A geographical study of the eastern Jebel Akhdar, Cyrenaica

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by

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PREFACE

I arrived in Durham in October 1957, with a view to study the problems of the economic development of the Jebel Akhdar of Cyrenaica. The Jebel Akhdar was chosen for three main reasons:- first, the development of the Jebel Akhdar achieved by the Italians had never been recovered; secondly, the tribal organisation is very strong, and most of the former E.N.T.E. farms are now occupied by the Bedouin; and, finally, the Jebel Akhdar represents the scope for agricultural expansion.

There are many difficulties to overcome. Most of the Italian literature and reports were destroyed during the Second World War, and it is difficult to trace any in Cyrenaica. Agricultural statistics were not available until 1959. Recognised administrative boundaries do not exist and make the analysis of the statistics hazardous. Transport and accommodation were incidental difficulties, but they were solved by the co-operation of the Nazaret Agriculture and Forestry in the former case and Nazaret of Education in the latter.

At first the topic of the study was broad; but later was fixed on the eastern Jebel Akhdar for four main reasons:- first, the eastern Jebel is occupied by one tribe; secondly the boundaries of Mutasarrifiya of Derna coincide with

eastern Jebel; thirdly, the eastern Jebel has a considerable number of springs which could be utilized for irrigation; and finally, Derna gardens are an interesting local study.

The field work was achieved in eight months, from June 1958 to January 1959. Derna Town was taken as a centre for field work, while residence at Benghazi was necessary for collecting reports and consulting some of the many experts at work. I also spent two months in Tripoli working on the Italian literature.

I wish to thank the many people in Cyrenaica who have shown an active interest in my work, and I am particularly indebted to the following who gave me much valuable assistance:-

Nazaret of Agriculture and Forestry:	Dr. E. Kroeller - Statistics Expert.
Nazaret of Finance:	Mr. Ahmed Swedi - Director.
Nazaret of Public Works:	Mr. H. Adams - Director of Water Resources.
Ministry of National Economy:	Mr. H. Jawhari, - Assistant Director.
Mutasarrifiya of Derna:	Mr. H. Abaidi - Director of State Property.
	Mr. A. Ghabiril - Director of Trade.

Derna Harbour H.Q.	Mr. Ramadan El-Muaddab – Harbour Master.
Municipality of Derna.	Mr. S. Jawadi – The Mayor.
	Mr. H.T. El-Kurdi – Statistics Department.
United Nations Mission.	Mr. M. Corroy, Documents Officer.
F.A.O. Mission - Benghazi.	Mr. N. Abudabbeh – Horticulturist .
U.S.O.M., Experts.	Mr. W. Johnson – Geologist.
	Mr. A. Basiuni - Assistant.
El-Gubba Nursery.	Mr. A. El-Rfadi - Inspector.
Derna Agrario.	Mr. M. Ben Agyad - Inspector.
Libraries.	Mr. Ismail Sueiah – Director of Government Library.
	Mr. Mansur Amer – Librarian.
	Dr. T. Provasi – Director Natural History Museum.
Farmers.	Mr. Ali Shelwi, Mr. Ahmed Ben Talib and Mr. Hamid Sheunile.

I gratefully acknowledge the assistance in the form of transport of Ess. Nazir of Agriculture and Forestry, and Nazir of Education who made accommodation available in the boarding schools in the Jebel.

In Durham, I must record my appreciation of the work of Dr. J.I. Clarke has offered me in his role as supervisor,

and my gratitude to Professor W.B. Fisher, who accepted me as a research studemt in his Department.

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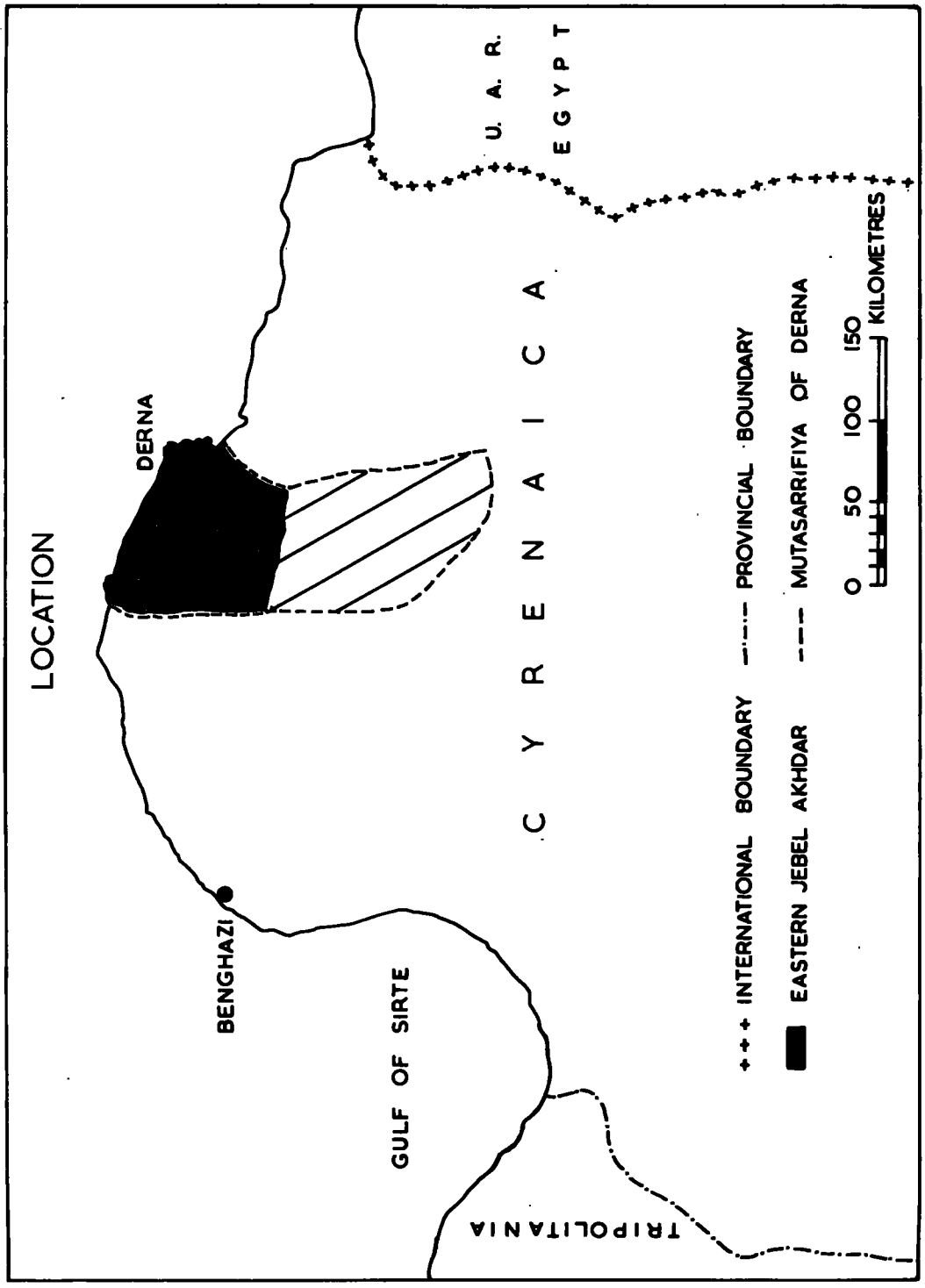
LOCATION
DERNA
BENGHAZI
GULF OF SIRTE
TRIPOLITANIA
CYRENAICA
U. A. R.
EGYPT
+++ INTERNATIONAL BOUNDARY
-·-·- PROVINCIAL BOUNDARY
EASTERN JEBEL AKHDAR
--- MUTASARRIFIYA OF DERNA
0 50 100 150 KILOMETRES

INTRODUCTION

Libya with a total area of 1,750,000 sq. km. is wedged between the Maghreb in the west and the U.A.R. Egypt in the east, and about 90% of its land forms part of the Sahara. The population numbered only 1,091,830 in 1954.

On December 24th, 1951, Libya became an independant nation, after centuries of intermittent domination by Pheonicians, Greeks, Romans, Vandals, Byzantines, Arabs, Spaniards, Turks, and Italians. The original Berber inhabitants remained little affected by the early invasions, but the Arabs, who arrived in two waves in the 7th and 11th centuries, largely displaced or assimilated the culture of their predecessors, who, in time adopted the Islamic faith and the Arabic language.

The United Kingdom of Libya is composed of three provinces, Cyrenaica, Fezzan, and Tripolitania. Cyrenaica, which is the largest province in size, has an area of 700,000 sq. km. Its population of 291,236 (1954) is predominantly tribal and leads a nomadic or semi-nomadic life, depending on the raising of livestock. Tripolitania, although smaller in area (250,000 sq. km.) has a larger population (738,338) which is more sophisticated and econo-

mically advanced. Fezzan is mostly desert and its small popluation of 59,315 (1954) is largely concentrated in a few small oases.

The economy of Libya is fundamentally agricultural. The agriculture depends on precipitation and water supply. Rainfall is limited and irregular. It occurs almost entirely in the period of October to March and is heaviest in December and January. The Jefara plain in Tripolitania has an average between 150 - 350 m.m. per annum. Northern Cyrenaica receives a higher average which varies between 200 - 600 m.m. annually. Libyan agriculture is broadly confined to the Jefara plain, along the coast between Misurata and Sabratha, parts of the Jebel escarpment to the south, the Benghazi plain and the Jebel Akhdar. It has been estimated that there are approximately 10,000,000 hectares of productive land in Tripolitania, 8,000,000 of which are grazing land. Of the remaining 2,000,000 hectares, about 400,000 are suited for static farming only part of which is developed.[1] Cyrenaica is estimated to possess about 4,000,000 hectares of productive land of which 145,000

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1. Rowland, and Robb, "Survey of land resources in Tripolitania". Tripoli 1945.

hectares are suited to dry-farming (80,000 hectares were cultivated by the Italians in 1940); the remaing 3.6 million hectares can be used only for grazing and shifting cultivation of cereals. In Fezzan there about 2,700 hectares of irrigated gardens and perhaps 120,000 hectares planted with date palms growing without the aid of irrigation.

Water is the main limiting factor in Libyan agriculture. There is virtually no surface water, owing to the lack of perennial rivers and it is exceedingly difficult to conserve rainfall because it is so irregular, to some extent torrential, and the water-holding capacity of the soil is very low. The irrigation possibilities are, therefore, dependant on the utilisation of underground water. The water table in Tripolitania is receding, and because of its increasing depth, water is becoming more expensive. The water table of artesian wells is also dropping and consequently they are losing their free-flowing properties. On the coastal belt of Cyrenaica, between Tocra and Benghazi, underground water is available in places at a few metres depth below the surface of the soil. However, the quality is not always drinkable as it is

sometimes brackish, and there is no concrete information on the volume of underground reserves. Surveys on artesian waters, carried out by the former Italian Government in the coastal region between Benghazi and Ajedabia, were unsuccessful. Cyrenaica has a considerable number of springs on the Jebel Akhdar. Unfortunately most of these springs are not in use at present. Under Italian rule considerable work had been done on the Great Jebel Aqueduct, which should have reached El-Marj and perhaps, Benghazi. The outbreak of the war stopped the work on the project, and the Libyan Government does not intend to carry out the scheme. Owing to the lack of water resources, agriculture can only thrive where water is available by drilling artesian wells or from springs.

Accordingly, the plain and the Jebel Akhdar are less developed agriculturally than the Jefara. The Tripolitanian farmer is mainly settled, in Cyrenaica on the contrary, most of the productive land is under the tribal systems. This is one of the most serious obstacles in the development of Cyrenaican agriculture. Jebel Akhdar is the most fertile region in the whole of Libya and represents the best prospect for development in Libyan agriculture. During the Italian colonisation, agriculture

on the Jebel progressed at the expense of the Arabs. The confiscation of the lands from the Arabs and the exclusion of the flocks from the margins of the cultivable lands left nothing for the Arabs to develop on their own. The repatriation of practically all the Italians from Cyrenaica offered a chance for improving the conditions for Arabs. Unfortunately the governmental schemes are being implimented slowly and are obstructed by the tribal system. Agriculture has declined from the level attained by the Italians, and consequently the production has dropped.

The poverty of the environment, the lack of accumulated capital the under-developed commercial and technical skills of the population, together with the absence of urban enterprise interact to give a slow-moving and under-capitalised economic framework in Libya. The statistics of international trade reflect the deficitary nature of the Libyan economy. Exports are directly and indirectly derived from agriculture, fishing, and animal husbandry. Imports are diverse and include on the one hand staple foods such as sugar, tea, and in many years, cereals, and on the other hand industrial raw materials, fuel, capital equipment and practically all manufactured goods. In view of the un-

diversified nature of the economy and the smallness and poverty of domestic markets, both exports and imports tend to represent low national income. The following table shows the Libyan international trade in 1951 & 1957 in £L.000.

	1951	1952	1953	1954	1955	1956	1957
Imports	11,842	11,566	11,294	11,286	14,282	16,601	28,077
Exports	3,090	4,363	3,322	3,479	4,340	3,805	5,415

Between 1956 and 1957 imports and exports increased by 70 percent and 42 percent respectively. The increase of imports in 1957 was due to the commodities imported by foreign petroleum companies (£L. 5,008,000). The 1957 Libyan trade deficit was, therefore, £L. 17,654,000.

Oil seems the only rescue for the country in economy. There have been oil strikes in many places in Tripolitaina and Cyrenaica as well as the Fezzan. The main find is at Zalten in Cyrenaica. The income from the oil will greatly help agricultural schemes.

The agricultural products of the Jebel Akhdar dominate the present export trade of Cyrenaica. At the same time

the Jebel offers best prospects for an extension of commercial farming. Most of the productive land is under tribal system and farmed under a dry-farming system. Moreover, the Jebel has an average rainfall greater than any other part of Libya. Flowing springs offer also a prospect for the development of irrigation.

This study is concerned with the eastern part of Jebel Akhdar (Vide Fig.1). The area covers about 16,000 sq. km. The eastern Jebel represents the most fertile area with a considerable number of springs which with development will irrigate more lands. Most of the springs are not utilized at present. Five areas in the eastern Jebel could be developed under dry-farming for cereals and irrigation for vegetables:- Labraq, El-Gubba, Ain Mara, Derna gardens, and El-Fatayah plain. The first two areas were colonised by the Ente per la colonazzione della LIBIA At present they are farmed by the Bedouin for cash crops, while the trees were neglected. Derna gardens are intensively cultivated under irrigation. Ain Mara is devoted to vegetable and cereal cultivation. El-Fatayah plain is farmed under dry-farming.

The thesis is divided in three parts, the first of which is a study of the physical geography of the area,

including the topography, geology, climate, vegetation, soils, and water resources. The second part is a study of the human geography; the tribal structure, settlement, demography and the Italian colonisation in the region. The third part is an analysis of the present economic conditions; agriculture and fisheries, commerce and industry. Agriculture is mainstay of the region economy and is likely to remain so for a long time to come. Animal husbandry is the most important single source of income. Cultivation and animal husbandry are practised by the Bedouin on the Jebel under a nomadic or semi-nomadic system. A plan for the resettlement of these people will be given.

Throughout the thesis the physical, human and economic conditions of Derna Town will be emphasised as it is the only urban centre in the region. Fisheries are a neglected source of income and the only revenuse from these is the export tax. This source could be developed to a certain extent for developing the town.

The names of places are spelt according to the Cyrenaican pronunciation.

This thesis is a general geographical study which we hope will help in the development of the eastern Jebel Akhdar.

PART ONE

CHAPTER I

RELIEF

Cyrenaica is the projection on the northern coast of Africa between the Gulf of Sirte and the western frontier of Egypt. Cyrenaica proper is thus the equivalent to the Jebel Akhdar of the Arab nomenclature or the Green Mountains of British usage, so-called because of its evergreen forests.

Broadly speaking, northern Cyrenaica may be divided into two relief regions; the Jebel and the Sahel (the coastal plain). The Jebel is a large area of high ground occupying much of northern Cyrenaica. It is roughly elliptical in plan and about 250 kilometres long from east to west. The crest line of the Jebel, rising in some places to over 800 metres lies to the north, always within 50 kilometres of the coast. To the south it billows gently towards the desert and to the east there is a similar gentle fall. Northwards and westwards, however, the Jebel is limited by an abrupt slope in the form of two successive escarpments.

The Sahel is a narrow, discontinuous coastal plain forming a strip of land which is often less than one to

three miles wide, extending from Benghazi in the west to a point about ten miles east of Derna, a total distance of about 200 miles.

These two elements are found in northern Cyrenaica where they comprise the essential relief background. As far as the area of this study is concerned, we shall describe the geomorphological aspects of the Sahel from east of Apollonia to the Gulf of Bomba, and the Jebel area which makes up its hinterland.

The Sahel

The greater part of the Sahel between Ras Et-Tin and Apollonia possesses a more or less uniform topography. The dominant feature throughout the lower escarpment, is the steep and often precipitous nature of the scarp, and the deeply incised notches in the outline caused by the action of wadis (vide Plate 1A). In most places the Sahel appears to be a most fine dividing line between the escarpment and the sea (Vide Plate 1B).

Generally speaking, the coast between Ras Et-Tin and Apollonia is crenellated, but in the eastern stretch between Marsa Belagig (45 kilometres east of Derna) and Derna the coast forms a regular outline, despite the intrusion of a few small wadi deltas. At Belagig the cliffs rise gradually

towards the west, reaching the height of 100 metres above sea-level at Umm-Amud. From this point and westwards for several kilometres there are a number of large land-slips to be observed. However, between the steep slope of the escarpment and the sea shore the coastal plain becomes wider at the point where it is named Sahel Es-Sneibet. In the vicinity of Wadi Bent, the Sahel is higher with a threshold rising nearly to 45-50 metres above sea-level; this ascent is obvious at Sahel El-Kanisa between Wadi Bent and Derna. At Derna the coastline becomes rather peninsular, Ras Bu Azza reaching one and a half kilometres wide. This delta of Wadi Derna has been formed by materials carried by the wadi during flood periods, the earliest sediments being of the Quaternary period. The thickness of the sand deposits is 90 metres.[1] Towards the west of Derna there are small flood plains built up at the mouths of the gorges which emerge from the lower escarpment particularly at Wadi Bu Msafer and En-Naga. The coast between Ras Bu Azza and Chersa is rather straight and the consolidated dunes are frequent in this zone where they rise to 18-23 metres high. The coast between Chersa and Ras El-Hilal is indented. According to Desio[2] the intrusions are due to marine erosion in some

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1. Desio, A. "Studi morfologici sulla Libia Orientale." Miss. Sci. della R. Acc. d'It. a Cufra, Vol. II, Rome 1939, p. 38.

2. Ibid. p. 39.

parts and to stream action in other places, the former being apparent through the presence of cliff formations of 15 to 20 metres height in the area. Towards the west, the coast turns sharply northwards forming the promontory of Ras El-Hilal where the cliff line rises to 30 metres, with a sheer drop to the sea. The coast between Ras El-Hilal and Apollonia is straight and sandy particularly in the vicinity of Apollonia.

The Jebel

The Jebel begins some 100 kilometres east of Benghazi and runs about 250 kilometres between the Gulf of Sirte and the Gulf of Bomba. Its greatest width is 50 kilometres, and it reaches an elevation of about 876 metres at a point fourteen kilometres north-east of Slonta. In its extreme eastern extension it forms the small, dissected ridge of El-Hamrin, which is the highest part of Cyrenaica.

The Jebel Akhdar is a sub-tabular plateau, deeply gashed by the wadis running to the Mediterranean. Fundamentally limestone in nature, this mass has given birth to many dissolution phenomena which in aggregate have resulted in a topography characteristic of the Adriatic karst. The country is dissected by a number of wadis, the courses of which occasionally penetrate deep into the rock formations to

be continued by caverns, grottos and dolinas, which have resulted from the action of the slightly acidic nature of the water flow against the limestone. This type of topography and the existence of underground water courses obviously have a bearing on the water supply position of the country as will be pointed out in greater detail in the chapter on water resources.

In the front of the Jebel there are two successive escarpments (vide fig. 2):-

The Lower or First Escarpment

The lower and outer-most of the two runs for over 400 kilometres between Ras Et-Tin and Antelat with its continuity unbroken throughout its length except for the gorges of innumerable wadis.

From Ras Et-Tin to Tolmeita it runs in close proximity to the sea. South of Tolmeita, however, it gradually retreats from the coast from which it is separated here by a gently sloping plain. The maximum width of the plain is about 50 kilometres at its western end, where it merges into the low lying country at the head of the Gulf of Sirte. At Tolmeita the top of the escarpment stands about 300 metres above sea-level (vide fig. 3); eastwards, it declines almost to zero at Wadi Giargarummah, then rises to 400 metres

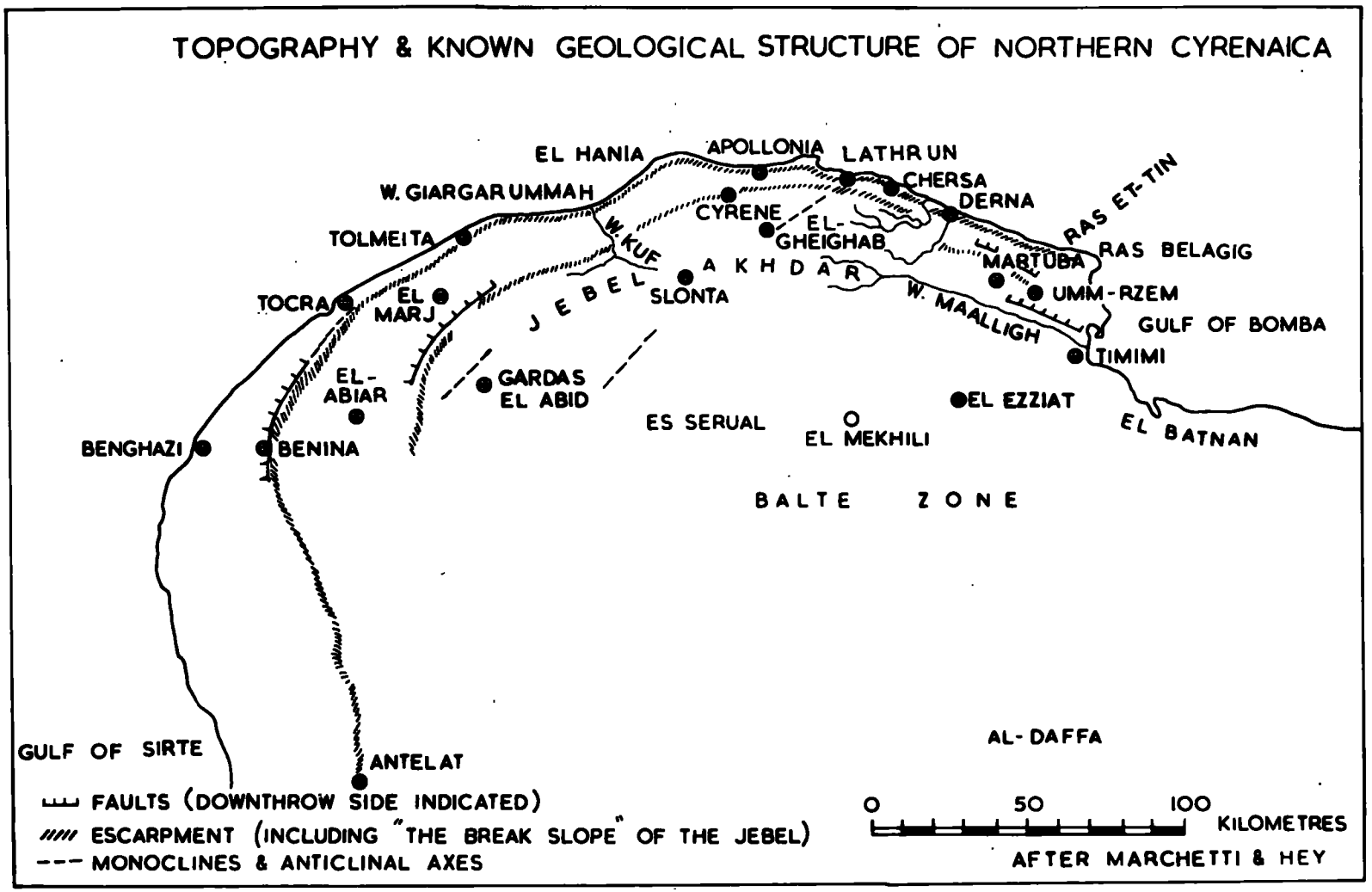
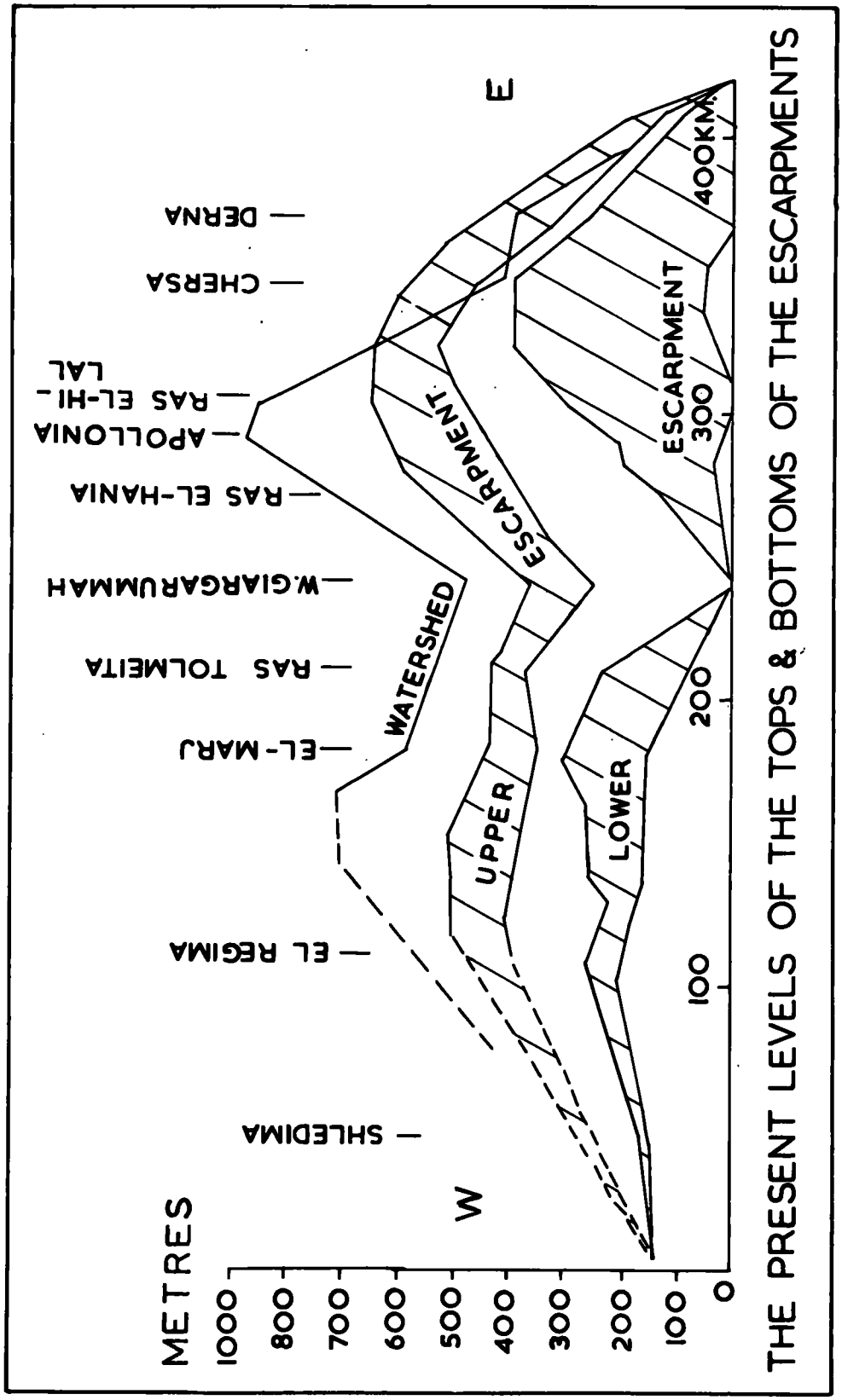

TOPOGRAPHY & KNOWN GEOLOGICAL STRUCTURE OF NORTHERN CYRENAICA
EL HANIA
APOLLONIA
LATHRUN
CHERSA
DERNA
RAS ET-TIN
W. GIARGARUMMAH
CYRENE
EL-GHEIGHAB
TOLMEITA
W. KUF
RAS BELAGIG
MARTUBA
A K H D A R
TOCRA
EL MARJ
J E B E L
SLONTA
UMM-RZEM
W. MAALLIGH
GULF OF BOMBA
TIMIMI
EL-ABIAR
GARDAS EL ABID
EL EZZIAT
ES SERUAL
EL MEKHILI
EL BATNAN
BENGHAZI
BENINA
BALTE ZONE
AL-DAFFA
GULF OF SIRTE
ANTELAT
FAULTS (DOWNTHROW SIDE INDICATED)
ESCARPMENT (INCLUDING "THE BREAK SLOPE" OF THE JEBEL)
MONOCLINES & ANTICLINAL AXES
0
50
100
KILOMETRES
AFTER MARCHETTI & HEY

Figure 2.

to the south of Ras El-Hilal, reaches a maximum of 540 metres at Eluet El-Shifshafa east of Ras El-Hilal before declining to 400 metres at Chersa, falling away further to 250 metres at Derna, and finally dropping to sea-level at the light house of Ras Et-Tin.

The broken country of the lower escarpment is called Arqub. The Arqub country appears as a succession of thickly wooded ridges broken into isolated hills and minor pinnocks by deep wadis, the sides of which make travel slow and arduous. To the west this broken country levels out and in a bay in the hills lies the extensive, treeless, but fertile basin of El-Marj (Barce Plain). The slope of the escarpment between Ras Aamer and Apollonia is steep and unbroken, and its foot is separated from the sea by only a single terrace. In this area, the lower escarpment is covered largely with narrow consolidated dunes ranging from about 20 metres to at least 100 metres above sea-level. Between Apollonia and Ras El-Hilal fragments of terraces along the foot of the escarpment are a frequently observed feature, but in all cases they are only of limited length. This could be ascribed to sub-aerial erosion to some extent. This terracing was first noticed by Desio, who indicated the presence of some kind of terrace between 120-150 metres

Figure 3.


THE PRESENT LEVELS OF THE TOPS & BOTTOMS OF THE ESCARPMENTS
METRES
1000
800
700
600
500
400
300
200
100
0
W
E
SHLEDIMA
EL REGIMA
EL-MARJ
RAS TOLMEITA
W.GIARGARUMMAH
RAS EL-HANIA
APOLLONIA
RAS EL-HI-LAL
CHERSA
DERNA
WATERSHED
ESCARPMENT
UPPER
LOWER
ESCARPMENT
100
200
300
400KM

above sea-level.[1] The width of this terrace was remarkably great, being seldom less than one kilometre. Hey attributed the origin of the terraces to marine erosion.[2] However, after Ras El-Hilal the escarpment remains equally steep as far as Ras Ben Gebara, though marine terraces are absent as far as Lathrun. To the east of Ras Ben Gebara, the escarpment soon becomes less precipitous and terraces appear once more. For some five kilometres to the west of Derna only two terraces are present, the lower being entirely hidden by alluvium.[3] The escarpment becomes generally steeper along the seashore itself, a line of cliffs delimiting its northern boundary with the sea. Between Derna and Ras Et-Tin, the escarpment is very close to the sea with altitudes ranging from 250 metres at Derna to 100 metres at Umm-Amud and less than ten metres at Marsa Belagig. According to Hey, the lower escarpment is partly submerged as is evidenced by the greater depth of water shown by sounding close to the land between Derna and Ras Et-Tin.[4]

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1. Ibid. p. 59.
2. McBurney, C.B. and Hey, R.W. "Prehistory and Pleistocene Geology in Cyrenaican Libya". Cambridge, 1955, p. 31.
3. Ibid. p. 32.
4. Ibid. p. 37.

The Upper or Second Escarpment

The upper escarpment, as the lower one, is only about 300 kilometres long. In many places it has undergone heavy sub-aerial erosion. The upper escarpment begins to the south of El-Abiar. In this area, sub-aerial erosion has been particularly intense. To the north-east, however, the escarpment soon becomes well defined, and runs without serious interruption as far as the country to the south-west of Derna. Here, it is obliterated for a distance of over fifteen kilometres by a net-work of wadis. East of Wadi Derna, the escarpment once more becomes prominent, and then finally peters out within less than ten kilometres of the Gulf of Bomba. In general, it is broad and rolling in the west, but narrower in the east.

The foot of the escarpment is well defined. The height of the top above sea-level varies greatly from place to place. From El-Abiar it rises to 450 metres above sea-level near El-Marj (Barce), then descends to 400 metres towards the east near Wadi Giargarummah, where it is about 150 metres above the first escarpment. At Cyrene the height of the summits ranges at approximately 620 metres, whilst the greatest height is attained at 875 metres above sea-level between Slonta and El-Faydiya. It declines to 350 metres near Derna before curving east-south-east at a

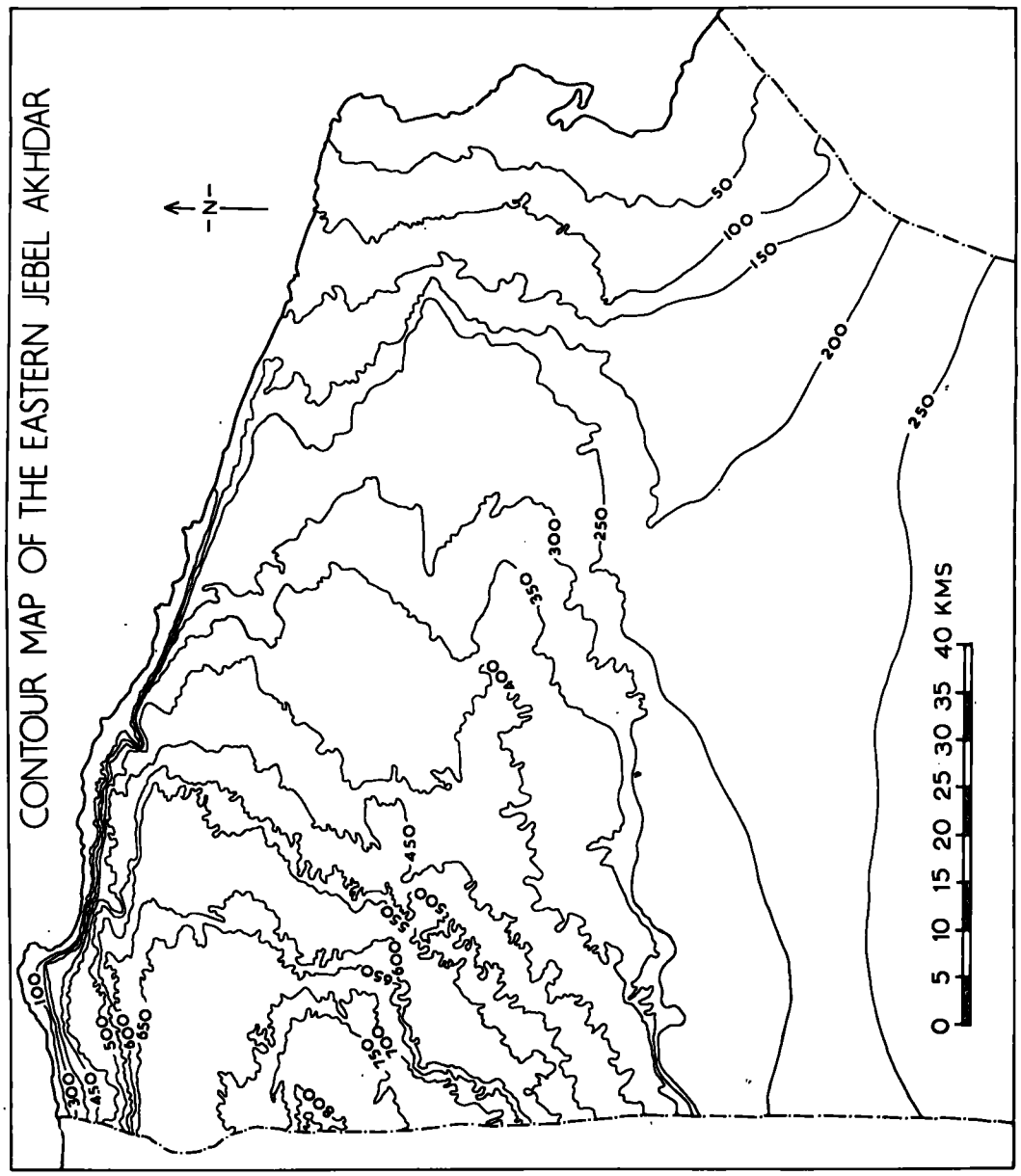
level of 315 metres near Martuba and 200 metres at Huiet Es-Sleiba.

Between the two escarpments lies a strip of country which is known as the 'Upper Terrace'; its width is variable, with a maximum of over 25 kilometres in western Cyrenaica, and a minimum of 3 kilometres behind Lathrun. In the same way as the upper escarpment, it has suffered from sub-aerial erosion. At the south-western extremity 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 and El-Abiar.

The highest part of the Jebel, above the upper escarpment is an area of negative relief with a monotonous appearance. It consists essentially of gentle slopes falling away on either side of an ill-defined crest line which runs roughly from west-south-west to east-north-east, always within 25 kilometres of the escarpment. South of the crest line, these slopes continue into the dip-slope of the main massif which extends southwards, apparently without break as far as the oasis depressions (vide fig. 4).

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, which is

Figure 4.


CONTOUR MAP OF THE EASTERN JEBEL AKHDAR
N
0 5 10 15 20 25 30 35 40 KMS

882 metres above sea-level. The other lies to the south of El-Marj and reaches a maximum height of 676 metres near Gardas El-Abid. The saddle is situated in the vicinity of Tecnis, at an altitude of between 400 and 500 metres.

The origin of the escarpments and the terraces

There are two main hypotheses explaining the origin of the escarpments and the terraces on the north front of the Jebel Akhdar. The first hypothesis is that the escarpments represent high wave-cut platforms, (Schweinfurth, Marinelli and Ahlman), and the second is that the escarpments may be ascribed to faulting or abrupt folding (Spratt, Gregory, Migliorini and Desio).

Hey, in his recent studies, believes that the upper escarpment, like the lower, cannot be a fault scarp. In Hey's opinion the upper terrace is a wave-cut platform, and the upper escarpment its associated cliff, formed, unlike the lower escarpment, during a single period of high sea-level. Some form of erosion must have been responsible, the faults merely succeeding in holding up its progress locally. However, marine erosion did occur and was followed later by considerable earth movements.[1] Differen-

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1. Hey, R.W., "The Geomorphology and Tectonics of the Jebel Akhdar Cyrenaica." Geol. Mag., Vol. XCIII, No. 1. 1956, p. 6.

tial erosion may be ruled out, for the lower is composed of rocks of various ages. Middle Miocene formations occupy the western reaches, Eocene the region east of El-Marj, Middle Miocene at Derna, and at the eastern extension of the Jebel. The upper escarpment is composed of Middle Miocene strata in the west and Oligocene east of El-Marj.[1]

The Wadis of the Jebel

Northern Cyrenaica has very few permanent streams. The exceptional cases are those of the Wadi El-Glaa, Murghes and Lathrun in Mutasarrifiya Derna, where the streams of perennial springs reach the sea. Even these permanent water courses are less important since the quantity of water passing through the beds is small. All of the other wadis are completely dry except for a few days each year when violent flooding takes place. The northern face of the Jebel Akhdar is dissected by many deep wadis. They are seldom wide, and east of Derna they are not numerous.

The wadis of the upper escarpment are usually less developed than those of the lower escarpment. Each wadi as it approaches the coast becomes more and more deeply

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1. Desio, A., op. cit. p. 64.

entrenched within a narrow gorge, which, owing to the hardness and homogeneity of the bed-rock, may be very steep sided. On the north coast where no true coastal plain exists, many gorges extend as far as the sea-shore. The focal point of the radial drainage pattern in the Jebel tends to fall eastwards in the more elevated area between El-Faydiya and Slonta.

The main watershed of the Jebel lies only a short distance from the coast (30-35 kilometres) (vide fig. 5). Between the crest line and the watershed there are some closed basins both large (basins of El-Marj and El-Abiar) and small (Shgif and dolinas).

The great majority of the wadis of the Jebel are less than 20 kilometres long; the longest of all, Wadi El-Maallegh, attains a length of 120 kilometres only by reason of the fact that it runs parallel to the main east-west watershed for the whole of its course, finally reaching the sea at the Gulf of Bomba. The wadis to the south of the watershed are larger and run south, or south-south-east in the case of the wadis of the west, where they are lost in the baltes (vide fig. 5). The baltes or playas are shallow alluvial basins separated by low, irregular ridges.[1] These baltes

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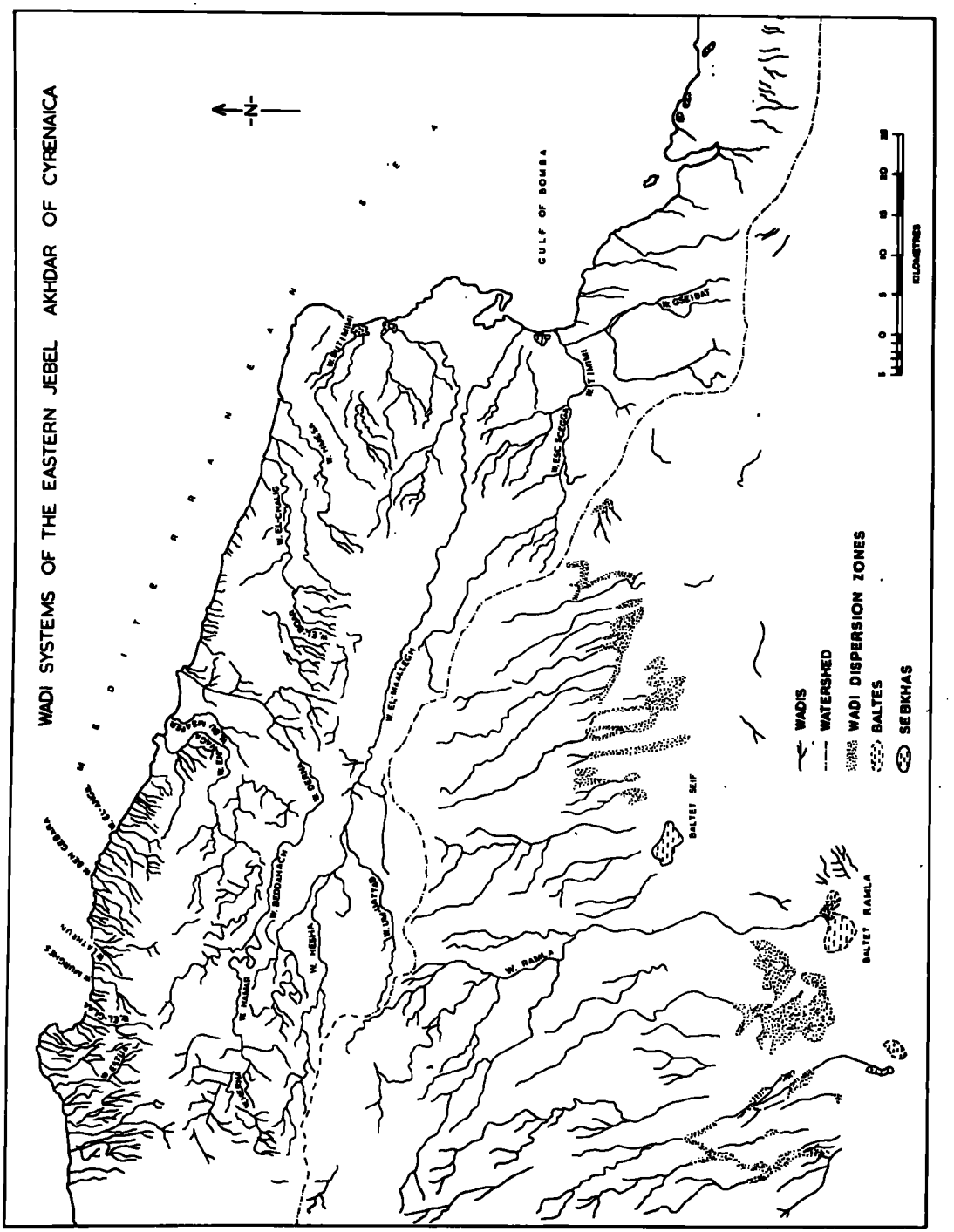
1. Fisher, W.B. "The Middle East". London Sec. Ed., 1952, p. 482.

Figure 5.


WADI SYSTEMS OF THE EASTERN JEBEL AKHDAR OF CYRENAICA
GULF OF SOLLUM
WADIS
WATERSHED
WADI DISPERSION ZONES
BALTES
SEBKHAS
KILOMETRES

referred to by Professor W.B. Fisher as playas, form through the action of sub-aerial erosion through solution and wind action at points of surface weakness developed at the crests of anticlines in Tertiary strata.[1] In two localities, both in Derna District, large wadis cut across the lower escarpment and reach the sea; these two are namely Wadi Derna and Wadi En-Naga.

(a) Wadi Derna, with a total length of 75 kilometres, is the second longest wadi on the north coast of the Jebel and the longest of all those which pass through the coastal escarpment before reaching the sea. It rises on the southern plateau south of El-Gheighab. Wadi Derna is known by several different names:- Wadi Herna, Wadi El-Hamar, Wadi Sgheigh, Wadi Agdebia, Wadi Beddahach, and finally Wadi Derna, which has large tributaries, Wadi Gahham at a distance of six and a half kilometres, and Wadi Bu Rueis about three kilometres from the sea. It is estimated that the catchment basin of Wadi Derna is 700 square kilometres. For much of its course it is relatively open in valley formation and cut into Miocene and Oligocene rocks. Near its mouth, however, it reaches the surface of the hard,

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1. Fisher, W.B. "Problems of Modern Libya" Geog. Jour. Vol. 119, part 3, June 1953, p. 187.

resistant Eocene limestone. From this point onwards it becomes steadily deeper, taking the form of a steep sided gorge through almost the whole of the Eocene formation (Plate 2A). The gorge then terminates abruptly at the coastal escarpment, and for at least 1,300 metres of its course, the wadi is no more than a wide, shallow trench across the alluvial fan upon which Derna is built (Plate 2B).

There are many references to the existence of terraces at the gorge of the Wadi Derna. The deposits of the lower terrace lie on either side of the river bed, banked up against the higher terrace. They were preserved only as isolated fragments often without well defined upper surfaces and standing four to five metres above the wadi bed. The higher terrace is well marked on the east bank of the Wadi Derna, just outside the walls of Derna Town (Plate 3a). Hey in his profile of the higher terrace of Wadi Derna gives the following levels:[1]

:- above the spring of Bu Mansur, which lies 177 metres above sea-level, the terrace was found at 192 metres, fifteen metres above the spring.

:- it is about 100 metres above sea-level at Wadi Gahham.

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1. McBurney and Hey, op. cit., fig. 9, p. 104.

:- at the town wall of Derna it is 40 metres above sea-level.

All that may be said concerning the evolution of the wadi delta is that the general high level does not agree with the present point where the wadi reaches the sea, rather, it tends to be situated one kilometre north towards Ras Bu Azza. The most likely theory is that Ras Bu Azza represents the old mouth of Wadi Derna.[1] Desio believes that Wadi Derna ran in a direction south-south-west to north-north-east into the sea at Ras Bu Azza, but then left its high bed to change its course towards the east, forming a large meander which is its present course (Vide Fig. 6). Wadi Derna is not only remarkable for its size, but also for the fact that it contains two perennial springs, both of which are among the most copious of any in Cyrenaica.

(b) Wadi En-Naga enters the sea about nine kilometres to the west-north-west of Derna. It is much shorter than Wadi Derna and its gorge somewhat narrower; nevertheless, it is still one of the major wadis of the northern face of

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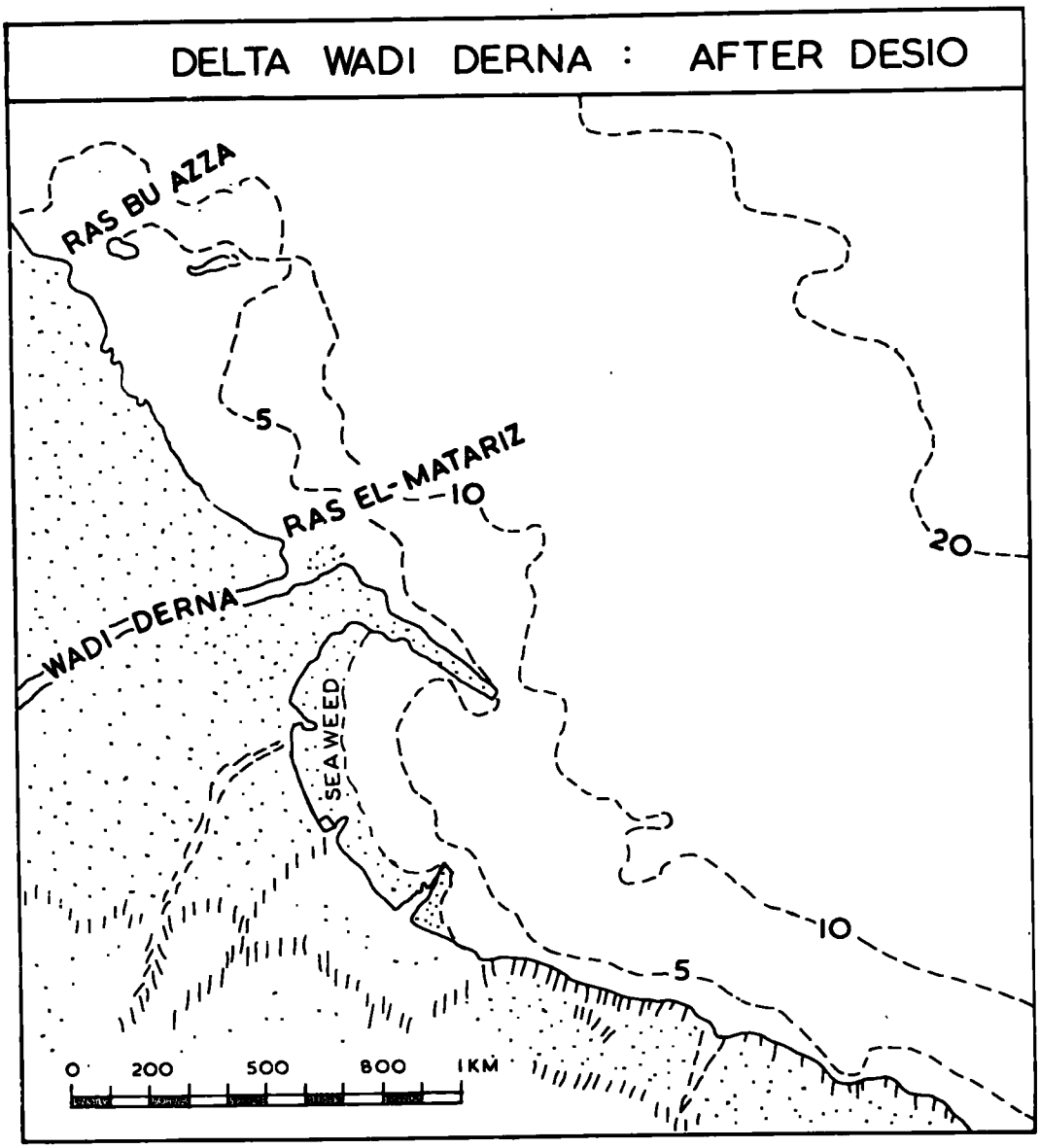
1. Desio, A. op. cit. p. 38.

Figure 6.


DELTA WADI DERNA : AFTER DESIO
RAS BU AZZA
5
RAS EL-MATARIZ
10
20
WADI-DERNA
SEAWEED
10
5
0 200 500 800 1KM

the Jebel. Like Wadi Derna it contains several groups of perennial springs, of which the two lowest issue from the base of the Oligocene and from the Middle Eocene respectively.[1]

(c) Another wadi on the north coast worthy of mention is Wadi El-Glaa, which reaches the sea at Ras El-Hilal.

(d) Further south there is the Wadi El-Maallegh, which, according to Marchetti, was affected by faults.[2]

The Development of Hydrographical Systems

The system of the wadis in the eastern Jebel Akhdar was accordant before the destruction of the major lines of slope by faulting.[3] The features in Wadi Derna are more complicated. The wadi rises in actual fact with two major tributaries, the first one is straight south-south-west to north-north-east, the other east-south-east to west-north-west. At the scarp of the lower escarpment there is a marked deviation in the course of the wadi. Wadi Derna goes parallel with Wadi El-Maallegh for a long distance, following the general slope of the Jebel. Wadi Derna was

1. McBurney and Hey, op. cit. p. 119.
2. Desio, A. op. cit. p. 84.
3. Ibid. p. 84.

very powerful in its early stages as it had been supplied by a copious spring.[1] At that time Wadi Derna captured the upper part of Wadi Hmesa, and the same period saw the capture by the Wadi En-Naga of a number of tributaries of Wadi Derna. The capture of these streams is quite easy to recognise in the upper part of the Wadi Ramla (vide fig. 5) which runs in a west-south-west to east-north-east direction. It is probable that Wadi Ramla was a tributary of Wadi Hesha.

Classification of Wadis

Desio in his studies of the geomorphology of eastern Libya recognised seven types of wadis as follows[2]:-

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 lower successive scarp or at the upper part of the coastal plain.
4. Wadis which rise and disappear on the scarp of the lower escarpment.

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1. Ibid. p. 84.
2. Ibid. p. 77.

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.

To summarise, the topography of the coastal plain offers great scope to agricultural development. Difficulties are present in this respect through the intrusion of the escarpment onto the plain, and through the gorge-like nature of the wadis which render utilization of the spring waters a costly problem.

On the Jebel, the broken country has many inherent disadvantages which restrict the possibilities of further agricultural extension except in the areas between Ain Mara and Labraq, and El-Fatayah (twelve kilometres south-east of Derna), which represent the only extension in the agricultural land available for the future.

CHAPTER II

GEOLOGY

Northern Cyrenaica has been studied in detail by Italian geologists and other authors. The first detailed study was by Spratt (1865), which was followed by those of Gregory (1908), Fabiani and Stefanini (1913), Desio (1931), Marchetti (1934), and the very recent study by McBurney and Hey (1955).

In this chapter we begin with the Upper Cretaceous, the oldest rocks known in the eastern part of the Jebel Akhdar, but the Jebel is composed almost exclusively of Tertiary rocks ranging from the Eocene to the Miocene, with a total thickness of about 1,000 metres.

UPPER CRETACEOUS

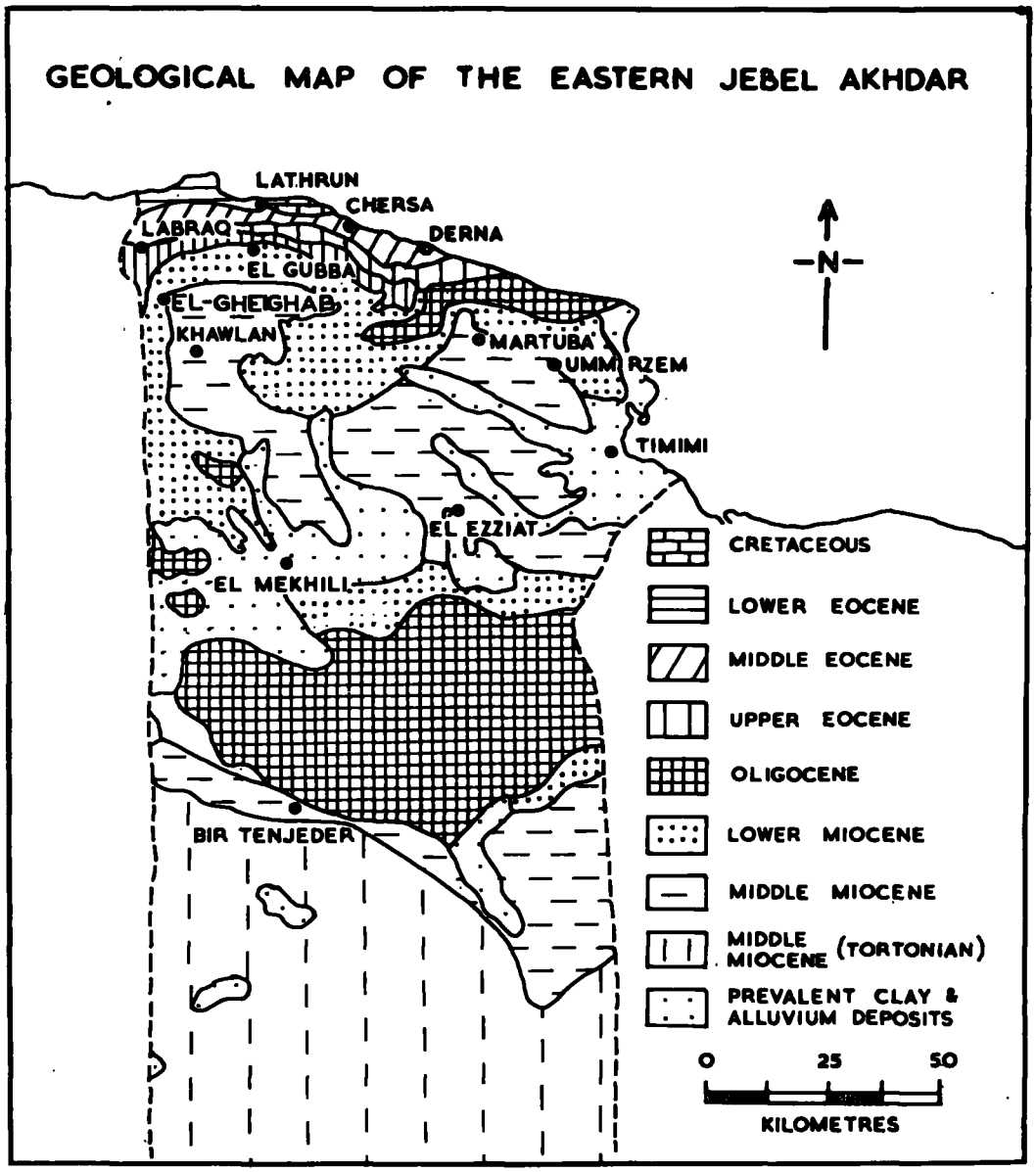
Marchetti mentioned a small outcrop of Cretaceous at the foot of the first escarpment in Wadi Lathrun (vide fig. 7). It is composed of white limestone, particularly marly underlying flint-bearing limestones, which have also been referred to as Upper Cretaceous.

Tertiary or Cainozoic

EOCENE

The Eocene constitutes practically the whole of the

Figure 7.


GEOLOGICAL MAP OF THE EASTERN JEBEL AKHDAR
LATHRUN
CHERSA
LABRAQ
DERNA
EL GUBBA
EL-GHEIGHAB
KHAWLAN
MARTUBA
UMM RZEM
TIMIMI
EL EZZIAT
EL MEKHILI
BIR TENJEDER
N
CRETACEOUS
LOWER EOCENE
MIDDLE EOCENE
UPPER EOCENE
OLIGOCENE
LOWER MIOCENE
MIDDLE MIOCENE
MIDDLE MIOCENE (TORTONIAN)
PREVALENT CLAY & ALLUVIUM DEPOSITS
0
25
50
KILOMETRES

first escarpment of the Jebel. These Eocene rocks are mainly limestone with all the alternatives ranging from limestone brecchias and tufaceous limestone to coralline limestone, the whole being consolidated and thus creating a typical karst landscape.[1]

(a) LOWER EOCENE beds extend almost without break between Derna and Bersis (10 kilometres south-west of Tocra), forming the base of the first escarpment and some portion of the coastal plain as for example at Derna (vide Fig. 8). The Lower Eocene in the region of Derna Town predominates in the two areas Mughar and the area between Wadi Derna and Wadi El-Furtas,[2] and also in the lower reaches of the Wadi Mback Es-Sighir (three kilometres west of Derna Town). They consist of massive compact siliceous limestones with a number of shelly beds containing many foraminifera and are terminated in the upper levels by a brecchia of flint fragments.

(b) MIDDLE EOCENE or Derna Limestone formations begin a little east of Wadi El-Husein which is itself east of

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1. Brichant, Andre M. "Broad outline of the Geology and the Mineral Possibilities in Libya", U.N. Report Series No. 7. p. 14. 1952.

2. Pfalz, R. Note geologiche sui terreni di El-Gubba e Derna, Boll. Geogr. Off. Studi del Governo della Cirenaica. No. 13. p. 18, Benghazi 1931.

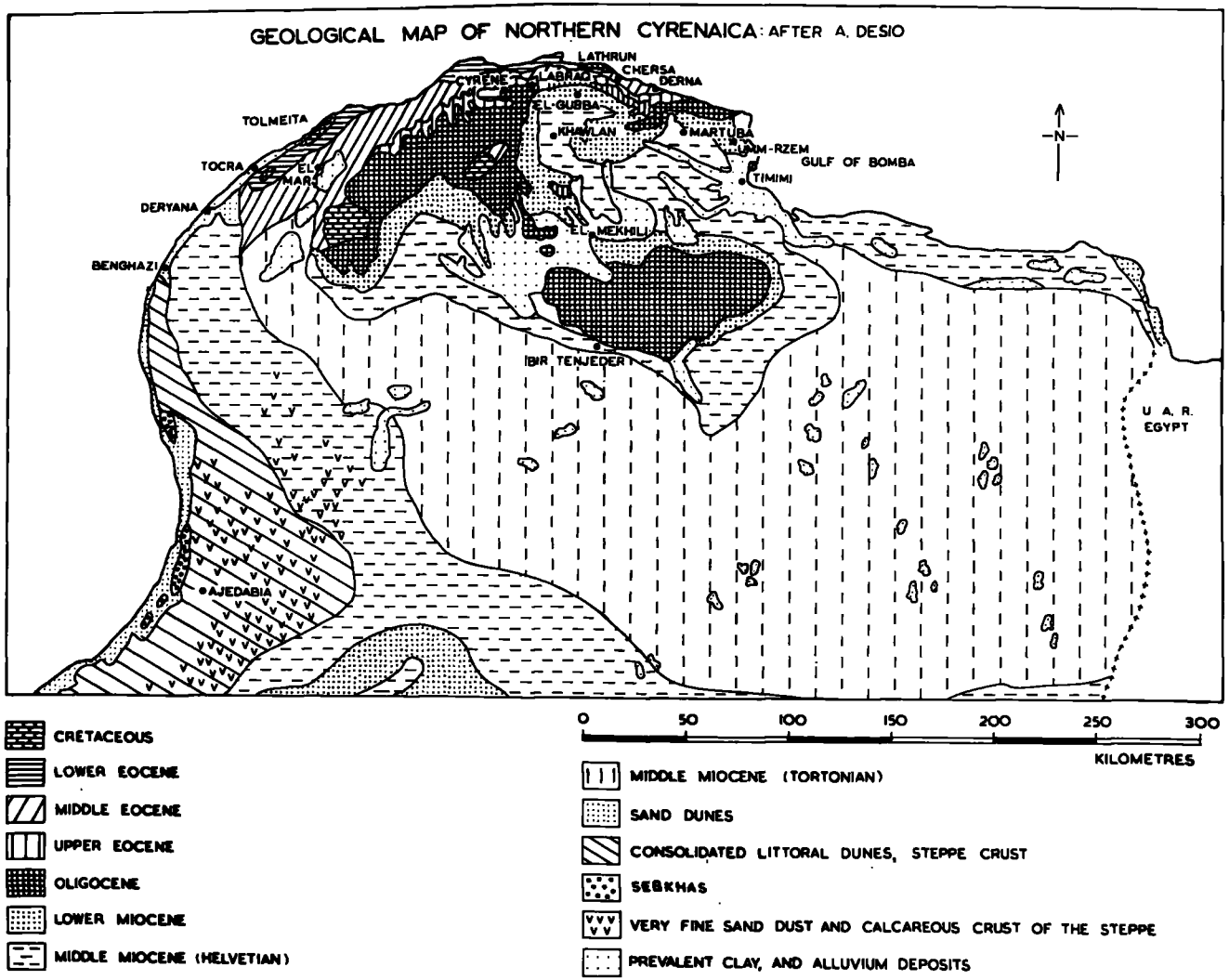
GEOLOGICAL MAP OF NORTHERN CYRENAICA: AFTER A. DESIO
LATHRUN
CHERSA
DERNA
CYRENE
LABRAQ
EL-GUBBA
TOLMEITA
KHAWLAN
MARTUBA
UM-RZEM
GULF OF BOMBA
TOCRA
EL-MARJ
TIMIMI
DERYANA
EL-MEKHILI
BENGHAZI
BIR TENJEDER
U. A. R. EGYPT
AJEDABIA
N
0 50 100 150 200 250 300
KILOMETRES
CRETACEOUS
LOWER EOCENE
MIDDLE EOCENE
UPPER EOCENE
OLIGOCENE
LOWER MIOCENE
MIDDLE MIOCENE (HELVETIAN)
MIDDLE MIOCENE (TORTONIAN)
SAND DUNES
CONSOLIDATED LITTORAL DUNES, STEPPE CRUST
SEBKHAS
VERY FINE SAND DUST AND CALCAREOUS CRUST OF THE STEPPE
PREVALENT CLAY, AND ALLUVIUM DEPOSITS

Figure 8.

Derna and forms a large part of the escarpment at Derna, where they are exposed in the deeply cut wadis. Westwards from Derna Middle Eocene formations constitute almost the whole of the coastal plain as far as Lathrun. According to Gregory[1] the Middle Eocene limestone in Wadi Bu Msafer and the limestones on the coastal plain both incline at an angle of 5 degrees to the north. Outcrops of a chalky limestone containing flint nodules occur about six kilometres west of Derna. This chert bearing rock is also well exposed in the banks of Wadi En-Naga (Gregory's Wadi Nagr), where it is represented by a soft, chalk-like limestone with lines of flat chert nodules dipping five degrees northwards. The chalky chert-bearing limestones pass gradually up into a harder limestone with chert nodules, which is succeeded by the cream coloured limestone.[1] The Middle Eocene Beds continue westwards along the first escarpment to a little south of the latitude of Deryana and then outcrop along a line south-east towards the neighbourhood of El-Marj and the base of the second escarpment. The Middle Eocene formations in Derna constitute the southern part of the Mughar making up the levels from the scarp foot to a height of 60 metres above sea level with

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1. Gregory, J.W. The Geology of Cyrenaica. Q.J.G.S. Vol. LXVII, p. 580, London 1911.

creamy coloured limestones.[1] Economically speaking, the Middle Eocene provides a particularly good limestone for building purposes. Certain ancient monuments, especially the Cyrene Necropolis were excavated from it, as well as the greater part of ancient Cyrene.[2] It is a white or creamy limestone with shelly bands and foraminifera. The base of the second escarpment at Cyrene is formed by finely stratified crystalline limestone.[3]

THE UPPER EOCENE is the Slonta limestone of Gregory. Stefanini regards the Lower beds of Slonta limestones as Middle Eocene and the Upper formations as Oligocene.[4] Upper Eocene beds follow regularly on the top of the Middle Eocene near Derna and along the summit of the second escarpment to the junction, in a series of faults, of the Eocene and the Cretaceous at Jardas El-Abid. Near Derna these beds

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1. Gregory, op. cit. p. 580.
2. Brichant, A. op. cit. p. 39.
3. Little, O.H. Geology of Cyrenaica, Handbook of Cyrenaica, Part One p. 27. Cairo 1944.
4. Stefanini, G., Cenni destrittivi a corredo dello Schizzo geologico demostrativo della Cirenaica, in Marinelli. O. La Cirenaica geografica, economica, politica. Milano, 1922. p. 227.

consist of white-yellowish bracchia limestone or of reddish limestone with nummulities.[1] The upper surface is blackened and irregular, indicating perhaps elevation above sea-level for a brief period.[2]

OLIGOCENE

The Oligocene constitutes the highest part of the Jebel Akhdar; it covers the Eocene of the Jebel in part, and extends to the south as far as the 32 degree parallel. It is likewise represented by a succession of nummulite limestones, coralline limestones, tufaceous limestones with urchins and molluscs etc. Although not very thick, the Oligocene covers the greater part of the Jebel, and is characterised by marine sediments of a considerably less deep origin than those of the Eocene, thus offering a greater lithological variety than the latter. Generally speaking, the continuity of sedimentation between the Eocene and the Oligocene seems well established with the exception of certain points indicating the existence of certain gaps.[3] From near Ras Et-Tin, where the Oligocene descends to the sea, it outcrops in a narrow strip towards Derna, where the

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1. Desio, A. Studi Geol. sulla Cirenaica sul Deserto Libico sulla Tripolitania e sulla Fezzan Orientali. Miss Sc. della R. Acc. d'Italia a Cufra, Vol. I, Rome, 1931, p. 267.
2. Little, O.H. op. cit. p. 28.
3. Brichant, A. op. cit. p. 14.

Oligocene formations constitute the higher parts of the first escarpment and Wadi Derna. The formations are composed of compact yellow and brown limestones.[1]

The Oligocene coralline limestones continue towards the west around Labraq. According to Desio, who studied the fossils between Zawiyat Tert and Cyrene, there are two different geological strata:- The Lower Oligocene is referred to the Lattorfian stage; and the Middle Oligocene to the Rupelian stage.

Oligocene formations extend to near Cyrene, where the northern boundary then swings towards the south-west and runs along the top of the second escarpment to the neighbourhood of El-Marj. It is indented and the Eocene extends in exposed areas up the wadis where they have eroded through the face of the escarpment. About ten kilometres east of Cyrene, the southern boundary bends round and runs south, the outcrops broaden considerably, and the Oligocene forms the area from Slonta through Marawa to Tecnis. Stratigraphically, the Oligocene formations to the south of Cyrene directly cover the Cretaceous formations.[2] Beyond Cyrene,

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1. Desio, A. Studi Geol. sulla Cirenaica sul Deserto Libico sulla Tripolitania e sulla Fezzan Orientali. Miss. Sc. della R. Acc. d'Italia a Cufra, Vol. I, Rome 1931. p. 267.

2. Desio, A. Missione a Cufra, op. cit. p. 277.

the Oligocene stretches out in two tongues; one to the south-west (between the Cretaceous strata and the Miocene boundary); the other tongue protrudes to the south-east towards El-Mekhili.

In the Baltes (the southern depressions), the Oligocene appears only along the wadis beneath the covering of Miocene beds and early alluvium. To the south of El-Mekhili it occupies a large elliptical area with a larger axis of about 100 kilometres which runs roughly through Bir Hamarin and Garet Mariem; the shorter axis is about 50 kilometres long with its southern end in the latitude of Bir Tenjeder (31 degrees 40 minutes north), but the well itself (Bir Tenjeder) is in the Miocene.

Marchetti in his studies of the profile from El-Fatayah plain to Ain Bent and to the sea suggests the following horizontal stratification (vide fig. 9).

A. Base level - Soft white and grey limestones, slightly marly in thick beds with nummulites, gizehensis and N. curvispira. (Middle Eocene).

B. Coarse yellowish limestones (Upper Eocene).

C. Yellow sandy limestones with ochreous and marly, spring-bearing horizons at the base. (Oligocene).

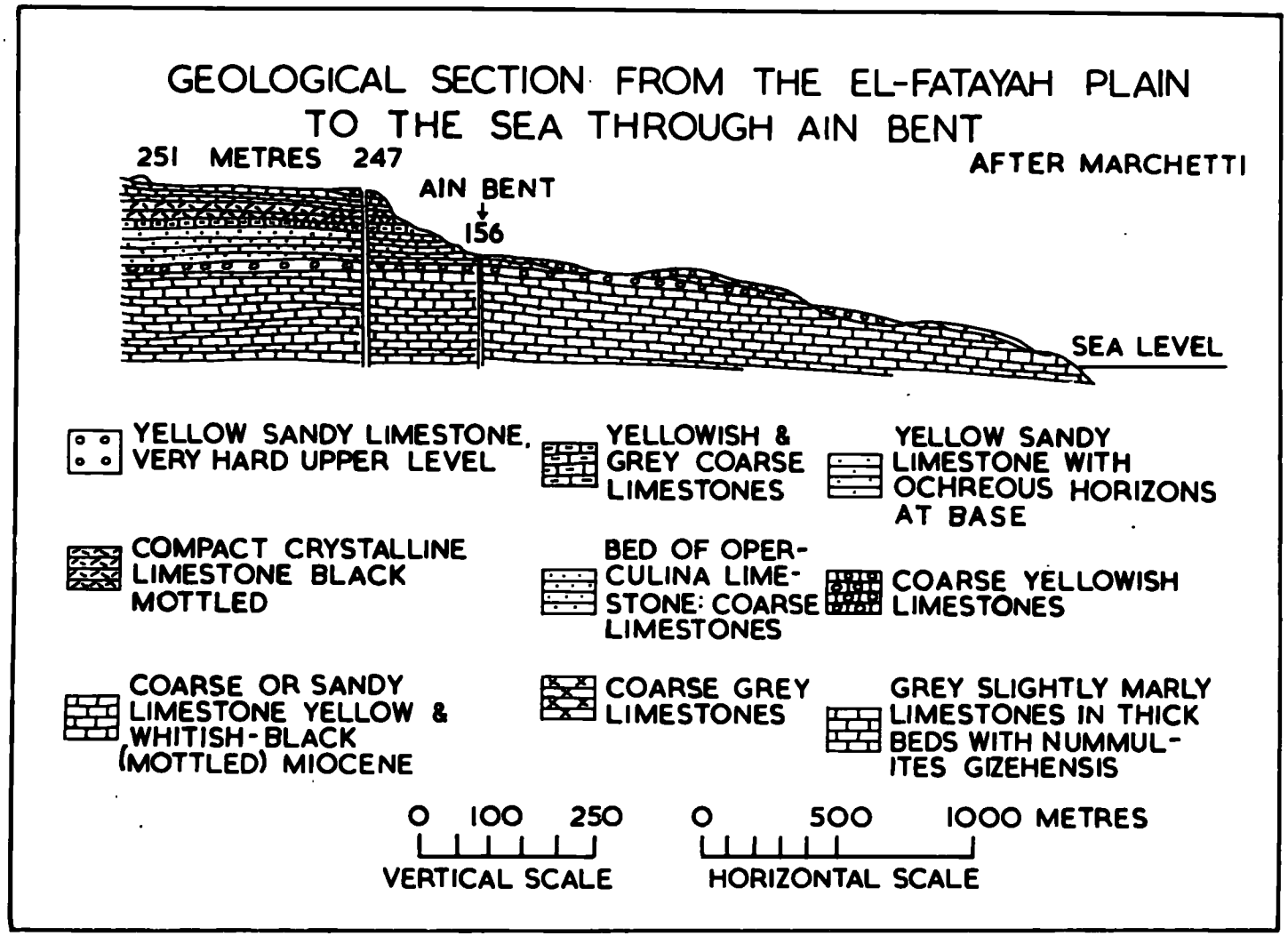
GEOLOGICAL SECTION FROM THE EL-FATAYAH PLAIN TO THE SEA THROUGH AIN BENT
251 METRES 247
AFTER MARCHETTI
AIN BENT
156
SEA LEVEL
YELLOW SANDY LIMESTONE, VERY HARD UPPER LEVEL
YELLOWISH & GREY COARSE LIMESTONES
YELLOW SANDY LIMESTONE WITH OCHREOUS HORIZONS AT BASE
COMPACT CRYSTALLINE LIMESTONE BLACK MOTTLED
BED OF OPERCULINA LIMESTONE: COARSE LIMESTONES
COARSE YELLOWISH LIMESTONES
COARSE OR SANDY LIMESTONE YELLOW & WHITISH-BLACK (MOTTLED) MIOCENE
COARSE GREY LIMESTONES
GREY SLIGHTLY MARLY LIMESTONES IN THICK BEDS WITH NUMMULITES GIZEHENSIS
0 100 250
VERTICAL SCALE
0 500 1000 METRES
HORIZONTAL SCALE

Figure 9.

D. Coarse grey limestones.

E. Bed of Operculina limestone; hard, coarse limestones with forminifera.

F. Yellowish and grey coarse limestones, rotten and friable, (Miocene).

G. Coarse or sandy limestones, yellow and whitish-black mottled (Miocene).

H. Compact crystalline limestone, black mottled.

I. Yellow sandy limestones, very hard. Upper level.

In this classification, the origin of the springs is in horizons at the base of C above.

Desio had classified the Oligocene as follows:-[1]

(a) Lattorfian or Lower:- marly limestones, coarse and yellow with nummulites; of Derna, Labraq, Cyrene, Bir Gandula etc.

:- coarse nummulitic limestones of creamy colour; of Slonta and Tecnis etc.

(b) Rupelian or Middle:- coralline limestones of Derna, El-Faydiya, Casr Bani Gdem and near Messa etc.

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1. Desio. A. Missione A Cufra. op. cit. p. 278.

:- white coarse limestones with notica crassatina etc. of southern Geshia and the region to the south of El-Mekhili.

:- Sandbank of Echinolampas Gauth; of El-Faydiya, Slonta, Gasr Bani Gdem, Sidi Muhammed El-Humri, near Messa and around Cyrene, etc.

(c) Chattian or Upper:- coarse yellow limestones with nummulites; of Labraq and Cyrene; and with molluscs around Derna and El-Faydiya.

According to Desio, the Oligocene formations are part coastal (marine) and part continental. While the Upper Oligocene is marked by marine sediments of little depth, the Middle and Lower levels are made up of continental and lagoonar formations.[1]

THE MIOCENE

The Miocene level is probably the most important in the whole of Cyrenaica. It covers nearly 90% of the zones of Cyrenaica north of the 32nd parallel and extends across Marmarica to the Egyptian frontier and through Sirte to eastern Tripolitania.

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1. Ibid. p. 294.

The whole of the southern slopes of the Jebel as far as Serir di Calanscio are formed of Middle Miocene limestones. Desio classified the Miocene of Cyrenaica on the basis of the work done by Gregory and Stefanini.[1]

(a) Lower Miocene (Aquitanian and Langhian):- Marchetti was the first geologist to study in detail the geology of the region between Derna and Tubruq, and he indicated that Lower Miocene occupied the area between Derna and Umm-Rzem. The Lower Miocene here consists of sandy yellow limestones, yellowish compact limestones, sandy marly limestones to nullepore, and compact limestone, all belonging to the Langhian.[2]

Southwards of Derna, as for instance in the region of Bu Mansur, the limestones are compact, grey and crystalline. The Aquitanian formation in Gasr Harib consists of brown marly limestones. The Lower Miocene continues westwards as small outliers along the second escarpment, and near Bir Liback in Wadi Umzigga is composed of yellowish limestones. It also appears in Wadi Hamarin and Khawlan. In Cyrene, the Lower Miocene (Gregory's Cyrene Limestone) consists of soft yellow, grey and greenish limestones, which form small

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1. Ibid. p. 294.
2. Marchetti, M., Note illustr. per un abbozzo di carta geologica della Cirenaica. Boll. Soc. Geol. Italiana. Vol. LIII, fas. 2. p. 317, Rome.

hills on which the ruins of the ancient city are situated and overlie the coarse limestones of the Upper Oligocene age. The Cyrene Limestones are of wide extent and form the eastern boundary of the Oligocene running south beyond El-Faydiya, where they are represented by very marly and calcareous limestones. The Cyrene limestones are followed in normal progression by a series of strata which comprise at the base, coarse marly, yellowish and brownish limestones, and at the top, coarse yellowish and white limestones and clay. This series outcrops widely in the area between Derna, Khawlan and Cyrene, where glauconitic water-bearing bands which are richly 'spring forming' often occupy the bottom of basins bordering the limestone heights as at Belghes, El-Gubba, Ain Mara etc. These strata are very fossiliferous and the abundant fauna indicates that they are of Langhian age. Similar strata are found still further east, where, however, their lithological character varies very little. Near Umm-Rzem they are white limestones with aperculines and fine sandy and marly limestones and with Langhian fauna.[1] In Martuba District the following strata occur from bottom to top:-

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1. Marchetti. M. "Idrologia Cirenaica". Biblioteca Agraria Coloniale, Inst. Agric. Col. It., Florence 1938, p. 116.

1. Yellow sandy limestones.
2. Coarse yellowish limestones with sea-urchins and pectens.
3. Coarse marly, sandy limestones with nullipores.
4. Compact limestones with gasteropod casts.

In the lower and middle of the section, the upper beds of which are water-bearing, fossils are abundant and of the Langhian period.

(b) Middle Miocene (Helvetian and Tortonian):- Occupies a large part of Cyrenaica to the south of Jebel Akhdar and the whole of Marmarica.

The Middle Miocene formations between Derna and Tubruq are represented in exposed soft yellow fossiliferous limestones. These formations appear on the surface at Wadi Abu El-Farayis and Wadi Luggati. Those occurring in El-Gubba, Tert and Gasr Mleis are composed of yellow marly limestones.[1]

Compact crypto-crystalline limestones of the Middle Miocene are found over-lying the Lower Miocene beds already described in discussion of the area around Martuba, and extend to the south as limestones which appear at intervals

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1. Desio, A. Missione a Cufra., op. cit. p. 47.

towards El-Mekhili and continue to the north-west as far as the edge of the cliffs above Derna.

(c) Upper Miocene:- is not well-known in Cyrenaica; but according to Desio, the marl limestones of Ras Bomba and Marsa Belagig are Upper Miocene formations.[1] The Upper Miocene in these areas contains a species of Gypsum.

PLIOCENE

Marchetti remarked that the existence of Pliocene in Cyrenaica had not been proved conclusively and that it appeared to be completely absent from the area. Desio, however, considers that though evidence is not abundant the deposits of Magtaa El-Gioder in Sirtè[illegible] are Pliocene, although as far as the eastern Jebel is concerned, he finds no evidence of it.

QUATERNARY PLEISTOCENE (Pleistocene and Recent).

The Quaternary deposits have given rise to very different opinions amongst Gregory,[2] Marinelli,[3] Stefanini,[4]

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1. Ibid. p. 328.
2. Gregory, J.W., op. cit.
3. Marinelli. O., "Sulla morfologia della Cirenaica". Rive Geogr. It., Annata XXVII, fasc. IV-VII, pp. 69-86, 1920.
4. Stefanini, G., "I Terrazzi fluviali e marini dell'Africa Italiana." Int. Geogr. Union, 2nd Rep. of the Commissioners on Pliocene and Pleistocene terraces. pp. 23-29.

Desio,[1] Hey,[2] and Ahlman.[3] The author found that most evidence corroborated the work of Desio and Hey.

We have already mentioned in the chapter on relief the characteristics of the cliffs and the terraces which are found on the coastal plain at the foot of the first escarpment. The terraces are products of marine erosion as seen by their marine Pleistocene deposits.[4] Most of the Pleistocene continental deposits on the coastal region of the eastern part of the Jebel Akhdar could be assigned to one of three lithological categories:-

(a) Alluvial deposits.

(b) Consolidated dune deposits.

(c) Deposits composed mainly or entirely of tufa.

(a) The greater part of the alluvial deposits can be found in the fans at the mouths of the gorges themselves, (Wadi En-Naga and Wadi Derna), its upper surface forming a single terrace. The latter deposits are called 'Higher Quaternary Gravels' by Pfalz[5] and 'Younger Gravels' by Hey.[6] These

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1. Desio. A. Studi Morfologici etc. op. cit.
2. McBurney and Hey, op. cit.
3. Ahlman. H.W. "La Libia Settentrionale", Ufficio Studi, Tripoli, 1930;
4. McBurney and Hey, op. cit. p. 23.
5. Pfalz. R. op. cit. p. 17.
6. McBurney and Hey. op. cit. p. 78.

deposits belong to the Upper Quaternary. The younger gravels are found on the higher terrace of Wadi Derna and at the gorge level and also near the hospital in Derna.

Another category of finer Younger Gravels constitute Derna plain and extend to the foot of the limestone hills in the west. These Younger Gravels are composed of gravels and sands of reddish-brown colour.

(b) As has already been mentioned in the chapter on relief, dunes are found along the whole coast. Two categories of dunes can be recognised; the consolidated dunes and the unconsolidated. The consolidated dunes, which consist almost entirely of minute shell fragments more or less firmly cemented with calcite, are usually called 'fossil dunes'. On the other hand, the unconsolidated dunes may be distinguished by the unconformity of their grains and the lack of fossils as well as by their stratifications. They are often false bedded.

One of the localitites of fossil dunes lies six kilometres to the west of Ras El-Hilal, known as Ras El-Aslab, which is the seaward border of the alluvial fan of Wadi Bu Saheba. To the east of Ras El-Hilal fossil dunes are rare.

Between Ras Ben Gebara and Derna, there are five groups of fossil dunes, each group situated near the mouth of a large wadi. They occur as chains which run from west to east, each one forming a well-marked headland, either by itself or in conjunction with the alluvial fan of the associated wadi. From west to east the headlands are Ras Ben Gebara, Chersa, Ras Bu Meddad, an unnamed headland at the mouth of Wadi Bu Msafer and Ras Bu Azza. Between Derna and Ras Et-Tin, the consolidated dunes are rare and are represented by sporadically distributed sandbanks.[1]

Everywhere on the coast the fossil dunes are now being attacked by the sea. In some places resistent fragments of the dunes form peninsulas where the surrounding formations have been eroded. In addition to marine erosion, there is also evidence of some degree of submergence. It is noted by Desio that at Derna the main chain of fossil dunes are continued offshore for some 600 metres, to the east of Ras Bu Azza by an islet, and further by an almost submerged shoal.[2]

Unconsolidated dunes exist along the whole coast parallel and near to the shore. They often form in the mouths of the wadis and partially block them. They consist

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1. Ibid. p. 87.
2. Desio, A. op. cit. p. 38.

of yellow, reddish and white calcareous sands, often false-bedded with pseudo oolitic grains.[1]

(c) As has already been mentioned, tufaceous deposits are a constant feature of those wadis which contain perennial springs at the present day. The tufa deposits mainly occur in the following localities:- the higher terraces of Wadi Derna, Wadi En-Naga, Ain Mara, Lathrun, Wadi El-Glaa near to Ras El-Hilal, and Wadi Bent 4.5 kilometres east of Derna. In Wadi Derna tufa appears in large quantities about nine kilometres from the sea, where it occurs in patches at different levels. At six and a half kilometres from the sea, where it occurs in patches at different levels. At six and a half kilometres from the sea, the tufaceous deposits are replaced by marls. Finally at three to one and a half kilometres from the sea the tufa reappears for a second time particularly at the town wall two kilometres from the sea where there are magnificent sections in which the deposits consist mainly of tufa with the addition of many layers of grey or white marl and some layers of pebbles (Vide Plate 3A). According to Hey, the deposits of the higher terrace were laid down at a time when summers were less warm and dry than at present.[2]

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1. Little. op. cit. p. 32.
2. McBurney and Hey. op. cit. p. 119.

In Wadi En-Naga the bands of tufa take the form of broken fragments of incrustation around reeds in their positions of growth. At Ain Mara, according to Marchetti, the deposits are mainly alluvial, with beds of pebbles and frequent intercalation of tufa.[1] In Wadi Lathrun there are two or three places where the entire deposit is composed of reddish-brown tufa. Hey suggests each mass of tufa was associated with a sharp drop in the original rock floors of the wadi and thus owed its existence of an ancient waterfall.[2]

GEOLOGICAL STRUCTURE

Gregory, in his contribution to the geology of Cyrenaica, states that the area is a plateau which has been isolated and fractured by a series of faults.[3] It has also been suggested by Marinelli,[4] Ahlman[5] and Stefanini,[6] that the escarpments might themselves be the products of comparatively recent marine erosion. This view had been opposed by Desio, who considered that they could more probably be

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1. Marchetti. op. cit. p. 111.
2. McBurney and Hey. op. cit. p. 124.
3. Gregory, J.W. op. cit. p. 614.
4. Marinelli, Sulla Morfologia della Cirenaica, op. cit.
5. Ahlman. op. cit.pp. 13-23.
6. Stefanini, op. cit.

ascribed to faulting or abrupt folding, but even Desio, with reservations, was prepared to admit the possibility of marine erosion at relatively low levels.[1]

However, the recent study by the Cambridge Expedition in 1947 and 1948 provided strong evidence to illustrate the fact that the escarpments represent a number of different shorelines, forming a chronological series with successively lower altitudes. The sea-level halted for a considerable length of time in each case before reaching its present position. Approximate estimates of these altitudes are as follows:- (metres) 140-200; 70-90; 44-55; 35-40; 15-25; 6. The last of this list represents the most recent example of the phenomenon.

TECTONICS

It has already been pointed out that the Jebel consists of a 1,000 metres of limestone sediments. These sediments have been heaved up to over 800 metres above sea-level, where they appear as a slightly undulating plateau landscape. The country as a whole has a sub-tabular aspect.

According to Marchetti, the eastern Jebel consists of one broad, simple anticline. Its axis runs from south-west

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1. Desio, A. Studi Morfologici, op. cit. pp. 63-67.

to north-east, striking the coast at Lathrun.[1] Inland the axis can be traced at least as far as El-Gheighab, (vide fig. 2) a distance of 30 kilometres. It has a decided plunge to the north-east. Marchetti states that between Derna and the Gulf of Bomba, faults run parallel to the escarpment and one in particular appears to coincide with the upper escarpment from the neighbourhood of Wadi Derna as far as Umm-Rzem. There is a group of faults in the area between Lathrun and Cyrene, but their total effect is small.[2] The upper escarpment is post Middle Miocene and in view of its relationship to the lower escarpment, it is probably pre-Pleistocene. The Martuba faults are older than the Upper escarpment and the Lathrun to El-Gheighab anticline is younger than the upper escarpment.[3]

The present topography of the Jebel therefore owes much to earth movements.

ECONOMIC GEOLOGY

As far as the eastern Jebel is concerned, the search for minerals has proved largely negative, with the exception of the salt deposits.

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1. Marchetti, op. cit. pp. 135-144.
2. Hey, The Geomorphology and Tectonics of the Jebel Akhdar, 1956. op. cit. p. 8.
3. Ibid. pp. 9-13.

(a) The salt deposits belong to the type of saline evaporation deposits. Evaporation takes place in stagnant lakes on the sebkhas, or in lagoons cut off from the open sea by a shelf or a narrow channel, which lets only a small quantity of sea water at high tide but prevents the accumulated and increasingly salt laden water from flowing back to the sea. When all the salts contained in the sea water are present in a salt deposit, it can be observed that their order of superimposition is precisely the order in which salts are precipitated when sea water is made to evaporate in a vessel under laboratory conditions.[1]

(b) Building materials:- It has already been mentioned that the Middle Eocene provides a good limestone for building purposes in the south-west of Derna Town. Certain ancient monuments, especially Cyrene Necropolis, were excavated from it, while the greater part of ancient Cyrene was also built with it.

(c) Petroleum:- The first methane emanation in Libya dates back to 1914. This occurred during the course of a boring at Sidi Mesri in Tripolitania, at a depth of 160 metres. However, petroleum is not a remote possibility,

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1. Brichant, A. op. cit. p. 36.

for oil strikes have been made in many parts of Libya. As far as Cyrenaica is concerned, the oil discovery at Zilten offers considerable grounds for hope. The first test from the Zilten well was 15,000 barrels per day and 17,500 barrels per day from the second well.

CHAPTER III

CLIMATE

Introduction

The climate has always been recognised as a most fundamental factor in agriculture. The study of climate assumes a special importance, constituting, as it does, the background for far reaching human development.

Northern Cyrenaica shows a passage from humid and sub-humid conditions on the coast through Mediterranean climate on the plateau to desert conditions in the south. Northern Cyrenaica has periodicity of rainfall with a long period of drought occuring in the summer. In this season, the desert conditions have a governing influence on the whole of Cyrenaica. In the winter, the desert conditions retreat to the south and the whole of the coastal plain and the Jebel are under the influence of the maritime winds. The rainfall occurs in winter with heavy showers of short duration, which cause serious problems of soil erosion through the scouring action of flooding wadis.

Important factors in the climate of northern Cyrenaica are the proximity to the sea at the coastal stations and the altitude of the Jebel stations, both of which have important

modifying effects upon the basic climatic regime. The existence of two more or less hostile influences - the desert and the sea - necessarily leads to a permanently unstable situation which is reflected in the climate characteristics of northern Cyrenaica.[1]

Rain is usually brought by the north-west winds which accompany eastward moving depressions. Because these depressions are very fickle, plus the fact that they usually follow a northern rather than a southern path across the Mediterranean, rainfall amounts fluctuate sharply from year to year and from month to month. Severe droughts, often of two years' duration, occur approximately every ten years, and crop failures are the inevitable result.

This chapter describes weaker and climatic conditions and it is divided as follows:-

(1) Pressure systems and air masses affecting northern Cyrenaica; wind directions.

(2) Precipitation.

(3) Temperature.

(4) Relative humidity.

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1. Data on the climate of Cyrenaica may be obtained from the office of the Meteorological Service of Libya. See also Fantoli, A., Tavole di climatologia Libica., Reale Ufficio Agrario (Sezione Met.) 1922 Tripoli. Fantoli, A., La Pioggie della Libia., Ministro dell' Africa Italiana, Inst. Metr., 1952 Rome. Ahlman, W.H., La Libia Septentrionale, Italian translation by Chiesa, 1927 Tripoli.

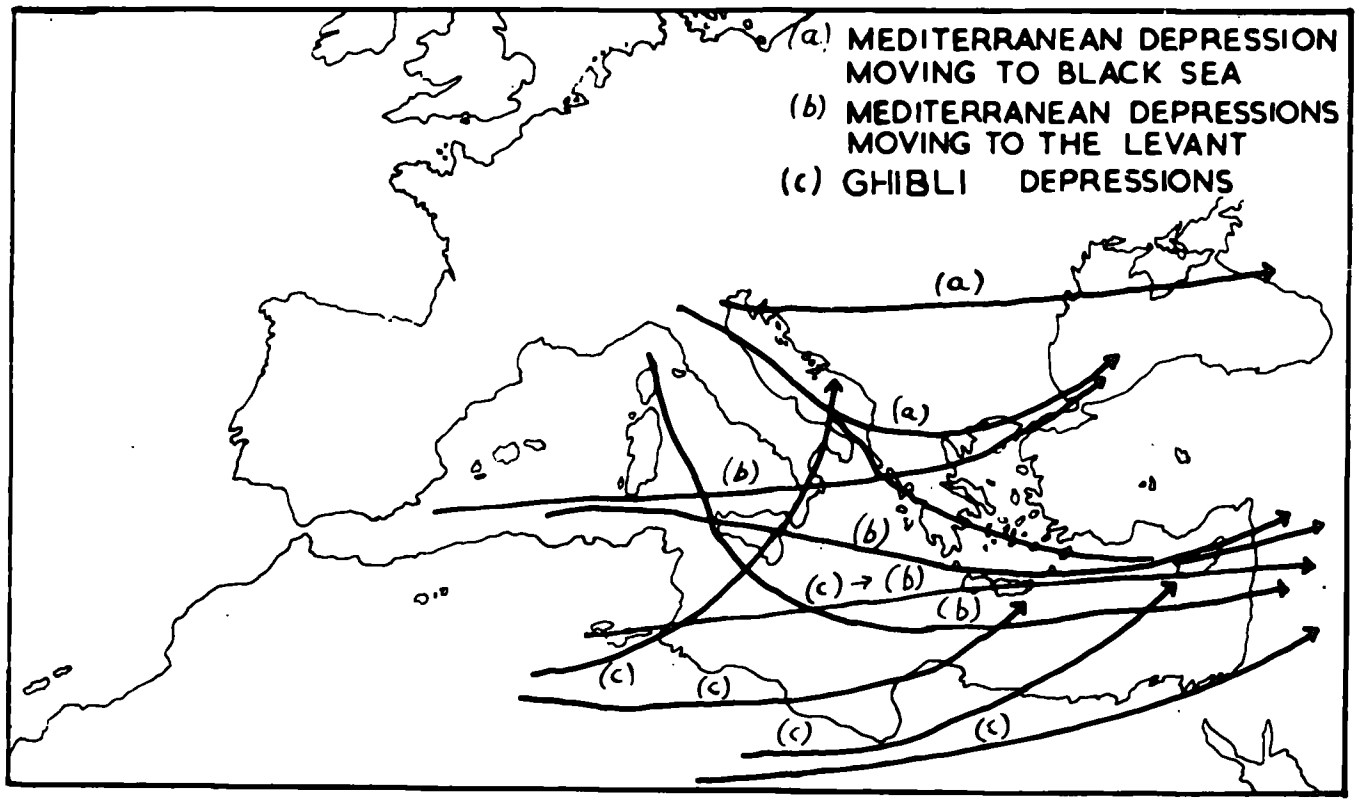
(1) Pressure systems, air masses and wind directions

(a) Winter

From late September onwards, the Mediterranean area comes under the influence of eastward moving depressions, which develop over the Atlantic. In the summer these depressions travel across Northern Europe, but as high pressure builds up over Russia with the advent of winter, the disturbances are forced to follow a more southerly track. Those that move through the Mediterranean area enter by various gaps, such as the Straits of Gibraltar and the Gate of Carcassonne; they may then move through the Gulf of Lyons and the Adriatic towards the Black Sea, or follow the north coast of Africa and pass over Sicily to the Eastern Mediterranean littoral (Vid Fig. 10). It is the depressions on the southerly path that bring most rain to northern Cyrenaica, particularly when they travel between Tunisia and Sicily. The main rain-bearing winds are north-westerly. The number of depressions travelling along the southern track in the Mediterranean varies from winter to winter, and at the same time, few of them are as active as those which move in the northerly track. These fundamental reasons for a fluctuating rainfall and a high frequency of droughts.

Sometimes the depressions come from over North Africa and these are often referred to as Ghibli depressions. These,

MAIN TRACKS OF DEPRESSION AFFECTING THE EASTERN MEDITERRANEAN



AFTER H.M.S.O. METEOROLOGICAL OFFICE

Figure 10.

like the Atlantic depressions following the southerly track across the Mediterranean, draw air from the south. The path of both types is along the north coast of Libya and winds at the front of the depressions are from the south veering to north-west as the depression passes. Ghibli depressions and shallow local depressions are most frequent in spring and early summer, that is February to June, and two to three may be expected from March to April. All depressions moving eastwards along the North African coast give rise to Ghibli winds of varying intensity and duration. Such winds may, of course occur in the autumn, but at this time they are usually the result of widespread low pressure, and since gradients are weak the associated winds are light. If south winds are drawn into the front of a deep and active depression, they reach gale force and because they often travel over great distances of dune country, sand is frequently lifted into the air for several thousand feet and carried northwards in the form of a sand storm.

Depressions in the south Mediterranean attract air masses from tropical maritime, polar maritime, Arctic and tropical continental source regions. The actual intermixing of cold and warm and cold air is not so well marked as it is in depressions which move across Western Europe, and warm fronts seldom develop. It is the cold front and the cold unstable air

masses behind it which bring most of Cyrenaica's rainfall. As the front passes there is a short but violent rainy period which is followed by showery weather with the frequency of the showers depending on the degree of instability of the air mass. Rainfall in northern Cyrenaica is nearly always intense and is never in the form of a gentle drizzle.

The winter months provide all the rainfall, but the actual rainy periods are brief, and fine spells of almost cloudless weather are experienced. Showers may persist until mid-May and occasionally even into early July, but then fine weather is the rule until mid-September.

(b) Summer

Summer conditions are much more stable than those in winter. Cyrenaica lies between the semi-permanent high pressure of the sub-tropical Atlantic and the seasonal low pressure over north-west India and Persia and over the southern Sahara. The Mediterranean is an area of descending air and pressure is high. The North-East Trade Winds which move southwards over Cyrenaica to the thermal flow in the southern Sahara regions are steady but light in force, rainless but humid. Along the coast they are strengthened by sea-breezes, which naturally modify temperatures; Derna has a daily mean which is usually almost 24°C., whereas inland it is usually around 30°C. in El-Mekhili. Clear skies

and bright sunshine are experienced day after day and occasionally a southerly wind may raise temperatures to a maximum of 26°C. alont the coast and 34°C. inland. Away from the coast temperatures drop considerably at night, because the cloudless skies permit the maximum radiation of heat; land breezes move northwards to the coast.

(c) Winds

Winds generally, are an extremely important factor affecting crop production, and particularly those winds from the north-west and south. At Derna, during the winter month of December, only 16% of winds come from the north-west, compared with about 47% from the south, south-east and south-west. The rain bearing winds are therefore infrequent. In January and March, nearly all winds come from the south-east, south or south-west as the following table shows.[1]

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1. Ministro Della Colonia, Boll. Met. della Col. It., Anno 1934, Tripoli 1940, p.225.

Table 1:- FREQUENCY OF WINDS FROM VARIOUS DIRECTIONS IN DERNA (1934)

Month	N	NE	E	SE	S	SW	W	NW	CALM
JAN	9	2	7	4	19	20	22	10	-
FEB	8	-	4	2	19	7	27	15	1
MAR	1	1	17	10	22	5	24	12	1
APR	9	4	12	5	10	-	15	29	6
MAY	16	5	14	8	8	-	16	24	2
JUN	7	3	10	1	-	1	3	57	8
JUL	-	-	3	-	-	-	-	90	-
AUG	13	4	1	-	1	1	6	62	5
SEP	31	5	3	-	1	-	-	46	4
OCT	31	7	9	2	10	8	2	22	2
NOV	4	8	20	9	11	18	7	10	3
DEC	11	3	-	2	3	39	18	15	2
TOTAL	140	42	100	43	104	99	140	392	34
%	13	4	9	4	9	9	13	36	3

Ghibli winds form only 22% of the total winds during the year. It has importance from the stand-point of its effects upon the vegetation. The Ghibli is a hot and exceedingly dry wind which blows from the desert. These dry winds partch the soil and frequently the vegetation also. If they occur during the critical period of the plant's growth,

the effect on yields may be disastrous. A ghibli during the milk-stage of cereal growing often making the difference between a good harvest and a poor one. A ghibli during the time when almond trees are in the pollination stage may drastically reduce the crop. In the eastern reaches of the Jebel, a few days of high velocity, hot, dry winds may ruin many of the vegetable crops. Even in the El-Marj plain, where winds of ghibli intensity are frequent, the operators of the wheat scheme complain that hot and dry winds often result in a deterioration of the cereal crop.

There is one redeeming feature of the hot dry winds that sweep northern Cyrenaica in the autumn. While they may damage other vegetation, the dates are generally benefited and their ripening hastened. On the other hand, if the winds fail to come in the autumn, the date crop may not mature properly and both production and quality are decreased.

The winds also have another important influence on agriculture in northern Cyrenaica in that they create sand dunes when the vegetative cover is disturbed either by unwise cultivation, grubbing of plants for fuel, or by over-grazing of the range areas.

Along the coast the general pattern of wind direction in summer is obscured by land and sea-breezes and it is therefore unwise to use figures for Derna. The figures for El-Gubba give a better picture of winds to be expected. They

show that 78.5% of the winds in August are from the north. The following table shows the frequency of winds from various directions in El-Gubba.[1]

Table 2:- FREQUENCY OF WINDS FROM VARIOUS DIRECTIONS IN EL-GUBBA (1934)

Month	N	NE	E	SE	S	SW	W	NW	CALM
JAN	22	2	1	9	4	15	17	23	-
FEB	24	5	2	3	4	10	15	21	-
MAR	9	2	1	17	14	6	16	28	-
APR	22	5	1	13	10	7	1	31	-
MAY	20	10	1	18	10	2	2	30	-
JUN	19	7	3	7	-	2	1	51	-
JUL	26	1	-	1	-	-	-	65	-
AUG	73	1	-	-	-	1	2	16	-
SEP	60	6	2	-	-	1	1	20	-
OCT	42	3	2	9	2	15	5	15	-
NOV	10	5	6	23	10	17	5	14	-
DEC	18	2	-	-	3	25	20	25	-
TOTAL	345	49	19	100	57	101	85	339	-
%	31	5	2	9	5	9	8	31	-

1. Ibid., p.241.

(3) Precipitation

Precipitation in northern Cyrenaica is mainly in the form of rainfall and dew. Snow is something of a novelty or curiosity in the area. During the winter of 1933-34 there was quite intensive snowfall; the layer of snow in the exposed places of the Jebel was greater than 50 centimetres. Snow occurs around El-Gubba, Cyrene and Beida; this phenomenon occurs every four or five years after heavy rainfall. Frost and hail are very rare and of no importance. It will be sufficient here to confine our attention to rainfall and dew.

(a) Dew:- is an important climatic factor in semi-arid regions, and at certain times of the year greatly facilitates grass growth. Very little is known about the amount of dew deposited in northern Cyrenaica and no figures are available. Dew is most copious during clear, cloudless nights, and is common in June, July and August. It is not uncommon to find the dew heavily coated on the vegetation, and it is a generally observed factor that the dew falling from the trees gives the impression of rain. Drivers who leave out their vehicles overnight find them covered with condensation when they collect them at 6 a.m. in the morning. The rising sun soon evaporates the thin film of moisture deposited during the night, and many people are unaware that it has fallen.

When depressions traverse the country during winter little dew is deposited at night, but the advent of one of the sunny spells which occasionally occur between the depressions brings copious amounts of dew.

Fortunately dew is precipitated at night when plants are growing and it is therefore absorbed by the foliage. When the dew is heavy, however, it drops from the leaves to the ground, and because it is in small quantities it is unable to percolate underground and be available to the plants. Usually it is re-evaporated as soon as the sun appears. If dew could be concentrated in sufficient quantities to allow percolation, then it would be a useful source of soil moisture.

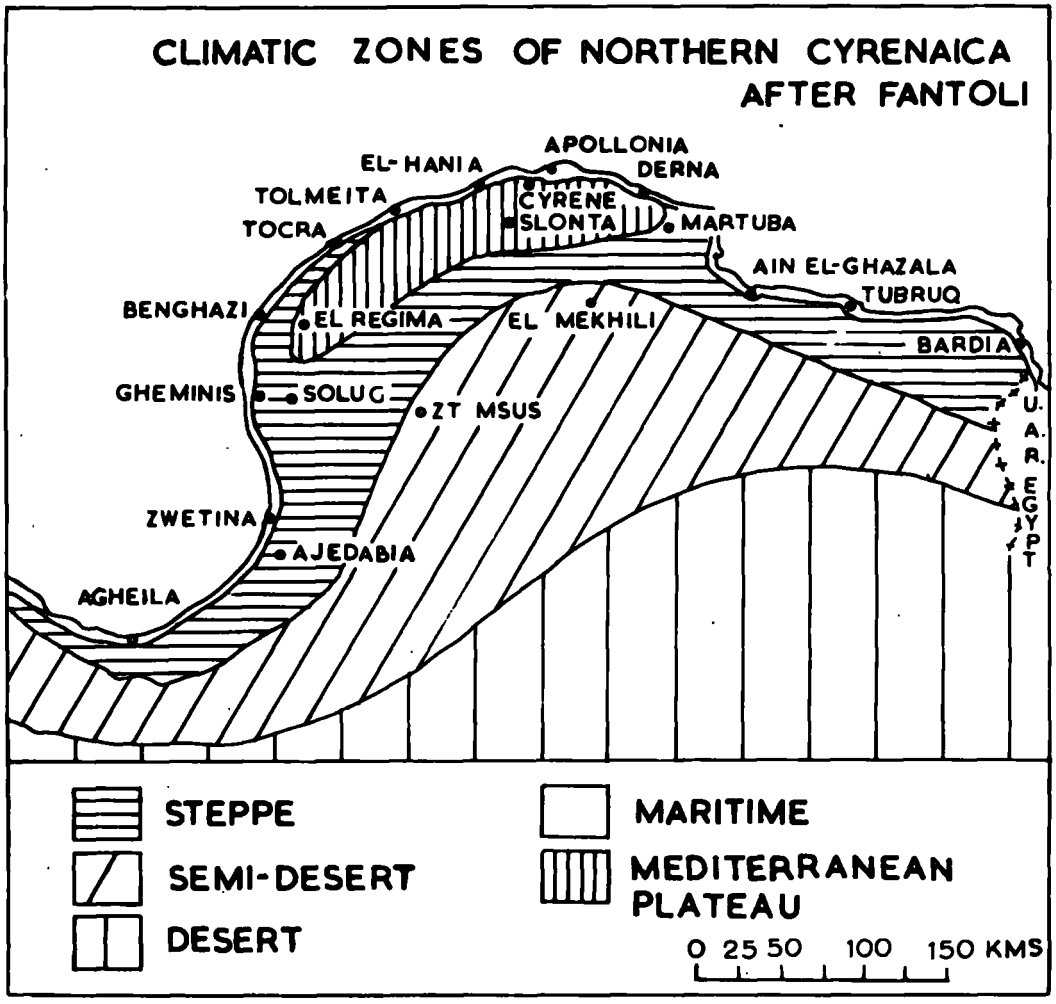
Dew, an occult form of precipitation, is commonly found during summer nights and occasionally during the winter nights. Even though total amounts may be small they are very important on the Jebel. Natural vegetation and crops must benefit from a nightly soaking of the soil in dew.

(b) Rainfall:- Water is the critical factor over the greater part of the Jebel since the rainfall amounts are generally small and unreliable. The pattern of rainfall distribution is well marked (Vide Appendix I Table 3), reflecting altitude and distance from the sea.

The coastal zone of northern Cyrenaica with its maritime climate (Vide Fig. 11) has an average rainfall from 200 to 300 mm. At Benghazi it is 266 mm. The dominant rain-bearing winds are from the north-west and only the area between Tolmeita and Chersa, which are the extreme east and northern parts of the coast, catch these winds after long passage over the Mediterranean Sea. Eastwards of Tolmeita, consequently, rainfall increases particularly towards Apollonia (Marsa Susa), and Ras El-Hilal, the extreme northern parts of Cyrenaica where the average reaches 350 - 400 mm. Rainfall decreases towards the north-east area; it is 300 - 350 mm. at Lathrun and 285 between Derna and Chersa. After the moisture is dropped on the coastal zone there is little left for the inner parts; it needs the orographic effects of the Jebel to raise rainfall figures to an annual average of 450 mm. The Jebel has a Mediterranean plateau climate. The area between El-Marj and Cyrene has the highest averages for the whole of North Africa east of Cape Farina (Tunisia).

Towards the south, in other words at the watershed, the average is sufficient for agriculture (Tecnis 321.1 mm., Marawa 265.5, Slonta 350.2, and El-Faydiya 318). Further south, towards the steppe belt there is a decrease in the annual average in Gardas Garrari (205.8 mm.) and Khawlan (171.5). Fantoli in his classification of climatic zones of Cyrenaica, considers that these two villages belong to

Figure 11.


CLIMATIC ZONES OF NORTHERN CYRENAICA
AFTER FANTOLI
APOLLONIA
EL-HANIA
DERNA
TOLMEITA
CYRENE
TOCRA
SLONTA
MARTUBA
AIN EL-GHAZALA
TUBRUQ
BENGHAZI
EL REGIMA
EL MEKHILI
BARDIA
GHEMINIS
SOLUG
ZT MSUS
U.A.R. EGYPT
ZWETINA
AJEDABIA
AGHEILA
STEPPE
SEMI-DESERT
DESERT
MARITIME
MEDITERRANEAN PLATEAU
0 25 50 100 150 KMS

the plateau Mediterranean category. East of El-Gubba (394.6 mm.) the annual average decreases particularly around Ain Mara and towards the north-east. It is 338.9 mm. in El-Fatayah south-east of Derna. Eastwards of this zone there is a low rainfall partly because it is in a rain-shadow zone and partly because much of its area is far from the coast. The annual average of rainfall falls to 172.8 mm. in Umm-Rzem. The rains become heavier from Ain El-Ghazala to Tubruq (153.5 mm.), since these two stations are situated on the coast. The rainfall average runs without alteration until Marsa Luck or to the east of Ras El-Mihr and ends in El-Bardi (Porto Bardia) where the rainfall average is (145.6 mm.).

The extremely long belt of steppe south of the Jebel Akhdar starts from Ajedabia in the west and follows a path through Shledima, Zawiyat Msus, Baltet El-Zullaq, El-Mekhili, El-Ezziat, Bir El-Kubi to Sidi Omar on the Egyptian border. This strip receives an annual average of 50 - 100 mm.

Rainfall varies in time and amounts fluctuate from season to season and year to year. Rainfall usually starts as showers in September, the beginning of the agricultural year, and finishes in the same manner in May. During December and January the rainfall is much more continuous and torrential. Figures for Derna show that 93.9% of its rainfall falls between September and April, 44.4% of the total rainfall falls in December and January, and the most

rainy months in order of importance are:- January 22.9%, December 21.9%, February 15.9%, November 15.2%, March 9.8, October 7.4%, April 3.6%, May 2.2%, and September 0.8.

During the wet season, the rainfall is not evenly distributed over the months and the intensities are very variable. As has already been noted, rain is usually brought by a cold front or the cold air mass behind it. At Derna, rainy periods are generally 3,4, or 5 days in duration. The intense nature of the rainfall is brought out by Fantoli's figures for the frequency of rain days and the annual average in a 28 year period. (Vide Table 4).

The annual and seasonal rainfall varies a great deal from year to year. An example of variation in Derna's rainfall are shown by Appendix I tables 5 and 6. The 28 year period shown is typical and adequately reflects the long term variations. However, variations may occur between two stations in one area: e.g. Zêrda, which is four kilometres from El-Marj has 70 mm. of rainfall more than El-Marj. Even on the Jebel there are marked variations; in less than twenty years at Cyrene the annual totals have varied frequently with extremes from one to ten, which indicates that the characteristics of the region further inland may sometimes, though not often, become the dominant characteristics of this area.

TABLE 4

Monthly Rainfall in Derna

MONTH	J	F	M	A	M	J
AVERAGE NO. OF RAINY DAYS	12.4	11.0	7.0	3.3	1.8	0.6
ANNUAL AVERAGE (mms.)	65.3	45.3	28.0	10.4	6.3	0.8

MONTH	J	A	S	O	N	D
AVERAGE NO. OF RAINY DAYS	0.1	0.2	1.3	3.8	7.2	10.3
ANNUAL AVERAGE (mms.)	0.1	0.1	2.5	20.8	43.2	62.4

Total number of rain days - 59
Total annual average rain - 285.2

The variability factor is emphasised further by the periodic occurrence of torrential downpours during brief periods causing serious damage through soil erosion and floods. These are associated with thunderstorms.

Rains early in Autumn may cause damage to crops, since such a period of rain would be followed by a long spell of fine, hot weather which will dry the soil and parch the young pasture. The early rains are also harmful to cereals if sown prematurely. Normally the young plant will survive long periods of drought.

The spring rains on the whole constitute a vital factor in determining yields, and if they fail, production may be very small. Even if the total rainfall is recorded, its incidence relative to the maturing and seeding of the cereals may render it useless.

Cyrenaica may be divided into the following pluviometric zones: (Vide Fig. 12).

(i) The zone of greatest rainfall, with an annual average of 400-500 mm. This stretches from El-Marj to Ain Mara. There is an area 50 km. long by ten wide from Messa to the west of Labraq, where the annual average is about 600 mm., and where the rainy season lasts far longer than elsewhere in this zone. Under the same head we may group the lands of the northern slopes of the Jebel through to the water-shed.

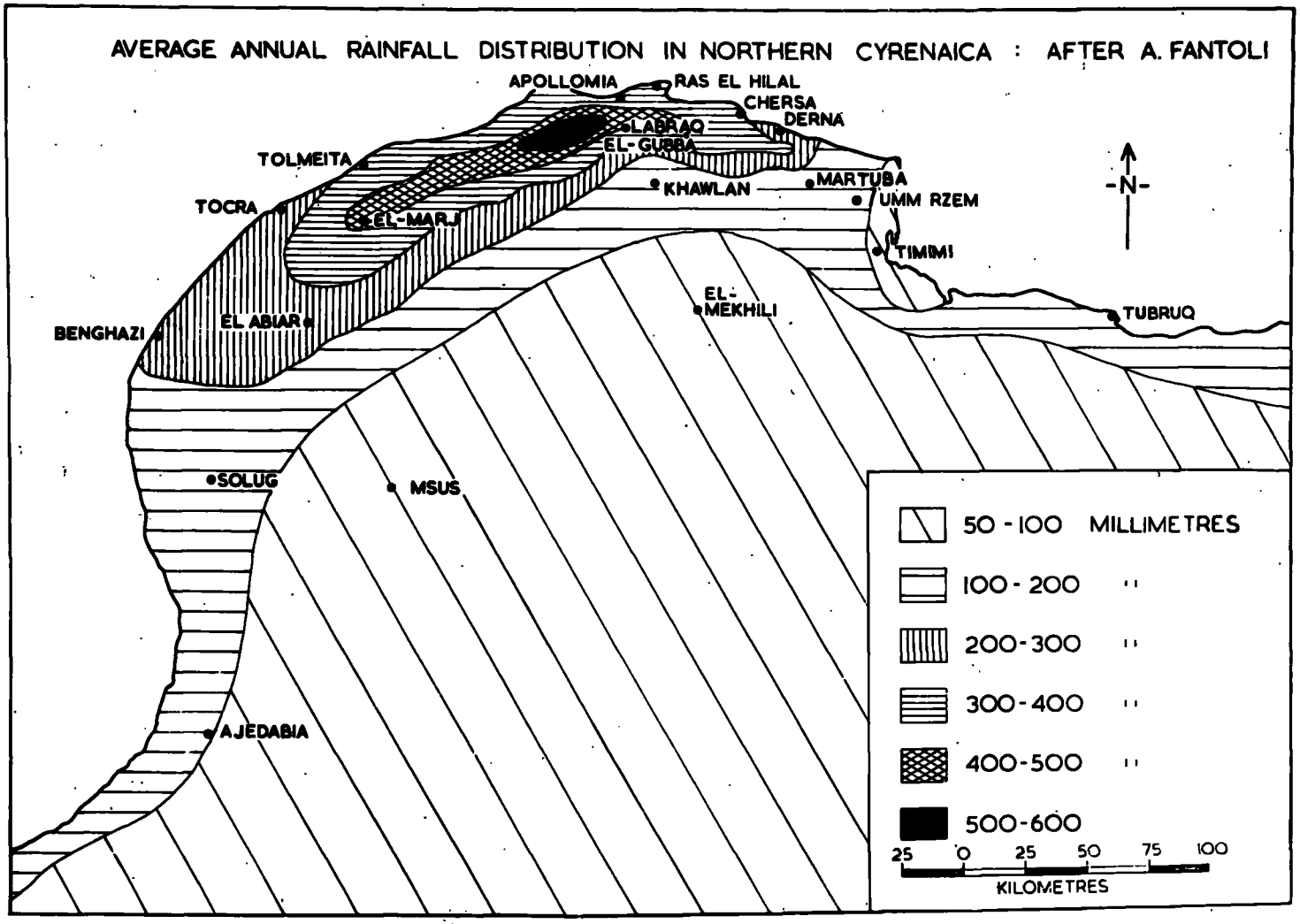

AVERAGE ANNUAL RAINFALL DISTRIBUTION IN NORTHERN CYRENAICA : AFTER A. FANTOLI
APOLLOMIA
RAS EL HILAL
CHERSA
DERNA
LABRAQ
EL-GUBBA
TOLMEITA
KHAWLAN
MARTUBA
UMM RZEM
TOCRA
EL-MARJ
TIMMI
EL-MEKHILI
TUBRUQ
BENGHAZI
EL ABIAR
SOLUG
MSUS
AJEDABIA
-N-
50 - 100 MILLIMETRES
100 - 200 "
200-300 "
300-400 "
400-500 "
500-600
25 0 25 50 75 100
KILOMETRES

Figure 12.

(ii) This zone, which receives yearly 300-400 mm. completely surrounds zone (i). It runs from El-Regima to El-Fatayah plain. This zone includes the coast between Tolmeita and Ras El-Hilal. In the interior it includes Gardas El-Abid, Tecnis, Marawa and probably Khawlan.

(iii) Annual precipitation ranging between 200-300 mm. The area includes the territory adjoining the south of zone (ii) and continues eastwards along the coast between Derna and the Gulf of Bomba.

(iv) The zone has a n annual rainfall of about 100-200 mm. It includes the plain of Ajedabia, Soluq and the northern parts of Marmarica.

(v) The rest of the province to Wadi El-Farigh has an annual average of 50-100 mm. and includes Zawiyat Msus, El-Mekhili, and ends with the areas bordering Egypt.

(c) Droughts

There is a very useful study of drought in Libya by Fantoli.[1] Every year some section of Libya suffers from droughts and every few years general droughts affect very large areas of the country. As much as half the productive

1. Fantoli, A., La Soccita in Libia, Real Acc. dei Leucei Vol. IV, part II, p. 130, Florence 1935.

area of the country may be seriously affected by drought once every three years or four years, while perhaps once in five years serious droughts may affect all the agriculturally productive land. Furthermore, in every ten year period two or more seasons of drought may occur successively over one half to two thirds of the territory. Since the rainfall is erratic, agricultural practices and methods in Cyrenaica are of necessity confined to those types which will produce returns for effort expended over an average number of years. It is also the climatic variability through fluctuating rainfall which influences the areal distribution of cropping.

(3) Temperature

Cyrenaica experiences some very high temperatures, as can be expected from the proximity to the Sahara. But it is moderated on the coast by the sea, and in the Jebel by altitude. July is the hottest month in the Jebel (Cyrene 22°C. in July); but on the coast it is delayed until August (Derna 24.5°C. in August). January is the coldest month, but any considerable rise in temperature is not experienced until the end of February or March. The climate of winter is mild and in the summer the strong heat is continuously moderated by sea-winds. The temperature in winter rarely decreased below freezing point except in Jebel, where temperatures of 3 or 4°C. have been recorded in some years.

The highest temperatures on record are those in the Benghazi plain during the ghibli winds. In this period, the temperature may rise 40°C. Altitude moderates the annual average temperature; it is 19.5°C. in Benghazi (sea-level), 16.5°C. in Cyrene (650 metres above sea-level) and 18.2°C. in Derna (10 metres above sea-level). Table 7 shows the monthly temperature in Derna as recorded in 1934.[1]

The mean temperatures, and still more, the variations from the mean and the minimum and maximum temperatures vary slightly from one maritime plateau to another. However, the main factors differentiating one sub-zone from another are: the prevailing winds; the relative humidity; and the way in which they vary during the year; and finally and most important, the rainfall. The latter is fundamental, particularly in a region such as Cyrenaica.

In the maritime zone the mean daily range is not more than 8°C. and the annual variation between January and August in Derna is 11.7°C. The annual isotherm along the coast is approximately 20°C. On the Jebel the mean temperature is lower than on the lowlands giving in El-Gubba an annual variation of 10.1° and in Cyrene 8.9°C. In the steppe zone the influence of the desert begins to prevail over that of the sea, but the latter does not lose its more general

1. Min.delle Col., Boll. Met., Op.Cit., p.224.

characteristics which are reflected in the typical behaviour of the temperature during the spring and autumn; the spring means of temperature are lower than autumn e.g., in Tubruq the mean temperature in April is 18.3°C., while in September it is 24.0°C. The annual curve of temperature in the steppe zone reaches its highest point in July, but the lowest point remains in January. The variation in temperature is naturally between 2 and 4 greater than the maritime zone, but this is not excessive, since the annual isotherm (21.0°C.) is only one degree higher than in the maritime zone. The maximum and minimum temperatures are further reduced from the average, which leads to a greater average daily range; this is one of the most marked changes from the maritime zone and the most obvious characteristic of the steppe zone.

(4) Humidity

The humidity of the atmosphere is affected directly by winds, temperature and precipitation. It is of considerable importance in Cyrenaica where the differences in humidity vary from one period to another throughout the year and sometimes during the same day. It is important to note that particularly in the coastal belt rapid changes in humidity are recorded with the onset or termination of a ghibli. It is this humidity which makes the climate on the coast rather excessive, despite the absence of high tem-

Table 7:- MONTHLY TEMPERATURE IN DERNA (°C.)

Month	J	F	M	A	M	J
Max.	16.8	17.5	20.4	22.6	24.9	27.8
Min.	4.5	5.6	7.5	10.5	13.1	16.5
Average	10.7	11.5	14.1	16.7	19.0	22.1

Month	J	A	S	O	N	D
Max.	28.8	29.8	27.6	27.0	24.9	20.3
Min.	18.6	19.2	17.1	15.1	12.0	7.9
Average	23.7	24.5	22.4	21.0	18.4	14.1

Annual mean maximum	24.0
Annual mean minimum	12.3
Annual average	18.2

Table 8:- PERCENTAGE RELATIVE HUMIDITY FOR SELECTED STATIONS IN NORTHERN CYRENAICA

Month	J	F	M	A	M	J
Derna	65	62	61	54	67	64
El-Gubba	70	66	47	42	42	41
Cyrene	68	66	58	51	44	44

Month	J	A	S	O	N	D
Derna	70	68	67	67	65	68
El-Gubba	40	45	58	57	53	68
Cyrene	41	65	69	63	73	73

Annual

Derna	65
El-Gubba	52
Cyrene	60

peratures, and it is sometimes oppressive and depressing to humans. The humidity in Derna is high but it is affected by the altitude of the Jebel. Indeed, as Professor Fisher has mentioned:

"Other points of interest observed were the effects of altitude on humidity and the extent to which air conditions varied within the southern desert area. It was noteworthy that at Benghazi and Derna the diurnal range of temperature was small, and the relative humidity high especially in the latter town which is backed by imposing scarps on its inland side. On the plateau at an altitude of almost 2,000 feet, nights were coller and the humidity markedly lower - a feature that atmospheric moisture is concentrated at low levels near the coast."[1]

Table 8 shows the relative humidity in three stations, one on the coast (Derna) and the other two on the Jebel. It is obvious from the figures that the relative humidity is affected by the altitude[2] and distance from the sea.

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1. Fisher, W.B., "The Aberdeen University Expedition to Cyrenaica", Scott.Geog.Mag., Vol.68, No.2, Sept. 1952, pp. 58-59.

2. Min.delle Col. Boll.Met.,Op.Cit, pp 220, 226 and 241.

Climate in Classical Times

The question of whether the climatic conditions in classical times were similar to those of today has been a popular subject with writers in recent years. Greek and Arab historians tell us of the flourishing days of ancient Cyrenaica. To what extent can this latter picture be related to present day conditions? During the Glacial periods in Europe, North Africa, no doubt, had a better rainfall than at the present time, for the European cyclone track lay further south and North Africa must have received more abundant rains.[1] However, the 'pluvial period' ended long before historic times, and the Greeks in the seventh century B.C. found Cyrenaica with a climate essentially the same as that which prevails today. The classical records show that the country produced a large quantity of crops. It was called by the Italian writers 'Granaio della Libia' (the Granary of Libya).

The general geographical similarity of the classical and present condition is shown by the establishment of cisterns, aquiducts and the utilisation of springs by the Greeks and Romans. Moreover, the direct evidence confirms the historic records. In Roman times the chief settlements

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1. Gregory, J.W., "Cyrenaica", Geog.Jour., Op.Cit., p.336.

were all around existing wells, springs and the areas of favourable average rainfall.

The country reached a high standard of civilization in classical times through the efforts of the people to utilise the water resources to the best advantage. Archeological evidence of this state of affairs abounds in Cyrenaica. The decline from this civilization was probably caused by the attacks of the nomads on the settled people and the effects of locust infestation and earthquakes. According to Professor Fisher, the weight of geographical evidence would suggest a broadly unchanged nature in the Libyan climate during the last two or three millennia.[1]

To sum up, it may be said that the rainfall in northern Cyrenaica is erratic but because of the greater altitude, is more reliable than average on the Jebel. The regular incidence of droughts causes heavy loss to the farmers. Hence schemes of development must find some satisfactory answer to these two major problems by rational use of the water resources which are available, if the lot of the Cyrenaican Arab is to be improved.

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1. Fisher, W.B., Frazer, I.R., and Ross, D.W., "The Aberdeen University Expedition", Op.Cit., p.29.

CHAPTER IV

VEGETATION

The distribution of vegetation in the eastern Jebel Akhdar varies with the amount of rainfall and also reflects the topographical zonation from the coastal plain to the Jebel. In the coastal plain and on the Jebel there are distinct differences in the community structure of the vegetation.

The flora of this region is unusual in North Africa and is related rather to Crete and Greece than to the adjacent deserts of Marmarica and Tripolitania. It was studied by several botanists who visited the country in the last quarter of the 19th century. In the years following the Italian occupation of Cyrenaica in 1911, a very great deal of botanical exploration was carried out and is recorded by Professor Pampanini[1] and other Italian scientists.

Westwards from Derna, on the coastal plain, there are occasional colonies of Ammophila arenaria and an associated

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1. Pampanini, R. "Prodromo della flora Cirenaica". Ministro Col. Forbi 1931.

Rhizomotous grass is Sporobolus arenarius. Zygophyllus album is also represented on the 50-90 m. terrace behind Derna known as Sahel Shiha, which constitutes a part of the coastal plateau. Other species conspicuous in this zone are the large Umbellifer Thapsia garganica and Urginea maritima.

At the base of the lower escarpment the vegetation as on the terrace continues on the talus, but includes individuals of a few addition dwarf-shrubs, such as Zizyphus lotus, Teucrium brevifolium and Juniperus phoenicea.[1]

On the slopes of the lower escarpment, the vegetation is composed of Poterium spinosum, Phlomis floccosa, Ballota pseudodictammus, Genista scanthoclada and Asparagus acutifolius. The vegetation, however, is much denser, and a greater variety of species of dwarf-shrubs is represented including Juniperus phoenicea and Dophnne-Jusminea.[2] The Lentisk tree is also found on the upper slopes of the lower escarpment, which is such a conspicuous feature of the interior hills. (Vide Fig. 13).

The forest in the eastern Jebel is not as dense as in the central part. Only isolated fragments of the forest

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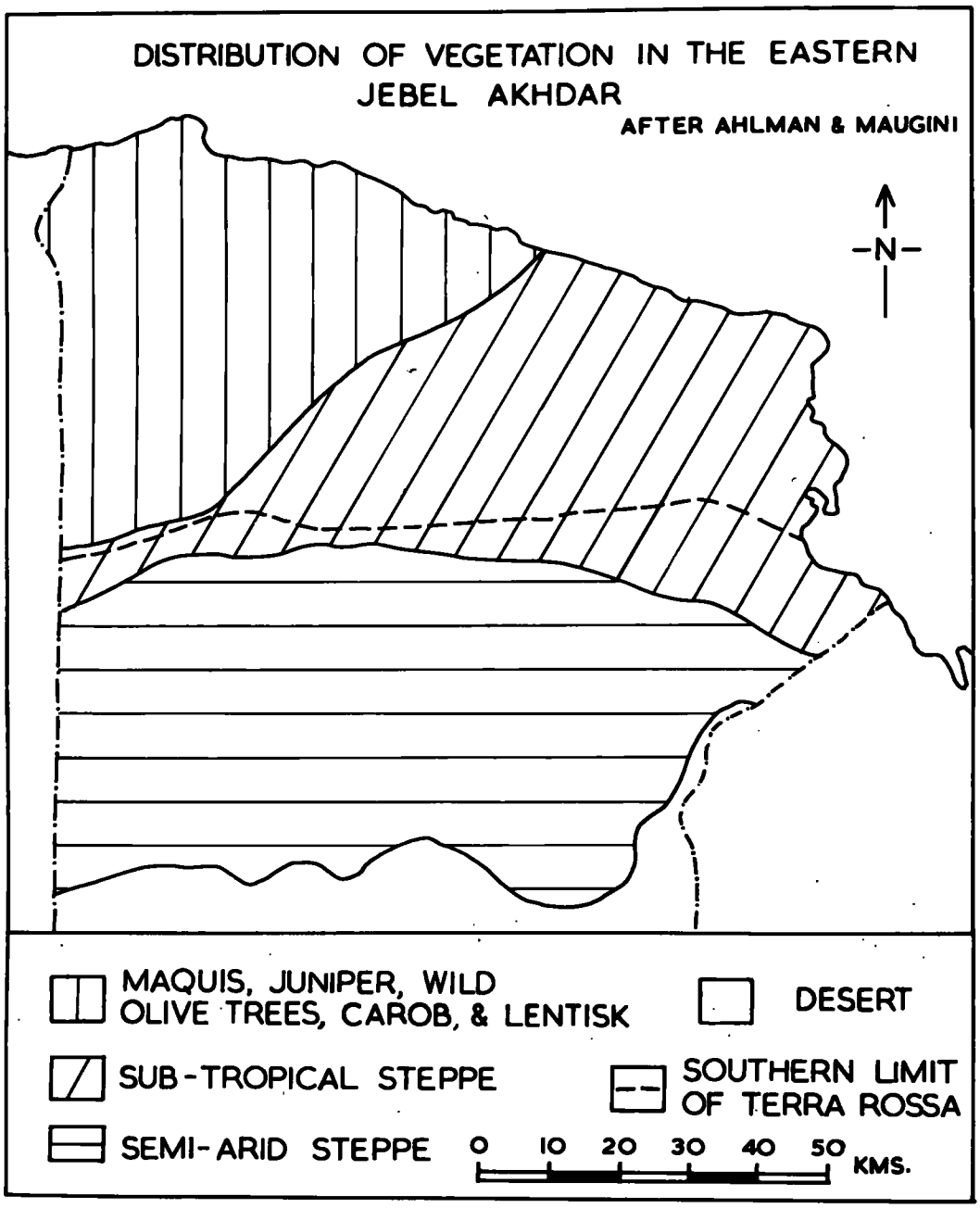
1. Gimmingham, C.H., & Walton, K., "The Environment and the Structure of the scrub communities on the Limestone Plateaux of Northern Cyrenaica." Jour. of Ecol. Vol. 42, No. 2, July 1954, p. 513.

2. Gimmingham, C.H. & Walton, K. op. cit. p. 514.

Figure 13. . .


DISTRIBUTION OF VEGETATION IN THE EASTERN JEBEL AKHDAR
AFTER AHLMAN & MAUGINI
N
MAQUIS, JUNIPER, WILD OLIVE TREES, CAROB, & LENTISK
DESERT
SUB-TROPICAL STEPPE
SOUTHERN LIMIT OF TERRA ROSSA
SEMI-ARID STEPPE
0 10 20 30 40 50 KMS.

could be found in Ain Mara, El-Gheighab, El-Gubba and Ras El-Hilal areas where it takes the form of an open woodland. The forested land in the eastern Jebel is estimated to be 9323 ha.[1]

Conifers

The most frequent is the Juniper, which exists in the areas around Labraq and Cyrene. Cypress up to 15 feet high, can also be found in a very limited area around Labraq. The Aleppo Pine is very frequent on the northern slopes between Derna and Apollonia, particularly in the wadis of this area. The Oleander can also be found in scattered places. Conifer represents 40% of the total trees.

Broadleaf trees

The Lentisk is ubiquitous and very often exists together with Juniper. Though the Lentisk is much smaller and rarely higher than 3 metres, its roots are quite developed. The wild olive is found among the bushes everywhere. The Carob can be seen in the wadis on the upper terrace where it exists on large areas. On the northern slopes of the Jebel the arbutus exists in limited numbers, like the

1. Kroeller, E.E. "Agricultural Statistics for Cyrenaica 1959". Nazaret of Agriculture and Forests, Benghazi, 1960, p. 24.

Oak (holm oak and coccyferous oak) which occurs in the wadis of the upper escarpment. The Laurel, Rhus, Oxiacantha wild fig and Tamarisk can be found on the Jebel but they are very rare.

The forest ceases a few kilometres to the south of the watershed of the plateau and gives way to steppe. The well known route of Tariq Aziza is generally regarded as the dividing line between the two types of vegetation.

The forest is of great economic significance since it provides fodder for the animals when there is lack of good pasture. This is manifest in the case of the goats which are regularly seen grazing on the shrubs even standing on their hind legs. The Bedouin and the goats are the most dangerous destroyers of the forest. Indeed as Professor Evans-Pritchard writes "The Bedouin of the forest are essentially a goat people."[1] Unfortunately grazing or over-grazing may have serious effects on deforestation and consequently soil erosion, but most of the forest species of this region are too tough to be entirely destroyed in this way. Even the cattle can be kept there permanently where grass grows. The forest also provides a supply of firewood, charcoal, poles as support for plants, and of

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1. Evans-Pritchard, E.E. op. cit. p. 34.

fencing, ploughs, pegs, hammers and such like accoutrements of the tent life. Moreover, it supplies fruits, among which those of the wild olive, lentisk and carob are noteworthy and are of minor importance in the economy of this region.

It is important to mention that those parts of the Jebel which are without forest, have a covering of scrub which prevents erosion. The plants which compose this scrub are also found as undergrowth to the forest. Chief among them are Poterium spinosum, favoured by camels and goats, the Sum Rose, Thyme, some sages, the giant fennel and the Derias plant (Vide Plate 3B). During the summer this Derias plant is poisonous and cannot be eaten by the stock. However, this difficulty can be overcome since the animals grazed on Derias during the spring may eat it in the summer without harmful effects.

Eastwards of Derna and south of Tariq Aziza, the steppe country yields excellent pasture especially in the springtime. These vast grazing lands are covered with asphodels, sage and phlomis floccosa. Ultimately vegetation becomes extremely spare, and it reaches vanishing point in the Deffa and Gardaba country to the north-west and west of Jaghbub.

Afforestation

Afforestation is at present under way in the eastern Jebel. In 1953 the Nazaret of Agriculture had been changed to the Nazaret of Agriculture and Forestry. The Provincial Government established an office in Derna to supervise forestry activities and to protect the forests from damage by the Bedouin and their flocks. Most of the forestry activities at present are concentrated on the protection of the natural forest and the re-establishment of areas in the Jebel. The following table shows the areas made over to forest in 1957.

Table 9:- AREAS AFFORESTED IN 1957 IN THE EASTERN JEBEL

Area	Hectares	Trees
El-Ghaighab	4	2500
El-Gubba	2	1100
Bu Msafer	7	4370
Umm-Rzem	5	3450
Timimi	5	3400
Derna	10	6200
Total	33	21020

The re-forestation is taking place in the areas around Derna Town and the village of Timimi and Umm-Rzem to protect the inhabited areas and the communications from invasion by sand. The economic and rapid re-afforestation of Derna - El-Gubba area, which has a fair average of rainfall (280-400 mms.) has proved possible by the study of ecological conditions as shown by the pine plantation at El-Gubba. The initial planting is carried out in the nurseries of Derna and El-Gubba and the seedlings are later transfered to the areas being afforested. Tetralinis Articulata and Accacia Cyclopis are suitable varieties for the eastern Jebel since 70% of the total young plants have grown successfully there.

The tribesmen look with hostility upon forestry activities, since they see in its spread a threat to their grazing lands. Bedouin with their flocks are still the most dangerous element in any consideration of young forests. During the five years 1953-1957, the courts of Cyrenaica found 1266 cases of trespass proved, in respect to illegal grazing and gathering of fuel.

The Forestry Department has organised the utilisation of the forests by authorising private firms to cut wood and produce charcoal for consumer purposes. The following

table shows the production of the forests of Cyrenaica, in the period 1953 to 1957.

Table 10:- PRODUCTION OF THE FORESTS IN CYRENAICA 1953-1957 - QUINTALS

Year	Charcoal	Wood	Poles	Fencing
1953	37795	55864	1154	3255
1954	44651	51826	3646	2538
1955	40250	49500	3635	1384
1956	38230	47733	4478	1395
1957	44889	56573	58060	733

(Statistics taken from Naz. Ag. & For., Annual Report, Benghazi, 1957).

The charcoal is used for cooking purposes in the towns, while the wood is used for agricultural purposes in the countryside. The Board of Inspection in the eastern Jebel is equipped with transport to facilitate its activities, and some of the Ente farm houses have been taken over for forestry posts and for fire-guard stations.

It may be said in summary, that the existing forest land in the eastern Jebel should be protected from the Bedouin and their flocks. Plantations in the better watered areas for timber production should be a second

priority. The peoples of the Jebel should be made aware of the value of forests and the need for conservation of this resource. In the well-watered areas, the trees will be easy to establish, since they will require irrigation only in the height of summer. Other areas, which are of a more arid nature or inaccessible to agriculture, such as the terrace south of Dèrna, the coastal plain between Derna and Chersa, the area of El-Ghaighab and Martuba would also lend themselves to re-afforestation.

CHAPTER V

SOILS

Documented datum on the soils of the eastern Jebel of Cyrenaica is difficult to utilize since there is a great divergence in the reliability of the different sources available. Soil studies tend to be incorporated with broader regional works. The most useful studies on this subject are by Cortese,[1] Ferrara,[2] Micheli,[3] della Catta,[4] and Principi.[5]

In the eastern Jebel the most characteristic soil is the Terra Rossa, which is found all over the Mediterranean region on limestone rocks. Reifenberg has defined the properties of Terra Rossa in the following terms:-

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1. Cortese, E. Reporti fra la formazioni geologiche ed i terreni agrari in Cirenaica e in Tripolitania, Florence 1927.
2. Ferrara, A. Analisi di terreni della Cirenaica. Ins. Col. Ital. Florence 1933, XI.
3. Micheli, A. Contenuto in umidita della 'Terra Rossa' della pianura bengazino and sua variazione in rapporto alle lavorazioni del terreno, Florence 1936.
4. Della Catta, L. Conoscenza attuali sulla costituzione e comfozzione dei terreni agrari della Libia, Florence 1940.
5. Principi, P. Osservazione su alcune terra rossa della Cirenaica L'It. Ag. Rome 1936. Caswell's translation, LATAS, Tripoli, pp. 95-104.

"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 climates, it contains large quanties of salt of the alkalies and alkaline earths. The high iron content together with low humus content are responsible for the red colour, which is often brilliant. They are mostly soils with an alkaline reaction and loamy structure; they may contain calcareous and ferruginous concretions."[1]

At the present time, Reifenberg's definition is generally accepted. However, the red soils of Palestine and the Jebel Akhdar of Cyrenaica are the most southern manifestation of the truly Mediterranean Terra Rossa, with the exception of some slight local variations.

The Mediterranean climate, with its heavy winter rainfall and dry summers, restricts the vegetal cover and therefore permits the presence of only very small quantities of humus. The large amounts of salt and alkaline earths in the soil coagulate the humus and inhibit its protective action on iron compounds. Owing to lack of humus and the

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1. Reifenberg, A. The Soils of Palestine, (Trans.) Whittles, London 1947, p. 14.

presence of chalk in the rock, the soil is alkaline.[1] Therefore Terra Rossa of the eastern Jebel may be termed residual alkaline soil formed by the physical and chemical disintegration of the Jebel limestone formations.

Terra Rossa covers a large area of the Jebel Akhdar, including El-Marj and El-Fatayah plains, and occupies the bottom of the depressions (dolinas) of the Jebel. In the eastern Jebel it can only be found in areas receiving an annual rainfall of more than 200 millimetres, that is to say areas with a plateau climate (altipiano).[2] In Principi's opinion, however, the most suitable climate for the natural red soil formation should correspond to the development of Mediterranean vegetation, having an annual rainfall of about 500 to 1,000 millimetres and an average annual temperature of about twelve to fifteen degrees centigrade.[3] In the eastern Jebel, Mediterranean type flora predominates, with the vegetation corresponding more to the coastal areas of southern France, Spain, Italy, Greece, Tunisia, Algeria and Morocco than most of Tripolitania.

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1. Ibid. p. 83.
2. Fantoli, A. Atlante Meteorologico della Libia, Ser. Cart. Min. della Colonie, Rome 1930.
3. Principi, P. op. cit. p. 98.

Terra Rossa covering the Eocene limestones and similar areas of the eastern Jebel exhibits a granular structure varying in colour from brick red to a purple red. In some places around Labraq and El-Gubba the upper horizon of Terra Rossa is a tobacco or brown colour, due to a greater concentration of humic material, while the typical Terra Rossa forms a lower horizon which lies directly on the Eocene limestone. In other places the brown colour predominates throughout the thickness of the stratum. In general, where Terra Rossa lies on hard limestone, it is homogeneous, compact and quite thick, brick red or purple coloured strata; but where Terra Rossa has a thickness of more than 50 centimetres and overlies soft limestones and marls this more or less distinct superficial brown coloured horizon appears. Grasses and shrubs usually form the vegetative cover. This peculiar brown tint seems in other cases to be related to special conditions existing in the rocky substratum which determine greater utilization of the atmospheric precipitation, or with some particular morphological condition which results in less insolation, thereby creating less rapid destruction of vegetative and organic material.[1]

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1. Ibid. p. 99.

Terra Rossa in the eastern Jebel frequently contains calcareous pebbles. Quartz fragments, particles of grey flint, parts of calcite, rare grains of amphibole, some tourmaline and zircon are also found in Terra Rossa. Soil reactions of Terra Rossa usually remains within the neutral limit (pH 6.6 to 7), largely because of percolating waters, which always contain sufficient quantities of carbonates to neutralize the acid reaction of the soil compounds. Terra Rossa associated with the Mediterranean climate can probably be considered as semi-humid pedologic formations; the precipitation during the cooler half of the year is sufficient to leach the soil. These superficial waters penetrate to great depth into the limestone fissures, while the rising capillary flow is negligible. The soil therefore assumes the characteristics of a humid soil although its nature is influenced by high temperature and intense desiccation during the hot season.[1]

The depth of Terra Rossa varies from about 30 metres in El-Marj plain to two to three metres and sometimes less than that in the eastern Jebel. As for their fertility, the soils of this region are rich in potash ($2^{0}/_{00}$), which is sufficient for plant growth, but they lack nitrogen (about

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1. Ibid. p. 104.

1.50^{0}/00. The maximum is 2.66^{0}/00 in the Martuba area). The soils in this region have a high clay content (about 20^{0}/00. The amount of the organic substances is between 15 and 20^{0}/00.

The salinity of the soils of the eastern Jebel is an important factor in a region where the atmospheric precipitation is limited. The amount of the soluble salts is between 1.30 and 4.32^{0}/00, but it amounts to 13.62^{0}/00 in the Labraq area. Terra Rossa, due to their high clay content, tend to be impermeable and restrict the accumulation of an underground water layer. The soils possess a high capacity for water retention and hold as much as 21 to 22% of their weight of water.[1] (Vide Append. II, Table 11).

East of El-Gubba, where bare rock is often exposed, the land is poor for farming. The surface has layers of stones and a tendency to form crustal nodules.

In the eastern Jebel and northern Cyrenaica as a whole, there is remarkably little evidence of soil erosion, and it is clear from the evidence presented by numerous recent excavations and trenches that have retained their original shape for two or three years, that the soil possesses an

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1. Micheli, A. op. cit. p. 12.

inherent resistance to erosion.

The character of the soils in the depressions is different from that on the ridges. The soils in the depressions are heavier, but unfortunately, in some areas they contain a high percentage of soluble salt due to sedimentation, accumulation of water, evaporation and capillarity.

Reifenberg states that though in Palestine Terra Rossa primarily is used as corn land, vine and other fruit trees grow well on it and, in all localities where there is a considerable depth of this soil, it is extremely well suited to the establishment of fruit trees of all types. In the eastern Jebel the most suitable crops are found to be olives, wheat and vines.

To the south of the Jebel, Terra Rossa quickly gives way to the steppe desert soils, in which extensive deposits of desert pan or crust occur. This hard pan is particularly noticeable in Marmarica from the region of Sollum as far west as Tubruq, east of El-Fatayah Plain and Bir Hakim[1] (Vide Fig. 13).

In conclusion the clay soils of the eastern Jebel are the residual product of weathering and decomposition of the parent rocky material. The soils contain a large amount

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1. Fisher, W.B. op. cit. p. 484.

of potassium, some phosphorous and a little nitrogen, but they are still relatively poor in plant food as compared to many soils in the temperate zones of the world. The soils in the eastern Jebel, on the other hand, are very difficult to till with the animal power used by Cyrenaicans, and, as a result, the farmers benefit only incidentally from the inherent high fertility of the area. Many types of farming machinery in common use in other countries would be very useful in this part of Cyrenaica, and as Italian colonisation experience has shown, these soils of the eastern Jebel are highly suitable for cropping and arboriculture.

CHAPTER VI

WATER RESOURCES

Owing to the lack of natural resources suitable for important industrial development, the eastern Jebel is at present essentially an agricultural region which can only achieve economic stability through a rational use of land. On the other hand, the development of this region depends entirely upon the utilization of water resources. In this part of the Jebel, with irregular rainfall and hot summers common to the whole of Cyrenaica, irrigation is essential to agriculture. Unfortunately the position of water resources is rather obscure at the present owing to the lack of an efficient hydrological service. Besides, no laws concerning the water development are observed or enforced at the moment.

While there are no important underground water resources, there are some springs; but it is not easy to ascertain the unsable flow of these springs because they are so intermittent. Generally speaking, it can be said that the springs are badly located for agricultural purposes because they are almost at the foot of the escarpment near the coast, where only a narrow strip of land is available for cultivation. On the Jebel, the wells are extremely scarce and the normal way of providing water is by cisterns.

Despite these unfavourable conditions, the Italian administration made considerable progress on the great Jebel aqueduct, which should have connected Ain Mara with El-Gubba, El-Marj and perhaps Benghazi. It was unfortunate that the outbreak of the war stopped the work.

Surface Waters.

There are no perennial rivers with the exception of the very small streams which flow from springs and disappear soon after, and occasional torrents which flow for a few days in winter. However, in this region, there is a considerable run-off which has special features: there are deep gorges, and because of the topography of those areas and the karstic phenomena, a large number of closed basins. Most of the basins are small; some are only a dozen metres in diameter in which temporary lakes are formed during the rainy season. Whether the water stagnates or disappears more quickly where the arid layer of earth is less thick or less impermeable, the soil is always moistened to a considerable depth. These depressions are extremely important in the study of underground water supply. In some canals have been constructed to convey excess water to the lowest point after the rainy season.[1] Another special feature is the existence, south

1. Poiger, R., "Water Resources and Development in Libya", United Nations Mission in Libya, F.A.O. Report No. 37, 1952, p.62.

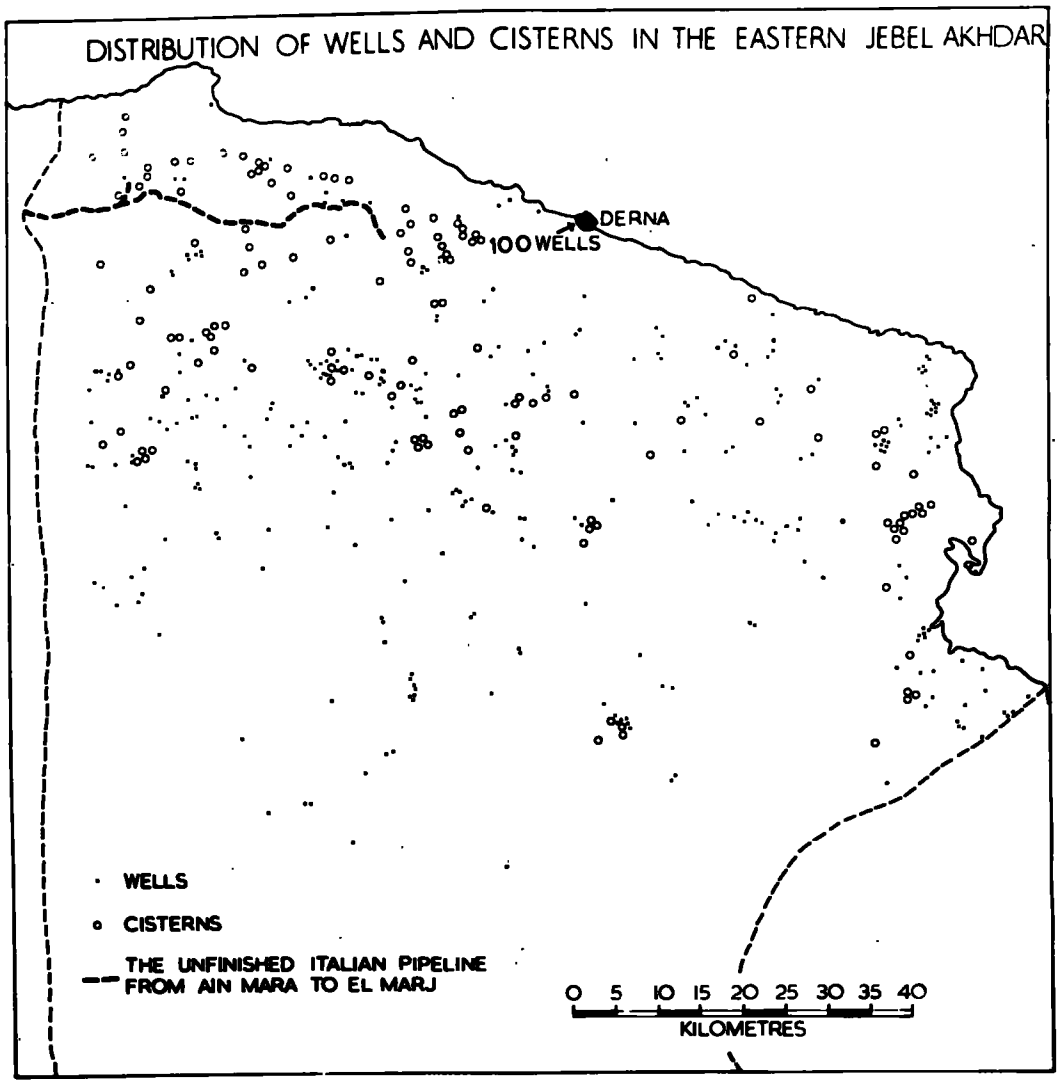
of the Jebel, of a zone where overflow waters are distributed in the Baltes. These Baltes are estimated by Dr. Pantanelli to cover 35,000 hectares.

Over the whole catchment area of Wadi Derna there is an annual average of 400 mm. giving a total water volume of 280,000,000 cubic metres. Unfortunately, the greater proportion of this runs off without being utilized in irrigation.[1]

The Greeks and later the Romans made use of the run-off by constructing cisterns in the region. A survey was conducted by the Italian services in 1927-29 and 2,300 tanks were discovered in Cyrenaica, some of which were very old (Vide Fig.14). The ground, which is pierced by natural caverns, lent itself to the construction of small tanks without offering too many obstacles. Some had a capacity of several thousand cubic metres. The Roman tank at Tubruq holds 10,000 cubic metres. The Italian Land Settlement Association (Ente per la Colonizzazione) repaired hundreds of tanks between El-Gubba and Labraq. The British Military Administration also repaired some of them which were destroyed in the course of later events; others were not maintained in good condition so that a great deal of work remains

1. Falorsi, J., Romagnoli, M., L'Oasi di Derna e il suo Problema idrico, L'Agric.Col., No.8, p. 291, Florence 1928.

Figure 14.


DISTRIBUTION OF WELLS AND CISTERNS IN THE EASTERN JEBEL AKHDAR
DERNA
100 WELLS
WELLS
CISTERNS
THE UNFINISHED ITALIAN PIPELINE FROM AIN MARA TO EL MARJ
0 5 10 15 20 25 30 35 40
KILOMETRES

to be done in these tanks in the furtherance of agricultural development. The well-known Roman reservoir or cistern of Saf Saf (Vide Plate 4A) west of Labraq is described by Gregory[1] and by Fisher, Frazer and Ross.[2]

According to Pantanelli, a tank holding 2,000 cubic metres can supply enough water for 250 head of cattle and 5,000 sheep for 200 days; this calculation is based on the fact that a family from the Apulia district of Italy, composed of from six to eight persons with their own livestock consisting of two mules, two head of cattle and fourty sheep, required half a cubic metre of water per day. apparently Cyrenaican herds, which are not watered so much in the winter time can get along on even less water. The necessary impluvium for a 200 cubic metre tank generally varies between 250 and 1,000 square metres in the eastern Jebel, depending on the rainfall.

Many writers have suggested reviving the old system of cisterns; the heavy nature of the top soil and its resistence to erosion offers great opportunity for extension of storage of run-off water in reservoirs of this kind.[3] The

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1. Gregory, J.W., "Cyrenaica", Geog.Jour. Vol.47, 1916, p.327.

2. Fisher, W.M., Frazer, R., Ross, D.V., Scot.Geog.Mag., Vol.69, No. 1 April 1953, pp. 27-29.

3. Keen, B.A., "Agricultural Development in the Middle East," p.102, London 1946.

quantity would be insufficient for irrigation on any scale, but would serve as a useful reserve for stock and domestic purposes. It is pertinent to note that the Italians made use of run-off from the roofs of their villas and farmhouses during the 1930's.

Underground Water

The initial absorbation of rain falling on a dry soil is by molecular attraction: soil permeability only becomes effective in infiltration, when the upper part of the soil has become fully moisture-charged. The amount of the precipitation reaching the water table, depends greatly on its distribution over the year. The largest contribution to the water table comes from precipitations when vegetation is dormant or non-existant.

Discharge from ground water reservoirs is by underground flow and by evaporation. Evaporation takes place when the water table rises near the surface of the soil and its' capillary zone communicates with the zone of vegetation. Water flowing underground resevoirs may help to feed surface streams, or break out on the surface in the form of springs.[1] The position of the Cyrenaiean water resources is rather

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1. Tison, J. "Hydrology". Guide Book to research data from Arid Zone Development. U.N.E.S.C.O. Frankfurt, 1957 p.76.

obscure at present, owing to the lack of an efficient hydrological service. The two documents which seemed most valuable to study water resources in Cyrenaica, were by Marchetti[1] and Pantanelli.[2]

The origin of the water supply of the Libyan Desert has been a much discussed question. Some geologists have always regarded the water as being derived from rainfall in the western Sudan, flowing underground in permeable beds towards the Mediterranean.[3] As far as the eastern Jebel is concerned, water infiltrates into the more or less permeable calcareous layers pierced by many caves. The water of these underground channels moves towards the sea. The water is drinkable, even when it flows near the sea or the sebkhas. Since the deep artesian water table is not exploited yet in the eastern Jebel, the wells are supplied by water from the first water table, as will be pointed out in this chapter.

Wells

Most of the underground water in the Jebel is deep and the wells in this region are very rare (Vide Fig.14). A

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1. Marchetti, M., "Idrologica Cirenaica" Florence 1939.

2. Pantanelli, E., "Le resorse idriche della Cirenaica" Florence 1940.

3. Ball, J., "Problems of the Libyan Desert" Geographical Journal Vol.70, No.2 August 1927. p.105.

survey in 1928 showed the following number of wells: -

First Terrace	171
Second Terrace	72
Derna Zone	7
Martuba Plain	21

After the Italian conquest, other wells were either cleaned out or repaired; most of the Italian efforts were concentrated on Marmarica where about 400 were drilled after 1933. Moreover, there are about 98 wells in Derna Town available for private use in houses, although most of these wells are not used today, since water is now available for domestic use by tapping Ain Derna. Difficulties of irrigation in some parts of Derna Town have obliged some farmers to use motor driven pumps of 2 h.p. capacity for the two wells used used for irrigation. The static level of water in the first well is seven metres and the depth from the water level to the bottom is 1.60 metres. In the second well, the aquifer is at six metres and the depth of the water is 1.80 metres. The static level of water in the western part of Derna Town varies from six to eight metres, in the southern part between sixteen and eighteen metres, and in the eastern part of the town from four to six metres. However, the wells in this region as a whole are of secondary importance, since water is available by gravity from spring sources.

The wells are usually privately owned and are part of the land upon which they are located. They are subject to personal rights of way originating in testamentary agreements or regulations. If the well belongs to a community it is subject to the peculiar customary laws of its locale. If a well exists on land owned by a single person, with the trees on the land being owned by another individual, this latter owner is entitled to one day's use of the well water in every week. In many of these cases, the land owner is compensated for the use of this water with a share in the products from the trees.[1]

Springs

According to an early Italian survey, there are about 71 springs in the eastern Jebel,[2] (Vide Fig.15). The springs have a comparatively small total flow as compared with the size of the impluvium. Generally speaking, it can be said that the springs are badly located for agricultural purposes, because they are almost at the foot of the escarpment, near the coast, where only a narrow strip of land, not always of good quality, is available for cultivation. More-

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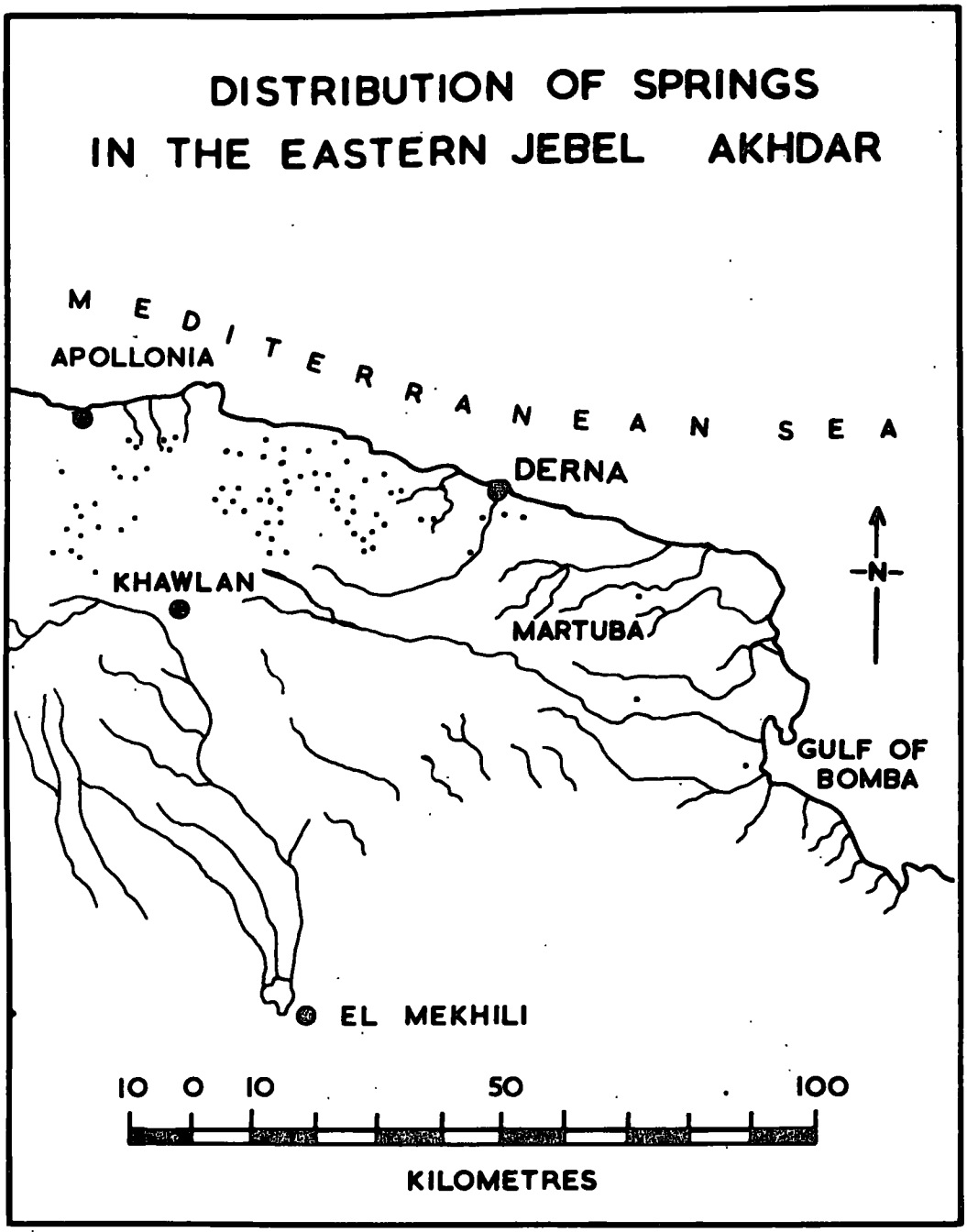
1. Caponera, D.A., in "Report to the Government of Libya on Agriculture," F.A.O., Report No. 21, p.198, Rome 1952.
2. De Agostini, E., Repertoria della principali localita di acqua (pozzi, sorgenti, cisterni) riconosciute in Cirenaica fino tutto il, 1926, Gov. della Cir., Series 2, No. 7, July 1927, Benghazi.

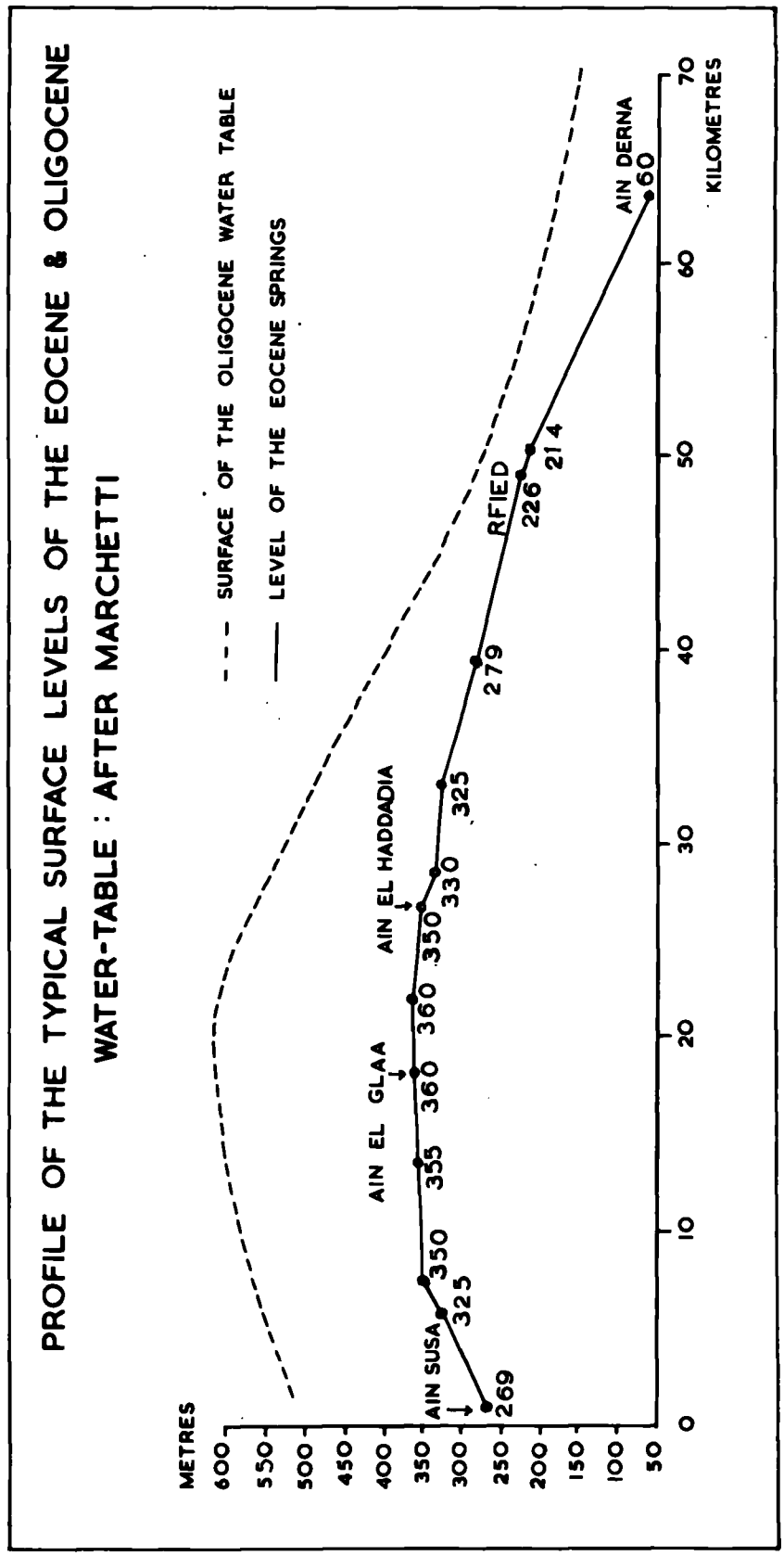
Figure I5.


DISTRIBUTION OF SPRINGS
IN THE EASTERN JEBEL AKHDAR
MEDITERRANEAN SEA
APOLLONIA
DERNA
KHAWLAN
MARTUBA
N
GULF OF
BOMBA
EL MEKHILI
10 0 10 50 100
KILOMETRES

over, some of the springs are located along deep wadis, as for instance Ain Dabbusia.

(a) Springs of the Eocene water table extend from Ain Susa (Apollonia) to Ain El-Blad (or Ain Derna) - (Vide Fig.16A), with flows of water confined almost exclusively in the bottoms of the wadis. From an altimetric point of view, it may be observed firstly that proceeding from the western spring to the east, there is an increase in altitude from 269 metres above sea-level at Ain Susa to 350 metres in the central area between Wadis Semmalus and Haddadia. A maximum height of 360 metres is reached at Ain El-Glaa, from which there is a decline in altitude towards the east to 279 metres in Wadi El-Angil spring, 214-226 metres at Wadi Rfied springs, falling to 60 metres at Ain El-Blad. However, from these altimetric differences, it may be noticed that a few of the important springs of the Eocene aquifers are situated at slightly lower altitudes than those mentioned above. The spring level is thus high and declines symmetrically towards east and west from the maximum level at Ain El-Glaa, and may be related to the symmetrical dip of the Eocene spring bearing horizon about the prolongation of the anticlinal axis of the Jebel. The continuity of the calcareous strata, i.e. of the aquifers, seems to be repeatedly marked by interruptions of two systems of faults at right angles to

Figure 16(a)


PROFILE OF THE TYPICAL SURFACE LEVELS OF THE EOCENE & OLIGOCENE WATER-TABLE : AFTER MARCHETTI
SURFACE OF THE OLIGOCENE WATER TABLE
LEVEL OF THE EOCENE SPRINGS
METRES
KILOMETRES
AIN SUSA
AIN EL GLAA
AIN EL HADDADIA
RFIED
AIN DERNA
269
325
350
355
360
360
350
330
325
279
226
214
60

each other, of which that parallel to the coast is the most influential.[1]

The number of springs increases west of Derna, especially between Ain Mara and El-Gubba, where permanent springs become common. In Ras El-Hilal area, the Eocene water table falls towards the north, and gives rise to several springs along the coast where the layers outcrop. Therefore Ain El-Barrada (2.5 metres above sea-level) probably supplies the water from Ain El-Glaa (360 metres).[2]

According to Marchetti, there is no upper Cretaceous water-table since the Cretaceous formations are marly, impermeable and the Middle Eocene spring bearing beds collect all the run-off and percolated rain water so that more of this cannot penetrate to the underlying Cretaceous. Moreover the lithological characteristics of the whole series are such that the complex of the beds between Middle Eocene and Upper Cretaceous may be considered almost impermeable. Any suggestion that water is fed to these strata by the hinterland water is untenable, not only because of tectonic activity, but also on account of the existence in the hinterland of two other impermeable horizons with their water tables (Oligocene and Langhian) overlying the Eocene

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1. Marchetti, M., op.cit., pp.118 - 121, Fig.37.

2. Ibid. p.195.

horizon. Hence it may be deduced that there is no aquifer in the Cretaceous.[1]

(b) The Oligocene water table with an altitude of 610 metres above sea-level at Sidi Bu Negela, 600 metres at Ain Cellala and Ain Aggar, declines eastwards to 560 metres at Ain Znedi, 177 metres at Ain Bu Mansur and 156 metres at Ain Wadi Bent (Vide Fig.16B).

(c) The other water table on the Jebel, which is that of the Langhian, is 825 metres high at Ain Belghes, 702 metres at El-Gheighab; then the water-table dips towards the east to 585 metres at El-Gubba, 500 metres at Ain El-Magga, and between 420-435 metres at Ain Mara (Vide Fig.17).

Details of Springs

(1) The Eocene Spring Bearing Horizon

(a) Ain Derna

Ain Derna or Ain El-Blad (Vide appendix III Table 12) is situated four and a half kilometres from the sea at the base of the western bank of the wadi of the same name. The spring is at 60 metres above sea-level and rises from a cave at the foot of the wadi bank (Vide Plate 4B). The rocks are composed of hard white limestone of the Middle Eocene.

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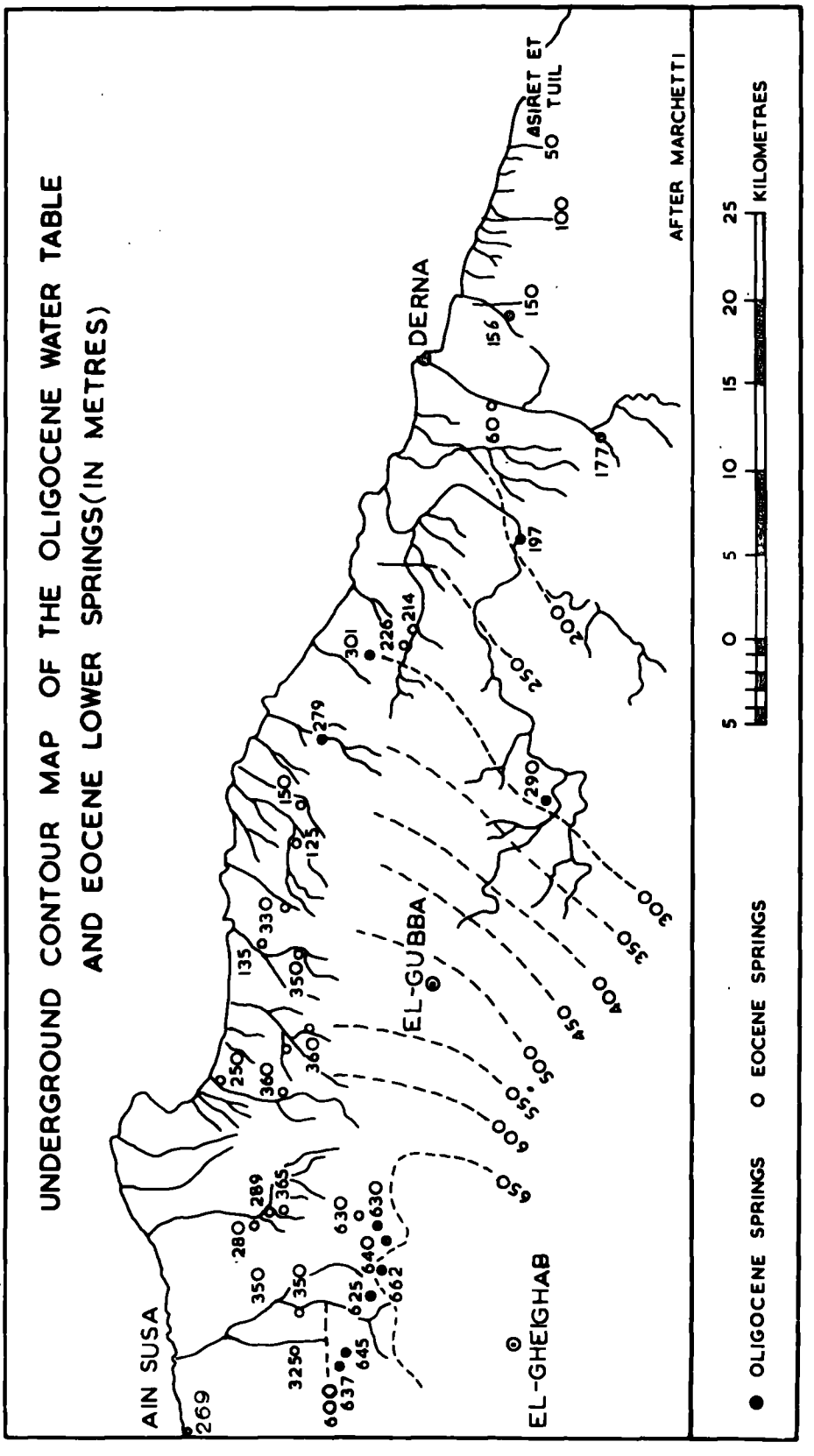
1. Ibid. p.195.

Figure 16(b).


UNDERGROUND CONTOUR MAP OF THE OLIGOCENE WATER TABLE
AND EOCENE LOWER SPRINGS(IN METRES)
AIN SUSA
EL-GUBBA
EL-GHEIGHAB
DERNA
ASIRET ET TUIL
AFTER MARCHETTI
OLIGOCENE SPRINGS
EOCENE SPRINGS
KILOMETRES

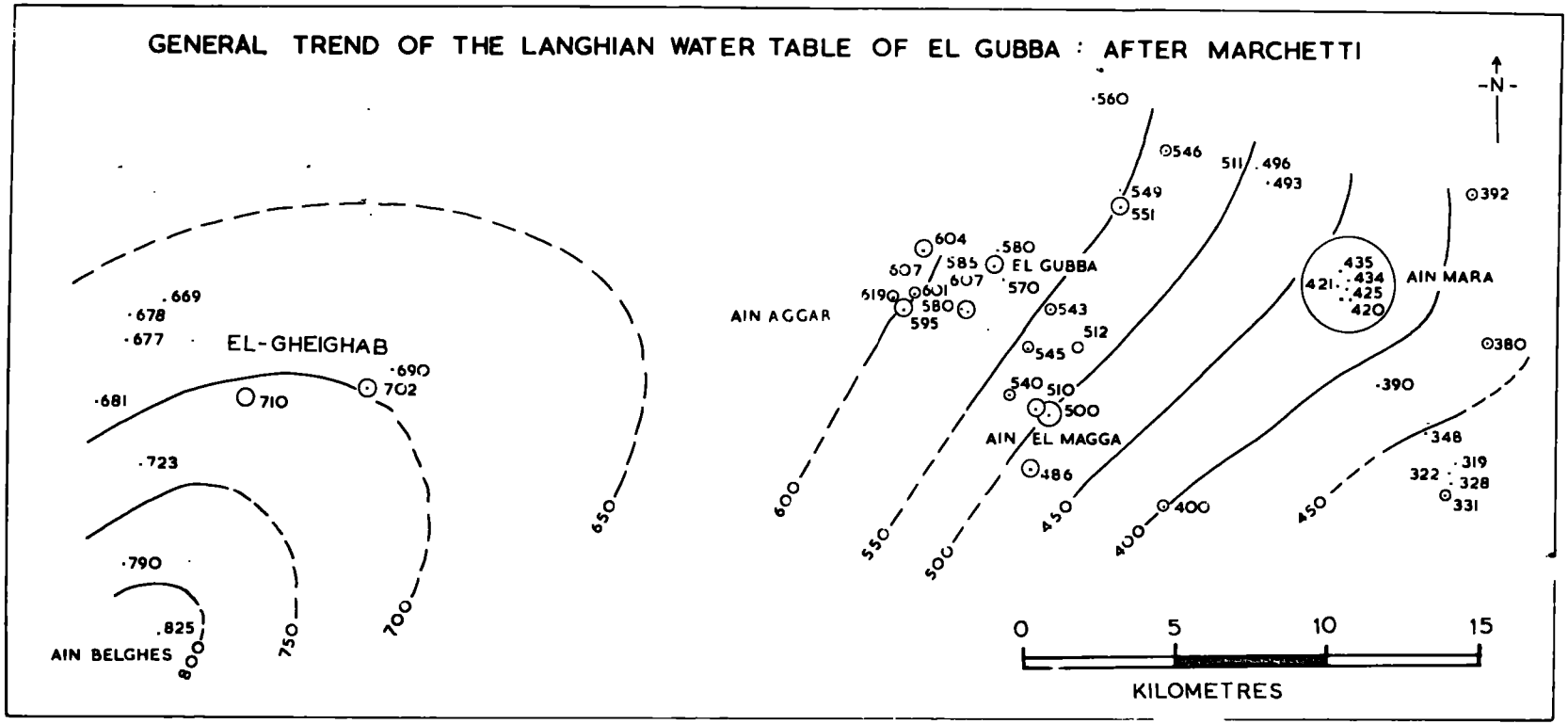

GENERAL TREND OF THE LANGHIAN WATER TABLE OF EL GUBBA : AFTER MARCHETTI
-N-
EL-GHEIGHAB
AIN BELGHES
AIN AGGAR
EL GUBBA
AIN MARA
AIN EL MAGGA
KILOMETRES
0
5
10
15

Figure 17.

The spring has been improved and covered by a hut made of walling board. The height of the supporting wall varies between 1.80 to three metres, depending upon the topography of the wadi bed. According to the official statistics, the yeild from this spring is 11,090,250 litres per day, of which only 40% is used. The water is piped down into Derna for domestic use and provides nearly all the larger households with private supply. The surplus represents about 60% of the supply, and is used for irrigation. The water flows in two pipes about eleven metres above the wadi bed. Every six months, the water is stopped so that the pipes can be cleaned. The pipes are covered to prevent corrosion and rust, so the bursting of the pipes is rarity, although it was common during the Italian Administration. Another problem facing the former administration was that the reservoir was built at a low level, causing a shortage of water in the western part of the town. Nowadays this problem has disappeared since the tank is at the highest point in the town. During the Italian Administration only six litres per second of the total yield of 250 litres per second flowed in the pipes for domestic purposes.

The surplus from Ain Derna flows in an uncovered channel for irrigation and so the problem of the flooding of Wadi Derna is faced nearly every two or three years. The sands and gravels carried by the rushing waters in the wadi cause

great damage to the channel and consequently impede the irrigation in the gardens of the town[1] (Vide Plate 5A).

(b) Lathrun Spring

The spring is situated about 36 kilometres west of Derna at 40 metres above sea-level. The spring appears out of the gravel in the wadi bed and the water flows in a channel with a yield of 7,938,000 litres per day. This source is probably fed from Ain Dabbusia, Sidi Magrun and Zaigh. The wadi is one of the few in the whole of northern Cyrenaica which has a stream perennial in nature along four kilometres of its course (Vide Plate 5B). Only between 30 - 40% of water is used for irrigation and domestic use for Lathrum village and Ras El-Hilal. The water is collected in a tank and piped to the villages.

(c) Haddadia Springs

A group of five springs is situated about four kilometres from the coast at 350 metres above sea-level. The yield from these springs is 585,445 litres per day. The water disappears in the Wadi bed and it is believed that it re-appears at Ain Lathrum. However, the waste from these

1. Wadi Derna flood in 1954 stopped Ain Derna, while 1959's flood destroyed the pipe-line completely.

springs is not used due to poor location.

(d) Ain Wadi El-Glaa.

The spring is situated about seven kilometres south of the mouth of Wadi Wl-Glaa (Vide Plate 6A). The total output of this spring is 1,077,750 litres per day. The water flows in the wadi bed for a distance of two kilometres without being utilized for domestic or irrigation purposes. It is believed that the water re-appears at Ain El-Barrada on the coast. About seven kilometres south-west of Ain El-Glaa there is a small spring in Wadi Estua with a yield of 15 ± 30 litres per second.

(e) Ain Dabbusia

The spring is situated between El-Gubba and Lathrun and it is estimated to produce between 12,000,000 and 2,400,000 litres per day. The spring is at 300 metres above sea-level, and it has not been used. As has already been mentioned, there is some difference of opinion as to whether or not the water from Ain Dabbusia, which is visible for a short distance from the cave, actually emerges at Lathrun, Sidi Magrun and Ain Seghi, of which the two former springs are being utilized. Army engineers have investigated this recently and are reported to prove that there is a single supply. In that case, only a portion of Ain

Dabbusia could be utilised at or near this spring without depriving Sidi Magrun and Lathrun of their supply.

(2) Oligocene Spring Bearing Horizon

(f) Ain Bu Mansur

The spring is situated twelve kilometres from the sea and is 177 metres above sea-level. It originates in an aquifer in the Lower Oligocene and rises from a large well surrounded by a clump of oleanders at the bottom of the wadi in the alluvium, but the rise is in strict relation to the marly ochreous horizon which may be seen for several metres away from the wadi bank.[1] The flowing water soon disappears in the gravel on the surface of the wadi, appearing again in a series of pools until the continuous perennial flow begins approximately 500 metres from the initial spring. A measuring weir (No. 1) has been constructed under the spring where the first flow (in the first week of November) gave a reading of an average yield of 397,845 litres per day; at the second weir it was 22,437,000 at the dam 15,102,000 and at the waterfall 18,773,500. Probably only 20% of the water from this spring is in use.

The water from the spring flows in an uncovered channel at Shallal (waterfall) (Vide Plate 6B) which is artificially

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1. Marchetti, M., op.cit., p.186.

levelled to 28 metres above wadi level. The channel follows the eastern bank of the wadi 35 metres above the wadi itself, then the height falls to four metres at Derna. The water is diverted for irrigation purposes in Bu Mansur quarter.

The abundant water and the high level of the channel prevent damage by flooding. It is estimated that after two and a half kilometres from the waterfall the total flow in the channel is 10,068,300 litres per day and 8,915,000 where the channel reaches the town wall. It is obvious that a considerable quantity of water is lost from the channel, however the most serious problem is that a large quantity of water is lost owing to sinking in the wadi bed, evaporation from uncovered and uncemented channels and spray loss at the waterfall.

(g) Ain Wadi Bent

The spring is situated on the western bank of a wadi bearing the same name, about 12 kilometres south-east of Derna. The spring rises at an altitude of 156 metres above sea-level with different outlets in sandy-yellow limestone layers with an ochreous and marly spring bearing horizon at the base.[1] The yield from the spring is calculated at 50

1. Marchetti, M., op.cit., p.161.

cubic metres per day. In the same area, there are some minor springs in the same horizon.

(3) Langhian Water Table

(h) Ain Mara

The name of Ain Mara is applied to a group of copious perennial springs which emerge from the Lower Miocene at the head of Wadi Mara, 25 kilometres west of Derna and fourteen kilometres from the sea. The wadi itself is in fact Wadi En-Naga, although this name strictly speaking is applied only to its own lower reaches.

It is a group of six springs: Ain Shayib, Magara, Es-Safa, Midi, Mara and Duway. They are between 435 and 420 metres above sea-level, and are distributed on the right bank of the wadi within a distance of one kilometre. The water appears from the limestone at the level of the wadi bottom and rises from a deep shaft as in a karstic spring. The water of the six springs joins up downstream and runs finally into a picturesque waterfall, indicating the upper limit of the regressive erosion, which has incised the alluvial deposits whose terrace fragments one notices going down the wadi (Vide Plate 7A). The total yield from these springs is 12,836,700 litres per day, of which only 30% is used for irrigation.

The Unfinished Italian Pipe-line from Ain Mara to El-Marj

This pipe-line was designed to carry water from Ain Mara to the agricultural villages of El-Marj (Barce) plain. It was called "El Grande Acquedotte dei Gebel" (The Great Jebel Aqueduct). The Italian scheme had ignored the neighbouring cultivable land and had made available no water for irrigation there. The general idea was to collect the water in a large tank situated among the springs mentioned above. The water was to be lifted by pumps to the pipe-line. The Italians built a collecting chamber in front of each spring at a lower level. The collecting chambers were connected to the main tank by pipes with the water reaching the tank under pressure. Inspection chambers were built to facilitate cleaning and maintenance of the pipes.

A recent investigation has shown that most of the pipes between the collecting chambers are blocked, while the chambers themselves are flooded. As a result, marshes have formed in the wadi. The operations in this project began in May 1939 and were carried forward so rapidly that in December 1940, when the work had to be broken off because of the war, all, or nearly all, the masonry had been finished and the pumping or booster stations had been equipped with power pumping plant. Only 40 kilometres were unfinished of a total water main length of 191 kilometres. The whole

water main was to consist of steel socket and spigot pipes varying in diameter from 225 - 375 mm. with sections about 10 metres long. Addison states that although when lying on the ground the piping appeared to be rather light, he had no doubt that it should be able to withstand a maximum static head of 130 metres which would be met in the part of the water main operating by gravity.[1] Moreover, the lay-out of the construction work obviously was intended to ensure the maximum protection for the pipe-line and prevent water-hammering and similar disturbances. Protection against corrosion was ensured by an inside asphalted coating and by an outer layer of concrete of five mm. thickness. The entire pipe-line was to be laid in a trench sixty to three metres deep, aligned as near as possible to the main road from Derna to El-Marj (Vide Plate 7B). At the many crossings under the road, the pipe-line was often placed in a casing or a large concrete tube to protect it against traffic vibration; in some cases however, it was merely sunk into the road foundation. Concrete man-holes placed at suitable points were to shelter the air chambers, and 155 mm. below, transversal ditches were to be dug to carry away the sludge; the concrete drain pipes were already finished.

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1. Addison, N., "Report on Ain Mara Project", February, 1943.

The construction of this water main by the Italians was planned in 1938, after having carefully studied all the springs in the region. It was decided to utilise Ain Mara springs when the analyses proved the excellent quality of the water. Tests indicated that the salinity was thirteen parts per 100,000 and total solids 29 parts per 100,000.[1] The two pumping stations were to deliver water up to the highest points of the water main (i.e. 681 metres above sea-level), where a surge tank was built 27 kilometres from the springs and six kilometres from the central reservoir of El-Gabu (50,000 cubic metres). With a total static lift of 255 metres, the central pumping station was built at Ain Mara with a storage tank of 600 cubic metres capacity (pumping yield 60 litres per second, static lift 160 metres). The booster pumping station built near Busmara (two kilometres west of El-Gubba) for a static lift of 95 metres has two storage tanks of 500 cubic metres capacity.

From the 27 kilometre point, the water system operated entirely by gravity and no further pumping was required. However, the anticipated yield had been appreciably increased to about 100 litres per second in order eventually to reach Benghazi, which was very poorly served with brackish water.

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1. Pioger, R., op.cit., p.87.

In this case springs near Wadi Esbua were tapped. According to the official figures the yield from these springs is 10,77,750 litres per day and they are not at present in use. The springs are 350 metres above sea-level and seven kilometres north of the highest surge tanks. A third pumping stations would be needed.

In 1945 Addison had to answer the question, "Is it worth while finishing the project?" and he replied that the Jebel aqueduct was intended to supply drinking water to large numbers of settlers (about 60,000) as soon as possible in the Jebel.[1] While the pipe-line was under construction and before water could be delivered, the settlers already established had seemed to manage quite well with only local water resources. All those settlers have now left and there is no question of re-settlement on a large scale. For whom then is the water intended? From the stand point of general agricultural production in the Middle East, Addison's impression was that efforts to complete the Ain Mara water system as originally planned could be expended more profitably in direct irrigation works, for instance in Syria and Lebanon. Addison had no information on the original project and had only a week to examine at close

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1. Addison, A., op.cit. p.42.

hand the whole pipe-line. It would be now possible for an estimate of the cost of completing work to be drawn up as well as for estimates for the price of water per cubic metre for different levels of consumption. There has been considerable damage to the installations. During the work on the project the Italians expelled the local tribes from the wadi and so, after the final expulsion of the Italians from Cyrenaica, the tribes returned to their wadi and their first desire was to destroy the Italian work. Hence the collecting chambers were badly damaged and most of the Italian project was destroyed. Finally of course the people of Ain Mara have a natural reluctance to allow any interference with their own water supply.

(i) El-Gubba

El-Gubba spring spurts out at the base of the rocky wall composed of coarse and fossilifereous white limestone and sandy glauconitic marl.[1] The spring is 585 metres above sea-level and yields 96,700 litres per day (Vide Plate 8A). It is estimated that between 70 - 90% of the water is never used for domestic, livestock or irrigation purposes. There is a Roman architrave supported by squared pillars near the spring, indicating its use in classical

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1. Marchetti, M., op.cit., p.108.

times. Opposite this spring at a distance of about 500 metres, there is another spring called Ain El-Surefa (580 metres above sea-level) in the same stratigraphical position as Ain El-Gubba. Pfalz had found the spring dry in July 1931 and it is possible that it is intermittent.[1]

In El-Gubba district there are twelve springs four of them situated about 60 kilometres above the bed of the north-west side of Wadi Beddahack four kilometres south-east of El-Gubba. The water for El-Gubba comes from these four springs. They are 500 metres above sea-level with an output of 477,000 litres per day, of which about 81,000 litres per day is supplied to El-Gubba. The Italians erected a concrete head, a collecting channel and also filled the crevices in the limestone above them to prevent infiltration of contaminated water. This operation is essential to confine the water because the ground is limestone, more or less fissured throughout, where over-pressure could open-up old channels now clogged, with the result that the spring may disappear or its flow may be greatly reduced.[2] Ain Tairet El-Essalem is 512 metres above sea-level, yielding 78,580 litres per day. Between 40 - 60% is used for domestic purposes, irrigation and livestock. Ain Fersella

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1. Pfalz, R., op.cit. p.10.

2. Pioger, R., op.cit., p.67.

is at 450 metres with an output of 38,925 litres per day. The other six springs in the district are of secondary importance and may be listed as follows[1]:-

Ain Umm Rekham	4 kms.	south	of El-Gubba	Yield 30 litres/sec.
Ain Miselah	9 kms.	S-E	of El-Gubba	Yield 1 litre /sec.
Ain Abu Shemal	5 kms.	S-E	of El-Gubba	Yield 1 litre /sec.
Ain El-Hati	2 kms.	S-E	of El-Gubba	Yield 1 litre /sec.
Ain Awenat	3 kms.	S-W	of El-Gubba	Yield 15 litres/sec.
Ain Mseder	3 kms.	east	of El-Gubba	Yield 15 litres/sec.

(j) El-Gheighab

There are two springs twenty kilometres south-east of Cyrene at 702 metres above sea-level. The yield is 98,090 litres per day, of which between 50 - 60% is used for local domestic supply and watering the livestock. One of the two springs has two tanks with a capacity of 15 cubic metres each. In the vicinity of the spring there is a well of no importance.

(k) Ain Khawlan

The spring is situated at a bottom of a small wadi at the confluence of Wadi Ramla with its tributaries. The

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1. De Agostini, "Repertorio etc", op.cit., pp. 105-106.

water rises from yellow fossiliferous sandy limestone.[1] The water is undrinkable and the yield is not estimated.

(l) Ain Martuba

Here there are two small springs. According to the 'Repertorio', the yield is 65 cubic metres per day.[2] Near the springs there are two wells with a depth of three metres.

(m) Umm-Rzem

The spring is situated a few metres to the east of a fort at the foot of a small scarp which girdles the northern region of the oasis. The water rises from a well with a depth of two metres. According to Marchetti, the yield from this well is twelve litres per second.[3]

Appendix III Table 12 shows the yield, utilization and the heights above sea-level of the main springs in the eastern Jebel Akhdar.

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1. Marchetti, M., op.cit., p.133.
2. De Agostini, Repertorio etc., p.107.
3. Marchetti, M., op.cit., p.100.

Ownership of Springs

The ownership of springs may fall under the two different categories as below[1]:-

(A) Mulk Property - privately owned property belonging to one or more proprietors who may acquire this right through discovery, inheritance, sale or purchase. If the proprietors are numerous, the waters are divided according to the right entitlement.

(B) Sbill Property - the springs do not belong to their users who are not of any fixed number, or of any definite group. They may be considered as public property. Those groups of individuals who have entered into territorial agreement with the public organisations which own the spring source have a generic right to use a certain amount of the water as fixed by local authorities.

Conclusion

In view of the prevailing aridity, most human and economic problems of this region centre on the question of water supply. A considerable amount of the surface water is lost every year by water rushing along the wadis to the sea or by infiltration into the limestone rocks. However,

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1. Caponera, D.A., in "Report to the Government of Libya", op.cit., pp. 198 - 199.

the Greeks and the Romans and later the Italians made considerable efforts to benefit from the surface water by establishing cisterns on the whole Jebel. It appears that systematic work on bringing back the Roman cisterns into use would enormously improve the lot of the people living in the Jebel. In years of exceptional drought, however, when the cisterns may not fill, the nomads must resort to permanent springs.

In the Jebel, there are no important underground resources, and it is useless to search for wells beyond the coast. Nevertheless, there are a number of springs of importance, but which are not fully utilized. Their utilization could bring a tremendous return for the development of this region. In the case of Derna, the most important and serious problem is that a large quantity of water is lost from two springs as a result of sinking in the wadi bed, evaporation from uncovered and uncemented channels, spray loss at the foot of the waterfall and damage by floods. However, more water will be available by tapping the springs, making use of the ancient cisterns and establishing more for the development of the region. A survey, aimed at a better utilisation of water supplies from some of the more valuable sources, should be carried out in order to avoid large

quantities of water running to waste as is happening at present. If more efficient schemes could be put into practice, large areas could, of course, benefit for irrigation and domestic water supply.

PART TWO

CHAPTER VII

HISTORICAL BACKGROUND AND THE TRIBAL STRUCTURE

The Historical and Ethnic Background to the Tribal Structure

The historical background

In the 7th century B.C., Cyrenaica came under the Greeks who established Cyrene (the modern Shahhat), and gave its name to the whole country. They also created the port of Apollonia (Marsa Susa),Barce (El-Marj), Darnis (Derna), Berenice (Benghazi) and Tenchira (Tocra). For about 500 years, the region enjoyed great prosperity owing partly to its agricultural production and partly to its trade with interior Africa. Then Cyrenaica was attached to Ptolemaic Egypt at which time Ptolemais (Tolmeita) was founded. Then the country passed from the Egyptians to the Romans in 96 B.C. In the 4th century it was attached to the Byzantine Empire. It is believed that the Romans valued the country highly. Rights of tenure, both for natives and Roman land-owners, were respected and agriculture was developed to a much higher level than that of the nomadic herds. In some parts wells were dug and in others run-off water was collected in cisterns, and Cyrenaica became the main agricultural region in Roman Libya. The

nomads remained in the country during the Roman Empire and frequently attacked the rulers. After the 4th century A.D. the Romans were less able to resist these attacks of the nomads, who had become more mobile by the use of the dromedary, so the whole of Libya suffered much in consequence.

In the 7th century A.D. the Arabs overran the country and united the whole of North Africa from Arabia to Spain, and Christianity gave place to Islam. In 1049 another Arab invasion took place, of far greater ethnic significance than the first. The vizier of the Fatimid Caliph El-Mustansir sent the two tribes of Bani Hilal and Bani Sulaim to reconquer Tripoli and Tunisia from his rebel governor Ibn-Badis. In fact, Bani Sulaim and Bani Hilal were inclined to be troublesome in Upper Egypt after they had been moved from Najd in Arabia as a result of the check of the Carmathian movement in Arabia in which they were involved.[1] The main invasion took place in 1051. The Bani Hilal passed on westwards, but the Bani Sulaim settled in Cyrenaica, where their descendants have been drifting ever since. The Arab historians have compared their migration to that of locusts or wolves as they destroyed the last traces of the ancient prosperity. Although agriculture was sorely

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1. Murray, G.W., "Sons of Ishmael"., London 1935, pp. 26-27.

hit cultivators struggled on, but from the 11th to the 16th century their lot was hard because of the prevailing anarchy.

At the end of the 16th century, the Turks occupied Libya. The Bani Sulaim tribesmen remained in Cyrenaica and many of them intermingled with the Berber nomads. As a result of their way of life, sedentary farming was practically impossible.[1] Unruly and independent, as these tribes were, they took every opportunity to provoke trouble with Tripoli where the Turkish Governor was installed. In the 18th century the Caramanlis took over the country, and during their rule, the Americans landed in Derna in 1803, with the support of the rebel brother of Yusef Pasha Caramanli, but they evacuated the town after six months. In 1835 a second Turkish Government was installed in the country. Both these regimes tried to make life in the interior a little more peaceful, but the Turks were generally content to control the coastal towns and to leave the tribes of the interior to their own devices. In their last years in Libya, they sought to improve the conditions of the Bedouin and developed agriculture. Under Ibrahim Pasha plans were drafted, but they were not put into

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1. Evans-Pritchard, E.E., op. cit., p. 48.

practice due to the Italian occupation.

The Italians occupied Cyrenaica in 1911. At first the Italians were merely able to occupy the coastal towns due to the resistance of the Arabs. Only in 1924 were the Italians able to start a colonisation scheme. In 1931 they extended their control over the whole of Cyrenaica after the resistance had died out by the capture of Omar El-Mukhtar, the leader of the tribal forces. When Italy declared war in 1940, the Arabs from Cyrenaica and Tripolitania who had been exiled in Egypt formed two battalions to fight in alliance with the British Army in the Western Desert. His Majesty's Government promised the Amir Muhamed El-Sanusi that his country should not come again under Italian domination.

In 1949, the United Kingdom transferred responsibilities to the Amir El-Sanusi in Cyrenaica, who was served by a Council of Ministers. In March 1951 a Federal Government of Libya comprising Tripolitania, Cyrenaica and the Fezzan was constituted.

Racial Elements

The ethnic composition of the population reflects the successive waves of conquest which have crossed the country. As far as is known the original inhabitants, the Berbers, remained little affected by the Greek

and Roman invasions. The Arabs who arrived in two successive waves, displaced or assimilated their predecessors who adopted Islam and the Arabic language. When the first Arabic invasion occurred, the Luata Berber tribes were controlling the whole of the Mediterranean littoral of Egypt, Cyrenaica and Sirte; and they drifted to the interior while the Arabs on the whole settled in the towns.[1]

Marabtin:- There is a difference of opinion about the origin of the Marabtin. De Agostini considers them as the remnants of the original Berber population of Cyrenaica, who were conquered by the Arabs and reduced to the condition of vassalage,[2] but it is more probable that the Marabtin are the descendants of the first Arab invaders. The word "Marabtin" has two meanings in Arabic:

a) the descendants of holy men and the first volunteers, who fought for Islam in the 7th century A.D.;

b) it may be derived from the word "Ribat" (the horse lines or garrison), for those volunteers who stopped

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1. Murray, G.W., op. cit., pp. 24-25.

2. De Agostini, A., op. cit. p. 12.

in these garrisons were called Murabitin. Murray recorded an opinion of His Majesty the Idris El-Sanusi I (the Sanusia Leader), that "these Marabtin are descended from the tribes mainly Yemenites in origin who colonised North Africa after the first Muslim invaders".[1]

The Marabtin of the Jebel fall into two classes. One class is formed by the Marabtin El-Asa (of stick) because they can be beaten with impunity, the Marabtin Al-Zibal (of manure) because they are of low origin, and Marabtin Al-Sadaga, because they pay a fee to Sa'adi tribes. The other class is Marabtin "Bil-Baraka" (with the blessing) or Marabtin El-Fatha (the first chapter of the Kuran). This latter class often claims to be Ashraf, descended from the Prophet Muhammed. The Marabtin "Bil-Baraka" do not find themselves in an inferior position, but in virtue of their descent, are privileged to live among Abaidat as equals.

The Marabtin use the earth by the grace of the Sa'adi. It is not a distortion to regard them as dependents of the Sa'adi. Each Marabtin tribe or section is attached to one of the Sa'adi tribes. They paid a fee for protection

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1. Murray, G.W., op. cit., p. 41.

and use of the land which the Sa'adi had obtained by the right of conquest. The larger groups, although they may in theory live on Sa'adi land, do in fact live independently and pay no fee to the Sa'adi. It is only the small broken up tribal fragments, who are regarded as dependents and inferiors living on sufferance on the Sa'adi land, and they are compelled to make presents to the masters of the earth and perform services to them. The more nomadic groups in the Jebel are mostly Marabtin. The Sa'adi tribes may refer to them as Marabtin of the Stick but these nomads regard themselves as independent. De Agostini calls them Marabtin "El-Bid" (those of the white earth); and Marabtin "El-Humr" (those of the red earth).[1]

Sa'adi:- They are the descendants of Bani Sulaim, and they are probably of as pure Arab stock as to be found outside Arabia; they speak no language except Arabic, practise no religion except Islam and have only Arab customs. We will examine them in more detail in the section on tribal structure.

Negroes:- Negroes and negroids are found in the northern oases of the Sahara. According to Coon, at some times during the late Pleistocene or during the periods of post-

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1. De Agostini, A., op. cit. p. 5.

pluvial climate change, the negroes and negroids had moved up and occupied the northern oases and mountains of the Sahara.[1] Kufra was a negro oasis until the Arabs took it. The white men moved down into the Sahara as swiftly riding nomads, enslaving the scattered groups of local negroes, and bringing others from the Sudan in slave caravans to cast a negroid tinge across the racial complexion of Cyrenaica, which hitherto had been wholly white man's country. Slave trading was carried on throughout Arab times. The descendants of these negroes are scattered at present in the whole of northern Cyrenaica.

Cretans:- They are an insignificant fraction in Derna and Apollonia, who came to Cyrenaica as refugees during the Turko-Greek war of 1897. They are Muslims and speak Arabic.

The Italians left the country during the Second World War and none remains.

It should be mentioned that no Jewish community exists in Derna, since all the Jews left after the events of the 1948 war in Palestine.

Tribal Structure

The generally acceptable definition of tribe or

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1. Coon,CS., "The Races of Europe". New York, 1939, p. 466.

cabila is "a large group of families descended from a common ancestor from whom the tribe generally takes its name". Hence its segments can be figured either as a series of political sections or as genealogical branches of a clan. A tribe is divided into several, generally two or three, primary divisions or sub-tribes, which owns well defined portions of the tribal territory; each sub-tribe has its "watan" (homeland), its soil, its arable land, its pasture and its wells. Under the main divisions of the tribe there are Ailat and Biyut. The Ailat (sing. Aila) are the lineages in which the clan is divided and hence the sections of a tribe of various sizes in which these lineages are found and after which they take their names. Biyut (sing. Bait) are small lineages or extended families, with a depth of five or six generations from the present day to their founder.[1]

The tribal lands are vested in the tribe. The kinship among the sub-division or extended family group is the basis of the tribal life. The tribe may be the residual owner of land and water, the Biyut are the owners in use. The members live in the same stretch of the

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1. Evans-Pritchard, E.E., op. cit. p. 57.

tribal territory, move during the rains to the same grazing grounds, use the same wells during the same season and cultivate adjacent strips of land. Each section of the tribe has its Shaikh and this shaikhship is generally hereditary in certain families.

The tribal organisation gives the individual some degree of assurance no matter how adverse the harvest, as he will receive some degree of assistance from other members of his tribe. Even more important, perhaps, than material assistance is the feeling that he can look to his tribe for support and assistance should he come in conflict with members of another tribe. Tribal disputes are relatively common. However, tribal organisation also seems to diminish the incentive to improve individual standards of living through efforts separate and apart from those of the tribe.

There are a considerable number of Arabs who have left their tribe and have migrated to the towns of Benghazi and Derna in search of work. Most of these workmen still retain some tribal affiliation; only a few are so completely alienated from their tribal connections that they could not go back to their relatives and friends in the tribe and secure some assistance should extreme-

ly difficult times befall them.

According to the official statistics,[1] the volume of migration to the town of Derna in the year 1947 was 460, while in 1957 this had fallen to 268. In 1948 the high rate of movement may be accounted to the fact that the displacement of the tribes from the Italian settlement areas was still effective and no scheme for the transfer of lands from the E.N.T.E. to the tribes had been arranged. Since the better grazing lands were closed to them, the Arabs had to find economic outlet elsewhere, and the migration to the towns offered the easiest line of resistence. In 1957 the number of migrations dropped by half the 1947 figure since the transfer of the ex-Italian settlement areas to the tribes had been completed. There was a corresponding tendency for the tribes to become more sedentary and for cropping activities to increase at the expense of nomadic pastoralism.

The peoples of the Jebel who move to Derna Town tend to congregate in the Mughar quarter or the Jebela quarter, where they are able to take over cheap housing or build shanties in the southern part of the town. Many of the immigrants into Derna take up employment in the offices of the Mutasarrifiya or in the schools. The monies they

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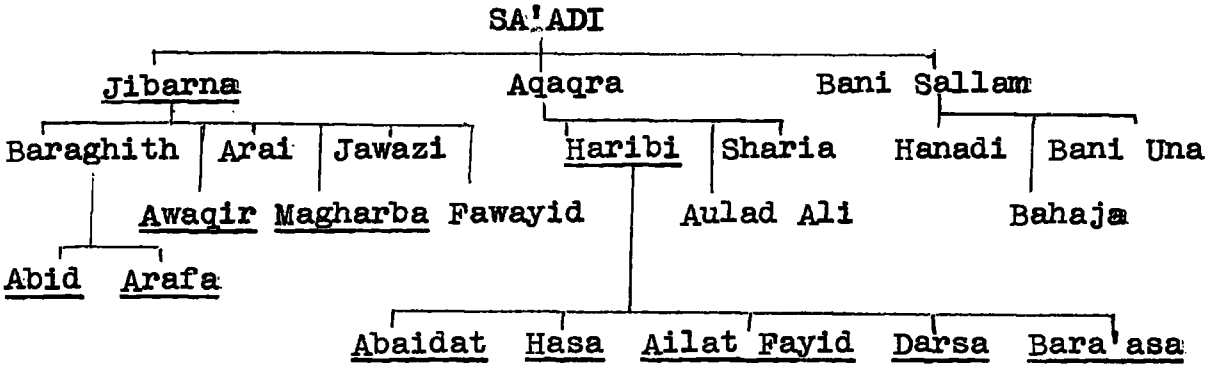
1. Municipality of Derna and Mutasarrifiya Offices.

earn are usually remitted to their relatives in the tribal domains, who can buy sheep, goats or camels on behalf of the family or the individual concerned.

Abaidat:- They are one of nine Sa'adi tribes who live in northern Cyrenaica. The Sa'ada of Bani Sulaim are said to be so-called after Sa'ada their ancestress. The Sa'adi in Cyrenaica are divided into two main branches, the Jebarna and Harabi. The Jebarna tribes are Magharba, Abid and Arafa. The Harabi tribes are Abaidat, Hasa, Ailat Fayid, Bara'asa and Darsa. These tribes are shown in Table 13, which presents them as tribes and not in the genealogical fiction of proper names.[1]

Table 13:- TABLE OF THE WHOLE OF THE SA'ADI TRIBES



(Tribes underlined are the Tribes of Cyrenaica)

Aulad Ali, who have a fraternal relationship to the

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1. Evans-Pritchard, E.E. op. cit. p. 49.

Harabi, lived in eastern Cyrenaica about a century and a half ago, were compelled to migrate to Egypt by pressure from the Harabi, who received support from the Caramanli rulers of Tripoli. Today they occupy the Mediterranean littoral from Sallum to Alexandria. Another branch of Sa'adi live in Egypt. They are Bani Sulaim. In this study we will deal only with the Abaidat tribe and their associated Marabtin, since this tribe occupies the whole region concerned in this study.

The Abaidat are the largest tribe in Cyrenaica in both numbers and territory. Their territory together with that of the associated Marabtin groups runs from the Egyptian boundary, where they meet their cousins Aulad Ali, to the centre of the bulge in the Cyrenaican peninsula, (east of Apollonia), where their lands march with those of the Hasa and Ailat Fayid tribes. This block is broken by a track of land around Derna owned by the citizens of that town. Table 14 shows the main ancestors from which the Abaidat descend: Uaar, Aukal, Shahin, and Muhamed Bu Sharia. The descendants of the latter are now in Egypt.[1]

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1. De Agostini, A., op. cit., p. 110.

Figure 18.

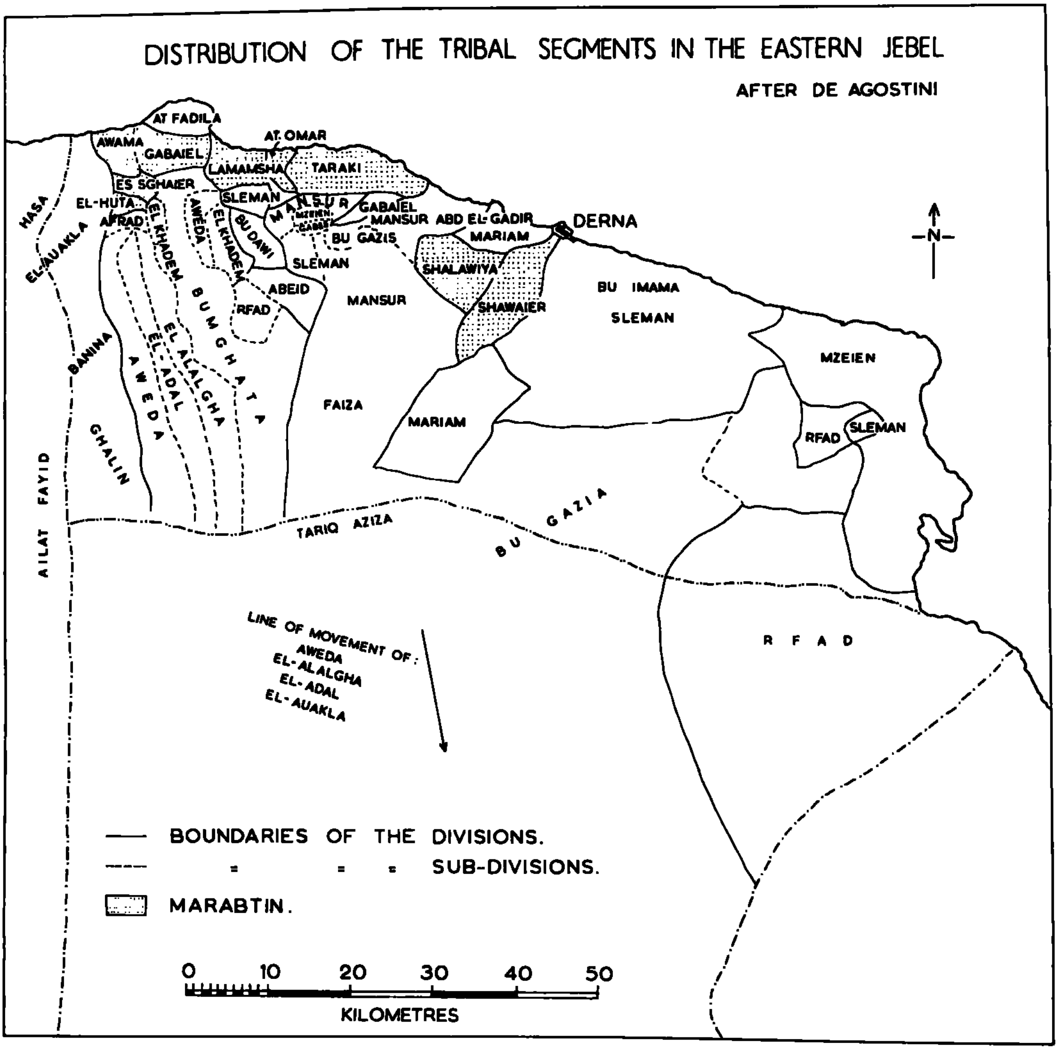
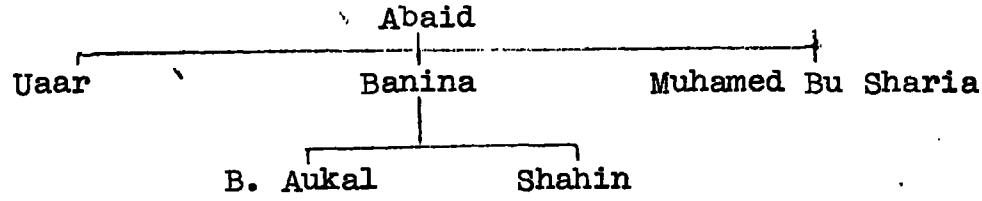

DISTRIBUTION OF THE TRIBAL SEGMENTS IN THE EASTERN JEBEL
AFTER DE AGOSTINI
AT FADILA
AWAMA
GABAIEL
AT. OMAR
LAMAMSHA
TARAKI
ES SGHAIER
SLEMAN
MANSUR
GABAIEL
MANSUR ABD EL-GADIR
DERNA
N
HASA
EL-HUTA
AFRAD
EL KHADEM
AWEDA
EL KHADEM
BU DAWI
BU GAZIS
MARIAM
EL-AUAKLA
SLEMAN
SHALAWIYA
ABEID
BUMGHATA
RFAD
MANSUR
SHAWAIER
BU IMAMA
SLEMAN
BANINA
EL-ADAL
EL-ALALGHA
AWEDA
MZEIEN
FAIZA
MARIAM
GHALIN
RFAD
SLEMAN
AILAT FAYID
TARIQ AZIZA
BU GAZIA
LINE OF MOVEMENT OF:
AWEDA
EL-ALALGHA
EL-ADAL
EL-AUAKLA
R F A D
BOUNDARIES OF THE DIVISIONS.
" " " SUB-DIVISIONS.
MARABTIN.
0 10 20 30 40 50
KILOMETRES

Table 14:- TABLE OF THE ABAIDAT TRIBE IN CYRENAICA



(a) Ghaith Group

They are one of the main groups of the Abaidat tribe. The Ghaith group has four sub-divisions;

(1) Bu Mghata:- They are composed of three Ailat, and are well known because of the vast territory which they occupy, and their numerical strength. They are semi-nomads and occupy a strip from south of Ras El-Hilal to the southern slopes of the Jebel. (Vide. Fig. 18).

The Marabtin associated with Bu Mghata are Lamamsha, Swana'a, Mserat and Shawaier of whom some are cultivators.

(2) Aweda:- At present they are the head of the Ghaith group. Composed of four Ailat, all of whom are semi-nomads except Ailat Madi and the Marabtin, they live in Tert, El-Ghaighab, Khawlan and El-Ezziat. The associated Marabtin are El-Huta and Lamamsha.

(3) Afrad:- They are descended from three sons of Ghaith and they are composed of different elements. According to De Agostini they are Arabo-Berber.[1] They live in the area north of Tert and are sedentary people. The associated Marabtin are Swana'a and Es-Sghaier.

(4) El-Khadem:- They are divided into two Ailat, Bu Tahia and Ailat Aman, and are sedentary. They live in Bashara, Gasr El-Tawil and Lamluda.

There are two minor groups of Ghaith, Ailat El-Alaga, who are semi-nomads and live in the area between Tert and Sidi Bu Dra'a, and Ailat El-Adal who live around Tert, Buerat and El-Ezziat.

(b) Bu Imama Group

This group has four sub-divisions:

(1) Mansur Abd El-Gadir:- They are semi-nomads and occupy the area between the coast and north Mansur Faiza territory, and some of them are to be found around Umm-Rzem. The associated Marabtin are Ailat Awama, Zalil, Eghab and Saiet.

(2) Mansur:- They are smaller in number than the first sub-division and in dispute over the land and authorities in the zone. They are distributed in the

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1. Ibid., p. 126.

territory south of Mansur Abd El-Gadir. This sub-division exhibits the characteristics of sedentary people. The associated Marabtin are Awama Saiet and El-Hirat.

(3) Sleman:- They live in the territory east of Derna and are semi-nomads except for the Embarka who occupy the area to the north of El-Gubba. The subsidiary Marabtin are the Lamamsha, Shalawiya, El-Huta, Gutaan and Shawaier and they form half of the population of this segment.

(4) Bu Gazia:- They are sedentary and live north of Bu Imama territory. The dependent Marabtin compose half of the population and are made up of Taraki, Shalawiya, Awama, Masamir, Swana'a and Gabaiel.

(c) Mariam Group

This group has two sub-divisions, Habib and Mansur. The descendants of the latter are living in Marmarica and Egypt.

Habib:- They are composed of four Ailat and live in the territory east of Jebel Akhdar, and west of Derna Town. The subsidiary Marabtin attached to this segment are Hasana, Awama, Tuagir of Derna and Gutaan.

(d) Five Minor Units of Uaar

(1) Rfad:- There are different opinions concerning the origin of the Rfad. According to De Agostini, they are Arabo-Berber,[1] but local sources indicate that the Berber descent is vastly predominant. They are scattered in many areas, south of El-Gubba, Umm-Rzem, Wadi El-Maallegh, Abu El-Farayis (on the Gulf of Bomba) and limited numbers are located around Derna. They are sedentary and associated with them are the independent Marabtin of Shalawiya who live in the area between Derna and Ain Mara.

(2) Bu Dawi:- They occupy the area between El-Gubba and Bashara (north of El-Gubba) and are sedentary people.

(3) Ailat Gabes:- They live in the area north-east of El-Gubba and are sedentary.

(4) Ailat Abaid:- They are settled and live south of El-Gubba.

(5) Ailat Mzeien:- A century ago they were living north of El-Gubba and Beit Tamer. At present their territory is Ras Et-Tin and they are sedentary. The associated Marabtin are Shawaier and Awama.

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1. Ibid., p. 156.

(e) Banina Group

This group is divided into El-Auakla and Shahin.

(1) El-Auakla:- They occupy the western strip of Abaidat tribal territory and since they are nomadic Bedouin they wander on the southern slopes of the Jebel in El-Mekhili and El-Ezziat. The joint Marabtin to the El-Auakla are Masamir and Taraki who live on the coast in Lathrun and Chersa.

(2) Shahin:- They are more mobile and live in the territory south of El-Auakla.

Table 15 of population was given by De Agostini from information gathered in field survey in 1922, and summarises the tribal situation of eastern Cyrenaica at that time.[1]

Table 15:- POPULATION TABLE, 1922

Group	Abaidat	Marabtin	Total
Ghaith	5840	2410	8250
Bu Imama	6120	2760	8880
Mariam	2340	700	3040
Minor Units of Uaar	3490	1650	5150
Banina	4060	1070	5130
Total	21850	8600	30450

1. Ibid., p. 173.

Unfortunately there are no equivalent data today, but Table 16 shows the number of sedentary and nomadic peoples according to the census of 1954.

Table 16:- POPULATION 1954

Settled	20,415
Semi-nomads	11,506
Nomads	3,965
Total	35,886

CHAPTER VIII

SETTLEMENT, COMMUNICATIONS AND ADMINISTRATION

In the eastern Jebel, the mountain and the plain, the forest and the steppe, the terra rossa and the sandy soils present clear environmental contrasts. Sedentary life and nomadism form a corresponding human juxtaposition. The topography of the area is also a very important factor in settlement; the broken country for nomadism and the plain for urban settlements. The urban element stands apart from the rural. There is no strong connection between them; but of the two, the town is more dependent upon the country than the country on the town. The town was created as a centre for commerce and exchange. On the other hand, the Bedouin of this area do not supply the towns with raw material for industry and have no major part in the economic activity of the towns. The distribution of water resources, vegetation and rainfall, which is liable to much variation from one year to another, has taught the Bedouin that experience provides the best means of survival. The Bedouin are more or less self-sufficient and import few of the necessities of life from outside. During the Italo-Sanusi war, however, they started to trade with Egypt.

There is therefore a clear distinction between the Bawadi, the people of the tents and the Hadar, the townsfolk. Profound differences of culture, outlook and ethnic origin divide the two. The latter are in the main of Tripolitanian origin, while the former are descended very largely from the Arab invaders of the eleventh century as has already been pointed out. In this sense, the settlement will be classified as follows:-

(1) Urban Settlement

(2) Rural Settlement - a - Nomads who live in tents
- b - Semi-nomads who live in tents
- c - Settled population who live in Hoosh, tin houses, zariba, caves, Italian farmhouses, former Italian villages and market places.

(1) Urban Settlement

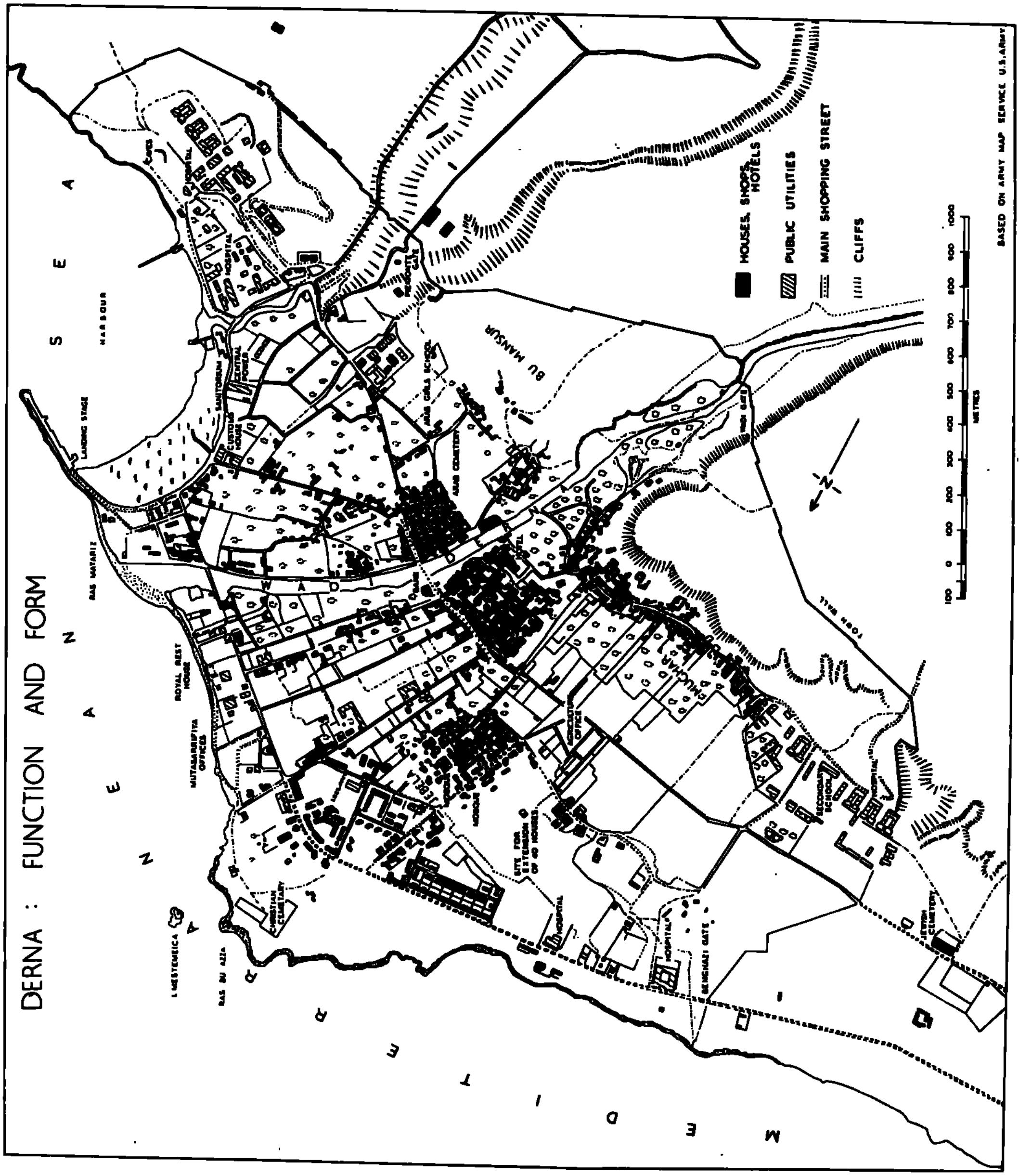
Derna Town

The town of Derna is situated on the delta fan of limestone gravel at the mouth of Wadi Derna at the eastern extremity of the small plain covering an area of one and a half square miles. The escarpment is some distance inland,

and as a result, communications from Derna are forced away from the coast and there is a difficult section of road known to the natives as Uqba both east and west of the town. On the other hand, the escarpment is beneficial in protecting the town from the southern hot winds (Ghibli).

Derna is found in latitude 32, 45', 43" north and longitude 22, 39', 20" east. The modern town stands on the site of the ancient Darnis, from which the Arab name is presumably derived. It was created by the immigrants from Thera in 650 B.C. There are the remains of a church east of the town known as 'Kanisa' which was probably destroyed by the Arabs during the first invasion in the seventh century A.D. It seems that the town continued to be occupied throughout the Arab period, but was given new life through the settlement of Muslim refugees from Spain at the end of the fifteenth century. According to tradition, towards the end of the seventeenth century the town was developed by a certain Muhamed Bey, who organised the irrigation from Ain Derna and built the great mosque and other public works. The population was much increased by the settlement of families from the coastal towns of Tripolitania. Most of the immigrants were Tuagir (from Tagiura), Msarta (Misurata), Zliten and some Kologlia

Figure 19.


DERNA : FUNCTION AND FORM
HOUSES, SHOPS, HOTELS
PUBLIC UTILITIES
MAIN SHOPPING STREET
CLIFFS
METRES
BASED ON ARMY MAP SERVICE U.S.ARMY
M E D I T E R R A N E A N S E A
HARBOUR
BU MANSUR

families from Benghazi. These Tripolitanians were sent by the Caramanli Governor of Tripoli to support the Abaidat tribe against Aulad Ali, who were compelled to flee to Egypt. Some of the Tripolitanians came to Benghazi, where they settled temporarily before moving to Derna because of a dispute with the tribes living around Benghazi. These immigrants settled in Derna and founded the bulk of the middle class which controlled commerce, while the poorer people comprised the working class. However, all these immigrants are called Magharba (the western people) by the tribesmen. When the Americans landed in Derna, they received support from some of the Magharba, especially the Msarta.

The town is surrounded by a wall built by the Italians to replace the ancient Turkish walls and to defend the town against the Arab forces during the Italo-Sanusi war. The town is not easily defended from the sea, but it is protected from the south by the escarpment, although not of course from troops armed with artillery. It is estimated that the town within the walls covers an area of 160 hectares. Derna is well known in Libya for its cultivated gardens, particularly those attached to the houses. The position of the town between sea and escarpment, its palm trees,

bananas and the perennial slowing waters, all these make Derna a magnificent spot, called by the Italians 'La Perla della Cirenaica'.

The town is divided into four quarters:- (Vide Fig. 19).

(A) Bu Mansur Quarter - situated to the east of Wadi Derna and carrying the name of Sidi Bu Mansur El-Faris, who was buried there and whose mosque was established three hundred years ago. There are five zawiyas in this quarter and a cemetry beside the wadi bank.

The inhabitants of this quarter are of Tripolitanian origin, from Tagiura and Zliten. The Msarta used to live in this quarter but they moved to Mughar quarter during the landing of the Americans in 1803. Table No. 17, which shows the number of the population of Derna in 1922 also indicates that Bu Mansur quarter was then the most populated one in Derna (8400); it remains so.

This quarter is cut by two small wadis, Luggati and El-Furtas. (Vide Plate 8b). To the east of the former wadi stands the hospital near to the sea. To the north of the quarter there is the central power station which supplies Derna with electricity. Further east of Bu Mansur there are the Libyan Army barracks, which were built by the Italians, occupied by the British after the

war 1939-45 and eventually handed back to Libya since independence. All these indicate that the eastern part of this quarter was for the extension of public utilities and military installations.

The houses of this quarter are typical of the Libyan hoosh, which is built of stones, with one floor and one or two windows. The roof is flat and often used to dry dates.

(B) Mughar Quarter - it is situated at the south-west of the town and it bears its name because of the caves, which are hollowed in the higher part of the terrace. There is a very serious housing problem in this quarter since most of the poor families of the working class live in these crude structures. These caves are indeed the black spots of Derna. There is another type of housing at the lower part of the terrace with gardens in front. The houses are located on a straight line from east to west and every house has climbing vines, which are a characteristic feature of Derna (Vide Plate 9a). With the exception of the people who live in the caves, the householders of the quarter owning gardens are usually part-time farmers, who work in the offices of the Mutasarrifiya and other public works department.

The people living in this quarter are from Misurata. There are also a few families of Tunisian origin, from the island of Jerba, This latter group is known as Khawanis (of the fifth section of Abathia), but, in fact, at the present day, most of them are Malakites. There is a mosque, established for 400 years, two zawiyas and three Marabutts of Moroccan origin. The topography of this quarter does not favour any extension, since the ground is broken by sharp changes in slope.

(C) El-Blad Quarter - it is the centre and the oldest part of the town. It is populated by families of different origin, and the Jewish community was concentrated in this part of the town before 1948. The people living in this quarter usually are shop-keepers, officers of the Mutasarrifiya and merchants. The main shopping street is Shara Es-Sur (Ex. Via Centia), which separates El-Blad from Jebela quarter. The bazaar is also situated in this quarter, where the Bedouin get their necessities. At the southern end of the bazaar stands the offices of the Municipality of Derna. In this quarter are the great mosque, Roman Catholic Church and the synagogue, as well as the hotels.

The solidly built shops and homes of this part of the town date mostly from the time of the Turkish occupation.

The narrowness of the zanghets (lanes), with the limited window space, means that many of the ground floor living rooms lack both light and air. The best housing accommodation in this part of the town is among the buildings constructed on the Turkish style. The outer wall of the house rises from the street or lane, and the outside windows are barred and shuttered for reasons of security as well as the privacy of women. The house plan is square with an inner courtyard into which all the rooms open, and the walled, flat roof is usually used for drying dates and sometimes for sleeping in the summer. A balcony is at the front wall of the upper floor. This type of the housing structure enables women to enjoy the sun and the air secluded from observation.

(D) Jebela Quarter - to the north and west of the town, most of this quarter is cultivated. The people living in this quarter are of Tripolitanian origin, i.e. from Zliten and Tagiura. According to De Agostini, the quarter was evacuated after the pestilence occurred in the last century.[1] The northern part of Jebela quarter was designed by the Italians as a garden city and built on the Italian

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1. De Agostini, A. op. cit. p. 432.

style with villas and houses of two or three floors, each floor with two separate appartments, and a balcony around the front of the houses. These houses were occupied by British officers after the Italian occupation was ended, but after the British evacuation of Derna in 1954, they were replaced by Libyan officers and Egyptian teachers. About 50 metres from the sea-shore stand the Mutasarrifiya Offices, the court and the Royal Rest House. Further south there is the post office. The growth of the town towards the western part of this quarter, where at present the authorities are building forty houses of one floor for the Mutasarrifiya employees. The topography of this part of the town is suitable for these extensions. At the western end of the Jebela quarter there are two hospitals and the meteorological station. The secondary school, the former British Barracks, is situated at the south-west of this quarter. (Vide Plate 9b).

When Della Cella visited the town in 1816, the population had been reduced to 500 from an original 7,000 by plague.[1] In 1911 it was about 9,500. The following table has been given by De Agostini showing the population

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1. Della Cella, op. cit., p. 177.

in each quarter in 1922, and the country from which the people came (excluding the Italians).[1]

Table 17:- POPULATION OF DERNA IN 1922 AND THE COUNTRY FROM WHICH PEOPLE CAME

	QUARTER OF DERNA				
Place of Origin	Bu Mansur	Jebela	El-Blad	Mughar	Total
Tagiura	3000	400	240	-	3640
Zliten	1040	770	340	30	2180
Misurata	80	50	150	1000	1280
Orfella	-	-	-	350	350
Kologlia	250	140	200	90	680
Tunisia	30	10	-	150	190
Abaidat & Marabtin	400	30	20	140	590
Others from Tripolitania & Cyrenaica	-	60	30	260	350
Refugees from Spain	-	-	50	-	50
Cretans	10	30	70	-	110
Native Muslims	4810	1490	1100	2020	9420
Jews	-	10	240	-	250
Total	4810	1500	1340	2020	9670

1. De Agostini, A., op. cit., p. 433.

Unfortunately there is no data available at present for each quarter, but in 1947 the total population was 15,413. In the census of 1954 it was 15,891, rising to 17,109 in 1957 and 17,514 in October 1958.[1] According to the census of 1954, about 43% of the total population of the Mutasarrifiya of Derna are living in Derna Town.

Commerce is important, since Derna is a transit town between Cyrenaica and the Southern Province of U.A.R., Egypt, for goods and livestock trading. Derna is also important because most of the exports of livestock to Malta, Greece and Italy go from Derna Harbour. The fisheries also give the town some activity since the Greek fishermen come to Derna under licence from March to April and again in September, October and November, when their catch is weighed and taxes exacted. The town is also concerned in the transport of pilgrims to Mecca and students to Egypt.

Unemployment in Derna is, however, a serious problem particularly since the evacuation of the British in 1954, when about 300 workers lost their jobs. However, some of these workers have been employed in the scheme for the construction of a federal capital at Beida, or have moved to Tubruq, where there is a chance of work with the British Army.

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1. Source-Municipality of Derna.

Derna is an ideal place for exploring tourists. Situated as it is on the eastern end of the Jebel Akhdar, Derna and its environs have much in the way of scenery and unspoilt native life to offer the visitor. It is well served by a system of modern roads which open up the beauty spots of the Jebel Akhdar to the tourist.

(2) Rural Settlement

(A) Nomads:- The population of this category lead a typical nomadic life and live outside the areas of cultivation on the Jebel and the southern slopes. They must migrate in search of pasture for their flocks and practise shifting agriculture. They are distributed in the areas around Khawlan, El-Mekhili, El-Ezziat and around the Gulf of Bomba. Although these nomads have their own centres and an area considered to be their own, they leave such areas for long periods and move great distances. They generally move towards lands where rain has fallen and sometimes settle down their without returning to their original centres. Illiteracy and lack of sanitation are two factors unavoidable for them in the conditions under which they make their living. According to De Agostini,[1] 5% of the population of the Mustasarrifiya of Derna in 1922 were nomads, while

1. De Agostini, op. cit. p. 173.

in 1954 at the time of the census the nomads represented 11%. The latter figure is probably the more accurate, since the former figure was based on a very rough survey. In the eastern Jebel, the Shahin division are the typical nomadic people amongst the Abaidat tribe.

(B) Semi-nomads:- The population of this category is concerned mainly with dry-farming. The area of land owned by the semi-nomads varies, but the average family owns about three hectares. Apart from this, every tribal division has a large area of grazing land. During the grazing on the southern slopes of the Jebel and the Es-Seruāl region, the families of any division are widely scattered to such an extent that the families of a fairly small division, of say about 700 persons, may be spread over an area of 30 kilometres in diameter. The Bedouin naja (Arabic: camp) is usually pitched in hollows or on the slopes of wadis and their feeders for shelter from rain and wind. On the Jebel, the camp is hidden in the forest. The semi-nomads are almost continuously mobile, but their movements are generally confined either within their own zones or within the area of their administrative districts. Only in drought years are they compelled to move outside such limits. Even then they return after a

very short time to their usual place of residence. The vast majority of the population in this category are illiterate. According to the census of 1954, about 32% of the total population of the Mutasarrifiya of Derna are semi-nomads, which is the same figure as given by De Agostini in 1922.

The nomads and semi-nomads live in tents. (Vide Plate 10a). The tent is called Beit Shaar (hair house), or often simply beit. The covering is composed of strips of coarse cloth woven from black goat's hair. Each strip is about three-quarters of a yard in breadth and runs the full length of the tent, of very variable length. Six or eight of these strips are stitched together to form a covering which, when new, keeps out even torrential rains. The Bedouin generally orientate their tents with the back-walls to the prevailing north-west winds. The large tent has two poles in the centre and another two, one each side. The tent is separated into two portions, one being for women while the other one serves as a guest room. From the point of view of health, there is little doubt that the tent life of the Bedouin, with the exposure to the elements, results in the building of hardy men and women, able to withstand considerable privation.

(C) Settled Population:- This category comprises the people who are living in a fixed place of residence during the major part of the year, from which they do not move except occasionally or during the seasonof cultivation, harvesting or grazing. Most of the settled population are engaged in cultivation on private farms or on the former Ente farms. The hoosh is the main residence. Many of the farmers in this category send one of their number to the Barr (Es-Seruel region) for the ploughing, a distance of about one hundred kilometres. The plot cultivated by the farmer varies greatly from one hectare to thirty, its cultivation depends on rainfall, human and animal labour and the amount of seed at the disposal of the family. Consequently the whole of the plot is not necessarily cultivated in any one year.

This category of population, with the dwellers in Derna Town, forms 57% of the total population of the Mutasarrifiya of Derna.

Types of Stable Dwelling.

(a) Hoosh:- The hoosh or house is a rectangular, solidly built structure of local stones or mud depending on the wealth of the owner. The majority of the houses in the rural areas are built with mud. Apart from the roof, which is of straw mats or brush supported by wooden beams and

plastered over with mud, the entire house walls are built of mud. The house usually contains two or three rooms with one floor. The outside door is crudely constructed and has some kind of lock for the security of the family's possessions. Each house has a square court-yard, which serves sometimes as a kitchen. The house usually stands on the plot where the owner cultivates. This type of housing is found in the villages of El-Gheighab, Khawlan, Martuba, Umm-Rzem and Timimi, where the native settlement was not affected by Italian developments.

(b) Tin houses:- The building material of these houses, inhabited by the very poor, consist of flattened-out petrol cans, now brown with rust, although some attempts have been made to whitewash the outside walls. Each house contains one room, in which the whole family is packed. This phenomenon in housing increased after the Second World War.

(c) Zariba:- It is a brushwood hut made of the branches of the trees, and is usually occupied by poor bachelors or widowed men or women.

(d) Caves:- There are a few families living in caves, which were tombs of the Roman period in the El-Gubba area. The tombs are hollowed in the rock and usually the inhabitants

use a wooden door at the entrance of the cave, and surround it by a fence of tree branches or flattened petrol cans (Vide Plate 10b).[1]

(e) The Italian Farmhouses:- As already mentioned, the Ente per la Colonizazzione della Libia established houses for the Italian colonists on the Jebel. They are scattered widely over the whole area colonised, (Vide Plate 11a). These one-storey houses were built of stones, and contain three rooms plus a cow-byre, storehouse, manure and silage pits. After the Italian evacuation and Arab occupation of the houses, they declined to a very poor state; the windows were broken and the doors stolen. It was a common sight on the Jebel to see the Bedouin in his tent while the farmhouse was used as a stable. The Provincial Government in 1954 repaired the houses and distributed them to the owners of the land. But the lack of investment and experience, and the poverty of the farmers are the main problems. Moreover the psychology of the nomads and the semi-nomads in resisting any scheme of resettlement is a serious obstacle. The farmers usually cultivate just cash crops i.e. wheat, barley, chick peas and lentils, ignoring the tree crops which need experience,

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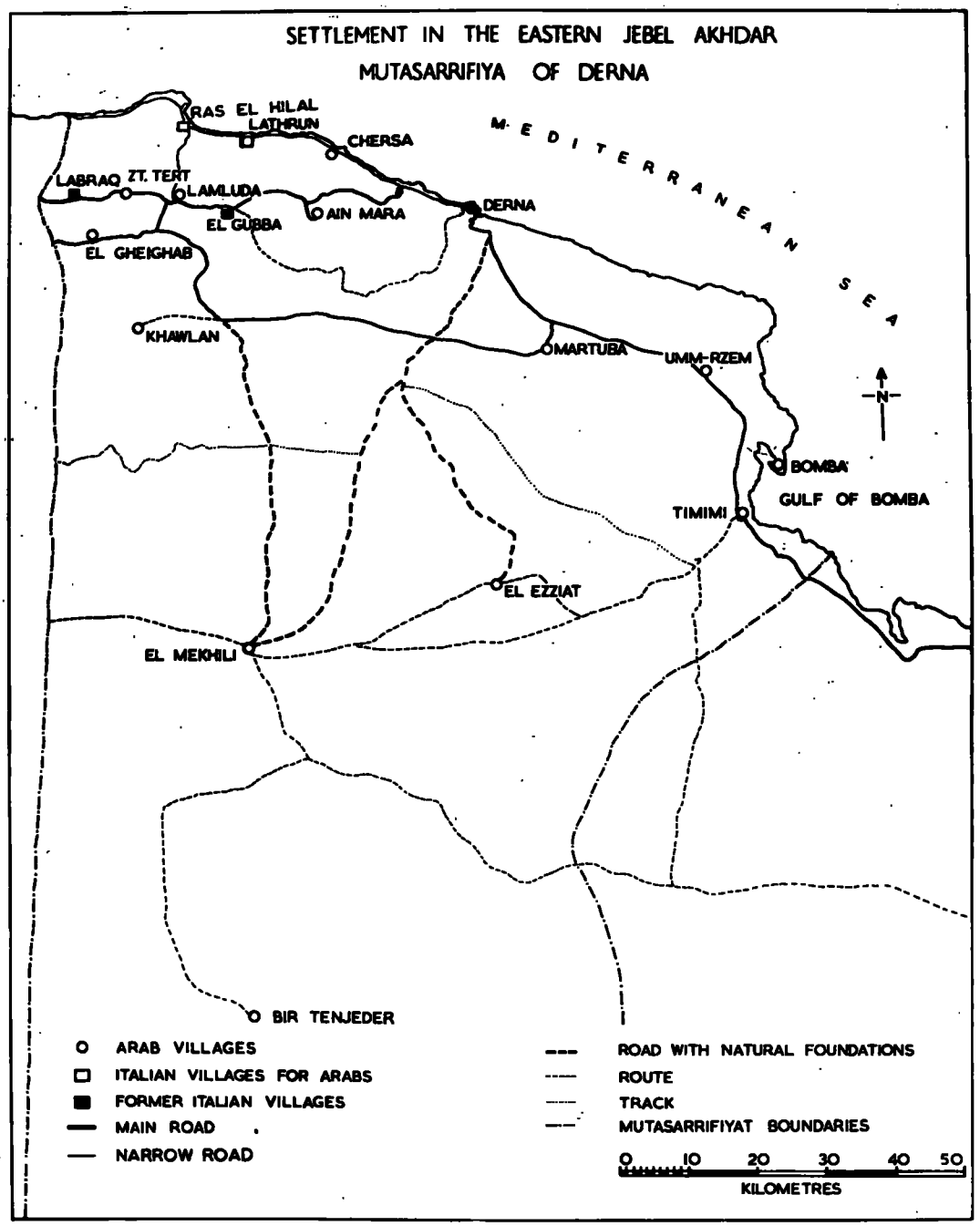
For further details see:-
1. Fisher, W.B., Frazer, I.R., and Ross, D.W., op. cit., pp. 24-25.

Figure 20.


SETTLEMENT IN THE EASTERN JEBEL AKHDAR
MUTASARRIFIYA OF DERNA
RAS EL HILAL
LATHRUN
CHERSA
MEDITERRANEAN SEA
LABRAQ
ZT. TERT
LAMLUDA
EL GUBBA
AIN MARA
DERNA
EL GHEIGHAB
KHAWLAN
MARTUBA
UMM-RZEM
N
BOMBA
GULF OF BOMBA
TIMIMI
EL EZZIAT
EL MEKHILI
BIR TENJEDER
ARAB VILLAGES
ITALIAN VILLAGES FOR ARABS
FORMER ITALIAN VILLAGES
MAIN ROAD
NARROW ROAD
ROAD WITH NATURAL FOUNDATIONS
ROUTE
TRACK
MUTASARRIFIYAT BOUNDARIES
0 10 20 30 40 50
KILOMETRES

training and a long time to start producing.

The Main Villages (Vide Fig. 20)

El-Gubba:- The former Giovanni Berta, it was founded by Ente in 1933. During the Italian occupation there were 800 Italians and 500 Arabs (1937), while at the 1954 census there were 3,808 Arabs in the Mudiriya. El-Gubba is the centre of the Mudiriya of the same name. The village is situated on a small, low plain to the south of the main road 44 kilometres south-west of Derna. The plain is marked especially where the police station and the school are sited. (Vide Fig. 21A). The school is for boarders, since the Bedouin are scattered over a vast area. The church is closed down and was transfered to the Vatican after the departure of the Italians. To the west of the school there are the teachers' houses and those of the officers of the Mudiriya (Vide Plate 11b). The southern part of the village is on a terrace and contains the market place, the court and the Mudiriya offices. At the foot of the terrace there is the ancient spring. El-Gubba is a market centre for the Bedouin around.

Labraq:- The former Luigi Di Savoia, it was founded by the Ente in 1933. It is situated on a very fertile plain about

VILLAGES OF MUTASARRIFIYA OF DERNA

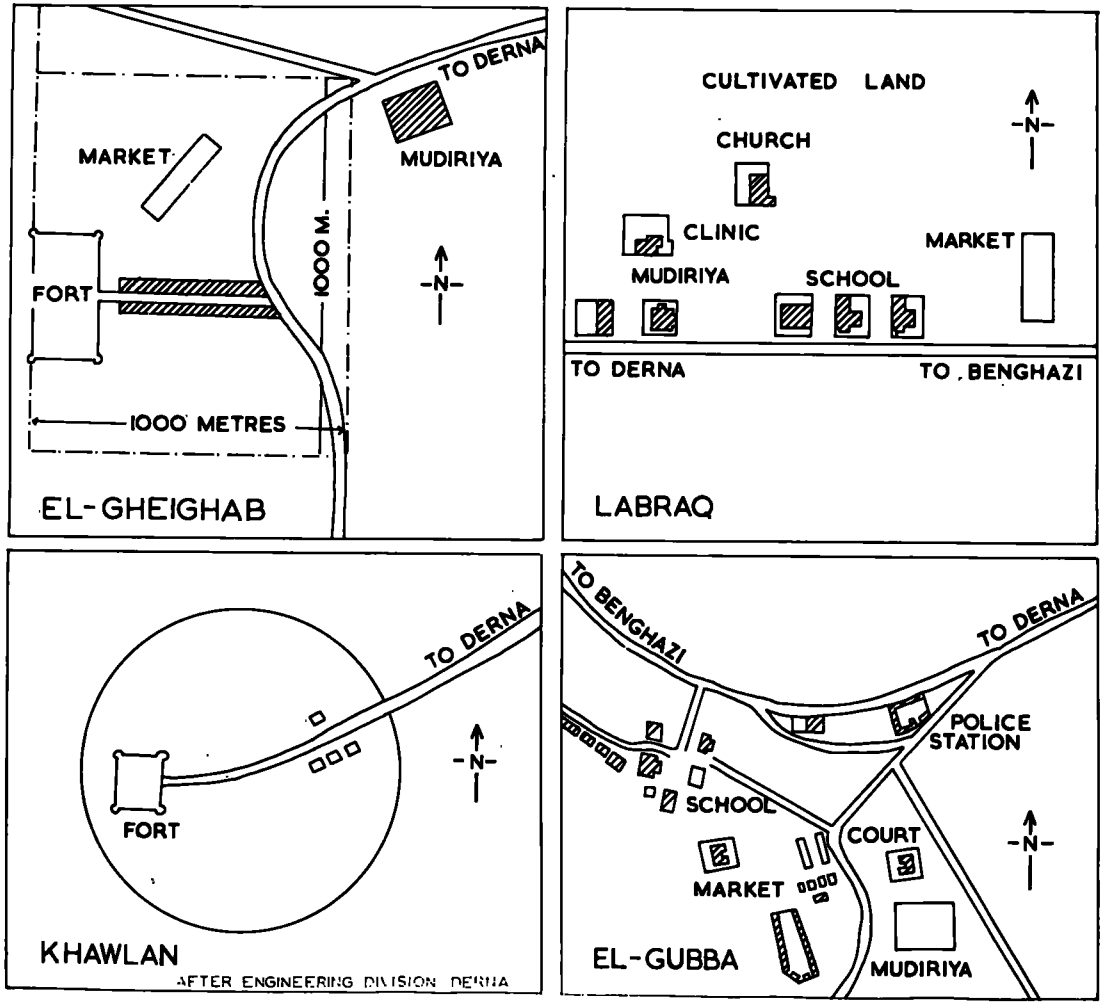


Figure 21(a).

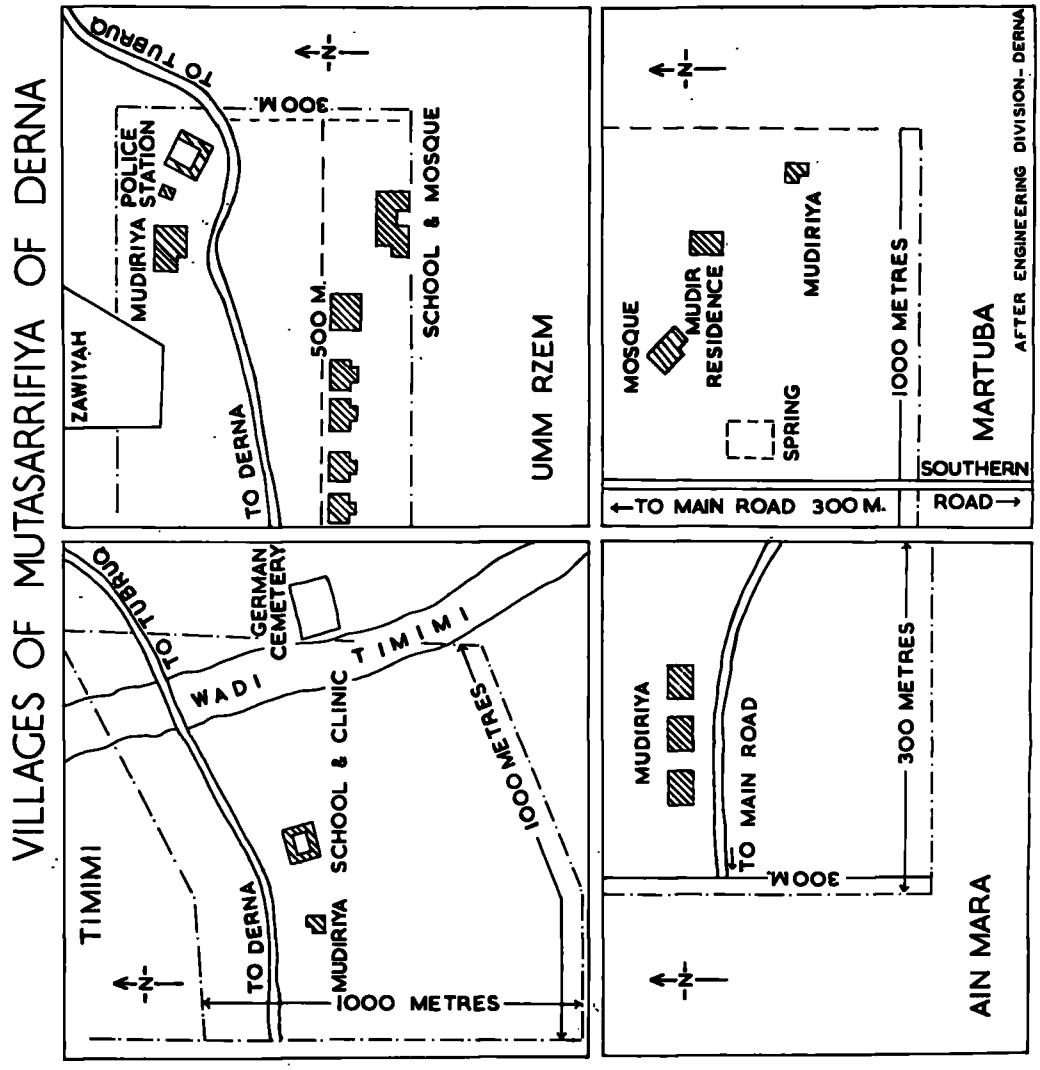
75 kilometres west of Derna, and 17 kilometres south-east of Cyrene on the main road. It had 700 inhabitants in 1937, while in 1954 there were 2,197 in the whole Mudiriya. To the north stand the clinic and the church, while the offices of the Mudiriya are on the main road (Vide Fig. 21A). The shopping street runs from the main road to the church. The Fascist headquarters has been used as dormitories for the boys of the Labraq school, which is situated to the east of the Fascist building. The market is at the east of the village and most of the shops in the market are built of flattened petrol cans. Labraq is the centre of the Mudiriya of Labraq. The housing problem in this village is difficult and building of new houses is vital for agricultural development in this important centre of the Jebel.

Khawlan:- It is an isolated Arab village about 35 kilometres south-west of El-Gubba, connected to the southern road by a track. It is a market place and a centre for the Mudiriya of the same name. The only road in the village runs from the fort to the southern road and in the village, this acts as a shopping centre administrative nucleus (Vide Fig 21A). Khawlan is well-known in modern Cyrenaican history because it was the centre of Arab resistence to the Italians.

El-Gheighab:- The former 'Acqua Viva', about 24 kilometres south-west of El- Gubba, on the southern road. The only street in the village is that between the Turkish fort and the main southern road. The shops and most of the houses are concentrated in this street (Vide Place 12a). To the north of the main street the market is situated (Vide Fig. 21A). Further west there is the spring which supplies the village with waters. The Mudiriya offices are located to the east of the main road. The village is connected with Labraq. The population of the whole Mudiriya was 3,400 at the 1954 census.

Ain Mara:- It is a very small village, situated in a shallow wadi of the same name, about four kilometres south of the main road and 35 kilometres south-west of Derna. In the main centre of the village there are the offices of the Mudiriya, the residence of the Mudir and the police station Fig. 21B (Vide Plate 12b). The school is situated on the main road. Ain Mara is well-known because of the abundant water and the unfinished pipe-line which was to have run from here to supply other Italian villages on the Jebel with water. In 1936 the population of the village was 150 while at the census of 1954 there were 3394 in the whole Mudiriya.

Figure 21(b).


VILLAGES OF MUTASARRIFIYA OF DERNA
TO TUBRUQ
300 M.
POLICE STATION
MUDIRIYA
ZAWIYAH
TO DERNA
500 M.
SCHOOL & MOSQUE
UMM RZEM
N
MOSQUE
MUDIR RESIDENCE
MUDIRIYA
SPRING
1000 METRES
SOUTHERN
ROAD
←TO MAIN ROAD 300 M.
MARTUBA
AFTER ENGINEERING DIVISION- DERNA
TIMIMI
TO TUBRUQ
GERMAN CEMETERY
WADI TIMIMI
SCHOOL & CLINIC
MUDIRIYA
TO DERNA
1000 METRES
1000 METRES
MUDIRIYA
TO MAIN ROAD
300 M.
300 METRES
AIN MARA

Martuba:- It is an Arab village situated at a distance of 26 kilometres south-east of Derna and four kilometres south of the main road. It is important as a market place and a centre of the Mudiriya of Martuba. In the west of the village there is the spring which supplies the village, while the mosque is in the northern part (Vide Fig. 21B). The Mudiriya offices are at the eastern end of the village. The total population of the Mudiriya is 1521 (1954).

Umm-Rzem:- It is about 50 kilometres south-east of Derna on the main road. The modern buildings of the village to the south of the main road were established by the Italians for administrative purposes, and are now occupied by the officers of the Mudiriya, and the police officers (Vide Fig. 21B). The school and the mosque are combined together in the southern part of the village. The Mudiriya offices, the Sanusia Zawiya and the Police Station are located in the northern part of the village. The total population of the whole Mudiriya in 1954 was 2,035.

Timimi:- The village is situated at the eastern part of the Mutasarrifiya of Derna, about 75 kilometres from Derna Town. Wadi Timimi runs between the village on the western

side and the German cemetary on the eastern bank (Vide Fig. 21B). The village is located to the south of the main road. The Mudiriya offices, school and the clinic are in the northern part. Because of their position on the main road between Benghazi and Alexandria, Umm-Rzem and Timimi experience considerable through traffic during the summer when students and pilgrims pass the villages on their way to and from Egypt.

Communication

Agricultural production, trade and economic development go hand in hand. If the farmer and the worker in under-developed countries like Cyrenaica are to concentrate on those types of activity which are most productive, they must be able to exchange their services and output for other goods and service.

Land transport

There are about 346 kms. of road in the eastern Jabel (Vide Fig. 20). There are three macadam main roads: the northern road, southern road and the coastal or tourist road.

The northern road: (ex Via Balbia). It was built by the Italians in 1937 to serve their colonisation schemes. It

is the main road for the whole of northern Cyrenaica and connects Derna with Benghazi and Alexandria. It crosses Mutisarrifiya of Derna from the western boundary to Labraq, then from El-Gubba to Derna it passes a very difficult section. The road turns south-east across El-Fatayah to Martuba Umm-Rzem, Timimi and Tubruq.

The road is 6 metres wide and 179 km. long from the western boundary of Mutasarrifiya of Derna to Abu El-Farayis. This road is very important since it is used by private cars, buses, and lorries travelling between Benghazi, Derna and Alexandria, and carries the external trade between Cyrenaica and Egypt. The northern road was heavily damaged during the last war and never repaired until 1949.

The southern road was built by the Italians and crosses the Jebel from El-Marj eastwards to El-Faydiya, and El-Gheighab. Ten kilometres east of El-Gheighab it connects with the northern road by means of a branch road of 5 km. long. It turns south east, then eastwards to the south of the upper escarpment to Martuba where it again connects with the northern road. The width of the road is 6 m. and it is 85 km. long from El-Gheighab to Martuba. The road is used at present for military purposes. It was the only road

used during the war following the destruction of the northern road.

The coastal road, or the tourist road, runs from Derna to Chersa, Lathrun and Ras El-Hilal. It is the only road serving these three villages to transport the agricultural products to Derna. It is 3 metres wide and 65 kilometres long. It crosses the coastal plain in many difficult sections where the low escarpment plunges straight into the sea. Other difficulties on this road are the wadi floods which emerge from the Jebel and cut off the road in the winter. This difficulty may be overcome in the future by building bridges over the wadi gorges.

The coastal road, as well as serving the villages along the coastal plain, is a tourist road to many delightful spots in the Ras El-Hilal area. This road is connected with the northern road for a distance of 12 kilometres in a very difficult section across the lower escarpment south of Ras El-Hilal.

In addition to these three main roads there are about 283 other roads which are not macadamised but of natural foundation and suitable for motor transport. These roads cross the Jebel from north to south:-

(a) Tariq Bab Shiha:- It is the main road between Derna and its hinterland. It runs south from Derna crossing the lower escarpment to Dehr El-Hamr and El-Mekhili a total distance of 102 kilometres. This road is usually used by the Bedouin in their movement from the Jebel to the Barr (Es-Serual region) for the cultivation of cereals there. To the south of the upper escarpment there is another road connecting Derna with El-Ezziat.

(b) Khawlan-El-Mekhili road:- It is the main road connecting El-Mekhili with the Jebel and also the main road for the movement of the Bedouin. It connects with the southern road east of Khawlan a distance of 15 kms. The total length of this road is 71 kms.

On the whole the roads in the eastern Jebel suffer from lack of maintenance. The Public Works Department make repairs to the roads only every four years. This period is too long for roads used by the heavy traffic on the Jebel and the effect of the wadis floods on the coastal road.

There are no railways in the eastern Jebel. At present railways are not necessary, since the main towns and villages on the Jebel are connected by very good roads. However, it seems preferable to maintain and improve these roads rather than to invest large sums in railways which could not be self-supporting.

There are two regular bus services from Derna to Benghazi and to Tubruq, run by the Cyrenaican Transport Company. There are also other taxi services from Derna to Benghazi and to Alexandria. The taxi services run at different times. The fare charged between Derna and Benghazi is £L.0.70.

Sea Transport

Next to the roads, the most important means of transport is the sea, although the only port along the coast between Benghazi and Tubruq is Derna. The natural conditions along this coast are not particularly favourable.

Derna Harbour:- Before the Italian occupation, the ships which came to Derna used to anchor in the basin east of Ras Matariz. In 1912 the Italians built a mole of 400 metres east of Ras Matariz to close the basin from the north, the mole was composed of two arms, the first is 120 m. long towards east-south-east (24°, 18') and the second 280 m. towards east-south-east (43°, 12'). The building operation finished in 1916. In the years 1914-1915 the depth of the harbour was 6-5 m. At the same time another sub-mole (100 m.) was built on the left bank of Wadi Luggati at the south of the harbour.

As has already been noted, the predominant winds are from the north, north-east, and north-west. The winds from the north cause big waves, which in 1913 and 1928 damaged most of the mole.

In 1912 the entrance of the harbour was free from sea-weed except for a little between the harbour head-quarters and the mouth of Wadi El-Furtas. After the arms of the mole was built, the sea-weed increased, but this problem was solved by building the second arm of the mole. The sea-weed enters the harbour with the winds from the north-east and north-west. In addition to the sea-weed there are the loads which are deposited by the wadis of Luggati and El-Furtas in winter.

During the Italian administration the depth of the harbour was 10 metres while at present it is only 5 metres. The harbour before the second world war received quite considerable shipping. During the war a ship sank in the harbour, and even today there are still 1,000 tons of the wreck unmoved. The harbour is used at present by the Greek fishing boats and small vessels for exporting livestock to Greece, Malta and Italy. The imports through Derna harbour are not important, except cement which is imported from Italy.

The obstacles to improving Derna harbour are partly due to the lack of maintenance and to the sinking of the wreck. It is estimated by the officials of Derna harbour that the total cost of the improvement would be approximately £L 30,000. This sum is quite reasonable if compared with

the returns from the economic activity.

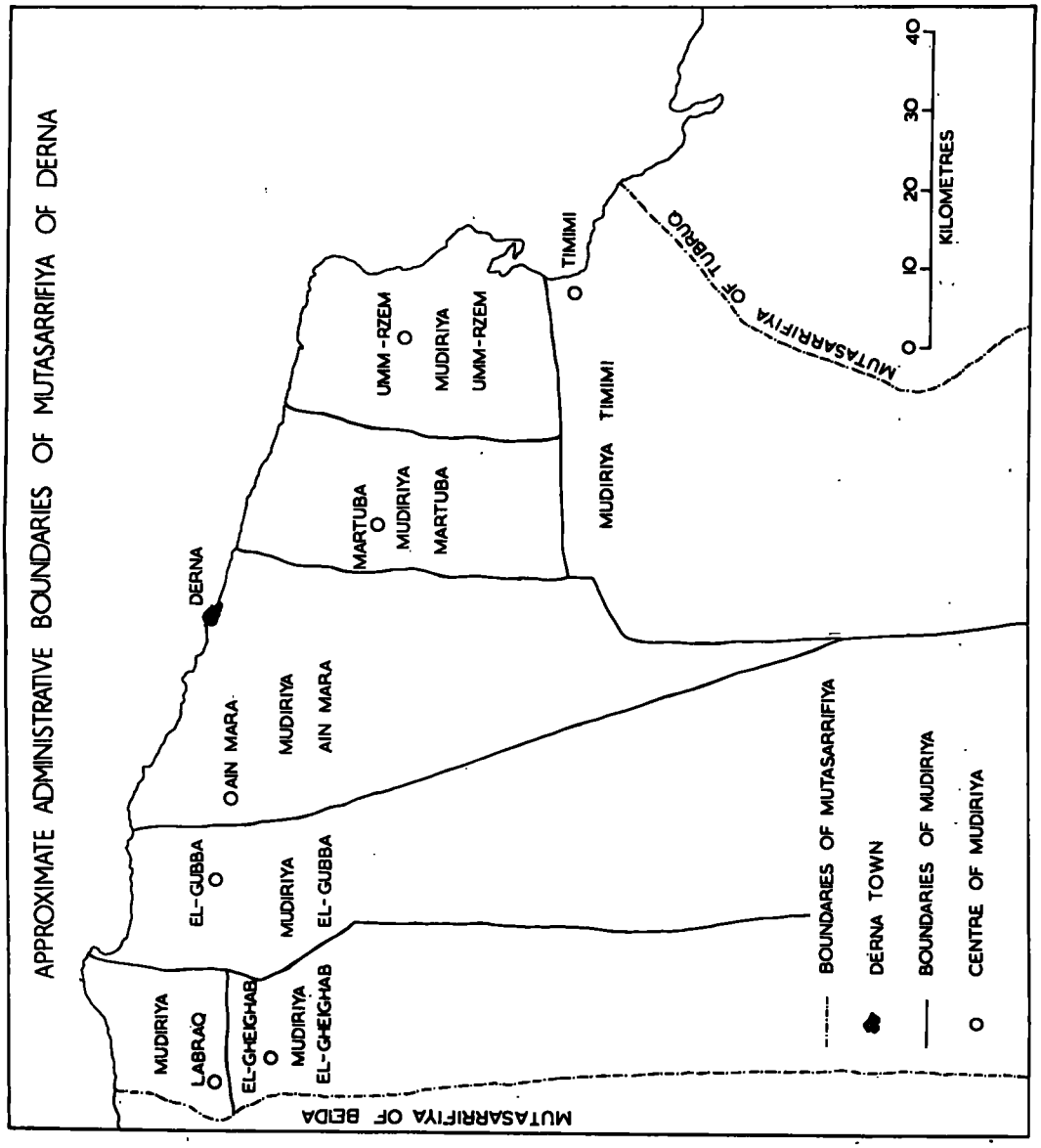
Administration

The United Kingdom of Libya is composed of three provinces Tripolitania, Cyrenaica and the Fezzan. Cyrenaica is divided into six administrative units called Mutasarrifiya. The eastern Jebel, its southern slopes and the area around Timimi and Umm-Rzem compose Mutasarrifiya of Derna. The western boundary of Mutasarrifiya of Derna begins east of Apollonia and runs southwards to the west of Labraq (5 km.) to the southern slopes of the Jebel. The eastern boundary is Wadi Abu El-Farayis (25 km. east of Timimi). The boundary then turns south-west for a distance of 62 km. and then runs towards the south. The southern boundary is not well defined but is supposed to include the whole of the Baltet region.

Mutasarrifiya of Derna is divided into seven districts, mudiriya. The seven mudiriyas of Mutasarrifiya of Derna, are Labraq, El-Gubba, Ain Mara, El-Gheighab, Martuba, Umm Rzem and Timimi (Vide Fig. 22). Each mudiriya is administrated by a Mudir, appointed by the Provincial Government and responsible to the Mutasarrif.

The most serious problem is the lack of recognised administrative boundaries. An attempt has been made to show the approximate administrative boundaries of each mudiriya

Figure 22.


APPROXIMATE ADMINISTRATIVE BOUNDARIES OF MUTASARRIFIYA OF DERNA
MUTASARRIFIYA OF BEIDA
MUTASARRIFIYA OF TUBRUQ
MUDIRIYA LABRAQ
LABRAQ
EL-GHEIGHAB
MUDIRIYA EL-GHEIGHAB
EL-GHEIGHAB
EL-GUBBA
MUDIRIYA EL-GUBBA
AIN MARA
MUDIRIYA AIN MARA
DERNA
MARTUBA
MUDIRIYA MARTUBA
UMM-RZEM
MUDIRIYA UMM-RZEM
TIMIMI
MUDIRIYA TIMIMI
0 10 20 30 40
KILOMETRES
BOUNDARIES OF MUTASARRIFIYA
DERNA TOWN
BOUNDARIES OF MUDIRIYA
CENTRE OF MUDIRIYA

in Figure 22. Mudiriya Labraq includes the north-west area of Mutasarrifiya of Derna, the western part of the promontory of Ras El-Hilal and Tert. The centre of Mudiriya is Labraq village. Mudiriya El-Gheighab includes the whole area south of Mudiriya Labraq as well as the western part of the Baltet region. Mudiriya El-Gubba is composed of the eastern part of the promontory of Ras El-Hilal, Lathrun, El-Gubba and the southern slopes of the Jebel to El-Mekhili. Mudiriya Ain Mara includes the whole of the area around Derna town, Chersa and extends to the north-west of El-Ezziat in the south. Mudiriya Martuba is to the east of Mudiriya Ain Mara, west of Mudiriya Umm Rzem includes the whole area of the north-eastern Jebel to the north of mudiriya Timimi. Mudiriya Timimi includes the rest of the south east of Mutasarrifiya of Derna to the western boundary of Mutasarrifiya of Tubruq.

Derna town is a municipality, and includes the area inside the town wall. The Municipality is responsible for the town planning, health and the local administration. The Mudiriya administers the public utilities.

During the Turkish rule there were no administrative units, only a garrison and a representative of the Governor, whose residence was in Derna. The Italians divided northern Cyrenaica into two Provinces, Benghazi and Derna. Derna

Province extended from Marawa (50 km. east of El-Marj) to the Libyan-Egyptian boundary. However, the present system in administration is very convenient since each Mudir administers the local public utilities.

Conclusion

Despite Derna's position between Benghazi and Cairo, its harbour and its fisheries, it has not developed greatly as a commercial centre. The reconstruction of the harbour is necessary to facilitate exports of livestock to Greece, Italy and Malta, as well as the imports for the Mutasarrifiya of Derna.

There is also opportunity for development of Derna by the extension of tree cultivation and vegetable growing, but it is difficult to stimulate agriculture and industrial development rapid enough to provide full employment.

Rural settlement is at a transitional stage; the government schemes to settle the nomads and semi-nomads by provision of a credit system and co-operative organisation and a renovation of ex-Ente farms all have good prospects for the future and should help to change the transition directed society.

The relationship between urban and rural settlements is not strong enough, but the resettlement of the nomads

and the development of the arable land on the Jebel will strengthen this relationship and raise the standard of living. We will deal with the resettlement in a separate chapter.

CHAPTER IX

POPULATION

It has already been pointed out in the chapter on relief that one of the important factors in northern Cyrenaica is the unfavourable topography which characterizes so much of the landscape. The narrow discontinuous strip of the coastal plain, the broken country of the Jebel, and the desert to the south, all these facts limit the expansion of the population, and so Cyrenaica is sparsely populated.

The primary sources of population data are three censuses, two carried out by the Italians in 1931 and 1936, and the third by the assistance of the United Nations in 1954. Detailed estimates of the population of Cyrenaica based on rough survey, were made by Col. E.De Agostini in 1922.[1] As far as the eastern Jebel Akhdar is concerned, one great difficulty in population study is the variation in administrative boundaries. De Agostini gave his statistics for the whole Abaidat tribe, which extends from Apollonia southwards to the southern slopes of the Jebel, and eastwards to the Libyan Egyptian boundary. The two Italian censuses

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1. De Agostini, E. op. cit.

give the population data for Derna Province, which extended from Marawa (50 kilometres east of El-Marj) to the Libyan Egyptian boundary, while the 1954 census uses the present boundaries of the Mutasarrifiya of Derna. Therefore any attempt to accurately determine the population trends in this area is extremely hazardous.

Population Estimates

It is interesting to conjecture how many people there were in Cyrenaica in the second and third millennia B.C., of which we learn something from ancient Egyptian texts.

The maximum of the population of Cyrenaica under a hunting and gathering economy can of course only be guessed in the most arbitrary fashion, but a comparison with some modern primitive people (Australian Aborigines, Hottentots, Bushmen and Paiute Indians), suggests that it may not improbably have been in 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 2000 of the whole Jebel.[1]. Bates concludes from contemporary records that the number of the Libyan fighting men and their allies taking part in the battles against

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1. McBurney, C.B. and Hey, R.W. op. cit. p. 13.

Merniptah and Ramases III in the thirteenth and twelfth centuries B.C. must have been in the order of 20,000-25,000 and 30,000 respectively.[1] While the total population of Cyrenaica and Marmarica can of course only be estimated in the most vague fashion from these figures, after deduction of an unknown number of foreigners, it is difficult to believe that the requisite number of young fighting men can have been produced by a population of less than, say 100,000.

The population of Cyrenaica in the classic period was possibly about 240,000 to 300,000, although in the most flourishing times under the Ptolemies it may have reached or exceeded half a million.[2] According to Gregory,[3] however, Roman Cyrene had only 25,000 inhabitants. He believes that a figure of 100,000 given to Roman Cyrene was too high since the water resources are too limited for large numbers of people.

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1. Bates, O. "The Eastern Libyans". op. cit. p. 31.

2. Toni, Y.T. "The Population of Cyrenaica". Tijdschrift voor economische en Sociale Geografie. Vol. 49, No. 1. January 1958, Rotterdam. p. 4.

3. Gregory, J.W. "Cyrenaica". Geog. Jour. Vol. XVII. No. 5, May 1916, p. 327.

Some attempts were made to estimate the population of Cyrenaica by early travellers who visited the country in the Turkish times. Heldebrandt,[1] records the following estimates:-

Raynaud, 1804	50,000	Jebel Akhdar
Pacho, 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	

Heldebrandt's own conclusion in 1904 was that the population was probably 200,000. Padretti,[2] in 1901 estimated the population at 200,000. The Jewish Territorial Organisation[3] expedition in 1909 estimated the population as

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1. Cited by Toni, Y.T. in "The Population of Cyrenaica". op. cit. p. 1.
2. Padretti, A. "Una escursione in Cirenaica nel 1901, Appunti di Viaggio." Reprinted in Bollettino della Societa Geografia Italiana, November 1903.
3. Report of the Work of the Commission sent out by the Jewish Territorial Organisation for the purpose of a Jewish settlement in Cyrenaica. London 1909. p. II.

well over 100,000, but they saw nothing impossible in the estimate of 200,000. The Turkish census gave the population as 198,345 excluding Kufra. The estimates of population based on the impression of travellers must be uncertain owing to the nomadic nature of the population. Blundell,[1] for example, reported Cyrenaica as practically empty of people, probably because he travelled along the northern route during the rainy season when people were away feeding their flocks in the southern slopes of the Jebel. Blundell's estimate is absolutely incorrect. These crude estimates, however, are not available for different sub-divisions whether territorial or tribal. We have no figures for these divisions prior to 1922.

De Agostini in his statistical summary,[2] written before the worst Italian excess, reckoned the native population of Cyrenaica, which did not include Kufra, 185,400 of whom 3,650 were Jews. Of the Arabs, 24,920 were living in urban centres, about 8,000 were in the oases and the rest were tented Bedouin. His classification into nomads, semi-nomads and stable (sedentary) was highly arbitrary, since there is no reliable criterion of stability among a tented people,

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1. Weld Blundell, 1895, Geographical Journal, Vol. 5. p. 168 wrote "I do not think that with exception of a little village called Marj and this place El-Marj, I have seen fifty inhabitants in the whole journey from Benghazi."

2. De Agostini, E. op. cit. p. 444.

but it gives a useful indication of relative mobility. De Agostini thus classed 54 per cent as stable, 19 per cent semi-nomads, 9 per cent true nomads, 4 per cent oasis-dwellers and 14 per cent town dwellers. The following table of types of settlement has been given by De Agostini for the Abaidat tribe who have been in Derna Province,[1] and shows a slightly higher proportion of stable population than the average for Cyrenaica.

Table No. 18:- POPULATION OF ABAIDAT TRIBE BY TYPES OF SETTLEMENT (1922)

Type of Settlement	Number	Percentage
Stable	19,110	63
Semi-Nomads	9,910	32
Nomads	1,430	5

A series of official estimates were presented during the interval up to 1931; these figures, however, are too weak to support any analysis of population trends. Registration of births did not exist in Cyrenaica until 1955.

Population Censuses

For the first census in Libya, taken in 1931, three

1. Ibid, p. 173.

kinds of schedules were used. The first calling for a complete listing of data for each individual, was used only for Italians. The other two schedules were used for the enumeration of natives according to local conditions. One of the schedules for natives provided for a separate listing of information for each member of each family, but in much less detail than was required for the Italians. The other called only for collective information for families, without any identification. As the natives had only first names, identification was difficult, and it was not possible to check efficiently for under-enumeration or repeated counting of the same individual, even where records of individuals were obtained.[1] For these reasons the census data are likely to be grossly inaccurate. The total de facto population of Cyrenaica according to this census was 160,451, including 136,215 for Benghazi and Derna Provinces. Data for these two Provinces are combined because of large inter-provincial migration during this period.

The next was taken on a de jure basis. In this census all the schedules including those used for enumerating natives, were uniformly called for listing of information by individual.

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1. Pan, C.L. "The Population of Libya". Population Studies, Vol. III part I. June, 1949. p. 105.

Other improvements of this census with regard to the natives consisted of a statement of name, father's name and the surname or family name of each person to establish his identity as a basis for later review. Religious registers were available for the cities of Benghazi, El-Marj and Derna, and provided checks on the census coverage.[1] To facilitate census taking, the cities were divided into sectors, communities into wards and the rest of the territory into districts corresponding to the localities inhabited by the various tribes. Each division was assigned to the local administrative authority for the execution of the census, and each was supervised by a native chief whose job it was to effect the co-operation of the natives.

The tribes, sub-tribes and living quarters according to which the census districts were formed, served in turn as controls by which the returns were grouped and were examined for completeness by local authorities of the districts, commissar and Province.[2] This procedure was an advantage only where exact location of all tribes and sub-tribes and of living quarters was known. For the settled population

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1. Italy. Instituto Centrale di Statistica. VII Censimento generale della popolazione, 21 April, 1936-XIV. Vol. V. "Libia, Isle Italiane dell'Egeo-Tienstin". Rome 1939. p. 35.

2. Pan, C.L. op. cit. p. 105.

in areas where not too many people were away from their usual place of residence, the difficulties of reviewing the grouped returns were not insurmountable. For the nomads, however, who had no definite residence, but who moved within the confines of a large or indefinite area, even an exact location of residence was impossible, much less a critical review of data.

On the whole the results of this census were considered more satisfactory than those of the previous one. According to this census the total resident population of the whole of Cyrenaica was 165,787 of whom 142,663 were natives and 23,124 Italians. Benghazi and Derna Provinces had 137,582.

During the British Military Administration of Cyrenaica, the need was felt for a fairly close estimate of the population mainly for rationing purposes. In 1943 it was decided to carry out a new registration of the population. According to this estimate the total population of Cyrenaica was 249,323 of whom only 193 were classed as non-natives. The results of this estimate were taken as a basis for the estimated population. It is believed that this figure was excessive.

The last census was carried out with the assistance of the United Nations, in 1954, and the complete results were

published in 1959. The census was based upon the de facto as well as de jure method. According to this census the total population of Cyrenaica is 291,236 including 35,886 for Mutasarrifiya of Derna.[1] Even these figures are not likely to be accurate, for in a country like Cyrenaica, with a high percentage of illiteracy, with long periods of opression and foreign domination people still look on the census operation with great apathy and much suspicion. They naturally lose sight of the solidarity of public and private interests.

As regards the data of the enumeration, it is very important that it should correspond to the time when the population is in its normal status. The time chosen for the Italian censuses (April) was unsuitable for such an operation. The census of 1931 was taken when the country was in anarchy due to the Libyan resistance to the Italian occupation. In 1930 Graziani started his concentration camps in Agheila, where about 80,000 men, women and children and about 600,000 beasts were herded prisoners.[2] Disease,

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1. Department of Census and Statistics. Ministry of National Economy. "General Population Census of the United Kingdom of Libya". Tripoli, 1959.
2. Evans-Pritchard, E.E. op. cit. p. 189.

hunger and broken hearts took a heavy toll of the imprisoned population. For the census of 1954, the date chosen for enumeration in August was much more suitable. The official agents in this census were Libyans, and new modern counting and tabulating machines were brought from Egypt.

To summarize, the primary sources of information regarding the population of Cyrenaica consist of three censuses, one which (1931) is highly unreliable, and the other two (1936 and 1954) are exasperatingly inconsistent and irreconcilable. Furthermore, the estimate of the population in 1922 was based only on a rough survey by De Agostini, while the British Military Administration figures are too weak to support any analysis of population trends.

Population Growth

The following table gives the population estimates and the intercensal increase and decrease for Cyrenaica excluding Kufra, during the period 1911 (Turkish estimate) to 1954 (Libyan census).

Table 19:- POPULATION ESTIMATE FOR CYRENAICA

Date	Population	Percentage Increase and Decrease Per Year
1911	198,345	
1922	181,750	Decrease 0.8
1931	136,215	Decrease 2.8
1936	137,582	Increase 0.2
1954	285,005*	Increase 5.8

The decline in the number of population between 1911 and 1931 to about two thirds may be due to emigration during the Italo-Sanusi wars, while the increase of 0.2 per cent in the period 1931-1936 is largely accounted for by the return of migrants after 1933. The remarkable increase of 5.8 per cent between 1936 and 1954 is partially due to the return of Cyrenaicans to their country after the Italian evacuation, to the co-operation of the citizens in the census and to the modern computers.

A check on the accuracy of the census figures for 1931 and 1936 is provided by a comparison of the annual rates of growth of the native population of the major parts of Cyrenaica, with regard to Libya.[1]

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* This figure is calculated by deducting the 6231 inhabitants of Kufra according to the present population census of 1954.

1. Adopted from Pan, C.L. op. cit. p. 106.

Table 20:- DISTRIBUTION OF POPULATION OF CYRENAICA ACCORDING TO 1931 AND 1936 CENSUSES

Province	Population		Annual Percentage rate of growth
	1936	1931	
Total Libya	732,973	654,716	2.3
Benghazi and Derna	137,215		0.2

The rate of 0.2 per cent for Benghazi and Derna stands in marked contrast to the rest of Libya, reflecting the possibilities of higher mortality, lower fertility and much larger emigration resulting from the Italian military custody of one third to one half or more of the regional population during 1923-1935. The net change in Cyrenaica between 1936 and 1954, however, is quite considerable especially in the case of the urban centres. The following table shows the rural, urban and oases population of Cyrenaica.

Table 21:- POPULATION OF CYRENAICA 1936 AND 1954.

Area	1936	1954	Percentage increase 1936 - 1954
Rural Cyrenaica	79,601	161,958	120
The Oases	11,129	12,346	9
Urban Centres	52,089	116,932	100
Total	142,819	291,236	100

It is obvious from the table that a considerable change has taken place in the rural-urban ratio, while there is little change in the oases population. It can be explained by the fact that after the Italian evacuation there is a tendency towards urbanizatiom emphasised by the return of Cyrenaicans from exile, particularly those who were in Egypt. It is also a result of the spread of health and maternity services and the stamping out of epidemic diseases; all these facts increased the number of population. A higher rate of increase among males than females is shown in the following table for 1931, 1936 and 1954 excluding Kufra, but enumeration of women in country like Cyrenaica is always inferior to that of males:-

Table 22:- POPULATION OF CYRENAICA ACCORDING TO SEX (1931, 1936 and 1954).

Date of Census	Males	Females	Males to 1000 females
1931	72,376	63,839	1133
1936	75,079	62,503	1201
1954	152,454	138,782	1095

These figures suggest a relatively greater under-enumeration for women in 1936. The following table shows the total population of Mutasarrifiya of Derna in 1954, by sex and

administrative divisions[1]:-

Table 23:- POPULATION OF MUTASARRIFIYA OF DERNA ACCORDING TO SEX 1954

Administrative Division	Males	Females	Males to 1000 females
Mutasarrifiya of Derna. Total	18,477	17,409	1062
Derna Town	8,206	7,685	1065
El-Gubba	1,967	1,841	1063
El-Gheighab	1,706	1,694	1006
Ain Mara	1,760	1,634	1060
Labraq	1,088	1,109	980
Ras El-Hilal	533	510	1060
Umm-Rzem	1,055	980	1070
Timimi	1,335	1,262	1050
Martuba	827	694	1200

The population figures by sex and age group show evidence of errors. These detailed figures are available only for the resident population of 1936 and 1954. The sex ratios by age group from these figures are represented below:-

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1. Adopted from "General Population Census of Libya". op. cit. p. 6.

Table 24:- SEX RATIOS OF POPULATION OF CYRENAICA (1936 AND 1954)

Age (years)	Males to 1000 females	
	1936	1954
Under 5	1016	997
5 - 9	1143	1002
10 - 14	1344	1167
15 - 19	1111	1080
20 - 24	885	1230
25 - 29	968	1220
30 - 39	1001	1003
40 - 49	995	1003
50 - 59	1173	1250
60 - 69	1152	1290
70 and over	1088	1020

The sex-age distribution of the resident native population in 1936 which is shown below, suggests under-enumeration at ages under 10 and 20-29 for both sexes.[1]

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1. Pan, C.L. op. cit. p. 108.

Table 25:- AGE DISTRIBUTION ACCORDING TO SEX (1936)

Age (years)	Percentage at different age-groups	
	Males	Females
0 - 4	14.5	15.3
5 - 9	15.0	14.1
10 - 19	17.6	15.1
20 - 29	11.6	13.4
30 - 39	13.7	14.7
40 - 49	10.5	11.4
50 - 59	8.1	7.4
60 - 69	5.1	4.7
70 - 79	2.7	2.7
80 and over	1.2	1.2
All ages	100.0	100.0

Dynamics of the Population

The figures for the censuses 1936 and 1954 imply a growth of 5.8, a high rate of increase which if continued would perhaps double the population in 13 years. With regard to the limited resources of the country, it shows a dangerous phenomenon.

Level of Fertility:- A rough measure of the fertility of the Cyrenaican women is furnished by the ratio of

children under five years of age to women 15-49 years old, as enumerated in the 1936 census. This ratio is calculated 683 children per 1,000 women which implies a relatively high birth-rate. Corresponding ratios for other Muslim countries are 550 for Algeria in 1936, 547 for Egypt in 1937 and 720 for Turkey in 1935.[1]

Early marriage and a low proportion of women remaining spinsters due to the practice of polygamy may be cited as factors contributing to higher fertility among the women. The following table shows the marital status of Cyrenaica's resident population in 1954 for all Cyrenaican women and men of 15 years and over.[2]

Table 26:- POPULATION OF CYRENAICA BY MARITAL STATUS (1954)

Marital Status	Total all classes No.	%	All males No.	%	All females No.	%
Total Cyrenaica	174,277	100.0	93,257	100.0	80,934	100.0
Single	41,277	23.7	32.116	34.5	9,161	11.3
Married	106,153	61.8	53,281	57.8	52,872	65.4
Widowed	15,935	9.2	3,031	3.3	12,904	16.8
Divorced	9,264	5.3	4,039	4.4	5,225	6.5

1. Ibid. p. 109.

2. Excluding persons of unknown age or marital status.

The figures suggest that about 88.7 of all Cyrenaican women 15 years old and over were married, widowed or divorced. The number of the polygamous husbands in 1954 census was about four per cent of the total married husbands as shown in the table below. The proportion of the polygamous husbands was greater in the higher age-group than in the lower; 0.5 per cent for those aged 20-24 years, against 0.9 per cent for those 25-29, and over 6 per cent for those 55 years old and over.

The following table shows the percentage of polygamous husbands to total married men for the Cyrenaican resident population in 1954.

Table 27:- PERCENTAGE OF POLYGAMOUS HUSBANDS AMONG MARRIED PERSONS BY AGE FOR THE POPULATION OF CYRENAICA IN 1954

All ages	3.4
Under 15	-
15 - 19	-
20 - 24	0.5
25 - 29	0.9
30 - 34	1.9
35 - 39	2.1
40 - 44	3.5
45 - 49	4.7
50 - 54	4.5
55 - 59	6.8
60 - 64	5.4
65 and over	3.9

Level of Mortality:- Data on mortality in Cyrenaica are totally lacking before 1955. One may assume, however, that mortality rates are at least as high as those of Egypt. Estimates based on Egyptian data may even tend to understate the mortality of Cyrenaicans who lead on the whole a primitive pastoral life and are less influenced by western medicine and hygiene. If the Egyptian life table for 1927-37 is accepted as applicable to the population of Cyrenaica and if the age distribution shown by 1936 is taken as a basis for a rough calculation of the crude death-rate, the result is a rate of about thirty-five deaths annually per 1,000 population.[1] However, this figure should be taken as a minimum estimate of the death-rate of the Cyrenaican population.

The Rate of Natural Increase:- Assuming that the 1936 census gives an accurate measure of the proportion of children under five in the native population, rough estimates of the crude birth-rate and of the natural increase can be derived. The calculation yields a birth-rate about 40 per 1,000 of the population which may be regarded as a minimum estimate because of the probability that children under five years old were underenumerated in the census, in proportion to the total population. A birth-rate

1. Pan, C.L. op. cit. p. 110.

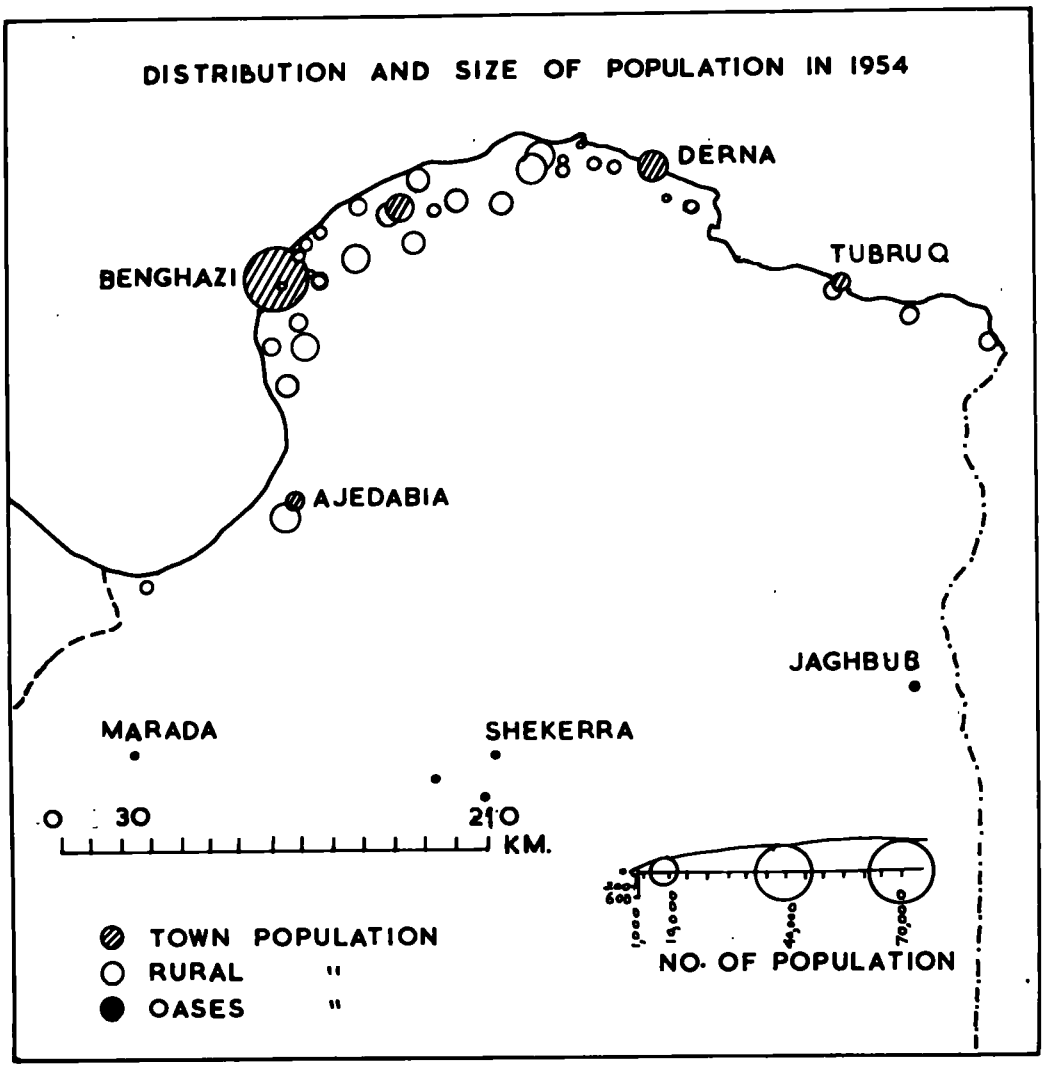
of 40 and a death-rate of 35 would imply a natural increase of five persons per thousand annually. According to the census of 1954 the annual increase is 5.8 per cent since 1936, so this estimate may not be far from the truth.

Distribution of Population

The most important factor which determines the distribution of the population is water supply. On the other hand, the Jebel Akhdar acts as a magnet and has a direct effect on the distribution of population. It is rich with the natural vegetation, contains a considerable number of springs, and in its central portion the annual average of precipitation exceeds 500 mm. Furthermore about 53 per cent of the total population of Cyrenaica are concentrated in Benghazi town and the surrounding plain (vide fig. 23).

Six of nine Sa'adi tribes live on the Jebel Akhdar. The semi-nomads are living on the Jebel by breeding animals and practising transhumance to the southern slopes of the Jebel where they sow barley. The roads which were built by the Italians, and cross the Jebel from east to west, north to the south have no influence on the distribution of the population.

Figure 23.


DISTRIBUTION AND SIZE OF POPULATION IN 1954
DERNA
TUBRUQ
BENGHAZI
AJEDABIA
JAGHBUB
MARADA
SHEKERRA
0 30 210 KM.
TOWN POPULATION
RURAL "
OASES "
NO. OF POPULATION

Marmarica has less people since the water resources are very limited, and the natural vegetation poor. The population is thinly scattered along the coast and about 25 per cent of the population of Marmarica are concentrated in Tubruq.

The following figures show the approximate distribution according to the census of 1954 by the main geographical regions:-

Table 28:- DISTRIBUTION OF POPULATION OF CYRENAICA BY THE MAIN GEOGRAPHICAL REGIONS (1954)

The Sahel (Coastal plain)	181,532
Jebel Akhdar	77,467
Marmarica	19,891
Oases	12,346

According to the census of 1954 the total population of the eastern Jebel is 35,886, of whom 44 per cent are living in the town of Derna. The narrow coastal plain has only three per cent concentrated in the villages of Ras El-Hilal and Lathrun. The eastern Jebel proper has 36 per cent distributed between Mudiriyas of El-Gubba (10 per cent), Labraq (8 per cent), Ain Mara (9 per cent), El-Gheighab (9 per cent). The steppe zone at the eastern

end of the Jebel has 17 per cent distributed among Mudiriyas of Timimi (7 per cent), Umm-Rzem (6 per cent), and Martuba (4 per cent).

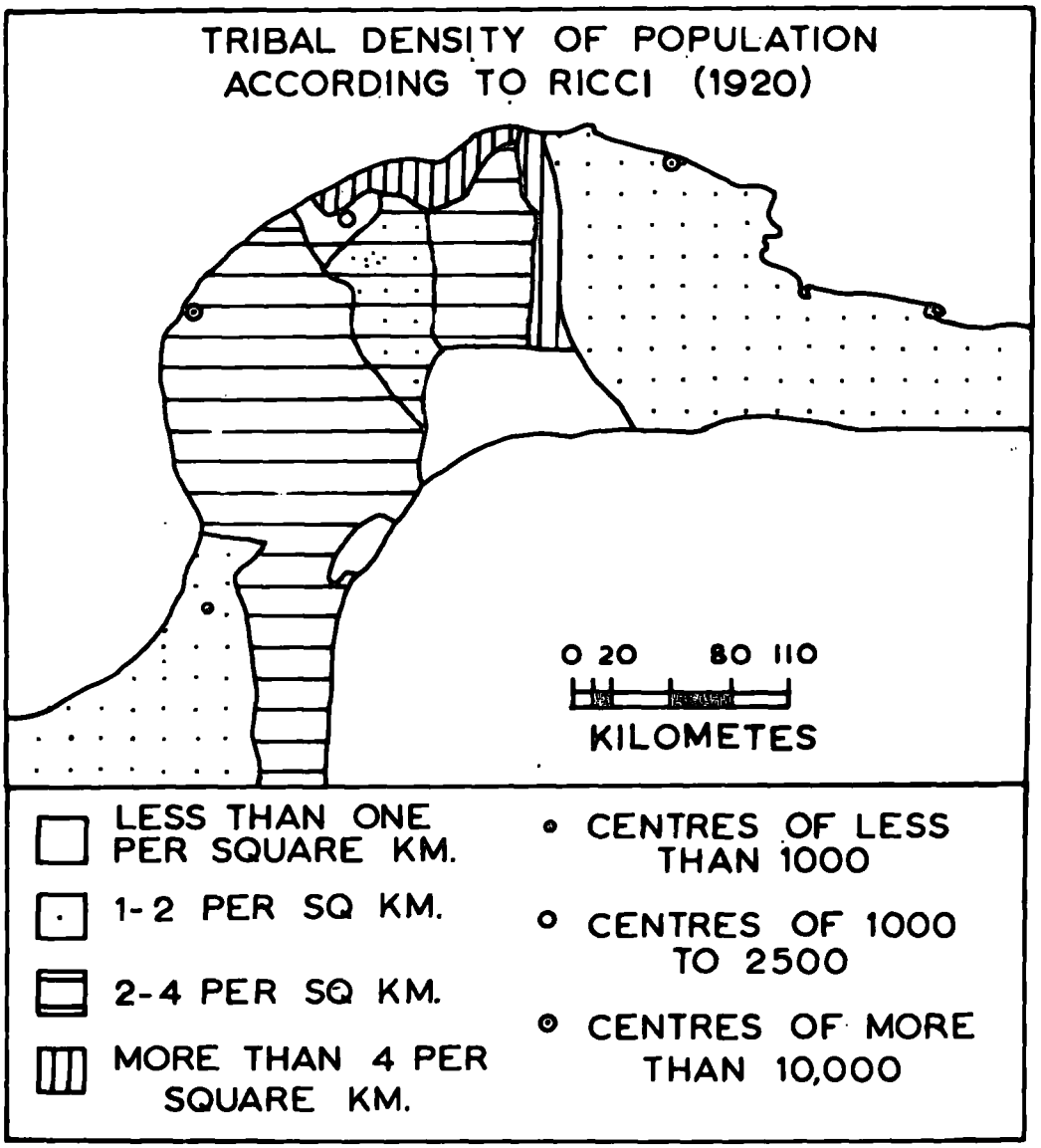
Density of Population

According to the census of 1936 over 90 per cent of the total population of Libya are living in the non-desert areas of northern Libya, which comprise an area of 44,600 sq. km. The density in that area was approximately 16 per sq. km. This figure is not high by comparison with densities in many other agricultural countries, but the average productivity of the land of northern Libya is relatively low.

A comparison of population density in different localities in Cyrenaica is not very meaningful in a country where the population is so fluid. Moreover, it is handicapped by the lack of the recognized administrative boundaries. However, according to the census of 1954 about 97.8% of the total population live in the north and the rest in the southern oases.

According to the 1936 census, the density in Benghazi Province was 0.83 per sq. km. and 0.70 in Derna. The total area was considered to be 263,800 sq. km. of which

Figure 24.


TRIBAL DENSITY OF POPULATION
ACCORDING TO RICCI (1920)
0 20 80 110
KILOMETES
LESS THAN ONE PER SQUARE KM.
1-2 PER SQ KM.
2-4 PER SQ KM.
MORE THAN 4 PER SQUARE KM.
CENTRES OF LESS THAN 1000
CENTRES OF 1000 TO 2500
CENTRES OF MORE THAN 10,000

about two-thirds were considered to be uninhabited. Ricci's map[1] of the distribution of population of Cyrenaica, which was based on De Agostini's tribal boundaries gave a density of 1-2 inhabitants per sq. km. for the Abaidat, Abid, and Magharba tribes, 2-4 for the Ba'asa, Orfa and Awaqir tribes and more than 4 sq. km. for the Dorsa, Hasa and Ailat Fayid (vide fig. 24). According to Ricci's map again, the towns of more than 10,000 inhabitants were Benghazi and Derna, those with from 1,000 to 2,500 were El-Marj, Cyrene and Apollonia, and those with less than 1,000 inhabitants were Tubruq, Tolmeita, Tocra and Ajedabia. The total urban population was 50,600.

The repatriation of practically all the Italians in Cyrenaica and the lower density offered a chance for improvement in the regional balance of population and resources. As has already been mentioned in the chapter on the Italian colonization, Cyrenaicans have occupied all the demographic Italian settlements, and the nomads have returned to the Jebel from margins of the cultivable lands, to which they were forced by the Italians.

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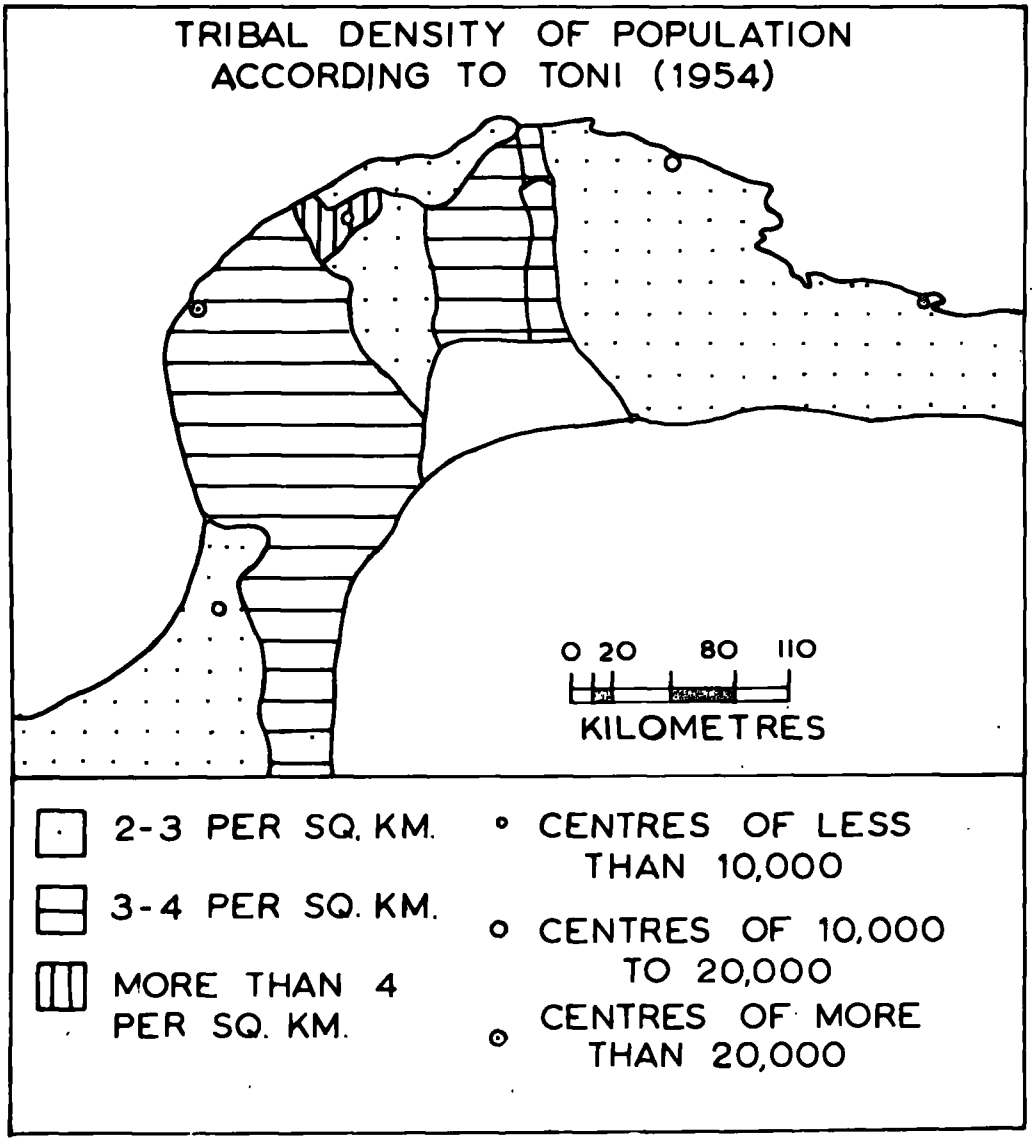
1. Ricci, L. "Centri abitati e popolazione nomade in Cirenaica." Rivista Geografia Italiana, July-September, 1929, p. 183.

Figure 25.


TRIBAL DENSITY OF POPULATION
ACCORDING TO TONI (1954)
0 20 80 110
KILOMETRES
2-3 PER SQ. KM.
3-4 PER SQ. KM.
MORE THAN 4 PER SQ. KM.
CENTRES OF LESS THAN 10,000
CENTRES OF 10,000 TO 20,000
CENTRES OF MORE THAN 20,000

According to the 1954 census, Benghazi had 69,718 people and Derna 15,891. The total urban population of Cyrenaica was 116,932 i.e. 40% of the total population. The towns of less than 10,000 were El-Marj and Tubruq, from 10,000 to 20,000 were Derna and Ajedabia. The tribal density in the census of 1954 was 2-3 per sq. km. for the Abaidat, Abid, and Mahgarba tribes, 3-9 for the Ailat Fayid, Bara'asa, Hasa and Awaqir and more than 9 for Orfa (vide fig. 25).

The eastern Jebel has an average density of 2-3 per sq. km. but the population is largely concentrated in the fertile and moist area between Ain Mara and Labraq. In this part of Cyrenaica the population densities vary between a number of different regions, the Jebel, the Sahel and the steppe in the east.

Conclusions

If the present population of Cyrenaica is 291,236, the ratio of the productive land per head is 2.3 hectares. It should be stressed that a large part of the productive area is fit only for pasture. However, most of the Jebel has not been developed again after the Italian evacuation. Moreover, it is necessary to build up a food reserve during the productive years. In the droughts of 1936 and 1946,

a large part of the population came to rely on outside relief, for subsistance. Reserve forage for livestock should be prepared to feed the animals in the bad years, since animal breeding is a very important element in the country's economy.

It is clear that no increase in population could be supported under the present farming technique without cutting down the standard of living of the population and exposing them to serious hazards of periodic starvation. For the immediate future internal migration is perhaps the most promising way of improving the regional differences of population pressure on resources. It may be possible to shift to the Jebel Akhdar some people from Derna Town, Benghazi and Tripolitania where the possibilities of the Jebel are fully explored. The most serious obstacle is the strong tribal organizationamong the Jebel tribes. The best solution seems to be the settlement of the Bedouin of the Jebel, who have the desire and can afford to settle. At the same time shifting farmers from the populated areas could be settled. The tribal organisation will inevitably be destroyed by education.

The discovery of oil in Cyrenaica and Tripolitania in the last two years should not be a blow to the agriculture.

The future of the country and its economy should be on an agricultural basis more than on temporary resources, although oil can greatly help agricultural schemes.

In the long run, the present high death-rate will be cut down with progress in health, medical and economic conditions, and the maintenance of peace in the country. The birth-rate will probably remain high for a long time, since the social traditions make birth control impossible, particularly in the rural areas. The present natural increase of 5.8 per cent is rather high in an under-developed country like Cyrenaica.

CHAPTER X

ITALIAN COLONISATION

It is necessary to mention some details of the Italian colonisation of Cyrenaica, especially in relation to the agricultural and social considerations, in view of its impact on the country. The Italians occupied Cyrenaica in 1911, and this led to the general uprising of the Arabs, who continued their resistence against the Italians until it died by the capture of Omar El-Mukhtar, the leader of the Arabs, in September 1931. This war had broken the Arabs on the Jebel and desolated their country. It is not easy to estimate from Italian figures the Arab casualties, nor to assess their reliability. Between 1911 and 1932 the Bedouin population was probably reduced by half to two-thirds by deaths and emigration.[1] Losses of livestock are even more difficult to estimate, but they were certainly numerous. The herds seem to have been slaughtered indiscriminately by the Italians. The Italians had suffered too. It is true that their casualties were mostly amongst their native troops, but the cost of the war imposed a grave burden on the Italian people. The Italians

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1. Evans-Pritchard, E.E. op. cit. p. 191.

had concentrated their efforts for colonisation on the Jebel, which was suitable for European settlement. The first step was to confiscate the Arab lands on the Jebel for their scheme of demographic settlement.

All the land is fundamentally common property, the permanent right to any piece of land cannot be claimed by any individual; on the ground the land shows no features of physical division of territory. The rights of use are vested in groups of families by virtue of habit, custom and tradition. However, in 1913 the Ufficio Fondiario (The Italian Land Registry) had been founded in Benghazi and had interested itself exclusively in the legal aspects of land ownership and transference of land. But, in 1919, it extended its activities to the confiscation of the Zawiya of Sanusi lands and to the regularisation of the position of Zawiya lands which had been occupied by the Italians during the military campaigns.

In 1922 the Italians took the first step towards an assessment of tribal lands by registering the best lands of the Bedouin in the name of the colony. There were also lands which were acquired by natural rights and the personal properties of those who took part in the rebellion, and thereby rendered their lands open to confiscation to the

state domains. The following table shows the activities for colonisation purposes of the Ufficio Fondiario up to 1931, areas in hectares.[1]

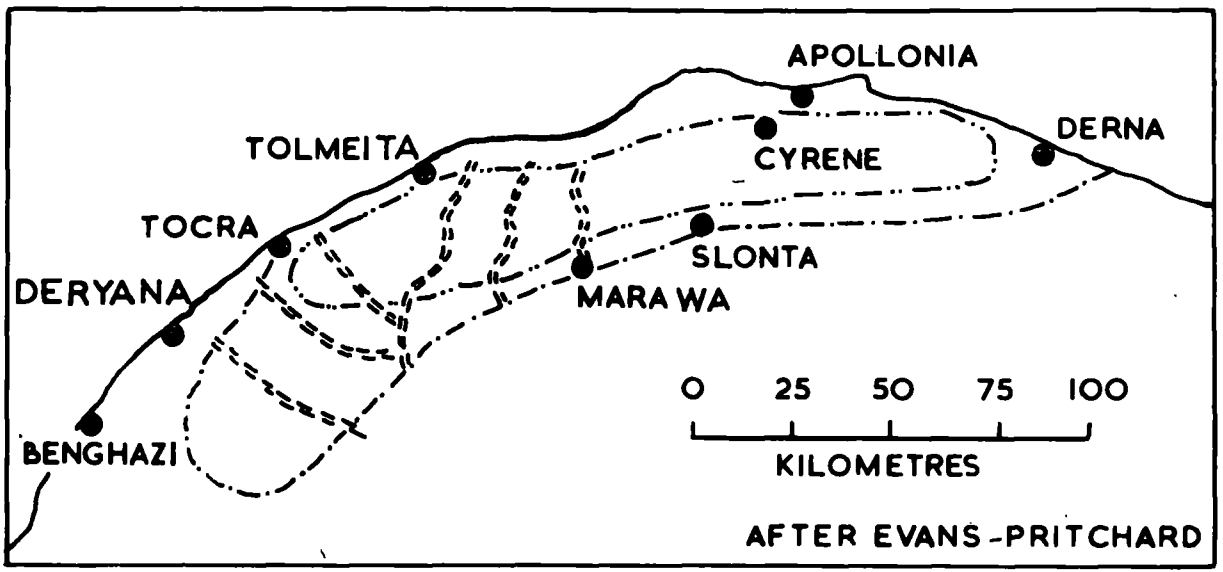
Table 29:- LANDS TAKEN BY THE ITALIAN GOVERNMENT (AREAS IN HECTARES)

Year	Lands officially purchased	Lands Domain by nature	Confiscated from Rebels	Lands Confiscated Zawiya	Total
1922-26	4,070	2,915	500	-	7,485
1927-29	39,371	4,762	5,300	-	49,433
1929-31	-	1,161	200	62,000	63,592
Total	43,441	8,844	6,000	62,000	120,510

As soon as the land was ceded to the Ufficio Fondiario, the amount of the indemnity was fixed. It varied between 24-26 lire per hectare, and the sum was placed in the Cassa Risparmio (Savings Bank). However, the Bedouin lost their best land and from their point of view nothing could compensate them for the loss of their lands to the Italian colonists. The Italians intended to take the best arable lands for themselves, excluding the Bedouin from the whole

1. Weir, D.H. The Italian Colonisation, 'Handbook on Cyrenaica' Part XI, op. cit. p. 6.

THE ITALIAN PLAN FOR THE COLONIZATION OF NORTHERN CYRENAICA



—·—·— BOUNDARY OF AREA TO BE COLONIZED

—··—··— AREA FOR ORGANISED GOVERNMENT SETTLEMENT

====== TRACKS FOR PASSAGE OF ARAB FLOCKS

Figure 26.

of the Jebel both for cultivation and for pastures. It was recognised that the Bedouin must move from north to south, from the narrow coastal strip to the area south of the Jebel Akhdar, in order to pasture their flocks and gain access to their areas of shifting cultivation. Passage belts for transport of stock across the reserved area were marked out. These passages were at the western part of the plateau (vide fig. 26). All that was left to the Arabs in northern Cyrenaica were the narrow coastal belt, the more rugged parts of the first terrace which would not yield to the Italian methods of cultivation, and the bleak southern slopes of the Jebel. The whole of northern Cyrenaica was expropriated for State purposes, therefore, the more fertile areas for metropolitan colonists and the less fertile for urbanized and semi-urbanized Arabs or such Bedouin as could be induced to submit to state direction and forsake their traditional economy.

Demographic Settlement

Colonisation before 1931 went slowly. The production of cereals by settlers progressed gradually from 440 quintals in 1923 to 11,300 quintals in 1930. Before 1923 there had been an insignificant sprinkling of adventurous colonists.[1] With

1. Ibid. p. 7.

a little encouragement, they worked within the auspices of a few private colonisation companies, and the number of such colonists increased slowly till 1926; but even by the end of that year the number of colonist-proprietors actually occupying farms was very small. In 1926 there were only two families in Derna, who colonised some 83 hectares.

The beginning of the final step in the demographic settlement of Cyrenaica was the formation of the Ente per la Colonizzazione della Cirenaica by a decree of the 11th of June, 1932 with a capital of 38 million lire. The decree of 11th of October authorized the Ente to extend its activity to Tripolitania, hece it was re-named the Ente per la Colonizzazione della Libia. The Ente began in a small way on the Jebel area in 1933. The lands immediately allotted to it were 30,000 hectares in the area between Cyrene and Tert, a fertile region with a climate like that which the colonists were familiar with in their homeland. The Italians then began to establish rural centres for their colonists (vide fig. 20):- Beda Littoria (now Zawiyat Beida) and Luigi di Savoia (Labraq) in 1933, Luigi Razza (Messa), and Giovanni Berta (El-Gubba) in 1934 and Maddalena in 1936. Each of these villages included buildings capable of housing municipal services, public utility undertakings,

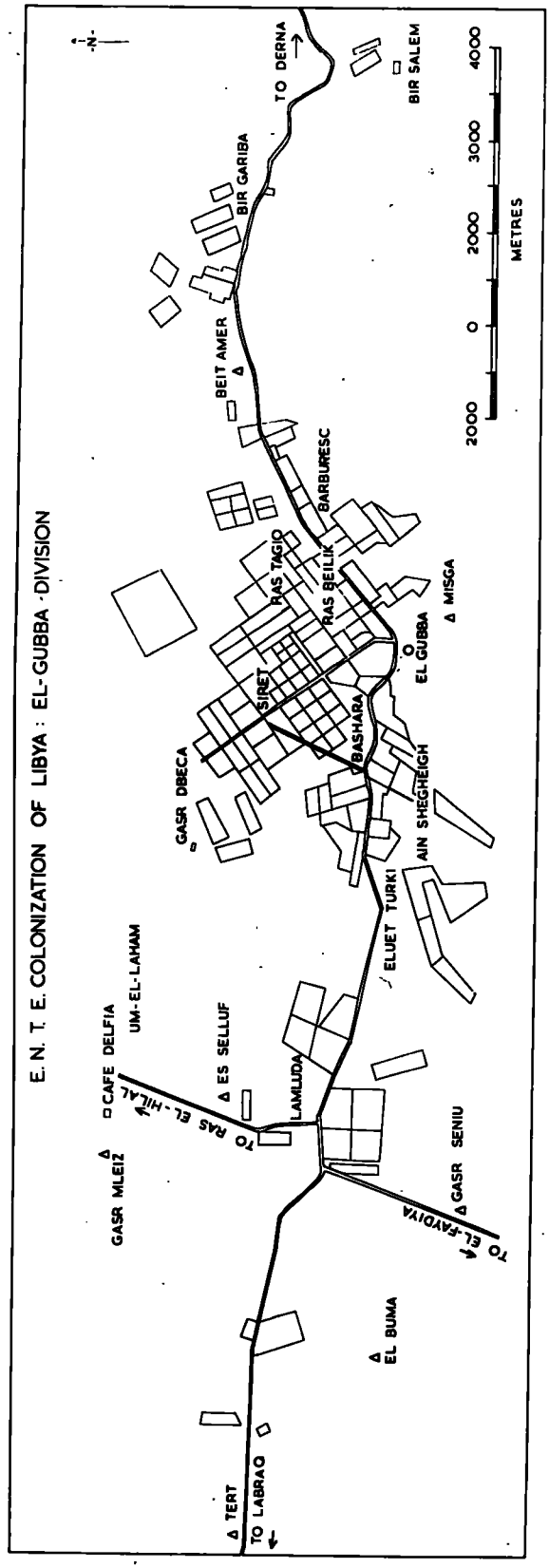
as well as a school, a granary, a church, a medical dispensary and a Fascist headquarters. Administrative offices were laid down for approving the necessary credits. The farm buildings included a cow-byre, storehouse, and manure and silage pits. The number of livestock per holding varied from four to ten cattle, with a horse, poultry and rabbits; sheep and goats were not kept, and neither were pigs.

The well tended farms on an area that previously was rough grazing land show that on the technical side the enterprise had been unquestionably successful. The homesteads were larger and better than the usual run of colonists houses. They were built on each side of a main avenue, which, with its lines of flowering trees and colourful gardens of the houses, were exceedingly attractive.

The unit of this demographic settlement was the family, so that each farm would be a self-contained economic unit run on its own labour. The farms had been prepared and the houses built in advance and furnished.

However, from 1933 to 1937 development continued slowly; by the end of 1937 some 450 Italian families had been settled in holdings. The following table shows the

Figure 27.


E. N. T. E. COLONIZATION OF LIBYA : EL-GUBBA DIVISION
N
TO DERNA
BIR SALEM
BIR GARIBA
BEIT AMER
BARBURESC
RAS TAGIO
RAS BEILIK
MISGA
EL GUBBA
SIRET
BASHARA
GASR DBECA
AIN SHEGHEIGH
ELUET TURKI
LAMLUDA
ES SELLUF
UM-EL-LAHAM
CAFE DELFIA
TO RAS EL-HILAL
GASR MLEIZ
GASR SENIU
TO EL-FAYDIYA
EL BUMA
TERT
TO LABRAQ
2000
0
2000
3000
4000
METRES

number of farmhouses built between 1933 and 1939 in Luigi Di Savoia and Giovanni Berta:-

Table 30:- FARMHOUSES BUILT IN L. DI SAVOIA AND G. BERTA BETWEEN 1933 AND 1939

	1933	1934	1935	1936	1937	1938	1939	Total
L. Di Savoia Settlement	-	80	-	-	8	38	-	126
G. Berta Settlement	-	62	-	-	9	21	-	92
	-	142	-	-	17	59	-	218

Fig. 27 shows the Ente plan for colonisation of El-Gubba area. The farms are concentrated along the main high way between Bir Salem and Tert. The first 20,000 colonists for Libya were given a tremendous send-off in March 1938 and their settlement completed during the following eight months. Of those who came to Cyrenaica, probably more than half of the 20,000 (1,800 families) partly went to complete the villages already in existence, and partly to occupy the new holdings prepared for them at Baracca, Oberdan, D'Annunzio and Battisti. No sooner had this been done than in 1939 a programme was approved for the introduction of a further 20,000 colonists into Libya, comprising 2,000

families (only large families were selected). In due course, 139 families disembarked at Ras El-Hilal in November 1939 bound for Mameli, Sauro and Filzi, and some 860 families went to Tripolitania.

Northern Cyrenaica became a part of Italy. Benghazi and Derna had become modern towns; modern roads cut through the Jebel, and a railway ran from Benghazi to El-Marj and was in process of extension to Derna.

The Ente scheme provided for three phases. In the probationary period of one or two years, all produce was the property of the Ente and the colonist was paid a living wage. In the second, or crop-sharing period, development expenses were still borne by the Ente, but the crop was shared equally, the value of the share of Ente being credited against the colonist's debts. In the third or purchasing phase, which was expected to last for 25-30 years, the colonist sold his crops and paid all the expenses, and also paid a fixed cash sum annually to the Ente until his debts were cleared.

Within each settlement the farms were uniform in area, but varied considerably compared to farms on other settlements. They ranged from 25 acres, all irrigated, to 62 acres of which 12 were irrigated, and 75-150 acres for dry-

land farming. The number of farms in a colony ranged from 20 to nearly 300, and quite extensive farms were founded in the Jebel during the first period of colonisation, partly due to direct purchase of land from the Arabs and partly to the Italian practice of granting concessions and thus helping the creation of enterprises on the capitalist pattern. Later it was believed to be an improvement to reduce the size of the new concessions by creating pieces of land that could be cultivated directly by the colonist.

Ente activity was concentrated chiefly on areas of the Jebel for smaller size farms. The Ente had upheld this latter principle and made it possible even for families without any capital to come to Cyrenaica, since these were attracted by the hope of soon becoming owners of the land which they would cultivate. The large farms of the capitalists showed a tendency to avoid applying the demographic rules imposed by the State.[1] They tried to avoid creating small farm units by employing Arabs. The tendency continued towards formation of large landed estates, which were much condemned in the terms of Fascist social organisation, and which were incompatible with expansion of population. Small-farmer colonisation had counteracted this and fulfilled all expectations. One of

1. Micheli, A. "Report on Cyrenaican Agriculture under the Italian Administration" Rome, year ? pp. 386-387.

the major objections which was raised against the colonisation as carried out in the first period by Ente, was that such a plan required considerable funds, and that so large an organisation as Ente necessitated a large staff. However, these objections were discarded when it became apparent that the task of Ente was very complex and included not merely agricultural development, but also credit facilities, the construction of farm buildings, as well as other works closely connected with the improvement of land.

The total Italian governmental investment in the development of Cyrenaica for the whole period of their rule is estimated at 534 million lire; that of Ente at 159 million lire; and that of private concessionaires at 718 million lire. By 1940, about 80,000 hectares were actually developed by the Italians.[1]

To summarise, the demographic settlements were technically moderately efficient but economically they were weaker than the private concessions. They were based on the idea of self-sufficiency, enough livestock being kept for domestic needs. Vegetables were grown in abundance, but the main crops were wheat and almonds. Grapes

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1. Lindberg, J. OP. cit. p. 10.

were also frequently grown. The labour was supplied chiefly by the colonist and his family.

After the confiscation of lands from the Arabs and the mass settlement of the Jebel by the Italians, the Italian Government took some measures towards the welfare of the Arabs. One of these offered the Libyans a "Special Italian Citizenship", which admitted the retention of Muslim laws of personal status, but was incompatible with full Italian nationality; they were known as Libyan Italians. Another measure towards the improvement of relations with the Arabs was the establishment of new agricultural centres for the Muslims, known to the Italians and the writers of the period as "The colonisation by the Muslims Themselves". The lands were less attractive agriculturally and the financial backing was modified. The villages were similar to the Italian villages, but smaller. These centres were part of the Ente programme and filled with the old soldiers of the Libyan Division and their families. It is impossible to make a fair estimate of the effectiveness of these Muslim centres, Alba (Ras El-Hilal) and Fiorita (Zahra or Lathrun) (Vide, Fig. 20), since when the country was evacuated by the Italians, they were still in the primary stages, where the Libyan farmers were receiving monetary allowances; few

have considered it desirable to preserve their farms on the same scale without financial advances.

The Italian experiment in Cyrenaica came to an end with the abrupt evacuation of the Italian community. Therefore, any attempt to assess the final effectiveness of the scheme is destined to failure. The occupation by the Italians ended long before the time had arrived when the expected results could have become apparent. In a few isolated cases, older colonists had become proprietors of their holdings; the majority of the early colonists were still in the second stage of their evolution to proprietorship - that is, they were not at that time fully self-supporting, much less in a position to redeem their advances. More than three-quarters of the total number were still in the first stage, where they were directly dependent upon cash allowances for subsistence. In fact, they had hardly settled in their new homes.

Conclusion

The Italians in their colonisation in Cyrenaica, brought with them new techniques and large capital resources and introduced a new agricultural system. The Arab and Italian systems exist side by side, sometimes in conflict, sometimes complementing each other. While the Arab

system is primitive, yielding a low agricultural surplus, it is in essential equilibrium. The Italian system, on the other hand, was technically more advanced and more efficient, but was unable to exist without outside aid, and was correspondingly vulnerable. The development of Italian agriculture required both direct and indirect investments. The demographic settlements were part of a modern market economy and depended upon previous investment in roads, ports, communications, hydraulic works, and railways, etc.

However, as a result of the Italian efforts, it might be said that in the Jebel there is a considerable agricultural potential and a good possibility for future development. With the mass migration of the colonists and the confiscation of lands from the Arabs, large numbers of Arabs had emigrated to Egypt and the Sudan, some were forced to join the Italian troops, and others turned to nomadism. Economic opportunities for the Arabs became very limited, not merely because of the land, but also because of the relatively high standards of living of the colonists.

After the evacuation of Cyrenaica by the Italians, the Arab tribes returned to their own land and occupied all Italian demographic centres. We shall deal with present-

day conditions in the chapter on Agriculture.

PART THREE

CHAPTER XI

AGRICULTURE

INTRODUCTION

Cyrenaica, an arid country, depends on agriculture as the chief resource whereby its inhabitants may make a livelihood. Farming and livestock raising have been carried on for thousands of years. From all the records and from the evidence furnished by the existing remnants of previous cultures, it would seem that the present day agriculture is much less developed than that which existed in the Greek and Roman periods.

A very large proportion of Cyrenaica is barren desert with vast expanses of shifting sand dunes. The agriculturally productive lands are limited to northern Cyrenaica, and to a few small oases scattered irregularly through the south.

It has been estimated that the total productive land in Cyrenaica is four million hectares.[1] This figure is admittedly only an estimate since there is no reliable way of assessing what may be considered marginal and sub-marginal land used either for shifting cultivation or grazing of such

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1. Rowland, F. and Robb,E., "Survey of Land Resources in Tripolitania". op. cit.

drought-resisting animals as sheep, goats and the more hardy camels. Even from a casual inspection of the country, it is evident that the agricultural potentialities depend more on skill, energy and capital applied to the vast areas of relatively sub-marginal land, rather than any actual shortage of land. Cyrenaica's agriculture is subject to tremendous fluctuations from year to year, from area to area, according to the occurrence of rainfall, and to a lesser extent the Ghibli.

The productive lands are concentrated on Benghazi plain and the Jebel. According to the official statistics, the total arable land of the agricultural holdings in Cyrenaica amounts to 943,740 hectares. About 40% of the arable lands are on the Jebel Akhdar. The total irrigated lands amount to 11,740 hectares, of which 50% are on the Benghazi plain.[1] The total agricultural area of Mutasarrifiya of Derna is 48,334 hectares.

The economy of Cyrenaica is predominantly agricultural. Parallel to the growth of agriculture, official interest and assessment of production in official statistics have also been expanding. Countless decisions in the field of

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1. Kroeller, E.E., "Agricultural Statistics for Cyrenaica 1959", op. cit. p. 12.

agricultural policy and development are based on the statistical data available. Governmental and technical assistance agencies, farmers and merchants depend upon accurate information. Before spring 1954, however, there were no data available in Cyrenaica.[1]

The Italian records before the evacuation of the colonists were destroyed during the Second World War. Many difficulties facing the collection of agricultural data - administrative, financial, tribal structure and the movement of the Bedouin may be overcome in the near future, but the Bedouin are unused to statistical enquiries and are thus prone to confuse statistical surveys with taxation measures. The result of this is that under-weighted returns are given.

The fundamental bases of the economy of Cyrenaica are cultivation and pastoralism. According to the Census of 1954, about 76% of the total population of over 5 years old are engaged in agriculture.

The present chapter will deal with the following topics:-

Land tenure, agriculture in Classical times, shifting agriculture, cultivation in Derna gardens, the major crops, fertilisers - manure, irrigation, agricultural development, pastoralism and livestock.

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1. Ibid.

LAND TENURE

Possession and ownership of land is of basic import- and for any enterprise involving agricultural development. Lands may be divided into five categories:-

(A) Mulk land, or property held in full ownership by private persons.

(B) Waqf land, or lands alienated in mortmain not liable to transfer.

(C) Miri land, or public property belonging to the State.

(D) Matrok land, or land made free for public use.

(E) Mawat land, waste, not cultivated and referred to as 'dead' land.

Almost the entire agricultural land of Cyrenaica is in the hands of the tribes, as will be seen from the table below.[1]

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1. Qureshi, A.I. "Report on Land Rights and Agricultural Taxation in Libya" United Nations Mission in Libya, Rome 1953, p. 6.

		Hectares
1.	State lands recorded officially (including ENTE)	118,063
2.	Agricultural lands held by Italians in concession and private property and now transferred to the Government of Libya.	38,389
3.	Estimate of other small areas of private land.	2,000
4.	Other lands including tribal lands	4,000 ,000
5.	Privately owned lands not registered (approx.)	40,000
	TOTAL	4,198,452

It is obvious from the figures given above that over nine-tenths of the land is held under tribal ownership. From time immemorial the lands have been under the occupation of the respective tribes, and are generally used for grazing and shifting agriculture according to rainfall. Lands under the occupation of each tribe belong to the tribe as a whole, which indicates that communal or joint ownership prevails. No part of such lands may be disposed of by any individual, as he personally does not carry any property rights for such an action. In the common interest these lands may be disposed of as a gift by the joint action of the tribe as a whole, and, in practice, when any occasion

arises, the Shaikh of the tribe calls a meeting of all the heads of families of his tribe and the decision is taken in a most democratic manner by a majority vote.

Although in strict theory no land is alloted to an individual as such, in practice, for purposes of shifting cultivation lands are allocated each year according to the availability of rainfall to each family head, which usually knows the general bearings of the area in which he operates, and customarilly it is understood that the area belongs to him and should not ordinarily be encroached upon by others. From the nature of things, it is clear that for practical purposes the question of private land and individual ownership has scarcely arisen.

In 1864 the Turks had founded the Defter Khana, an office set up to determine territorial property. Nomadic Arabs are not receptive of finer periodical points of land tenure and naturally continued to abide by the old confusion of possession, habitual use and ownership. The efforts of the Turks in this direction were confined to the townships and in rural areas they were content to leave the nomadic conception undisturbed, as they did in other nomadic countries under their rule.

The acquisition of suitable land for Italian colonisa-

tion could not take place without some regard to generally accepted Arab rights, nor indeed the existing military and political situation. As has already been mentioned in the chapter on colonisation, in 1913 the Ufficio Fondiario (Land Registry Office) was founded in Benghazi and had interested itself exclusively in the legal aspects of ownership and transference of land for colonisation purposes. However, although the Italian regime, on one pretext or another, either by paying some compensation or without paying for it, did reserve a large part of the comparatively better agricultural lands belonging to the tribes on the Jebel for colonisation purposes, most lands were left in tribal hands.

The present Libyan Government for all practical purposes admits the right of the tribes to the ownership of the land irrespective of any legal or juridicial controversies.

The scant rainfall, the tribal organisation and various other handicaps imposed by nature kept Cyrenaica free from the grip of big landlords, so common in other Middle Eastern countries. Although there has always been plenty of land available in the country, it has never paid anyone to make an effort to convert it into his private property. The scanty and uncertain nature of the rainfall does not

provide the possibilities for extending the scope of cultivation, and the small population of the country has never made the employment problem a pressing one. Again, the smallness of the population has left little scope for any big trading communities to rise who could amass more wealth than they could plough into business and then turn to investment in real estate. Therefore, in this respect, Cyrenaica is more fortunate than its neighbours, as there are no landlords to dominate the scene, and the problem as such does not exist in the country.

Most important for the purpose of land tenure is the super-structure of inheritance. The successional law as well as other family rights and personal status matters (divorce, affiliation, donation, legacies etc.) are ruled by the Shari'a (the Islamic law). According to this law, all sons have an equal share of claims in the inheritance, but the daughters and wives are also entitled to their share. The result has been that the smallholdings have been hopelessly fragmented, and in order that each inheritor should get an adequate share in the more fertile lands, these have been further sub-divided until some are so small that it does not pay to cultivate them. Fruit trees are also divided, and one tree may belong to many people. In the cultivated gardens of Derna this is a very serious problem as most cultivated plots are rectangular, since it is considered desirable for the

inheritor to have a frontage on the road. This aspect is well developed west and south-west of the Town of Derna.

AGRICULTURE IN CLASSICAL TIMES

In the ancient world each urban community was originally supplied with food produced in its own adjacent territory, but in the case of Derna this was not possible, since it was the centre of a vast empire and maintained a population much beyond the limits of the agricultural potential of the rural environs. It was to Africa, including Egypt, that the rulers of the Roman Empire looked for the supply of grain and olive oil required to maintain the swollen population of the imperial capital. Later, when Constantinople became the capital of the eastern half of the Roman Empire, and began to have its own supply problems, grain was shipped from Egypt. Rome had to rely on supplies from Africa proper - Libya, Tunisia, Algeria and Morocco.

Of Libya's three regions, only Tripolitania and Cyrenaica were profoundly influenced by Mediterranean civilization. The former was brought into contact with the progressive world by Phoenician merchants who established trading centres in the coastal terminals of the main caravan routes. The latter was colonised by the immigrant Greeks from the island of Thera, who occupied the most fertile parts of the Cyrenaican plateau, the Jebel Akhdar. They established Cyrene and Barce whose prosperity sprang

from agriculture and from herds. Although Cyrenaica obtained little benefit from the African caravan trade, she enjoyed a monopoly of the remarkable silphium plants which grew in the steppe region south of the plateau. For reasons which are by no means clear, the plant later became extinct and its character and valuable medicinal properties are known only from the testimony of ancient writers.[1]

The Greeks were predominant on the Jebel, while the natives were absorbed either into the Hellenised community, or left entirely outside it in the marginal areas which were considered worthy of intensive agricultural development. As has already been pointed out, Rome inherited Cyrenaica in 96 B.C. It may be said, that by the beginning of the Roman period, urban life in Cyrenaica, or Pentopolis ("Five Cities"),[2] had almost completely gravitated to the coast, leaving the interior to agricultural expansion based on village and farm.

The initial phase of Roman occupation in Cyrenaica saw agricultural development only in those areas which were favoured by rainfall, i.e. around Cyrene, El-Marj, Zawiyat Tert and El-Gubba. The springs on the Jebel certainly have

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1. Goodchild, R., "Farming in Roman Libya", Geog. Mag. Vol. XXV, No. 2, June 1952, p. 73.

2. The Five Cities are Cyrene (Shahhat), Berenice (Benghazi), Tanchira (Tocra), Ptolemais (Tolmeita, and Apollonia (Marsa Susa).

served to irrigate some of the fields in their immediate vicinity, but, generally speaking, the Roman farmer in Cyrenaica depended on his own skill at getting the maximum value from rains. However, cisterns were needed for men and beasts. As previously noted, their capacity was too limited to allow their use for irrigation. Dams were a rarity, probably because the major water-courses flow down the escarpment into the sea with no considerable coastal plain.

More common in the Jebel are simple terrace walls, built across the width of the wadi beds. These walls, dry in construction were built of untrimmed boulders as in many Mediterranean countries today and were not intended to stem the flow of water. Their function was to hold up the soil behind them so that the gradual slope of cultivable land was transformed into a series of terraces over which carefully controlled rainwater descended.

In the fourth century, and the opening years of the fifth, the tribes of the interior and the nomads who were in the marginal areas of the cultivable lands devastated the countryside, destroyed crops and vines, and killed numbers of Roman land-owners. After the collapse of the Western Empire, the Byzantines retained control of Cyrenaica and the settled life continued in the Jebel. Agriculture

survived through to the Arab invasion.

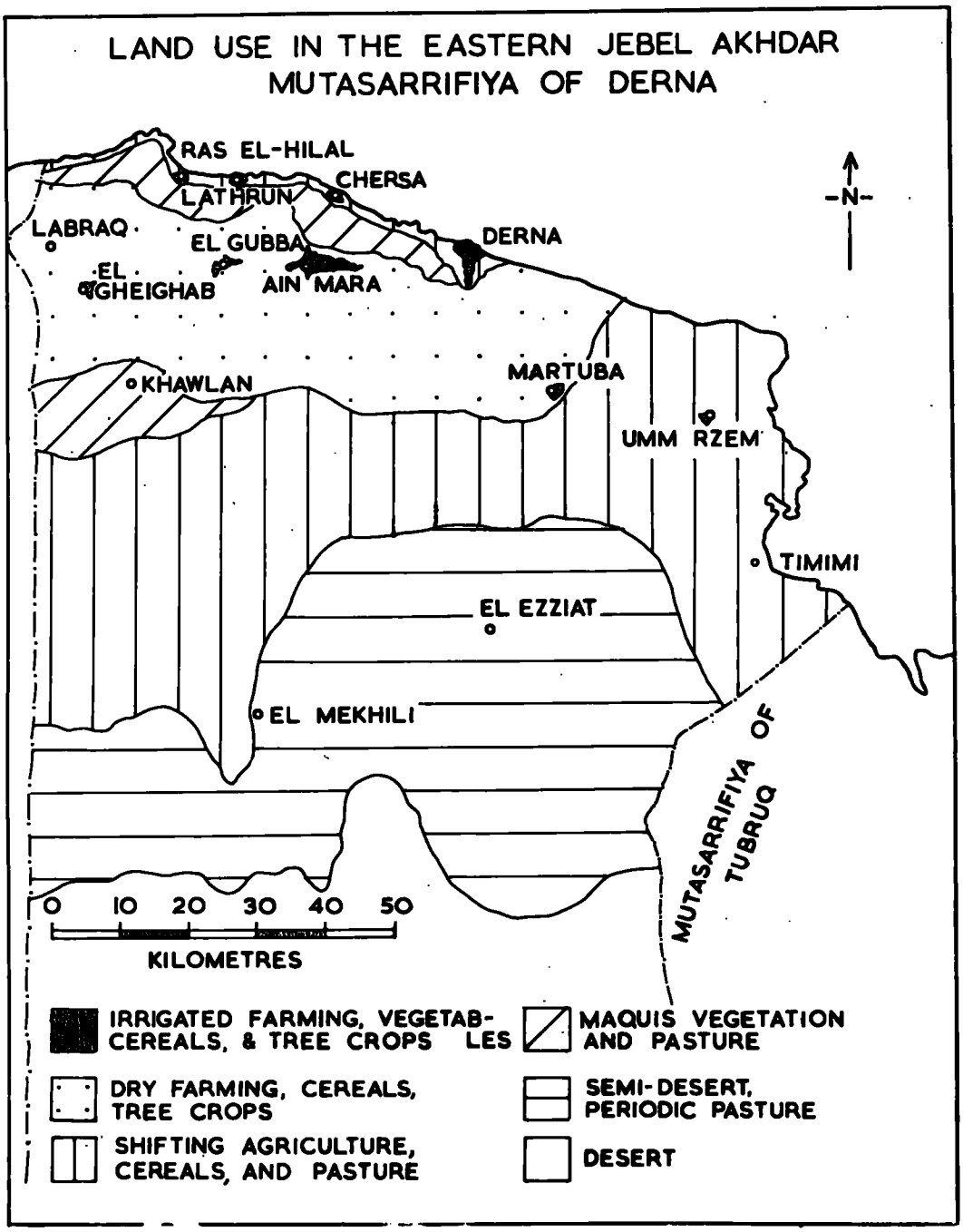
SHIFTING AGRICULTURE

Figure 28 suggests that a large part of the eastern Jebel and the southern slopes are devoted to shifting agriculture. This is misleading, for only the more favourable patches of land are in fact utilized, the remainder being used for grazing animals which belong to the nomads and the farmers on the Jebel.

The low and irregular rainfall, eliminates from permanent cultivation a large portion of the land of region, and explains the importance of shifting agriculture. The farmer moves with the rains and ploughs where reasonable rainfall is available. This also explains the difficulty of delimiting the area of cultivated land in any year, or pronouncing a judgement on the cultivability of any particular piece of land.

The area of shifting cultivation in the eastern Jebel is located on the narrow coastal plain and in the Barr "The Es-Serual" region. Tariq Aziza is the northern limit of the shifting agriculture in the Barr, and the southern limit is a line from Bir Hakim, running westwards to Bir Tenjeder and then turns south-west to Ajedabia. To the south of Tariq Aziza there are no property boundaries and

Figure 28.


LAND USE IN THE EASTERN JEBEL AKHDAR
MUTASARRIFIYA OF DERNA
RAS EL-HILAL
CHERSA
LATHRUN
LABRAQ
EL GUBBA
DERNA
EL GHEIGHAB
AIN MARA
N
KHAWLAN
MARTUBA
UMM RZEM
TIMIMI
EL EZZIAT
EL MEKHILI
MUTASARRIFIYA OF TUBRUQ
0 10 20 30 40 50
KILOMETRES
IRRIGATED FARMING, VEGETABLES CEREALS, & TREE CROPS
MAQUIS VEGETATION AND PASTURE
DRY FARMING, CEREALS, TREE CROPS
SEMI-DESERT, PERIODIC PASTURE
SHIFTING AGRICULTURE, CEREALS, AND PASTURE
DESERT

the land is common property. Each person ploughs where he pleases and the average area of cultivation is three hectares.

Generally speaking, the shifting agriculture is practised by the nomads and semi-nomads. Even the settled people occasionally undertake movements of this nature; some Derna families send one member to the Barr or alternatively hire someone to go out for them. The members of the sub-tribal division send a group to the Barr for ploughing. The ploughing starts from the middle of October to the middle of November according to the rains. The coastal belt is sown a little later. The crop sown in the Barr is barley. After sowing the seeds, some of the Bedouin stop in the Barr to graze their flocks whilst the rest of the group returns to the residence in the Jebel. By mid-April the first harvest on the southern slopes of the Jebel is being reaped, and on the Jebel reaping goes on from May to the end of August.

The cultivators are not greatly concerned about yields per unit of land: they are more interested in securing a large multiplication of the seed sown. Sometimes the cultivators sow in many areas favoured by rains and use as much seed as they dare risk. They also seek to sow in

a number of areas hoping that if the rains fail in one area they will be better in another.

Shifting agriculture has several disadvantages. The shifting cultivator scatters his seed very widely in order to make the best use of moisture available. Only in a few years, when rainfall is good and the slopes of the Jebel and the Es-Serual region are one mass of green in the late autumn is a satisfactory harvest gathered. The shifting cultivator is using the land that would produce the best grazing lands and he is constantly destroying much of the bush vegetation where he ploughs.

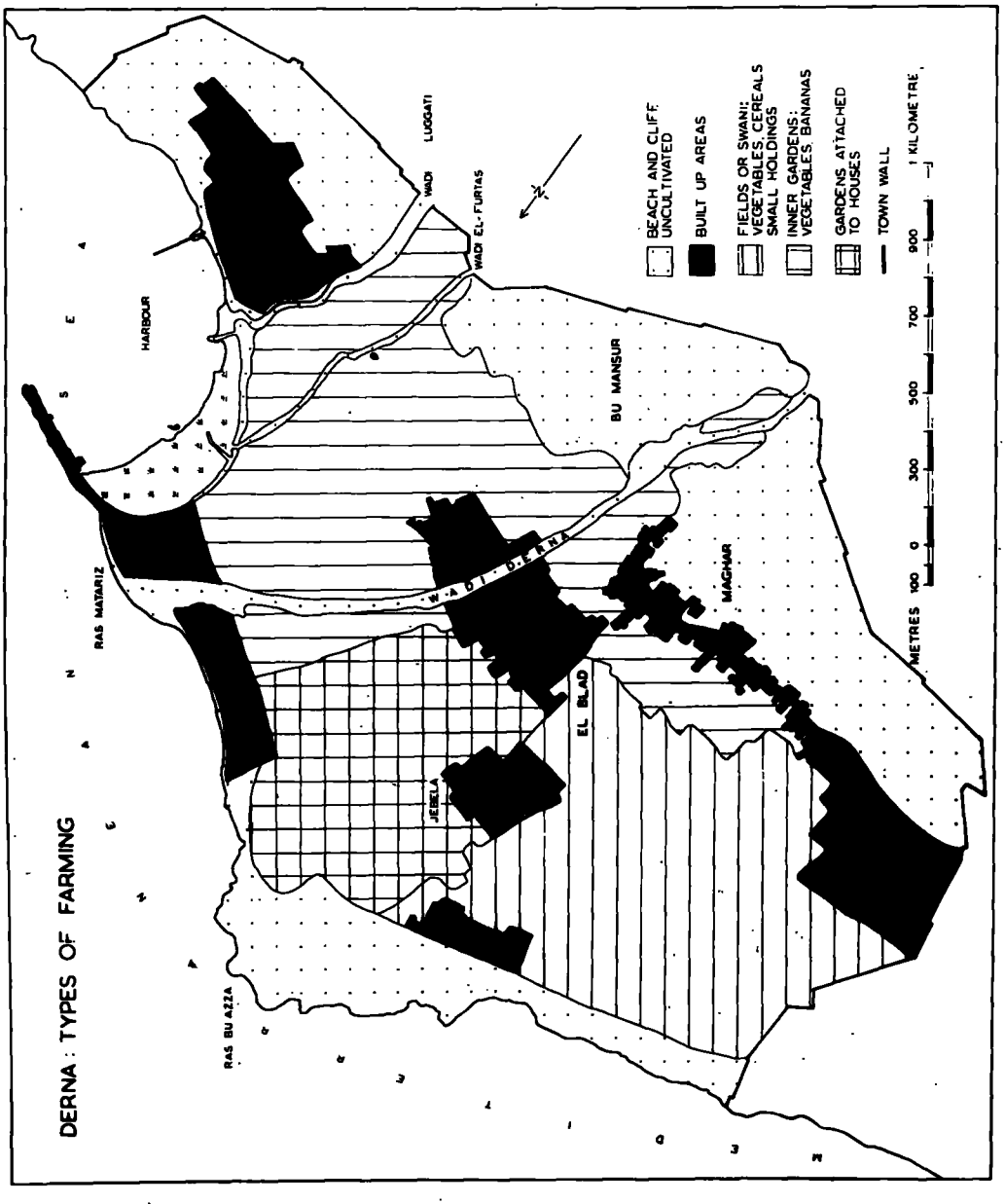
CULTIVATION IN DERNA GARDENS

The most interesting aspect of the agriculture in this region is the cultivation in the gardens of Derna. The success of cultivation here depends entirely upon irrigation. The gardens fall into the following three classes and will be considered in this order (Vide Fig. 29).

(A) Gardens adjacent to houses
(B) Inner gardens
(C) Fields known locally as Swani (sing. Sania)

(A) These gardens are situated in El-Blad quarter, the extreme part of the Jebela and west of Bu Mansur. Some protection

Figure 29.


DERNA: TYPES OF FARMING
RAS MATARIZ
HARBOUR
WADI LUGGATI
WADI EL-FURTAS
BU MANSUR
WADI DERNA
MACHAR
EL BLAD
JEBELA
RAS BU AZZA
BEACH AND CLIFF: UNCULTIVATED
BUILT UP AREAS
FIELDS OR SWANI: VEGETABLES, CEREALS SMALL HOLDINGS
INNER GARDENS: VEGETABLES, BANANAS
GARDENS ATTACHED TO HOUSES
TOWN WALL
METRES 100 0 300 500 700 900 1 KILOMETRE

from the north and north-westerly winds is afforded by the surrounding walls and buildings. Fruit trees, date palms and climbing vines are the principal crops.

(B) The inner gardens are situated in Bu Mansur and upper Mughar, and are levelled artificially, especially in the former. Tree cultivation, particularly of date palms, olives and vines predominate. These gardens are well protected from sudden winds by the escarpment and from the maritime winds by the stands of date palms.

(C) These fields are occupied by the Jebela quarter and lower Mughar and are located between upper Mughar to the south, the sea to the north, Benghazi gate to the west and El-Blad to the east. These fields are exposed to the winds, consequently they are not suitable for tree culture. Hence, maize, millets and some wheat and barley and vegetables are grown. The small size of the holdings reflects the fragmentation of the cultivable land. The inner gardens and the fields are the most widely spread and the most intensively developed in Derna. But any detailed estimate of the cereals as compared with other crops is difficult owing to the frequent practice of inter-sowing cereals with vegetables and also tree crops such as dates, pomegranates, figs and oranges. Almost certainly because of the difficul-

ties experienced with water supply, cereal growing is largely confined to the lower marine terraces, with the fruit trees increasingly predominant as slightly higher levels are attained. The use of irrigation water allows the planting of cereals at different times, and as many as six stages of growth of some cereals could be observed within one plot.

Cultivation occurs on both sides of the wadi for a distance of four kilometres (Vide Plate 13a), except where the steep sided cliffs leave no room for cultivation. There are 598 gardens distributed among the four quarters of Derna and the wadi as follows:-[1]

Bu Mansur	149 gardens
Jebela and El-Blad	148 gardens
Mughar	233 gardens
Wadi Derna	68 gardens

The high proportion of Mughar gardens is explained by the number of small holdings as compared with the larger gardens of Bu Mansur, which, in the former, do not exceed three hectares.

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1. Source Mutasarrifiya of Derna.

MAJOR CROPS

Cereal Crops:- The agriculturally productive land is on the Jebel and in the gardens of Derna, plus small areas scattered around Martuba, Umm-Rzem and Timimi. Production of cereals is the largest source of income for the people of this region. Tree crops occupy second place.

The fields are ploughed to a depth of seven to eight centimetres with a nail plough drawn by a horse or camel (Vide Plate 13b). The compact soil of the Jebel presents some difficulties to cultivation works, since there are layers of stone on the surface and there is a tendency for these to form clods, which are difficult to split with the primitive nail-plough. This explains why the soil is ploughed when it is moist. In this region, farming machinery is made available by the Nazaret of Agriculture. These agricultural machines, tractors, horticultural tractors and harvesters, are operated by the workers under the supervision of an experienced technician. Demand for the use of this equipment by the farmers is growing in strength. Considering the size of Cyrenaica, the numbers of machinery of various kinds is small, as seen below:

Table 31:- AGRICULTURAL MACHINERY IN CYRENAICA[1]

	Numbers in Use			
	1959	1958	1957	1956
Wheel tractors	50	50	20	15
Crawler or track-laying tractors	50	50	45	40
Garden or horticultural tractors	10	10	8	6
Combined harvester - threshers (self-propelled)	15	15	10	10

Farm Population

According to the agricultural statistics,[2] the total number of persons in the agricultural households are ennumerated at 22,238 (Table 43). Of the total number, 62% are found in nomadic agriculture, 30% on private farms and 8% on the Ente farms.

Wheat:- The tools and methods which are used at present in wheat cultivation are primitive. Generally, the seeds are sown after the first rain in Autumn when the land would be ploughed. In the second ploughing, the seeds are turned over and buried under the surface. If the farmers sow the seed on dry soil, these seeds will easily be eaten by birds

1. Kroeller, E. op. cit. p. 206.

2. Kroeller, E., op. cit., p. 24.

and the spontaneous grasses develop in a considerable way after the rain. The farmer sows only a limited quantity of seed on a unit of land, there are cases very often, when the cultivator sows about 15 to 20 kilogrammes of seed per hectare on the Jebel, and these give a return of more than 40 kilogrammes. The only care which the cultivator knows is weeding or simple hoeing, which he cannot always do.

However, the production of wheat and cereals as a whole depends upon the amount of rainfall received. The following table shows the production of wheat and barley for the last six years.[1]

Table 32:- PRODUCTION OF WHEAT AND BARLEY IN THE MUTASARRIFIYA OF DERNA IN RELATION TO TOTAL PRODUCTION IN CYRENAICA 1954-1959 (TONS)

		1954	1955	1956	1957	1958	1959
Cyrenaica	Wheat	9470	10700	8400	21343	13592	9064
	Barley	22610	25000	18200	24913	23117	8543
	Total	32080	35700	26600	46256	36709	17607
Mutasarrifiya of Derna	Wheat	850	900	800	3838	497	936
	Barley	3100	3000	2700	3933	495	1637
	Total	3950	3900	3500	7771	992	2573

1. Kroeller, E.E., op. cit. p. 76.

The figures suggest that production was low in 1958; in fact this was the year of lowest production since 1954, when collection of agricultural statistics was first begun. In 1958, production in Cyrenaica as a whole totalled 17.6 thousand tons of cereals, of which wheat accounted for 9.1 thousand tons and barley 8.5 thousand tons. Compared with the 1957-58 wheat crop, that of 1958-59 was only two thirds and the barley crop only slightly more than a third. During the 1958-59 season, as a matter of fact, more grain was sown than in 1957-58: 50,000 quintals of wheat compared to 43,000 in 1957-58, and 63,000 quintals of barley (54,000 in 1957-58). While in 1957-58 the over-all multiplication of seed was 3.2 times for wheat and 4.3 times for barley, the corresponding ratios for 1958-59 were as low as 1.8 times for wheat and 1.4 times for barley. Owing to the different agricultural conditions and to variations in rainfall, these seed multiples give greatly different quantities in different regions. While the wheat crop failed almost completely in Ajedabia, Benghazi and Tubruq, and the returns remained below the amount sown, the seed multiples amounted to 6.3 times in Derna, 3.5 in Beida and 3.3 in El-Marj.

Appendix IV :- tables 33-42 show the production of wheat, barley, land utilization, wheat and barley prices in

1957, and the number in the holders' households in Cyrenaica, and Mutasarrifiya of Derna, District of Derna and Mudiriyas by types of settlement. The area under wheat in 1958-59 in the Mutasarrifiya of Derna was 3,689 hectares, while for the whole of Cyrenaica, some 125,000 hectares were sown. The wheat belt in the eastern Jebel extends from Ain Mara to Labraq in the former Ente farms. It is obvious from these figures, that most of the area sown wheat is in the sector of nomadic tribal units, and the nomads must consequently be accepted as persons engaged in agriculture and these consequently apply to the persons engaged in agriculture.

During the 1957-58 season, 23,000 quintals of wheat (17% of the total crop) were sold by the cultivators. The prices received in Derna were about £L 3.35 per quintal, which is the highest price in Cyrenaica. The lowest prices in the Province were offered at Benghazi: £L 2.40.

Wheat is grown on the Jebel and the southern slopes as a dry-land crop. In the gardens of Derna and the southern oases it grows under irrigation and produces well considering the small amount sown. Experience in recent years has shown - except in the coastal plain where the temperature is higher and the rains rather insufficient - that the hard grains grow better and give abundant production. The hard grain offers several advantages:

(i) It may be sown for a long period, from October to January.

(ii) Owing to its late growth in comparison with the soft grain, it does not suffer so adversely from the ghibli.

(iii) Hard grains are less sensitive to drought.

(iv) Hard grains bring better prices at market.

(v) At sowing, hard grains have greater capacity than the soft grains, as much as 20-25 kg. of seed can be sown per hectare.

Different types of wheat can be found among the local ones. There are the Mogarbia strains which have given good results, but have been since replaced by Senator Cappelli and other types such as Biscri and Azzizih. The two latter types, owing to their reduced resistence to drought and their aptitude to break easily are not cultivated in the region now. Mohamondi and Sbei selections have shown great adaptability to the region and give good production.

In the last few years there has been a tendency towards cultivating more wheat than barley since wheat is increasing in price as the standard of living rises.

Barley:- It was more important in the past than it is now, since it could be used for a variety of purposes necessary to simple economic life, e.g. food for people and stock. However, barley still occupies a larger area than

wheat.

Barley grows under dry-farming on the Jebel, but in Derna it is grown under irrigation in the Jebela and lower Mughar quarters where tree crops are not possible due to the exposure to maritime winds. Barley is the dominant cereal because it grows quickly. It is sown in October and matures in April, when it is harvested before it is burned by the hot sun and parched through lack of moisture. On the southern slopes of the Jebel, barley is the only cereal sown.

The area of barley varies from one year to another. In 1959 the area under barley amounted to almost one third of the total arable land in the eastern Jebel, while wheat and barley together occupied about half the total area of arable land. The area sown with barley in the eastern Jebel in 1959 was 7,565 hectares, while in 1958 only 4,326 hectares were sown. This could be explained by the fact that the rainfall in 1958 was insufficient and so the crop was poor; thus, the farmers in 1959 have sown large areas to secure a large multiplication. The total yield was very poor in Timimi and Umm-Rzem. These latter areas have always a lower average rainfall and so the production varies greatly from year to year. The largest returns in that year were at Labraq, where the seed per hectare

had given 2.1 times per quintal. These variations depend upon the availability of rainfall. The March rains are also important; should they fail, then the success of the crop is in jeopardy.

In 1958 about 75% of the total production was from the nomadic agricultural units, 17% on Ente farms and 8% on private farms (Swani). As a whole, barley gives an average of 3.4 quintals per hectare.

Barley also exceeds wheat because wheaten bread is not considered a necessity for the rural population and barley is necessary for feeding stock. They could not sow a better crop. There are wild varieties of barley in the eastern Jebel and the region is in every way suited to its culture. It is very hardy, stands up to drought and holds its own against the grasses which are ploughed in with the seed in the Jebel. When the barley, as well as wheat, have been reaped, the grain is stored in kuf. On the Jebel, these are ancient tomb-caves; elsewhere they are holes dug in the ground. In bad years, and even more in a succession of bad years, the peoples on the Jebel have experienced famine. In Turkish times, however, there was a large export of grain from Cyrenaica. Mondaini says that it was to the mean annual value of 40,000 lire for the years

1885 to 1900.[1] Much of this surplus was bought by English brewers.

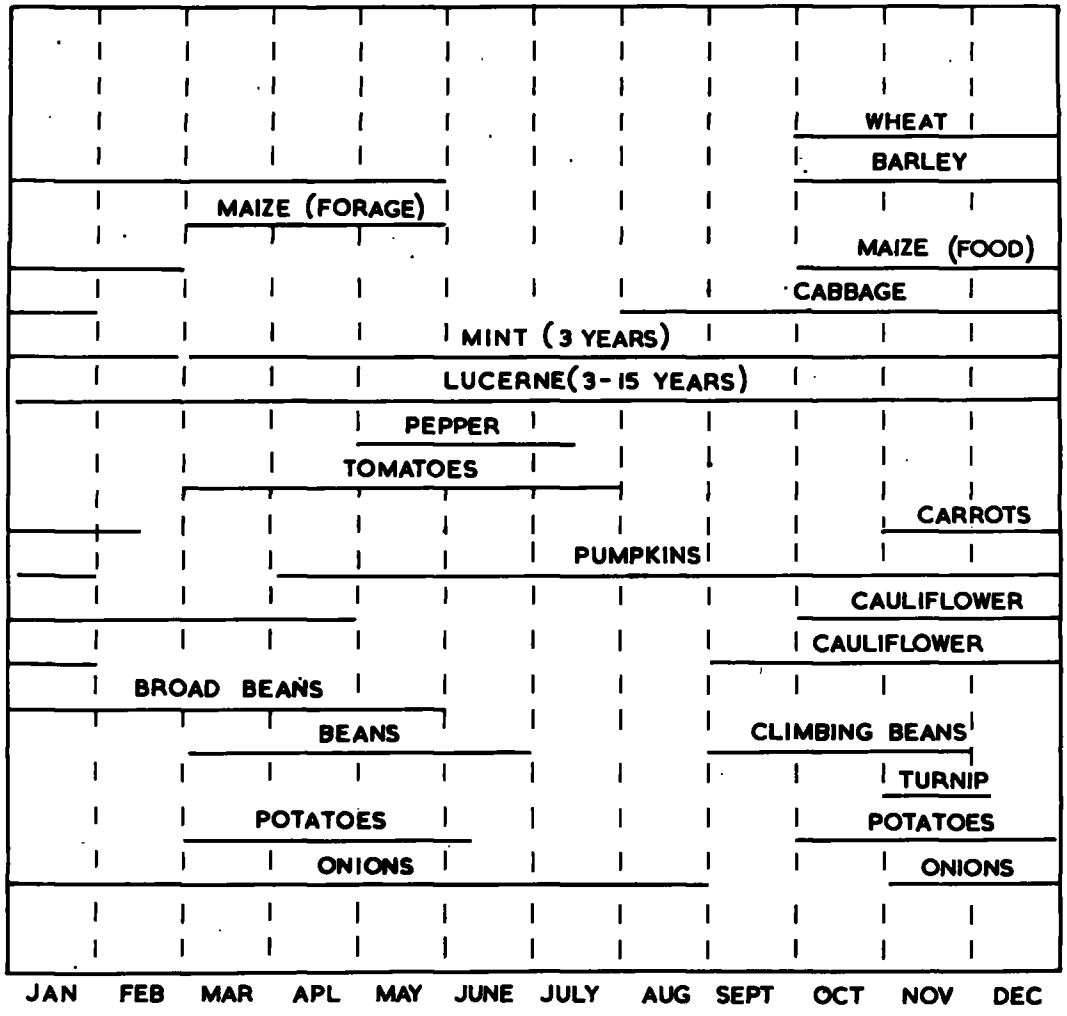
Maize:- It is cultivated under irrigation in Derna and Ain Mara. Maize in Derna gardens has a rapid growth period of four months with two periods of sowing (Vide Fig. 30). The first crop sown in October is cut green in December and provides a fresh quantity of fodder of good quality; the second sowing in March is harvested in June largely for use as food for human consumption. In Ain Mara the period of sowing is March or the first ten days in April and harvests in July. Maize for human consumption usually is used for bread or to be roasted before the maturation is quite complete.

There were attempts by the Italians to cultivate maize by dry-farming on the area west of Labraq and this gave a reasonable return. The return from the cultivated maize is about twelve quintals per hectare. The only obstacle to the extension of its cultivation is the limited area available where conditions are optimum. On the coastal plain wheat and barley give good returns and maize appears to have failed in competition for land. The total production of maize in the Mutasarrifiya of Derna in 1959 was 4,348 quintals, of which about 67% of the total production came from Derna gardens and the rest from Ain Mara.

1. Mondaini, G., Manuale di storia e legislazione Coloniale del Regno d'Italia, 1917, Rome p. 308.

Figure 30.

SEASONAL RHYTHM OF AGRICULTURE AT DERNA



Millet:- This is also grown in Derna on the irrigated fields. It is usually used as flour or is sold in the market as forage for animals.

Vegetables:- The variety of vegetables grown in the eastern Jebel is much the same as other littoral areas of northern Libya. Amongst the vegetable crops are tomatoes, pumpkins, peppers, dry onions, cabbage, carrots, beans, broad beans, melons, turnips, cauliflowers and aubergines.

Vegetables are dominant in Derna gardens and Ain Mara, where they grow under full irrigation. In Derna gardens, vegetables constitute a large element in the Jebela, lower Mughar and Bu Mansur quarters (Vide Fig. 29). In the two former quarters the fields are exposed to the maritime winds and so the vegetables replace more sensitive crops. Most vegetable crops are grown both in winter and summer. A slight break in cultivation occurs in October when there is a temporary shortage of water after the summer drought. There is a distinct routine for cultivation. Autumn is the time for planting vegetables such as onions, potatoes, turnips, cabbage, climbing beans (Vide Plate 14a), carrots and so on. The harvest is in August, the first ten days of December, January and April, November, mid-February and January respectively. At the beginning and during the

summer, a second potato crop is planted alongside the beans, pumpkins, tomatoes, peppers and mint; the harvest is in the first ten days of June, January, mid-July and February respectively. The figure number 30 illustrates the seasonal rhythm of agriculture in Derna.

Since the fields are very small, intercultivation is necessary in each jedula.[1] The field is divided into jedawel. The main crop is cultivated in the middle whilst other crops are grown around the sides and the mount (serir) of the jedula. The jedula in Derna gardens is rectangular in shape and usually measures 2 times 15 metres. (Vide Plate 14b). In the system of intercultivation, turnips are grown with tomatoes and potatoes, aubergines or carrots with peppers. It is supposed in these additional crops that they do not remain in the field more than four or five months.

The vegetables produced in the gardens of Derna are sold in the local markets where there is considerable demand. However, after the evacuation of British troops in 1954, the consumption of vegetables declined since much of the trade had been supported by purchases by service personnel.

The second area for vegetable production in Ain Mara,

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1. Jedula is the Libyan term for a small rectangular plot measuring two by three metres which is used to facilitate peasant irrigation.

where water is available during the whole year for irrigation purposes. The cultivated lands are concentrated in the area between the main road and the village and in the wadi of Ain Mara (Vide Plate 15a). The vegetables cultivated here are broad beans, tomatoes, pumpkins, melons, onions, peppers and cabbages. The products are sold in Derna market. Since the prices offered in the Derna market are not encouraging, the farmers tend to hold over cultivation in spring and summer in Derna, hence during these seasons, most of the vegetables come from Ain Mara. The problem of over-production of vegetables in Derna could be solved by exporting some of the produce to Benghazi and Tubruq. Another element of competition for Derna grown vegetables is that costs of production at Ain Mara are less since water may be obtained cheaper.

A third area for producing vegetables in the eastern Jebel is Lathrun, where about 21 hectares are cultivated under irrigation. The vegetables cultivated here are tomatoes, melons, and broad beans. The area is quite suitable for producing vegetables, but the limited area of land is the main factor of the non-extension of cultivation. Other less important areas for vegetable production are El-Gubba, Ras El-Hilal, Martuba, Timimi and Umm-Rzem. The land in El-Gubba is devoted to cereal crops while other areas, Martuba, Umm Rzem and Timimi suffer through lack of adequate

The production of grapes from the indigenous climbing vines of Derna is mostly for dessert grapes. This type of grape is of attractive appearance and of good quality. Methods of cultivation are primitive, and most of the vines at Derna are trailed against trellise-work or over roofs of houses and sheds (Vide Plate 9a). Sometimes they may simply trail along the ground, in which case they are supported by sticks, so they are not in contact with the surface of the soil. Once the plant has attained the required height, the only attention needed to ensure fructification is the annual pruning of shoots. In fact, it is general practice to prune the shoots only once every three years, by which time they may have grown to unmanageable proportions. No other care of the wines is given until the grapes are ready for harvest. Excellent harvests are the result mainly of a favourable climate rather than of agricultural skill.

Bananas

Banana cultivation in the eastern Jebel is concentrated in Derna gardens. As has already been pointed out, bananas grow best in areas sheltered from sea winds especially those which blow in summer. Banana culture is a dominant factor in the agriculture of Mughar and Bu Mansur and a

Attempts were made by some Derna farmers to grow bananas in Ain Mara on a large scale but unfortunately these efforts failed. The local farmers in Ain Mara have refused to share water for irrigation of the new project. At present there are only 188 banana trees in Ain Mara. The land is quite suitable for banana expansion in the shadow of Wadi Mara which is protected from the winds. It is also a fact that water is available at all times of the year, and there is no fear of shortage, a factor which is vital for banana growing. The total production of Ain Mara in 1959 was only 33 quintals which was sold in Derna market.

The banana industry of Derna is of great importance in the local agricultural economy. Bananas are in good demand on the local market and at present are bringing profitable returns. Since the environmental conditions at Derna are not reproduced elsewhere along the Cyrenaican coast, there is little chance of competition in the province.

Almonds

They appear to grow very well in the eastern Jebel. Most of the almond trees are planted in alternate rows in the vineyards. Almond trees grow without irrigation except for light watering to start the trees, and they begin bearing significant quantities of nuts after five or six years.

Most of the nuts produced are of the thick-shelled variety and are sold in the local markets of Derna and Benghazi.

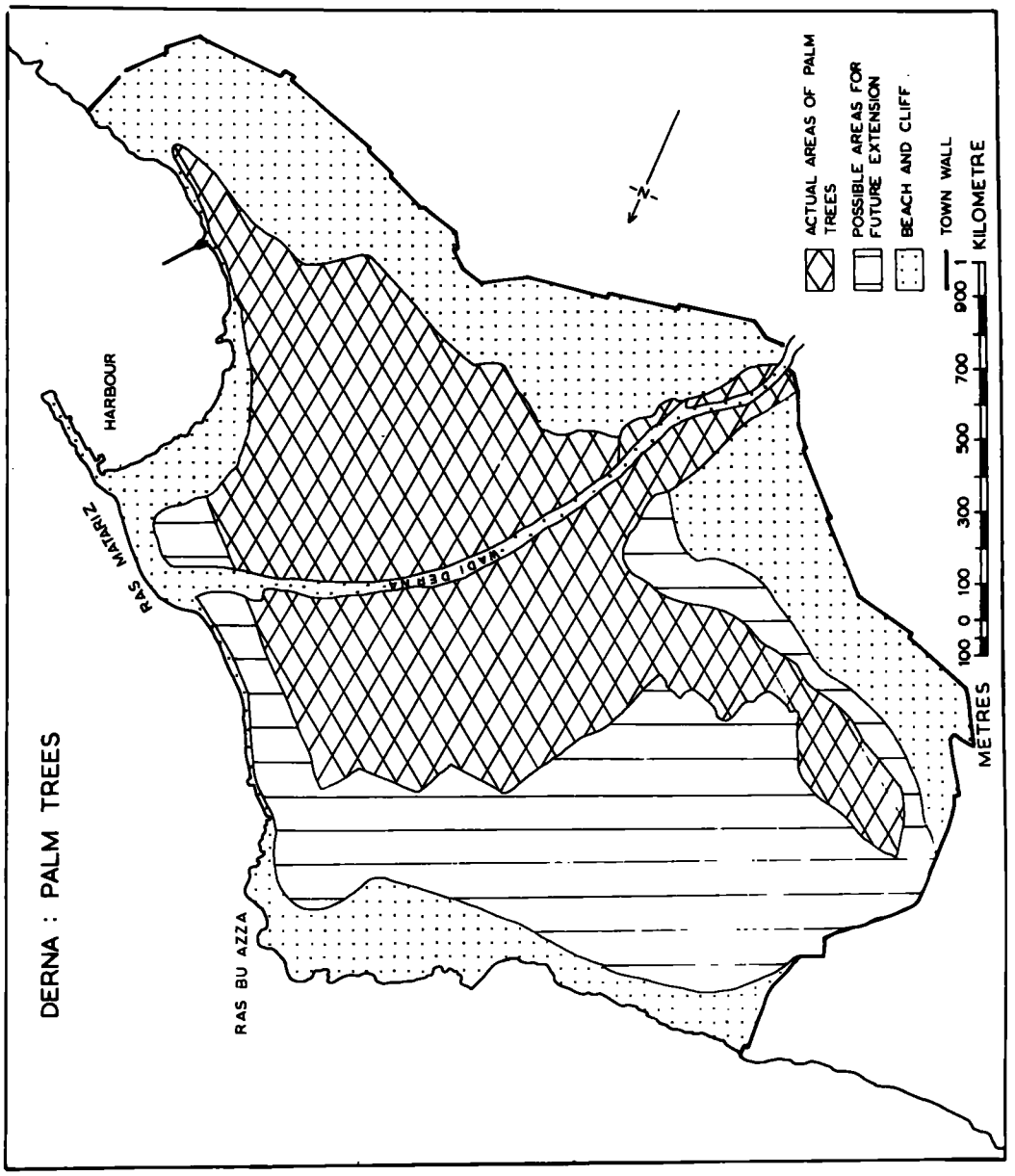
The Italians during their colonisation activities had planted a considerable number of trees on the Jebel in Labraq, El-Gubba and Ras El-Hilal. In the period 1943-54 the almond trees suffered a great deal of damage at the hands of the goats and the Bedouin. Since 1954 the Provincial Government has taken over protection of the trees by settling the semi-nomads in the former Ente farms.

The total number of almond trees in the eastern Jebel at present is 2711 and the production 509 quintals in 1958-59 (Vide App. IV Tables 43-9). In Labraq there are 848 trees which gave a production of 164 quintals in 1958, 876 trees in El-Gubba produced 126 quintals, 705 trees in Derna 171 quintals, and 213 trees in Ras El-Hilal 48 quintals. The figures show high production in Derna gardens compared with others on the Jebel. This may be explained by the ignorance of the farmers on the Jebel in the culture while in Derna the farmers are more skilful and look upon the trees as an economic crop. Almond trees in Derna are found in the areas protected from maritime winds; i.e. in Bu Mansur, upper Mughar quarters and along the terraces of Wadi Derna.

Dates

Dates are an important item in the diet of the people

Figure 31.


DERNA : PALM TREES
HARBOUR
RAS MATARIZ
WADI DERNA
RAS BU AZZA
ACTUAL AREAS OF PALM TREES
POSSIBLE AREAS FOR FUTURE EXTENSION
BEACH AND CLIFF
TOWN WALL
METRES
100 0 100 300 500 700 900 1
KILOMETRE

and furnish a large proportion of their food. In Derna the date palms, of which there are about 32 species, occupy about 152 hectares of the irrigated lands. The date palms are affected by two main factors - temperature and humidity. Romagnoli considers an average temperature of 18°C and a humidity of more than 50%[1] to be optimum conditions for cultivation. Compared with dates produced elsewhere in Libya, the dates in Derna are not of high quality. The more humid climate of Derna is apparently responsible for the difference in quality but the variety grown is also important. Dates of low quality usually supply food for the animals. The actual area of palm trees in Derna is Mughar, El-Blad and Bu Mansur (Vide Fig. 31). However, the Jebela quarter offers possibilities for extension, since it is not protected from the maritime winds and would offer further protection for other tree crops in the area. The cliffs in the south and the beach to the north are impossible to plant with palms. It is estimated that date palms number 470 and that the total production was about 299 quintals in 1958-59.

The second area for date palms is Umm-Rzem, where there

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1. Romagnoli, M., "La coltura della palma da dattero in Cirenaica e la principali razze essistenti nell' oasi di Derna". Rassegna Economica della Colonie, Vol. 17, No. 7-8, July-August. Rome 1929, p. 681.

are about 103 trees with a production of 34 quintals in 1958-59. The quality is very poor and they are consumed by the local population.

Olives

The cultivated olive trees are very few in the eastern Jebel. The olives are grown as dry-land crop, but water is very helpful, even essential in getting trees started. After the tree has reached an age of three or four years it grows without irrigation in high rainfall areas. Most of the cultivated olives were planted by the Italians. The Italian Administration carried out some experimental work on olives for varietial selection and it has been found that Caratina and Leccino varieties are suitable for the Jebel for oil production whilst the Shemlali variety is suitable for the coastal plain.

The number of cultivated olives in the eastern Jebel is 1621, which gave a production of 95 quintals in 1958. The majority of these cultivated olives are concentrated in El-Gubba area and a few in Labraq and Ras El-Hilal.

Beside the cultivated olives there are the wild ones. It is estimated that there are about a million and a half wild olives on the Jebel.[1] A great number of these olives

1. Abudabbeh, N., "Report on horticultural development in Cyrenaica", F.A.O. Report No. 951, Rome 1958, p. 11.

are not wild in the strict meaning of the word, but due to complete neglect they have run wild. A great number could be brought to normal condition by proper pruning and ordinary cultivation. In El-Gubba nursery, top-work trees made vigorous progress, would be bearing fruit in the second year and would be expected to come into full bearing capacity in four or six years of top working. The top working of these wild olive trees, and pruning the abundant ones would improve the economic conditions of many of the farmers concerned.

The possibilities for extension of olive growing can be in the region of five to six times present numbers if the farmers would exert a strong effort to expand the industry. Such extension would require settlement of the farmers who plant olive trees which do not produce for ten or twelve years.

Figs

Figs grow well in the eastern Jebel and thrive with practically no irrigation. Most of the figs are grown in Ain Mara in the wadi bed of the same name, where about 1138 trees produced 442 quintals of fruit in 1958. In El-Gubba and Labraq the fig trees are grown in the gardens

opposite the houses (Vide Plate 11b). In Derna, garden figs are grown in upper Mugher, Bu Mansur and on the terraces of Wadi Derna. The total number of trees in the eastern Jebel is 3142, producing 992 quintals in 1958-59.

Citrus

The experience in Tripolitania shows that the eastern Jebel has a great opportunity in citrus growing. The number of citrus trees is very small (994 orange trees and 664 lemon) and are concentrated in Derna in Bu Mansur and El-Blad quarters. The production (152 quintals in 1958-59) is consumed locally. The quality of the fruit is excellent and the yields obtained are satisfactory, especially if the trees are adequately fertilised. At present there are no plans for the extension of the area cultivated in spite of the obvious opportunities which are known to exist in Lathrun, Ras El-Hilal and Ain Mara, where the water is available throughout the year.

Other soft fruits such as apples, apricots, pears, plums and peaches are grown well in the region. Most of the fruit trees were planted by the Italians during colonisation in the Jebel, but the number declined due to the destruction of trees by goats and the Bedouin. The possibility of greater consumption of these fruits by the local population and the feasibility of dry or industrial

use of these foods are great.

FERTILISERS AND MANURING

Most of the soils of the eastern Jebel are very fertile, especially if they are compared with those of other parts of Cyrenaica or Tripolitania, and this explains why many Ente farms succeeded in giving good returns without using any manure. On the other hand, we have to take into consideration that soil feeds the vegetation during a few months of the year. Thus the limit of production in the eastern Jebel is not given by the nutritive elements but by the quantity of rainfall and its distribution according to the needs of different plants. This does not mean that manuring is not important in the region, on the contrary it is one of the important means of intensification of production, particularly in the areas which have sufficient rainfall. However, the artificial fertilisers are very necessary since there is a scarcity in phosphorous and nitrogen. There is also low humus content, particularly in the soils which do not get organic manure. The organic manure is available in limited quantities in spite of the fact that there are numerous herds in the area. The cattle and goats and sheep tend to be kept in the open and seldom stabled. The farmers collect the manure and make up a dung-hill, where, after three months it turns

into good manure, and more so the excrement of horses and sheep, which contains fertiliser elements, especially phosphorous.

Manuring in Derna gardens ise essential in order to maintain the high yields of crops and to increase the potential cultivation. Inorganic fertilisers are not used extensively, because the farmers have not sufficient capital to meet the cost. The small size of the fields tends to make the use of chemical fertiliser uneconomic and the farmers of Derna use only organic fertiliser.

Animal manure is available in quantity from the Jebel (Vide Plate 16b). A quintal of organic manure costs about £L 1-10-0. The method of preparing the manure for use is to sink the wastes into a pit of some two or three metres in depth and to leave it covered for a time. After three or four months, the manure is at its best for use in the fields (Vide Plate 17a). Recently the Health Department has forbidden the storage of animal manure in the town.

IRRIGATION

The insufficient rainfall on the Jebel, the irregular distribution of the frequently torrential rain and the summer drought, make the economic study of irrigation very important. As has already been noted, most of the Jebel is devoted to dry-farming, in spite of the existence of many co-

pious springs, especially in the triangular area formed by Ras El-Hilal, El-Gubba and Derna, and even these springs at present are not utilised except in the fields in their vicinity. Before dealing with the irrigation system, it is necessary to mention the index of aridity in the Jebel.

Index of Aridity

Various indices have been suggested by geographers, meteorologists and other specialists. One of these indices, the index of aridity devised by E. de Martonne,[1] divided rainfall by temperature, and can be seen in his world map on which are marked along the coast of Libia figures from 10 to 20.[2] As a matter of fact, aridity drops slightly on the littoral due to atmospheric humidity which diminishes evaporation. Ahlman finds Cyrene has an annual index of 25 (23.2 according to Fantoli and Magazzini), El-Fatayah 13 (12.0) and Derna 11 (9.9).

Monthly aridity index

The climate of a country cannot be defined merely by examining the annual aridity index. The dry season of the Mediterranean climate, coincides with high summer tempera-

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1. de Martonne, E., "Une nouvelle fonction climatologique: L'indice d'aridite - La Meteorologie", Paris 1926.
2. Ahlman, Hans, W., "Libya Septentrionale", op. cit.

tures. In Cyrene, for instance, where the annual index of aridity is 23.2 the three months June, July andAugust have an index below 1, and the six months from April to September have an index of 3.4. The monthly index of aridity as given by Magazzini is as follows[1]:-

Table 52:- THE MONTHLY INDEX OF ARIDITY IN CYRENE

J	F	M	A	M	J	J	A	S	O	N	D
101	51.4	34.8	10.3	5.3	0.6	0.07	0.04	3.8	16.3	39.1	83.2

annual + 23.2

Winter Aridity

The dryness of the summer season is general throughout Cyrenaica. During this period, vegetation growth for all plants except those with special water supply or with root systems which can seek out water from long distances is slowed down.

Ground water supply for irrigation depends mainly upon the aridity of the previous winter season, which lasts from October through to March inclusive. However, Magazzini and Fantoli have worked out winter aridity in many places In Libya. According to them we find the following classifi-

1. Personal communication.

cation of the climate index for the winter season: Cyrene 50.4, El-Marj 38.0, El-Fatayah 26.1, Marawa 21.1, Derna 20.2 and El-Mekhili 3.9. Rainfall alone for the same period (October to March inclusive) would have given the following classification: Cyrene 554.5, El-Marj 457.8, El-Fatayah 314.3, Marawa 244.1, Derna 262.4 and El-Mekhili 48.9. There is a variation in the order of classification for instance, Marawa which is little drier than Derna, seems less arid during the six months from October to March. In Derna, summer aridity is tempered by air humidity.

According to F.A.O. reports, the boundary line for the growing of olive trees is located somewhere between ten and fifteen of the seasonal index, except in the case of the wadi beds or groundwater at shallow depths.[1] The index curve 20 delimits the regions most favourable for the dry-farming of cereals and for re-afforestation.

Pioger has used the index of aridity to work out the water required by crops.[2] He found a station with a monthly index of 11.5 and an average temperature of 22°C (October) requires 700 cubic metres per hectare for the months under consideration. However the data concerning

1. F.A.O., "Report on Agriculture of Libya", op. cit. p.155.
2. Pioger, R., "Water Resources". op. cit., pp. 14-16.

the water requirements of crops is not available in Cyrenaica. An attempt has been made by Magazzini and Fantoli to work out the water requirements for crops in Tripolitania. Unfortunately all the meteorological records, which had been accumulated during the Italian Administration in Cyrenaica were destroyed during the war.

Irrigation systems

The fields in the eastern Jebel are irrigated by gravity irrigation with spring sources. As has already been pointed out, in the chapter on water resources, the water table in the Jebel is very deep, while on the coastal plain the land suitable for cultivation is very small. There is no attempt made to exploit the artesian layers in the area.

The total irrigated area in Cyrenaica is 11739 hectares, half of which is in the Benghazi plain. In the eastern Jebel the total irrigated area is 2123 hectares, half of which is situated in Ain Mara where there are copious springs and the water surplus flows into the marshes in the front of the springs. The agriculture in Derna depends entirely on irrigation during the whole year. The total irrigated area in Derna gardens, the wadi terraces and Derna environs are estimated at 609 hectares. The other irrigated areas

are distributed among El-Gubba (173 hectares), Martuba (141 hectares), El-Gheighab (69 hectares), Ras El-Hilal (69 hectares) and Umm-Rzem (31 hectares). There is no irrigated land in Labraq.

The irrigation in the Jebel, El-Gubba Ain Mara, Ras El-Hilal, Derna, El-Gheighab, Umm Rzem and Martuba depends upon the flowing waters from the springs. As has already been pointed out in the chapter on water resources, all of the springs are not fully utilised. The water from the springs is lost by sinking in the wadi and by evaporation.

Another serious problem facing the development of agriculture in the region is the ownership of springs. During the Italian administration it was considered that all springs were for public use, and no private ownership was allowed in the main springs. After the Italian evacuation, and the return of the Bedouin to their lands, the tribal ownership of springs re-appeared again. This case is well developed in Ain Mara; the farmers there have refused to divide the water to the requirements of each individual field but have shared the water equally irrespective of the areas owned by different farmers.

For many years, probably ever since the Arabs first

arrived in North Africa, the land in Derna has been irrigated by flooding (Vide Plate 17b). Each field is divided into jedawel, which are flat but have a banked edge. The water for irrigation radiates into a complicated system of channels. Mughar and Jebela are provided with water from Ain El-Blad. The irrigation starts from Mughar to the western part of the town, after dividing into secondary channels (Vide Plate 18a). It then flows into irrigation trenches (saqia) for a distance of more than 200 metres (Vide Plate 18b). In some fields the two jedawel are connected by a gap, so that when one jedula is flooded, the water flows easily into the next.

The fields in Mughar, Jebela and El-Blad are irrigated once every 21 days, which is not convenient for vegetable cultivation. This period may be extended to a month during the summer, when the cultivation depends on irrigated lands entirely, with the supply of water taken from the springs if the main channel of the wadi is blocked by damage from flooding.

In Bu Mansur, the gardens are irrigated from Ain Bu Mansur. The abundant water and the level of the channel prevent damage by floods. The irrigation period in this quarter is every twelve days, a satisfactory time for cultivation, and there is no shortage of water during the year.

It has been noted in the chapter on water resources that the difficulties in irrigation in Jebela quarter have obliged some farmers to use motor driven pumps. The water from these wells flow into channels to a collecting storage tank (Arabic: Jabia) (Vide Plate 19a). The capacity of each storage tank is 50 cubic metres. When sufficient head is available, irrigation commences and the water is led along earth ditches, which cause a considerable loss by percolation and evaporation.

The irrigation in the fields is carried out over a maximum of three to four hours in a day and six to eight hours in the case of the two farms irrigating with the use of electric pumps.

The distribution of water for irrigation in Derna is controlled by the Nazaret of Public Works, which sells the water to the farmer. The cost of water for irrigation is £L 8 per hectare in the year. The distribution of water is under the control of 18 workers. About 70% of the irrigation channels in Derna town are concreted and covered.

The irrigation system is less comprehensive in Ras El-Hilal, Lathrun, Ain Mara and El-Gheighab. The water flows in channels from the storage tanks to the gardens. The same jedula type could be found in all the areas mentioned above. The irrigation trenches are not concreted.

Irrigation takes place not less than every week, since the water is available at any time of the year, moreover in Lathrun the surplus is diverted into the sea.

Irrigation development could be achieved through tapping the water from the springs to irrigate more land in Ain Mara, Derna, Ras El-Hilal and El-Gubba. A considerable quantity of water is lost at present through seepage through the surface, evaporation and the lack of maintenance of the springs.

AGRICULTURAL DEVELOPMENTS

The agricultural developments under the Italian Administration came to an end with their evacuation during the war. The Ente farms are mostly on the highway from Ain Mara to Labraq, although there are a number along portions of the southern road and on several of the roads connecting the north and south highways.

The size of Ente farms range from about 20-30 hectares. The farm houses suffered great damage during the war and immediately afterwards from looting and vandalism by the Bedouin. However, the Provincial Government of Cyrenaica repaired the houses and distributed them to the farmers in 1953 under special conditions i.e. to look after the tree

crops and to cultivate wheat, barley and chick peas. They were not allowed to keep goats and were prohibited from owning more than five cattle. In the case of the farmers returning to the nomadic life they will be disqualified from future tenancy.

The rent of the farms varies between two and three pounds annually and is for three years if there is a house on the land and for one year if there is not. The period of three years is considered as a test for the farmers.

When the Bedouin occupied the farms they tended to cultivate cash crops i.e. wheat and chick peas. Until the present there was not desire on the part of the farmers to plant tree crops since these take from five to six years to come into production.

Improvement in Crops and Crop Production

One problem for development of the Jebel is the absence of co-operative growing and marketing organisations for the use of the farmers. On the other hand, co-operatives have made progress in recent years in the neighbouring countries of Algeria, Egypt, the Sudan and Tunisia and are making a contribution to the economic and social progress of these countries. The co-operatives have been set up in

many places in Tripolitania and the same would be a great benefit to Cyrenaica. In Cyrenaica, the chronic indebtedness of the rural population also holds back the development of agriculture as much as, if not more than their low level of education, though the latter is being raised gradually as village schools are started. The farmers at present obtain loans from the Agricultural Credit Bank. The credits are for short-term grants and the farmers find that this period is short for their needs. Agricultural credit and co-operative organisation are two main factors regarding development in the eastern Jebel.

In the eastern Jebel there are considerable agricultural potentialities. The improvement of crops is crucially important. It has been suggested that the most promising single improvement would be to grow cereals in rows instead of broadcast.[1] If the cereals were planted in rows as they are in many parts of the Middle East, a substantial increase would be possible, since the moisture and the plant food available would all go to promote the growth of cereals, whereas the present practice of light seeding results in the growth of weeds in competition with the cereals. By adopting row cultivation it would also be possible to break

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1. F.A.O. "Report on Agriculture of Libya". op. cit. pp. 228-229.

the tradition of prolonged fallow. The land in Cyrenaica is not fallowed in the ordinary sense of the term - it is simply left to grow weeds and thus it has few of the advantages of clean fallow. Those areas of the world where it is practice to have clean fallow show improved yields.

There is considerable interest in the eastern Jebel in the production of cereals by the mechanised methods which have become popular in other similar areas of the world. The climate, land and other conditions are essentially the same as those obtained in Australia where mechanised production of cereals has proved highly successful. In the eastern Jebel the soils are heavy and not readily susceptable to wind erosion, and much of the farmland would respond to the introduction of new methods. As yet, however, there are no private farms under mechanised system.

There are two nurseries on the eastern Jebel, namely El-Gubba Nursery (Vide Plate 19b) and Derna Agrario (Vide Plate 20a). These nurseries are administratively under the direct supervision of the District inspectors and technically under the jurisdiction of the F.A.O. experts. These nurseries are used for improving the crops and introducing new crops which suit the climate there.

Tree crops are very important especially those which grow under semi-irrigation (e.g. olives) or on full irrigation

(e.g. almonds, citrus and bananas) in areas where water is available. During the Italian Administration, the tree crops were being developed. Unfortunately, during the last war most of these crops were destroyed. The Ente farms were distributed to farmers on a tribal rather than on an efficiency basis and as a result, the fruit and vegetable production in Cyrenaica fell to a level where most of the fresh fruits and vegetables had to be imported from Tripolitania for local consumption.

The Provincial Government programme for development in Northern Cyrenaica should be as follows:

(a) The Derna area should concentrate on the banana as the major crop, with vegetables as a supplement. Small holdings should be united and the farmers organised in co-operatives for growing and marketing bananas. At present a little of every crop is grown and as a result, no major crop is available to justify a co-operative system.

(b) The Jebel should concentrate on growing deciduous fruit trees, grapes, pistachios and mid-season vegetables under dry-farming.

(c) Water resources should be given more attention, and efforts should be made to utilise the springs which are not in use at present.

(d) Cereal crops should be produced under mechanised methods particularly in Labraq, El-Gubba, and El-Fatayah plain.

(e) Investment in the region does not exist, so national capital should encourage investment on a large scale.

(f) Credit should be provided to aid the small farmers.

The future of the country depends upon the agricultural and pastoral developments. The exploitation of oil will greatly help in furnishing capital for development and should promote an internal market for the agricultural sector of the territory.

PASTORALISM AND LIVESTOCK

In the economic system of the eastern Jebel livestock breeding has been, and should remain the prime activity. Prospects for extension of livestock rearing are exceptionally good on the southern slopes of the Jebel where there is little else to sustain the population. The Arab shows a predilection for pastoralism, which arose with the post-Hilalian nomadic tradition, and thus pastoralism is an obvious means of development. Cash returns from the flocks on the southern slopes yield a superior income to the people than corresponding returns from arable farming.

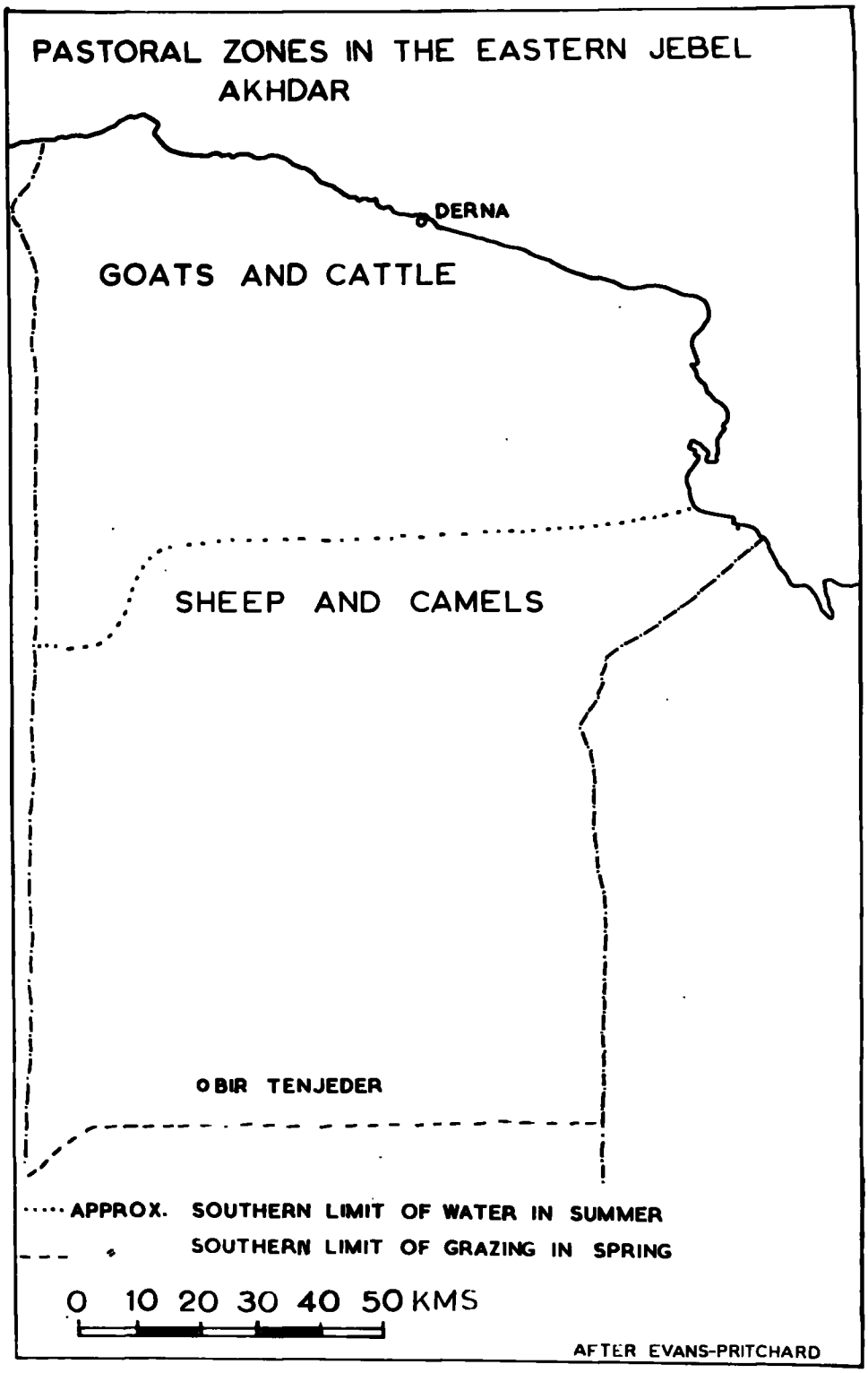
The movements of the herdsmen and their flocks are determined by the incidence of rainfall and the availability of pasture following the rains. Shrubs are found over vast areas of the eastern Jebel, constituting a thin and low cover. This vegetation has epiphytic adaptation capacity and grows as spiky plants with some herbaceous inter-mixture which appears during the rainy season of the year. The herbaceous vegetation varies from one zone to another and from one year year to another depending on the rainfall and the first occurrence of high spring temperatures. After the rains in autumn the vegetation makes its appearance, and if the rains continue, the herbaceous cover remains and becomes a thick mat in the well watered areas. In years of poor rains, the vegetation is sparse and each individual plant tends to be puny, but even in poor years the herbaceous plants are to be seen until the first hot days of spring. The graminaceous vegetation is more resistent to drought. At the first rains these plants exhibit rapid growth and are succulent enough for camel grazing. In years of exceptionally poor rains, when the autumn falls are not followed by more substantial precipitation, the animals are left in desperate plights since the new pasture is insufficient to maintain them.

Nomadism

The move southwards begins in December after the barley has been sown, with the tribe or part of a tribe taking to the desert. Most of the semi-nomads return to the Jebel in May when water becomes scarce in the interior; even today there are groups, some of which are numbered amongst the most powerful in the region, who stay in the south when the other groups return north. Those who do move to the Jebel are able to utilise the autumn grasses of the mountain pastures, whilst in the south nothing remains but patches of vegetation in the favoured depressions. Nomadism in Cyrenaica thus allows the population to feed their flocks on the best pasture available at the different seasons.

The lambing time for the sheep is usually November which is the time when the herbaceous vegetation is making its appearance in the Barr and so the nomads are able to give their flocks the best of the vegetation when they are most in need of it. Concentration in the north also allows the flocks to lamb in less extreme conditions than prevail in the interior. In the autumn, the water problem is not very pressing since the animals obtain most of their water requirements from the succulent vegetation and the water accumulations in the wells may be retained until the need arises for them in late spring as the heat becomes

Figure 32.


PASTORAL ZONES IN THE EASTERN JEBEL AKHDAR
DERNA
GOATS AND CATTLE
SHEEP AND CAMELS
BIR TENJEDER
APPROX. SOUTHERN LIMIT OF WATER IN SUMMER
SOUTHERN LIMIT OF GRAZING IN SPRING
0 10 20 30 40 50 KMS
AFTER EVANS-PRITCHARD

intense. During the rains domestic water needs are taken from the temporary pools which form - this again saves the wells until later in the spring.

To the south of Tariq Aziza, generally speaking, there are no recognised rules for ownership of land, and there is complete freedom to graze and sow to all-comers. Ownership of wells on the other hand is closely controlled by family interest. Spring water is less a family right and it is available to those who need the use of the waters for the flocks. Arable land comes under the same head as wells.[1]

The animals grazed on the southern slopes of the Jebel are mainly sheep and camels (Vide Fig. 32). Cattle and goats are normally excluded from the movements in December. The southern limit of grazing in spring is a line between Bir Hakim and Bir Tenjeder and beyond this line, there is little grazing. Camels are important in nomadic life since it is impossible to move camp without them, and the richer the Bedouin are in camels, the more they tend to be on the move, intent on seeking richer pasture.

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1. Clucci, M., "Il Regime della Proprieta nell' Africa Italiana". Vol. i, Rome 1942, p. 210.

Livestock

The livestock industry is of vital importance in the eastern Jebel, since it is by far the most significant source of income. Accurate statistics of livestock numbers did not exist before 1959. The following table shows the estimated number of livestock in 1954-58 in Mutasarrifiya of Derna.

Table 53:- ESTIMATED LIVESTOCK NUMBERS IN MUTASARRIFIYA OF DERNA

(Figures in 000s.)

	1954	1955	1956	1957	1958
Sheep	114	113	90	70	72
Goats	160	163	120	105	18 ?
Cattle	13	13	8	4	6
Camels	10	10	10	10	11

Animal numbers fluctuate enormously from year to year. The low numbers for years 1956 and 1957 are due to the effects of the drought of 1955. The more accurate figures are for 1959 as shown in the following table:-

Table 54:- LIVESTOCK IN MUTASARRIFIYA OF DERNA BY MUDIRIYA WITH REGARD TO CYRENAICA, IN 1959

Mudiriya	Sheep	Goats	Cattle	Camels	Horses	Asses	Chickens
Cyrenaica	509838	393553	42815	73614	21393	44984	152104
Mutasarrifiya of Derna	32641	54718	3279	3452	3809	4556	11035
Labraq	4237	4045	478	224	152	192	1081
El-Gubba	8816	10720	962	882	467	731	2438
Ain Mara	3505	18813	792	335	2189	2281	1516
El-Gheighab	5610	6418	82	903	152	140	613
Derna	3161	2029	854	-	320	470	1217
Martuba	3188	4305	69	215	136	109	1471
Umm-Rzem	3624	4948	42	270	270	377	2174
Timimi	500	3440	-	623	123	256	525

The figures suggest that sheep are equally distributed amongst the mudiriyas. The goats and cattle are concentrated in the Jebel in the oases of Ain Mara and El-Gubba, where there are pastures and water available most of the year. The sheep and goats are most important in respect to numbers. Camels and cattle are also important but less in number. All milk production is for human consumption; but assessing the livestock without milk production as the criterion of importance the order of significance is as

follows:- goats, sheep, cattle and camels.

Livestock is the major trading activity in the area. Cattle, sheep and goats are exported to Greece, Malta and Italy through the port of Derna. Export of animals to Egypt is achieved by Bedouin drives on the hoof across the frontier. Since these latter flocks travel along the coastal strip, they arrive in the Egyptian markets in good condition. The following table shows the number of livestock exported to Egypt, Greece, Malta and Italy.

Table 55:- NUMBER OF LIVESTOCK EXPORTED FROM MUTASARRIFIYA OF DERNA 1955-58 [1]

Year	Sheep	Goats	Cattle	Camels	Horses
1955	76,772	15,031	3,815	4,365	8
1956	70,494	19,063	4,157	3,357	52
1957	13,665	3,275	1,627	4,234	58
1958	-	-	3,844	5,983	29

In the last six months of 1957 and the whole of 1958, the Government has prohibited exportation of sheep and goats because the drought of 1955 reduced the number of livestock. All of the camels and most of the sheep, cattle and horses were exported to Egypt, and the rest to Greece, Malta and Italy.

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1. Source Mutasarrifiya of Derna.

Characteristics of the livestock

(a) Sheep: they are of Barbary type with a fat tail. From the stand point of their productive capacity they are superior to other varieties found in Cyrenaica and they form a desirable base for future improvements. In general the sheep are well-developed animals of medium size, approximately 60-63 cms in height with mature ewes weighing 55 kilogrammes and rams 75 kilogrammes. The availability of green pastures in spring has a considerable effect upon the weight of animals, and it is usual for a great increase in weight to be recorded at this time. The quality of the wool is rather inferior and rough and there are a lot of dead piles. The wool is used for making barracans and mattresses or for rough textiles. The wool is dirty and contains a high percentage of terra rossa. The sheep produce as much as four or five kilogrammes of wool. After washing in warm water the fleece loses 33% of its original weight.

The meat production is very important and could be made more important if new markets could be opened up. At present most of the meat trade is confined to the local markets. Urban markets tend to be exclusively consumers of mutton, whilst in the Jebel mutton and goats' meat is consumed equally. Since the sheep are sent to the

abattoirs in poor condition the meat % from a carcass is very poor. Sales of meat tend to be done between individuals, and auction markets in the usual sense are unknown.

(b) Goats:- Goats are reared in considerable quantities in the eastern Jebel and here they outnumber cattle, sheep and camels absolutely. The goats are able to flourish on the Jebel since they can find sustenance in the most barren areas and are able to withstand the winter cold much better than sheep. In some ways the goats are used as guides to the sheep. At times supplementary goats' milk is fed to the young lambs when the ewes are unable to feed them.

The physical characteristics of the Cyrenaican goats are, a black colour with white patches, and horns which are small and at times totally lacking. Local varieties of goats weigh about 25 kilogrammes at one year. The Italians introduced Maltese and Sicilian goats and some of them are still to be found in Derna used for milk production. In addition to the supplies of milk obtained from the goats, the hides are used to make shoes and water bags for the Bedouin, and at times the coarse hair is used intermixed with other rough material to make tent cloth.

Goat rearing on the Jebel is inconsistent with conservation of the forest and the spread of static farming, and it may be suggested that the activity should be curtailed or more closely controlled in the interests of agricultural development.

(c) Cattle:- Most of the cattle in Cyrenaica are of the Bos Taurus type. They are small, horned, hardy and light red in colour. The average weight of the bulls is 300-350 kilogrammes, and the cows 220-230. One year old calves weigh 100 kilogrammes. The local cows serve a double purpose and provide both meat and milk. It is only rarely that these animals are used for ploughing and general draught purposes as one finds in Tripolitania.

At the spring time the cattle are fed well and the average weight of the animals increases to the extent that meat production goes up by 60%. Before the spring feeding, the cattle reaching market fall in number (40%) and the quality of the meat is poor. The average daily milk production varies between 3-4 litres for three or four months. On the Jebel the cows are kept for milk and meat, but in Derna they are used solely for milk production.

The Italians introduced the Pantellarian breed from the islands of the same name, and this breed has shown itself

resistent and has readily adapted itself to the environment. At present there are only a few hybrid cattle remaining from this introduction. The Pantellarian cow is capable of giving 600 gallons of milk per annum. The Italians also introduced the Brown-Swiss variety (Bruno-Alpino) which has a reputation of being very tolerant of heat, second only to the Jersey of the European breeds. From experience with a small number of animals this reputation would seem to be justified, for breeding for several generations in Libya has shown that the cattle have lost little in weight although there has been a reduction in production of milk. Under Cyrenaican conditions, the Swiss-Brown gives about 800 gallons of milk per annum.

The Nazaret of Agriculture has established a management control over cattle in El-Gubba to improve the condition of local cattle. Trials are being made with imported zebu cattle from Pakistan.

(d) Camels:- The one-humped camel of Cyrenaica is important as a beast of burden. It produces milk at the rate of about one gallon per day. The greatest advantage of the camel is that it may be driven for several days without drinking. Without the camel, the Bedouin would not survive for long since the greater the proximity to the desert, the greater its indispensibility. The ability of

the camel to make use of the most unpromising vegetation which is untouched by other animals, its suitability for work and transport and its longevity give the animal its supreme place in the life of the nomad groups. Camel meat too is used widely by the poorer people.

(e) Donkeys and Horses:- The donkey, small as it is, is undoubtedly one of the most important, if not the most important draught animal in Cyrenaica. Its power to withstand the local environment and the poor treatment it gets from the Arabs makes it an ideal maid-of-all-work. The horse, which is used for work in the settled areas and for riding in the nomadic communities, is not of great economic importance to the country.

Livestock Disease

Deficiency diseases are very common amongst cattle in the region. Ecto-parasites of stock are troublesome and they are found in most animals in the area. Tuberculosis is widespread amongst imported cattle, and in all cattle there is a high incidence of cystercercus stroughlyosis and echinococcus, which also effects sheep and goats. Sheep also suffer from pox and mange.

Tape-worm is very common in lambs but as they grow

older they develop greater tolerance or immunity to the parasite and the condition appears to be no problem in adult life. Ring-worm and paratyphoid are commonly diagnosed in calves, an indication of the poor nutrition and management to which they are subjected. Sarcootic mange is common in camels, horses and goats.

Livestock Products

Wool:- The Barbary sheep produce a light fleece, composed mainly of carpet type wool, which is mixed in grade and colour. The natural coloured wools, whilst useful for rugs, carpets and blankets, brings lower prices than white wool from the commercial manufacturers. Cyrenaican wools are predominantly white, with about 15% of natural coloured wools in black and grey and various shades of brown. Local handicraft industries use the natural coloured wools.

Methods of sheep-shearing have been developed in Cyrenaica over a long period without any modification in present times. Shearing is usually done in April and early May, depending on the state of the weather. Both sheep and goats are shorn with small, hand-made steel scissors manufactured by local blacksmiths. By working about twelve hours a day, an experienced worker can shear 30 to 40 sheep and goats daily, and occasionally as many as 60 animals

are completed in one day. Sheep are shorn on the bare ground and the individual fleeces are tied in loose bundles, but always with the weathered side of the wool outwards. Hence the fleeces always present a dirty unattractive appearance. White and coloured wools are packed together for marketing and a cloth cover is used to protect them until they are baled for export. The bulk of the wool is brought by truck or donkey cart to the Derna market. Advances of cash are often made by the merchants to the shepherds before the shearing with the understanding that the merchant will handle the eventual produce. This service tends to diminish the competitive value of the wool and leads to lower prices being paid to the owners of the herds. It has been suggested that this would be overcome by instituting a co-operative system.

The wools are exported unwashed and bring only low prices. A sample of washed wool was sent abroad - to the United Kingdom and the United States to promote interest in the Cyrenaican produce. The reports received were encouraging and in 1957 the government established a washing plant in Benghazi of a modern type. In spite of the washing plant many fleeces are still exported from Derna as unwashed items, and it would seem that a further

plant for washing wools should be established in the Derna region. About 80% of the total production of wools in Cyrenaica are exported and the residue used locally. One bad feature of Derna market is the influence of the Italian buyers, who are prepared to accept fleeces in poor condition at equally poor prices. The Italian agents send the wool to Italy where it is washed and re-sold. Egypt is a secondary importer of wool from the area. The following table shows the exports from Derna in 1955-58.

Table 56:- EXPORT OF WOOLS FROM DERNA IN 1955-58 (IN QUINTALS)

1955	1956	1957	1958
346	130	240	200

These figures suggest that the present export is low in relation to the true potential of the Jebel flocks, and that this export could readily be increased by the establishment of a co-operative, which could organise the collection, washing and grading of the fleeces. With some capital investment and a rationalisation of production and marketing there is no reason why the industry should not make great strides forward in the next few years.

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1. SOURCE: Mutasarrifiya of Derna.

Hides and Skins:- Hides and skins are made available through Derna slaughter house. This is well built in concrete, with tiled walls and plenty of air and light. The skins are usually cured within a few hours after the slaughter. The hides and skins are washed on a sloping floor so that the water drains away. Some of the curers then spread a mixture of salt and water onto the hides, whereas other curers add nothing but salt. In the latter case the skins are folded and left for four or five days then re-salted again before being again dried out. Final drying is done by exposure to sun-light and napthalene sprinkling down the backbone. After treatment the hides are baled. This procedure results in a dry, clean floor, and an absence of flies. The wool and hair is removed from the hides and skins by lime, which is left covering them for a day. After this time the hairs come away easily from the skin, which can then be washed either in running water for two hours or in a drum, or alternatively by treating the hide with bare feet in a pit with four soakings of water. Even this intensive washing does not always remove the lime and at times, further treatment by suspension from bare beams is necessary, which might extend over eight days.

Hides and skins which are flayed in the villages outside of the slaughter house are partly salted and kept for a week or more before being properly cured. In Derna there is one small tanner producing upto 20 dried skins per week and some hides.

The hides and skins after being tanned are transported to Benghazi and quite a few left over for use in shoe making in Derna. The shoe makers work as master artisans in their small shops-cum-work rooms. Trade in shoes is slow since the people of Derna have only a low purchasing power. Imported leather from Egypt and the Sudan is another problem facing the industry in addition to local difficulties arising through poor techniques and lack of capital investment in the industry. With large-scale investment by the Government and the introduction of modern methods, there is some hope that the industry will expand in the future. The following table shows the production of skins and hides in Cyrenaica in 1955-1959.[1]

Table 57:- PRODUCTION OF SKINS AND HIDES IN CYRENAICA 1955-59

(Figures in '000s)

	1955	1956	1957	1958	1959
Cattle hide and calf skin	2.6	4.8	4.8	3.8	6.1
Sheep Skins	50.0	45.0	40.8	61.3	63.2
Goat skins	31.7	37.4	32.0	27.7	33.3

1. Data from Kroeller, E.E., op. cit. p. 204.

Unfortunately, there are no statistics available to show the production of each Mudiriya.

Meat Production:- The animals in Derna town are killed in the slaughter house under municipality supervision. In rural areas there are no slaughter houses and killings come under the control of the Mudiriya. The following table shows the number of animals killed and meat production in Derna 1955-1958.

Table 58:- NUMBER OF ANIMALS KILLED AND MEAT PRODUCTION MUTASARRIFIYA OF DERNA 1955-1958

	1955	1956	1957	1958
Sheep	6580	6901	4730	8175
Goats	10509	11481	11550	9991
Cattle	393	451	507	690
Camels	5	3	12	22
Meat production (Tons)	221	248	224	272
Meat Consumption (per capita)	6.2	6.9	6.2	7.6

The goats slaughtered are mainly consumed in the rural areas. The low numbers of slaughterings in 1956 and 1957 are due to the drought effects of 1955.

Milk Production:- Consumption of milk tends to rest at a very low level since the standard of living prevailing in the area is poor and milk is treated by most people as a luxury. The following table shows the milk production in Cyrenaica in 1955-1959.[1]

Table 59:- PRODUCTION OF MILK IN CYRENAICA 1955-59

(Figures in 000,000 litres)

	1955	1956	1957	1958	1959
Cow milk	7,2	5,0	2,8	5,0	3,5
Goat milk	10,4	8,8	7,9	9,9	5,9
Camel milk	20,5	20,5	20,5	2 2,4	19,9
TOTAL	38,1	34,4	31,2	37,3	29,4

Goat and cattle milk are usually consumed in Derna, while the camel milk is consumed in the rural areas. A feature of the milk production is that little of it is actually taken in liquid form, but is manufactured into butter, cheese or formented forms of butter-milk before consumption.

In summary we may point out that livestock and livestock products are the main source of income at present in the area under survey. The improvement of the livestock

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1. Kroeller, E.E., op. cit., p. 204.

industry depends very largely upon the rate of capital investment in the eastern Jebel. Local capital is both scarce and shy, going hand in hand with the primitive standards of economic life. Since the prosperity of the area will rest essentially upon the livestock industry it is in the interests of the Government to help build up the economy upon a sound basis. Some beginnings could be made in this direction by the clearing of the pastures of rocks and stones. Further development must also concentrate upon the problem of provision of forage to tide over the poor years when the stock are particularly vulnerable. Again, it can be said with truth, that the lack of adequate watering points for the use of the flocks is a further hinderance to extension and rationalisation. To augment the wells, cisterns could be constructed on the slopes of the Jebel and permanent deep wells drilled to provide water in even the worst drought years. The economy of the country is pastoral, and future development must be begun with the improvement of what already exists by following the lines we have suggested above.

CONCLUSIONS

In the eastern Jebel there are considerable possibilities of increasing agricultural production by the adaptation of

improved methods of cultivation. Present methods of cultivation are primitive and are holding back an increase in yields. The farms on the Jebel are known to be readily adaptable to mechanisation especially in respect to cereal production. Government assistance should be effected through the directions we have suggested earlier in the chapter. Movement by the Bedouin should be restricted by settling them on the former Ente farms and educating them in the cultivation of both cash crops and, more important still, in the cultivation of tree crops.

The present production of tree crops is inadequate and there are real opportunities for intensive development to meet not only the needs of the local population, but also to provide a valuable cash crop for export. Exports of tree crops and other agricultural produce could be promoted so that Cyrenaica could exploit the geographical advantage of being close to European markets.

Education of the rural community is a difficult problem and has so far resisted the efforts made by the foreign agencies working in the area. The work has been beset with problems of contact with the Government departments which has not always been amicable and by the fact that many of the experts from overseas are unacquainted with the difficulties of the Cyrenaican environment.

Much of the land of the Jebel is devoted to dry-farming, which has meant that agricultural production has been at the mercy of the erratic rainfall and there are frequent crop failures in the area. To escape from this dilemma, irrigation works could be instituted based on the supply from the springs which are under-utilised at the present time. The water from the springs at Lathrun and Ras El-Hilal flows into the sea instead of being used to irrigate the lands in their vicinity. In Derna the particular problem to be resolved is the seepage of water through the wadi bed and evaporation from the open reticulation system. Floods and spray loss at the waterfall also contribute to the poor return obtained from this wadi. Ain Mara has a great potential for agricultural extension, especially in terms of semi-irrigation of crops such as cereals, olives and other tree crops.

A most significant increase in production from the area could most likely be obtained through improvement of the farms of the eastern Jebel. The terraces, the coastal plain west of Derna, the plain of El-Fatayah (with its 5,000 hectares) and the area between Ain Mara and Labraq comprise the best areas for the extension of agriculture.

It is suggested that the three following items are the essential pre-requisites for development - provision of

long term credits for agriculture; establishment of co-operatives for growing and marketing; the destruction of the tribal system by education. The discovery of oil in Cyrenaica should improve the standard of living and thus increase the demand upon the farming community. Capital made available through the sale of petroleum abroad should help tremendously in the task of agricultural development.

CHAPTER XII

COMMERCE AND INDUSTRY

Agriculture is the economic mainstay of the eastern Jebel, and is likely to remain so for a long time to come. The Jebel's poverty in industrial raw materials is so great that there is little prospect for industrial development, and it is agriculture that finally will have to supply the products for export, in payment for imports of manufactured goods.

Internal Trade:- The internal distribution of goods is done primarily through small shop keepers in and through local village markets. Most of the business is transacted on market days. Derna Town has two markets, while the villages have one market each. The villages have one market day, and the day varies from village to village to permit the merchants to attend as many markets as possible. Villagers bring to Derna market their eggs, wool, livestock, and other agricultural produce, and sell it to buy tea, sugar, cloth, and simple manufactured articles, which the proceeds of their small production will allow them to buy. Markets serve primarily to exchange goods between people who specialise in different fields and local land production. They also accumulate supplies to send to Tubruq

and Benghazi for sale, to pay for tea, sugar, cotton, and other small necessities which the people do not produce locally.

Derna is the centre of commercial activity in the eastern Jebel. The merchants distribute the goods to the shop keepers. The textile trade is concentrated in Derna market, which supplies nearly all the Bedouin. The only shopping centre for textiles outside Derna is Labraq.

In this typical primitive marketing system, goods pass through the hands of many dealers; each must have a margin. Obviously, the marketing margins under this system are high and a relatively large percentage of the population are traders and merchants instead of primary producers.

In order to control the cost of living and to guarantee supply under its rationing schemes, the Provincial Government has bought and sold the essential food-stuffs, mainly cereals. In good years the Government bought local supplies at fixed prices, thus supporting the farmers and maintaining prices. In bad years the Government sold wheat and barley, often at a loss, preventing local prices from getting out of hand, and thus protecting the consumer.

In the last three years, some of the merchants have moved to Tubruq from Derna, following activity created by

the movement of British troops to Tubruq.

External Trade:- The agricultural exports are of vital importance, since Cyrenaica's resources are almost entirely limited to agriculture. Livestock, livestock products, and sponge fishing have been the most important items in the past (aside from scrap metal, which was an important but temporary consequence of war destruction), they will also reamin important, even when Cyrenaica starts to export oil in 1961.

Exports:- Exports from the Mutasarrifiya of Derna are live animals, wool, and the export tax on sponges.

Table 60 EXPORTS FROM MUTASARRIFIYA OF DERNA IN 1957, 1958, and 1959 (in £ L)[1]

	1957	1958	1959
Livestock	236,048	292,051	1,385,494
Sponges	34,839	20,654	-

A much greater income is derived from livestock than from sponges. Livestock is exported to Egypt, Malta, Greece and Italy. However, the statistics of sponges are

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1. Source Mutasarrifiya of Derna.

more reliable than those relating to livestock numbers, which are lower than reality owing to the clandestine exports of livestock via the desert. Livestock exports vary from year to year; in good years more are exported, but in the bad years the Government allows only the male animals to be exported, as happened in 1957.

Imports:- The imported goods are those necessities which Cyrenaicans do not produce locally. During the droughts, cereals, mainly wheat, are imported. Other imported items are sugar, tea, coffee, rice, cement, textiles, electrical goods, chemicals, tobacco, and metal goods. The main countries from which imports come are; Egypt, The United Kingdom, Italy, Ceylon, Hong Kong, United States of America, Japan and Belgium.

Table 61 IMPORTS INTO MUTASARRIFIYA OF DERNA IN 1957, 1958 AND 1959 (£ L)[1]

1957	37,802
1958	82,264
1959	50,116

The figures suggest that imports are less than exports

1. Source Mutasarrifiya of Derna.

as shown in table 60 . The explanation is, that most of the livestock of the Jebel is exported through Derna, while the small population of the eastern Jebel does not demand many imported goods compared with the other districts of Cyrenaica. It is worthy of note that licences for imports are issued from Mutasarrifiya offices without reference to Benghazi. It is therefore apparent that trading activity in the eastern Jebel is at present dependent on livestock, and livestock products, and is likely to remain so for a long time until agricultural schemes for tree-crop production are successfully achieved.

Industry

It has already been observed that the natural economic conditions of the eastern Jebel have not favoured the growth of modern industry. The industry of the present day applies only to a few local inhabitants engaged in the weaving of woollen barracans and carpets, in the production of salt and in tanning.

The weaving of woollen barracans and carpets is practised by the Bedouin on the Jebel. The production is too small to meet local needs. The barracans are made usually from white wool spun on primitive wooden looms,

operated by Bedouin women. Textiles for the local dresses are imported from Benghazi and Tripoli.

As has been pointed out, in the chapter on Geology, salt is produced from natural, uncontrolled deposits. This salt is collected by local people, under a free licence. Salt is produced from the Sebkhas around the Gulf of Bomba, where there are many deposits of apparently unlimited capacity which might provide a considerable export commodity if developed under proper management.

The tanning industry is very small in Derna considering the large local supply of the tanner's raw materials - hides and skins. As has already been mentioned in the section on livestock, tanning is practised in small shops or in the houses. Unfortunately there are no statistics available of production.

Shoes and boots are manufactured, but many are of poor quality, since the leather from local tanneries is very loose in structure and damaged by flaycuts. The leather for better shoes is imported from Egypt and The United Kingdom.

To sum up, industry in the eastern Jebel is extremely limited, except for the local handcrafts which is in a

primitive state. Improvements should be made in the existing industries. Pastoral industries represent the best prospect for small-scale industrialisation of the eastern Jebel, although, fish canneries are a possibility. Derna, with its geographical situation in the eastern Jebel, is favoured for any development in industry.

Trade activity should be encouraged through maintaining Derna harbour, to enable ships to use it, instead of depending on Benghazi (300 kms.). This would save time, money, and give the town activity to improve the economic conditions.

CHAPTER XIII

FISHERIES

Fisheries

The Libyan sea constitutes an important source of revenue which is insufficiently exploited. Italian research reports state that approximately 10 miles off the coast, the bottom is muddy, and suitable for trawling, and very rich in hake. The Libyan sea could in fact be extremely productive, as the fish caught are unusually large and well-developed.

Sponge fishing

The coast of Derna is one of the important sources of sponge fishing. There are large sponge beds along the continental shelf, with the exception of a few areas where the sea bed is sandy, or composed of shifting mud. The Derna sponge bank is 30-35 miles long and starts at Ras El-Hilal where the continental shelf is very narrow, varying between 5 and 2 miles, and the sea is almost always rough. After Ras Ben Gebara, the plateau becomes broad and even. It is 13 miles wide off Derna but gradually narrows towards Ras Et-Tin where the Gulf of Bomba begins with a continental

shelf 20 miles wide, which extends over a distance of 120 miles up to the Gulf of Salum at the eastern border of Cyrenaica. Along this coast sponges are sometimes found very close to the shore, and several miles out to sea, depending on the type of sea bed, depth and other factors. According to Serbetis;[1] from Tolmeita to Ras El-Hilal the coast is steep, the shelf narrow, and consequently the sponge ground is very narrow.

The sponges east of Ras El-Hilal are always of excellent quality. However the most highly reported sponge ground in Cyrenaican waters is located in the Gulf of Bomba. Quite close to the coast, the sea bed is rocky except for a zone located of Goletta where the bottom is sandy down to a depth of six fathoms. At depths of 6-12 fathoms opposite Goletta, the bottom is silty, and this is the only part of the Gulf of Bomba where the sponges have a red base. The rest of the sea bed, down to a depth of 20 fathoms, consists of 'tragana', (rock detritus) and produces excellent quality sponges. Between 20 and 28 fathoms the bed is formed of rocky slabs which bear large, excellent quality honeycomb sponges, some mediocre turkey cup and zimocca, not many but of excellent quality.

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1. Serbetis, C.D. "Report to the Government of Libya on Fisheries". F.A.O. Report No. 18,p. 6, Rome 1952.

Several methods of sponge fishing are common:-

(a) The simplest method is that practiced by the Arabs. It consists of scouring the seaboard after a storm to collect the sponges, which, torn from their attachments by the force of the waves, are washed to the beach.

(b) Another method was when the sponge fishermen stripped to the skin, waded out into the sea and when he saw a sponge, dived down to pull it. This system was improved upon when a row boat, 4-5 m. long manned by two oarsmen was sculled along the coast, while a person using a water glass scanned the sea bottom. As soon as he saw one or more sponges under the boat, he gave a signal, and a diver plunged into the sea, holding a flat stone attached to the boat by a cord, and tore up the sponge. One or two other divers awaited their turn. The stone was supposed to regulate the speed of the divers descent, and also served as a guide marker for the next plunge. The diver put the sponges he obtained into a net bag. The time spent under the water was from two to four minutes, and each dive was followed by half to an hours rest for each diver. A dive frequently brought a haul of 5 to 10 sponges. This primitive method was very common practice fifty years ago.

(c) Fishing with a sponge hook is also a very old and rudimentary method. The sponge hook is an iron harpoon fitted with four straight prongs, 8-10 cm. long and attached to a pole 6-7 m. long. With this implement, the skipper of a small boat, manned by two oarsmen, removes the sponges he locates on the sea bottom, by means of a waterglass. The sponge removed by a sponge hook is damaged, since the tissue is torn by the prongs. Therefore a lower price is obtained for the sponges fished by this method, than for sponges brought up by the second system. Introduced by the Greek sponge fishermen, this method is frequently utilised by the Arabs who often fish in waters off the coast.

(d) Machine diving: The greatest quantity, and best quality sponges are obtained by the larger diving ships (10-20 tons) with a 25-100 horsepower engine and a crew of ten to twenty, and five to fourteen divers equipped with diving suits.

(e) The Fernez system is similar to the preceeding method, but is a less expensive method of sponge fishing; the divers are equipped with masks, rather than complete suits. This method can only be utilised for a limited period during the year, and the dives are of short duration.

About 70% of the sponges are fished by the machine diving system, 20% by Fernez system, 3% by trawlers and 7% by small boats with harpoons or naked divers.[1] It is obvious therefore that the diving ship is the most important method of sponge fishing. Furthermore, sponges fished by the diving ships obtain the highest prices.

The Italians, during their occupation of Cyrenaica engaged in sponge fishing and surveyed the Libyan coast;[2] although the Greeks have been traditionally engaged in sponge fishing off the Derna coast. The Greek boats come to Derna in March and April to register for fishing in Derna waters. The operation for sponge fishing starts in May. The boats usually start operating at the location farthest away from the coast, toward which they work gradually, according to the number of sponges collected. In October and November the boats come to Derna with their sponges for weight and taxation (Vide Plate 20b).

In 1952 the Provincial Government of Cyrenaica granted the monopoly of fishing to a Cyrenaica firm. The firm paid the Government £L 7,000 annually. At the same time, the company received £L 500 from each ship owner. In 1959

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1. Serbetis, C.D. op cit.pp.26-27.

2. Mazzarelli, G. "La pesca sui banchi di spugne" Rome 1938.

the Cyrenaican Company raised the fees to £L 1,000. Subsequently the Greek boats refused to pay the fees and left Cyrenaica for Tripolitania. Cyrenaica received no income from the sponge fishing as a result of this action. Early this year the Cyrenaican Company reduced the fees to £L 500, and the Greek boats returned for fishing in the Cyrenaican waters.

The Mediterranean species found on the sponge grounds off the Cyrenaican coast are:- the honeycomb, fine turkey cup, the elephant's ear and zimocca. The quality is excellent. The Greek sponge fishermen obtain the best prices for all grades of sponges. The prices in 1952 were £L 10 per kg. for top grade, £L 5 per kg. for second grade £L 2-10-0 for third grade and £L 1-5-0 for fourth grade.[1]

The export tax is calculated according to the total weight of the exported sacks of sponges; it is fixed at £L 0-10 per kg.

The sponge trade has been in existance since ancient times. The sponge was used for body cleaning, and later as a remedy for several diseases.[2] Today, only the best sponges are used for the bath, the great majority being

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1. Serbetis, C.D. op. cit. p. 33.

2. Ibid. p. 33.

used industrially. Large quantities go to pottery, crockery, glass, skins, chemical, carpentery and furniture making industries. Considerable quantities of sponges, chiefly of inferior qualities are used in different sectors of industry as industrial filters.

Derna does not benefit directly from the sponge trade since all the production fished by the Greeks is sold in Greece. The following table shows the production of sponges from Derna waters in 1955-1958.[1]

Table 62 SPONGE PRODUCTION IN DERNA WATERS 1955-1958

Years	Production in Kg.	Values £L
1955	23,665	58,928
1956	10,948	49,489
1957	6,385	34,839
1958	18,734	20,654

The income from the sponges depends upon their grade.

Sponge fishing helps to maintain Derna harbour, some fishermen from Derna should be encouraged to engage in sponge fishing. At the moment sponge fishing merely gives Derna some trade during the fishing season, when the boats

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1. Source Mutasarrifiya of Derna.

are provided with water and food, particularly vegetables.

Fishing

In the Mutasarrifiya of Derna, despite the length of the coast and the productivity of the sea, inshore fishing plays a negligible role. There are very few fishermen, and they fish from the beaches, often with explosive or nets. The only place where fishing is practised regularly is Bomba village, where a group of Yugoslav refugees have settled. They live by fishing although they are not fishermen by profession. One night a boat using a harpoon caught 100 Kg. of large, top quality fish. Another day one of the fishermen from Bomba had a catch of 300 kg. and he was obliged to travel all the way to Benghazi (500 km) to sell his fish. There is not one fisherman between Bomba and the Libyan-Egyptian frontier. There are, however, about ten Greek trawlers fishing along the whole coast of Cyrenaica. They fish in the international waters, and their catch is kept in refrigerated holds and taken to Greece at the end of the fishing trip, which lasts from eight to ten days. They stop in Derna harbour for supplies of water and food, and they do not unload their catch or otherwise it would be taxed.

The Cyrenaican sea is very productive. According

to Serbetis[1] this productivity is emphasised by the Ghibli winds which carries out to sea large quantities of sand with a fairly high salt content.

To summarise, there are exploitable sponge grounds all along the Cyrenaican coast, from the shore out to a depth of 100 m and sometimes deeper. The Greeks are engaged in sponge fishing. It is necessary for the Government to encourage the people of Cyrenaica to exploit sponge fishing by giving the fishermen a long term loan sufficient to pay for building new boats and so the Country will really benefit from sponge trade.

Fishing represents another aspect to develop Derna. Inshore fishing could be very important, because it could provide productive employment for a large number of the unemployed people in Derna, as well as a perishable, but valuable food which is easy to distribute to small communities. At present Libyan fishing installations are concentrated in Tripolitania. Efforts should be made to establish new installations in Cyrenaica and to develope the export of sardines to Egypt, now practised by Tripolitanian factories. The main problems are financial and technical but they can be surmounted.

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1. Serbetis, C.D. op. cit. p. 55.

CHAPTER XIV

RESETTLEMENT

The increase and improvement of agricultural production is strictly connected with all the problems which can be included in the term "settlement". As has already been pointed out, the economy of the eastern Jebel is fundamentally agriculture and pastoralism, and settlement in the eastern Jebel means the fixation of nomadic and semi-nomadic people, a remedy for Derna Town overcrowding, and a wider use of land and water. These aims can be achieved in the eastern Jebel in two ways:-

(i) Resettlement of farms already abandoned, which previously belonged to the Ente per la Colonizzazione della Libia.

(ii) Enlargement of the existing oases of Martuba, Umm-Rzem and Timimi.

(1) Resettlement

Resettlement is very important in the Jebel, which includes the greater part of the arable land of Cyrenaica. Most of the arable land of the Jebel, which previously was largely uncultivated and covered by bushes or steppe-like vegegation, was fully reclaimed and developed by the Italians,

but abandoned during the last war. As regards land ownership, all the area once owned by the Italians has become de facto, if not de jure, State property. As has been noted already, the Provincial Government repaired the farm houses, and distributed them among the Cyrenaicans.

First of all, the cabila (tribal) system was followed, whereby only families belonging to the Cabila traditionally living in an area were allowed to settle in the farms situated in that area. The farms were allocated by payment of a modest rent for a period of three years, during which the newly settled peasants, theoretically, were expected to prove their skill and qualifications. Unfortunately, it seems that in practice no selection took place, and that the Government intended to give those people full ownership of the farms, following a modest payment over a period of twenty years.

(2) Enlargement of the oases

This enlargement concerns the villages of El-Gheighab, Khawlan, Martuba, Umm-Rzem, and Timimi. It is a more effective and sounder way of obtaining the settlement of nomads, and a general improvement in agriculture. Unfortunately, the general conditions of the villages are at present very

poor. The enlargement of the villages depends on the water supply; the water from the springs is available in Khawlan and El-Gheighab, while in the others could be obtained by drilling new wells. Moreover, water from the wadis could be utilised by constructing cisterns at the foot hills.

The increase and the improvement of cultivated land are the most effective weapons to prevent the migration of the rural population to Derna and Benghazi.

Problems and solutions of resettlement

There are many problems facing the work of resettlement in the eastern Jebel. These problems, and ways and means for the solution are summarised below.

(a) Institutional Reforms: As has already been mentioned, about nine-tenths of the land suitable for agriculture is held by the tribes. It is necessary to stress the disadvantage of such a system which hinders any substantial improvement of the land; an individualisation of land tenure, cautiously and gradually carried out would be most helpful in its development. The tribal organisation in the Jebel is very strong, and it is difficult to reform the tribal ownership since experience during the Italian occupa-

tion showed that the tribes will strongly resist any interference with their lands. Therefore, the settlers should be of the tribe to which the land belongs.

Fragmentation of the ownership by inheritance and sale is always a serious problem, and every effort should be made in the resettled area to avoid future fragmentation, which in a few generations would bring about the same state of affairs now existing in Derna and other parts of Cyrenaica. The holdings should be considered as an economic unit and should not be sub-divided. Otherwise the plots could not be economically farmed, nor could the farm provide an adequate income to meet the needs of the settler. Moreover, the technical level of their management would be lowered. Many advantages would be attained if in the resettlement the farms were allocated on the basis of a long-term lease, the Government retaining the ownership of the land. This would prevent the breaking up of the farms either because of inheritance or through sale.

(b) Reorganisation of Old Italian Settlements for Cyrenaicans:

The Ente had established two villages for Cyrenaicans, Lathrun and Ras El-Hilal which are still occupied and farmed by the Cyrenaicans. The settlers however, require constant assistance and advice. When the Italian rule ended

however, this was not made available to them by the Provincial Government. There has been no radical change even today in this situation. What guidance exists is both inadequate and incompetent.

(c) Utilisation of Underground Water:

Water is the limiting factor in Cyrenaican agriculture. The irrigation possibilities are dependent on the utilisation of springs and underground water. The position of Cyrenaican underground water is rather obscure at present, owing to the lack of an efficient hydrological service, and no laws concerning water development are observed or enforced. The area between Ain Mara and Labraq has a sufficient average of rainfall for agriculture. Derna and the area eastward could be developed for new settlement by utilising the underground water. Moreover, the unfinished Italian pipeline should be finished, which would supply large areas with water for domestic use.

(d) Settlement of Pastoralists

Large resettlement work is expected to be accomplished by the Provincial Government. However, the resettlement is primarily a human and social problem which must be undertaken gradually, competently and with perseverance. The

problem consists of changing the people from pastoral nomadic tribes into farmers. On its success will depend the development of agriculture. The success of the settler is not created merely by issuing pieces of paper allocating pieces of land. Continued education, assistance and advice are required to develop new attitudes, to teach new skills and to instill new ideas.

The first problems to be tackled in resettlement work should be the study of the best means to reconcile the requirements of pastoral activity with those of agriculture and the conservation of forest resources. In this connection the importance of animal husbandry in the Jebel, the attitudes and skillfulness of its people for pastoral activities will be very important factors for the development.

Another problem is overgrazing on the Jebel. A policy of controlled grazing should be carried out in order to avoid the havoc which overgrazing causes to the soil and other natural resources. Co-operative organisation should be established in the areas to be resettled, not only for crop storage and marketing, but also for tillage operations and for the purchase of agricultural implements. Good organisations for guidance and advice are essential.

(e) Education

In the eastern Jebel, with its large tribal nomadic population, education is very important. During the Italian occupation, the education for Arabs was limited to the elementary schools in Derna. After the evacuation of the Italians, schools were established everywhere in the Mutasarrifiya of Derna. The total number of elementary schools in the whole Mutasarrifiya is twenty three, with 4994 boys and girls, and two secondary schools in Derna, with 248 children. The vast area of the Jebel and the nomadic nature of its people, has meant that the schools on the Jebel are boarding schools. Although education in the eastern Jebel is making progress, in the eastern Jebel unfortunately there is no agricultural school, which is crucially needed. Only one agricultural school exists in the Jebel, at Aweliya (12 km. east of El-Marj).

However, education is not just a matter of establishing a certain number of schools, but first of all, as a most delicate spiritual and social problem. A change from a tribal nomadic way of life to a sedentary one is needed to give the tribal people the right understanding of the importance of agricultural activities. Fortunately, in boarding schools at present a strong emphasis is placed upon developing a feeling of belonging to Libya as a

nation rather than to a particular tribe. It is important that the boy should be encouraged to say "I am Libyan" instead of "I am from such and such Cabila". Education is the most important weapon to destroy the strong existing tribal organisation.

To summarise, resettlement in the eastern Jebel depends on the reform of the ownership, technical guidance and the utilisation of the springs, from which large quantities of water are running to waste. In addition the establishment of co-operative organisation, the granting of short, medium, and long credit terms, a careful selection of the settlers, and education, are all of vital importance in the development of the area to be resettled.

CONCLUSIONS

It has been seen in the foregoing that the agriculture of Cyrenaica is adjusted to the particular and harsh nature of land and climate. The different branches of agriculture and livestock-raising fit together into a system which permits the people to utilize existing resources to good advantage, at their low level of technique. In particular, the population adopted the ways and means of surviving in spite of recurring droughts.

Cereals are of greatest importance in terms of the local diet, but livestock is the most important single source of local income.

The future development of the farms on the Jebel and irrigated farming are essential elements, particularly if combined with tree crops. Productivity, measured either per hectare or per man, is unusually low on the Jebel. Even though Cyrenaica is predominantly agricultural, it is hardly able to afford an adequate diet for its own people.

The future of Cyrenaica depends on utilization of water resources and destruction of the tribal organisation. The tribal organisation will inevitably be destroyed by education.

Tourism is a neglected source of income. The Jebel has much in the way of scenery and unspoiled native life to offer the discriminating visitor.

From where will the money come for this development?

Since the independence of Libya, the country has relied on foreign aid to cover the deficit in the budget. The grants are regarded as temporary expedients. Unfortunately no vital schemes have been achieved by foreign aid. In fact money disappears in few hands, and much is spent on the huge administrative system of four Governments. Libya with its one million people does not need these four Governments, while the standard of living the people is five hundred years behind western civilization.

During the nine years of independence, the hope was that "oil is the only rescue". This hope came true by striking of oil in many places in Libya on a commercial scale. The revenue from oil can greatly help agricultural schemes which are crucially important. If money from oil again disappears in few hands, such as happened in Iraq and is happening in Sa'udi Arabia, internal disorders may occur.

Education is an important factor for the development of the country, to provide it with specialized elements

who understand the problems of the country and how to overcome them. At present, the high posts in the Government are occupied by personalities depending on tribal support.

There are many foreign agencies with their experts working for development in Libya. No substantial positive results have been obtained for two main reasons:- first, the poverty of the Government does not allow the provision of the schemes suggested: secondly, the experts from overseas are often unacquainted with the difficulties of Libyan environment.

For ten years, Libya has lived on charity; it is hoped that oil will improve the present poor conditions and enable a better general standard of living.

APPENDICES

APPENDIX I

Table 3:- MONTHLY RAINFALL IN SELECTED STATIONS IN CENTRAL AND EASTERN PORTIONS OF THE JEBEL AKHDAR (IN MILLIMETRES)

Climatic Zone	Station	Average	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual Average	Period
Maritime	Marsa	Rainfall	100.1	61.4	34.2	10.0	5.4	0.1	0.3	0.2	4.9	29.5	42.1	115.1	403.3	1922-1940
	Susa	Ave. No. of Rainy Days	13.2	11.7	6.9	3.6	1.5	0.2	0.1	0.1	1.5	5.6	7.6	11.9	63.9	"——"
	Timimi	Rainfall	16.4	11.4	25.4	3.7	4.7	0.3	0.0	0.0	0.0	8.1	21.8	11.5	103.3	1934-1936
		Ave. No. of Rainy Days	6.0	3.3	1.7	0.7	0.7	0.3	0.0	0.0	0.0	1.0	1.7	3.3	18.7	
Mediterranean Plateau	Cyrene	Rainfall	153.7	78.7	59.7	20.4	12.3	1.4	0.2	0.6	8.9	38.8	80.7	140.1	595.5	1915-1941
		Ave. No. of Rainy Days	15.5	12.6	9.7	4.5	2.7	0.8	0.2	0.4	2.0	6.0	9.3	15.0	81.0	
	Saf-Saf	Rainfall	128.7	79.9	59.0	22.3	7.1	3.2	0.2	1.2	3.6	28.6	52.7	102.5	489.0	1931-1940
		Ave. No. of Rainy Days	12.5	0.9	7.3	4.5	1.3	1.0	0.3	0.8	2.0	3.0	1.1	11.6	52.3	
	Labraq	Rainfall	146.3	110.6	61.4	18.5	15.0	0.0	0.5	0.0	4.6	27.7	57.4	121.0	563.0	1934-1941
		Ave. No. of Rainy Days	12.7	9.3	7.1	3.4	1.1	0.0	0.1	0.1	1.5	3.6	7.6	11.0	57.5	
	El-Gubba	Rainfall	122.6	57.1	30.1	9.8	5.7	0.9	0.1	0.2	3.5	28.9	53.4	82.3	394.6	1923-1940
		Ave. No. of Rainy Days	14.5	11.8	6.5	3.1	1.8	0.9	0.2	0.4	1.5	4.5	7.6	11.8	65.2	
	Ain Mara	Rainfall	115.0	55.7	44.2	5.9	1.9	0.1	0.3	0.0	1.3	21.6	37.9	75.1	359.0	1923-1940
		Ave. No. of Rainy Days	10.4	9.2	4.9	1.6	1.0	0.1	0.1	0.0	0.5	3.3	3.8	7.7	42.6	
	Khawlan	Rainfall	33.9	15.4	11.7	1.2	2.5	0.2	3.7	0.0	5.9	21.2	23.1	52.7	171.5	1934-1936
		Ave. No. of Rainy Days	8.0	4.0	1.3	1.0	2.0	0.3	0.3	0.0	0.3	3.0	3.0	7.3	30.5	
	El-Gheighab	Rainfall	43.4	45.3	30.5	3.1	6.9	6.6	0.0	0.5	0.2	22.0	25.1	59.2	236.8	1931-1936
		Ave. No. of Rainy Days	12.0	8.5	7.2	1.3	1.0	0.2	0.0	0.2	0.6	3.8	4.6	9.2	48.6	
	Marawa	Rainfall	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	1927-1940
		Ave. No. of Rainy Days	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	
	Gardas-Garrari	Rainfall	58.1	29.9	29.0	5.2	3.8	0.0	0.0	0.0	0.4	9.1	23.4	46.9	205.8	1933-40
		Ave. No. of Rainy Days	11.4	7.3	6.0	2.3	1.3	0.0	0.0	0.0	0.4	2.0	4.0	9.6	44.4	
	El-Fatayah	Rainfall	85.2	52.2	38.5	10.0	4.0	0.5	0.0	0.1	3.0	26.1	46.0	73.3	338.9	1921-1940
		Ave. No. of Rainy Days	12.2	8.7	6.2	2.3	1.2	0.5	0.0	0.1	1.0	4.0	6.0	9.2	51.4	
Steppe	Martuba	Rainfall	22.3	29.6	22.9	3.9	7.3	0.0	0.0	0.0	0.9	9.1	24.6	52.2	172.8	1930-1936
		Ave. No. of Rainy Days	6.2	6.6	2.5	1.3	1.9	0.0	0.0	0.0	0.7	2.3	4.0	6.6	32.1	
	Umm-Rxem	Rainfall	26.8	26.1	11.2	3.0	1.8	0.0	0.0	0.0	0.0	12.6	14.6	20.5	172.8	1933-1940
		Ave. No. of Rainy Days	6.0	3.1	2.2	0.7	0.7	0.0	0.0	0.0	0.0	13.	2.4	4.1	20.5	
Semi-Desert	El-Mekhili	Rainfall	13.9	7.1	3.3	2.6	3.3	0.0	0.7	0.0	0.9	5.2	4.3	15.1	56.4	1925-1940
		Ave. No. of Rainy Days	6.7	5.1	2.0	0.9	1.2	0.1	0.0	0.0	0.2	1.8	2.5	3.7	23.6	

Table 5:- TOTAL MONTHLY AND ANNUAL RAINFALL IN DERNA (28 YEARS)

Year	J	F	M	A	M	J	J	A	S	O	N	D	Total
1913	-	-	-	-	-	-	-	-	6.5	11.5	87.0	168.0	(273.0)
1914	42.5	40.0	10.5	5.0	0.0	6.5	0.0	0.0	0.0	22.0	40.8	13.5	180.8
1915	24.5	3 6.8	5.7	5.8	0.0	0.5	0.0	0.0	6.3	3.2	10.5	1.5	94.8
1916	62.0	22.0	10.0	29.5	3.3	0.0	0.0	0.0	0.0	2.5	6.2	12.5	148.0
1917	10.3	15.2	10.0	0.5	5.5	0.0	0.0	0.0	0.3	8.2	11.3	99.8	161.1
1918	36.8	39.3	20.5	15.0	2.0	0.0	0.0	1.5	4.0	11.0	24.3	57.5	211.9
1919	14.7	10.3	0.2	31.5	4.0	0.0	0.0	0.0	0.0	19.4	50.5	62.4	193.0
1920	53.0	59.5	32.5	10.2	3.5	0.8	0.5	0.0	0.0	13.0	65.0	23.0	261.0
1921	38.6	37.4	40.9	55.0	20.5	1.5	0.0	0.0	0.0	2.2	64.1	65.0	325.2
1922	?	26.6	11.0	1.5	25.8	0.0	0.0	0.0	0.0	2.8	60.8	49.6	(178.1)
1923	58.9	18.5	45.4	7.6	0.0	0.4	0.0	0.0	0.0	14.9	13.0	15.5	174.0
1924	103.1	23.5	20.4	0.0	0.0	0.6	0.0	0.0	3.2	53.0	124.2	155.8	483.8
1925	169.9	17.8	11.9	3.7	2.2	4.0	0.0	0.0	0.0	103.8	?	57.5	(370.8)
1926	81.2	37.6	137.4	2.3	7,5	0.0	0.0	0.0	6.5	0.7	0.0	49.2	322.4
1927	59.4	104.7	55.3	3.7	1.2	0.0	0.0	0.1	0.3	57.6	13.6	11.1	307.0
1928	39.1	103.7	30.9	5.2	0.0	0.0	0.0	0.0	0.0	4.3	52.8	89.3	325.3
1929	105.0	100.1	22.1	2.5	2.3	1.2	0.0	0.2	5.2	29.0	64.8	66.0	398.4
1930	73.0	?	7.0	0.2	0.0	0.0	0.0	0.0	0.2	8.7	29.1	91.4	(209.6)
1931	32.4	57.3	32.4	14.0	18.0	0.0	0.2	0.0	0.9	9.4	75.3	18.0	257.9
1932	108.0	44.9	22.2	0.3	0.0	0.0	0.0	0.0	7.8	61.2	107.0	204.0	555.4
1933	18.3	15.6	18.1	8.8	11.0	0.4	0.0	0.5	0.0	2.5	19.9	42.8	137.9
1934	81.9	104.7	4.6	5.2	0.2	0.5	0.2	0.0	0.3	4.0	30.3	71.2	303.1
1935	77.8	54.5	34.8	8.5	0.5	0.0	0.0	0.0	9.5	24.4	47.0	7.4	274.4
1936	90.6	11.8	14.0	3.7	42.2	0.0	0.5	0.0	0.0	29.0	15.6	172.3	379.7
1937	113.5	12.2	3 .0	25.5	1.0	0.0	0.0	0.0	3.5	23.1	77.7	15.4	274.9
1938	68.3	56.0	59.5	6.4	1.0	0.0	0.0	0.0	0.5	59.6	26.7	48.5	326.5
1939	41.1	24.8	82.7	0.0	17.5	3.0	0.0	0.0	2.0	0.0	41.6	58.6	271.3
1940	93.0	102.2	12.4	28.1	0.5	1.0	0.0	0.0	0.0	0.0	6.1	21.2	264.5
Av.	65.3	45.3	28.0	10.4	6.3	0.8	0.1	0.1	2.5	20.8	43.2	62.4	285.2

Table 6:- AVERAGE OF RAINY DAYS IN DERNA (28 YEARS)

Year	J	F	M	A	M	J	J	A	S	O	N	D	Total
1913	-	-	-	-	-	-	-	-	4	3	14	16	(37)
1914	9	12	3	2	0	1	0	0	0	1	10	6	44
1915	8	9	4	4	0	1	0	0	1	4	6	1	38
1916	8	7	5	5	3	0	0	0	0	2	1	7	38
1917	7	9	7	1	6	0	0	0	1	3	2	11	47
1918	11	10	15	4	2	0	0	2	2	4	8	12	70
1919	8	5	1	3	4	0	0	0	0	4	5	16	46
1920	8	13	10	2	2	1	1	0	0	3	6	9	55
1921	11	12	14	8	2	2	0	0	0	3	9	9	70
1922	?	8	2	1	3	0	0	0	0	5	15	11	(45)
1923	10	9	4	2	0	2	0	0	0	4	4	8	43
1924	19	15	5	0	0	1	0	0	3	10	13	13	79
1925	24	6	5	8	1	1	0	0	0	6	?	9	(60)
1926	14	9	8	1	3	0	0	0	1	1	0	9	46
1927	13	15	6	4	1	0	0	1	1	4	12	14	75
1928	15	18	10	2	0	0	0	0	0	7	2	14	76
1929	17	17	8	3	1	1	0	1	5	2	9	7	(42)
1930	16	?	5	2	0	0	0	0	1	3	8	4	55
1931	9	12	8	5	3	0	1	0	2	7	12	12	77
1932	17	17	9	1	0	0	0	0	2	1	3	12	48
1933	7	7	8	4	3	2	0	1	0	5	4	17	70
1934	16	12	5	5	1	2	1	0	2	5	9	5	65
1935	15	13	10	1	1	0	0	0	6	6	7	17	60
1936	11	6	4	1	7	0	1	0	0	2	10	8	51
1937	16	6	2	4	1	0	0	0	2	4	12	12	82
1938	19	14	11	8	1	0	0	0	1	0	7	9	52
1939	8	11	12	0	2	2	0	0	1	0	4	13	54
1940	7	13	7	8	1	1	0	0	0	3.8	7.2	10.3	59.0
Av.	12.4	11.0	7.0	3.3	1.8	0.6	0.1	0.2	1.3				

APPENDIX II

Table No. 11:- ANALYSIS OF SOILS IN THE EASTERN JEBEL AKHDAR BY FERRARA

	Saf-Saf	Labraq	El-Gheighab	El-Fatayah (N.W. part) plain	El-Fatayah (Grotte Farm House)	Martuba
Preliminary Tests						
Soil Colour	Grey-Yellowish	Grey-Yellowish	Dark Grey	Red	Red	Grey-Yellow
Behaviour with acids	Strong	Strong	V. Strong	Weak	Weak	Strong
Watery Extract Reaction	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral
Mechanical Analysis						
Fine Soil (particles 1 mm. in diam)%	115.50	187.5	295.0	62.0	60.0	150.0
Frame (particles 1 mm. in diam)	884.50	812.5	705.0	838.0	940.0	850.0
Fine Soil Structure:						
Part. Diam. 0.2 mm	374.80	351.2	374.50	401.5	385.10	568.0
" " 0.2 mm	148.20	168.1	161.90	383.65	152.20	312.0
" " 0.05:01 mm	208.9	201.1	204.10	26.60	187.10	18.45
" " 0.01:0.05 mm	184.50	168.4	164.8	96.80	105.20	16.70
" " 0.1 mm	83.6	112.2	94.70	91.45	170.40	84.85

Fine Soil Physical and Chemical Analysis - %						
Moisture (105°C)	4.93	4.37	3.84	6.12	6.10	4.20
Organic Matter	5.14	6.01	5.61	7.40	5.06	15.52
Limestone	38.70	41.28	41.50	3.50	1.68	37.0
Sandy Matter	40.73	38.50	38.25	64.89	64.80	38.60
Argillous Matter	10.50	9.80	10.80	18.09	22.36	4.68
Partial Fine Soil Chemical Analysis - ‰						
Total Nitrogen	1.64	1.75	1.68	1.54	1.43	2.66
P_2O_5 (solubles in strong acids)	0.57	0.43	0.61	0.30	0.58	1.36
Potash	1.85	4.15	1.99	1.29	2.20	0.75
Salt Solubles in Water (total)	2.79	13.62	2.67	1.30	1.42	4.32
Chlorine (water extract)	0.48	Trace	Trace	0.12	0.16	1.17

APPENDIX III

Table 12:- YIELDS AND UTILISATION OF SPRINGS

Serial No.	(a) Name of Source (b) Description	(a) Yield Litres 24 Hrs. (b) Method of Measurement	(a) How water is used at Present (b) % so used (approx.) (c) Whether fit for drinking	(a) Height above Sea Level (b) Geological Horizon (c) Remarks
(1)	(2)	(3)	(4)	(5)
1.	(a) Ain Bu Mansur (b) Spring	(a) 397,845 (b) Weir No. 1	(a) Initial East Bank irrigation channel (b) 20% (c) Yes	(a) 177 metres (b) Lower Oligocene (c) -
2.	(a) Ain Bu Mansur (b) Stream	(a) 22,437,000 (b) Weir No. 2	(a) Becomes East Bank irrigation channel (b) - (c) Yes	(a) - (b) Lower Oligocene
3.	(a) Ain Bu Mansur (b) Stream	(a) 15,102,000 (b) Volumetric Calcn. First Dam	(a) E. Bank irrigation channel (b) - (c) Yes	(a) - (b) Lower Oligocene (c) -
4.	(a) Ain Bu Mansur (b) Irrigation channel	(a) 18,773,500 (b) Waterfall Weir	(a) E. Bank irrigation channel (b) - (c) Yes	(a) - (b) Lower Oligocene (c) -
5.	(a) Ain El-Blad (b) Spring	(a) 11,090,250 (b) Weir	(a) Derna Water supply (b) 40% (c) Yes	(a) 60 metres (b) Eocene (c) -

(1)	(2)	(3)	(4)	(5)
6.	(a) El Angil (b) Irrigation channel	(a) 5,418,000 (b) Upper Weir	(a) Irrigation (b) - (c) Yes	(a) 340 metres (b) Eocene (c) -
7.	(a) El Angil (b) Irrigation channel	(a) 2,621,250 (b) Check Weir	(a) Irrigation (b) - (c) Yes	(a) 279 metres (b) Eocene (c) -
8.	(a) Ain Mara (b) Springs	(a) 1,283,6700 (b) Weir & Volumetric calcn.	(a) Irrigation (b) 30% (c) Yes	(a) 420 metres (b) Lower Miocene (c) -
9.	(a) Ain Lathrun (b) Stream appearing out of gravel in wadi bed.	(a) 7,938,000 (b) Flow in existing channel	(a) Irrigation (b) 30% - 40% (c) Yes	(a) 36 metres (b) Eocene (c) This source is probably fed from Ains Dabbusia Haddadia, Sidi Magrun and Zaieh.
10.	(a) Ain Seghi (b) Spring in wadi bed	(a) 526,500 (b) Volumetric caln.	(a) Not used (b) 0% (c) Yes	(a) 50 metres (b) Eocene (c) -
11.	(a) Sidi Magrun (b) Spring	(a) 2,484,000 (b) Weir	(a) Irrigation & Domestic supply to Lathrun (b) 40% (c) Yes	(a) 150 metres. (b) Eocene (c) Disappears in bed of Wadi Sciuaar
12.	(a) Ain Zaigh (b) Six small springs	(a) 83,700 (b) Volumetric calcn.	(a) Not used (b) 0% (c) Yes	(a) 300 metres (b) Eocene (c) Most inaccessible

(1)	(2)	(3)	(4)	(5)
13.	(a) Ain Haddadia (b) Group of 5 springs	(a) 585,445 (b) Volumetric calcn.	(a) Not used. Irrigation channel now disused (b) Yes 0% (c) Yes	(a) 350 metres (b) Eocene (c) Water disappears in bed of Wadi probably reappears at Ain-el-Lathrun
14.	(a) Dabbusia (b) Underground stream in cave	(a) 12,000,000 - 2,400,000 (b) Visual estimate	(a) Not used But, later form part or all of the supplies at Sidi Magrun, Ain Seghi, and Ain Lathrun (b) Yes (c) Yes	(a) 300 metres (b) Eocene (c) -
15.	(a) Ain El-Gubba (b) Spring	(a) 96,700 (b) Volumetric calcn.	(a) Domestic purposes, Livestock & irrigation (b) 70% - 90% (c) Yes	(a) 585 metres (b) Lower Miocene (c) Supplies El-Gubba
16.	(a) Ain El Haj (b) 3 Springs	(a) 231,321 - 85,062 50,625 95,625 231,312 (b) Volumetric calcn.	(a) Domestic supply to local irrigation & watering livestock (b) 40% - 60% (c) Yes	(a) 540 metres (b) Lower Miocene (c) Existing concrete collecting tanks in use.
17.	(a) Tairet El Essalem (b) Springs	(a) 43,020 35,560 78,580 gls. (b) Volumetric calcn.	(a) Domestic, Irrigation & Livestock. (b) 40% - 60% (c) Yes	(a) 512 metres (b) Lower Miocene (c) Existing concrete collecting tanks in use.

(1)	(2)	(3)	(4)	(5)
18.	(a) Ain El Magga (b) 4 springs	(a) 477,000 (b) Volumetric calcn. Existing measuring chamber at Pump house	(a) Main domestic supply to El-Gubba - about 364,500 litres per day (b) As above say 17% (c) Yes	(a) 500 metres (b) Lower Miocene
19.	(a) Aim Fersella (b) Spring	(a) 38,925 (b) Volumetric calcn.	(a) Domestic, Irrigation & Livestock (b) 40% - 60% (c) Yes	(a) 450 metres (b) Lower Miocene (c) -
20.	(a) Wadi Scemeila (b) Springs	(a) 351,000 (b) Volumetric calcn.	(a) Not used (b) 0% (c) Yes	(a) 300 metres (b) Miocene (c) Disappears in bed of Wadi Seibaar
21.	(a) Wadi Fasch (b) Spring	(a) 129,600 (b) Volumetric calcn.	(a) Not Used (b) 0%	(a) 350 metres (b) Eocene (c) Very inaccessable place Water disappears into Wadi bed.
22.	(a) El-Glaa (b) Stream in Wadi Bed	(a) 1,077,750 (b) Weir	(a) Not used (b) 0% (c) Yes	(a) 360 metres (b) Eocene
23.	(a) Wadi Estua (b) Springs	(a) 1,077,750 (b) Weir	(a) Not used (b) 0% (c) Yes	(a) 280 metres (b) Eocene (c) Water disappears in bed of Wadi

(1)	(2)	(3)	(4)	(5)
24.	(a) Sidi be Nagela (b) Springs	(a) 112,500 (b) Existing collecting galleries and tanks	(a) Piped supply to Labraq (b) 30% (c) Yes	(a) 610 metres (b) Lower Oligocene (c) Pump house on site
25.	(a) El-Gheighab (b) Two Springs.	(a) 56,434 41,656 98,090 (b) Volumetric calcn.	(a) Local Domestic supply watering livestock (b) 50% - 60% (c) Yes	(a) 700 metres (b) Lower Miocene (c) -
26.	(a) Maaten Lali (b) Springs	(a) 34,344 (b) Volumetric calcn.	(a) All domestic purposes Livestock etc. (b) 50% - 80% (c) Yes	(a) 720 metres (b) Lower Miocene (c) Main supply of locals

APPENDIX IV

Province of Cyrenaica

Table 33

Land utilization, Production of Wheat and Barley 1958/59 Farm Sales, and Prices 1957/58, and sizes of the holders' households by type of Agriculture

		Type of Agriculture			
		Total	Settled Agriculture		Nomadic Agriculture (tribal units)
			ENTE farms	Private farms	
Number of holdings		-	1892	5137	516
Land Utilization 1958/59 (in ha)	Arable land	492161	29226	16421	446514
	Land under permanent crops	10586	2366	4241	3979
	Land under permanent pastures	142205	4364	427	137414
	Forested land	171803	9264	59	162480
	All other land	114914	3002	518	111394
	Total area of the holding	931669	48222	21666	861781
	Thereof irrigated	11739	101	8391	3247
1958/59 Wheat	Amount sown (Qtls)	49714	5442	2305	41967
	Area (ha)	124879	13334	6390	105155
	Production (Qtls)	90637	25065	11364	54208
1958/59 Barley	Amount sown (Qtls)	62778	3399	1926	57453
	Area (ha)	183768	9503	4764	169301
	Production (Qtls)	85427	14812	5961	64654
Amount sold of the 1957/58 harvest (Qtls)	Wheat	22564	3944	1661	16959
	Barley	37575	3976	1059	32540
Price received per quintal (in piastres)	Wheat	254	276	293	245
	Barley	118	134	131	116
Number of persons in the holders' household (summer 1959)	Total	221905	13492	39831	168582
	Male	111490	6538	18656	86296
	Female	110415	6954	21175	82286

Mutasarrifiya: Derna

Table 34

Land utilization, Production of Wheat and Barley 1958/59
Farm Sales, and Prices 1957/58, and sizes of the holders' households
by type of Agriculture

		Type of Agriculture			
		Total	Settled Agriculture		Nomadic Agriculture (tribal units)
			ENTE farms	Private farms	
Number of holdings		-	220	1031	23
Land Utilization 1958/59 (in ha)	Arable land	24992	3509	1279	20204
	Land under permanent crops	1422	361	469	592
	Land under permanent pastures	6947	92	-	6855
	Forested land	9323	-	-	9323
	All other land	5650	-	-	5650
	Total area of the holding	48334	3962	1748	42624
	Thereof irrigated	2123	93	1484	546
1958/59 Wheat	Amount sown (Qtls)	1486	587	99	800
	Area (ha)	3689	1470	221	1998
	Production (Qtls)	9355	4968	527	3860
1958/59 Barley	Amount sown (Qtls)	4291	432	171	3688
	Area (ha)	7565	830	359	6376
	Production (Qtls)	16365	3180	939	12246
Amount sold of the 1957/58 harvest (Qtls)	Wheat	1877	677	-	1200
	Barley	2870	448	42	2380
Price received per quintal (in piastres)	Wheat	335	315	-	346
	Barley	150	159	153	148
Number of persons in the holders' household (summer 1959)	Total	22238	1747	6683	13808
	Male	12084	801	3176	8107
	Female	10154	946	3507	5701

Mudiriya: Labraq

Table 35

Land utilization, Production of Wheat and Barley 1958/59
Farm Sales, and Prices 1957/58, and sizes of the holders' households
by type of Agriculture

			Type of Agriculture			
			Total	Settled Agriculture		Nomadic Agriculture (tribal units)
				ENTE farms	Private farms	
Number of holdings			-	92	17	2
Land Utilization 1958/59 (in ha)	Arable land		2750[1]	1559	51	1100
	Land under permanent crops		118	118	-	-
	Land under permanent pastures		156	56	-	100
	Forested land		300	-	-	300
	All other land		200	-	-	200
	Total area of the holding		3484	1733	51	1700
	Thereof irrigated		-	-	-	-
1958/59 Wheat	Amount sown (Qtls)		413	296	7	110
	Area (ha)		1043	751	17	275
	Production (Qtls)		3426	2458	48	920
Barley	Amount sown (Qtls)		1069	199	10	860
	Area (ha)		1103	363	20	720
	Production (Qtls)		3646	1232	54	2360
Amount sold of the 1957/58 harvest (Qtls)		Wheat	495	245	-	250
		Barley	932	112	20	800
Price received per quintal (in piastres)		Wheat	335	324	-	345
		Barley	15	150	150	150
Number of persons in the holders' household (summer 1959)		Total	1859	700	109	1050
		Male	1056	368	48	640
		Female	803	332	61	410

Mudiriya: El-Gubba

Table 36

Land utilization, Production of Wheat and Barley 1958/59 Farm Sales, and Prices 1957/58, and sizes of the holders' households by type of Agriculture

		Type of Agriculture			
		Total	Settled Agriculture		Nomadic Agriculture (tribal units)
			ENTE farms	Private farms	
Number of holdings		-	128	56	10
Land Utilization 1958/59 (in ha)	Arable land	4423	1950	103	2370
	Land under permanent crops	299	143	56	-
	Land under permanent pastures	611	36	-	675
	Forested land	3250	-	-	435
	All other land	230	-	-	230
	Total area of the holding	6098	2229	159	3710
	Thereof irrigated	142	93	149	-
1958/59 Wheat	Amount sown (Qtls)	493	291	-	202
	Area (ha)	1222	719	-	483
	Production (Qtls)	3836	2510	-	1326
1958/59 Barley	Amount sown (Qtls)	659	233	9	412
	Area (ha)	1320	461	19	834
	Production (Qtls)	5136	1948	56	3132
Amount sold of the 1957/58 harvest (Qtls)	Wheat	982	432	-	550
	Barley	1316	336	-	980
Price received per quintal (in piastres)	Wheat	325	310	-	337
	Barley	299	162	-	294
Number of persons in the holders' household (summer 1959)	Total	4912	1047	607	3258
	Male	2489	433	262	1794
	Female	2423	614	345	1474

Mudiriya: Ain Mara

Table 37

Land utilization, Production of Wheat and Barley 1958/59
Farm Sales, and Prices 1957/58, and sizes of the holders' households
by type of Agriculture

			Type of Agriculture			
			Total	Settled Agriculture		Nomadic Agriculture (tribal units)
				ENTE farms	Private farms	
Number of holdings			-	-	243	3
Land Utilization 1958/59 (in ha)	Arable land		2531	-	387	2134
	Land under permanent crops		644	-	144	500
	Land under permanent pastures		520	-	-	520
	Forested land		3130	-	-	3130
	All other land		30	-	-	30
	Total area of the holding		6845	-	531	6314
	Thereof irrigated		1031	-	531	500
1958/59 Wheat	Amount sown (Qtls)		254	-	45	209
	Area (ha)		633	-	110	523
	Production (Qtls)		1660	-	221	1439
1958/59 Barley	Amount sown (Qtls)		681	-	55	626
	Area (ha)		1373	-	121	1252
	Production (Qtls)		3958	-	254	3704
Amount sold of the 1957/58 harvest (Qtls)		Wheat	400	-	-	400
		Barley	622	-	22	690
Price received per quintal (in piastres)		Wheat	360	-	-	360
		Barley	150	-	155	150
Number of persons in the holders' household (summer 1959)		Total	5774	-	1425	4349
		Male	3451	-	707	2744
		Female	2323	-	718	1605

Mudiriya: El-Gheighab

Table 38

Land utilization, Production of Wheat and Barley 1958/59 Farm Sales, and Prices 1957/58, and sizes of the holders' households by type of Agriculture

		Type of Agriculture			
		Total	Settled Agriculture		Nomadic Agriculture (tribal units)
			ENTE farms	Private farms	
Number of holdings		-	-	13	2
Land Utilization 1958/59 (in ha)	Arable land	2623	-	23	2600
	Land under permanent crops	95	-	3	92
	Land under permanent pastures	360	-	-	360
	Forested land	1808	-	-	1808
	All other land	740	-	-	740
	Total area of the holding	5626	-	26	5600
	Thereof irrigated	69	-	23	46
1958/59 Wheat	Amount sown (Qtls)	48	-	3	45
	Area (ha)	119	-	7	112
	Production (Qtls)	131	-	16	115
1958/59 Barley	Amount sown (Qtls)	807	-	7	800
	Area (ha)	1616	-	16	1600
	Production (Qtls)	933	-	33	900
Amount sold of the 1957/58 harvest (Qtls)	Wheat	-	-	-	-
	Barley	-	-	-	-
Price received per quintal (in piastres)	Wheat	-	-	-	-
	Barley	-	-	-	-
Number of persons in the holders' household (summer 1959)	Total	1889	-	85	1804
	Male	1129	-	49	1080
	Female	760	-	36	724

District of Derna

Table 39

Land utilization, Production of Wheat and Barley 1958/59 Farm Sales, and Prices 1957/58, and sizes of the holders' households by type of Agriculture

		Type of Agriculture			
		Total	Settled Agriculture		Nomadic Agriculture (tribal units)
			ENTE farms	Private farms	
Number of holdings		-	-	598	-
Land Utilization 1958/59 (in ha)	Arable land	379	-	379	-
	Land under permanent crops	241	-	241	-
	Land under permanent pastures	-	-	-	-
	Forested land	-	-	-	-
	All other land	-	-	-	-
	Total area of the holding	620	-	620	-
	Thereof irrigated	609	-	609	-
1958/59 Wheat	Amount sown (Qtls)	21	-	21	-
	Area (ha)	42	-	42	-
	Production (Qtls)	107	-	107	-
1958/59 Barley	Amount sown (Qtls)	31	-	31	-
	Area (ha)	64	-	64	-
	Production (Qtls)	182	-	182	-
Amount sold of the 1957/58 harvest (Qtls)	Wheat	-	-	-	-
	Barley	-	-	-	-
Price received per quintal (in piastres)	Wheat	-	-	-	-
	Barley	-	-	-	-
Number of persons in the holders' household (summer 1959)	Total	3759	-	3759	-
	Male	1751	-	1751	-
	Female	2008	-	2008	-

Mudiriya: Martuba

Table 40

Land utilization, Production of Wheat and Barley 1958/59 Farm Sales, and Prices 1957/58, and sizes of the holders' households by type of Agriculture

		Type of Agriculture			
		Total	Settled Agriculture		Nomadic Agriculture (tribal units)
			ENTE farms	Private farms	
Number of holdings		-	-	47	3
Land Utilization 1958/59 (in ha)	Arable land	3141	-	141	3000
	Land under permanent crops	-	-	-	-
	Land under permanent pastures	1600	-	-	1600
	Forested land	250	-	-	250
	All other land	1550	-	-	1550
	Total area of the holding	6541	-	141	6400
	Thereof irrigated	141	-	141	-
1958/59 Wheat	Amount sown (Qtls)	54	-	-	54
	Area (ha)	135	-	-	135
	Production (Qtls)	-	-	-	-
1958/59 Barley	Amount sown (Qtls)	227	-	12	215
	Area (ha)	454	-	24	430
	Production (Qtls)	-	-	-	-
Amount sold of the 1957/58 harvest (Qtls)	Wheat	-	-	-	-
	Barley	-	-	-	-
Price received per quintal (in piastres)	Wheat	-	-	-	-
	Barley	-	-	-	-
Number of persons in the holders' household (summer 1959)	Total	1371	-	259	1112
	Male	747	-	141	606
	Female	624	-	118	506

Mudiriya: Umm-Rzem

Table 41

Land utilization, Production of Wheat and Barley 1958/59
Farm Sales, and Prices 1957/58, and sizes of the holders' households
by type of Agriculture

		Type of Agriculture			
		Total	Settled Agriculture		Nomadic Agriculture (tribal units)
			ENTE farms	Private farms	
Number of holdings		-	-	12	2
Land Utilization 1958/59 (in ha)	Arable land	7026	-	26	7000
	Land under permanent crops	14	-	14	-
	Land under permanent pastures	3000	-	-	3000
	Forested land	185	-	-	3000
	All other land	1000	-	-	1000
	Total area of the holding	14040	-	40	14000
	Thereof irrigated	31	-	31	-
1958/59 Wheat	Amount sown (Qtls)	160	-	-	160
	Area (ha)	400	-	-	400
	Production (Qtls)	60	-	-	60
1958/59 Barley	Amount sown (Qtls)	502	-	2	500
	Area (ha)	1005	-	5	1000
	Production (Qtls)	800	-	-	800
Amount sold of the 1957/58 harvest (Qtls)	Wheat	-	-	-	-
	Barley	-	-	-	-
Price received per quintal (in piastres)	Wheat	-	-	-	-
	Barley	-	-	-	-
Number of persons in the holders' household (summer 1959)	Total	1437	-	79	1358
	Male	796	-	38	758
	Female	641	-	41	600

Mudiriya: Timimi

Table 42

Land utilization, Production of Wheat and Barley 1958/59 Farm Sales, and Prices 1957/58, and sizes of the holders' households by type of Agriculture

		Type of Agriculture			
		Total	Settled Agriculture		Nomadic Agriculture (tribal units)
			ENTE farms	Private farms	
Number of holdings		-	-	45	1
Land Utilization 1958/59 (in ha)	Arable land	2169	-	169	2000
	Land under permanent crops	11	-	11	-
	Land under permanent pastures	600	-	-	600
	Forested land	400	-	-	400
	All other land	1900	-	-	1900
	Total area of the holding	5080	-	180	4900
	Thereof irrigated	-	-	-	-
1958/59 Wheat	Amount sown (Qtls)	43	-	23	20
	Area (ha)	95	-	45	50
	Production (Qtls)	135	-	135	-
Barley	Amount sown (Qtls)	315	-	45	270
	Area (ha)	630	-	90	540
	Production (Qtls)	1710	-	360	1350
Amount sold of the 1957/58 harvest (Qtls)	Wheat	-	-	-	-
	Barley	-	-	-	-
Price received per quintal (in piastres)	Wheat	-	-	-	-
	Barley	-	-	-	-
Number of persons in the holders' household (summer 1959)	Total	1237	-	360	877
	Male	665	-	180	485
	Female	572	-	180	392

Mutasarrifiya: Derna

Table 43

Production of Field Crops and Vegetables and Number and Production of Fruit Trees 1958/59, by type of Agriculture

	Type of Agriculture			
	Total	Settled Agriculture		Nomadic Agriculture (Tribal Units)
		ENTE farms	Private farms	
Number of holdings	-	220	1031	23
Field Crops and Vegetables	Production (Qtls)	Production (Qtls)	Production (Qtls)	Production (Qtls)
Maize	4485	-	4348	137
Potatoes	-	-	-	-
Dry Beans	-	-	-	-
Broad Beans	1575	128	1367	80
Dry Peas	33	33	-	-
Chick Peas	714	414	-	300
Lentils	-	-	-	-
Tomatoes	5710	164	4702	844
Cucumbers	110	-	-	-
Pumpkins	4993	-	-	-
Melons	3126	251	1175	1700
Water Melons	99	70	29	-
Cabbage	899	-	899	-
Cauliflower	69	5	64	-
Dry Onions	2427	15	1905	507
Pepper	1905	-	1905	-
Carrots	640	-	640	-

Fruit Trees	Number of trees	Production (Qtls)	Number of trees	Production (Qtls)	Number of trees	Production (Qtls)	Number of trees	Production (Qtls)
Oranges	961	67	107	27	854	40	-	-
Lemons	660	85	53	21	607	64	-	-
Apples	1076	225	574	146	502	79	-	-
Pears	844	195	524	131	320	64	-	-
Apricots	1170	317	459	109	711	208	-	-
Peaches	874	246	557	163	317	83	-	-
Plums	415	106	296	81	119	25	-	-
Grapes	155338	2228	154487	1516	821	652	30	60
Figs	3142	992	470	109	2422	823	250	60
Bananas	6019	1154	-	-	6019	1154	-	-
Almonds	2711	509	1937	338	774	171	-	-
Dates	762	395	-	-	722	380	40	15
Olives, cult.	1621	95	1464	90	157	5	-	-

Mudiriya: Labraq

Table 44

Production of Field Crops and Vegetables and Number and Production of Fruit Trees 1958/59, by type of Agriculture

	Type of Agriculture			
	Total	Settled Agriculture		Nomadic Agriculture (Tribal Units)
		ENTE farms	Private farms	
Number of holdings	-	92	17	2
Field Crops and Vegetables	Production (Qtls)	Production (Qtls)	Production (Qtls)	Production (Qtls)
Maize	10	-	10	-
Potatoes	-	-	-	-
Dry Beans	-	-	-	-
Broad Beans	-	-	-	-
Dry Peas	33	33	-	-
Chick Peas	-	-	-	-
Lentils	-	-	-	-
Tomatoes	13	3	10	-
Cucumbers	-	-	-	-
Pumpkins	-	-	-	-
Melons	-	-	-	-
Water Melons	-	-	-	-
Cabbage	-	-	-	-
Cauliflower	5	5	-	-
Dry Onions	-	-	-	-
Pepper	-	-	-	-
Carrots	-	-	-	-

Fruit Trees	Number of trees	Production (Qtls)	Number of trees	Production (Qtls)	Number of trees	Production (Qtls)	Number of trees	Production (Qtls)
Oranges	-	-	-	-	-	-	-	-
Lemons	-	-	-	-	-	-	-	-
Apples	260	58	240	51	20	7	-	-
Pears	307	41	307	41	-	-	-	-
Apricots	189	46	189	46	-	-	-	-
Peaches	238	39	204	36	34	3	-	-
Plums	123	31	123	31	-	-	-	-
Grapes	53666	578	53666	578	-	-	-	-
Figs	342	83	281	66	61	17	-	-
Bananas	-	-	-	-	-	-	-	-
Almonds	848	164	848	164	-	-	-	-
Dates	-	-	-	-	-	-	-	-
Olives, cult.	240	-	240	-	-	-	-	-

Mudiriya: El-Gubba

Table 45

Production of Field Crops and Vegetables and Number and Production of Fruit Trees 1958/59, by type of Agriculture

	Type of Agriculture			
	Total	Settled Agriculture		Nomadic Agriculture (Tribal Units)
		ENTE farms	Private farms	
Number of holdings	-	96	56	7
Field Crops and Vegetables	Production (Qtls)	Production (Qtls)	Production (Qtls)	Production (Qtls)
Maize	168	-	168	-
Potatoes	-	-	-	-
Dry Beans	-	-	-	-
Broad Beans	231	128	103	-
Dry Peas	-	-	-	-
Chick Peas	414	414	-	-
Lentils	-	-	-	-
Tomatoes	226	161	65	-
Cucumbers	-	-	-	-
Pumpkins	-	-	-	-
Melons	251	251	-	-
Water Melons	70	70	-	-
Cabbage	-	-	-	-
Cauliflower	-	-	-	-
Dry Onions	118	15	103	-
Pepper	28	-	28	-
Carrots	-	-	-	-

Fruit Trees	Number of trees	Production (Qtls)	Number of trees	Production (Qtls)	Number of trees	Production (Qtls)	Number of trees	Production (Qtls)
Oranges	107	27	107	27	-	-	-	-
Lemons	53	21	53	21	-	-	-	-
Apples	334	95	334	95	-	-	-	-
Pears	217	90	217	90	-	-	-	-
Apricots	363	72	270	63	93	9	-	-
Peaches	353	127	353	127	-	-	-	-
Plums	173	50	173	50	-	-	-	-
Grapes	100480	1050	100821	938	159	112	-	-
Figs.	674	202	189	43	485	159	-	-
Bananas	-	-	-	-	-	-	-	-
Almonds	1089	174	1089	174	-	-	-	-
Dates	149	47	-	-	149	47	-	-
Olives, cult.	1254	90	1224	90	28	-	-	-

Mudiriya: Ain Mara

Table 46

Production of Field Crops and Vegetables and Number and Production of Fruit Trees 1958/59, by type of Agriculture

	Type of Agriculture			
	Total	Settled Agriculture		Nomadic Agriculture (Tribal Units)
		ENTE farms	Private farms	
Number of holdings	-	-	243	3
Field Crops and Vegetables	Production (Qtls)	Production (Qtls)	Production (Qtls)	Production (Qtls)
Maize	1211	-	1211	-
Potatoes	-	-	-	-
Dry Beans	-	-	-	-
Broad Beans	834	-	834	-
Dry Peas	-	-	-	-
Chick Peas	-	-	-	-
Lentils	-	-	-	-
Tomatoes	1417	-	1417	-
Cucumbers	110	-	110	-
Pumpkins	2430	-	2430	-
Melons	950	-	950	-
Water Melons	-	-	-	-
Cabbage	66	-	66	-
Cauliflower	-	-	-	-
Dry Onions	537	-	537	-
Pepper	293	-	293	-
Carrots	-	-	-	-

Fruit Trees	Number of trees	Production (Qtls)	Number of trees	Production (Qtls)	Number of trees	Production (Qtls)	Number of trees	Production (Qtls)
Oranges	33	-	-	-	33	-	-	-
Lemons	66	-	-	-	66	-	-	-
Apples	166	55	-	-	166	55	-	-
Pears	-	-	-	-	-	-	-	-
Apricots	66	-	-	-	66	-	-	-
Peaches	232	77	-	-	232	77	-	-
Plums	99	22	-	-	99	22	-	-
Grapes	364	431	-	-	364	431	-	-
Figs	1138	442	-	-	1138	442	-	-
Bananas	188	33	-	-	188	33	-	-
Almonds	45	-	-	-	45	-	-	-
Dates	-	-	-	-	-	-	-	-
Olives, cult.	110	-	-	-	110	-	-	-

Mudiriya: El-Gheighab

Table 47

Production of Field Crops and Vegetables and Number and Production of Fruit Trees 1958/59, by type of Agriculture

	Type of Agriculture			
	Total	Settled Agriculture		Nomadic Agriculture (Tribal Units)
		ENTE farms	Private farms	
Number of holdings	-	-	13	2
Field Crops and Vegetables	Production (Qtls)	Production (Qtls)	Production (Qtls)	Production (Qtls)
Maize	81	-	24	57
Potatoes	-	-	-	-
Dry Beans	-	-	-	-
Broad Beans	50	-	20	30
Dry Peas	-	-	-	-
Chick Peas	300	-	-	300
Lentils	-	-	-	-
Tomatoes	66	-	42	24
Cucumbers	-	-	-	-
Pumpkins	-	-	-	-
Melons	33	-	33	-
Water Melons	-	-	-	-
Cabbage	-	-	-	-
Cauliflower	-	-	-	-
Dry Onions	16	-	16	-
Pepper	-	-	-	-
Carrots	-	-	-	-

Fruit Trees	Number of trees	Production (Qtls)	Number of trees	Production (Qtls)	Number of trees	Production (Qtls)	Number of trees	Production (Qtls)
Oranges	-	-	-	-	-	-	-	-
Lemons	7	-	-	-	7	-	-	-
Apples	-	-	-	-	-	-	-	-
Pears	-	-	-	-	-	-	-	-
Apricots	-	-	-	-	-	-	-	-
Peaches	16	3	-	-	16	3	-	-
Plums	20	3	-	-	20	3	-	-
Grapes	43	60	-	-	13	-	30	60
Figs.	307	53	-	-	107	23	200	30
Bananas	-	-	-	-	-	-	-	-
Almonds	-	-	-	-	-	-	-	-
Dates	40	15	-	-	-	-	40	15
Olives, cult.	-	-	-	-	-	-	-	-

District of Derna

Table 48

Production of Field Crops and Vegetables and Number and Production of Fruit Trees 1958/59, by type of Agriculture

	Type of Agriculture			
	Total	Settled Agriculture		Nomadic Agriculture (Tribal Units)
		ENTE farms	Private farms	
Number of holdings	-	-	598	-
Field Crops and Vegetables	Production (Qtls)	Production (Qtls)	Production (Qtls)	Production (Qtls)
Maize	2900	-	2900	-
Potatoes	-	-	-	-
Dry Beans	-	-	-	-
Broad Beans	410	-	410	-
Dry Peas	-	-	-	-
Chick Peas	-	-	-	-
Lentils	-	-	-	-
Tomatoes	3161	-	3161	-
Cucumbers	-	-	-	-
Pumpkins	2328	-	2328	-
Melons	192	-	192	-
Water Melons	-	-	-	-
Cabbage	833	-	833	-
Cauliflower	64	-	64	-
Dry Onions	1249	-	1249	-
Pepper	1584	-	1584	-
Carrots	640	-	640	0

Fruit Trees	Number of trees	Production (Qtls)	Number of trees	Production (Qtls)	Number of trees	Production (Qtls)	Number of trees	Production (Qtls)
Oranges	854	40	-	-	854	40	-	-
Lemons	534	64	-	-	534	64	-	-
Apples	107	-	-	-	107	-	-	-
Pears	320	64	-	-	320	64	-	-
Apricots	449	182	-	-	449	182	-	-
Peaches	-	-	-	-	-	-	-	-
Plums	-	-	-	-	-	-	-	-
Grapes	278	107	-	-	278	107	-	-
Figs	470	139	-	-	470	139	-	-
Bananas	5831	1121	-	-	5831	1121	-	-
Almonds	705	171	-	-	705	171	-	-
Dates	470	299	-	-	470	299	-	-
Olives, cult.	-	-	-	-	-	-	-	-

Mudiriya: Martuba

Table 49

Production of Field Crops and Vegetables and Number and Production of Fruit Trees 1958/59, by type of Agriculture

	Type of Agriculture			
	Total	Settled Agriculture		Nomadic Agriculture (Tribal Units)
		ENTE farms	Private farms	
Number of holdings	-	-	47	3
Field Crops and Vegetables	Production (Qtls)	Production (Qtls)	Production (Qtls)	Production (Qtls)
Maize	95	-	35	60
Potatoes	-	-	-	-
Dry Beans	-	-	-	-
Broad Beans	50	-	-	50
Dry Peas	-	-	-	-
Chick Peas	-	-	-	-
Lentils	-	-	-	-
Tomatoes	-	-	-	-
Cucumbers	-	-	-	-
Pumpkins	235	-	235	-
Melons	-	-	-	-
Water Melons	-	-	-	-
Cabbage	-	-	-	-
Cauliflower	-	-	-	-
Dry Onions	7	-	-	7
Pepper	-	-	-	-
Carrots	-	-	-	-

Fruit Trees	Number of trees	Production (Qtls)	Number of trees	Production (Qtls)	Number of trees	Production (Qtls)	Number of trees	Production (Qtls)
Oranges	-	-	-	-	-	-	-	-
Lemons	-	-	-	-	-	-	-	-
Apples	-	-	-	-	-	-	-	-
Pears	-	-	-	-	-	-	-	-
Apricots	24	-	-	-	24	-	-	-
Peaches	35	-	-	-	35	-	-	-
Plums	-	-	-	-	-	-	-	-
Grapes	-	-	-	-	-	-	-	-
Figs	94	12	-	-	94	12	-	-
Bananas	-	-	-	-	-	-	-	-
Almonds	24	-	-	-	24	-	-	-
Dates	-	-	-	-	-	-	-	-
Olives, cult.	-	-	-	-	-	-	-	-

Mudiriya: Umm-Rzem

Table 50

Production of Field Crops and Vegetables and Number and Production of Fruit Trees 1958/59, by type of Agriculture

	Type of Agriculture			
	Total	Settled Agriculture		Nomadic Agriculture (Tribal Units)
		ENTE farms	Private farms	
Number of holdings	-	-	12	2
Field Crops and Vegetables	Production (Qtls)	Production (Qtls)	Production (Qtls)	Production (Qtls)
Maize	-	-	-	-
Potatoes	-	-	-	-
Dry Beans	-	-	-	-
Broad Beans	-	-	-	-
Dry Peas	-	-	-	-
Chick Peas	-	-	-	-
Lentils	-	-	-	-
Tomatoes	807	-	7	800
Cucumbers	-	-	-	-
Pumpkins	-	-	-	-
Melons	800	-	-	800
Water Melons	29	-	29	-
Cabbage	-	-	-	-
Cauliflower	-	-	-	-
Dry Onions	200	-	-	200
Pepper	-	-	-	-
Carrots	-	-	-	-

Fruit Trees	Number of trees	Production (Qtls)	Number of trees	Production (Qtls)	Number of trees	Production (Qtls)	Number of trees	Production (Qtls)
Oranges	-	-	-	-	-	-	-	-
Lemons	-	-	-	-	-	-	-	-
Apples	209	17	-	-	209	17	-	-
Pears	-	-	-	-	-	-	-	-
Apricots	79	17	-	-	79	17	-	-
Peaches	-	-	-	-	-	-	-	-
Plums	-	-	-	-	-	-	-	-
Grapes	7	2	-	-	7	2	-	-
Figs	67	31	-	-	67	31	-	-
Bananas	-	-	-	-	-	-	-	-
Almonds	-	-	-	-	-	-	-	-
Dates	103	34	-	-	103	34	-	-
Olives, cult.	19	5	-	-	19	5	-	-

Mudiriya: Timimi

Table 51

Production of Field Crops and Vegetables and Number and Production of Fruit Trees 1958/59, by type of Agriculture

	Type of Agriculture			
	Total	Settled Agriculture		Nomadic Agriculture (Tribal Units)
		ENTE farms	Private farms	
Number of holdings	-	-	45	1
Field Crops and Vegetables	Production (Qtls)	Production (Qtls)	Production (Qtls)	Production (Qtls)
Maize	20	-	-	20
Potatoes	-	-	-	-
Dry Beans	-	-	-	-
Broad Beans	-	-	-	-
Dry Peas	-	-	-	-
Chick Peas	-	-	-	-
Lentils	-	-	-	-
Tomatoes	20	-	-	20
Cucumbers	-	-	-	-
Pumpkins	-	-	-	-
Melons	900	-	-	900
Water Melons	-	-	-	-
Cabbage	-	-	-	-
Cauliflower	-	-	-	-
Dry Onions	300	-	-	300
Pepper	-	-	-	-
Carrots	-	-	-	-

Fruit Trees	Number of trees	Production (Qtls)	Number of trees	Production (Qtls)	Number of trees	Production (Qtls)	Number of trees	Production (Qtls)
Oranges	-	-	-	-	-	-	-	-
Lemons	-	-	-	-	-	-	-	-
Apples	-	-	-	-	-	-	-	-
Pears	-	-	-	-	-	-	-	-
Apricots	-	-	-	-	-	-	-	-
Peaches	-	-	-	-	-	-	-	-
Plums	-	-	-	-	-	-	-	-
Grapes	-	-	-	-	-	-	-	-
Figs	50	30	-	-	-	-	50	30
Bananas	-	-	-	-	-	-	-	-
Almonds	-	-	-	-	-	-	-	-
Dates	-	-	-	-	-	-	-	-
Olives, cult.	-	-	-	-	-	-	-	-

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PLATES

Plate 1(a) - Wadi En-Naga emerging from the lower escarpment towards the sea.

Plate 1(b) - The escarpment plunging into the sea, 5 km. east of Lathrun.

Plate 2(a) - Gorge of Wadi Derna at Shallal.

Plate 2(b) - Wadi Derna at its lower reaches at Derna Town looking towards the south.

Plate 3(a) - The deposits of the higher terrace at the town wall of Derna.

Plate 3(b) - Derias plant in El-Gubba area.

Plate 4(a) - The Roman cistern at Saf-Saf.

Plate 4(b) - Ain Derna (El-Blad) at the base of the western bank of Wadi Derna.

Plate 5(a) - Damage caused by the flooding of Wadi Derna to Ain Derna. December 1958.

Plate 5(b) The stream of Lathrun Spring running into the sea.

Plate 6(a) - Ain Wadi El-Glaa.

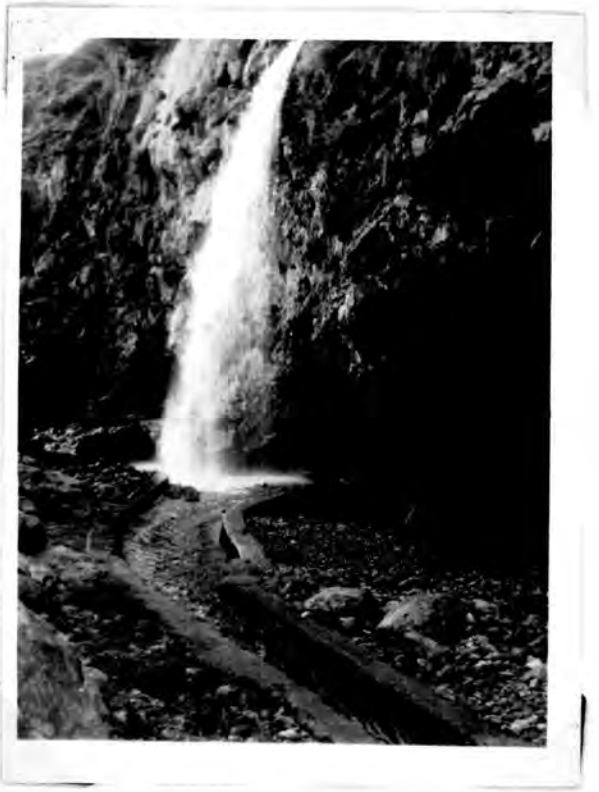

Plate 6(b) - Waterfall of Ain Bu Mansur at Shallal, used for irrigation.

Plate 7(a) - Picturesque waterfall of Ain Mara forming marshes.

Plate 7(b) - The unfinished pipeline between Ain Mara and El-Marj.

Plate 8(a) - El-Gubba spring.

Plate 8(b) - Wadi El-Furtas entering Bu Mansur quarter Derna.

Plate 9(a) - Type of settlement, Hoosh in Mughar with climbing vines on the roof.

Plate 9(b) - Jebela quarter, the Grammar School can be seen in the foreground.

Plate 10(a) - Type of settlement, Bedouin tent.

Plate 10(b) - Type of settlement, Roman tomb inhabited by a family in El-Gubba.

Plate 11(a) - Type of settlement, former Ente farm house occupied by a Bedouin family.

Plate 11(b) - Type of settlement, houses in El-Gubba village occupied by officials and teachers.

Plate 12(a) - The main shopping street in El-Gheighab.

Plate 12(b) - The village of Ain Mara, Mudiriya offices Mudir residence and the police station.

Plate 13(a) - Cultivation in Wadi Derna occurs on the terraces of both sides.

Plate 13(b) - Ploughing the land for cereal cultivation in El-Fatayah plain.

Plate 14(a) - Vegetable cultivation in the Swani of Jebela quarter - climbing beans.

Plate 14(b) - The Jedula: rectangular in shape, used to facillitate irrigation.

Plate 15(a) - Cultivation in Wadi Ain Mara, cereals and tree crops.

Plate 15(b) - Inter-cultivation of vines with olive and almond trees.

Plate 16(a) - Bananas, Lebanese variety - Derna.

Plate 16(b) - Organic fertiliser manure brought from the Jebel.

Plate 17(a) - A method which was used by the farmers in Derna to prepare organic manures; this method has been forbidden by the Health Department.

Plate 17(b) - The flooded jedula irrigation systems in Derna.

Plate 18(a) - A secondary channel from Ain Derna, for irrigation in Jebela quarter.

Plate 18(b) - Suqia - irrigation trench to distribute water for irrigation to the jedawel.

Plate 19(a) - A well with an electric pump, the water flows into a storage tank (jabia).

Plate 19(b) - El-Gubba nursery.

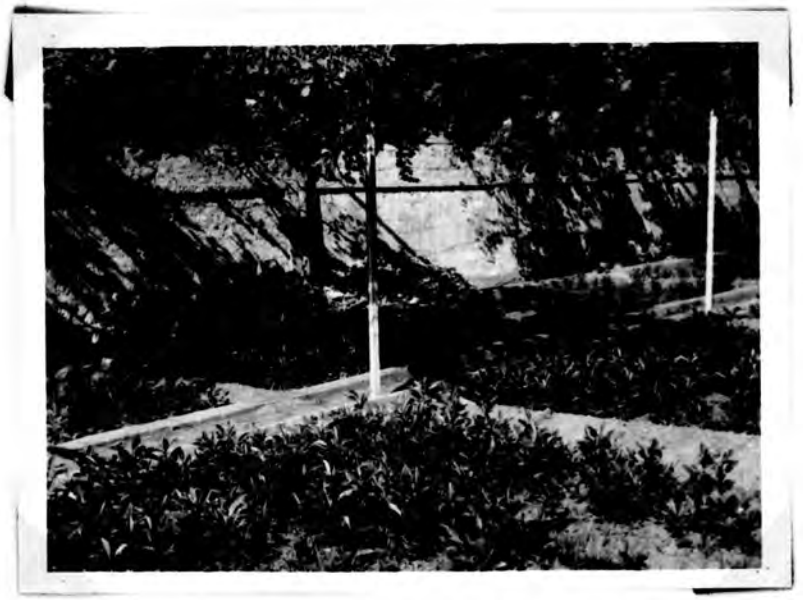

Plate 20(a) - Derna Agrario, climbing vines and lemon rhizomes are planted for improving tree and vegetable crops.

Plate 20(b) - Derna harbour, Greek fishing vessels come to Derna in October and November with sponges they have caught, for weight and taxation.