agricultural technical schools will be provided. Modern hospitals, dispensaries and outpatient clinics will be designed according to the needs of the time. The municipality, Mutasarrifia, police station, courts, post office and various other branches of the Government offices will be built in conspicuous places in the centre of the town. Market and trading centres will be placed in a central position. A Funduk where cattle, grain and vegetables are sold wholesale by farmers is to be built on the out-skirts of the town. Recreation, (sports areas and parks) will be provided for the inhabitants of the town. A large central mosque is to be located in the main square of the new town, and smaller mosques will also be built to serve the neighbourhood areas.

A ring road will be designed as a belt of the new town. The town will be away from the traffic of the Benghazi - Derna highway, but will be within easy reach for the traveller. The railway line lying north of the site of the new town is a branch rail and is of no great importance but will not be completely neglected. The main communication to and from the new town is the main Benghazi - Derna highway.

Cinemas, hotels, cafes, two or three bank branches, light industrial centres, garages and fuel stations are planned. As the people prepare their own dough bread only small bakeries will be provided. A veterinary

district hospital and cemetery will be located on the outskirts of the town.

Therefore, it seems that the New El-Marj will be an up-to-date town.

So planned to give an atmosphere of a city rather than a town.

In February 1964, a memorial inauguration monument was laid on the site of the new town. The B.R.O drilled two wells in 1964, and it was said that by 1967, the first homeless families will move into free new homes. Agriculture and canning will be the main occupations in the new town. The cost of building the new town is £L.10 million. It is the biggest single financial project ever undertaken in Libya. The old El-Marj is to be made into an agricultural village.

However, the old El-Marj has always been an important agricultural and marketing centre and even after the earthquake resumed normal life despite the fact about 17 per cent of the total population migrated to the other urban centres. The booming city of Benghazi and the towns of El-Beida and Ajedabia have attracted those who migrated and it seems they will not return to the new town. Traders and the poor people who are interested in the new town will probably form the bulk of the population of the new town. Furthermore, the construction works will attract the Bedouin from the surrounding areas.

To sum up, the old El-Marj town is the only urban centre in the Mutasarrifia of El-Marj. The town with its indigenous pattern is a marketing and agricultural centre in addition to its administrative function. As the structure of the region seems unstable, the town was struck by an earthquake which reduced most of the town to heaps of rubble. A new up-to-date

town in contrast with the old El-Marj, will be built west of the destroyed site to accommodate the homeless families. The new urban centre will probably attract many Bedouin to the urban life where they will mix with the administrators class, traders and artisans who seem certain to form the bulk of the new El-Marj population.

The villages and towns are an alien element which represent the ruling power, for centuries, the Bedouin never attempted to build houses and to live in villages or towns. The tent life is deeply rooted, and there is no indigenous call for change but agents of progress situated outside the area are gradually affecting the Bedouin.

B:- Impact of oil discoveries on economic and social life :-

When Libya became independent in 1951, the country was resource-poor stagnant and as noted earlier characterised financially by deficits. The historical evidence shows that the country was prosperous in the Greek and Roman times. The Italian development is still in sight everywhere in Libya. The Turks left the Libyans to their own devices. Prosperity has usually been a result of foreign investment in the country. The country was poor in skilled manpower and capital, with fluctuating rainfall, an obscure situation with regard to underground water, and lack of power and mineral resources. The economy of the country consisted almost wholly on agriculture including animal husbandry; and even the agricultural development was far behind in mechanisation and technique except for those farms run by the Italians and very few Libyans in Tripolitania. With all

these handicaps, the new independent state was aided by the United Nations, and the United Kingdom and United States in particular contributed to the development of the country. Towards the end of 1953, Libya concluded a long term (twenty years) agreement with the United Kingdom under which Britain promised £3,750,000 per year for 1952-57, of this £1,000,000 per year was specifically earmarked for development projects. The United States agreed to pay \$4,000,000 per year for five years.

In 1959 the first oil well was struck in Zelten, Cyrenaica, and was followed by numerous wells throughout Libya.

The impact of the oil boom is most readily apparent in the cities of Tripoli and Benghazi. Here the oil companies have their offices and workshops and employ a large staff. New hotels are being built and other businesses have grown as a result of petroleum activity. Purchasing power is concentrated here and the sharp rise of prices, particularly in the case of goods and services consumed by foreigners and the wealthy Libyans, is most strongly felt. And here the mushrooming shanty-towns are bleak reminders that there are some social problems which the discovery of oil will not by itself solve.

The El-Marj region has not itself been directly affected by oil-strikes but indirect forces are of fundamental importance. As noted elsewhere in the thesis, the relief efforts after the El-Marj earthquake, the introduction of cash wages in a way which affects even family farming, the provision of public services, investigation and investment for development, all these derive from the impact of petroleum. For the first time for

centuries El Marj Plain as with others has to be understood not in isolated terms but in terms of national, even international, economies.

Impact on the Economy :- 1 - The first impact of oil was to close the gap in the balance of payment of the country and to relieve the Libyan budget from the chronic deficit. The following table gives a summary of the annual external trade of Libya in the period 1954 - 1964¹¹ in £L. million :-

Table 92 :- Summary of the Annual External Trade of Libya, 1954 - 1964

Year	Value of Imports	Value of Domestic Exports
1954	11.2	3.7
1955	14.4	4.3
1956	16.6	3.8
1957	28.0	4.8
1958	34.5	3.3
1959	40.6	3.7
1960	60.4	3.1
1961	53.3	6.5
1962	73.4	49.0
1963	85.3	133.5
1964	104.4	217.9

The table shows that in 1963, for the first time, Libya had a favourable foreign trade balance. The increase in exports was due to the production of oil and the continuous increase of crude oil export since 1962.

The sudden rise in the imports in 1956 and the continuous rising in the following years records the imports of machines and transport equipment for oil companies. The rise is also due to the increase of importing goods and foodstuff for consumption as a result of availability of money. Crude oil exports accounted 98.6 per cent of total exports in 1963 and 99.1 per cent of the total export in 1964. Export of groundnuts were the most important item after crude petroleum. These exports formed 49 per cent of total export other than petroleum. Next to groundnuts in export is livestock and products, castor seed, almonds and citrus fruits.

In the non-oil sector there was an adverse balance of £L.54.9 millions in 1963 compared to £L.41.7 millions in 1962.¹²

The national income estimates show a rapid increase in the period 1959-1963 as shown in the table below:-¹³

Table 93 :- National income estimates in 1959-1963

Year	National income estimates in million Libyan pounds
1959	56
1960	61
1961	70
1962	82
1963	91

Revenues from oil constitute the bulk of the Libyan budget. Revenues in the budget for 1964-65 amount to £L.85.8 millions representing an increase of 41.1 per cent over the budget for 1963-64. Revenues from oil are

estimated at £L.46.5 millions (102.2 per cent increase), from income tax £L.6.5 millions (35.8 per cent increase), and from customs £L.15.5 millions (3.3 per cent increase). These form 58.9 per cent, 8.2 per cent and 19.6 per cent respectively of total domestic revenues (£L.79.0 million).¹⁴

2 - The agricultural sector is an important factor in the national income source estimated on the factor cost. In 1959, the agricultural sector share in the national income was £L.13.7 millions i.e. 26.1 per cent. Vegetables and fruits are the most important which must receive more attention particularly with the increase of population and the suitable environment in Libya for growing such crops.

3 - Production of food-stuffs locally could lead to a better diet, and also reduce the cost of living and close the gap in the trade balance for these items. About 68 per cent of food-stuffs imported in 1959 are of items produced or which might be produced in Libya.

4 - The total number of employees in the petroleum industry was estimated at 12,600 at mid-year 1963, of which 71.4 per cent were Libyans. The International Bank mission has estimated that the industry will eventually provide direct employment to 20,000 workers at the very most, or about five per cent of Libya's total force. The number of the Libyan workers in oil industry will increase during the next few years as exploration and development proceed simultaneously and new concession holders begin operations. Then it will level off and may decline some what. In Saudi Arabia, for example, only 12,000 nationals are employed in the oil industry.

Of course, Libyans will find work in oil refinery, fertilizer and other industries which use petroleum as a raw material, but such industries are also comparatively small employers of labour.

5 - A considerable proportion of the oil revenues should be directed to the development of agriculture in which a large section of the population is engaged and consequently to provide economic and social stability and progress for that section of population. The availability of capital will enable the authorities to achieve agricultural development which will give a return in the long run instead of the short term schemes. The expansion in olive and other tree crops, search for under-ground water, improvements of pasture and afforestation give the most important opportunities for the agricultural and economic development. It will also be possible to use the fuel oil in agricultural machines and in water pumps. The available power source will enable Libya to utilize the iron ore in Fezzan, and the potash in Marada (Cyrenaica) and Zuara (Tripolitania). This will be affected by construction of new roads which at the same time will serve the oil companies interests.

As the majority of Libya's population is engaged in agriculture also few in the small industries and administration, a development plan was necessary to cope with the economic and social changes in Libya. Since the Libyan Government is aware of the present economic and social situation, 70 per cent of oil revenue is allocated to development by law. Furthermore, in 1963 the Majlis (the National Assembly) approved the first Five-Year Development Plan drawn up by the Government. This consisted of a

collection of projects submitted by the various Government departments, with the Ministries concerned deciding their priorities. The Five-Year Development Plan 1963-68 is expected to cost about £L.169.1 millions, and is to be financed by oil revenue. The shares of the different sectors in the plan are as follows :-¹⁵

Table 94 :- Shares of the Different Sectors in the Five-Year Development Plan (1963-68)

	Amount (£.L.million)	Per cent
i) Public Works	44.9	26.6
ii) Agriculture	29.3	17.3
iii) Transportation	27.5	16.2
iv) Education	22.2	13.1
v) Public Health	12.5	7.4
vi) Planning and Development	11.4	6.7
vii) Labour and Social Affair	8.7	5.1
viii) Industry	6.9	4.1
ix) National Economy	3.0	1.8
x) Information and Guidance	2.5	1.5
xi) Public Administration	0.2	0.1

The order of importance of the first four items was mentioned in the 1963-64 budget and again in 1964-65. These two annual budgets also indicate that public works and transportation are to be emphasized in the first years of the plan, leaving agriculture and education to gain importance in the future, and plans for them exist and will eventually evolve in the form of new projects.

In addition to technical difficulties confronting implementation of the plan, a bottle-neck in the supply of skilled labour is envisaged, even though 70 per cent of the proposed expenditure are to be on construction projects which usually requires little skilled labour compared to other projects.

6 - The oil companies spend huge sums of money in the country on contracts for transport, services, materials, supplies, and wages. The actual expenses of oil companies in Libya for 1957 were £L.4.3 million, £L.9.6 million in 1958, £L.10.3 million in 1959, £L.21.3 million in 1960, £L.27.5 million in 1961, £L.46.2 million in 1962, £L.59.5 million in 1963 and £L.90 million in 1964.

7 - It is recognised that there is an inflationary tendency in the Libyan economy. This inflation can be precisely defined as "the existence of demand for goods and services in excess of current output capacity."¹⁶ Although economists speak of different kinds of inflation such as cost, currency, income and price inflation, it is the latter which is usually implied in the expression and which is relevant here. The two main factors which started the upward trend in prices in Libya were the relatively high increase in foreign spending on the one hand, and the inflationary gap in the budget on the other. The upsurge in foreign expenditure - especially of the oil companies, put inflationary pressure on prices by increasing demand for goods and services in excess of the immediate ability of the economy to produce. The budget has been continuously run on a deficit basis financed by external revenue. The

Government has been spending more money than it has collected in taxes. The Bank of Libya's report on "Inflation in Libya"¹⁷ suggests many policies i.e. the present automatic currency issue should be replaced with a regular one, control of the volume of credit extended by the commercial banks, to encourage savings and simplification of the Government administration. The report states that price control for some items such as fixing the profit margin for consumer durable is advisable. It suggests also that over the long run there is no better solution to the problem of inflation in Libya than increasing domestic output. Economic development should be directed mainly towards increasing output of food by developing agriculture.

As far as the development is concerned, the long run term development seems the most important factor to decrease inflation. Indeed as Prof. Higgins states "in the underdeveloped countries any event favouring growth immediately creates inflationary pressure. If for example, public investment for development purposes increases, income will increase; induced investment will come into play, and the high multiplier will begin to operate. Output cannot possibly keep pace with the increase in money income that will be generated, and inflation is the only possible result".¹⁸

8 - Should an oil refinery industry be established this would provide a good opportunity to invest the available capital and so reduce inflationary trend in the country. As has been pointed out in Chapter II, a small refinery plant now exists in Marsa Al-Burayqa to supply Libyan needs, in time this plant will obviate the need for imports. Libya's oil consumption, although still small continued to rise. In 1959, the country imported fuel

and other oils valued £L.3.7 million and increased to £L.7.8 million in 1963. These products could be produced locally. The availability of fuel will serve to produce electric power and in turn the use of kerosene in cooking instead of wood and charcoal will conserve forests and reduce erosion.

The Impact on Social Life:- The impact of the economic, social and political revolutions is giving rise to both hope and frustration. As the symbols of progress and a better life, i.e. the bicycle and the transistor radio, spread, people are learning that their nation is suddenly wealthy and want their share. When asked what they want most, frequently the initial answer is money, a personal share in the oil profits.

However, the high wages of £L.0.50 (10 shillings) per day for unskilled labour attract the labour force from the deep rural and nomadic areas. The labour in the oil field enjoys three meals per day, one day off per week, plus limited working hours per day (eight hours). The farm worker spends from 10 to 11 hours per day in the field. For these reasons many workers have deserted farming and joined the oil industry. As the Libyan Labour Code obliges the oil companies, particularly the exploration groups to employ unskilled labour in the district they are exploring, so that the opportunity for work will be shared by a large proportion of population. The striking fact is that almost over one night oasis cultivators and desert herdsmen have become part of a complex industrial undertaking. The cultivator or the poor nomad leaves his family, farm or livestock with one of his relatives as the work usually lasts only six or

eight weeks the period the surveyors group stay in the district. If the worker gains experience and becomes skilled he may continue working with the oil exploration groups when they move to another district. It is estimated at least 50 per cent of the work force is terminated after the job is finished and operations are shifted elsewhere.¹⁹ The peak of work for the cultivator in the rural areas is during ploughing and harvest time, for the oasis dweller it is the date harvest and the lambing period for the nomad. Therefore, a temporary job with the exploration groups is convenient to all three groups for any period not coinciding with their harvest or peak time. A few labourers who decide to carry on working with the oil industry seek jobs in Tripoli or Benghazi where the oil companies and contract transport offices are situated. This contributes to and encourages the exodus to the urban centres; the phenomenon is an old one which started during the last war and has continued. Before, immigrants worked in administration and commerce but since the exploration groups operated in the desert migration to the towns had increased.

The skilled labour force for the oil industry is recruited from Tripoli and Benghazi. The Libyan worker starts usually as unskilled labour with wage of £L.50 per day. He may be promoted during one year and his earning wage jumps to £L.1200 per annum. These high wages attract the working force from every sector, but in the near future when most of the jobs will be filled it will be difficult for the cultivator to find a job with the oil industry.

The temporary workers spend their earnings on their traditional

concern to demonstrate hospitality to strangers and on helping relatives who may support him when he has no job. Therefore, the temporary employment with oil companies for this type of workers does not provide enough or real security.

As the oil companies provide transport facilities only between the two main urban centres (Tripoli and Benghazi), large number of the labour force migrate to these centres for a job in the oil fields. Furthermore, almost all the Libyan workers in the oil fields accumulate their weekly rest day for five or six weeks and then spend a week with their families in the cities or the villages.

This movement of men to the oil fields and urban centres which frequently necessitates periods of separation from their families results in shifts in basic family relationships. For example, boys have been removed from the primary influence of their mothers at 6 or 7 years of age and guided by their fathers. In the company of men they learned their roles in the family and in society. With the father away the father-son relationships are weakened or destroyed. When there is no mature male relative near the family to care for the sons, circumstances vest both mothers and the sons with new and greater responsibility. For the young Libyan oil worker, who stays five or six weeks in the oil field, the separation satisfies the somewhat conflicting desires to get away from under family authority and still to return periodically to their families and the surroundings which are familiar to them.

The migration from the rural areas to the town has created new problems for the agricultural economy. In Wadi Shatti in Fezzan it is estimated four million gallons of artesian water are lost daily due to run-off and evaporation because of this neglect.²⁰ The young Fezzaneze migrated either to Tripoli or Benghazi. Even on the more favoured costal belt, where standing water is found and intensive cultivation is possible, much good land is unworked. A further fact is that the money accumulated by some people through oil has been used to buy parcels of land. So that many agricultural holdings were dismembered; and fragmentation makes for uneconomic use of land.

The Libyans are in the midst of major change, transition of a personal and social nature. Ways of living, deep rooted patterns of services and security, inadequate as they may appear to-day were understood and accepted. Values and institutions are being disrupted and cannot be modified or new ones created at a pace to match the present rate of change. As people become aware of, and educated for a better life, and fail to find economic and social satisfaction in their oil rich nation, they tend to become disillusioned.

Libya's wealth must in the long run change the whole outlook of the country. So far it has had surprisingly little effect. 70 per cent of it is earmarked for economic development, but comparatively little of the sums so far banked has been spent. Objects for expenditure are not far to seek. Schools are badly needed and training facilities for teachers to reduce

Libya's dependence on expatriate teachers. The medical services can use all the money they can be given. Fishing along the country's Mediterranean shore is a neglected source, and could be very important to develop the villages along the coastal plain. Local industries are either primitive or lacking capital, and need for the Government subsidiary is necessary. Tourists must be attracted to the country's magnificent Greek and Roman remains, by building new roads. Above all, agriculture must be expanded to combat widespread unemployment. Delays are alarming. The Government has been excessively over-cautious, partly because of regional jealousies and partly because of a desire to avoid a Kuwait-style spending spree.

Since independence Libya has enjoyed the political stability necessary for any programme of economic development, and since 1963 there has been sufficient capital available for investment. However, as a result of delay, over cautiousness and regional jealousies these assets have not been fully exploited and many opportunities have been wasted. It is hoped that the oil will improve the present poor conditions and enable a better standard of living.

The relevance of these notes on petroleum to the El-Marj region need little explicit expansion here. The point which needs emphasizing is that as a consequence of the oil boom the social and economic processes which operate not in vacuo but in this particular region, among others, are significantly changing both in power and in variety.

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CHAPTER XII

CONCLUSIONS

El-Marj Plain's principal natural resource is in agriculture and the raising of livestock. Under the prevailing forms of agricultural exploitation, natural limiting factors bear strongly on the activities of most farms. The unfavourable topography of the Jebel makes the treeless flat Plain of El-Marj the only scope for agricultural extension in Cyrenaica and perhaps in the whole of Libya. The underground water situation is rather obscure and water may be procured only at great expense. Lacking capital, security of tenure and access to credit sources, the farmer is at the mercy of a variable rainfall. The shortage of farm labour, and particularly skilled farm labour, has been indicated as a factor of considerable importance in inhibiting agricultural development in the area.

The main crops are barley and wheat, followed by olives, almonds and vines. Vegetables are grown in the area on only a small scale. Live-stock production in the area probably accounts for a greater value than crop production in most years. The Bedouin who settled in the Ente farms are helped by the Government to extend fruit tree crops. The major problems met in this programme have been the lack of skill and resources amongst the Bedouin for maintaining newly-planted trees. Their indifference to orcharding is reinforced by insecurity of tenure; naturally, they are unwilling to undertake long-term improvements on land which might well be taken from them. Pre-occupation with livestock herding also militates against successful orcharding policy.

Nomadism is giving way to sedentary farming interest. The Bedouin who settled on the former Ente farms consider the farms as their own land which was taken from them during the Italian colonial era. The N.A.S.A. activities for re-settlement will be mainly concentrated on the Bedouin who have already settled and to help them financially and technically towards complete settlement. This is not an easy task as the land ownership rights are still confused. Nevertheless, the area is not affected by the inhibiting institutional obstacles which be-devil agricultural development in most countries of the Middle East. Even more, the willingness of the Bedouin who have already settled to adopt more advanced technology should assure the scheme of success.

By the discovery of oil and the continuous increase in production Libya has suddenly been transformed from "a have not" nation to "a have" nation. The national income has largely increased in the last two years and probably will continue to rise. It has been decided that 70 per cent of the net oil revenues will be allocated for financing economic development. The main problem of development in these circumstances will be how best to use the large sums of money available to promote the well-being of the nation as a whole. Only a minority of the population can expect to earn their living by working in the oil industry or in the other industries and trades that will be immediately affected by the impact of oil operations. Other sources of livelihood must be developed to provide employment and income for the majority, whose needs will not automatically be taken care of by the growth of oil production.

Apart from oil, agriculture and the raising of livestock are the mainstays of the Libyan economy. It is the belief that, with good administration, better education, and increased capital investment, a much larger production can be obtained from the land than at present. It is also the belief that good opportunities exist for the development of fisheries and tourism.

The backward state of agriculture, animal husbandry and fisheries, and the limited and extremely variable marketable surpluses, have inhibited the development of agricultural processing industries in El-Marj Plain and Cyrenaica as a whole.

Cyrenaica, in the lights of the 1954 census and the primary results of 1964 census, has an annual rate of growth of 5.5 per cent. This is a very high rate growth and is due to Cyrenaica's natural increase and the immigration from Tripolitania and abroad, the latter particularly after oil discovery. Economic development and increasing productivity are essential to meet the needs of the increasing population. With improvements in hygienic conditions and the raising of living standards, the population numbers will continue to increase.

The new El-Marj town, which will replace the destroyed old urban centre, will probably attract many Bedouin to the urban life. Here they will mix with the administrators, traders and artisans who seem certain to form the bulk of the new El-Marj population. The old El-Marj, apart from being an agricultural village, will not regain a large population. Apart from agriculture, food processing is planned to be the main occupation in the new El-Marj and will contribute to the development of the area.

The long-term outlook for the economy is promising. Libya is more fortunate than some oil-producing countries in that it has other natural resources to exploit and at present has no problem of over-population to contend with. Although shortage of water for agriculture is the main physical obstacle to economic development, this can in time be overcome by the application of more capital to the land. As noted already the soil and climate combine to provide a good biological potential which will repay investment. The only human and social problem in developing agriculture in Cyrenaica is the tribal tenurial system. However, the highly favourable terms offered by the N.A.S.A. scheme for re-settlement, combined with a powerful internal trend towards sedentary life, appears to give grounds for optimism.

APPENDICES

APPENDIX I

Table 1:- Mean maximum and minimum of temperature in
El-Marj (1921-1940)C°

Year	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.
1921												
M.max	16.4	16.0	17.0	22.4	26.5	27.4	30.6	33.5	28.4	24.3	20.2	16.7
M.min	6.8	5.0	4.1	7.6	10.9	12.9	14.3	16.9	13.6	11.2	10.1	6.4
1922												
M.max	14.8	16.2	19.2	22.8	23.8	31.5	28.2	30.8	34.5	29.0	17.7	14.9
M.min	5.9	6.7	4.8	7.6	9.1	14.4	16.8	15.9	15.7	13.3	9.9	6.4
1923												
M.max	12.5	13.3	15.6	22.5	26.7	33.5	28.5	28.9	27.8	26.2	25.9	17.8
M.min	5.1	6.5	4.6	9.0	12.4	16.1	14.6	15.1	14.2	10.8	10.4	7.0
1924												
M.max	14.3	19.0	22.5	27.5	29.2	32.3	33.2	?	32.7	29.1	21.6	18.7
M.min	6.0	5.9	5.0	6.3	9.6	13.4	16.4	?	13.5	13.5	9.6	5.7
1925												
M.max	14.9	17.4	20.3	22.9	?	33.0	33.1	32.3	32.3	28.7	20.9	?
M.min	3.5	3.9	5.9	6.2	?	10.3	13.3	13.7	12.9	12.8	10.7	?
1926												
M.max	18.0	18.3	23.6	25.5	28.1	33.5	31.6	31.2	29.7	28.6	28.3	18.5
M.min	?	?	5.2	6.6	10.8	13.2	13.8	13.5	11.1	8.2	6.0	5.1
1927												
M.max	17.3	16.5	20.8	22.6	30.9	33.0	35.5	32.7	32.4	28.1	25.7	21.0
M.min	2.8	1.7	4.5	?	13.0	13.9	16.5	17.8	14.7	14.1	11.0	7.8
1928												
M.max	17.5	14.6	18.5	17.9	31.3	31.8	31.7	33.7	32.7	22.1	23.7	16.4
M.min	5.0	6.2	6.8	10.7	12.3	18.3	17.0	17.0	14.4	13.2	11.9	6.4
1929												
M.max	14.9	15.0	17.9	26.3	32.4	32.8	31.8	33.4	31.1	26.6	25.0	18.9
M.min	4.4	4.9	4.8	8.4	15.2	14.9	15.6	16.7	15.1	11.1	10.1	7.3
1930												
M.max	16.0	17.0	21.0	25.0	28.4	29.2	32.4	30.9	29.7	27.3	22.7	19.2
M.min	5.0	6.0	6.0	8.0	11.5	15.4	15.9	17.1	14.9	12.5	9.3	7.8

Year	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.
1931												
M.max	16.3	22.9	24.5	27.5	32.3	32.8	32.4	32.3	28.1	23.9	19.0	?
M.min	4.9	8.2	9.3	11.4	15.3	17.4	17.3	15.8	13.5	7.5	6.3	?
1932												
M.max	14.7	18.2	22.6	20.4	?	33.9	35.4	31.3	30.9	31.9	22.1	18.6
M.min	6.3	7.0	7.7	9.0	12.7	14.6	17.2	16.7	15.8	12.9	11.0	5.3
1933												
M.max	17.7	18.2	20.0	22.3	26.9	33.6	35.7	30.3	28.3	28.1	27.8	18.3
M.min	4.3	6.3	6.9	6.9	10.5	15.6	16.2	16.1	14.8	10.2	13.7	7.9
1934												
M.max	15.2	14.7	21.4	25.1	28.8	31.6	32.4	30.2	33.2	28.4	25.5	18.4
M.min	5.0	4.5	5.8	9.5	13.2	14.8	15.9	14.9	16.0	13.2	11.2	8.0
1935												
M.max	15.4	16.1	18.3	25.8	32.0	30.2	29.3	31.0	29.3	27.3	?	19.0
M.min	6.2	6.4	7.3	9.6	15.1	15.7	16.6	16.0	15.7	11.4	8.6	6.3
1936												
M.max	17.7	17.9	20.9	25.1	26.1	30.5	30.6	29.3	28.3	29.5	21.8	15.8
M.min	6.3	7.9	7.1	9.8	12.8	14.7	17.7	16.6	13.8	14.0	9.1	7.9
1937												
M.max	15.4	17.8	22.5	24.5	26.9	31.7	29.6	31.8	33.4	26.8	23.0	16.9
M.min	5.1	6.9	7.0	8.5	10.7	13.4	16.7	16.3	16.0	12.3	10.3	4.6
1938												
M.max	14.8	15.0	15.6	20.9	26.7	28.3	30.0	32.7	30.0	27.3	21.5	18.3
M.min	4.4	3.9	4.2	7.8	11.2	11.8	15.1	16.3	13.2	10.9	7.3	4.8
1939												
M.max	16.2	16.8	17.0	24.1	28.8	28.8	31.8	31.8	34.3	29.5	23.1	18.1
M.min	3.7	5.2	4.4	8.0	10.8	10.7	13.5	15.0	15.0	9.3	8.3	7.2
1940												
M.max	16.2	17.3	19.8	24.5	29.4	31.7	31.0	30.8	32.1	30.2	33.6	16.0
M.min	5.6	4.8	4.8	5.9	9.0	15.9	16.2	16.1	14.8	13.5	10.4	6.4

Table 2: Extreme Maximum and Minimum of Temperature in
El-Marj (1921-1940). C°

Year	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.
1921												
E.max	20.6	22.6	26.1	34.1	36.2	41.0	36.2	43.0	34.5	28.4	25.0	21.0
E.min	0.4	0.1	0.1	0.0	4.4	9.0	9.8	13.7	8.4	5.9	4.2	0.5
1922												
E.max	20.1	19.7	26.2	32.1	34.2	43.7	33.8	41.9	42.7	37.8	29.4	19.0
E.min	2.5	0.1	0.0	1.4	3.8	9.3	11.4	12.6	10.6	7.5	4.8	0.1
1923												
E.max	17.1	17.2	26.0	39.5	39.0	44.0	38.0	35.2	35.0	31.0	32.0	23.8
E.min	0.3	3.3	0.5	0.1	7.0	11.0	13.0	12.0	10.0	4.1	2.4	1.5
1924												
E.max	21.9	27.4	34.0	40.2	38.5	41.6	36.2	?	40.8	35.3	28.2	22.3
E.min	2.2	0.4	0.2	1.4	6.4	9.8	12.4	?	10.2	7.0	4.0	0.1
1925												
E.max	20.4	22.6	24.2	33.2	?	38.8	39.8	41.3	40.9	24.0	29.0	?
E.min	0.0	0.2	0.2	0.1	?	4.5	10.3	8.3	9.6	5.4	6.1	?
1926												
E.max	23.4	24.1	32.0	36.0	30.2	48.0	42.2	33.1	34.0	39.0	36.0	25.0
	0.6	0.5	1.0	1.2	5.3	7.9	10.3	10.2	8.1	1.2	0.9	0.0
1927												
E.max	21.1	21.4	29.5	32.8	35.9	40.0	39.0	36.6	38.1	35.2	32.4	25.8
E.min	1.0	1.4	1.2	.2	3.8	9.6	13.4	15.0	14.0	8.0	4.8	1.2
1928												
E.max	20.6	18.3	28.4	40.2	43.3	38.4	35.0	37.7	32.4	33.7	31.8	21.2
E.min	0.0	1.5	1.8	1.8	4.8	8.1	12.7	12.8	8.6	5.2	4.5	1.4
1929												
E.max	20.6	21.1	24.0	39.0	40.4	38.2	37.5	37.8	38.2	32.8	31.2	26.3
E.min	0.5	1.5	1.0	1.1	8.8	11.9	11.8	12.8	11.8	6.1	4.1	3.2
1930												
E.max	21.8	25.9	30.6	36.8	39.9	42.2	40.2	31.9	36.4	31.6	30.8	23.9
E.min	1.3	0.1	3.0	1.1	5.0	8.6	10.9	12.8	11.0	8.5	4.8	2.0

Year	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.
1931												
E.max	20.4	21.6	33.7	32.5	38.0	39.7	40.0	39.8	39.7	34.4	29.6	24.3
E.min	0.2	1.2	3.2	1.3	8.5	10.8	14.0	14.8	13.2	6.8	2.0	0.7
1932												
E.max	24.6	32.3	32.9	35.2	?	41.3	43.8	34.6	39.9	39.2	30.0	22.9
E.min	1.4	0.6	0.2	1.0	5.0	10.2	12.6	12.7	10.3	9.0	5.0	1.0
1933												
E.max	27.0	25.5	29.5	36.7	35.4	44.0	37.5	33.8	27.4	32.4	33.5	26.7
E.min	1.5	0.2	0.6	1.5	4.6	7.0	11.4	11.0	10.2	5.2	3.3	1.7
1934												
E.max	19.5	21.7	29.7	32.5	39.5	40.9	39.8	36.5	44.1	32.1	31.6	33.3
E.min	0.2	0.6	0.8	1.9	4.9	7.2	12.2	11.0	13.0	8.0	4.9	1.0
1935												
E.max	22.9	23.5	24.8	44.2	40.8	39.5	34.0	35.1	35.3	34.5	26.0	28.1
E.min	2.0	0.3	0.2	1.3	6.0	10.9	10.8	13.5	10.7	6.7	3.0	1.2
1936												
E.max	21.4	28.5	28.4	28.2	34.9	38.4	39.5	31.8	36.7	38.5	25.8	19.1
E.min	0.1	0.2	1.5	0.9	4.2	7.8	13.1	12.5	11.6	7.6	5.2	3.9
1938												
E.max	17.6	20.5	21.2	32.6	34.7	32.8	42.4	40.4	34.1	24.8	22.2	20.0
E.min	0.9	2.0	0.8	2.9	3.0	10.4	12.2	6.4	7.2	2.2	2.5	2.9
1939												
E.max	24.4	20.9	29.2	32.7	39.7	39.0	39.5	37.8	40.5	37.0	34.2	22.7
E.min	0.1	1.2	0.4	0.9	3.6	6.9	3.5	11.3	10.1	4.6	1.7	1.5
1940												
E.max	20.5	22.8	35.4	30.5	39.6	43.8	37.2	37.1	39.1	35.3	27.8	22.5
E.min	1.0	0.7	0.5	2.6	2.2	10.2	11.5	12.6	9.0	8.6	4.7	1.0

Table 3A:- Total monthly rainfall and average rainy days
in El-Marj (1921-40) in mm.

Year	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.
1921												
Rainfall	47.3	19.6	45.9	15.8	1.8	3.8	0.0	0.0	0.0	0.0	97.2	104.5
R.Days	14	14	17	4	1	2	0	0	0	0	7	17
1922												
	150.0	29.5	12.0	2.3	25.2	1.2	0.0	1.5	0.0	0.0	10.4	178.1
	19	12	5	2	5	1	0	2	0	0	20	18
1923												
	115.6	125.5	55.6	6.7	0.2	6.5	0.0	0.0	1.0	64.2	22.5	98.0
	15	12	10	3	1	1	0	0	1	6	5	17
1924												
	240.8	61.8	15.7	0.0	0.0	1.8	0.0	?	0.0	96.7	119.2	47.4
	22	14	9	0	0	1	0		0	7	11	11
1925												
	93.8	80.3	35.6	7.8	11.0	1.3	0.0	0.0	0.0	13.0	69.3	122.3
	21	12	7	7	2	2	0	0	0	4	8	11
1926												
	127.9	65.4	214.0	30.5	11.5	0.0	0.0	0.0	2.2	2.3	0.0	174.0
	14	13	13	5	6	0	0	0	2	3	0	17
1927												
	103.7	121.3	23.2	31.9	0.4	0.0	0.1	0.2	5.4	60.3	29.6	23.8
	18	13	6	5	2	0	1	1	1	11	3	10
1928												
	128.0	155.6	44.2	38.4	0.0	0.0	0.0	0.0	0.0	12.6	111.1	231.3
	17	17	10	2	0	0	0	0	0	3	15	20
1929												
	78.1	255.4	36.4	0.7	0.7	1.7	0.0	0.0	6.3	131.0	20.9	242.1
	13	23	8	1	1	1	0	0	3	10	7	24
1930												
	86.4	91.8	22.2	43.9	0.0	0.0	0.0	0.0	5.1	31.2	44.5	144.2
	16	12	8	6	0	0	0	0	2	8	9	15

Year	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.
1931	69.1 ?	69.4 19	19.5 5	9.3 5	9.5 4	0.0 0	4.7 2	0.7 3	5.4 2	8.2 5	6.4 1	31.2 12
1932	56.8 19	47.7 19	42.9 6	1.9 1	0.0 0	0.0 0	0.0 0	0.0 0	4.0 5	72.0 7	98.6 11	32.9 8
1933	37.7 8	36.9 11	9.9 4	10.5 6	5.1 2	0.3 1	0.0 0	5.0 2	1.5 3	9.5 3	12.8 3	150.7 19
1934	138.2 18	84.1 13	82.5 8	6.9 2	0.0 0	6.5 9	0.1 1	0.1 1	0.0 0	14.5 9	5.8 4	231.5 22
1935	146.4 19	55.1 11	18.0 10	2.1 2	2.7 1	0.0 0	0.0 0	0.0 0	2.5 3	59.9 2	64.5 7	? ?
1936	157.0 15	137.6 12	0.6 2	0.8 4	22.8 9	0.0 0	0.7 3	0.0 0	0.2 1	10.9 8	39.7 14	169.4 23
1937	132.0 14	39.6 10	9.9 2	15.5 7	2.2 3	0.0 0	0.0 0	0.0 0	2.0 2	96.7 8	96.7 10	44.8 16
1938	148.7 19	109.9 17	52.6 11	41.4 10	0.2 1	0.0 0	0.0 0	0.2 1	2.7 3	33.8 5	47.2 10	136.2 14
1939	126.6 11	45.4 7	108.6 19	18.2 3	12.3 2	0.2 2	0.0 0	0.6 1	0.0 0	0.0 0	84.5 12	74.7 13
1940	86.8 11	47.2 11	31.0 7	48.7 9	0.8 1	2.6 3	0.0 0	0.0 0	0.0 0	0.0 0	10.0 4	155.8 21

Table 3B:- Annual Rainfall in El-Marj (1921 - 1940)
in mm.

Year	1921	1922	1923	1924	1925	1926
Average	362.3	590.2	495.8	583.5	434.4	648.2
Year	1927	1928	1929	1930	1931	1932
Average	399.9	721.1	773.3	470.9	333.4	356.4
Year	1933	1934	1935	1936	1937	1938
Average	280.3	566.2	388.3	539.8	440.4	579.4
Year	1939	1940				
Average	471.0	383.5				

APPENDIX II

Water Resources

The test drilling carried out by the United States Operation Mission in Libya in 1958-61 in wells drilled in El-Marj area searching for water drilled 21 wells in western part of the Jebel Akhdar. A brief account of these wells follows:-

The well in Farzugha was drilled at a total depth of 158 m. Water of good quality was reached in limestone at a depth of 112 m. the well is a low potential yield of 1.2 m^3 per hour. Because of the shortage of water in the village, a windmill and a pump were installed and the well at present supplies the village need.

The well drilled at Zorda Agricultural Station is 190 m. total depth, and the water is 65 m. deep with a yield of 3.7 m^3 per hour. While the well north east of Sidi Rahuma has a total depth of 152 m. and the water is only 32 m. deep. In the El-Aweliya well the distance between the ground and water is 111 m. and the water is 75 m. with a yield of 1.2 m^3 . Because also of the shortage of water in the village and the Agricultural school, a windmill and a pump were installed to meet the needs of the village.

Finally the well at Batta is 98 m. deep to the surface of water, and the depth of water is 66 m. and the

capacity about 1.6 m^3 per hour. The well is equipped by a windmill and a pump to provide the village with water. The inhabitants of the village before the well had been drilled were obtaining water from a shallow well at Maaten Tass one kilometre north east of the village.

The abandoned Italian Pipeline from Ain Mara to El-Marj:-

This pipeline was designed to carry water from Ain Mara to the El-Marj plain and the farm houses on the route. Operations began in May 1939 and were carried forward so rapidly that in December 1940, when work had to be broken off because of the war, all the masonry had been constructed and the pumping stations had been equipped with power pumping plant, leaving only about 40 kms. out of a total of 191 kms. to be finished. The water main was to consist of steel socket and spigot pipes, able to withstand a maximum static head of 130 m. encountered in the part of the water main operating by gravity. Protection against corrosion was ensured by inside asphalted coating and by an outer layer of concrete bound. The entire pipeline was to be laid in a trench 60 cm. to 3 metres deep, aligned as near as possible to the main north road from El-Marj to Derna. At the many crossings under the road, the pipeline was often placed in a casing on a large concrete tube to protect it against

traffic vibration; in some cases, however, it was merely sunk into the road foundation.

The construction of this water main was planned in 1938 and after completing studies of all the springs near the region to be serviced, it was decided to utilise the Ain Mara springs in a shallow wadi about 3 kilometres south of the main road leaving Derna on the west, and 31 kms. away from this town and others about 14 kms. from the Mediterranean coast. In the last few years, the springs have been closely studied and accurately measured. Tests made by the Public Works Department in Benghazi indicate a yield of 1,283,67000 litres per day. The same authorities' tests indicate a salinity of 13 parts per 100,000.

Pumping stations were to deliver water up to the highest point of the water main (that is at an elevation of 681 m. above sea level), where a surge tank was built, 27 kms. from the springs and 6 kms. from the central reservoir of El-Gabu (5000m^3 .) with a total static lift of 255 m. The central pumping station was built at Ain Mara with a storage tank of 600 m^3 . and the booster pumping station near Bismara (2 kms. east of El -Gubba), for a static lift of 95 m., has two 500 m^3 . reservoirs.

Beginning from the 27 kms. point, the water system operated entirely by gravity and no further pumping

was to be required. However, the anticipated yield had been appreciably increased (up to about 100 litres per second) in order eventually to reach Benghazi, badly serviced at that time with water which was rather brackish, before discovering the new Benina wells. In this case a spring near Wadi Stua was to be tapped; under the Italian control it was supposed to yield 25 litres per second, and measured by the Public Works Department in 1948 as supplying 239, 500 gallons per day, i.e., 1, 090 m³. per day or 12. 5 litres per second, namely half. Wadi Stua is located 7 kilometres north of the highest surge tank. A third pumping station would need to be set up.

The scheme was intended to supply drinking water to as large a number of Italian settlers as possible (about 60,000).

APPENDIX III

MECHANICAL ANALYSIS
by Bouyoucos Method

PHYSICAL AND CHEMICAL ANALYSIS

-496-

Lab. No.	Reference No.	Sand %	Silt %	Clay %	pH paste	Carbonates Total 2s CaCO ₃	Nutrient Elements		
							Total Nitrogen % /100	P ₄ O ₅ ppm	K ₂ O ppm
608	TULMETHA	60.2	7.8	32.0	7.65	55.15	1.25	87.9	468
609	"	63.2	9.2	27.6	7.60	45.20	1.04	111.5	384
610	EE-HEMDA	66.2	6.8	27.0	7.45	0.25	1.65	10.3	842
620	"	57.0	12.2	30.8	7.10	0.30	1.24	6.2	449
624	N. of SIDI RAHUMA	47.4	16.2	36.4	6.75	0.35	1.07	7.5	374
611	"	59.2	8.2	32.6	7.20	0.20	1.15	4.1	299
612	"	63.2	7.2	29.6	7.45	0.20	1.43	10.3	795
629	S. of EL-MARJ PLAIN	61.4	10.6	28.0	7.20	0.40	1.24	6.2	589
627	"	56.4	14.2	29.4	6.55	0.25	1.56	16.5	617
613	N.E. EL-MARJ 4Km	72.2	7.4	20.4	7.40	0.30	1.12	10.3	898
614	"	65.2	7.0	27.8	7.15	0.10	1.61	14.2	1067
615	EL GHARIQ	58.0	13.8	28.2	7.10	0.20	1.15	8.2	861
617	"	51.4	13.2	35.4	6.90	0.15	1.46	224.3	486
616	W. of EL-MARJ Km 7	46.4	20.6	33.0	6.90	0.15	1.25	73.3	299
620	"	67.0	10.6	22.4	7.30	29.75	2.37	175.9	571
618	W. of BATTA Km 3	66.4	14.4	19.2	7.35	34.05	1.15	58.2	505
630	ZORDA	53.0	10.6	36.4	7.30	0.45	1.16	6.1	870
619	"	50.4	12.6	37.0	7.50	0.25	0.85	4.8	505
623	FARZUGHIA	53.4	12.2	34.4	7.10	0.15	1.29	7.5	571
621	"	50.0	15.6	34.4	7.10	0.25	1.28	3.4	440
622	W. of BATTA Km 8	54.0	12.0	34.0	7.40	1.05	0.95	2.7	187
628	"	42.0	24.5	33.5	7.15	0.65	0.84	3.9	121

CHEMISTRY OF THE SOILS

Lab. No.	Moisture %	Total Solub. in HCL %	Total ins. %	Fe ₂ O ₃ %	Al ₂ O ₃ %	Ca O %	Mg O %	Na ₂ O %	K ₂ O %	So ₃ %	P ₂ O ₅ %	le %
608)	2.64	72.39	27.61	3.83	3.19	30.24	0.56	0.395	0.492	0.105	0.022	0.015
609)	3.57	68.56	31.44	4.67	4.37	25.62	1.00	0.364	0.614	0.163	0.026	0.012
610)	2.65	30.47	69.53	8.82	8.48	1.41	0.82	0.053	0.405	0.134	0.023	0.014
626)	2.95	33.23	67.77	10.45	10.19	1.42	1.27	0.102	0.514	0.192	0.025	0.014
624)	2.54	21.31	78.69	7.98	5.02	0.80	0.24	0.154	1.092	0.693	0.025	0.010
611)	2.69	22.75	77.25	7.98	5.28	0.46	0.47	0.153	1.041	0.094	0.031	0.015
612)	5.10	25.91	64.09	11.18	8.61	0.92	0.88	0.155	1.102	0.591	0.054	0.022
629)	3.12	33.85	66.15	17.24	3.98	1.88	0.18	0.093	1.217	0.274	0.045	0.015
627)	5.15	34.12	65.88	10.69	8.15	1.30	0.41	0.134	1.123	0.185	0.061	0.025
613)	5.18	37.89	62.11	11.88	10.20	0.96	0.08	0.136	1.174	0.334	0.052	0.024
614)	5.22	42.94	57.06	12.45	12.15	1.64	0.61	0.347	1.419	1.046	0.062	0.382
615)	5.10	40.21	59.79	11.88	13.26	0.88	0.80	0.196	1.456	0.561	0.051	0.055
617)	2.48	32.32	67.67	9.26	9.66	1.36	0.33	0.195	0.818	0.373	0.043	0.015
616)	3.83	41.84	58.16	12.44	14.20	0.96	0.52	0.193	1.343	0.159	0.027	0.015
620)	4.09	60.84	39.16	6.95	12.17	15.04	1.06	0.312	0.942	0.147	0.063	0.015
618)	5.17	63.00	37.00	7.02	2.38	24.12	0.06	0.341	0.754	0.243	0.046	0.025
630)	2.75	32.03	67.97	9.42	9.98	1.46	0.18	0.124	1.240	0.481	0.016	0.015
619)	3.74	35.47	64.53	11.02	9.54	1.32	0.95	0.225	1.151	0.212	0.017	0.014
623)	2.87	32.52	67.48	9.50	10.09	0.48	0.55	0.196	0.972	0.273	0.034	0.013
621)	3.77	36.80	63.70	10.46	10.90	0.64	0.80	0.154	1.053	0.355	0.025	0.014
622)	3.53	37.53	62.47	9.34	12.06	2.40	0.42	0.142	0.734	0.887	0.012	0.014
628)	3.27	38.22	61.78	11.81	12.35	1.36	0.658	0.123	0.701	0.268	0.015	0.014

Lab. No.	Conductivity Water Extract Millimhos at 25° C	ANALYSIS ON SATURATION EXTRACT				CATION EXCHANGE CAPACITY	EXCHANGEABLE CATIONS				S.A.R.	
		SATURATION EXTRACT DETERMINATIONS					EXCHANGEABLE CATIONS			EXCHANGEABLE CATION PERCENTAGE		
		Na meg/l	K meg/l	Ca+Mg meg/l	Total mmeg/l		Na meg/100gr	K meg/100gr	Ca+Mg meg/100gr			
608)	1.39	5.30	.655	7.50	17.75	1.056	.976	5.575	5.9	5.7	32.8	2.74
609)	.75	4.35	.435	3.70	18.50	1.449	1.733	4.711	7.8	9.4	25.5	3.19
610)	1.22	3.15	.800	10.00	28.12	.893	.573	3.407	3.2	2.1	12.1	1.41
626)	.67	1.55	.250	4.80	26.75	.578	1.364	2.932	2.1	5.1	10.9	.97
624)	1.10	3.60	.490	5.80	15.00	.460	.781	1.235	3.1	5.2	8.2	2.11
611)	.75	3.30	.515	4.70	14.50	.736	1.783	1.380	5.1	12.3	9.5	2.16
612)	.96	2.30	.775	6.70	24.12	.900	1.741	2.706	3.7	7.2	11.2	1.26
629)	.87	1.85	.420	5.60	26.75	.587	1.780	2.733	2.2	6.6	10.2	1.11
627)	.74	1.40	.410	5.00	25.75	.533	2.131	2.260	2.1	8.3	8.7	.89
613)	.55	1.55	.510	4.00	26.25	.875	2.500	2.846	3.3	9.5	10.8	1.10
614)	18.50	88.55	3.125	93.50	27.25	2.473	2.049	2.201	9.1	7.5	8.1	12.32
615)	3.25	13.00	1.125	14.00	25.75	2.412	.797	2.171	9.4	3.1	8.4	4.93
617)	.96	2.70	.500	7.00	20.25	.916	1.100	1.621	4.5	5.4	8.0	1.44
616)	.53	1.80	.190	3.00	24.50	.961	.940	2.000	3.9	3.8	8.2	1.43
620)	.85	1.25	.295	6.30	42.25	1.151	1.483	7.158	2.7	3.5	16.9	.71
618)	.50	1.00	.200	3.60	38.50	1.246	1.113	7.087	3.2	2.9	18.4	.75
630)	.77	1.60	.355	5.00	29.50	.572	1.732	3.222	1.9	5.8	10.9	1.01
619)	.63	1.85	.215	4.00	30.50	1.105	1.389	2.919	3.6	4.5	9.6	1.31
623)	.84	2.15	.410	5.20	23.25	1.048	1.131	2.065	4.5	4.8	8.9	1.33
621)	.69	1.80	.330	7.60	26.75	1.086	1.059	2.187	4.1	3.9	8.2	.93
622)	.62	1.40	.140	4.80	26.25	1.150	.493	4.709	4.4	1.9	17.9	.91
628)	.85	3.80	.100	4.40	30.25	1.140	.495	2.843	3.8	1.6	9.4	2.55

APPENDIX IV

Definition of some terms used by the Libyan census of
Agriculture 1960

Holding

A holding for census puposes is all land which is used wholly or partly for agricultural production and is operated by one person (the holder), alone or with the assistance of others, without regard to title, size, (see, however, the explanations under "Coverage" above) or location. Livestock kept for agricultural purposes without agricultural land was considered as constituting a holding (Livestock holding). If a person holds no land or livestock but has the right to (palm) trees, this group of trees constitutes a holding (tree holding). This means that it is irrelevant if the holder operates the holding by a formal title (e.g. as its owner) or not; nor is it relevant where the holding is located, in an urban or in a rural area.

The holding may consist of one or more separated parcels, provided that they are located in a single territorial division and that they form a part of the same technical unit. In the Libyan Census of Agriculture the Mudiria has been established as territorial division. In Tripolitania, however, where the fragmentation of parcels is very large, those parcels constitute one holding which are located in the same qabila, provided that they form part of the same technical unit, i.e. that the same labourers, animals, machinery, etc. are used for their management.

The holding may be known as a lot, piece or parcel of land, garden, orchard, vineyard, estate, ranch, plantation, rural establishment, or by some other name.

Establishments and other units not including any agricultural land but producing livestock or livestock products (piggeries, hatcheries, poultry batteries, city dairies with livestock, livestock kept by nomadic tribes, rabbitries, apiaries, etc.) were considered as holdings, whether they are located in rural or urban areas.

When two or more establishments are under the same ownership and general direction, but the immediate management is done by different persons, they were classified as separate holdings.

Arable land

Arable land means all land generally under rotation, whether it is under temporary crops, used as temporary meadows, or market and kitchen gardens, is temporarily fallow, or lying idle.

Land under temporary crops (except vegetables and flowers)

This includes all land used for crops whose growing cycle is under one year and which must be newly sown or planted after the harvest of each crop, such as wheat, barley, maize, beans, potatoes, etc. Temporary crops may be grown successively on the same land several times during the agricultural year (successive crops), mixed or inter-planted with other crops on "arable land", or associated with "permanent crops" (e.g. planted between trees).

Land under temporary meadows

Land under temporary meadows is understood to be land temporarily cultivated with forage crops for mowing or pasture. To differentiate "temporary meadows" from "permanent meadows and pasture" (to which reference will be made below), a period for rotation not over five years is to be considered as temporary.

Land under permanent crops

Land under permanent crops means land cultivated with crops which occupy the land for a long period of time, and do not need to be planted for many years after each harvest, such as fruit trees, nuts and vines.

Land under permanent meadows and pastures

This means land in the holding used permanently, i.e. five years or more, for herbaceous forage crops, either seeded and cared for or existing naturally (grazing land). Land under permanent meadows and pastures which was not part of the holding - as the Tribal grazing land in Cyrenaica - was not included in the census.

N.B. The total number of holdings shown is not equal to the horizontal sum of the number of holdings in the different tenure components, as the number of holdings was counted in each of these components where applicable. The area components do also not add up horizontally because the table shows only the components under single tenure forms, while the area component of holdings under more than one tenure form is not shown but included in the total.

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The farmers are requested to answer the following questions which will be used for academic study. If the question does not apply to you, please answer 'No'.

1. Name (not necessary).....
2. Tribe.....
3. Where is your farm situated.....
4. Farm's total area.....No. of the house.....
5. Is the house your own property or rented?.....How much rent do you pay?.....
6. Is your farm one unit or two parcels?.....
7. If two parcels or more, where are these parcels situated?.....
8. Is the farm inside your tribe territory, or outside?.....
9. Is the farm an Ente farm?.....
10. Do you practice pastoralism in addition to cultivation?.....
11. Do you practice rotation (to cultivate part of the farm and leave the rest fallow)?
12. What is the area of fallow?.....
13. What are the main crops you cultivate each year?.....
14. For cereals, please give the area, kind and production of each of the following:

	1959-60	1960-61	1961-62	1962-63
	area	area	area	area
	production	production	production	production

Wheat
Barley
Chickpeas
Other crops

15. For tree crops, what are the kind, number and production of the following:

	1959-60	1960-61	1961-62	1962-63

Olives
Almonds
Vines
Other tree crops

16. Do you cultivate vegetables? What are these vegetables and production?.....
17. Where do you sell your product?.....
18. Do you work on the farm by yourself or with your family?.....
19. Do you employ workers during certain periods of the year (for instance during ploughing or harvesting?.....Or the whole year?..... Wage per day.....
20. Do you use local wooden nail plough?.....
21. Do you plough with tractors?.....Is the tractor private or hired?.....
22. Have you joined a co-operative society?.....
23. Do you cultivate in the Barr.
24. If so, do you go by yourself?.....With a member of your family?.....Or with the whole family?.....
25. What is the area in the Barr you cultivate?.....
Area cultivated?.....Production?.....
26. Do you possess livestock?..... If so, please give the number for the following:

Sheep

Cattle

Goats

Camels

27. Where do you pasture the livestock?.....
28. Does a member of your family pasture the livestock or do you hire a shepherd?.....If so, what is the shepherd's wage?.....
29. Do you pasture your livestock on the Jebel throughout the year, or in other areas?.....
30. What are the names of wells from which the livestock drink?.....
31. Do you prefer to settle permanently in one place?.....
32. If so, do you prefer cereal cultivation only (wheat, barley, chickpeas), or fruit trees?.....
33. What do you do after ploughing and harvesting?.....
34. Do you live in a house, separated tent or in a Naja'a?.....
35. What are the transport means?.....
36. In case of illness, what hospital do you use?.....
37. If you live in a house, has it been damaged by the earthquake?.....
38. Do you use irrigation from wells?.....

39. How many members in your family?.....
40. Do your children go to the school?.....
41. How much do you earn per year (approximate)?.....

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El-Marj Town

The citizens are requested to answer the following questions, which will be used for an entirely academic study. Information given will be strictly confidential.

If the question does not apply to you, please answer 'no'.

1. Name (not necessary).....
2. Mahallah (quarter).....Street.....
Tribe.....
3. Number of members in family.....
4. Occupation (labourer, trader, civil servant, independent, organisation employee)
5. Type of house (Arab haush, apartment, villa, hut, tent)
6. Is the dwelling private or rented? permanent or temporary?
7. Does another family live in the same house?.....
8. Do you visit your relatives in your original place?.....
9. Does one of your family work outside El-Marj town?.....
Where?.....Does he send you money?.....
10. Do you work in El-Marj town? or outside?.....
11. Do you live near people from your tribe or town?.....
Are you in contact with them?.....
12. How much do you earn per year (approximate).....
13. How do you spend your income on the necessities and luxuries?
Pounds or percentages.....
14. Are you married, with one wife or more?.....
15. How many children have you?.....
16. Do your older sons practice your occupations?.....

17. Is your wife one of your relatives?.....Is she from El-Marj or from your home place?.....or from neighbouring tribe?.....
18. What is the transport means? Walk, private car, bus, bicycle.....
19. Is your house provided with tapped water and electricity? How much do you pay for these facilities?
20. If the house is not provided with such facilities, how do you get water and what is the means of lighting?
21. What is the means of cooking in your house? Bottled gas, electricity, charcoal, wood.....
22. Is there a servant to help with the housekeeping? What is his wage?
23. Have you radio, transistor?
24. Do you get any financial assistance in providing the family requirements?
Source of assistance?.....
What is the amount of this assistance?
Have you another house or a farm contributing to your income?
Where are these properties?
25. Have you problems concerning your occupation?
26. Have you problems concerning the dwelling?
27. Have your problems concerning transportation?
28. Have your problems concerning prices?
29. Have your problems concerning children?
30. Do you prefer to settle permanently in El-Marj or do you prefer to migrate to another town if you get the opportunity?
31. Do you buy your requirements from El-Marj or Benghazi?.....
Why?
32. Have you any information or comments you would like to add concerning El-Marj town, particularly after the catastrophe of the earthquake?.....
.....
.....

Appendix V

General remarks and suggestions re the proposed building of
the new town of Barce (El-Marj)

It is required to design and prepare a plan for the new town of Barce, (El-Marj), which is to house 20 thousand people at the start, Such plan to be prepared, is to take into allowance the possibility of extending the town in future to house 30 thousand people according to the progressive requirements of the industrial, commercial and agricultural developments of the inhabitants of Barce and its surrounding areas.

The new Barce town should be designed by the Planner after a detailed and thorough study of the full requirements of an up-to-date town, which is to include the following points:

- 1) Population as indicated above.
- 2) Residential areas erected are to be one storey high only unless otherwise specified.
- 3) Area for each residential unit should not exceed 900 m^2 (i.e. 300 m^2 to 900 m^2).
- 4) Number of rooms in each residential unit is to consist of 2-3-4-5 or 6 rooms, in addition to the utilities. In the case of large families, two adjacent units can be connected together.
- 5) Excluding the market area and the main streets, all residential units should be detached. No two houses are to share one bearing wall (i.e. roofs must be completely separate).
- 6) Streets should not be less than 10 metres in width in addition to pavements.
- 7) The new town of Barce may be divided into neighbourhoods and each neighbourhood is to include the necessary utilities. These are in addition to the main town square.
- 8) A ring road should be designed as a belt for the new town. Protruding areas of state property land may be ignored wherever it conflicts with the general layout of the plan.

- 9) The plan of the new town should be made on state property owned land as indicated on the survey maps.
- 10) The main buildings required in the new town of Barce are as indicated below, in addition to those the Planner may suggest or deem necessary:

A) RESIDENTIAL BUILDINGS

- a) The Barce Reconstruction Organisation will build about 1400 residential units as compensation to those who lost their homes in the old town. This phase will be the first stage of construction. These buildings should be designed to conform with items 2, 3 & 4 above.
- b) 1000 units of the new houses or similar types are to be designed as Popular Houses (low cost houses) consisting of one floor. These units are to be built in row houses.
- c) About 600 units should be designed as two storey houses.
- d) The rest of the residential units should be designed at the discretion of the Planner. The Planner should demonstrate in his plans the significant outlook of the new town of Barce to the whole country and to bring it out in such a form as to give it an atmosphere of a city rather than a town.

B) SCHOOLS

All children of Barce and area should go to school. To bring this about, it is necessary to build schools to conform with the requirements of the inhabitants.

The number and type of schools should be indicated in the plan by the Planner. They are to be so placed as to serve the whole areas of Barce in a perfect way.

C) HOSPITALS

The necessary number of hospitals and dispensaries and outpatient clinics should be designed to give the whole area an extensive and excellent medical service.

D) MUNICIPAL AND PUBLIC BUILDINGS

It is required to erect the Municipality Building in a conspicuous place in the centre of the town. The duties of the Municipality is that to supervise and control the markets, streets and all other activities usually associated with municipalities. Near this building to erect a building or buildings to house the Mutassarifia Police Station, Courts, Post Office and various other branches of the government offices and such necessary and vital public utility buildings etc. which is left to the discretion of the Planner, and as deemed necessary by him.

E) MARKET & TRADING CENTRES

A main market is required and should be placed in a central position easily accessible to all areas of the town. This market is to have an open and covered sections. This centre market is in addition to the other small neighbourhood ones.

A Fonduk where cattle, grains and vegetables in bulk are sold by farmers etc. is required to be built in an area located on the outskirts of the town, preferably near the Slaughter-house as deemed fit by the Planner.

E) RECREATION & SPORTS AREAS & PARKS

It is desired to have a number of public gardens and parks to be located on sites most suitable for such facilities. It is the wish of the El-Marj Reconstruction Organisation to preserve the existing grown good trees wherever possible as a basis for the new proposed parks.

Sports and Recreation areas should be so designed wherever possible, to serve the inhabitants of the town and all schools including the Agricultural Technical Schools etc.

G) MOSQUES

A central large Mosque is to be located in the Centre of the main Square of New Barce. Other smaller Mosques are required to serve the neighbourhood areas.

GENERAL EXPLANATORY REMARKS

- 1) With regards to the main highway Benghazi/El-Beida in connection with the new town of Barce, the following should be taken into consideration:
 - a) It should be within easy reach of the traveller but the town should be well away from the traffic.
 - b) For this purpose, the present main road could be deviated to conform with the above.
- 2) The site of the new town should be selected on the plain land shown on the survey maps. The majority of the public opinion and the inhabitants of Barce, is to site the new town on the plain land situated South of the present road. This is left to the discretion of the Planner as he deems necessary.
- 3) The Planner should attach great importance when selecting the towns Purifying Sewerage Plant site. Also the sites for the Power Station and the drinking water station. (It is hoped that the new power station which is to be erected in Benghazi in the near future, will serve to supply electric power to Barce too.)
- 4) The net of communication roads should be easily connected and it is preferred that such roads be cross parallel, i.e. Grid Iron System preferably, wherever the contour of the land permit.
- 5) Footpaths leading to the various public utilities and residential areas should be given importance by keeping them away from the main traffic roads.
- 6) The Railway line lying North of the site of the new town is a branch rail and is of no great importance. It should not be given great importance and at the same time not to be completely neglected. It is noted that the main communication to and from Barce is the main Benghazi/El-Beida highway
- 7) Wherever possible consideration should be given that all residential units and popular houses be provided with small frontal gardens and children's playgrounds.
- 8) As the main means of communication with the town of Barce is by road transport, consideration should be given to design a station or stations for Auto Buses and all other types of vehicles.

- 9) A cemetery site is to be selected at a short distance from the outskirts of the town.
- 10) Water fountains are to be erected in some of the squares and plazas and should be decorated in appropriate designs. Consideration should be given to the fact that the Memorial Inauguration Monument will be moved to the main town square after re-designing it.
- 11) Appropriate locations for Cinemas, Hotels and Cafes etc. is to be taken into consideration.
- 12) Appropriate locations are also to be taken into consideration for the erection of two or three bank branches.
- 13) A Veterinary District hospital is necessary which should be located preferably on the outskirts of town.
- 14) As the majority of the inhabitants prepare their own dough for bread, it is necessary to have small bakeries appropriately situated in the various residential areas.
- 15) Light Industry Centres, Garages and Fuel Stations are to be appropriately placed as seen fit by the Planner.

GLOSSARY

Glossary

Abiar	Wells; Cisterns
A. rgub	Hill; Slope
Bir (B)	Well; Cistern
Dahar	Hill; Ridge; Table land
Eluet	Hill
Gaṣr (gr.)	Castle; Old Fort
Gabr	Muslim Grave
Got	Depression
Gsur	Castles; Old Forts
Gur	Hills
Ras	Cape
Sidi	(Proper Name), Saint, Marabut
Tariq	Trail

Cyrenaican Place-Names Frequently Mentioned in the Text

Spelling in the text

Italian Spelling

Ajedabia

Agedabia

Al-jaghbub

Giarabub

Aujila

Augila

Benghazi

Bengazi

Deriana

Driana

El-Beida

El-Beda (Beda Littoria)

El-Makhili

El-Mechili

El-Marj

El-Merg (Barce)

Jalu

Gialo

Jardas El-Abid

Gerdes El-Abid

Marawa

Maraua

Suluq

Soluch

Tacnis

Tecnis

Tubruq

Tobroch

Tulmeitha

Tolmeta

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AMENDMENT

Amendment.

As the thesis was going to the binder the author received the first detailed volume of the 1964 census. The figures for the population are the same preliminary results and do not invalidate the argument in Chapter X.

The significant fact[^] in the detailed figures is the increased percentage of settled population in the Muhafadat of the Jebel Akhdar. The figures show 55.7 per cent of the total families enumerated in the Muhafadat of the Jebel Akhdar as settled, 27.3 per cent semi-nomads, 16.4 per cent nomads and 0.6 per cent unknown.

Marj in 1956-1962.

TABLE 85.

Table 85:- Net Change due to emigration and immigration in Mutasarrifia of El-Marj in 1956-1962.

<u>Year</u>	<u>Total Population</u>	<u>Emigration</u>	<u>Immigration</u>	<u>Net Change %</u>
1956	37,834	1,691	2,350	1.7
1957	39,128	489	1,290	+2.0
1958	39,517	666	682	-
1959	40,393	966	1,325	+0.9
1960	40,595	522	357	-0.4
1961	40,618	862	385	-1.2
1962	41,212	1,076	1,035	-0.1

Source:- Mutasarrifia of El-Marj Office.

The figures for 1960, 1961 and 1962 show more emigration from the Mutasarrifia. The detailed figures for the town of El-Marj indicate to an increase by immigration even after 1960. The earthquake which struck the town reduced its population from 12,850 in July 1962* to 10,645**, i.e. a net change of -17.2 per cent in two years or 8.6 per cent per year. Most of the people who migrated have settled in Benghazi, Ajedabia and other urban centres. It is not certain whether all of these people who migrated from El-Marj will return after the rebuilding of the new town.

* Source:- Municipality of El-Marj.

** Source:- 1964 Census, Primary Results.