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SECTION THREE

Chapter Five - The present situation with regard to Land Use and Farm Management as an Indicator of Economic Growth in the Agricultural Sector.

Part One

I - A Classification of Land Use in Misuratio.

- (A) Cropland
- (B) Pastureland
- (C) Woodland
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- (E) Agriculturally Un-productive land.

II - Supplementary Notes to Crop Distribution Maps - An Examination of Varietal Land Use in Misuratio

Arab Cropland

Italian Cropland

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Table 32 - A Classification of Land Use in Misuratio.

<u>ORDINARY CATEGORY</u>	<u>GENERIC CATEGORY</u>	<u>SPECIFIC CATEGORY</u>
(A) <u>Cropland</u>	I Intensively Cultivated Land	1 Inter-cultivated Land 11 Non-Inter-cultivated Land
	II Less Intensively Cultivated Land	1 Interdunal Palmeries 11 <u>Ginan</u> 111 Dry-land <u>Sueni</u> 11 Dry-land Orchards V Dry-land Enclosures
	III Extensively Cultivated Land	1 Peripheral Steppe 11 Inner Steppe
(B) <u>Pastureland</u>	IV Pastureland Associated with the Oases	1 Dune and Rock Waste Land 11 Peripheral Steppe
	V Pastureland Associated with the Inner Steppe	1 Wadi Basins 11 Open Steppe
(C) <u>Woodland</u>	VI Managed Woodland	1 Plantation Woodland 11 Woodland Associated with Dune Fixation 111 Wind Breaks
(D) <u>Scrubland</u>	VII Unmanaged Scrub	1 Steppe Scrub 11 <u>Sebkha</u> Scrub
(E) <u>Agriculturally Unproductive Land</u>	VIII Land Occupied by Buildings Roads etc.	1 Village Areas 11 Farmhouses and Out-buildings 111 Military Waste 11 Other Non-Agricultural Land

Classification Adapted Freely from Fox, J.W. 'Land Use Survey', (65)
Auckland University College, Bulletin No. 49, Geog. Series No. 1, 1956.

PART ONE - An Examination of Land Utilisation and Economic Growth

(1) A Classification of Land Use in Misuratio.

The major problem facing any student of the Geography of Libya is the poverty of fundamental material available on the subject in the country. The geographical method does provide adequate means to overcome these disabilities; in the present thesis, the writer has called into use the basic tools of his subject i.e. appraisal of land resources and its expression through the medium of cartography to redress the paucity of derived information. The writer had seen the value of field to field land use survey during his association with the work completed in Malta by the Department of Geography in the Durham Colleges under the direction of Mr. H. Bowen-Jones, and the appropriateness of the technique in Libyan conditions was immediately apparent in view of the want of alternative base intelligence. Details of the methodology, timing and coverage of the survey are provided in Appendix 2.

The over-all system of classification employed in this land use survey of Misuratio has been adapted freely from the scheme outlined by James W. Fox in his publication 'Land Use Survey. General Principles and a New Zealand Example.'⁽⁶⁵⁾ Techniques of field survey and organisation built up during the Land Use Survey of Malta have been adapted where they have been applicable to the Libyan environment⁽⁶⁶⁾. Grateful acknowledgement to these authorities is made here.

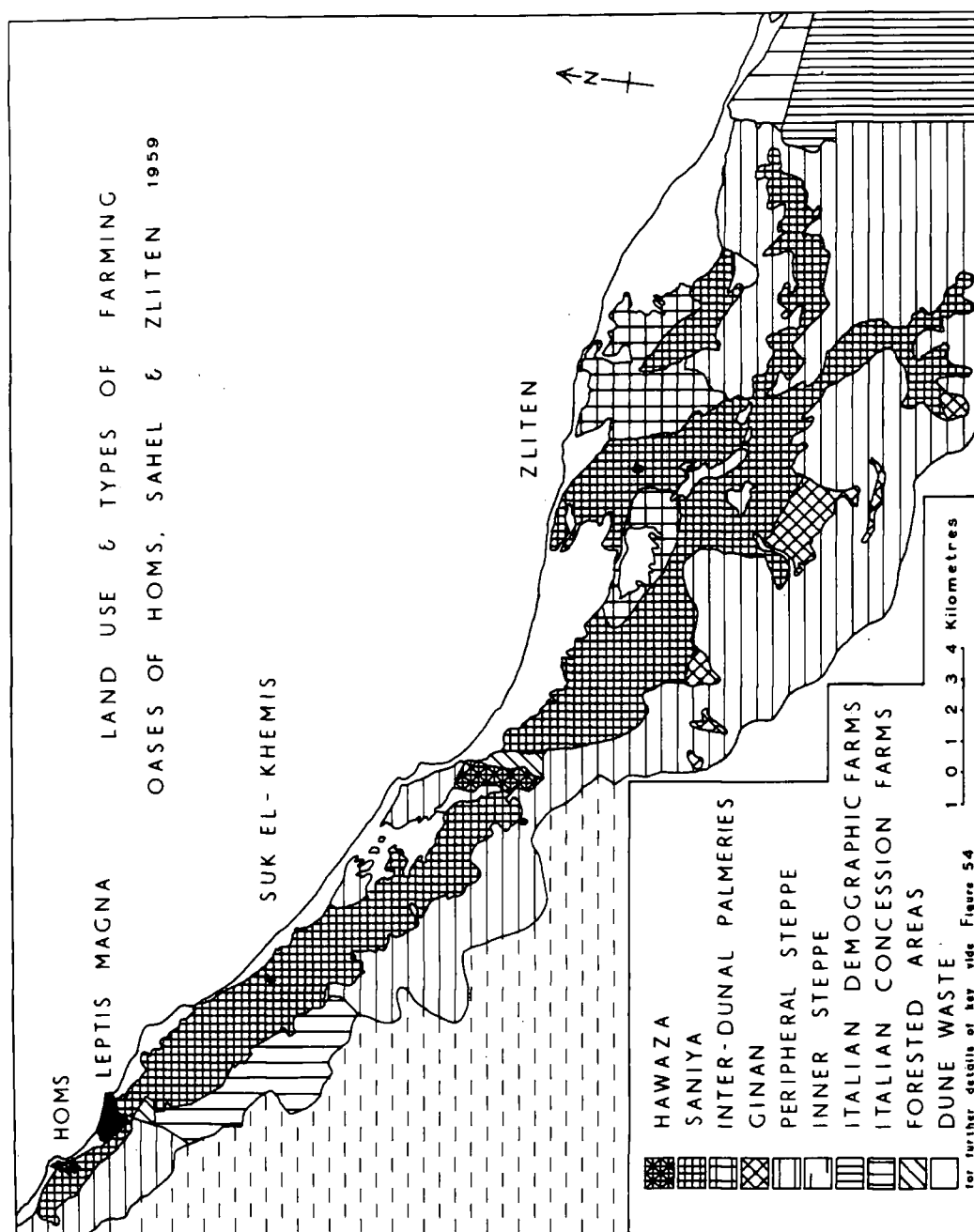


Figure 53

The dynamics of social and economic growth, which we have discussed in preceding chapters in respect to tribal disintegration and features of land holding in rural areas are directly reflected in the changing approach to land use and consequently in the changing values of different categories of land. The indigenous revolution, which has taken place within the last century, and which has seen the sedentarisation of most of the peoples of Misuratio, has also witnessed a great realignment of land use zones. In land use terminology, the erstwhile cropland of the steppe under shifting occupance, has relapsed to unimproved grassland, or in many instances, to scrubland (D VII 1) in the non-agricultural category; and, in the same process, the unimproved grasslands of the peripheral steppe were reclaimed to use as intensively cultivated land. These are but the two obvious and outstanding examples of the re-adjustment of the utilisation of land in the climate of economic growth; and there have been a multitude of associated movements in land use at a local level occasioned by both indigenous growth and Italian colonial development. In the succeeding pages, we shall analyse the classification of rural land use for each category, from the ordinal to the varietal i.e. from the macrosmic to the microsmic view of the land use constitution. (Vide Table 32).

(A) Cropland

The prime features of croplands in Tripolitania are their confined geographical spread, and the twofold concentration

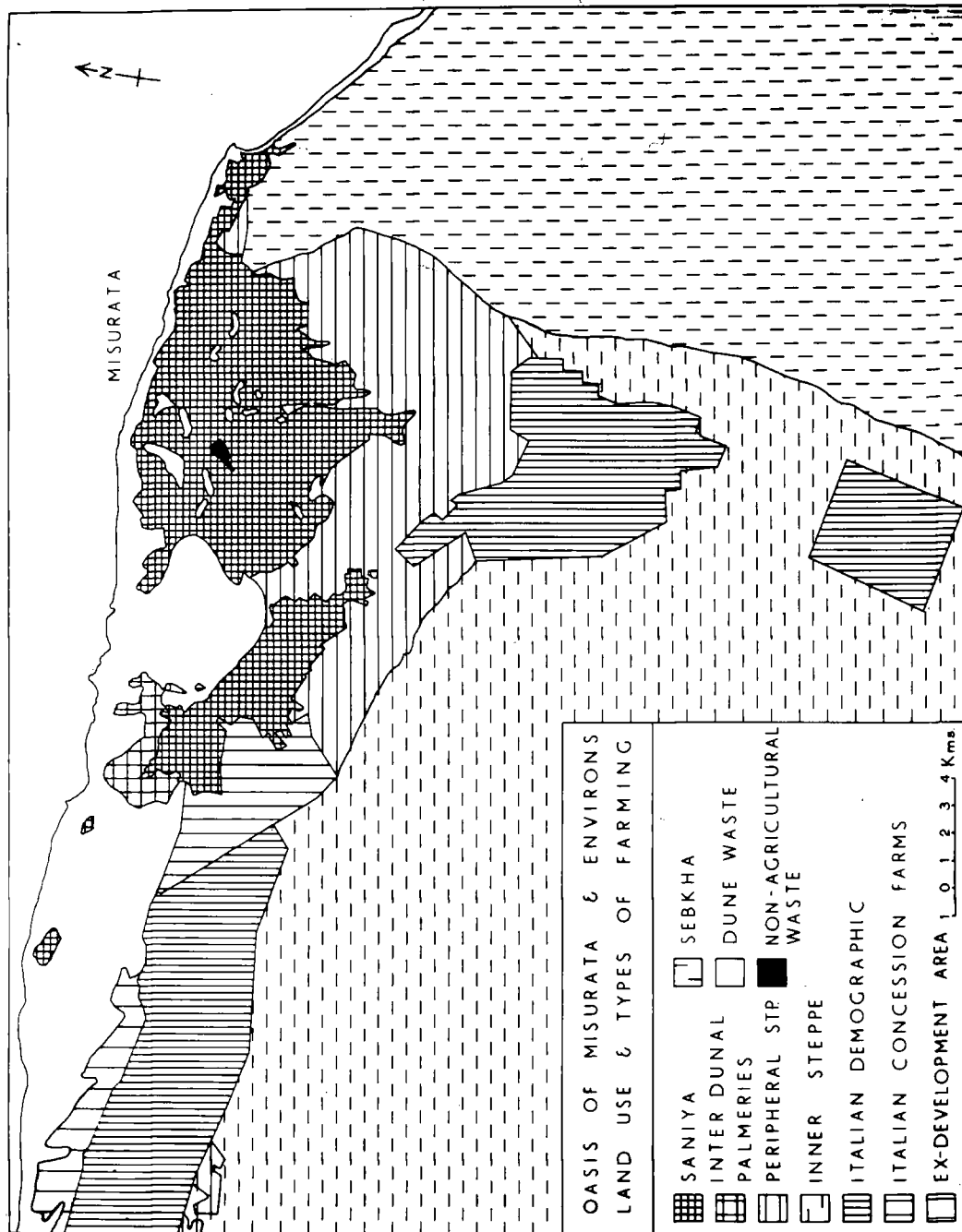


Figure 54

along the Jebel front and along the littoral. The natural fertility of these two areas resulting from the particular characteristics of climate, soils and physiography, has tended to attract human settlement since Libya was first occupied by the Berber peoples. In an earlier section, we pointed out the common strand of occupation in these littoral and Jebeline oases through the tenacity of the 'Arbi' and the peasant Berbers in the two areas respectively. Nevertheless, during the Arab invasions, the hold of the cultivators on the oases became tenuous, and it is certain that the area of cultivation declined considerably in the face of nomadic incursions. Thus, the pattern of land use which prevailed in the era before sedentarisation tended to exhibit features of dispersion in the steppe land, a distribution arising from the sporadic occurrence of available water supply and sowing areas. In the Twentieth Century, the gathering forces of social and economic change have combined to give the inverse relationship between steppe and oasis which we know today (Vide Figures 53 and 54). The rate of change is illustrated rather pertinently by comparison between the assessment of Land Use in 1960 and the Survey of Land Resources in Tripolitania prepared in 1945 (Figure 55). In 1945, activity in the steppe by nomadic and semi-nomadic groups was sufficient to justify a classification of "shifting cultivation," encompassing most of the lands of Misuratio disposed between the littoral oases and the climatic zone of the inner steppe. By contrast, field survey in 1959-60

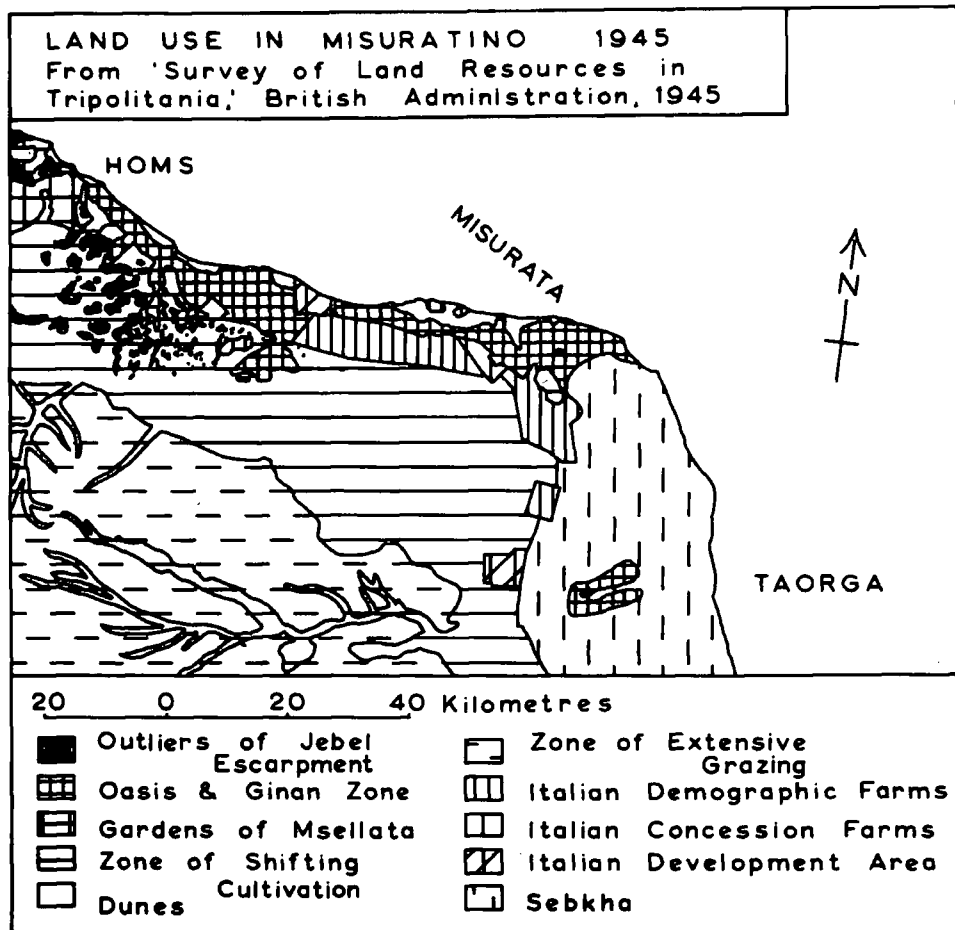


Figure 55

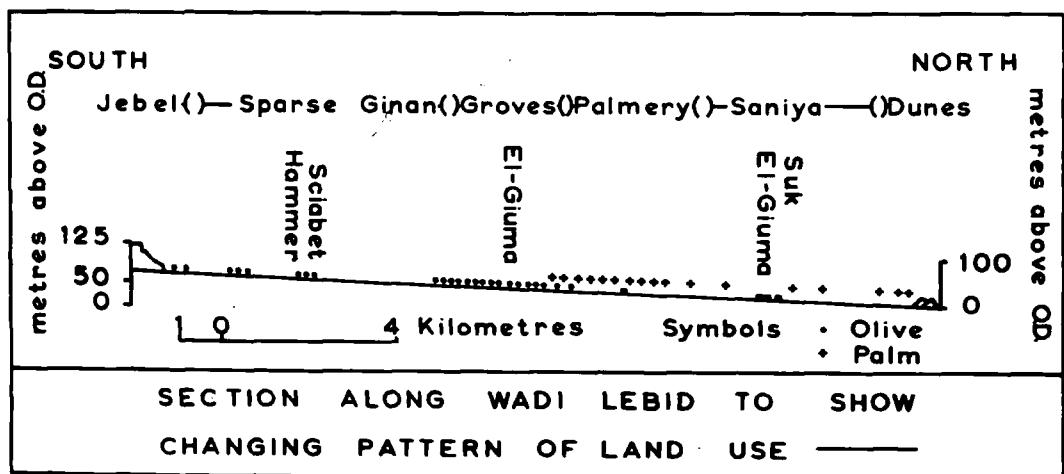


Figure 56

both in terms of land use mapping and questionnaire survey, showed that the designation of "shifting cultivation" was barely applicable to the area. The inter-action of economic and social factors involved in the growth mechanism has brought about a re-evaluation of land. In 1960, the peripheral steppe was essentially an adjunct of the oasis economy: from data collected in the Questionnaire Survey it is apparent that 65% of the farmers in the area may be considered as completely oasis-aligned, without any tillage interest in shifting cultivation (Vide Chapter⁶, page 559 Table.). Co-ordinated with this tendency for cropping to be exclusively concentrated in the oases, the lower-developing minority at early levels of economic growth have moved north into the steppe lands vacated by farmers at a more advanced state of evolution. The net result of these movements has been to contract the surface area and modify the usage of the steppe lands from extensively used croplands to pasture land. This inversion may be seen readily by contrasting Figures 53 and 54 with 55.

The transformation in the geographical area of cropland which has been brought about by changes in the social and economic environment has been accompanied by a corresponding re-orientation of land use within the major classification. Dynamic evolution of indigenous life associated with the trend towards sedentarisation, the claims of individual ownership of land, the capitalisation of the water resources of the littoral oases and the impact of European ideas through the Italian

occupation, necessarily brought in its train a constantly shifting balance of land appraisals and land values. Hence, land use at the microsmic plane varies immensely both in respect to the forces exerting influences at any particular time, and also in respect to the individual operator's stage of evolution along the path of economic growth. Thus, farmers occupying Hawaza units respond differently to market conditions from Phase III farmers, who tend to be self-sufficient in outlook. In the case of the Hawaza units, rapid response to market prices for high profit cash crops brings about changes in land use, whereas the advanced subsistence farmer at Phase III, with only marginal interest in commercial cropping, would be more likely to respond to sustained high prices offered for food crops such as broad beans, or fodders such as alfalfa. The differentiation of reaction between the varying types of farmer tends to be exaggerated or diminished according to the rate of growth at each Phase, i.e. the rate of growth in an early developing economy tends to be geometrical, hence the apparent gulf between those farmers at Phases IV and V and those at I and II appears to be greater than it is, since the early Phase farmers have the same potential of growth at compound interest (and the advantage of the set example) as those who have gone before. Before beginning study of land use at a crop by crop level, we shall discuss the intermediary division of the category to give a clear picture of the cropland pattern in the area.

In the Generic category of classification, three major divisions may be recognised within the Ordinal Cropland grouping. The distinction drawn between the categories is based on the intensiveness of land utilisation as suggested by Fox⁽⁶⁵⁾, but above and beyond this schematic definition used in the classification of land use, there emerges a clear basis of gradation between areas of varying water availability, running from north to south. Illustration of the zones of land use symbolised by a section of the Wadi Lebidi is given diagrammatically in Figure 56. Hence the following examination will be conducted largely in terms of land use in relation to the features of economic growth, but the local environmental distribution presented in Figure 56 should be borne in mind as a guide to the localities to be discussed.

(i) Intensively cultivated land occurs where plentiful irrigation water can be drawn from the phreatic or artesian aquifers. The boundary between these areas where water is exploited and those where it is not tends to be demarcated clearly: there is no gentle transition from oasis to peripheral steppe, rather one begins where the other ends. Intensively cultivated lands in Misurafino are characterised by small gardens utilising irrigation waters to produce two crops a year with only short fallow periods.

(ii) Less intensively cultivated land includes all those areas where direct irrigation facilities are not present, but where alternative sources of water are available. Much of this area

may be accounted for by those coastal reaches of the oases where the phreatic water table is close enough to the land surface for thinly spaced palms to survive. In other areas, man-made water gathering points in the peripheral steppe, or dispersed bores into artesian water sources provide a basis for cultivation. Lands in this category are marked at ground level by enclosures, both on a small scale as in the case of the qinan and the larger scale in plantations of olives of the Italian demographic farms and private concessions.

(iii) Extensive cultivation areas constitute the largest and the least valuable lands of Misuratio. Land use in these areas has tended to become less and less intensive as shifting cultivation has declined in the face of sedentarisation in the oases proper. As we have pointed out earlier, the zone of dry-land cultivation in the littoral steppe has contracted, and to some extent this may be regarded as an area of increasing concentration if only because dry-land cultivation is limited to the reaches of the peripheral steppe in the immediate vicinity of the oases. The narrow strip of peripheral steppe apart, the dry-land areas, unenclosed and unimproved are expanding and becoming of less importance in the agricultural economy of Misuratio.

Specific Categories - Intensively Cultivated Land.

(A I 1) The break-down of land use to the specific category illustrates several interesting features of economic growth in respect to the changes in land appraisal by farmers at

varying stages of evolution and throws light upon the associated problems of farm size and management which we have dealt with elsewhere. The areal extent of group (A I 1) may be equated roughly with the distribution of farming types Saniya and demographic farms shown on Figures 53 and 54, an area, in fact, which accounts for a large proportion of the land surface of Misuratio. The common factors distinguishing this intensive category are -

(a) The use of irrigation water for most cropping activity, usually with the aim of producing two crops per year.

(b) The enclosed nature of the gardens and cultivation plots. In the case of the Arab suani mud retaining walls separate each garden; in the case of the Italian demographic farms the slightly larger operating units are enclosed by eucalyptus or tamarisk hedgerows.

(c) Of prime importance in analysis of characteristics peculiar to this category is the practice of close intercropping of field and tree crops. This latter feature is the significant land use differentiation between suani and demographic farms as opposed to hawaza units at the Wadi Gaam Settlement and the mezzadria small-holdings within the framework of La Valdagne private concession.

The Libyan agricultural dilemma in broad terms hinges on the extremely confined area of cultivated land compared to the vast surface area of the country itself. The scale of this disparity is illustrated clearly by maps of land use (Figures 53

and 54). Those areas included within the intensively used category are comparatively minute alongside those zones which are extensively utilised or utilised scarcely at all. Later in this Section we shall discuss the problems arising from the apparently paradoxical relationship of land use. The superficial areas of the (A I i) grouping, taken from the data included in Figures 53 and 54 are as follows:-

<u>Oasis Land/Suani</u>		<u>Demographic Farms</u>	
Homs/Sahel El-Ahamed	4,000 Ha.	Tummina	3,700 Ha.
Zliten Oasis	10,034 Ha.	Dafnia	9,428 Ha.
Misurata Oasis	12,644 Ha.	Kararim	1,200 Ha.
<u>Total</u>	<u>26,678 Ha.</u>		<u>14,328 Ha.</u>
<u>Category (A I i) total areas 41,006 Ha.</u>			

Assessment of the absolute total of land under intensive utilisation is somewhat more complicated than the preceding figures indicate. The writer has used data which in many ways tend to reflect past occupation, especially in respect to Italian demographic areas. At one end of the scale for example, several of the farm units at Tummina have been consolidated in the hands of one farmer; inter-cultivation is still practised but the result of the amalgamation of units has been to reduce the intensiveness of utilisation, if only in terms of a reduction from double to single cropping. In some cases an increase in the size of the farm unit has meant changes in the type and number of varieties cultivated; sufficient to alter the degree of land use intensiveness from category (A I i) to the succeeding category (A I ii) (Vide Table 32). Economy of time

precluded a detailed varietal land use survey at Tummina hence the whole estate appears on Figure 54 in category (A I 1): the existence of exceptions to this over-all classification should be borne in mind.

Further small scale deviation from the apparent homogeneity of this grouping arises in the case of Kararin. Here, social, political and economic factors, which are discussed at greater length in Chapter 6 (page 667), have exerted pressure upon the Italian settlers who have recently completely evacuated the estate. Economically the estate has relapsed into self-sufficiency since the Arab tribes in the vicinity have either looted the remaining produce or taken over small areas at convenient sheltered points for cultivation under their shifting occupancy. From the land use point of view, the olive trees are still producing and the Arabs, whether looting or not are gathering the olive fruits; the bastard cultivation of cereals by the tribes has replaced the skilled culture of grain by the Italian settlers, thus it must temporarily be classified as "intensively cultivated" land. This designation is likely to vary either towards intensification or to more extensive use depending upon the rate of economic growth as suggested in Chapter 6 (page 679).

The theme of economic growth also tends to be obscured by the scale of definition present in Figures 53 and 54. Those areas nominated to the suani sub-group of (A I 1) in fact include within their boundaries farm units of three distinct

Phases of growth, i.e:-

(A) Irrigated farms situated in oasis palmeries which are self-sufficient in nature and which have been classified as Phase III in the writer's mechanism of growth.

(B) Saniya farms sited mainly within the Sahel El-Ahamed, but also present in other oases of the littoral, which are orientated primarily to production of cash crops for the commercial market. In physical form they are indistinguishable from the farms in the less advanced Phase III. In terms of land use these farming units represent some of the most intensively utilised land in Misuratio, since inter-cultivation of palm and olive plantations implies an equal emphasis between the two activities. The tree crops are used for commercial production, especially the olive, and the varietal specialisation in field crops compares favourably with those cultivated on more highly developed units representing Phase V. This transitional type of farm unit, classified as Phase IV, is tending to expand rapidly as rural economic growth takes place.

(C) Irrigated hawaza units concerned entirely with production for the commercial market. The land use pattern associated with this particular Phase of farming activity diverges from (B) paramountly as a result of the decline in the importance of tree crops; it should be noted that this does not apply to areas outside Misuratio, especially the oases of the Jefara and the richer areas of the Jebel front, where arboriculture

tends to increase in importance in the latter stages of economic growth, (e.g. the expansion of citrus and olive areas on hawaza in the Jefara, (9)). On the other hand varietal intensiveness through specialisation does increase. In compiling the Land Use Maps (Figures 53 and 54), it was found impossible without further time and capital spent in the field survey to separate the hawaza farms from the Phase III and IV units, with which they were inter-mixed. Nevertheless, in study of the varietal category of land use we shall be able to observe the regional differences which do occur and which indicate the changes in economic status of the farming areas.

(A I ii) Intensively Cultivated Land - Non-inter-cultivated.

The present day insignificance of intensive commercial farming in Misuratio is illustrated by the small area given over solely to such production. In terms of land use, the intensively cultivated areas - non-inter-cropped - are represented by two different cultural elements; the hawaza gardens of Wadi Caam Settlement and the mezzadria podere of La Valdagne Concession. The geographical distribution of these latter areas is determined by the demands of the larger colonisation schemes of which they were, at separate times, an integral part. The hawaza farms of Wadi Caam Settlement exhibit tremendous variations in intensiveness of utilisation, corresponding to the aptitude and ability of the individual farmers occupying each farm unit. Nonetheless, the varying style of land use is more apparent at the varietal category of analysis than at

the specific, and from the point of view of intensity of use alone, the divergencies are less appreciable.

Italian intensive farming of this category is closely approached by several of the consolidated units at Tummina as we have seen in earlier discussion, but ignoring these precocious developments, the only clear-cut area of non-intercropped intensive farm units is to be found at La Valdagne. On this private concession, the dichotomous nature of the farming activity, made up of a central management with lands under its exclusive control, and mezzadria tenants occupying irrigated podere outside these domains, allowed a straight division between orcharding and intensive cropping. This being the case, the necessity for inter-cultivation was obviated. The actual distribution of cropland on the estate is shown in Figure 51, and it is pertinent to note at this juncture that the central management retains a portion of the apoderate zone in the intensively cultivated strip of the estate, and that the mezzadria contractors hold small areas of orchard.

The approximate areas under this form of land use are as follows:-

<u>Sub-grouping</u>	<u>Designation</u>	<u>Surface Area</u>
(A I ii)	Wadi Gaam Settlement	240 Ha.
	La Valdagne	376 Ha.
	<u>Total</u>	<u>616 Ha.</u>
(A II) <u>Less Intensively Cultivated Areas.</u>		

As a preface to study of these intermediary areas of

cultivation it would be useful to indicate once again that land use zones situated peripheral to the oases proper, which have been defined in (A I i) and (A I ii) sub-groupings above, exhibit characteristics both of increasing intensity and decreasing intensity of utilisation. In terms of economic growth, those areas where cropping results are poor, or where good results demand uneconomic effort in time and labour are being vacated gradually. Thus, the ginan in the peripheral steppe and the foot-hills of Msellata which were highly valued in the framework of traditional economic life, have become de-valued in status in recent years as a result of rationalisation of indigenous agriculture. The production of olive fruit from the groves of the ginan is proportionally greater than from a similar number of trees in the littoral areas, but the farmers who own trees of this kind are less and less prepared to tolerate the inefficiency involved in pruning and gathering crops from the dispersed gardens and in maintaining the wide net-work of drainage channels which lead water from the upper wadi slopes to the ginan. Ownership rights in long-established plantations such as the olive groves in the ginan tend to be complicated by large numbers of claimants upon the production of olive fruit, and the net gain from these areas is insignificant for any individual. In these conditions, the ginan areas are losing ground, since better farmers invest their time and effort in the concentrated oasis gardens where better returns are to be had. Active ownership of ginan by the default of the

commercial farmers has tended to lapse into the hands of the poorer subsistence Arabs of Phases I and II, and, to a lesser extent, to Phase III.

A similar trend may be discerned in the case of the interdunal palmeries, which, cut off physically from the main bulk of farming land, yielding low returns of unsaleable dates and, offering scope for only occasional cereal crops, are tending to become the symbols of the badly run and economically retarded farm units. Farmers at Phase IV or V development have no further interest in grazing lands or small scale dry-land cultivation plots which are the functions of the interdunal palmeries. The position of the dry-land walled gardens in the main body of the oases is not quite so cut and dried as the former two cases. The small pockets of dry-land gardens which are to be found in Misuratine, in most instances, merely await capitalisation into full suani. Hence, they might lie undeveloped during the early Phases of economic growth when farmers' capital is committed to improvement of existing suani, and all the associated expenditure necessary to advance agricultural practice; later, when accumulated capital is available, latitudinal consolidation is possible by means of reclaiming previously dry-land suani. Thus, the balance of economic progress in any given area by and large determines the move towards intensiveness or extensiveness of land utilisation of this sub-grouping (A II iii).

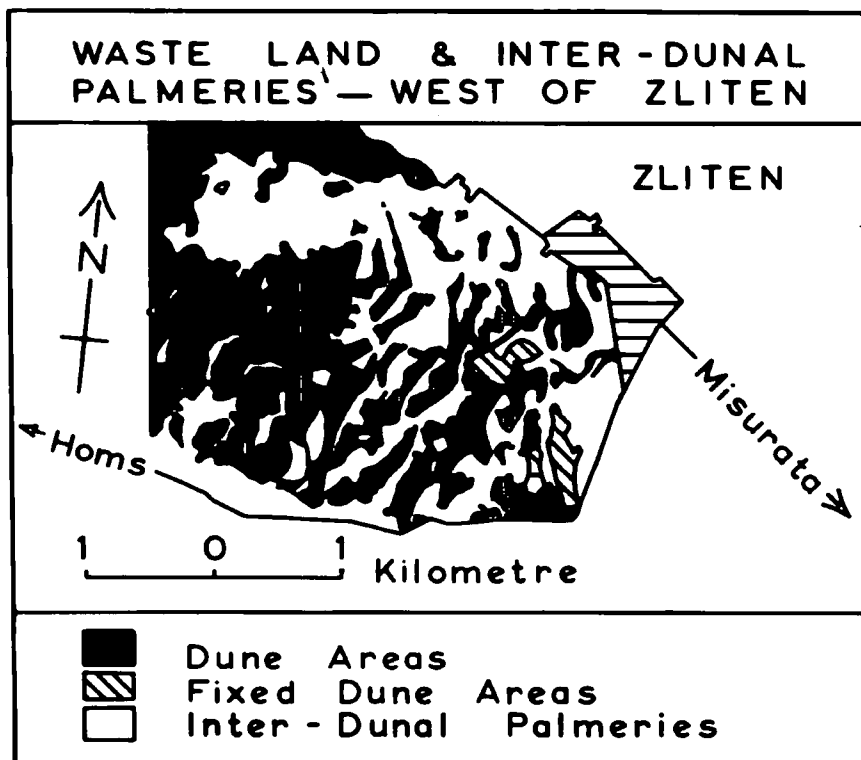


Figure 57

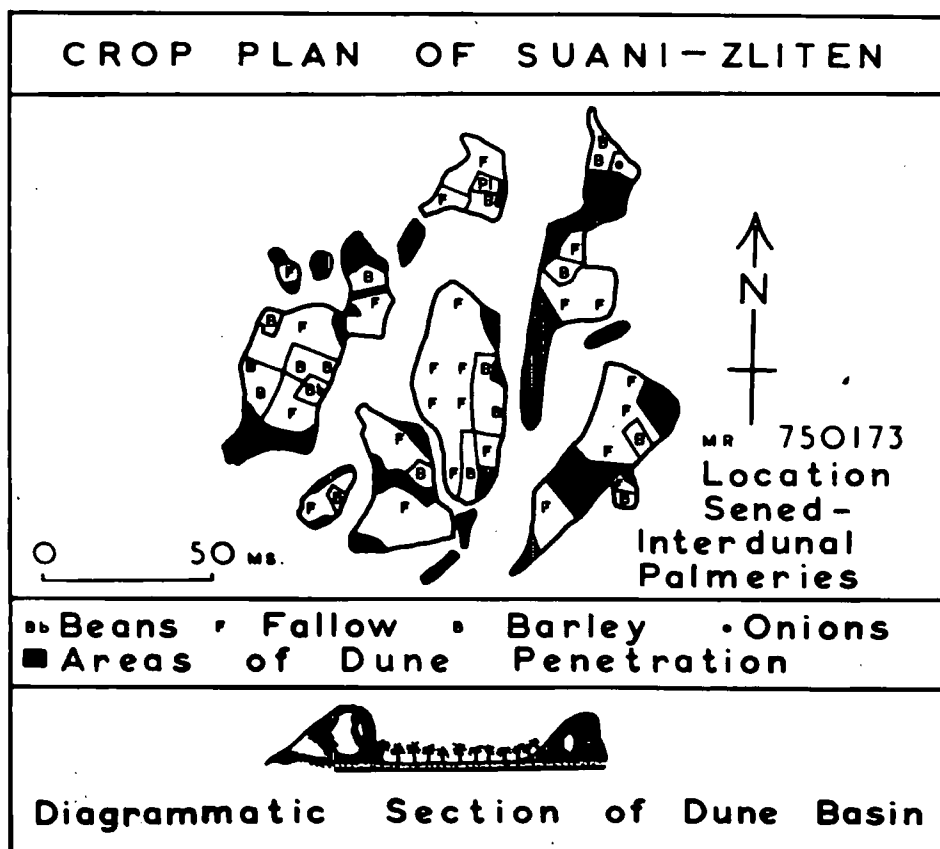


Figure 58

(A II 1) Interdunal palmeries

The greatest concentrations of interdunal palmeries occur to the north of the oases of Zliten and Misurata, amongst and bordering the extensive ramla coastal dunes. To a rather less well defined extent, they also occur along the entire northern margin of the oases of Misuratio from Homs to Misurata Marina, coinciding with the incidence of dune formation, e.g. in the Leptis borderlands of Homs Oasis and the perimeter of the Sahel El-Ahamed west of Goz Ed-Dchela.

There are two constituent types of interdunal palmery found in Misuratio:

(a) those which have been reclaimed from the sand seas and integrated as satellites of the suani farms, and

(b) those which originally were full suani, and have since been lost to marine dune encroachment. Most of the interdunal palmeries of Misurata and those of the north western districts of Zliten Oasis are accounted for in this latter class. Small patches of reclaimed land are present in the western limits of Zliten Oasis. Each plot of land is separated from its neighbour, and in many cases is isolated completely from the surrounding plots by the impassible sand dune intrusions. Enclosure of the palm plots depends largely upon the area in question, and where this culture is highly developed, walling is the usual technique employed in protecting the garden from the sands around. In Figure 58 the fact that the larger and better developed gardens close to the suani are enclosed by strong

retaining walls may be observed, whereas, further towards the centre of the dune mass the sheer pressure of encroachments and the poor productivity of the land, result in only half-hearted efforts to protect the palms.

Until recent times cultivation of the interdunal palmeries was regarded as a temporary expedient by the local Arab fellah, since it was known that movement of the sand dunes in the vicinity of the gardens onto the planted area was only a matter of time. Modern efforts at sand dune fixation, begun by the Italians and continued to the present day by the succeeding administrations have made it possible to regard the interdunal palmeries as permanent features of the landscape. This may be seen in Figure 57, where many of the interdunal palmeries of the west Zliten Oasis have been made secure from encroachments through systematic fixation of the dunes. The technical difficulties have been solved in respect to this type of palm garden; the influence of economic growth tends to ^{be} moving in the opposite direction as we have noted above, and it appears likely that the interdunal areas will relapse into disuse.

Cropping in the interdunal palmeries, where the phreatic water table approaches the land surface, and where the pressure of the sand encroachments is not detrimental to soil fertility, tends to be confined to dry-land cultivation of cereals, particularly dry-land barley. Occasionally where these poor areas are owned by poorer farmers at Phases II or possibly III, then cultivation tends to take in some vegetables such as broad

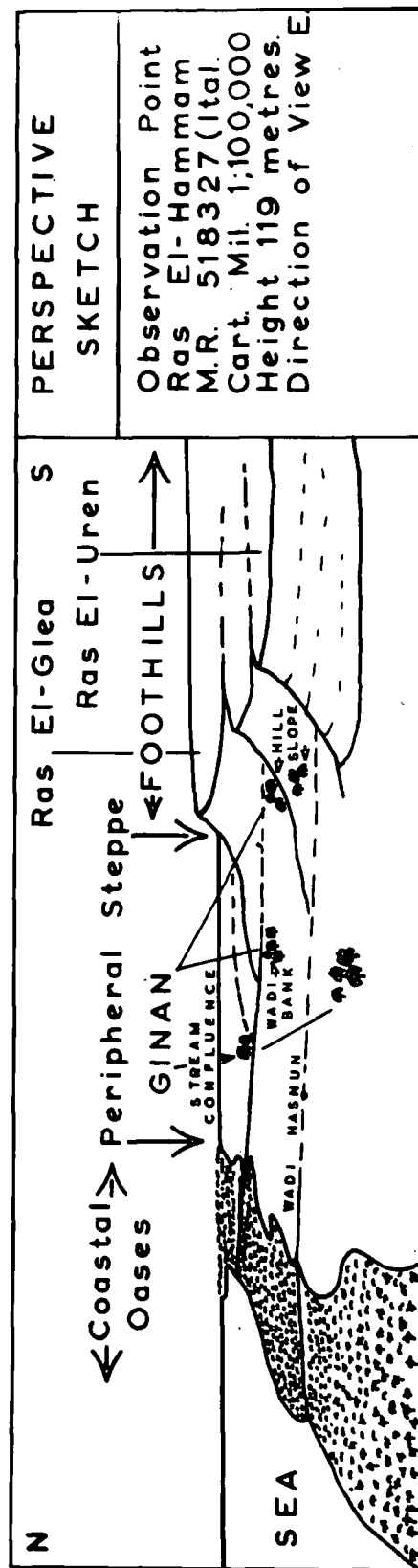


Figure 59

beans and pepper, although the yields are exceptionally poor, even by local Libyan standards (Vide Figure 58).

(A II ii) Ginan

Ginan cultivation is characteristic of the southern peripheral steppe areas especially in the Sahel and Zliten Oases (Vide Figure 59). The particular environmental conditions giving rise to the exploitation of tree culture by this method resolve down mainly to the question of water availability in Wadi catchment areas. The sites of ginan occur where the slope of the land permits the construction of small enclosed gardens at the foot, and where it is possible to lay out a series of shallow trenches to divert all the surface drainage water flowing down the slope during periods of rain (Vide Figure 60). In some cases the length of the trenches may be as long as a quarter of a mile although the normal extension is about 200 metres. Land Use in these gardens is concentrated exclusively upon tree crops and especially upon olives and pistachio trees, the drought resistant qualities of which allow the plantations to survive throughout the arid summer. Where ginan are owned by Arabs at Phase I and Phase II, there is a marked tendency to associate cereal cropping with tree culture. It should be noted that the dry-land cereals grown under this practice are sown outside the ginan proper in the unenclosed steppe land or in extra ginan enclosures (Vide Figure 61), generally in sufficient proximity to the catchment drainage channels to make use of seepage water escaping from the main trench.

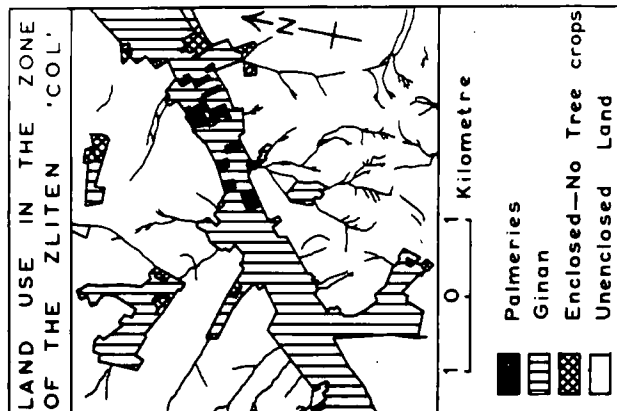


Figure 61

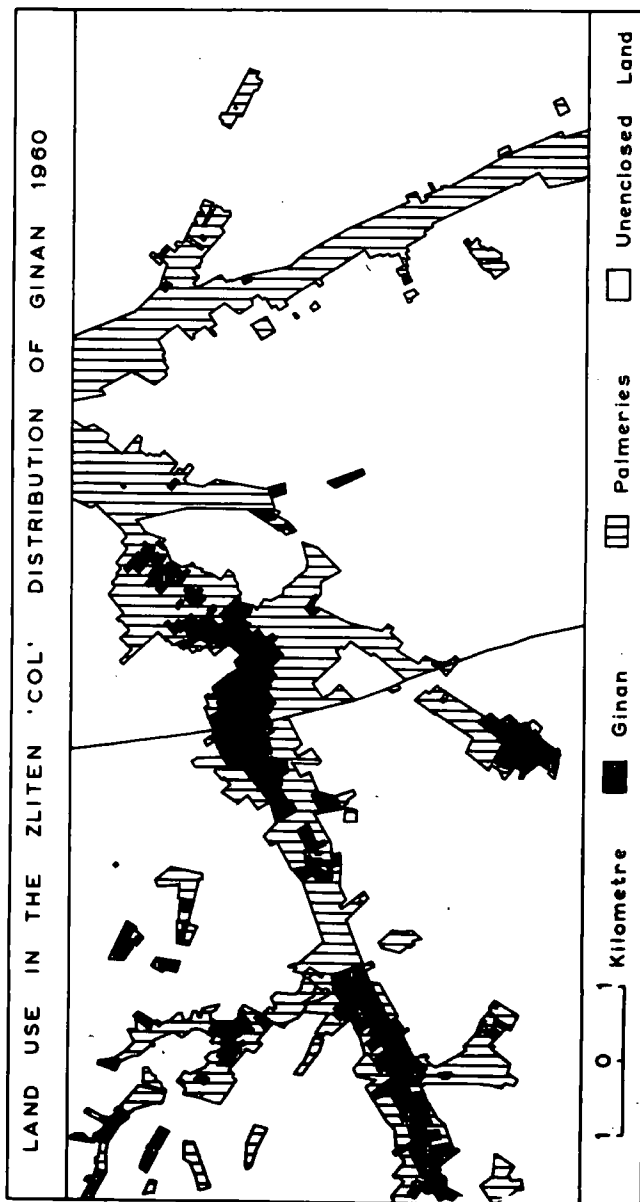


Figure 60

(A II iii) Dry-land Suani (Enclosed gardens in the oasis areas; non-irrigated).

The disposition of dry-land suani follows no apparent pattern, for, as we have pointed out earlier in this discussion of Category (A II), dry-land suani result from the technical and capital deficiencies of the Arab farmers rather than from any inherent infertility. The greatest incidence of this grouping is to be found in oasis areas where the phreatic water table is at a depth of more than 15-20 metres, i.e. where well construction was expensive and difficult using traditional methods (Vide Figure 56). A further broad zone of concentration is to be found in the suani bordering the oases where recent enclosure has taken place, which has not been followed up by the provision of irrigation facilities. On a more local scale, dry-land suani occur in those localities where there is a confusion of water rights through the operation of the Moslem inheritance laws; hence a farmer might gain a legacy of land situated some distance from the bulk of his holding where he has no claim to water from the existing well system. The costs of well construction would make the provision of irrigation water uneconomic unless the land area was greater than two hectares, hence the land would be retained as a dry-land holding.

In Misurata the existence of a large proportion of dry-land suani is to be explained on environmental grounds in most instances. The Oasis of Misurata is blighted, especially in the east and south-east, by brackish phreatic water table

supply, and, as a direct consequence of the poor quality of water, large areas are left unirrigated, whilst other suani have become infertile through constant use of saline water and have lapsed into dry-land cultivation.

The utilisation of dry-land suani is limited by the non-availability of water to production of cereals or to grazing, depending upon stage of growth attained by the owner-farmers. In the early Phases of growth, including Phases I, II and III, stock grazing is the more likely use for these areas, whilst in the later Phases, when livestock lose importance in the farm economy, dry-land cultivation of cereals is the usual designation.

(A II iv) Commercial Dry or Semi-Irrigated Plantations.

The advanced pole of economic growth is represented in land use by commercial dry or semi-irrigated plantations of olive trees, which, in Misuratio, are owned entirely by Italian concessionaires at the present time. The two large units operating within this category of land use are situated on the extreme southern limits of the oases in Homs-Sahel and Misurata, occupying significant areas of the peripheral steppe as indicated in Figures 53 and 54; La Valdagno to the west and Concession Volpi to the east. The situation of the private concession plantations has been influenced largely by the availability of land marching with the oases and land which received ample amounts of natural precipitation. These factors explain the reason for the way in which La Valdagno

and Concession Volpi 'knit-into' the bordering lands of indigenous agriculture.

Since the period of the Italian occupation, several technical advances in water extraction and reticulation have been introduced into Tripolitania which released dry-land development from the reliance on rainfall, and which have elevated plantation cultivation from the plane of dry-land to semi-irrigated status; a change involving an increased intensity of land use. On the Tripolitanian Jefara, the introduction of techniques such as sprinkler irrigation have had the two-fold result of intensifying and expanding the area of land under this category of use. In Misuratio, some intensification has been observed, but expansion has not taken place to date; nevertheless, the possibility of an expansive phase in land use, incorporating the area of the peripheral steppe in the Oases of Homs, the Sahel El-Ahamed and Zliten cannot be ignored.

(A II v) Dry-land Enclosures.

Within this major category of land use, large areas of enclosed land comprising integral parts of the Italian Demographic estates have been included. In all cases, the land considered under this head lies adjoining the intensively utilised zone of settlement, but is differentiated from it by the non-availability of irrigation water. The enclosed dry-land at Kararim has lapsed into disuse and is inseparable from the surrounding lands of the inner steppe in strict terms of land use. At Dafnia, effective utilisation of the dry-land

areas tends to be erratic and considerable portions of it are left uncultivated for periods up to five years. At the present time dry cultivation of barley is undertaken by private contractors, usually Italian farmers from Dafnia itself. On Figure 54 this dry-land area is included under the main classification of the demographic farming type and is not differentiated from the intensively utilised farms which make up the occupied area. The land use intensiveness at Tummina is many times greater than at either Kararim or Dafnia, since all the fertile reaches of the surrounding steppe are worked under a systematic dry-land culture of cereals by the Italian settlers.

Under the terms of the Italic-Libyan Accord, ownership of the dry-land areas bordering the central settlement areas of the Demographic estates is to revert to the Libyan Government. In this situation, it appears likely that the intensiveness of land utilisation at Dafnia and Tummina will decline to that level apparent at Kararim i.e. to pasture-land under extensive range occupance typical of inner steppe conditions (B V ii) (Vide Table 32). Since land use survey must essentially treat with what exists at the time of recording, this is not taken into account in the present assessment. Further reference to the future of these lands is given in Chapter 6, p. 667 et seq.

The dry-lands of Nahima, the abandoned Italian development area to the west of Misurata are in a similar position with respect to land use as the previously quoted zones attached to the Italian Demographic estates. In 1945 Nahima was unused

apart from sporadic grazing by the local indigenous herds; in 1959/60 the estate was under a rational pattern of extensive dry-land grain cultivation undertaken by Arab contractors. Future changes in intensiveness may be expected in this estate, since the Ministry of Agriculture is implementing a new scheme of development involving the provision of water supply. (For further reference vide Chapter 6, p.652).

The surface area of those land use groupings included in Category (A II) is difficult to ascertain, since they are by nature diffusely distributed. The following figures are intended to give as precise an indication as possible of the areal extent of the component groupings of the Category (A II).

<u>Sub-Grouping</u>	<u>Designation</u>	<u>Surface Area - Ha.</u>
(A II i)	Interdunal Palmeries	1,000
(A II ii)	<u>Ginan</u>	700
(A II iii)	Dryland <u>Suani</u>	6,000
(A II iv)	La Valdagne	407
	Concession Volpi	950
(A II v)	Dry-land Enclosures:-	
	- Tummia	3,500
	- Dafnia	4,980
	- Kararim	600
	- Nahima	500
	<u>Total</u>	<u>18,637</u>

(A III) Extensive Cropland Use

The prime indicators of this sub-grouping of land use are:-

(a) That it is dry-land without semi-irrigation, or without any man-made means of gathering water.

(b) That it is entirely unenclosed either by wall or planted shelter belt.

In fact, the justification for the existence of this type of land use in Libya as a whole is to be found in the cropping habits of the nomads and semi-nomads. The vast areas of inner steppe, the Ghible, are occupied by a sprinkling of nomadic peoples who are a residue left from the days of complete nomadic occupation. Cultivation techniques under the system of nomadism resolve around shifting agriculture and large scale herding in the steppe. The areas cropped by the nomads are sporadically situated in the wadi basins and the gravel plains of the south, hence in spite of the fact that the actual surface area utilised by these peoples is infinitesimal, the widely distributed patches of cultivation necessitate a general grouping which takes account of the occasional land use.

Unenclosed land use is not entirely accounted for by the activities of the nomadic tribesman; the peripheral steppe is also extensively cultivated by oasis farmers. In an earlier chapter, it was pointed out how the mechanism of growth working through a gradual process of sedentarisation brought varying intensity of land use to the peripheral steppe in the following Phases:-

- Phase I The peripheral steppe utilised as a temporary grazing area and for sporadic shifting cultivation.
- Phase II As the majority of Arabs move to residence in the oases, grazing activity and shifting cultivation in the peripheral steppe increases.
- Phase III Farmers are using irrigation techniques, grazing

interest decreases yet again, hence the peripheral steppe lapses to a low intensiveness of utilisation both in categories (A) and (B) (Vide Table 32).

Phase IV Expansion of irrigation in the suani of the oases tends to force out dry-land cereal cultivation from the suani into the peripheral steppes of traditional shifting usage. Within the same Phase, many farmers reclaim steppe areas as enclosed appendages to the main mass of suani, and there is a subsequent decline in utilisation in the unenclosed steppe.

Phase V Re-newed varietal specialisation in the suani brings about the spread of irrigation to dry-land suani, which in turn causes grain cultivation to be moved to the unenclosed steppe. In a few cases, commercial Arab farmers contracting for Government land, undertake extensive mechanised grain cultivation in the peripheral steppe. In Misuratino this is instanced by the area alongside Nahima, which has already taken on increased intensiveness of usage in this way.

Thus the use of the peripheral steppe shown in Figures 53 and 54 varies tremendously through the operation of the dynamics of economic growth. Naturally, the sequent changes in land use are not smoothly regulated transitions Phase to Phase; rather the landscape exhibits a whole complex of the Phases of growth corresponding to the varying degrees of development displayed by

individual farmers, in which the constituent elements are constantly permuted.

(A III 1) The Cultivation Zone of the Peripheral Steppe

The broad disposition of the peripheral steppe is defined on the one hand by the line of the coastal oases, and on the other hand by the gradual increase in aridity. In earlier discussion of climatic effects in Misurata we saw that the gradation of climatic zones in more or less regular sequence away from the northern coast is paramountly a result of the declining incidence of rainfall. Nevertheless, it was also indicated that the scale of rainfall in the region of the coastal oases was only a reinforcing factor in the locational influences bearing on the oases: the ultimate criterion of distribution arose through the presence of exploitable phreatic water resources. Thus the oasis frontier with the peripheral steppe is capable of a large measure of oscillation depending upon the state of technical advancement and the economic regime prevailing in the oases.

The boundaries of the peripheral steppe as a climatic region (Vide Figure 4) to the south of the oasis belt are to be found in a broad zone of transition into the Ghibla, the inner semi-desert. By contrast, the land use region of the peripheral steppe as demarcated in the land utilisation maps (Figures 53 and 54) at the present time tends to be confined to the area of Quaternary deposition north of the Misellatan foothills and to the immediate south of Misurata Oasis. This

situation has resulted from the gravitation of human occupation to the oases, which has implied a concentration of effort in the suani and a consequent diminution in the time available for seasonal movement south. Under the traditional system of pastoralism and Phase I and Phase II of economic growth from the pastoral economy, intensiveness of utilisation in the oases is small, hence nomadic and semi-nomadic groups are able to travel over virtually unrestricted distances to sowing areas in the steppe. In the framework of traditional economic life, represented by Phases III, IV and V, intensiveness of land utilisation in the steppe precludes large scale seasonal movement and the effective area of steppe occupation declines substantially.

Rainfall amounts in the climatic zone of the peripheral steppe vary on average between 200 and 175 mm. a year, and the variability of rainfall is in the region of 40-45%. Since cultivation in these areas is directly dependent upon the amount and periodicity of rainfall, there is obviously a powerful climatic influence upon the scope and intensity of plant growth. Grains and esparto are the only significant crops grown or gathered from the peripheral steppe. The sowing of cereals varies in amount and concentration according to the particular type of economy under which it is cultivated. Thus, nomadic and semi-nomadic culture of grain cropping is based upon the precept that the larger and more scattered the area sown, the greater the chance of securing a return should drought conditions

prevail over localised areas. At the opposite pole of land use, extensive mechanised dry-land farming exploiting modern techniques of drill sowing and harvesting and making use of chemical fertilisers brings a far more intensive utilisation to land. Between these extremes exist a large range of variations in intensiveness of land utilisation arising from the mutation of Phases of growth present in any given area.

(A III ii) The Cultivation Zone of the Inner Steppe

It has been indicated earlier that the essential nature of land utilisation in the inner steppe lands arises from the activities of the semi-nomadic and nomadic groups associated with traditional pastoral occupation. The form of land use in these conditions closely resembles the shifting cultivation we have described in relation to the peripheral steppe. The main factor differentiating the two zones is our original criterion of intensiveness of use. In the inner steppe, increasing aridity and heightening degrees of rainfall variability greatly extend the area of cropping, both in respect to individual patches of cultivation and the spread of cultivated patches owned by any group. Thus the qualifying factor for delimitation of this sub-grouping is the characteristic of 'diffuseness', signified culturally by nomadic society.

The sheer scale of the Libyan steppe environment precludes absolute bounds being imposed, and for convenience it is possible to say that the inner steppe emerges from one broad band of transition with the peripheral steppe in the north and

peters out in the sand seas and stony deserts of the Ghibla.

At the present time, assessment of the surface area of the steppe zones is obviously more a matter of intelligent conjecture than scientific measurement. The B.M.A. Report suggested that the total area of shifting cultivation in Tripolitania amounted to 1,320,000 Ha. for the zone we have nominated the 'peripheral steppe', of which, the writer estimates from the maps produced by the B.M.A. (Vide Figure 55), some 100,000 hectares are allotted to Misuratio⁽²⁴⁾. From the writer's own field work in the area summarised in Figures 53 and 54, it appears that the concentration in the area of effectively utilised land has reduced the present day surface area to 50,000 to 60,000 hectares.

The extensive grazing area and patch cultivation area of sub-grouping (A III ii) was estimated by the B.M.A. in 1945 at 7,000,000 hectares for the whole of Tripolitania, of which approximately 20% is accounted for by the Ghibla of Misuratio⁽²⁴⁾. It must be borne in mind that this vast total hectareage includes only minute areas utilised under the head of Category (A) ; the District Commissioner at Homs indicated that he thought that a thousand hectares of effectively used cropland was an over-estimate of the zone.

Summary (A III)

<u>Sub-grouping</u>	<u>Designation</u>	<u>Surface Area</u>
(A III i)	Peripheral Steppe	50,000 - 60,000 Ha.
(A III ii)	Inner Steppe	1,000 ^x Ha.

^x Estimate from Mutaserif Homs

Summary Category (A)

The surface area of cropland is decreasing at a rate corresponding closely to the intensification of land utilisation following the sequent phase of economic growth which we synthesised on pages 348-349 of this chapter. As economic evolution continues, it is possible to discern an inverse movement for re-appraisal of the peripheral steppe lands in commercial agricultural land values. This latter trend is less marked at the moment than the obvious large scale abandonment of the southern peripheral steppe and the inner steppe as a whole.

(B) Pastureland

The greater area of Libya constitutes one of the major world zones of pastureland use in terms of exclusiveness of occupance and surface coverage. As we shall see later (Chapter 6 p. 573 - The Livestock Dilemma), this high world rating is not supported by the economically tangible results of significance of productivity and intensity of use. Those vast grazing lands constituted by the Cyrenaican Jebel Akhdar; the coastal plains of Benghazi, Marsa Susa-Derna and Martuba; and the Bahar of the south, remain at the present day under exclusive nomadic occupance, with only minor oases of cropland utilisation dotted at restricted intervals. The Tripolitanian economic system has never been quite the preserve of pastoralism, as typified by Cyrenaica, since the time of the Hilalians, and the social framework in the former Province has never been so tribal

in structure as that existing to-day in Cyrenaica; nevertheless, the gulf in land use between the provinces is still prodigious, and it is a gulf which has been made amply apparent only in the last half century. The reasons for the economic gap between the provinces is our concern here partly because the modern land use pattern in Cyrenaica provides us with many pointers to the situation which existed in 'traditional' Tripolitania, and partly because derived evidence of nomadic culture in Libya has been taken from Cyrenaica, whereas there is very little accumulated information available concerning land use under this system in Tripolitania.

It has already been noted that the implication of social and economic growth in Tripolitania has been to bring more specific locational influences to bear upon the question of pastureland. Under traditional occupation, grazing lands encompassed all those areas where cultivation was not currently being undertaken, although, following the seasonal rhythm, specialisation of land use was appreciable as between oasis and steppe and between the spontaneous and xerophytic plant communities. In the transitional climate of the oases at the present day the ambit of grazing activity is controlled closely by the degree of varietal specialisation pursued by individual farmers. The sequence of increasing control upon movement to pasture follows closely the Phased growth we have already outlined. Thus, the pasture demands of the flocks under nomadic occupation are answered by seasonal movement from

regions of scarcity to regions of availability. As greater and greater engagement with agriculture is undertaken, so the pasture demand has to be met by less and less movement. The total grazing land contracts in size with the ultimate result that there is an absolute decline in flock numbers, even if this is not proportional to the diminution in the pasture available. At Phase III, farmers are no longer shifting outside the lands of the peripheral steppe; at Phase IV, livestock are essentially of domestic importance and become scavengers in and around the oases; and at Phase V grazing activities cease to be of significance. The over-all trend discernable in the distribution of pastureland at the present day is for a consolidation of grazing in the vicinity of the oases. Residual elements of early Phased semi-nomads and farmers operating non-irrigated, self-sufficient farms cannot be discounted, and account for the apparently wide ambit of grazing activity.

(B IV 1) Grazing Lands Associated with the Oasis Economy.

Much of the grazing land which is primely biased towards the oasis is an integral part of farming economies which represent Phases IV and V. Under head (B IV 1) we have included these grazing lands which may be grouped with transitional farming activity, where the locational factor, which we have shown to be essentially a matter of time available for movement in relation to the demands imposed by varietal specialisation in cultivation in the oases, is optimum. In Phase V farming livestock lose their importance economically ,

although in many cases both in Misuratine and the Tripolitanian Jefara advanced farmers retain an interest in their flocks as prestige symbols. This is more true in saniya and hawaga units which are sited within the bounds of the oases rather than those which are located on the ex-Italian or modern Arab farming estates such as Wadi Gaam. In Phase IV farming the position of livestock tends to be more confused; in the absence of cost accounting and with the prevalence of traditional attitudes, operators do not consciously discount livestock from the farming economy. Nevertheless, the effective value and number of livestock is necessarily reduced by the constant demands of the cultivated unit. In such a situation, encompassing Phases IV and V, the distribution of pasture is limited to the dune and rock wastes interspersed within or around the actual cultivated farm. From Figures 53 and 54 it emerges that relatively vast areas of such land are disposed in close proximity to the oases. This general pattern obscures the fundamental picture of land use in Misuratine under Phases IV and V, in which grazing is undertaken only in the immediate vicinity of the individual operator's farm.

(B IV 11) Grazing lands associated with the oasis economy - Peripheral Steppe.

Land use of the peripheral steppe presents a dynamic complex of the scale we have noted previously (A III 1). In the same way that the indigenous appraisal of land values changed in respect to cultivation in the peripheral steppe, so the same mutations are apparent in relation to grazing within

the area. Under early developing Phases of traditional economic life indiscriminate use of the peripheral steppe for grazing and shifting cultivation is the general rule. As the economy gathers way in Phase II, corresponding to the gradual process of sedentarisation, the peripheral steppe tends to lose value as a zone of shifting cultivation as dry-land suani cultivation grows in importance. In consequence, grazing land use increases absolutely, even though its economic importance declines relatively. Where Phase II farmers operate in this portion of the steppe, and it is estimated in Questionnaire Survey that some 35% of the farming population fall under this Phase of growth, land use is paramountly pastoral. On the contrary, Phase III land use in the peripheral steppe tends to reflect the growing preoccupation of farmers with irrigated production, where grazing might be continued as a subsidiary activity and pushed from the better lands where enclosure or unenclosed dry-land cultivation could be undertaken.

Thus the pastureland of the peripheral steppe increases in area in the early developing stages of economic growth in indigenous economy; thereafter a steady decline in pastoral land use becomes apparent.

(B V 1) Grazing lands of the inner steppe associated with traditional economic framework: - Wadi Basins.

The large wadi basins of the inner steppe have served as the true 'oases' of traditional grazing occupance, i.e. Phase I semi-nomadic and nomadic society. In years of good rainfall these lands provide a large area of spontaneous vegetation

sufficient to keep the flocks without water for several months. During the summer, the deep-running water table in the wadi basins permits the survival of xerophytic plants which can be grazed by the flocks. Even in years of poor rainfall there is some spontaneous vegetative cover in spring time, which enables the nomadic peoples to weather mild periods of drought.

The wadi-basin pasture-lands which were juxtaposed with the oases of Misuratine during traditional semi-nomadic and nomadic occupance of the area in the period after the Hilalian invasion, were those of the Caam-Tarreglat and the Soffegin. The position of the wadi basins are defined by J.A.W.Brehony, who gives further reference to the present day land use pattern in the area in relation to the tribes of Misuratine and Msellata⁽²⁰⁾.

(B V ii) Grazing lands of the inner steppe associated with traditional economic framework: - The Open Steppe.

The open steppe lands lying south of the peripheral steppe provided and still provide a vast grazing zone. At the time of writing, the persistence of the nomadic tradition amongst a limited number of small tribes brings these vast areas under the general land use category of pasture. As we have noted earlier, the broad view of the steppe tends to hide the fact that land use is characterised by a great diffuseness, which becomes increasingly so each year as the nomadic groups lose ground in the face of the economic and social advances in the sedentary oases. In the previous chapter the state of nomadism in Misuratine and its economic implications was outlined; bearing

in mind these earlier comments it is obvious that the distribution of open steppe grazing lands is confined largely to the areas surrounding the Tarreglat and to the Sirtican zone.

Summary Category (B)

The balance of economic effort has moved from the steppe to the oases resulting in an inverse relationship between the two areas. Increasing technical efficiency of cultivation and a gradual but substantial rise in the living standards of urban and sedentary rural peoples appears to be dictating intensiveness of land use in the oases to the total exclusion of the steppe. Above and beyond the normal cycle of economic growth, Government action to curb the operation of the nomads and social disruption occasioned by oil company activities in the steppe are also militating against the continuance of the nomadic tradition (Vide Chapter 6 - The Livestock Dilemma).

As an epilogue to this discussion of land use in the steppe-lands it would be invaluable to summarise the findings of those experts who have been engaged in assessment of grazing problems in Tripolitania at the invitation of the F.A.O. and the Nazara of Agriculture. The main value of these reports arises from the fact that there is so small an amount of material available that any contribution, however cursive, is worthy of consideration in this context. In the following point by point survey, we shall mention only those factors brought out by grazing experts which are directly germane to the problem of land use in the steppe.

(i) The incidence of pasture in the inner steppe is governed largely by the character of rainfall in any area for any given year. In the present context we would limit this statement by acknowledgement of the fact that the use of pasture, no matter how plentiful the rainfall in a year, depends essentially upon the distribution of water holes in the wadi beds. Thus effective use, as opposed to potential use, of land is restricted within these terms.

(ii) Over-grazing of the pastures is reducing the carrying power of the Libyan range areas. Under traditional occupation the problem of over-grazing as such scarcely existed on a wide scale in the steppe regions. Except for those years when rainfall failed completely, the ratio of beasts to land available maintained itself in natural equilibrium. Over long periods of time intensive land use tended to bring about a limited amount of vegetation degradation; the question of over-grazing has arisen, nevertheless, only in recent years and is basically associated with the break-down of traditional economic life. From the view-point of our present Land Use analysis, over-grazing is a symptom of economic change. This is borne out by the evidence brought out by both J.O. Grandstaff⁽⁶⁷⁾ and Lang⁽⁶⁸⁾ who indicate clearly that the decline in vegetation is more apparent in the areas surrounding the oases and the peripheral steppe than in the traditional grazing lands proper. A factor which neither appreciate is that this decline is only important transitorily; economic growth through its own force

is leading to an abandonment of pastoral land use in the steppe in the same way that it originally brought concentration of grazing activity to the peripheral steppe.

(iii) Both of the experts we have quoted take as a basic assumption that it will be profitable and necessary to undertake extensive range regeneration. Since the economics of the livestock industry are an unknown quantity, and since the influence of growth is tending to eliminate pastoral pursuits, these assumptions are unfounded. At the present time it would be costly to finance a controlled range management policy especially in the light of the knowledge that the future of the livestock industry remains a quandary. Land use reflects the state of economic growth; land use mapping shows the actual present utilisation. Unfortunately, many of the experts of F.A.O. and U.N. tend to see land use in potential terms; i.e. see the best use of a particular piece of land but refuse to accept present use as the key indicator of social and economic values of the specific environment. As we shall point out later in Chapter 6, development in an area such as Libya may be effected only by integrating development schemes into the local society (Chapter 6, p.667). In the present case, the re-establishment of the range is a decade too late to help traditional society and a decade too early to be of significance in any possible commercial phase of exploitation.

(C) Woodland

All the woodland in Misuratio has been classified under

the general head of managed woodland, since there is a complete absence of indigenous and natural forests⁽¹²⁾. It is deemed highly probable that large tracts of woodland existed in Roman and Pre-Roman times, made up of batoon (Pistacia atlantica), talha (Acacia tortillis) and sedra (Zizyphus lotus). Italian estimates of the natural forests of Tripolitania were rather inflated; the general picture presented by Italian propaganda was of a flourishing forest and orchard area extending along the Jebel, supported by a well wooded and fertile coastal plain. Less biased judgements of the pre-Hilalian situation, provided mainly by Broc, show a thinly wooded area along the Jebel made up of batoon, sedra and talha, with a bush and shrub association extending onto the coastal plain⁽⁶⁹⁾. Of this original forest covering only scattered, individual remnants are to be found at the present day.

The distribution of woodland in Misuratine is closely correlated with those areas of Italian agricultural development in both the private and Government spheres which took place in the period post-1928. In fact, there has been no large scale afforestation in Misuratine since the departure of the Italians in 1942, apart from specialised areas of dune fixation in the vicinity of the coastal oases.

Throughout the Hilalian era and the subsequent period of pastoral occupance, the natural forest lands of Misuratine were subjected to constant depredations by both man and beast. The decline of the forest must have been a long drawn out process resulting from the indiscriminate thinning for timber

and charcoal and uncontrolled grazing by the flocks in the same way that the Jebel Akhdar of Cyrenaica is undergoing degradation at the present day. This contrasts with the process of de-forestation typical of the Levant, where early urban growth, commercial exploitation of forest land and clearing of forests for cultivation tended to be the main factors behind the decline of the woodlands. In terms of land use, the traditional economic system did not differentiate between woodland and grazing land.

This same attitude is carried on through most of the later Phases of growth, so that the same non-discriminate appraisal is made of woodland up to and including Phase IV. The tendency remains for farmers to consider woodland as yet another 'waste land' comparable to dune scrub. A further factor of importance at local level is that the woodland areas are owned either by the State or by Italians; hence the indigenous operator tends to look upon such areas as permissible looting grounds, since there is no owner to whom he feels responsible. Obviously, the existence of large areas of forest in these conditions is very precarious; and worse, the local farmers do not understand the function of woodland and thus take no part in building up the forest reserves of the area. This explains the clear-cut division we have mentioned previously between the unwooded Arab holdings and the relatively heavily wooded Italian holdings.

Land use appraisal of woodland at Phase V is radically

different from that prevalent in earlier Phases. In part this is a result of the more advanced educational level displayed by Phase V operators and in part a result of the function of woodland. One of the most telling educational influences introduced into the schools and farms by the agricultural and associated extension services has been the distribution of propaganda concerning the preservation of plants and trees. The success of these campaigns has been general throughout the country, but the particular spheres of gain have been amongst the school children on the one hand, and amongst the economically advanced farmers on the other hand. In the latter case, accounted for by Phase V farmers, the readiness to adopt new techniques springs from the fact that the palms, which were essential components of suaní farming become worthless in the Hawaza unit where there is no value set by the availability of farm privileges. Naturally, Hawaza farms are eager to accept new ideas, especially in view of the fact that a tamarisk, eucalyptus or pine shade and shelter belt requires less water and can be more commercially profitable than traditional preoccupation with palm cultivation. This trend in Arab farming areas is scarcely appreciable as yet outside the orbit of the modern estate development areas, but it is worthy of note as an indication of land use re-evaluation which will be significant in the near future.

(C VI 1) Managed Woodland - Plantations.

We have described earlier the causes behind the limited spread of woodland to those areas of Italian colonial settle-

ment and development. The distribution of major plantations in Misuratio illustrates this basic theme present throughout Tripolitania. The Ente development areas at Dafnia, Tummina and Kararim were each allotted a broad band of perimeter afforestation to act as both wind break and defence against dune encroachment. At Dafnia and to a lesser extent at Tummina, lateral shelter belt plantations were planted to augment the perimeter woodlands. In terms of surface area alone, this Italian contribution to afforestation is small in the three areas, but as we shall note later in consideration of field and road lateral wind breaks, the total effect is considerable. The following figures indicate the surface area of plantations only:-

Dafnia	10 hectares afforested
Tummina	50 hectares afforested
Kararim	20 hectares afforested

It is probable that further forestry activity would have been undertaken as the estates matured, since the areas actually planted in the pre-war years proved insufficient to prevent sand dune encroachment. In the prevailing climate of insecurity in the post-war years, the Italian agencies have been reluctant to extend their fixed assets particularly in respect to forest land.

Considerable enterprise was shown by private concessionaires in establishing woodland both at La Valdagno and Concession Volpi. The distribution of woodland at the former estate is illustrated on Figure 75. The plantations here extend along the entire western and southern boundaries, and

culminate in extensive development in the east. According to figures given to the writer by the estate manager in 1960, the surface area of the estate given over to woodland is 464.00.00 hectares, i.e. the largest individual apportionment of terrain to specialised land use in Tripolitania. The large plantings at La Valdagno were part of an industrial plantation scheme evolved by the concessionaire whereby the Libyan possessions he owned could be integrated into his industrial plans in metropolitan Italy. The woodland areas, the major section of which was planned to be at Valdagno, were to produce high quality eucalyptus for export to Italy for pulping and processing into cellulose. This arrangement collapsed at the outbreak of World War II, but was renewed later together with an offer to re-build the harbour at Homs to facilitate export. The Libyan Government has been unco-operative towards the scheme, feeling that development should be in the hands of Libyan nationals rather than aliens. Whatever the moral problems involved in the plan, it is still clear that as a rational and profitable use of land, it has much to recommend it. As the largest single plantation of private woodland in the Province, the Valdagno scheme could show the ideal way for private investment in woodland land use whether by alien or indigenous operator. In the later varietal section of land use analysis, we shall discuss the Valdagno plantation in more detail.

Following the pattern laid out by the Italian development

areas, Wadi Gaam Settlement has adopted wind-break plantations into its economy. The areal extent of the Gaam plantations is illustrated in Figure 53. The unique feature of this woodland is change in varietal specialisation brought about by technical improvements since the time of the Italian occupation. Estimates of the area of the main plantation flanking the estate in the east vary between 15-20 hectares.

(C VI ii) Managed Woodland - Dune Afforestation.

The sand dune fixation programme in Tripolitania began in Italian times as an integral element in the over-all afforestation policy. Unlike plantation woodland described in the previous paragraphs, the dune fixation areas are associated with indigenous rather than Italian agriculture, although the enterprise and capital has again been provided by the central authorities. At the present time the effect of dune fixation is restricted to small, selected areas, which to a large degree represent pilot schemes. The costs incurred during the fixation of one hectare of dune land may reach £60, whilst the average is approximately £130 per hectare. In these conditions, stabilisation of the dunes is only economic where the terrain being protected from encroachment is under intensive cultivation. In Misuratino, there are only limited areas in Zliten and Misurata Oases where the productivity of the land justifies the out-lay on fixation of dunes. The distribution of stabilised dune areas in Zliten Oasis is illustrated in Figure 57.

The present policy of the Forestry Department of the Nazara of Agriculture is dictated primarily by lack of funds, i.e. the question is how effectively to invest available resources in view of the fact that there are so many pressing claims upon those resources. To date the Forestry Department has had to operate without any measuring rod, especially in the realm of dune fixation. There was no ready yard-stick whereby it could be decided that one area was worthy of protection and another was not. The result of this constant difficulty has been for efforts at protection to be sporadically distributed geographically, as we have shown in respect to Misuratio, and for a large proportion of waste caused by irrational selection of priority areas, as we have seen in Zliten Oasis. Phase-growth and land use analysis offer several sound lines of assessment which would apply directly to the problem of which areas? and when? in respect to dune fixation. The points following summarise the findings of land use survey and the situation regarding economic growth in respect to those areas threatened by sand dune encroachment in Misuratio.

(a) Immediate action is necessary in the following land use areas:

- (A I i) where demographic farming units are being violated by sand dune movement. The north western fringes of Tummina Estate fall under this head, together with much of the western perimeter of Kararim, and restricted stretches of the steppe margin of Dafnia.

- (A I ii) where both Hawaza and private concession farms are under pressure from dunal attack. At the present day this problem is limited to the indirect influence of the dunes to the south of Goz Ed-Dehela, which might well affect the course of the Wadi Gau-Gau in the region of the Wadi Gaam Settlement.

- (A II iv) where dune penetration is impinging upon commercial, dry-land or semi-irrigated plantations. The inclusion of this sub-grouping here is more a reflection of conditions on the Tripolitanian Jefara than in Misuratio, and in this general classification it is useful to list it in its over-all position of priority.

(b) Local action to be taken corresponding to the state of economic evolution as determined either by intensiveness of land utilisation or by analysis of questionnaire survey.

- (A I i) In these areas of the oases where the balance of economic growth is at Phase IV. As we have seen in the previous chapter and as outlined in Chapter 6 following, farmers operating at Phase IV tend to be commercial farmers using what is essentially a traditional unit in terms of method and area. From the point of view of land use and its bearing upon dune fixation, these Phase IV operators are non-traditional in the scale of intensiveness of land utilisation and in their attitude to pasture-land: - such farmers are sufficiently commercial-minded to appreciate strict differentiation of land use between

woodland and pasture; furthermore grazing activity wanes rapidly in Phase IV of economic growth in any case. In these conditions stabilisation of dunes is worth-while -

1. because the evolution of a majority of farmers to Phase IV gives sound evidence of good farming and permanence of settlement.

2. control of dune movement in the vicinity of the saniya will give added impetus to indigenous development by means of an increase in the climate of security.

3. grazing animals no longer constitute a menace.

- (A II iii) The areas of dry-land suani that are associated with farms at Phases IV or V would automatically be included in the group above in most cases.

(c) Reserve action scheduled to be implemented as the various areas of the oases move from traditional to transitional economy.

- (A I i) Mainly a factor referring to the slow-developing localities within the oases. Obviously it would be wasteful to finance sand dune stabilisation in any oasis area until it was clear that indigenous occupation was assured permanently. Thus action in this case would be reserved until such time as the balance of evolution attained Phase IV. The mis-use and non-understanding of many farmers of the stabilised areas of Zliten and Misurata Oases indicates the folly of measuring the urgency of action by the rate or scale of movement of the dune mass rather than by

the value of the farming community to be protected. In both these oases, the main direction of effort in stabilisation has been localised around the inter-dunal palmeries; i.e. in Zreggh, Sidi Bu Hadi and Es Suaua in Misurata, and around Sened in Zliten. Even taking into account that efforts in Misurata up to the present day have been experimental in nature, it would have been sounder policy to have concentrated activity in oasis areas where the economic reaction could have been gauged and more permanent benefits achieved.

- (A III 1) Reserve action might also be held to be pertinent to areas of the peripheral steppe where extensive commercial cultivation of grain is undertaken by contractors. The problem of assessing the economic justification for protection of dry-land areas is more complex than that applying to oasis zones. Nevertheless, the increasing importance of mechanised extensive agriculture in the peripheral steppe, especially by Arab operators, would appear to justify a measure of protection in the near future. In Misurata, it is likely that sand dune encroachments in the neighbourhood of Nahima will demand some attention if they are not to suffer invasion by the dune formations aligned along the littoral to the east of Zliten Oasis.

(d) Supplementary action to be taken in the distant future, assuming that all the previous categories have received attention.

- (A II i) Control of dune movement in and around the inter-dunal palmeries, especially where this action will supplement the efforts to stabilise the dunes on the perimeter of the oasis land proper, as, for example, in the Maguib area of Misurata.
 - (A II ii) Protection of the large areas of ginan, particularly in the Zliten 'col' zone (Figure 53) where it is likely that commercial production will continue on permanent agricultural holdings.
 - (A III i) Stabilisation of continental dune formations which form potential hazards to the permanent agricultural areas of the littoral. This refers mainly to the steppe areas within the lower catchment basin of the Caam-Tarreglat system, where small groups of dunes hinder development of an otherwise fertile area.
- (e) No action will be necessary in areas (A III ii), (B) and (D) where range management rather than dune stabilisation is the basic problem.

(C VI iii) Managed Woodland - Wind-breaks.

The wind-break systems introduced by the Italians in the pre-war years served the purpose of protecting cultivated areas from the full force of the sea winds, the Ghibli and dune encroachment. The most significant areas of wind-breaks are found in the areas of Italian colonial settlement at Darnia, Tummina and Kararim, but the following areas are also affected:

- (a) Areas of private concession.

- (b) Roadways, particularly the Via Littorania (Tripoli-Benghazi road).
- (c) Italian quarters of the towns of Homs, Zliten and Misurata.
- (d) Tourist and historical sites such as the environs of Leptis Magna.

Arab interest in wind-breaks is confined mainly to the area of recent settlement at Wadi Gaam. As we have already seen in respect to true plantation land (C VI 1), Arab participation in development is confined to Phase V, where palm cultivation becomes unprofitable and wasteful, and a more economic use of land is sought through replacement of palm-eries by eucalyptus and pines. It is inconceivable that the prime characteristic of the Arab gardens, the palm tree, will be superseded entirely by introduced species, but it is a possibility that the palm will cease to be the one and only symbol of oasis cultivation. The causes behind the decline of palm tree cultivation are discussed later in this section.

(D VII 1) Scrubland.

The semi-desert zone reaching south of Kararim to the coastlands of Sirte, forms the major area of scrubland associated with Misurata. The link between the two areas is a legacy from traditional society, when the tribes of Misurata found undisputed pasture in Sirtica after being pushed out of the west by the Orfella and Tarhuma groups. Rainfall in these southern areas is very low, ranging between 100 and 150 mms., insufficient for cultivation except in the large wadi depressions we have described earlier under Category sub-grouping (A III 1i). The differentiation

between the sub-groups (A III ii), (B V) and (D VII i) arises purely through land use; i.e. they respectively imply unenclosed cereal cultivation, range grazing land and scrubland. Geographically they represent the same area. In local terms, cereal cultivation is confined to the immediate area of the wadi bed; range grazing, although rather indiscriminate, tends to be concentrated on the slopes above the wadi beds; scrubland covers the upper interfluves and rocky pretruberances surrounding the two former zones.

Vegetation is extremely sparse in the scrublands, so that where any land is brought under pasture land use in years of poor rainfall, it is only important for goat and camel grazing. In normal years, the lack of water holes outside the confines of the wadi beds precludes pasture land utilisation. The vegetation in the scrubland consists of isolated herbs and shrubs separated by bare ground. Common species found, include saltwort (Caroxylon articulatum), spurge flax (Daphne gnidium), goosefoot (Chenopodium spp.), worm wood (Artemisia herba alba), Artemisia campestris and Asphodel. In the scrublands proper the perennial flora tends to be extremely thin even in years of good rainfall, since the soil cover is patchy and shallow⁽⁷⁰⁾.

(D VII ii) Scrubland - Sebkhah Scrub

The distribution of Sebkhah scrub north of the line of Kararim is marked on Figure 54. The area presents a more or less uniform surface and vegetation pattern from the margin of

Zarrough Oasis in Misurata in the north to Sirte in the south. The particular drainage and vegetation features associated with this great salty area are given elsewhere in the thesis. A minor sebkha occurs in Misurata at Gos Ed-Dchela close to the Wadi Caam Settlement. In terms of land use, these sebkha areas are agriculturally unproductive. Throughout the length of the great Sebkha of Taorga, the only utilisation of land is to be found in the occasional pasturing of camels and possibly goats, this activity being limited mainly to the environs of Taorga Oasis. The Gos Ed-Dchela is generally avoided by shepherds, who prefer dune waste grazing since it is more profitable than grazing from the heavy vegetation of the sebkha.

In summary it might be said that the sebkha present one of the most unproductive and unpromising prospects of any land use category relevant to the country. Even the plentiful water supply of the Taorga spring will be piped from the sebkha to the steppe land to the west before its value can be capitalised for agricultural development. And this is a key factor in assessment of the future land use of the sebkha of Misurata, for increasing pressure on land resulting from economic growth is more likely to be taken up in expansion into the steppe than in reclamation of the sebkha. The oasis lands of Tripolitania, unlike the Nilotic areas, are dependent more upon underground than surface waters, and the potential artesian resources of the peripheral steppe remain virtually

untouched apart from Italian developments. Thus, pressure on land can find out-let by economic and proven expansion in alternative areas to the sebkha.

(E VIII) Agriculturally Unproductive Land.

In the special conditions prevailing in Misuratio, there are very few areas which may be designated 'unproductive' in any absolute or complete sense. The universal tendency amongst all these economic levels of activity below Phase V Hawaza farming is for non-differentiation of land for grazing purposes. Thus the sebkha areas are utilised for camel grazing, and the semi-desert scrublands for goat and camel grazing to an extent which precludes their classification as unproductive land. Lands which are totally barren and unutilised, such as the Hamada El-Hamra and the Jebel Es-Soda, are found only in the extreme desert interior of Libya outside the economic orbit of Misuratio proper. In the absence of distinct areas of unproductive land, the most important sub-grouping within this category must be ascribed to these lands occupied by buildings, roads and other subsidiary built-up areas.

(E VIII 1) Village areas.

The limited spread of the small urban units of Misuratio may be seen in Figures 53 and 54. Of the three larger units, Homs, Zliten and Misurata, only the latter covers a consolidated area made up of housing and workshops, where the housing units are not associated with attached garden enclosures. In all the urban units, the Arab quarters tend to be small in

area relative to the proportion of land taken up by modern settlement and administrative blocks. The distribution of village sites in Misuratine bears no direct correlation to land use values prevailing at the present day, in that village sites have grown up around traditional suks in the centre of the oasis land rather than on a convenient area of wasteland close to the oasis. Throughout the various phases of village growth described in the preceding chapter, no regard was paid to the question of building encroaching upon the restricted amount of oasis land. It might well be suggested that this non-appreciation of land values arose inevitably from the fact that village life hinged exclusively around alien enterprise, which in itself was directed largely towards commerce and trade without any significant roots in agriculture.

(E VIII ii) Farmhouses and outbuildings.

Unproductive land occupied by farmhouses and outbuildings represents an important element in land use at a local level. The predilection for dispersal of settlement in Misuratine, noted in the previous chapter, results in the use of small but significant areas of land for buildings on each farm unit. Thus, a traditional haush may cover a surface area of 25 x 25 metres, whilst smaller housing units adopted in recent years cover an area of approximately 10 x 10 metres. These areas, small in themselves, nevertheless account for considerable portions of a two or three hectare farm, especially in view of the fact that the haush will be sited on one of perhaps three or four plots of land owned by the individual farmer. In

all fairness, it should be pointed out that the construction of the haush is such that the necessity for supplementary out-buildings is obviated.

On the Wadi Gaam Settlement great care has been taken to secure an economy of land use for each separate farm unit. The total area allotted to each farm unit is two hectares gross, of which 0.35 hectares are taken up by the haush. This type of housing offers a great economy of space over the traditional pattern of permanent housing in the oases, providing that extensive out-buildings are not necessary at a later date.

The standardisation of construction employed by the Italian colonial authorities in Tripolitania resulted in some rather anomalous situations, which arose from a more or less constant pattern of farmhouses and out-buildings imposed upon a variety of farm sizes. The figures below indicate the extent of the anomaly in Misuratio:

<u>ESTATE</u>	<u>AREA OF FARM UNIT</u>	<u>AREA OF FARMHOUSE & OUTBUILDINGS</u>
Dafnia	30 hectares	1200 squ. ms.
Tummina	10 hectares	1200 squ. ms.
Kararim	12 hectares	1200 squ. ms.

In the case of farmhouses constructed at Concession La Valdagno, the superficial area occupied by the farmhouse and out-buildings amounted to 5000 square metres in a total farm unit of 16½ hectares.

The overall trend apparent in land use of Category (E VIII 11) corresponds closely to the trend in rural economy for concentration within the littoral zone. Thus there are

an increasing number of haush under construction in the oases following upon the final moves to sedentarisation which take place in transitional society, post Phase III. This movement is off-set by the fact that traditional haush are being replaced by smaller, more compact housing units, and the fact that concentration in the oasis has indirectly led to a migration from the land.

(E VIII iii) Military Waste

The unenclosed nature of the peripheral and the inner steppe in Libya, together with the fact that the country is sparsely populated makes the area very desirable as a military range. In later study of the national economy in Chapter 6, it will be shown that Libya gains substantial amounts of foreign exchange by virtue of agreements with the U.S.A. and the U.K., whereby the Government of Libya provides military bases and training areas for use by the armed forces of the two countries. There are two permanent bases in Misuratio, one in the Homs Oasis and the other in Misurata Oasis. At Homs the British Barracks is built adjoining the village with small out-buildings further east in the vicinity of Leptis Magna. Associated with the barracks are a permanent testing range lying directly to the south of Homs and an air-strip which is situated to the south of Leptis Magna. To a large extent it might be said that the military waste at Homs, and the American air-strip adjoining Concession Volpi at Misurata, take up land which is undeveloped peripheral steppe, and which is an insignificant area in relation to the total surface area

of peripheral steppe available to the Arabs. Nevertheless, the military areas share the disadvantage apparent from experience with the Italian and Arab development estates; each pocket of land used for an air-strip or an agricultural estate adds to the grand total of land alienated from the indigenous economy. The sum effect of land alienation has aggravated the problem of grazing in the oasis environs.

In addition to the fixed military installations we have enumerated above, account must also be taken of the rights of alien Forces to training areas in the inner steppe. Large areas of the steppe south of the Zliten 'col' are officially scheduled as military ranges. In fact military use of this zone interferes only slightly with indigenous economic activity. The worst complaint levelled against the effects of military operations in the steppe was made by the officials of the local Agricultural Offices:- They pointed out that shifting cultivation in the military range areas had increased astronomically in recent years as many of the local Arabs had discovered that they could reap larger profits from compensation claims against the British Army than by serious labour in their fields. Hence, it is a great possibility that the distribution of shifting cultivation in this area is governed more by the incidence of military routeways than by soil fertility.

(E VIII iv) Other Non-Agricultural Land.

The residue of non-agricultural land falls under the following heads and needs no explanation:-

- (a) Historical sites such as Leptis Magna.
- (b) Moslem cemeteries.
- (c) Mosques and the small wakf areas surrounding the mosques.
The largest individual area is covered by the mosque of
Sidi Al-Fergiani in the Sahel El-Ahamed.
- (d) Tombs of Sceriff and Marabouts.
- (e) Roadways, including rough tracks in the oasis.
- (f) Wadi beds, which constitute significant areas, e.g.
the Wadi Hasnun and Wadi Gaam.

SUMMARY - LAND USE CLASSIFICATION IN MISURATINO.

This survey of land use in Misuratino has been intended to illustrate the macroscopic view of land appraisal as seen at the generic and specific stages of classification defined in Table I. It has been demonstrated that effective land utilisation reflects the dynamics of economic growth at ground level, just as the state of the tribal framework reflects it at the social level.

We have determined that there has been a major shift in the balance of land utilisation from the pasture lands of the steppe to the cultivated areas of the oases. In terms of geographical areas, the change in location of economic life tends to give an over-all impression of progressive decline corresponding to the Phased development of society. Thus, at the traditional pole many nomadic groups confine their scope entirely to pastoral land use in the steppe, whilst at the transitional pole hawaza farmers are interested solely in crop-land land use in the littoral.

It has also emerged from analysis, that the forces of social and economic growth have meant increasing intensiveness

of land utilisation. This has been achieved through the interaction of technical improvement and drive to varietal specialisation occasioned by sedentarisation and the capitalisation of the phreatic water resources. It must be noted that intensiveness of varietal specialisation increases throughout all Phases of growth, but that a counter trend in intensiveness of land utilisation is apparent in Phase V, when intercultivation is discontinued and mechanised extensive grain farming becomes practicable.

Pasture land utilisation declines according to the degree of pre-occupation with agriculture in the oases. Each Phase of growth is characterised by a new appraisal of the livestock element in the farm economy, which culminates in Phases IV and V with a relative or absolute lapse in grazing activity. The decline in livestock, brought about by the forces of growth, has implied a re-assessment of land values, particularly in respect to differentiation of land quality and the cessation of indiscriminate grazing. Thus land use analysis has offered both instructive reflection of, and insight into the critical question of the present day climate of indigenous and Italian land appraisal and also an indication of economic growth in the agricultural sector.

PART ONE - An Examination of Land Utilisation and Economic Growth

(II) Supplementary Notes to Crop Distribution Maps (Figures 62 to 77)

An Examination of Varietal Land Use in Misuratio.
Land Use Category (A) - Arab Cropland.

In the foregoing discussion (I), we have shown that intensiveness of land utilisation is at its greatest in the irrigated suani of the oases, and that it decreases in a variety of scales, depending upon the characteristics of the environment, both inland and towards the coast (Vide Figures 53 and 54). It has also been demonstrated that the balance of economic activity has moved from the steppe pasturelands to the cultivated lands of the oases. In the summary which follows, attention will be directed mainly towards the present situation with respect to land utilisation in and around the oasis gardens, since it is here that the major indicators of economic growth are to be discerned.

The value of the land use survey technique at the varietal category is manifold; particularly, mention should be made of the fact that the coverage of the Oasis of Homs and the Sahel El-Ahamed is the first attempt in Libya to grapple with the problem of land utilisation at ground level; secondly, the availability of basic data concerning the frequency and distribution of individual cropping patterns has been of immense value in the establishment of a synthesis of Phased economic growth. There are obvious disadvantages involved in a land use survey of this nature, and it should be borne in mind that field research was confined to a short period and

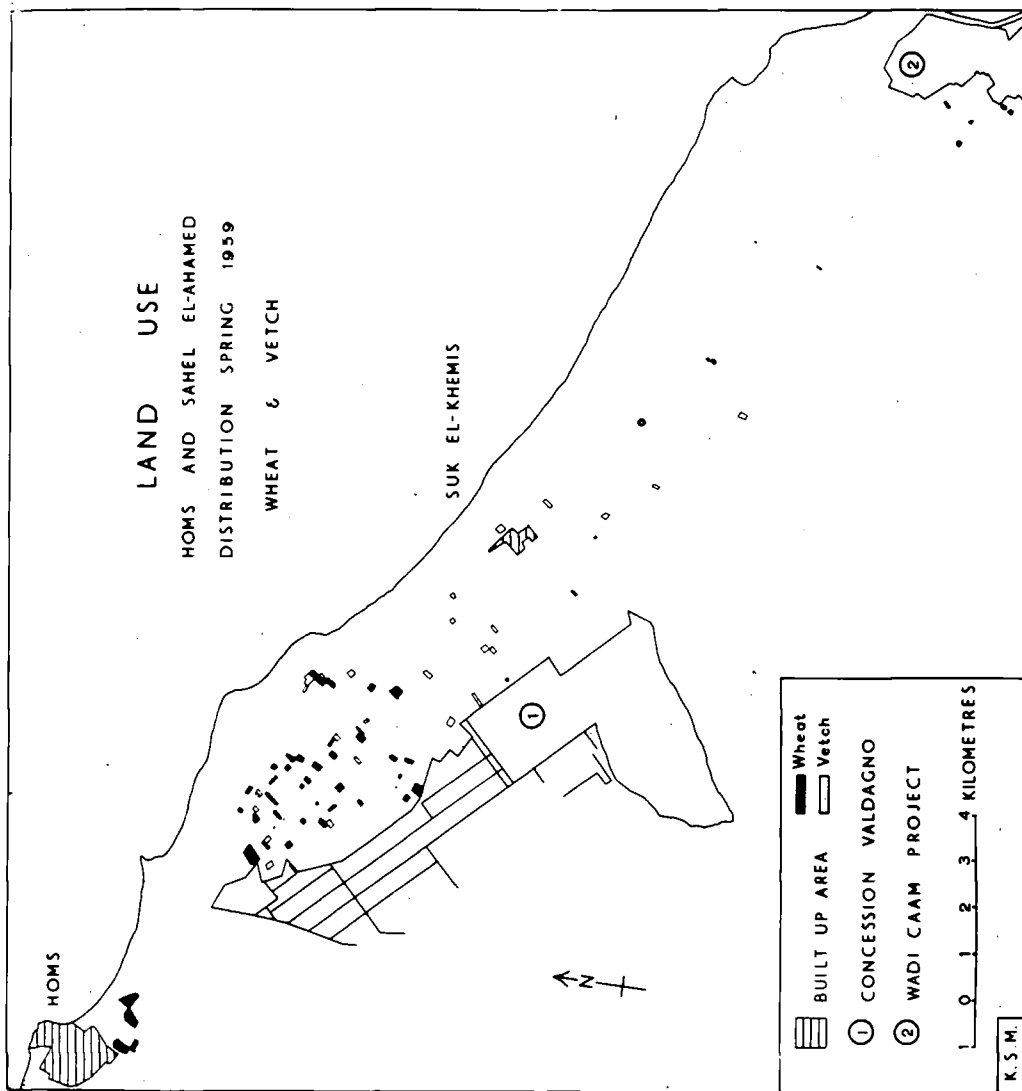


Figure 62

thus represents the situation which existed in a selected season in one specific year. (Further information about the survey is listed in Appendix 3).

In the succeeding paragraphs we shall examine varietal land utilisation from the point of view of the Arab sector of the agricultural economy as a separate entity from the Italian sector as a preparation for the analysis of agricultural yields and production in Chapter Six following. After consideration of the major cropland category, we shall go on to study samples of varietal land use in the residual categories.

Land Utilised for Grain Cultivation

The Land Use Survey of 1959 demonstrated that cereal cultivation occupied a greater area in the oases than any other individual crop group. This generalisation hides the essential factors of variety and differentiation of areas which are apparent through the interaction of vertical economic stratification and regional variations in water availability:-

Wheat (Taam, Arabic)

The distribution of the 1959 crop may be seen in Figure 62, from which it is clear that its importance in the indigenous economy is severely limited. Significant areas in the western reaches of the Oasis of Homs both near the village and in the Leptis locality are to be accounted largely to the influence of the military markets in Homs Village.

In Libya, wheat is cultivated under systems of dry and irrigated farming within the oases. Dry-land wheat is grown only after a year's ley, usually in a four year rotation, which

is widely prevalent in Misuratino, on the following lines; fallow - wheat - fallow - barley; or alternatively a biennial rotation; fallow - wheat. Using dry farming techniques, the rainfall of the first year can be conserved in the soil, thereby permitting a second year crop to be grown with the sum rainfall of two years. In many Phase IV and V cases, surface mulching with the locally adapted plough is undertaken, together with careful weeding in order to make full use of the accumulated soil moisture. In the non-commercial Phases, cultivation is haphazard and the value of the year's fallow is reduced through inattention to mulching and weeding. Ploughing is effected by use of a wooden plough (Vide Plate 2) which is tipped with steel; the appearance of the instrument is crude, but its utility lies in its ability to furrow the soil without turning it over, thus preserving the soil moisture.

The acceptance of fertiliser is by no means wide-spread amongst the indigenous farm operators. In the Questionnaire Survey of 1959-60, the average amount expended by farmers on the purchase of fertiliser was £L 3.00 per unit, and the total import of fertiliser for indigenous farmers was less than 10,000 quintals. (Vide Table 43). Under dry-land cultivation, wheat is generally given 1.5 to 2.0 quintals of superphosphate and 1.0 quintal of ammonium sulphate per hectare sown.

Dry-land wheat relies as much upon the time of sowing as upon the amount of rainfall. Since dry-land wheat is cultivated primarily by non-commercial farmers, the demands of careful timing are often unmet. The more advanced of the operators

at Phase IV, and also the commercial farmers utilising extensive techniques in areas such as Nahima, sow their wheat at the first opportunity after the first rains have fallen, but not before a total of 15 - 20 centimetres have been recorded. If the seed is not sown before the end of November, the chances of harvest are poor, since the possibility of scorching with an early onset of high summer temperatures or Ghibli winds is vastly increased. Sowing is carried out by broadcast methods by most indigenous farmers, but Phase V operators, excluding those at Wadi Gaam Settlement, are taking more interest in drill seeding which gives better yields. Harvesting usually takes place in the early days of April.

Irrigated wheat is much more common than dry-land wheat. In the normal oasis rotations, wheat follows tobacco, potato, or lucerne, the foliage of which is ploughed in after harvest. Even under indigenous agriculture, irrigated wheat, which is confined to commercial Phase V operators, is given heavy fertiliser cover. The standard practice for the crop was as follows, 6 - 8 quintals of superphosphate, 1 - 2 quintals of ammonium sulphate, and 0.5 - 1.0 of potassium sulphate per hectare. Irrigated wheat is sown in Misuratio from October 15 to November 15: Arab practice is to broadcast the seed, though the more advanced element are drill sowing at 20 centimetre spacings. At the time of seeding, the plot is given a light irrigation, followed by two or three irrigations in February and March depending upon the rainfall. Harvesting takes place early in April. This accounts for the fact that the area of

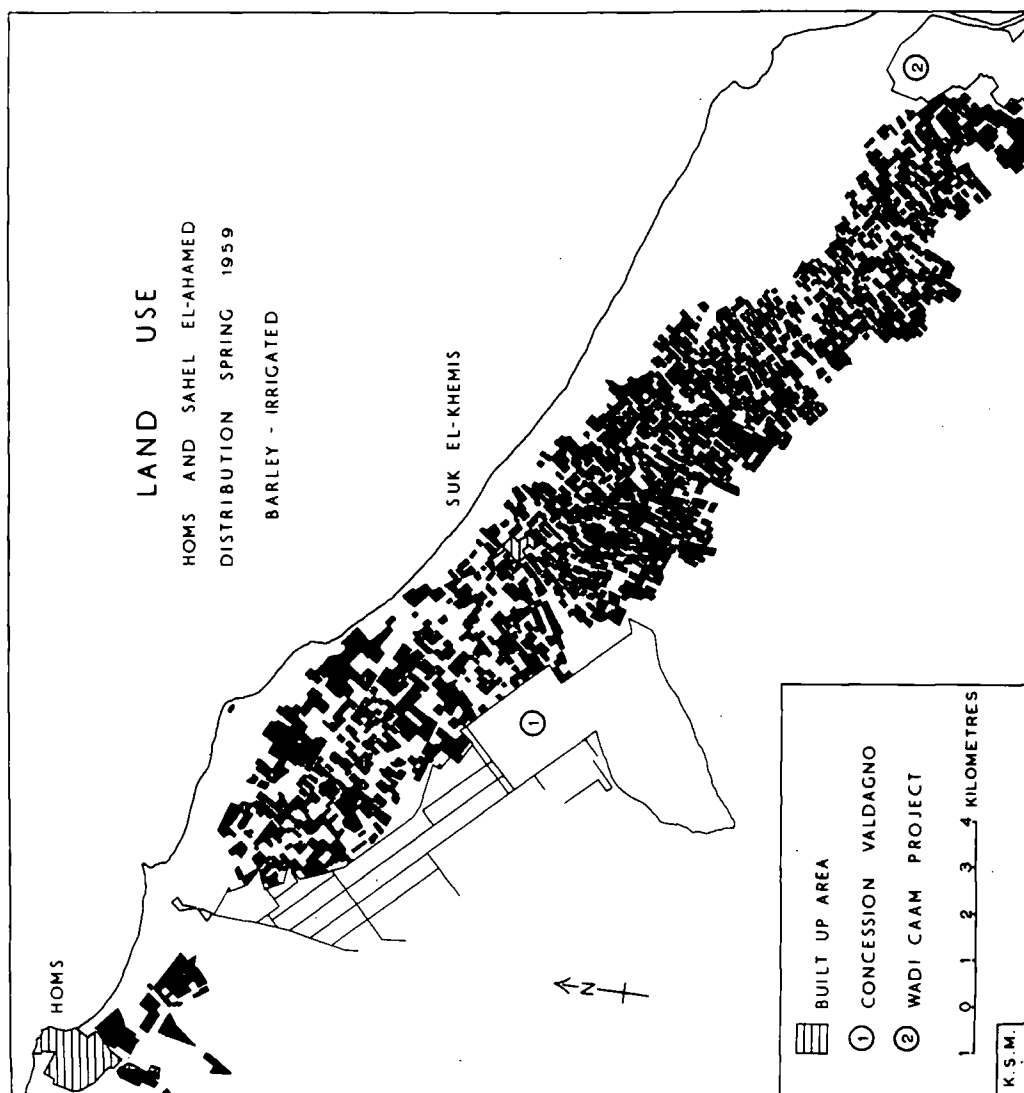


Figure 63

wheat illustrated on Figure 62 tends to be only a representative fraction of the total area of wheat grown in the oases, since the harvest of irrigated wheat was nearing completion during the field tour. Nevertheless, Figure 62 does emphasise the small importance of wheat in the indigenous economy especially in comparison with Figure 63 which shows the distribution of oasis barley in the same year.

Barley

The barley cropland recorded by the land use survey accounted for the greater part of the oasis garden area in the late spring. Figure 63 shows the distribution of the crop, which is universal throughout the area; examination of this distribution is illuminated by contrast with the general land use classification offered in Figures 53 and 54. In regional terms, barley is most intensively grown in the dry-land suani, the inter-dunal palmeries, the inter-cultivated land of the oases proper and in the subsidiary areas of the steppes. The regional bias in barley cultivation is essentially towards the poorer lands, predominately the dry-land. Expressed in features of economic growth, barley is a crop associated with farmers operating at economic levels of Phases I, II, III and IV. Phase V farmers have followed commercial development to the stage where varietal specialisation precludes land utilisation for crops with only small profit margins and an unstable market basis. Thus, apart from the fact that the commercial farmer is tending to look at his land in very specialised terms, it is pointless for him to direct

a large portion of his efforts to production of a crop, the market of which fluctuated wildly according to the vagaries of the climate and the consequent production of other operators in the steppe and dry-lands. Thus, within the oasis area of Misuratio, land utilisation for barley production shows small but highly significant concentrations; and the importance of this is to be seen mainly in the areas without barley, for these are the localities which represent the advanced and high production sectors of the indigenous economy.

The present day monopoly enjoyed by barley cultivation in the self-sufficient Phases of farming results from direct climatic and social effect. Barley is the crop which offers the most secure returns for the least effort expended in the environment of Misuratio. The system employed by the Libyans is exceedingly simple; - after the first rains of November the ground is loosened with the plough and sown broadcast with seed retained from the previous years yield. Nothing more is done until spring when harvesting is necessary. In the oasis areas, where the rainfall is slightly heavier and more reliable than the interior, an operator will normally sow an area sufficient for his annual domestic and seeding requirements. In the steppe lands, the variability of rainfall and the regional differences in fall necessitate a more wide-spread activity, and one operator may well sow as many as four or five quite separate plots. As we have explained earlier, the diffuse nature of the cultivation areas permits a measure of

security against the localized character of rainfall in the steppe zone. From a series of four or five different plots a farmer might harvest only two or three of the more successful productions. In years of poor rainfall, or when the rains fail completely, the production of dry-land barley drops to zero. In the year 1959/60 a total drought extending throughout the critical months from December to April inclusive, brought a failure of dry-land barley in both the oasis and the steppe areas.

The trend present in Phase V farming, whereby barley, together with other lesser dry-land crops falls from the area of the oasis, will apply more and more as economic development takes place. The position of dry-land cultivation appears to be moving back to the steppe according to the evidence presented in the land use survey and the Questionnaire Survey. The smaller of the hawaza farmers are turning from barley and have almost dropped it entirely from their rotation in the oasis. In some cases, barley cultivation is being re-established on the peripheral steppe in semi-enclosed or unenclosed dry-land areas. More capitalised Phase V operators are taking interest in extensive cultivation using mechanised methods. These movements are comparatively insignificant at the moment, but their effect in future years might be of major importance in its repercussions on the non-commercial producers. One farmer in the Sahel told the writer that soon he would be able to buy barley locally produced by the commercial extensive operators which would be cheaper than his own. Barley as a commercial

crop for small operators was finished. We need not agree that the future expansion of mechanised cereal farming is so full of hope as the Arab farmer we quote, but the implication of increased quantities of cheap barley on the local market are obvious.

Other grains

(a) Maize is grown by Arab farmers on the Jefara but has no importance in Misuratino. Maize cultivation is not increasing on the Tripolitanian Jefara and there is small likelihood that interest will spread to Misuratino in the near future. Essentially it is a crop confined to commercial producers. Heavy manuring is necessary up to 200 quintals per hectare, and fertiliser added to the extent of 5 Superphosphate and 5 quintals of ammonium sulphate per hectare. Sowing takes place in spring at regulated distances of 40-50 centimetres with row spacings at 30 centimetres. The small areas in Misuratino which are given over to maize are hand sown. Irrigation for the crop is heavy since there is little or no precipitation during the period from April to July. At present, irrigation demands of the crop are high in relation to the alternative returns which can be made on vegetable crops.

(b) Bescena and Gassab (millet) are cultivated in the same habitat and by the same methods as maize. In general they tend to be associated with small self-sufficient farm units in the oases at Phase III, where the grain is used domestically and the foliage used as feed for the livestock. Production is limited by the heavy water demands, and estimates for Misuratino

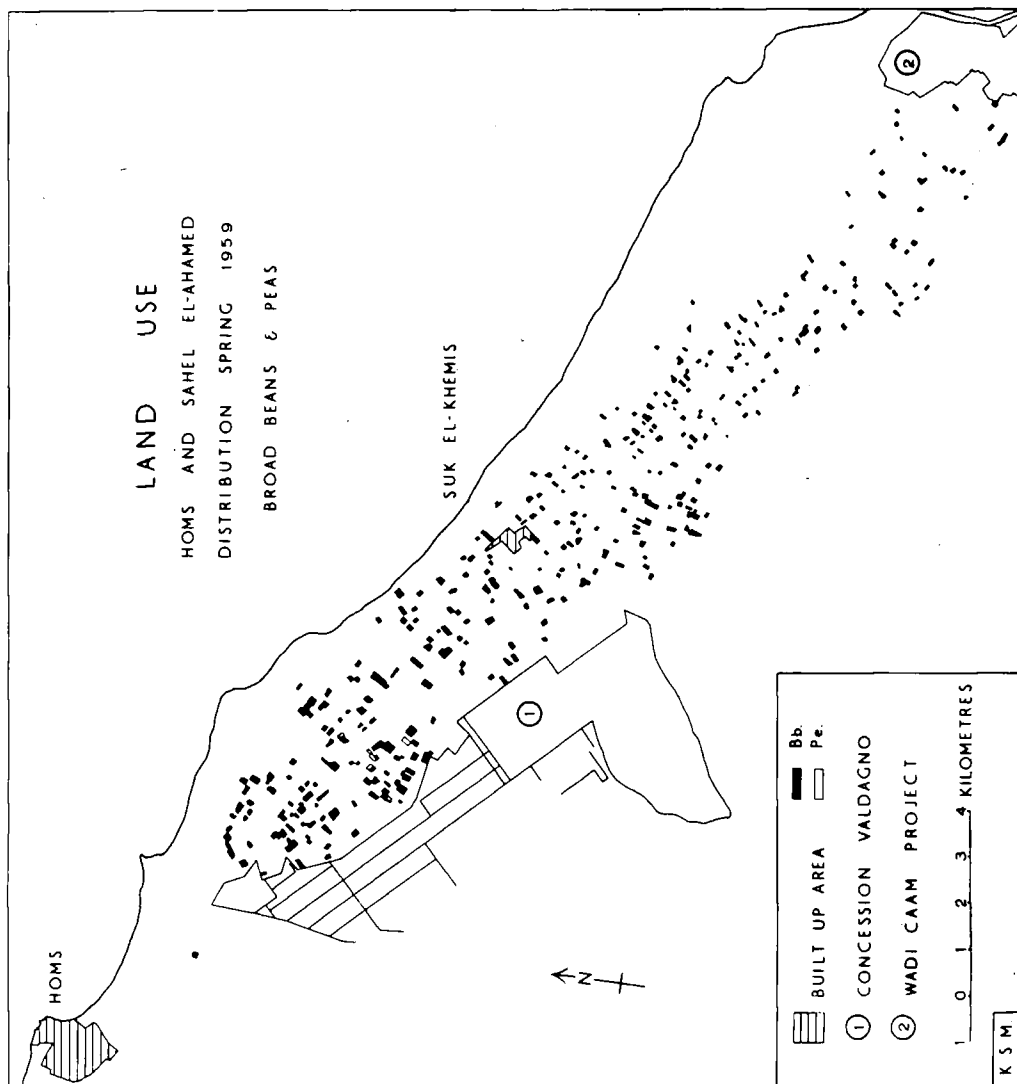


Figure 64

show that less than 10 hectares were devoted to its production in 1959.

Land Utilised for Leguminous Cultivation

Peas and Broad Beans

The leguminous plants, particularly beans and peas, are grown on a large scale throughout the oases of Misuratio in close relationship to the distribution of barley. Unlike barley, the incidence of these areas is controlled by the availability of irrigation water, hence the association of the two crops is at a maximum in Phase III farming, where irrigation and self-sufficiency go hand in hand. In Phase IV and V farming legumes act as preliminary plantings for irrigated wheat production. Normally beans and peas are cultivated as a winter crop. Fertiliser is not used by most of the indigenous farmers, but commercial operators generally use superphosphate at a rate of 5 quintals per hectare with a slight dressing of ammonium sulphate. A further advantage of the broad bean is that irrigation is necessary only occasionally and lightly. In these circumstances, it is obvious that the crop is popular in those areas where irrigation water is scarce, or where farmers share irrigation facilities and thus have a limited apportionment of water. Land Use Figure 64 illustrates the extensive importance of the crop at the present day, but it is interesting to note that the bean especially offers a simple and early line of varietal specialisation to the Phase III farmers who are beginning to use irrigation and hence graduating from the dry-land self-sufficient to the irrigated

non-commercial Phase of evolution.

The distribution of chick-pea shows much the same characteristics as the broad bean, acting in a similar capacity as a leader crop for cereals. As we have seen previously, the livestock dilemma is particularly acute at Phase III, when farmers are moving into more varietal specialisation, hence chick pea is used as a fodder crop to supplement rough grazing and scavenging in and around the oases.

Land utilised for Potato, Tomato and Roots

In Libya these crops are cultivated under irrigation and are used as both winter and summer crops.

Potato (batata; Arabic, Local)

Cultivated in autumn and spring. The gardens given over to potato are usually turned with a hoe, since the local plough only scrapes the surface of the soil. This factor limits the distribution of the potato, since only in the richer areas of the oases is there a sufficient soil depth to permit deep hoeing. Indigenous cultivators use heavy manuring on the gardens, although amongst the commercial producers fertiliser is being used. Normal dressings are 200-300 quintals of manure, 6 quintals of superphosphate and one quintal of ammonium sulphate per hectare. Arab farmers tend to overcrowd the potato rows (a feature we noted with respect to Wadi Caam Settlement - Chap. 6 p.576), but the standard plant spacing is 30-40 centimetres, with a row spacing of 15-20 centimetres. Hand planting is common to most farm units, although this tends to be more

specialised on the commercial farms, where rigorous selection of the tubers is undertaken during the operation.

Most of the production of potatoes in Misuratio is destined for local consumption, either in the indigenous markets, or to an important extent in the military market at Homs. Thus, the influences prevailing in the Jefara, where much of the crop has to be carefully timed for the export market do not apply in Misuratio. Whereas Hill records the bulk of Jefara potato plantings in middle of November to middle of December, experience in Misuratio shows that plantings are anything up to a month earlier, i.e. with the first rains of autumn⁽⁹⁾. Spring sowing is increasing, since the military base at Homs provides a steady and profitable market.

Irrigation for the winter grown potatoes depends upon the rainfall, but it is general for three heavy irrigations to take place during the three months in which the plant remains in the soil. Hill⁽⁹⁾ suggested that there were excellent prospects for potato cultivation, in view of the expanding export trade. The factors apparent on the Jefaran areas do apply fully to Misuratio, nevertheless, the present state of commercial farming in the area, and especially the efforts being made at the Wadi Gaam Settlement, indicate that the opportunities for participation in the export trade and the Tripoli market may soon be opened to producers in Misuratio. In this case, it is probable that the importance of the potato will increase in Misuratio.

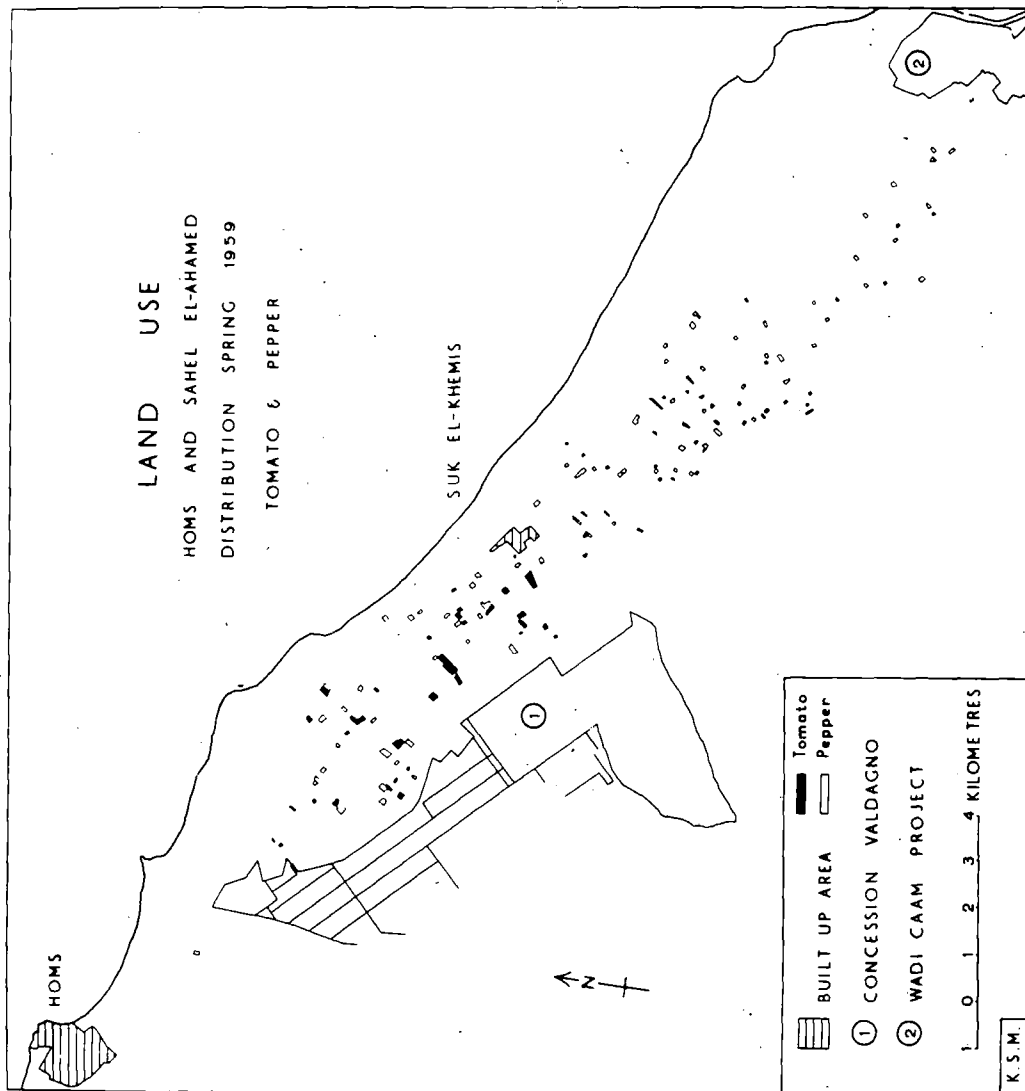


Figure 65

Tomato (Figure 65)

The distribution of the tomato in Misuratio is general, since it is a basic crop associated with self-sufficient farming, where it is used domestically, and it tends to appear on most commercial farms as a cash crop of some importance. The outstanding concentration of the tomato area in the east of the Homs Oasis may be attributed to two factors; in the first place, the area is largely self-sufficient, Phase III, hence one might normally expect there to be a wide distribution of the crop here; secondly, the writer suggests that above and beyond this influence, the reason for this relatively high intensity of land use for the crop is to be explained by the influence of the Homs market. The environs of the village are infertile and the availability of irrigation water very limited, hence the demand for tomatoes from both Arabs and Europeans is met from the nearest guani area which happens to be the Leptis-Suk El-Khemis zone of the Sahel. The total area given over to the tomato crop is difficult to estimate, but 500 hectares for Misuratio would seem to be a reasonable estimate according to the local Department of Agriculture.

Tomato growing in Misuratio is confined mainly to table and condiment varieties, the former being directed to the local alien markets and the latter being retained for domestic use or for sale on the Arab markets. The spring tomatoes are cultivated in areas of deep soil, prepared as if for potatoes, with deep hoeing to a depth of 35-40 centimetres and dressings of 800 quintals of manure per hectare, 8-10 quintals of super-

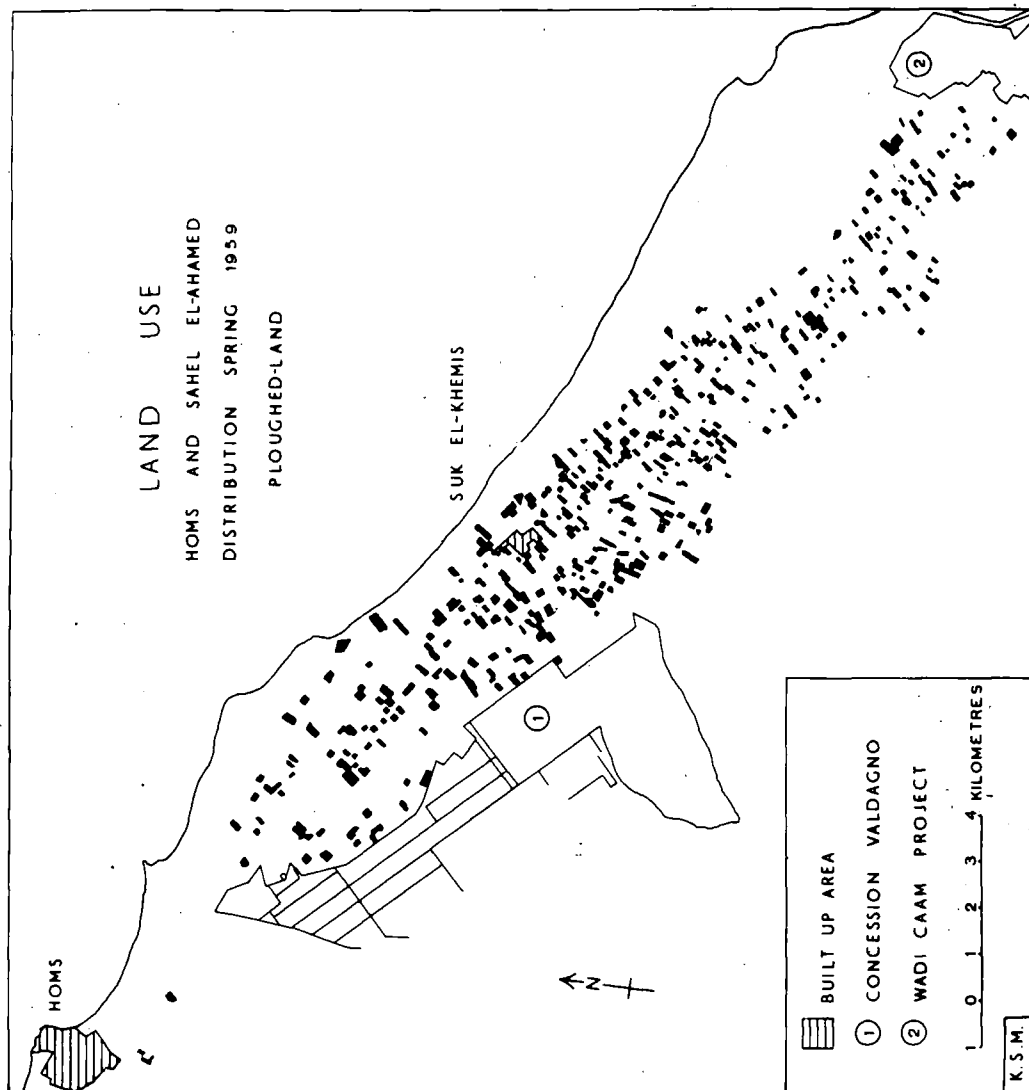


Figure 66

phosphate, 1-2 quintals of ammonium sulphate, and 1-2 quintals of potassium sulphate per hectare. The seedlings are planted out towards the end of February.

Roots

Are scarcely used by the Arabs; recent plans brought forward by the Nazara of Agriculture for the cultivation of sugar beet to help reduce the amount of imported sugar might have an effect in the future on those lands at present under tomatoes and potatoes.

N.B. As a final note to this summary of potato and tomato cultivation, it should be mentioned that the large areas appearing on Figure X66 as ploughed land (Pl.) represent in large part the area ultimately to be sown with potatoes, and to a lesser extent with tomatoes (Vide Figure 66).

Land Utilised for industrial crops.

The present day land utilisation in Misuratine is biased heavily towards the non-commercial or neo-commercial spheres of activity. In the areas given over to self-sufficient farming, industrial crops are totally absent, and in the areas where commercial farming is in its infancy, land utilisation is still confined by the standard of techniques and the mental horizon inherited from the preceding Phases. It must be expected therefore, that the area of land under industrial crops is small in the Arab sector of the economy. During the period of the land use survey, the writer recorded several minor pockets of tobacco cultivation in the oases. These have not been noted on the final maps, since they were essentially part of the

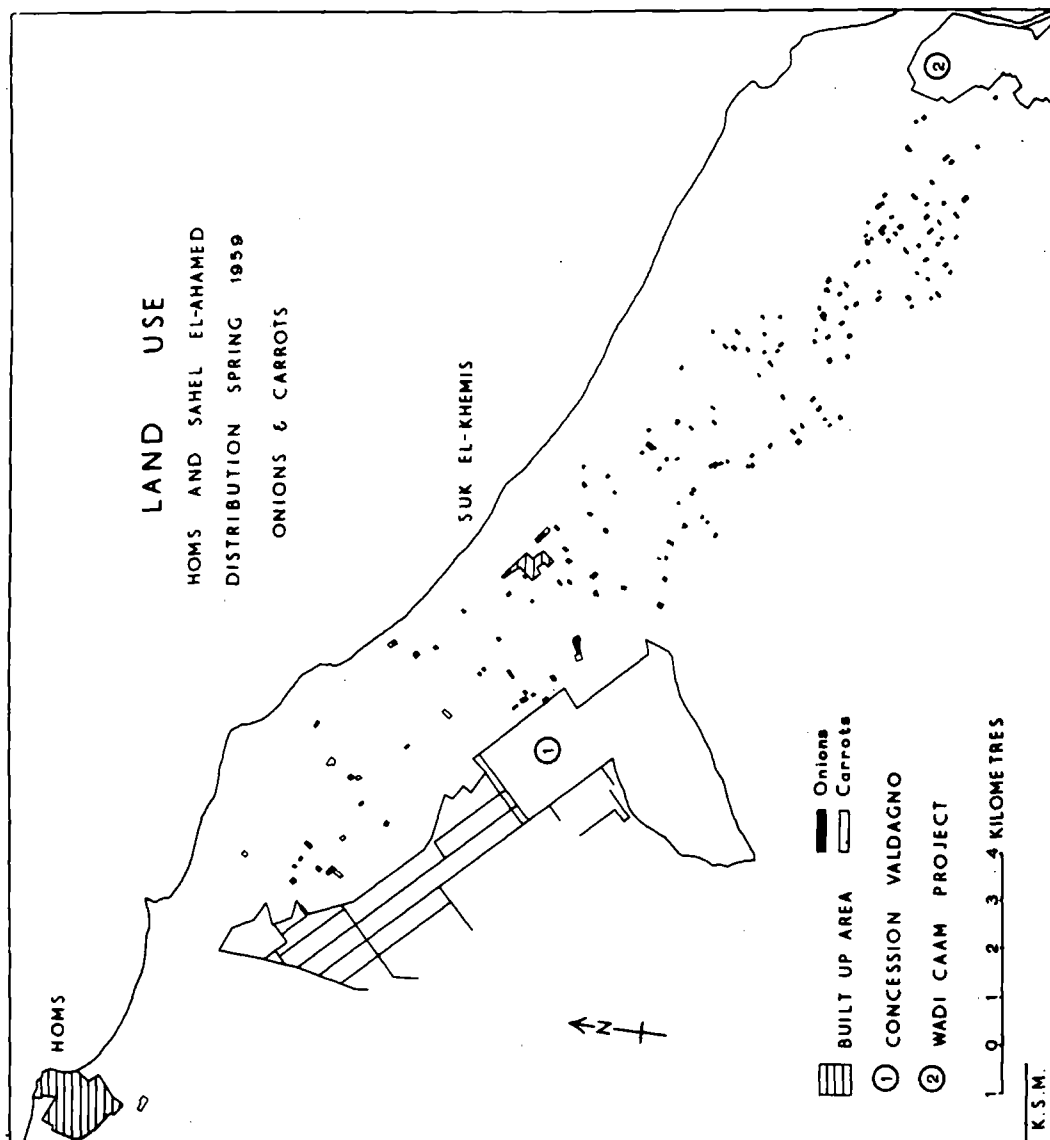


Figure 67

domestic garden, accounted for only one or two plants and were pirate crops unauthorised by the Tobacco Monopoly. Later, in Chapter 6 the state of production of tobacco is described in detail together with further supplementary notes on its cultivation.

Fodder Crops (Figure 67).

The distribution of fodder crops in the Arab sector may be delimited by the area of chickpea. Most of the livestock held on the indigenous farm units finds grazing in and around the oases, and the beasts are rarely stall fed. Supplementary feeding may be necessary in years of very poor rainfall, but it is usual for livestock to be fed solely upon the straw residue left from the cereal harvest and upon the chick pea, which is often grazed directly without cutting. During the normal rotation of fallow, fallow, barley, the animals are allowed to graze the volunteer crops and the stubble in the year of harvesting. At the Wadi Gaam Settlement, a new approach to the livestock problem has been introduced by Dale Morrison the estate manager. The re-appraisal of the livestock element in the indigenous farm is discussed in the following Chapter 6 (p. 573). In terms of land use, the re-assessment offered by Morrison necessitates an increase in the area under fodder crops. At the Wadi Gaam Settlement in the year of the land use survey, an average of a quarter hectare per farm was under lucerne as an irrigated spring crop. This represented a contribution by the farmers to the upkeep of their stock, which were gradually being moved off the farming area to a restricted zone. The

management bought the lucerne from the farmers, and sold back manure. Eventually, all the animals will be the property of the estate co-operative, and the farmers will merely produce the feed which will be sold to the co-operative; the co-operative will act reciprocally by providing by-products from its livestock holding. To date, fodder crops on the estate have been restricted to lucerne.

The plant is a perennial giving three or four years consistently high yields. The irrigation demands of the crop are exceedingly high, and some forty irrigations per year are usual. Before planting in the spring, the soil is prepared in 'gedula' form, in small metre square basins, and manure is laid at a rate of 300 quintals per hectare; fertiliser dressing is undertaken as follows, superphosphate 6 quintals per hectare, ammonium sulphate one quintal per hectare. Irrigation frequency varies from every five to six days in summer to 10-12 in winter. After the third year of cropping, the plant is either grazed, or ploughed in.

Land utilised for garden crops.

Garden crops are distributed in those areas where there is a reliable supply of irrigation water and where the soils are deep and fertile. In Misurating most areas designated saniya on Figures 53 and 54 fall into this province to some extent. The scope and nature of varietal specialisation within the land use category varies according to the state of economic growth prevailing in each farm unit, or for the area as a whole the

balance of development present in each section of the oases. Given access to a sound supply of water, a self-sufficient farmer is able to grow the greater part of his domestic needs in foodstuffs, since the climate favours a vast range of plant life. The Questionnaire Survey indicated clearly that the oasis lands are typified in Misuratio by the true self-sufficient minifundia unit, hence the spread of garden culture is of general significance. In order to appreciate the scale of varietal specialisation, it will be necessary to analyse the status of land use at the various Phases of economic growth:

(a) Phase III (Irrigated self-sufficiency) - garden crops in Phase III farming exhibit the characteristics of the true minifundia, with a small quantity of each of a large number of crops grown essentially for domestic use. To illustrate this point, attention is drawn to Figure 76 where a sample farm of this grouping is illustrated. The farm in question is situated in the Wadi Zennad at Homs village, and represents the unit of production of one man for his household, which comprised: his widowed mother, his wife and three children. In spite of the proximity of Homs market, this farmer produced only fortuitous surpluses for sale. No less than eight different crops are grown on the farm, disregarding the production of dry-land barley taken from the upper wadi slopes above the plot. Using the gedula pattern, the farmer is able to divide the suani into sections for each crop and thereby adjust the irrigation demands of each crop separately. In this particular sample, the tendency for garden culture is at its height, and the next

step intended by the operator is for a move into commercial production for the Home market. In many Phase III units, the garden is confined to a narrow strip adjoining the well and the cultivation of separate crops is consequently obscured.

(b) Phase IV (Saniya)- garden cropping at this Phase tends to be more rationalised. The move to commercial farming is touched off by, or itself gives rise to a greater availability of irrigation water. Domestic demands upon the produce of the gardens are still met largely by the farmer, but the increased availability of water for irrigation gives more scope for production of consistent surpluses for market. In one sample farm, the number of varieties cultivated has remained more or less stable with the change from traditional to transitional farming, but varietal specialisation has come about through concentration upon one or two commercial crops on a scale which diminishes the relative role of other subsistence crops. In this sample, the normal 'kitchen garden' exists in close proximity to the hansh, but the bulk of the suan are taken over entirely for production of broad beans and irrigated barley. The positions of the 'kitchen garden' and the commercial area of any given farm varies according to a multitude of factors connected with the forces of economic growth, soil fertility and water availability:- in terms of land use, the Phase is signalled by a contraction in area and significance of the 'kitchen garden'.

(c) Phase V - (hawaza) Examination of the degrees of intensiveness of land utilisation in Part One of this chapter showed

that the hawaza farms were somewhat less intensive in nature than the less developed farm units. Whereas the 'garden' element of the minifundia changes in importance from comprising a full farming area to a parcel of 'kitchen garden' with the corresponding change from Phase III to Phase IV, the sequent move from Phase IV to Phase V is marked by the elimination of the domestic garden and the practice of palm intercultivation. To this extent, intensiveness of land utilisation declines. On the other hand it must be borne in mind that the application of new techniques, particularly in the realm of irrigation and use of fertiliser, brings about a great intensiveness of cultivation in respect to field crops. The implications of latifundia organisation which are normally associated with Southern Italy do not apply in Misuratino at the present day. The limited availability of land, the necessity for heavy irrigation and the character of the commercially profitable crops have influenced development to follow a traditional pattern of cultivation, in form at least. Thus, the hawaza units exploit the gedula system of cultivation in the same way as farms at Phase III.

The Garden Crops.

A brief survey of production of vegetables, the problems involved in commercial specialisation and the possible trends in the future is given in Chapter 6. Figures 64, 65 and 67 indicate that of the large range of vegetables grown in Misuratino, only carrots, onions and pepper occurred over

appreciable areas which were large enough to record consistently throughout the area. The distribution of vegetables illustrated in Figures 64, 65, 67 reflects the area of land utilised for this purpose on a commercial scale, since the 'kitchen gardens' were too small to plot at a 1:24 scale, which was used for the base field sheets. In addition to the vegetable areas shown on the relevant figures, there are small plots of melons, sugar cane, broccoli, marrow and other minor vegetables. The groundnut is unrepresented on the land use maps since it is a summer crop. The export potential of the groundnut, which has been demonstrated by Jefaran farmers, has not been realised by most of the oasis farmers of Misuratio and the area under groundnuts is unimportant at the present day.

Tree Crops

The present situation with respect to orcharding presents an agricultural dilemma as acute as that posed by the livestock industry, and fundamentally, the two problems are closely inter-related. The question is simply whether arboriculture has a place in future development, and if it has, what policy to implement meanwhile? The present day distribution of the orchard areas as recorded by the land use survey and field observations permit accurate appraisal of what actually exists, and thus provides a basis for discussion of the livestock problem as it affects social and economic growth.

The broad lines of orcharding and its regional distribution have been sketched by R.A. Taylor in relation to the whole of

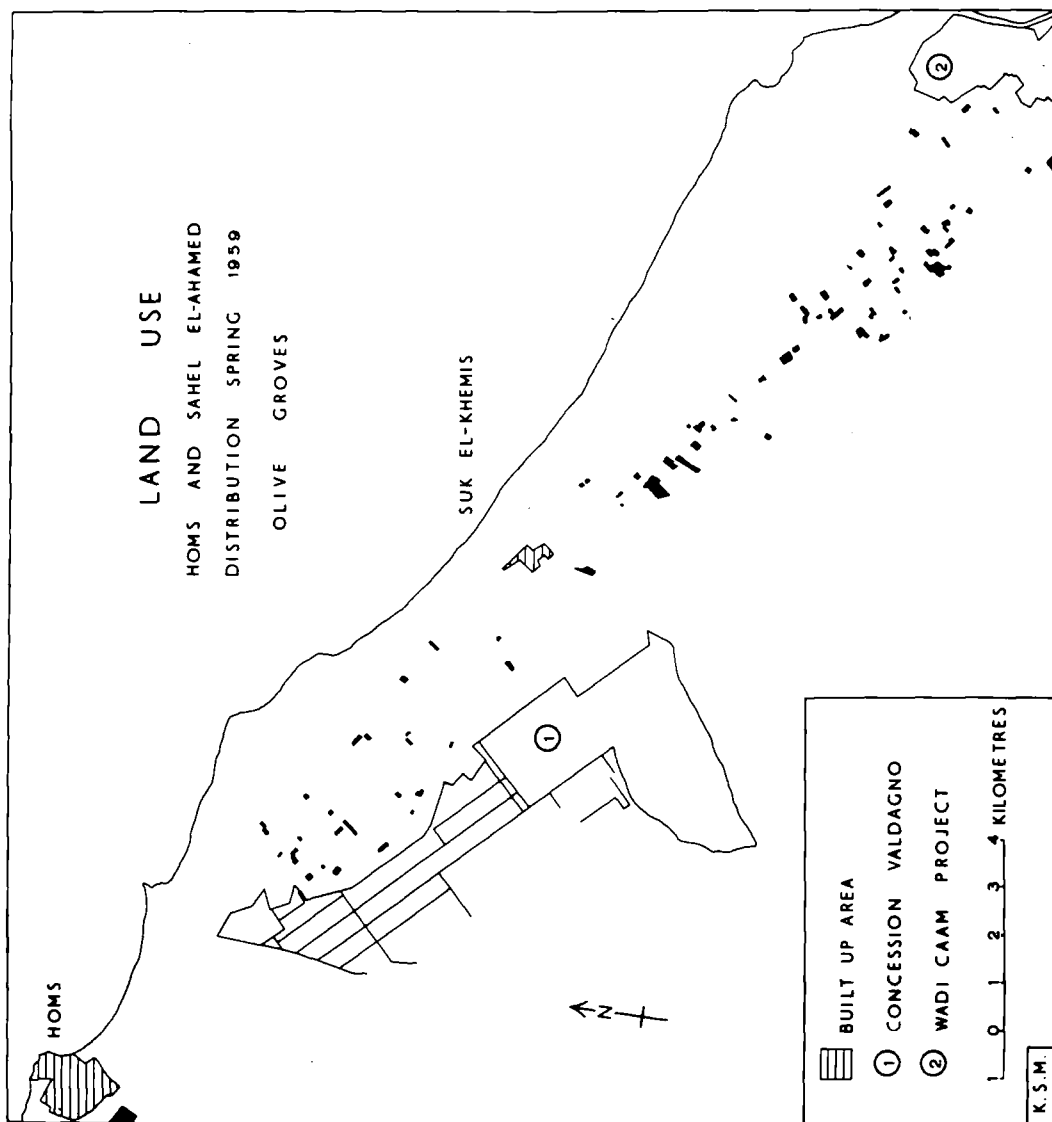


Figure 68

Tripolitania Province⁽⁷¹⁾. It is immediately apparent from this work that arboriculture is as important in indigenous farming as in Italian farming, although in terms of numbers alone, Italian plantings tend to out-number indigenous. The survey of Land Use and Resources produced by the B.M.A. in 1945 showed that there were 970,000 olive trees in the Arab sector of the economy and 2,111,000 in the Italian in Tripolitania⁽²⁴⁾. Indigenous olive trees in Misuratio are cultivated under two quite distinct systems; the ginan plots of the peripheral steppe have been described earlier in the chapter; in addition to the inundation areas of the steppe, there are several outstanding localities where olives are grown under semi-irrigation in the oases proper. The distribution of these olive groves in the sample oases of Homs and the Sahel El-Ahamed is illustrated in Figure 68. Some of the plots are old established plantations, and have every appearance of evolution from ginan, which have been incorporated into the oasis system as enclosure got underway at the turn of the century. This is particularly the case with many of the olive groves of the Sahel, where enclosure has been comparatively recent.

The extensive area of ginan culture in the Zliten-Bir Dufan 'col', shown in Figure 53 is possibly the largest and most concentrated area of indigenous olive culture in Tripolitania outside the Jebeline areas. Towards the east, indigenous orcharding falls off throughout the Dafnia zone, and re-appears

in scattered plots in the western area of Misurata. The region of Zaviet Maguib is characterised by several large and productive groves, but the rest of the oasis offers only poor and dispersed single trees.

Methods of cultivation employed by Arab farmers are exceedingly simple. The young trees are planted haphazardly either in clumps, or more usually in the already crowded area of the suani, without any reference to water needs, root catchment or variety competition. During the first two years, the seedling is irrigated two or three times according to the climate prevailing. Thereafter the tree is left to grow undisturbed until it becomes productive in due course. Harvesting is accomplished by 'beating' the tree with sticks to dislodge the olive fruit, which is then gathered from the ground. Pruning is not fully understood, and is either neglected completely, or done with the indiscriminate aid of an axe. In both cases, the tree suffers and production is kept well below optimum. The influence of the Italian development in olive cultivation has not been without effect, both in respect to introduction of new varieties into the indigenous culture and the adoption of new techniques of cultivation. The influence of these modern developments tends to be confined to the better farmers, although it is noticeable that Arab areas close to La Valdagno have been affected at all levels, since employment on the estate has brought the Arab into direct contact with European cultivation at its best.

In earlier discussion of land use, it was pointed out that the palm tree loses value with progress through the varying Phases of economic growth, at the following rate:-

(a) Phase I - The small areas of palm trees in the oasis are an adjunct to the steppe economy. During the infrequent visits of the nomadic communities to the oases, the palms are pollenized by hand, and later, the fruit is gathered at the time of the cereal harvest.

(b) Phase II - The palm becomes the symbol of sedentarisation, since date production is important where irrigation of crops is negligible. During the early period of development, the palm, which has only minimum demands upon the environment and the cultivator, represents an easy line of advance for the Arabs.

(c) Phase III - Irrigated self-sufficiency increases the value of the palm tree, since its production is augmented by consistent water supply. The multitude of uses to which the palm and its products may be put, maintain the tree in a state of relative importance. The dates provide a steady source of foodstuff; the date stones can be ground into coffee substitute; the fronds become the universal construction components for shelters, roofs and wind-breaks; the sap can be used to provide laghbi and bekha beer and spirit; the trunk is invaluable for building purposes.

(d) Phase IV - Commercial development and the end of total self-sufficiency reduces the value of the palm. Varietal specialisation changes the erstwhile virtues of adaptability

into vices. The quality of the coastal palms and their production is low, thus they cannot compete with dates from the Fezzan in the urban markets. The palm becomes a minor feature of the oasis economy, with increasing use for by-products such as laghbi and bekha and for animal feed.

(e) Phase V - The large ground space occupied by the palm and the water demands of the tree are sufficient to make its presence a nuisance. At this stage hawaga operators tend to look for some more profitable re-placement.

At the present time, the palm is distributed throughout the suani of Misuratio, and spreads to a modest extent in those areas de-limited in Figures 53 and 54 as inter-dunal palm-eries and ginan (vide Figure 60). The two important controlling elements upon the spread of the date palm are the depth of the water table, and the salinity of water. In Misuratio the palm tends to fade out where the level of the water table falls below 24 metres. The ease with which the palm maintains itself in dunose areas is explained by the fact that the dune contains its own internal water table, which maintains, and is maintained by the palms around. Date palms have a high resistance to salinity in soil and water, but the salinity of the water in the east of Misurata Oasis in the vicinity of the Sebkha is sufficient to preclude growth of the palm. The special conditions prevailing in the Oasis of Taerga are to be accounted mainly to the leaching effect of the spring waters, which have washed away the salt elements to a degree which permits poor palmeries. A further factor in assessment

of the palm's tolerance to alkalinity which is apparent at Taorga Oasis, and which has been noted in Iraq and Egypt⁽⁷²⁾ is that the palm will grow in areas where the ground surface is covered with white efflorescence, provided that the roots are able to reach to horizons which are alkaline free. Popenoe suggests that the limit of tolerance is about 3% alkaline and that good production results are only to be had where 1% alkaline content prevails. Again, evidence in other Middle Eastern countries confirms that if the irrigation water is free from alkalinity, the palm will tolerate high degrees of alkalinity in the soil, and the relationship holds true inversely.

The palms are planted by means of rooted off-shoots which have been prepared in the shelter of the haush or the 'kitchen garden'. The shoots are generally spaced in regular lines in 2-3 metre pits, which are floored with manure and covered with soil, leaving only the bud protruding above ground level. Each seedling is protected from animal and wind attack by a small frond enclosure and given two or three irrigations in the first two years. The advantage of taking off-sheets for new plantations is necessary in view of the dioecious character of the palm, and the waste involved in seeding male palms which have then to be destroyed. Most of the plantations in Misurata are 100% female, with a small number of male palms held by the specialist palm workers, who themselves pollinate most of the trees by hand. Practice varies from locality to locality and in Misurata and Zliten each farmer will retain his own male plantations.

Culture of the date palm in Misuratio is at a very poor level in contrast with other areas in the Sahara. The farmers have little knowledge of selection of either species or high producing strains. Frond pruning is haphazard and at times over-zealous often leading to a reduction in production. As with the olive tree, the Arab is content with a maximum number of fruits rather than a limited number of high quality fruits, hence the trees are left to produce massive quantities of small size dates.

A new plantation begins to bear fruit in the sixth, seventh or eighth year according to variety and the irrigation techniques employed, and reaches maximum production in the eleventh or twelfth year. The untended palms of Misuratio tend to be intermittent bearers since the fruit clusters are unpruned and the tree is allowed to carry heavy frond foliage. Laghbi and Bokha tapping aggravate this situation. Harvesting in Libya is mainly in the last week of October and the first two in November, depending upon the incidence of the Ghibli and the early or late fall of the autumn rains. The occurrence of a Ghibli of autumn is essential if the dates are to be ripened, and when it does come, date gathering follows immediately. Should the rains begin in force before a Ghibli, then the crop is usually ruined.

The following represent the major varieties grown in Misuratio, unfortunately, none of the individual types has adapted itself well to the prevailing sea winds and the variability of humidity in the area:

- (a) Amme
- (b) Bacrary
- (c) Tabuni
- (d) Ftiety - the most common variety used as a dessert date.

Date palm cultivation is an integral part of the orcharding dilemma in Tripolitania; as we have seen from the analysis of the position of the date palm at the various Phases of growth, the present-day status of the palm is being steadily devalued. Later in the chapter, we shall take up the discussion of the orcharding dilemma in terms of its future as an element in land utilisation.

The position of tree crops other than olives and dates in the indigenous farming economy tends to be that of adjuncts to the 'kitchen garden'. In the irrigated areas of the oasis, there is scope for a large range of tree crops, including almond, apricot, plum, fig, peach and pomegranate, in addition to supplementary fodder crops such as carob, prickly pear and pistachio. As yet varietal specialisation has not progressed beyond the development of the olive tree, and although most of the varieties mentioned above are to be found in the suani of all farmers advanced beyond Phase II, they are usually sporadically distributed in ones or twos or are found concentrated together in the area of the 'kitchen garden' or a ginan plot in close proximity to the oasis.

In summary, it should be noted that orcharding is a neglected aspect in indigenous farming in Misuratio. The expansion in the export trade of citrus fruits has not affected

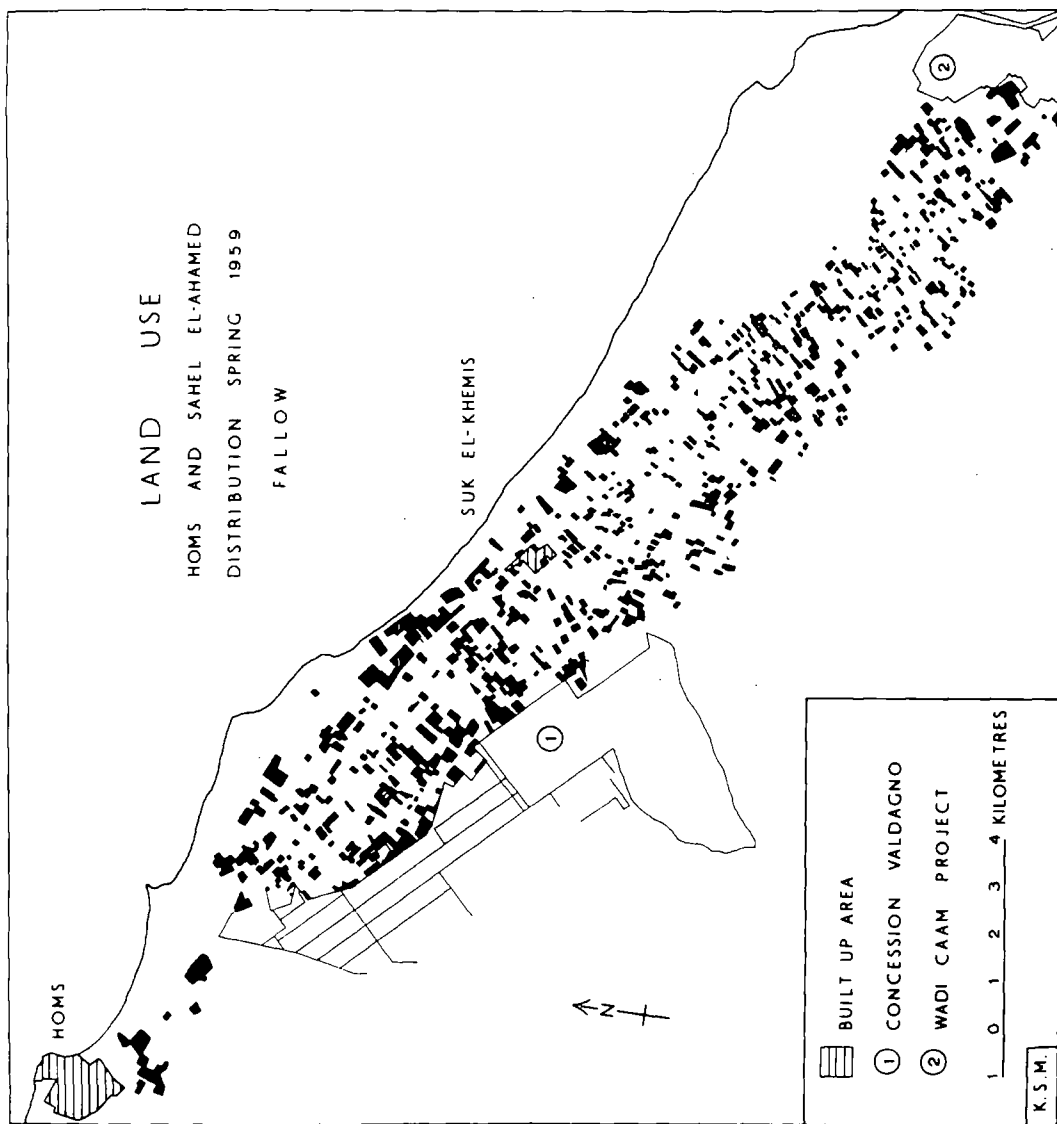


Figure 69

the area to any degree. The present-day land use pattern illustrates the extent of the general dilemma, since even in Phase V units there is no positive trend in planting which compares with the development of citrus and olives under hawaza farming in the Tripolitanian Jefara.

Land under fallow

The distribution of land recorded as fallow is illustrated in Figure 69. Under this head we must bear in mind that there are two distinct cultivation factors involved; in the first place fallow associated with irrigated rotations; in the second place land associated with dry-land rotations. Under irrigation, a plot of land is normally retained as fallow for half a season, especially in Phases IV and V farm units, when the land is prepared for a summer crop of groundnuts or potatoes. In less intensive production at these Phases summer fallow is followed by a leader crop of lucerne or chick pea, followed by grain or vegetables. Intensity of land utilisation of this scale obviously minimises the area under fallow.

Dry-land cultivation fallow periods have an altogether different character, essentially acting as water gatherers for the succeeding years grain crop. In some cases cultivation takes place more upon a basis of demand from the household or the availability of rainfall than upon any set rotation. Thus a dry-land plot may be cultivated for as many as three consecutive years for barley, and in subsequent years of poor rainfall it is left for grazing. This is especially true of those

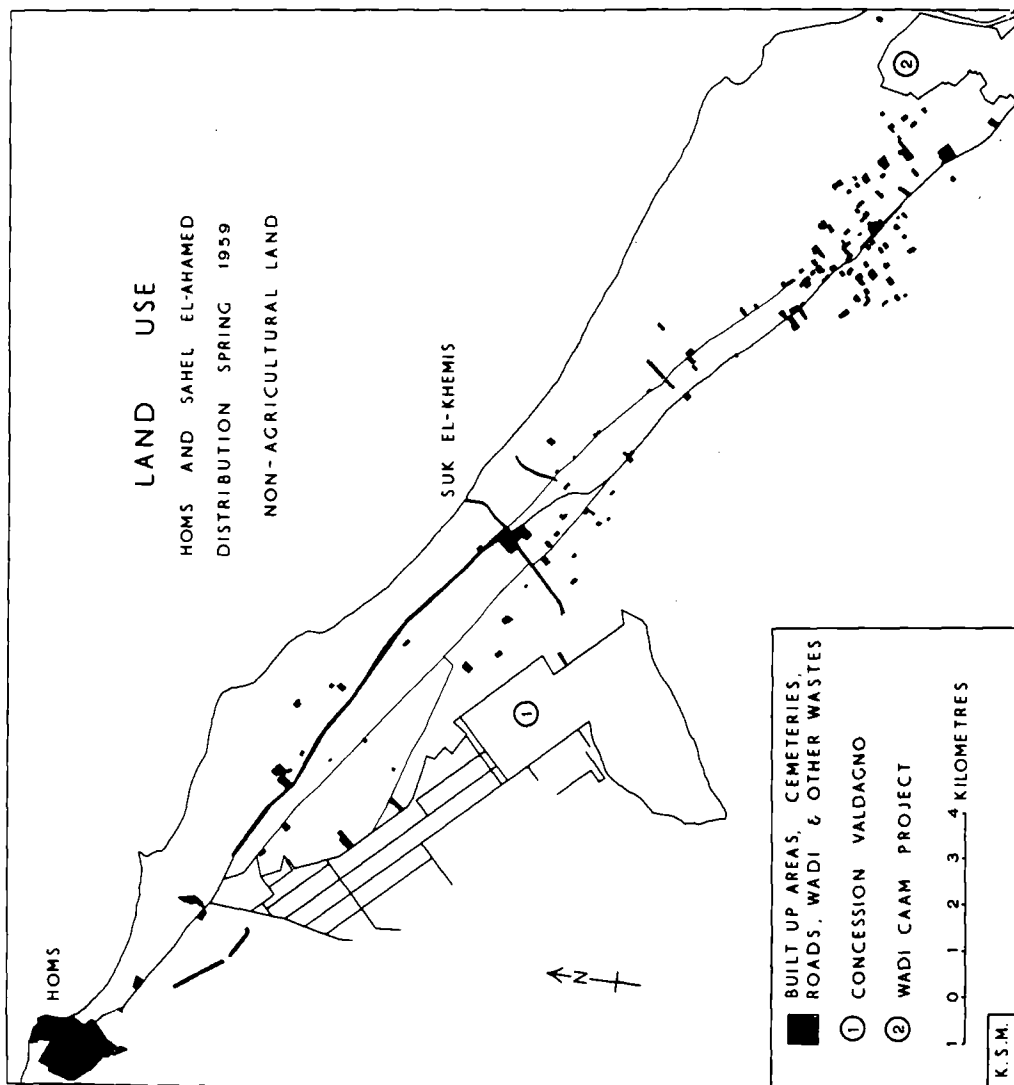


Figure 70

fallow zones on the northern periphery of the oases or the zone of inter-dunal palmeries. Fallow areas in the steppe are difficult to define since the erratic nature of exploitation for cropping precludes any authoritative delineation of specifically fallow areas. The contraction in the area of Steppe cultivation brought about by the increase in oasis activity appears to be implying a more rational rotational framework in the zone, but this process must be regarded as in its infancy.

Land Utilisation in the Arab Sector - A Summary

- (i) The largest areas recorded under single categories of land utilisation in the oasis zone were as follows: barley, fallow, ploughed land.
- (ii) Other crops are characterised by wide distribution, a factor arising through the minifundia unit organisation towards self-sufficiency.
- (iii) Concentrations of crops other than barley tend to show regional and economic bias. Thus the attraction of Homs market accounts for the importance of tomato cultivation in the east of Homs Oasis, and the advanced state of farmers in the Sahel accounts for the distribution of vegetable crops and ploughed fields prepared for summer cropping.
- (iv) The land given over to orcharding is exceedingly limited and confined to olive groves. Other tree crops are sporadically distributed and fundamentally part of the self-sufficient economy.
- (v) In common with the rate of sedentarisation and the changing nature of land tenure, the type and scope of land

utilisation acts as a sensitive index of economic and social growth. The maps of land use prepared as companions for these notes illustrate the essentially traditional balance of development in the area;- and the newly emerging sectors of transitional agriculture, where varietal specialisation is coming to the fore, are clearly apparent against this traditional background.

Land Use Category (A) - Italian Cropland.

The Oases of Homs and Sahel El-Ahamed, which were used as representative samples of Arab oasis land utilisation, cover an area estimated at about 4,000 hectares. In order to obtain a full picture of land use in Misuratio some account must be taken of the Italian colonisation areas, and to this end field by field examination was applied to the La Valdagno private concession, which is contiguous with the Arab area described in the preceding paragraphs.

La Valdagno estate comprises three distinct zones;- that area farmed by mezzadria contractors, a central apoderated area farmed by the management, and a large adjoining area of orchard land farmed by the management. The original intention of the estate owner was for the apoderated area to be contracted out to share-croppers, whilst the orchard area was to be retained under management control. As a result of the climate of insecurity which has prevailed since 1951, many of the farmers have returned to metropolitan Italy, and in consequence the greater part of the apoderated zone is now in the hands of the management. In terms of land use the estate exhibits features

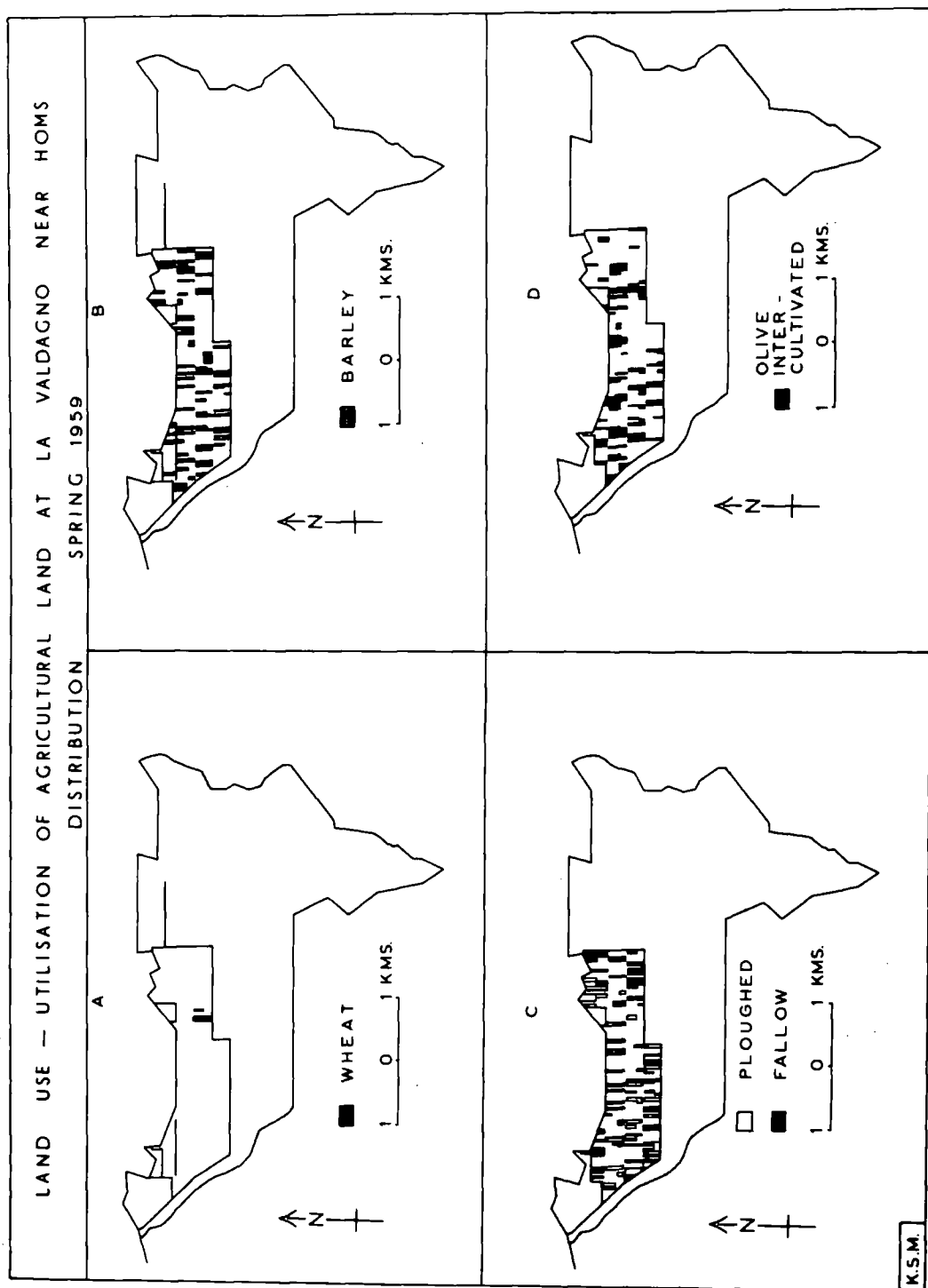


Figure 71

of Category sub-groupings (A I ii) and (A II iv) (Vide Table 32).

Of the 1,864 hectares included within the estate, some 376.5 hectares are utilised for intensive cultivation of crops under irrigation. We shall examine the principal crops and their distribution on the estate roughly in the order of surface area recorded in February 1959.

Barley (Figure 71B)

Barley cultivation occupied some 90 hectares of irrigated land, and was common both to the area controlled by the management and the area farmed by the mezzadria. As a winter crop the fields demand only light irrigation to supplement the rainfall. At La Valdagne sowing is normally complete by mid-October, since the reliance upon the former rains of autumn we observed amongst indigenous farmers is broken by the availability of water for irrigation. Early sowing also means that the fields can be reaped and ploughed up for a summer crop of lucerne, before the end of the spring rains. In spite of the supplies of irrigation water, the use of fertilisers at La Valdagne for cereal crops is unusual, since experience shows that 'burning up' by fertiliser is a great risk. Account must also be taken of the fact that most cereals grown on the estate are destined for consumption on the estate by the livestock, thus the crop does not justify a large capital out-lay for irrigation water and fertiliser.

The importance of barley at La Valdagne arises from the fact that alternative crops are not available: if the farmers

could find a more remunerative crop, which also provided fodder for their animals, then the cultivation of barley would become a matter of history. As it is, barley offers a crop on which least losses, and occasional profits are to be made. Modern market developments in the country, which are noted in the following chapter, appear to be offering new scope for winter vegetables, and it may be expected that as urban consumer trends become more sophisticated, the pre-eminence of barley will decline proportionately.

Wheat (Figure 71A)

The area of land utilised for wheat cultivation was insignificant, being limited to two plots of land owned by one farmer. Wheat cultivation has the disadvantage that the long growing period precludes a further follower crop being planted in the summer, and the low quality of the straw also diminishes the popularity of the crop. Unless there is Government subsidy of the wheat acreage, there appears little likelihood of any appreciable expansion in the area sown to the crop. Experience with wheat cultivation at the Wadi Caam Settlement led to much the same economic conclusions as had been reached at La Valdagno, and in consequence the area under the crop declined considerably at Wadi Caam by 1960/61.

Inter-cultivated olives (Figure 71B)

The area given over to inter-cultivated olives at La Valdagno was second only to the area of barley, with approximately 85-90 hectares under cultivation. The greater part of the land classified under this head represents recent

plantings of olive trees on the mezzadria plots undertaken by the farmers as a private venture, but now incorporated in the management zone. During the period taken by the olive trees to come to fruition, the plots are being utilised for summer crops of lucerne, chick pea and groundnuts. When the plantations come into full production, inter-cultivation will be discontinued. The transfer of the land from irrigated crop production to irrigated olive production brings down the margin of profitability of the plots quite substantially, but in view of the declining Italian mezzadria element, the central management has decided that the more extensive cultivation of the olives will be best adapted to the limited and unskilled labour of temporarily employed Arab workers.

Fallow land (Figure 71C)

On a large estate such as La Valdagno there are bound to be a series of rotations relevant to each farming area. The particular distribution of fallow land in the February of 1959 is thus difficult to explain by any generalisation. In the case of several of the mezzadria farms, it is true that some of the fallow represents land under dry-cultivation of barley, but on the other hand, some of the area is temporary fallow being retained from a summer crop in 1958 of lucerne, clover or chick for cultivation of a summer crop of tobacco or groundnuts. In round terms, the fallow recorded in Figure 71C represents about one fifth of the farm land at Valdagno. It is interesting to observe that less than a quarter of the irrigated land at the Wadi Caam Settlement was fallow at the

same time of year.

Ploughed Land (Figure 71C)

As in the indigenous sectors of the oasis, the incidence of ploughed land in the spring months generally indicates an intention to sow a summer crop. It is interesting to compare the areas of ploughed land and fallow recorded by the land use survey in 1959 with the cropping results returned by the Questionnaire Survey in the following spring. Figure 71C shows the distribution of approximately 120 hectares of ploughed and fallow land in February 1959, whilst the exact designation of summer cropland in the same year was as follows:-

Lucerne (Erba Medica)	14	hectares
Tomatoes	2.25	"
Groundnuts	20	"
Tobacco	90	"
Lettuce	2	"
	128.25	hectares

The correlation between the two figures is not absolute, since some of the land classified under lucerne in the table above will have been used for winter grains. Nevertheless, the figures illustrate the normal practice of winter preparation for summer cropping which is becoming increasingly important in commercial agriculture, especially at the present during the groundnut export boom.

Broad Beans (Figure 72B)

The broad bean is as much in evidence on the Italian farms as on the Arab ones, although the crop changes from a staple vegetable of the human diet to an animal feed. Broad bean

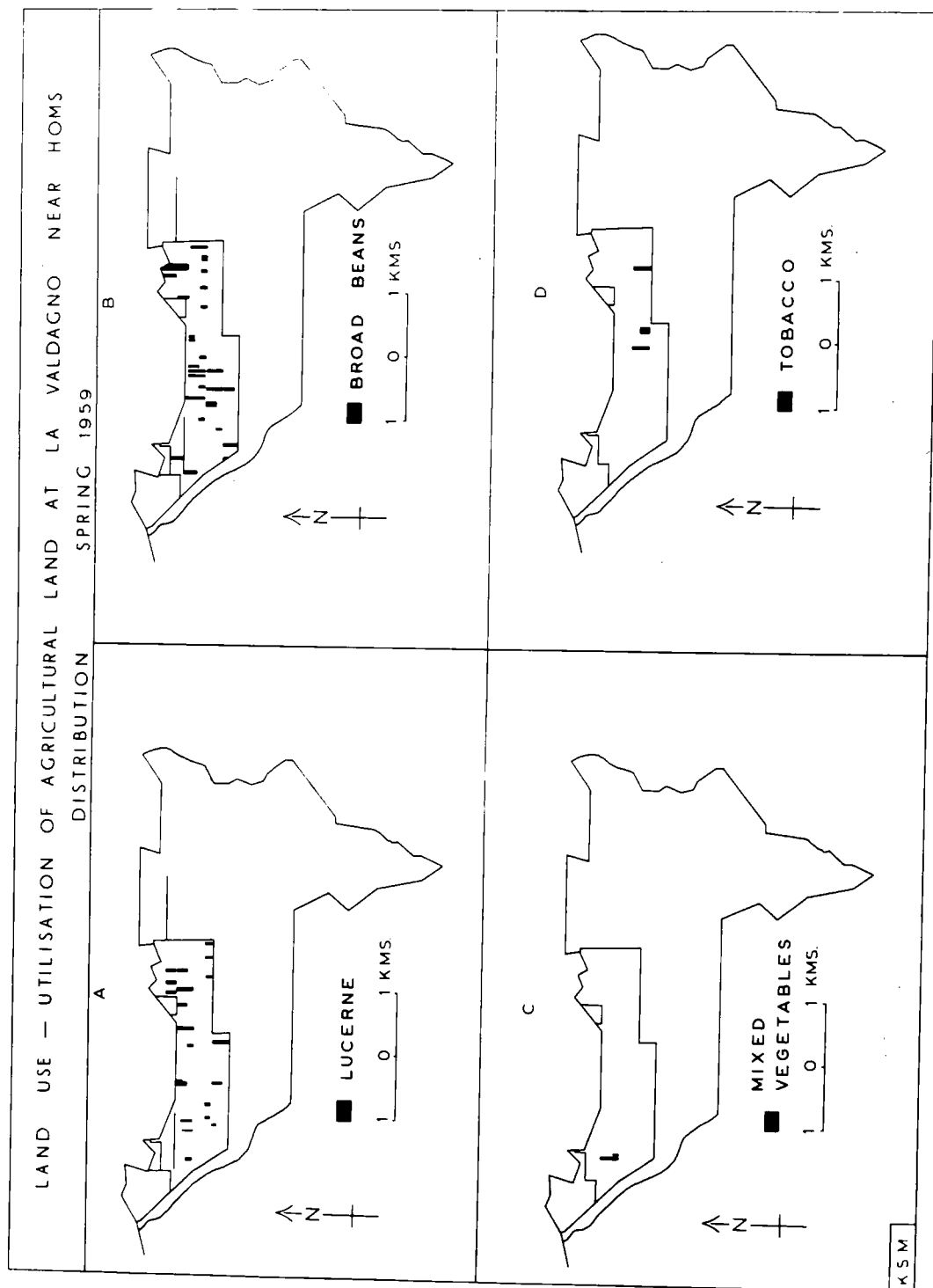


Figure 72

cultivation closely parallels that of barley on the estate; the plant offers almost guaranteed high production with a minimum of effort on the part of the farmer, and may be used either for domestic or stall purposes; furthermore, it has no more profitable competitor for land space.

During the winter months, the broad bean, sometimes in association with chick pea as a fodder crop, can be grown with light irrigation thus reducing the costs of production considerably. In the 1958/59 season some 30 hectares were sown on the estate.

Tobacco (Figure 72D)

The 4.5 hectares of tobacco recorded in Figure 72D was entirely volunteer residual growth and in no way represents the season's planting. Tobacco growing areas are strictly controlled by the Government Tobacco Monopoly, and the annual production at La Valdagno is restricted to some 90 hectares. The major varieties grown at La Valdagno are Salento, Beneventano and Virginia, most of the plantings of which are now under the area farmed by the central management.

As we have indicated previously, the tobacco crop is grown under irrigation, usually as a summer crop. Preparation of the terrain is done by cultivation of a leader crop of clover or chick in a three year rotation; tobacco, barley, clover. The ground is spread with manure at a rate of 300-400 quintals per hectare together with a dressing of 5-6 quintals of superphosphate, 1 - 1.5 quintals of ammonium sulphate and 1 - 1.5 of potassium sulphate per hectare. The seedlings are nursery

grown during the winter before being planted out in April. The intensity of planting varies greatly according to the particular variety under cultivation, but the plants are invariably set in quincunx form, one row set back a half spacing against the preceding row. Harvesting varies with variety, but most crops are lifted by the end of October before the rains set in.

A brief survey of the varieties under cultivation at La Valdagno will illustrate the pattern of cultivation and the characteristics of the crops.

Burley An introduced variety from Italy and the basis of pre-War tobacco growing in Tripolitania, in the 'plains' areas of Suk El-Giuma, Suani Ben Adem, Azizia, Castel Benito and Homs. It is an irrigated summer crop. The seed-beds are laid down at Valdagno in January and harvesting takes place from July to October depending upon the date of planting. At Valdagno, the crop is sun-cured in the drying lines adjoining the curing plant in the centre of the estate. The Tobacco Monopoly uses the Burley leaves as 'filler' for local cigarettes as a replacement for imported varieties.

Salento As with Burley, this variety is an import from Italy; seeds are imported annually from Italy. The crop is cultivated widely in the 'plains' area and is still the main variety used at Valdagno. Seed-beds are prepared in January, and depending upon the climate, the crop is gathered from August to October. Unlike the Burley, Salento is silo-cured inside the curing plant at Valdagno. The position of the Salento is

rather weak since its qualities as cigarette filler could be replaced with a cheaper crop. Tobacco trials held at Sidi Mesri experimental farm by the Tobacco Monopoly in 1957 showed that imported varieties of Java and Maryland could be adapted to local environmental conditions with good results.

The area utilised for tobacco at La Valdagne appears to be held at a static level. The expansion of area will depend entirely upon the export of leaf, and according to the Manager of the Tobacco Monopoly, Mr. G.A.R.Rands, this is unlikely until the problem of variety is solved. (73)

Lucerne (Figure 72A)

Grown at La Valdagne as a winter irrigated or semi-irrigated fodder crop, usually in the three or four year tobacco rotations; tobacco, barley, lucerne; tobacco, barley, lucerne, barley. Often the plant is inter-sown with the broad beans as a soil replenishment and fodder crop. In 1959, it accounted for an area of 18 hectares of cropland.

Mixed Vegetables (Figure 72C)

Most of the vegetables grown on the estate are enclosed within the small 'kitchen garden' near the farm houses; these small pockets of cultivation do not appear on the maps of land use. One farmer had given over two hectares of land to the gedula cultivation of vegetables for the Homs market, and the plot included lettuce, cauliflower, brocciolli and tomatoes. Using regular irrigation, the farmer was having considerable success with the crops, particularly with the tomatoes which

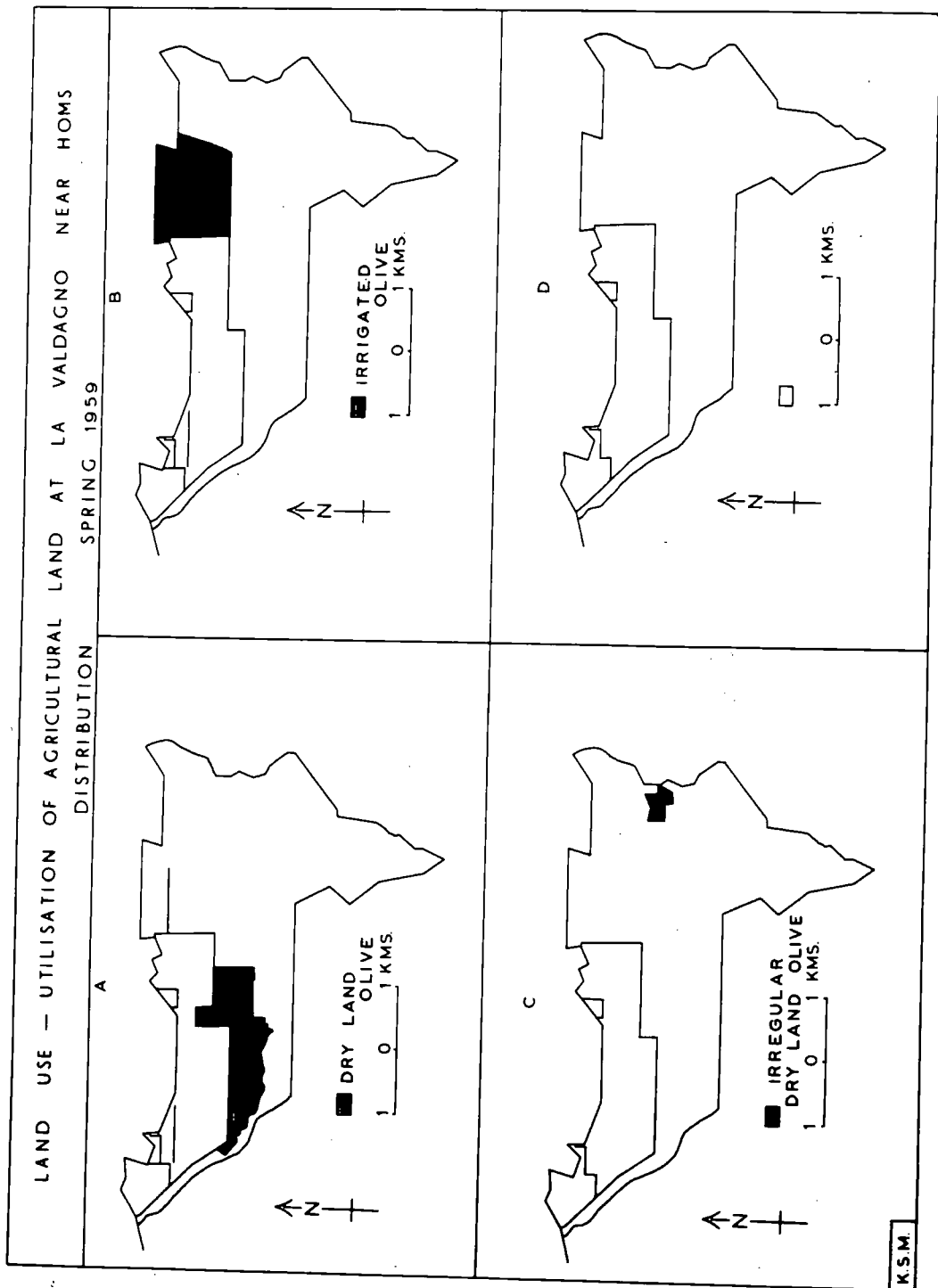


Figure 73

were Italian varieties well suited to the European market in Homs Village. 'Yellowing' appeared to be affecting some of the green crops, probably as a result of soil deficiencies in nutrients. The importance of vegetables on the estate as a whole is at present under review, and the management imported several varieties of English seeds for variety trials in 1959/60. The future of vegetables production would seem to be excellent at Valdagno, since the standard of cultivation common to the Italian farmers obviates most of the problems which have beset similar enterprises at the Wadi Caam Settlement.

Orcharding at La Valdagno

Dry-land olives (Figure 73A)

The total area of dry-land olives at La Valdagno is 159.5 hectares. Trees are planted in a 20 x 10 metre pattern mainly in the undulating zone to the south of the apoderated area of the estate. The dry-groves are ploughed three to four times a year to keep back the weeds and maintain the dry-cultivation moisture. All the areas with dry olives can be irrigated in years of poor rainfall, although there is an increasing tendency for semi-irrigation techniques to be applied in all years to increase yields. At Valdagno, where the trees are relatively closely spaced, use of semi-irrigation has a great effect upon yields, since even in years of good rainfall, the competition between adjacent trees must be detrimental to optimum production. It is being recognised throughout Tripolitania that the capital outlay necessitated by introducing

irrigation into dry-land areas can be rapidly amortised by the increase in oil production in consequence of stabilising yields.

In years when low olive production is likely, the area is inter-cultivated with barley. This practice is not widespread at Valdagne, but its effect upon production must be considerable, since the available water and nutrient supplies are constantly depleted. Soil erosion also becomes an increased hazard in the inter-cultivated dry-land zone, since the run-off from the heights to the south is extremely powerful, and the over-cultivated soils have little resistance to erosion.

The dry-land olive area in the centre of the apoderated zone results from the presence in that strip of a small wadi bed, which has deposited large quantities of gravel and loose sand which preclude cultivation of normal field crops. This situation is further aggravated by the inter-cultivation of barley in the dry-land olive groves to the north, since the wadi bed is extending its area of deposition with materials brought down from the lands above.

Irregular Dry-Land Olives (Figure 73C)

The small area of irregular dry olives in the extreme east of the estate is an ex-Arab ginan which has been incorporated into the cultivated zone by new plantings of irregular olives around the old Arab trees. In many ways it represents an unprofitable anomaly but does serve the purpose of restraining erosion in the upper reaches of a small tributary of the Wadi Hasnun. The total area of this plot has been extended to 12



ABOVE Panorama - Dry-land olives at La Valdagno.

BELOW Olive groves under semi-irrigation-La Valdagno.



hectares, but the woodland developments in the contiguous areas indicate that further expansion is not contemplated.

Irrigated Olives (Figure 73B)

There are some 226 hectares of olives under irrigation at La Valdagno situated between the apoderated area to the west and the Wadi Hasnun to the east. The pre-eminence of the irrigated olive is explained by the following production from the dry-land sector:-

- (i) Earlier production from the trees.
- (ii) A greater density of trees.
- (iii) Higher production per hectare.
- (iv) Greater certainty of crop returns.

The trees are planted at a 10 x 10 spacing common to most Italian irrigated groves in Tripolitania. From the date of planting until the first production a lapse of 15 years may be expected, since the influence of the sea-winds and the variability of humidity experienced on the estate are detrimental to early fructification. Normal practice of cultivation is for two or three disc-ploughings and one 14 centimetre ploughing during the year. Even using irrigation, the Italians feel that clean-weeding is essential, especially as the erosion danger on the lower plain lands is only slight in any case. Irrigation is provided by underground pipe distribution from artesian wells. The costs of this form of irrigation are high both in initial capital outlay and running costs.

The olive groves at Valdagno are not yet complete since the irrigated areas of the estate were inter-cultivated with the vine during the first 15 years, and were only replaced by secondary

olive plantings as the first olives came into production. The maximum age of the trees is 22 years, whilst there are still many trees under seven years.

Harvesting on the estate is accomplished with the help of large numbers of hired Arab labourers, most of whom are employed only at the harvest season. At the peak of the olive gathering, some 600 labourers are engaged on the estate as a whole. Most of the fruit is processed at the Italian press in Homs Village, and retained on the estate until the markets appear to be most remunerative. Thesanza, (the residue left after extraction of the oil) is sold to the press owners who further process the material for soap production in the plant adjoining the olive press close to Homs Harbour.

Other tree crops

Land utilisation at Valdagno is highly specialised, and tree crops other than olives are confined to the (kitchen garden' areas of the mezzadria farms. In these small cultivation plots both orange and lemons are produced for home consumption, with individual trees of almond and apricot, with vines and figs interspersed amongst the citrus trees. The recent expansion in export sales of citrus fruits has so far not encouraged the estate to take up cultivation. The costs of replacing the existing olive groves are felt to be unjustified on the grounds that the citrus boom has not consolidated itself into a steady demand from sound markets, and that the uncertainty surrounding the future of the estate gives little

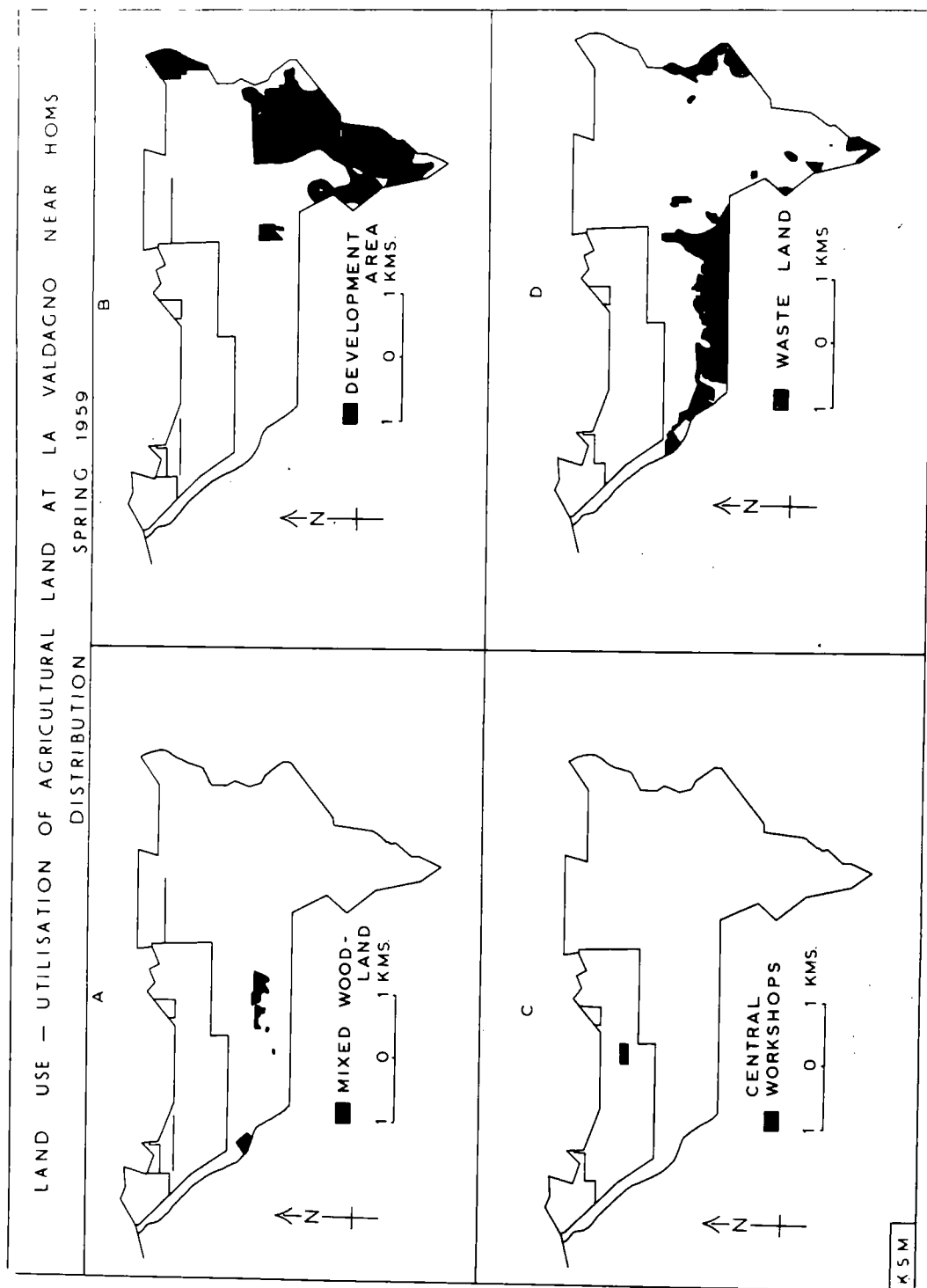


Figure 74

confidence for further capital investment. Discussion of the distribution and the cultivation of tree crops other than the olive will follow in Part Two of this Chapter under the head of 'The Orchardng Dilemma'. (Chap. 5, p.439)

LAND UTILISED FOR WOODLAND (C) - LA VALDAGNO - A CASE STUDY.

The private forest estate in Tripolitania consists of those areas which are integrated into the colonial development areas of Ente, INPS and the private concessions. The future of the woodland areas of the country and the rate of expansion of woodland is of key importance in agricultural development, partly in terms of the need for conservation, and partly in terms of effective land use in an arid climate. Woodland plantings at La Valdagno have been unequalled by any other private operator in the region, and they offer a living illustration of what may be achieved with capital and enterprise. The land which was reclaimed for the construction of the estate presented much the same appearance as much of the peripheral steppe does today in the same area in neighbouring Sahel El-Ahamed, with small tussock and asphodel accumulations interspersed with sporadic clumps of camel-grass. The only advantage enjoyed by the area at present occupied with woodland plantations is the presence of the Wadi Hasnun and the associated tributaries which flow down from the Miselatan foothills in the south.

Early plantings on the estate were directed towards the rocky lands of the hills, where small areas of pines, cypress

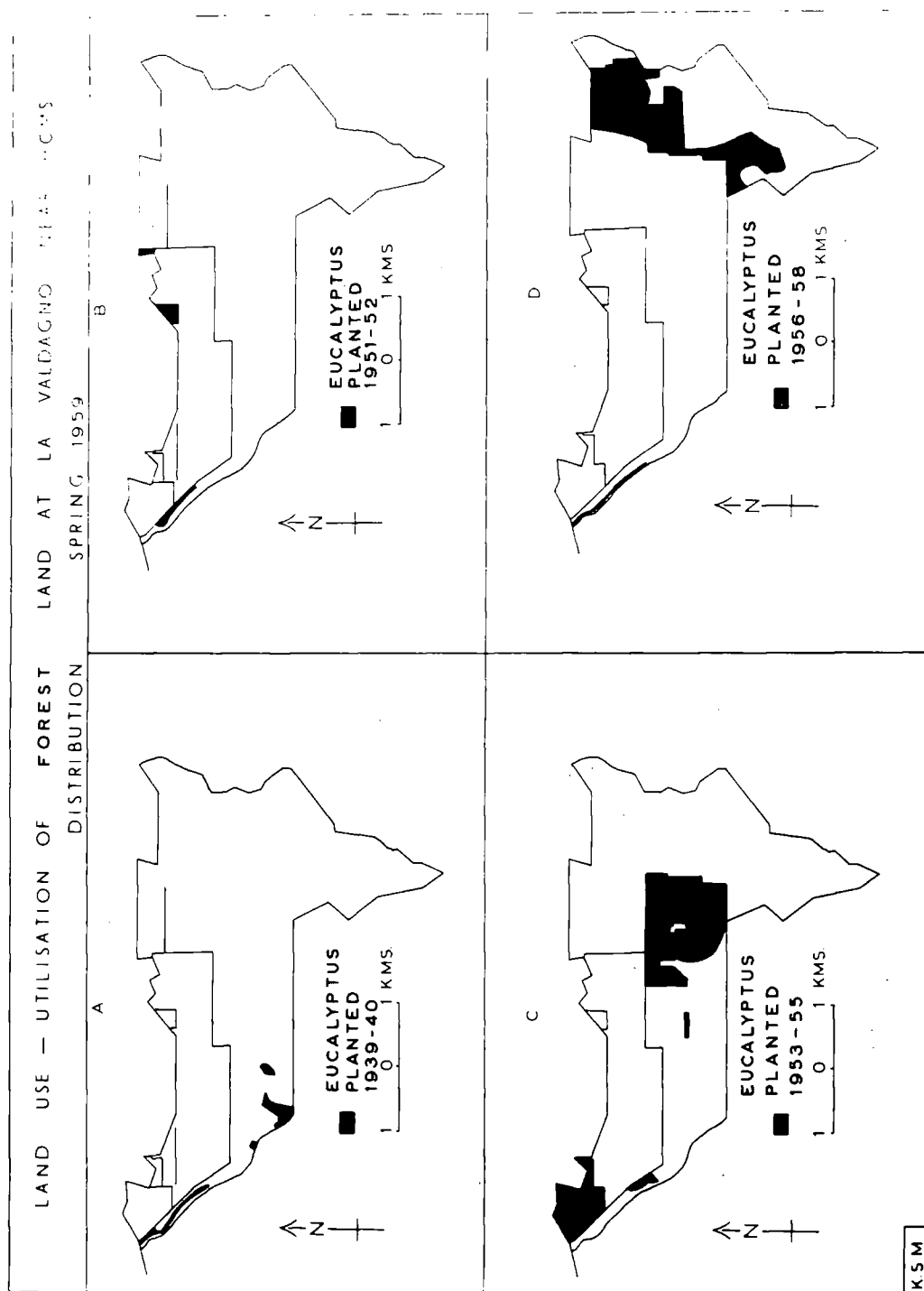


Figure 75

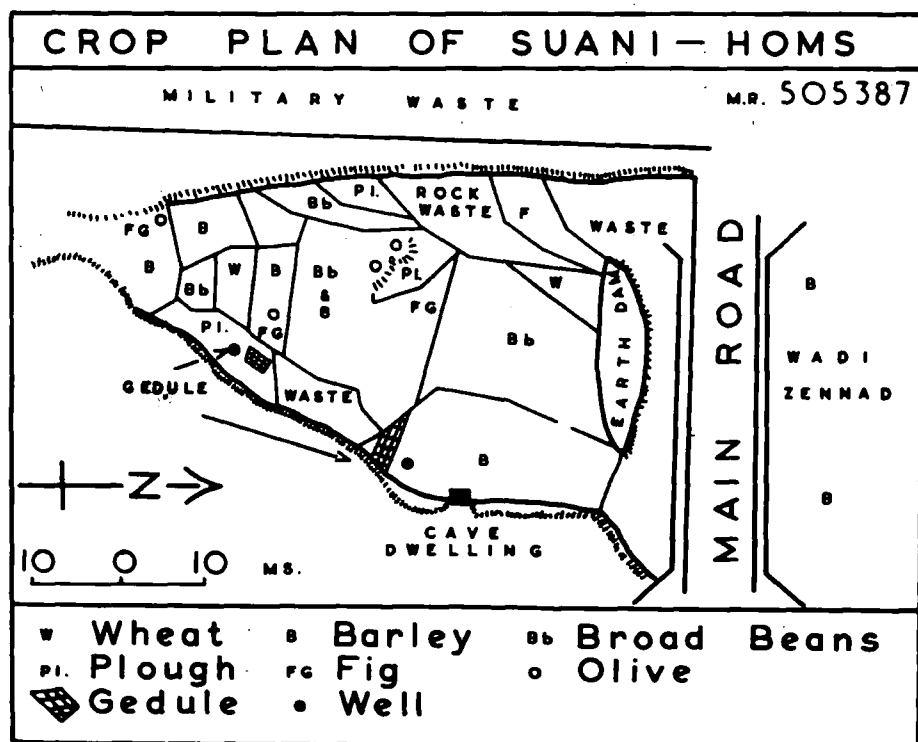
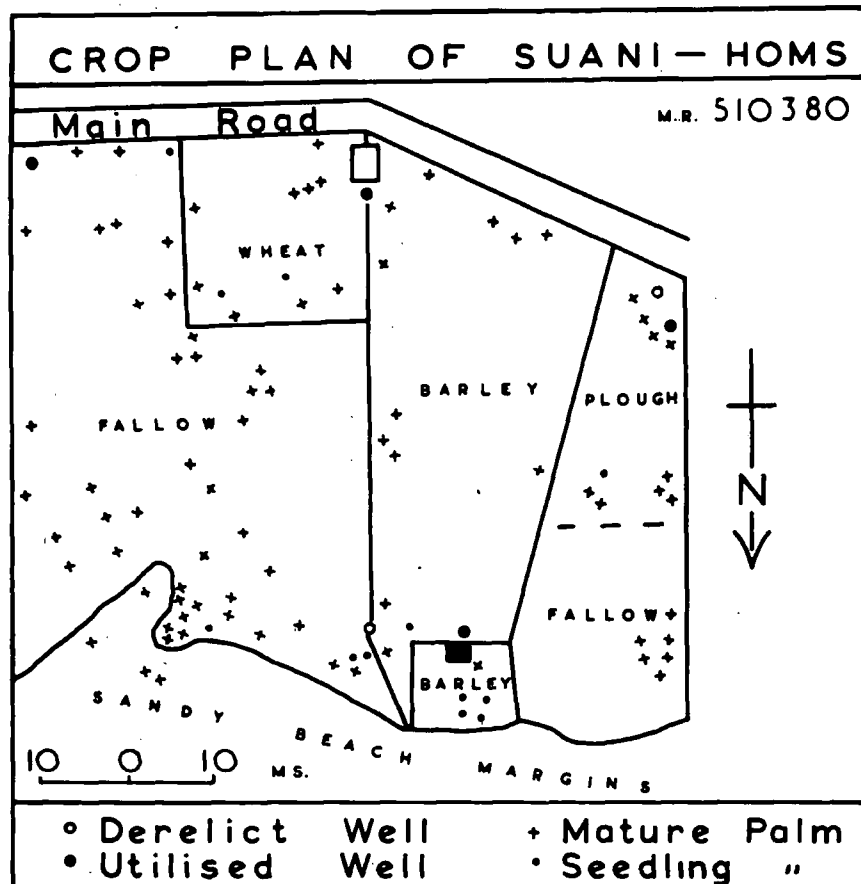
and eucalyptus were planted to diminish the erosion hazard. (Vide Figure 74A). Shortly after this initial work further wind-break and conservation plantations were established:-

- (i) wind-break systems along the course of the Wadi Lebda in the west.
- (ii) conservation stands in the rocky hill area in the west.

The areas concerned are indicated in Figure 75A, and account for a surface area of 25 hectares (Vide Table 33), all of which is planted irregularly according to the configuration of the terrain.

Forestry activity came to a halt during the period from 1940 to 1950, but meanwhile the estate management formulated a scheme for commercial woodland development aimed at producing eucalyptus for export to Italy. The owner of the estate, Conte Gaetano Marzotto, had industrial interests in metropolitan Italy and hoped to build up a cellulose plant based on imports of timber from his Valdagno concession. As we have remarked earlier, negotiations between the management and the Libyan Government have not led to any final plans; nevertheless, the woodland holding at Valdagno has been systematically increased since 1951.

The distribution and the scales of increase in forest estate are indicated in Figure 75 and Table 33, illustrating the rapid enclosure of the peripheral steppe in the region of the Hasnun. All plantations, with the exception of 9 are spaced at 2.5 x 5.0, and area 9 is spaced at 5.0 x 5.0 metres. The last recorded enclosure took place in 1958, but it appeared that further work was in process in 1960 in the so-called



Above Figure 77

Below Figure 76

development area in the upper reaches of the Wadi Hasnun, where bull-dozers were contour ploughing the land in readiness for additional enclosure.

TABLE 33

Area, Tree Variety and Distribution of the Forest Estate -
La Valdagno

<u>Key Number in</u> <u>Figure 75</u> <u>& Variety</u>	<u>Year of</u> <u>Planting</u>	<u>No. of</u> <u>Plants</u>	<u>Area each</u> <u>Year Ha.</u>	<u>Aggregate</u> <u>Area Ha.</u>
74 A Mixed pine, cypress eucalyptus	1938	-	7.50	7.50
75 A Eucalyptus	1939-40	5,000	25.00	25.00
75 B "	1951	5,000	7.50	32.50
75 B "	1952	7,000	8.75	41.25
75 C "	1953	70,000	89.25	130.50
75 C "	1954	50,000	63.00	193.50
75 C "	1955	70,000	90.00	283.50
75 D "	1956	24,000	30.50	314.00
75 D "	1957	83,000	105.00	419.00
75 D "	1958	18,000	45.00	<u>464.00</u>

Data from Estate Office Concession La Valdagno.

As yet, the future of the Valdagno woodland is uncertain, for, political problems apart, the economics of eucalyptus plantations are unproven. The estate management are confident that export of the timber will be possible, and are also expecting that the surge in urban growth will lead to greater demand for timber for specialist work. It is possible, as we shall see later (Chap. 6) that urban growth will necessitate

constructional and industrial use of the timber produced at Valdagno, and recent oil developments point to a further opening; nevertheless, large scale planting without proven results is a risky under-taking. No doubt the estate management can afford such risks, but it cannot be expected that the indigenous farmers will be so keen to hazard productive land to an unknown quantity. Should the Valdagno plantations reveal themselves to be an economic success, then commercially minded Arabs will be presented with a ready-made formula for exploitation of the peripheral steppe and private forestry will move out of the exclusively Italian sphere into the Arab sector.

Land Utilisation in the Italian Sector - A Summary

- (i) There is a clear division of farming activity between winter and summer cropping, although the two are related in respect to organisation of rotations.
- (ii) Winter cropping is directed to production of fodder crops and barley, broad beans and chick pea predominate in the land use pattern of the estate as recorded by the survey of 1959.
- (iii) Up to one third of the apoderated area of the estate lies under fallow or ploughed land during the winter, and the greater part of this area is under preparation for summer cropping.
- (iv) Summer crops represent the cash production of the estate. Tobacco is the main summer crop, followed by lucerne and small areas of vegetables.
- (v) The major problem associated with cultivation is economic; i.e. which crops to grow where irrigation costs are high, and

where double cropping is necessary to reduce static overheads? At present there is a tendency to cultivate crops which offer least losses under semi-irrigation, e.g. barley and broad beans.

(vi) Virtual monoculture of the olive in the orcharding sector of the estate has reduced the flexibility of management - this is especially noticeable in view of the export opportunities for citrus fruits.

(vii) Dry-land cultivation of the olive is giving way to semi-irrigation.

(viii) The generally poor results associated with olive cultivation have encouraged the estate to turn to a new arboricultural opening in commercial woodland. It remains to be seen whether in fact the utilisation of land for eucalyptus woodland is more profitable than for olive groves.

(ix) In comparison with the Arab pattern of utilisation, Italian practice is characterised by:-

- the predominance of no single crop
- Intense varietal specialisation with all crops.

(x) In conclusion it may be said that Valdagno is not absolutely typical of Italian farming throughout the region, rather it illustrates a close approximation of an ideal condition rarely attained by the operators on the demographic estates. Nevertheless, study of La Valdagno brings out the essential differences between the appraisal of land utilisation by indigenous and Italian farmers in the same environment.

Chapter Five

Part Two - An Examination of Farm Management in Misuratio.

- I. Size and Nature of the Farm Business in relation to the Phases of Economic Growth apparent in the Arab Sector of Agriculture in Misuratio.
 - (i) The Size of Arab Farm Units
 - (ii) The Farm Business and Land Use
 - (iii) The position of orcharding in the scheme of Economic Growth
 - (iv) Livestock and the Farm Business
 - (v) Farm Capital
 - (vi) Farm Labour and the Farm Business
 - (vii) The Arab Farm Unit, a Summary.

PART TWO - An Examination of Farm Management in Misuratio.

(I) Size and Nature of the Farm Business in Relation to the Phases of Economic Growth apparent in the Arab Sector of Agriculture in Misuratio.

The Arab Farm Unit.

We have seen that land utilisation in Misuratio varies as much in terms of the type of farmer occupying a given area as it does with environmental conditions. Appraisal of each category of land is a dynamic factor depending upon the stage of development reached by the individual farmer in his evolution through the Phases of economic growth, or upon the diverse levels of economic advance exhibited by the mass of operators utilising the area at any given time. In these conditions it is necessary that examination of the farm business should be conducted with strict reference to the Phases of economic growth. In the following paragraphs we shall discuss the characteristics of the Arab farm units, e.g. total land, irrigated land and farm capital, each in relation to the break down of Phased growth.

(1) The size of Arab Farm Units.

The factors which influence the size of farms in Misuratio have been mentioned in Chapter 3 during analysis of land tenure and the associated topics. In that section it was suggested that:

- (a) The distribution of land still reflected the egalitarian nature of Arab society.
- (b) Variations in land holdings arose through larger or smaller areas of dry-land attached to each farm unit.
- (c) There was little variation in the oasis holdings between one farm and another.

In the present context it is relevant to carry the scrutiny of

farm size to a further degree and ask - to what extent are there variations in land holdings ? and how significant are they in respect to economic growth ? In answer to the former question it may be said that there are both horizontal and vertical cleavages apparent in the present day situation:-

... Horizontal differences in land holding are clearly distinguishable from one oasis to the next, but within confined limits, thus the largest average land holding recorded by the Questionnaire Survey was in Homs Oasis and the lowest average in Zliten Oasis:

Average Size of Farm Units in Misurata/Sample 40 Farms.

Homs	10.2	hectares
Misurata	10.1	"
Zliten	4.8	"
Sahel	9.6	"

The average figures quoted above need further amplification if they are not to be misleading, since the low area returned for the Sahel hides the underlying fact that the farms in the oasis proper average some 14.6 hectares per unit; whilst the hawaza farms on the Wadi Caam Settlement average only 2.3 hectares. Excluding the Caam Settlement, the absolute variation in farm size within the scope of the Questionnaire Survey was 17 hectares in the Sahel to 5.5 hectares reported separately in Homs, Zliten and Misurata Oases. Obviously the larger ranges do exist which were not recorded in the sample taken. In the Zavla area, Theodorou encountered a range in farm size in the Libyan sector from 4.5 hectares to 225.5 hectares, but it is unlikely that this scale of divergence is present in Misurata. (39)

It may be said that the differences emerging between the constituent oases of Misuratio are relatively slight; certainly, the differences in farming technique and rate of capital investment discernable between the Sahel and Misurata Oases are much greater than the variation in farm size suggests.

... Vertical cleavages, i.e. the variations in economic status (which often, though not invariably, tend to be linked to social status), which have been ascribed to the agrarian economy of the area, display well marked trends in respect to farm areas. A synthesis of the results of the Questionnaire Survey referring to the problem of farm size is offered in Table 34. In Misuratio as a whole, there is a distinct tendency for total farm size to increase from the lower scales of economic development to the higher in all the oases. Anomalies do occur, which, in the case of the Sahel El-Ahamed, may be explained through the presence of the farm units from the Wadi Gaam Settlement. In the case of Misurata, the slightly larger size of unit recorded at Phase II must be accounted a result of the superior aggregate number of units within this Phase as opposed to the low representative sample at Phase III. Differences in land holding also tend to be increased in a quasi-geometrical progression up the scale of development, a factor which appears from the average returns for Misuratio in Table 34.

Thus, the size of farms is more important in respect to land distribution amongst the various Phase groups than its distribution throughout the Oases.

Table 34 - Size of Arab Farms - by Phase
Oases of Homs, Sahel El-Ahamed, Zliten and Misurata -
Sample 40 Farms 1959-60.

(a) Homs

<u>Phase of Growth</u>	<u>Number of Farm Units</u>	<u>Average Area/Farm Unit.</u> <u>Ha.</u>
Phase I		
Phase II	4	8.25
Phase III	4	9.25
Phase IV	2	16.00
Phase V		

(b) Sahel El-Ahamed

Phase I		
Phase II		
Phase III	4	13.5
Phase IV	2	17.0
Phase V	4	2.3

(c) Zliten

Phase I		
Phase II	4	6.0
Phase III	6	7.3
Phase IV		
Phase V		

(d) Misurata

Phase I		
Phase II	6	8.7
Phase III	2	8.0
Phase IV	2	17.0
Phase V		

(e) Summary - Misurata

Phase I		
Phase II	14	7.70
Phase III	16	9.43
Phase IV	6	16.66
Phase V	4	2.30

Farm Size and Economic Growth.

The evolution of the agrarian economy in Misuratio has barely begun to gain momentum; the trends in sedentarisation and irrigated farming, which we have discussed, took place within the basic framework of traditional society. Inevitably therefore, there are many residual elements from the traditional system still present in the oases. This applies particularly to the situation with respect to farm size. Farmers at all stages of growth tend to retain interests in and rights to land in most of the natural areas which were delimited in Part One of this chapter. Hawaza farmers have a proportionate share of the steppe grazing lands just as Phase I farmers, even though the former in no way participate in grazing activity. There again, there are several factors affecting the situation which do not appear at first sight:-

- (i) Commercial farmers tend to be precise about the amounts of oasis land under their ownership, since much of it will be registered at the Land Registry. Less advanced operators are more vague about their oasis possessions as their relative importance is small.
- (ii) Hawaza farmers tend to be pre-eminently educated and powerful members of the tribes, thus their claims to shares of the tribal common lands are extensive.
- (iii) The idea of complete personal ownership of land tends to be poorly developed in the pre-commercial Phases of growth, since the precepts of economic life are essentially those of traditional pastoral society, where common ownership is the rule.

The variations in economic development apparent in the oases of Misuratio are such as to render the measurement of the farm business impossible in terms of farm size alone. There

is a marked trend for the size of farms to increase up the scale of growth, but this indicator to the size of farms apart, it is obvious that further yard-sticks are necessary to determine the size of the unit business.

(ii) The Farm Business and Land Use.

Discussion of the broad distribution of the land use categories has indicated the extreme significance of land appraisal. This importance is reinforced by analysis of the distribution of land use types amongst the Phases of growth. Of the forty farms included in the Questionnaire Survey the average farm size was 9.15 hectares, and the oasis to oasis distribution of this land is illustrated by Phase in Table 35. The break-down of the total land into land use categories emphasises the trend as indicated in Table 34. The Sahel El-Ahamed exhibits clear features of intensive growth with a large return of irrigated land, whilst Zliten, at the other extreme, has recorded a small area of irrigated land. Homs and Misurata illustrate characteristics of the same kind, although the more advanced development of Phase II farmers in Homs Oasis shows that the rate of development there, is stronger than in Misurata.

The average distribution of land for the region as a whole is rather illuminating:-

Distribution of Land Use Types Misurata.			
<u>Irrigated Land</u>	<u>Dry-land</u>	<u>Steppe Land</u>	<u>Waste Land</u>
2.55 Ha.	1.17 Ha.	4.68 Ha.	0.67 Ha.

It is important to bear in mind the fact that returns for the steppe areas are inconsistent, partly through the fact that

Table 35 * Distribution of Land Use Types-Arab Farm Units
by Phase-Oases of Homs, Sahel, Zliten and Misurata.

Sample of 40 Farms.

(a) Homs

<u>Phase of Growth</u>	<u>Average amount of irrigated land - Ha.</u>	<u>Average amount of dryland - Ha.</u>	<u>Average amount of steppe land - Ha.</u>	<u>Average amount of waste land - Ha.</u>
Phase I				
Phase II	2.00	1.75	4.50	1.00
Phase III	2.50	1.50	4.00	2.00
Phase IV	4.00	2.00	10.00	-
Phase V				

(b) Sahel El-Ahamed

Phase I				
Phase II				
Phase III	5.25	1.75	7.00	1.25
Phase IV	5.00	2.00	10.00	0.00
Phase V	2.00	0.00	0.00	1.00

(c) Zliten

Phase I				
Phase II	0.75	1.75	3.50	0.50
Phase III	1.50	2.16	3.66	0.66
Phase IV				
Phase V				

(d) Misurata

Phase I				
Phase II	0.86	3.34	4.32	2.00
Phase III	2.00	2.00	4.00	0.00
Phase IV	4.00	3.00	10.00	0.00
Phase V				

(e) Summary - Misuratio

Phase II	1.14	2.42	4.13	1.00
Phase III	2.75	2.12	4.62	0.69
Phase IV	4.34	2.32	10.00	0.00
Phase V	2.00	0.00	0.00	1.00

assessment of surface areas as such is rarely applied to the steppe lands, and partly because the relation between utilised steppe land and total steppe land under any individual control is immensely variable. Thus a Phase I or II operator might utilise some 50 hectares of steppe land in the course of a year, whilst a Phase IV or V farmer might well use only one or two hectares for occasional pasturage. Nevertheless, the relationship between land types in Misuratio emerges clearly from the average statistics suggested above. Steppe land remains an important but residual element in the economic life of the area, indicating the strength of the traditional past. The dry-land areas are generally in retreat as we have suggested earlier, but the position of the peripheral steppe areas is in the balance: it is becoming an area of concentration for shifting agriculture and grazing; simultaneously, the margins of the oases are expanding gradually as enclosure takes place. Irrigated land is becoming the significant land use area in Misuratio, accounting for an average of 2.55 hectares per farm unit recorded.

The results of the Questionnaire Survey listed in Table 35 give evidence of the following features of economic growth in the oases of Misuratio:-

(1) The key indicator of land utilisation at Phase II is the position of irrigated land in relation to dry-land. In both Zliten and Misurata, the farms at Phase II recorded considerably less irrigated land than dry-land. At Homs the position gave only a slight bias towards a greater area of irrigated land.

In all cases, Phase II farms returned a larger area of land utilised in the steppe than in any other area.

(ii) Phase III farms show more diversity than Phase II farm units, since the growth of irrigation facilities for self-sufficiency may affect a larger or smaller area depending upon the capital and skill of the individual owner. Significantly, the area of irrigation becomes expanded above the amount of dry-land when commercial farming really becomes paramount. This factor is well marked in the advanced oases of Homs and Sahel, but the incipient nature of transition in Zliten and Misurata obscures the change of balance there. A further change appreciable at Phase III is the decline in the relative importance of steppe land, which equals or is less than the sum total of enclosed suani.

(iii) Throughout the Phase III stage of evolution, the area of irrigated land increases as capital is accumulated, so that when the move to transitional growth is achieved, the average amount of land irrigated has increased two-fold. The diminution of dry-land which took place as irrigation advanced during Phase III is counter-balanced in Phase V by a tendency to expand into the steppe or on to neighbouring farm areas. It is significant in this respect that Phase III farmers record a similar average holding in the dry-land sector as Phase IV farmers. The large average steppe holding of the Phase IV operators reported in the Questionnaire Survey over-emphasises the value and utilisation of such areas.

(iv) The only Phase V farmers included within the range of the actual Questionnaire Survey are those from the Wadi Caam Settlement. The value of the figures reported at the Caam Settlement has rather limited application to oasis conditions; their importance lies in the fact that the pilot activities of the Settlement give good indication of the conditions which will be relevant to further demographic schemes and to the ex-Italian estates which eventually become integrated into the indigenous farming economy (Vide Chapter 6, p. 669). Interesting comparisons arise from the Wadi Caam Settlement in relation to oasis areas -

- (a) the farm unit comprises irrigated land only.
- (b) livestock are eliminated from the economy and the grazing lands of the steppe and other peripheral areas to the oasis cease to be utilised.

In the oasis hawaza units, the trend towards irrigation of all oasis land is not complete (and may never be complete since the scope for mechanised dry-land farming in the peripheral steppe, and the possibilities of extensive grazing in the inner steppe lands, imply more intensive use of the dry-lands in the future under commercial operators). The most striking advance in land use between Phases IV and V is the greatly increased acreage of irrigated land; for the relationship between Phases III, IV and V in respect to the proportion of irrigated land is geometrical with 2.27 hectares of irrigated land per farm unit at Phase III, 4.34 hectares at Phase IV, and approximately 16-20 hectares average at Phase V. Similarly, the variations in farm size and percentage area of irrigable land increase throughout

the Phases of growth.

We have used the relative areas of irrigated land as a base index to the pattern of economic growth, since it is the use of irrigation water for agricultural expansion which provides the technical mechanism for both indigenous and alien operators in over-coming the greatest environmental problem of the area - i.e. the problem of aridity. Behind this technical advance lie the forces of dynamic economic growth, particularly the accumulation and movement of capital to agricultural investment in the farm business, and the exploitation of livestock and cropping activity. In continuance of this analysis of the farm business, we shall go on to examine the component elements in dead and live stock which make up the farm unit.

(iii) The Position of Orcharding in the Scheme of Economic Growth.

The position of orcharding in Misuratino, and in Libya as a whole, is resting in the balance at the present day. Extensive arboriculture is not an Italian innovation by any means; there were large areas under olive plantations recorded in Roman times and many of the trees found on the Jebel Tarhuna, Jebel Garian and Msellata are of pre-Hilalian origin. Nevertheless, the greater part of the commercial orchards in Tripolitania are a result of Italian colonial development. Since this is so, the question of their maintenance in independent Libya arises as a critical issue.

The Future of the Italian Plantations and the Potential for Arab Development.

(a) Ecological Factors present in the situation.

The olive tree has proved itself to be one of the most adaptable trees in the Libyan environment. The tree is able to exist and fructify in most of the climatic zones of the country outside the inner steppe, and even here it may be grown successfully in good conditions, e.g. the groves of the Ben Ulid. Perhaps the major advantage of the olive in Libya is the fact that its growth is such as to permit the tree to utilise the scanty and variable rainfall when other tree crops would fail completely. There are several crucial disadvantages connected with olive cultivation, which may be summarised as follows:-

(1) The lapse between the initial planting and the first year's fruit harvest may be as much as 15-16 years. This unproductive period is a great draw-back for the small producer, whose capital is thus rendered ineffective for this long period without any return. It has been hinted already that capital is exceedingly short during the initial period of growth, and that there are more profitable methods of development which are available to the small operators. The problem of the lapse between planting and fructification has been answered in Tunisia through a simple mogharsa tenancy system under which those with land and those with capital enter into contract for land development. During the unproductive period of the olive the capitalist supplements the income of the farmer/land holder; when the trees bear fruit, the land is divided equally between the two contractors. In Libya the tendency in both Italian and modern Arab groves is for inter-cultivation to take place during the unproductive period of the olive. In some cases this takes the form of

direct inter-cultivation of cereals between the olive rows, and in others the initial olive plantings are made with double spacing between the trees, the intervening areas being planted with almonds or vines. The problem arising in Libya, where the mogharsa has fallen into disuse, is that inter-cultivation of the olive can only be undertaken with crops such as barley, or alternatively almonds and vines, all of which are commercially marginal in their return.

(ii) Dry-land cultivation of the olive is tending to decline in favour of semi-irrigation. The implication of this movement in orcharding in terms of capital, is to make extension of olive cultivation an even greater capital investment than previously. It is notable that improvements in irrigation in the past decade, particularly in respect to the introduction of sprinkler irrigation, have tended to cut the costs of extensive irrigation considerably.

(iii) The growth of semi-irrigation techniques in Tripolitania is a result of Italian experience in the area, which has shown that aridity reduces the potential production of the olive to a level which is barely economic. The olive tree has tremendous powers of adaptation to the vicissitudes of the rainfall regime, but commercial producers are unable to assume the risks inherent in fluctuating yields which occur under dry-land cultivation. Furthermore, the seven months aridity of the summer months is aggravated by the frequency of the Ghibli wind especially at the critical stages of flowering, when the entire season's blooms

are exposed, and also in the period before harvest, when a prolonged Ghibli withers the fruit and produces a high acidity content in the olive oil.

(iv) Serious environmental problems are present through the influence of the sand dune areas. Mobile dunes, affect both the interior steppe and the littoral in varying degrees. In the region of dry-land olive plantations dune encroachment represents a special menace, since the clean-weeding of plantations means that the advance of the dunes may be accelerated over the smooth ground surface. Quite apart from the incessant creep of the large dune associations, small scale sand accumulation and ripple movement soon develops in the plantation areas. At the present time the characteristic plantation accumulations are confined to the Jefara, but are to be expected in all areas beyond the margins of the peripheral steppe.

(v) The steady but prolonged decline in the depth and fertility of soils of the steppe lands and the concurrent heavy erosion of the terrain may be accounted the main factors limiting the extension of the olive trees in Tripolitania.⁽⁶⁹⁾ It has been pointed out that the olive can survive in extremely thin soils, but production from plantations in areas which have suffered heavy erosion is insufficient to justify commercial development.

(vi) Associated with the problems of erosion is the fact that the water table is sporadically distributed and poorly developed in the steppe except for the small areas of the wadi beds. The great depth of the artesian water table is a great limiting

factor in the steppe. Obviously the cost of water exploration and exploitation is prohibitive for the private operator.

(b) Human Factors present in the Situation.

The exponents of arboricultural expansion in Tripolitania emphasise that the Arabs of the area display a well-developed cultural adaptation to orcharding. Both Mazzochi⁽⁷⁴⁾ and Broc⁽⁶⁹⁾ point out that the long-established groves of the Jebel, and the ginan associated with the coastal oases show that the Arabs already have a good understanding of the elements of tree cropping and may well be persuaded to expand the scope of their activities in this direction. Whilst there is some truth in the contention put forward by Mazzochi and Broc, it should be noted that Arab orcharding is very primitive in every respect, and that the areas of intensive olive cultivation occur mainly in those regions of traditional Berber culture, as for example in Msellata-Kussabat Plain. The successes achieved by the Arab settlers on the ex-Italian estates in the Jefara in the field of orcharding are more a result of Italian training and Italian techniques than of traditional Arab skill.

The indifferent attitude to arboriculture on the part of the Arabs arises basically from the fact that under traditional economic life, land appraisal was conducted exclusively with reference to the demands of the herds; in discussion of land utilisation this was defined as 'non-differentiation' of land zones. Under traditional existence, arboriculture and herding were mutually excluded, and from the time of the Hilalian

invasion it was herding which dominated the scene.

We have seen that the steppe lands of the interior represent the domain of the residual elements of Arab traditional occupance. Corresponding to this situation, the system of land ownership prevailing in these areas is communal in nature, with no acknowledged individual rights to either land or water resources. Naturally, the problem is gradually waning in the face of sedentarisation, and offers only a small scale difficulty compared with the massive dilemma of tribal ownership of lands met with in Cyrenaica. Nevertheless, the unsettled ownership pattern prevailing in the inner steppe is^a barrier to development in the area.

(c) Summary.

The future of the Italian plantations and of Arab developments is closely inter-related. Experience at Wadi Caam and at the ex-Italian farms, indicates that Arab farmers are as yet unfitted to accept the duties of ownership of modern farm units. In more precise terms, farmers who have not moved from the sphere of traditional economy are unable to adapt themselves over-night to the demands of transitional, commercial operations. As we shall show later in examination of the future of the Italian estates, development has to be carefully grafted into indigenous life. In Misuratio, the Questionnaire Survey of 1960 showed clearly that the balance of economic development in the area was still traditional in character; ^{for} only ten farmers of the forty who were interviewed in connection with the

questionnaire were commercial, Phase IV and V operators, and it is suggested by the writer that this proportion over-states the level of evolution in the area. At Wadi Caam, the following broad analysis of attainment is suggested by the estate managers:-

Farmers at Wadi Caam Settlement

<u>Class</u>	<u>Number</u>	<u>Comments</u>
Phase II	60	Complete failures.
Phase III	30	Lack commercial drive.
Phase IV	24	Improved under supervision.
Phase V	6	Successful commercial farmers.
<u>Total</u>	<u>120</u>	

Since the Italian demographic farm units can be operated successfully on commercial lines alone, it is apparent that the arboricultural section of these farms will become assets only when the majority of Arab operators are able to farm at least at Phase IV. Thus immediate acceptance of the orchard legacy left by the Italians is out of the question; it is possible to estimate that the rate of economic growth in the oases will be sufficiently rapid to imply that an appreciable percentage of the Italian plantations will eventually be integrated into the indigenous economy within the next decade, subject to the regional variations and economic provisos laid out in Chapter 6 (pp. 679-80).

Further development of orcharding by the Arabs is subject to the same problems outlined above in relation to the Italian areas of olive plantations. The key factor in the situation will be the speed and direction of economic growth in the indigenous economy. In particular reference to olive cultiva-

tion, three major problems are important for future development in Misurantino.

(1) The Problem of Variety.

The outstanding characteristics of olive varieties in Misurantino is the large range of indigenous and introduced species which are grown on both Arab and Italian farms. The basic indigenous varieties which enjoy wide favour with Arab and Italian farmers are the Induri, Gariani and Rasli. There are a vast number of introduced trees, the most important of which are the following: Chemlali (Tunisia), Frantoio, Leccio, Mariolo (Tuscany), Coratina (Apulia) and others from Sicily. The adaptability of the olive varieties differs immensely from area to area, and it is unfortunate that the Italians failed to undertake region trials of olives before the haphazard distribution began. At the moment, there is still a great amount of uncertainty surrounding the problem of variety in Misurantino, since the influence of the sea winds and the high humidity appear to have an injurious effect upon all the introduced varieties planted by the Italians. On the other hand, local varieties are notoriously poor yielders, and the fruit tends to be low in quality, with a large stone and high acidity content. The immediate answer lies in the grafting the resistant local varieties with imported grafts, particularly Tunisian species, which have proved themselves to be highly successful in the littoral regions of the Tripolitanian Jefara. The successes recorded in the Jefara have yet to be proved in the environment

of Misuratio, and until this is done, there is only a small chance that Arab operators will either graft the trees which they already have or alternatively undertake new plantings.

Grafting the large numbers of established trees in Misuratio will be a costly process. The actual grafting of each tree absorbs a great amount of time and calls for skills which are not generally found amongst Arab farmers. In addition to the expenses incurred in purchase of the grafts and the labour involved in establishing the individual trees, it must be borne in mind that the farmer must also account for the fact that he will lose three or four years production from his plantations. Shortage of capital in the hands of the private operators will obviously be the main obstacle to progress in the field of olive tree extension in the coming years. At the moment, the Nazarate of Agriculture is supporting a scheme for distribution of young olive trees to Arab farmers at the cost of approximately a shilling per seedling. This is an acceptable form of credit for arboriculture, but fails to grapple with the real problem of olive culture; the lack of credit for grafting and regional research into the question of varietal adaptation.

(2) Government Policy and Arboriculture.

The greatest hope for orcharding in Tripolitania lies in the fact that the Nazara of Agriculture and the officials of E.A.O. have consistently implemented a policy favourable to orcharding development. Their efforts have been rather dispersed and unco-ordinated up to the present day, but in

principle, the Government bodies support a development plan for agriculture throughout the province which is based on arboriculture. The main features of this policy have been based upon control of livestock activities in the orcharding areas and upon subsidised distribution of olive seedlings to Arab farmers. There are several important ways in which Government help must be directed if the spread of the olive and associated plantations is to be successful:

- (a) Provision of capital installations for irrigation. This applies especially in the steppe zone, where artesian water resources are to be found only at great depth. Private capital is unlikely to be available on the scale necessary to exploit the underground waters of the area, and any lead in artesian development will have to come from the Government.
- (b) Provision of credit facilities to help tide the farmers over the long period between planting and fructifying. Further credit must also be made available for grafting at a later stage.
- (c) Increased management of the range lands, as a preliminary move to begin control measures over erosion throughout the area. The process will be long and costly, but without control of erosion further extension of orcharding would be an unsound investment.
- (d) A system of care and maintenance for the ex-Italian estates financed by the central authority is essential if the large areas planted by the Italians are not to be rendered useless through neglect and damage. At Kararim the trees are already

declining as the semi-nomadic tribes in the neighbourhood absorb them into their economy for occasional tree crops and firewood.

(3) Does the olive offer an assured future as a leading commercial crop ?

'Olive cultivation will not bring untold wealth, but will mean a reasonable prosperity. A modest but attainable aim.'
Quote Broc. (69) The export of olive oil has been the main export crop of Tripolitania for many years, bringing in an average of £L 1,000,000 per annum in foreign exchange. Nevertheless, the olive oil trade is dependent upon the good will of the Italians and upon the tariff structure prevailing in Europe. The recent emergence of the two customs zones in Europe has yet to be assessed in terms of its effect upon Tripolitanian exports to Italy. Thus the special nature of the Italian trade in oil, which accounts for the greater part of total exports, renders the whole question of olive growing a hazardous business. The trading position of Tripolitanian olive oil is summarised under the following points:

- (a) Of the total production of Tripolitania, only one sixth is exported.
- (b) The large scale fluctuations in olive oil production in Tripolitania are a serious disadvantage to the establishment of firm export markets in a highly competitive field.
- (c) There is a great variability in the quality of oil produced in the area, and the major part of the exports of oil are made up of un-graded qualities. Prices paid for unlabelled oil are poor compared with prices for high quality labelled oils.
- (d) The technical standards of oil processing employed in

Tripolitania contribute substantially to the poor standard of oil. Refining, particularly in the Arab olive presses is very primitive, resulting in a low extraction rate of oil from the fruit and a low grade final product. Most oil is refined again after export.

- (e) The quality of the Tripolitanian produce is further diminished by the high acidity of the oil (7%) which precludes its use as table oil.
- (f) Tripolitanian exports are entirely reliant upon the good will of Italy, since this country takes an annual total of 2,500 metric tons of oil duty free. The new alignment of trade groups in Europe might end this important concession. As the Italian element in the area decreases, the Italian Government will be less prone to maintain the preference to Libyan oil.
- (g) Olive oil is the most important export in the Libyan economy at the present day, but the position is precarious. In view of this, it cannot be expected that olive orcharding will offer sound investment for the future.

We see then, that the position of olive production is essentially marginal in economic terms, and unpredictable in political terms. In view of these findings, it is apparent that olive oil producers in Tripolitania will either have to reduce the profit margin on their crops, or alternatively lose their over-seas market; in either case a substantial decline in the rural standard of living is implied. We shall examine the trends in rural and urban living standards in the following chapter, and show that to compete with the urban sector of the economy in future years, the agrarian economy will have to offer a good standard of living for farm operators if the movement from the land is to become a controlled process. The attraction of European standards of living prevailing in the capital based upon oil wealth will preclude any marginal or subsistence level farming in the oases. Thus if the

production of olive oil and its by-products offers only a poor future it is useless to embark upon an extensive orcharding policy at the present day. In the present climate of social and economic growth, what is acceptable poverty today is unthinkable tomorrow. Development activity must take account of this in the same way that such activity should be integrated closely into the present state of indigenous agriculture.

The maintenance of the present rate of production of olive oil and associated products, and the future expansion of the olive tree plantations both offer considerable problems. Arboriculture in the indigenous economy is still the province of the self-sufficient producer in Misuratio. Commercial Arab farming in the area has not shown any marked tendency towards orcharding, but there is some possibility that as economic evolution advances, the olive plantations on the ex-Italian demographic farms will be integrated into the Arab farm business. Nonetheless, there are many major problems yet to be overcome before the future of the olive is assured.

Prospects for other Orchard Trees

Almonds

There were some 450,000 almond trees reported by the 1953 estimate by the Nazara of Agriculture, of which 400,000 were in production. As with the olive tree, the almond is essentially an Italian introduction into Tripolitania, although some small areas of the Jebel were under cultivation on a local scale. The position of the almond was entirely

supplementary to the olive in the plantations established by the Italians during the colonial period, and only 20% of the total plantings of almonds were in individual stands. As the olive trees have come into production, so the almonds have declined and have been replaced by young olive trees.

The country lacks any indigenous varieties, and the majority of trees are imported; e.g. the Pizzuta, Romana and the Fragiulis. Since the almond trees take as much care and irrigation as the olive, it is generally accepted that their profitability is low, especially in the coastal regions where the sea winds have an adverse effect upon growth. The export almonds are produced in the Jebeline areas and the production from Misuratio is mainly of local importance. There is no scope for expansion on the basis of present experience.

Plum, Peach and Apricot.

Development of these varieties has thus far been confined to the coastal areas and they constitute only small elements of the 'kitchen garden' on commercial farms and occasionally form part of the richer self-sufficient farms in the oases. The commercial future of these fruit trees is largely unexplored since Italian farmers tended to concentrate upon the olive, which it was their statutory duty to plant under the terms of the contract either with the Government or with Ente. The rise in urban living standards and the increasing numbers of Europeans in the towns seem to point to the fact that there could be a sound internal market for the fruits. From the

point of view of the Arab farm business, the cultivation techniques necessary for successful soft fruit orcharding could only be found in Phase IV and V farmers, where skill, commercial mindedness and capital are available. This sector of orcharding remains an unknown quantity, but a potential sphere of activity for the future.

Citrus orcharding

The expansion of agricultural production in the Tripolitanian Jefara has been achieved through the development of citrus orcharding by large commercial farming units. These developments have scarcely affected Misuratino. The hawaza and private concession units represent the chief sectors of citrus growing in the Jefara; in Misuratino these Phase V producers have not found it possible to take part in the citrus boom partly because the difficulties of production are greater in Misuratino, and partly because the exclusive dependence upon the olive at both La Valdagne and Concession Volpi deprived the managements of a basis for rapid expansion of acreage when the boom first got under way. The nature of the Arab Phase V farm units, most of which are to be found at the Wadi Caam Settlement, precluded orcharding from the start (Vide Chapter 6, p.669).

The current trend in citrus exports points to the fact that there will be a steady market for Tripolitanian produce if standardisation of produce is achieved before the boom period ends. It appears unlikely that the farm units of

Misuratino will be able to initiate citrus orcharding and break into the market before the Jefaran producers consolidate their lead.

The orcharding policy at present being implemented by the Government in Tripolitania aims at increasing the area and number of trees throughout the area. Concurrently, livestock activities are being curtailed in the zones adjoining the plantations. On the basis of the fore-going survey of the orcharding problem, the following points must be made in respect to Government policy:-

- (i) The discernable trends in indigenous economic growth indicate that orcharding is on the decline.
- (ii) The ex-Italian areas of plantations may be integrated into the indigenous economy de facto as a result of Arab occupation of the Italian farms.
- (iii) The future of the orcharding industry, particularly in respect to the olive tree plantations, is uncertain.
- (iv) Is arboriculture a more profitable means of exploiting the resources of the environment than livestock rearing in the long run? And in any case, are the two industries mutually excluding?

It must be admitted that development of the steppe lands remains the greatest dilemma of the agricultural economy. It is difficult to see that orcharding alone will answer this dilemma in Misuratino, where environmental and human factors are militated against it from the outset.

Orcharding and the Size of Farm Business in Misuratino.

In order to give some idea of the scale of orcharding in the Arab farm business, a summary of data returned in the Questionnaire Survey is given following; the figures apply

to the Oases of Homs and the Sahel El-Ahamed only:-

Table 36 - Distribution of Orchard Trees-By Phase-Homs and Sahel

<u>Phase</u>	<u>Ave. Number of Trees per Farm Unit</u>					<u>Comments</u>
	<u>Date</u>	<u>Olive</u>	<u>Citrus</u>	<u>Almond</u>	<u>Vine</u>	
	<u>Palm</u>					
Phase I	-	-	-	-	-	No Farms surveyed
Phase II	30	10	2	19	13	Four Farms
Phase III	22	23	6	3	19	Eight Farms
Phase IV	20	9	16	12	10	Four Farms
Phase V	4	17	0	0	0	Four Farms-Wadi Caam Settlement

The orchard holdings of all the Arab farmers included within the survey are relatively insignificant in numerical terms, indicating the lack of specialisation applied to tree crops in the area. Whilst the date palm represents the major tree on most farms, its importance relative to olive and citrus trees declines up the scale of development. The mixed nature of tree cropping is apparent at all Phases, illustrating the 'kitchen garden' status of the orchard.

Under traditional farming, the distribution of palms acts as a sound index of the size of the farm business, since the dates and other by-products of the palm are important to the self-sufficient farmer. In terms of income Phase II farmers in the Oasis of Homs all recorded half their total income from tree crops, whilst farmers at Phase IV relied for less than an eighth of their income from orcharding activity. The changing bias from date production to olive oil production, reflected in the figures presented in Table 36, is also marked in respect to income from the different fruits. The olive is pre-eminently a commercial crop at Phase IV, whilst there is

little or no marketing interest in the date, which is an occasional market crop at Phases II and III.

It is clear from the evidence available in the Questionnaire Survey and the land use survey, that orcharding is a diminishing element in the farm business in Misuratio.

(iv) Livestock and the Farm Business

The outline of the livestock dilemma in Libya is given in Chapter 6 (p.573), but as a preface to this later discussion, analysis will be given here of the position of livestock in the farm business.

Livestock distribution amongst the various Phases of growth exhibits the same complexity, which has already been mentioned with reference to orchard trees; the factors which obscure the situation may be itemised as follows:-

- (a) the fact that livestock represent more than an economic holding. There is considerable prestige attached to the ownership of a large number of beasts, which is more of a social than an economic matter. Thus a livestock holding above and beyond the demands of the household and the farm is a frequent occurrence.
- (b) livestock are utilised both as beasts of burden and sources of meat and milk produce for the farm household.
- (c) the variability of the climate, and in particular the variability of rainfall in the steppe lands, results in violent fluctuations in livestock numbers throughout the area. Two years successive drought has been known to reduce the livestock population by as much as two-thirds.
- (d) in periods of drought the regional pattern of ownership changes radically. Semi-nomadic and nomadic peoples are willing to sell a large proportion of their livestock to the oasis farmers to help out their losses. The oasis farmers on their part are prepared to accept the risk that their fodder and grazing resources may fail, on the

understanding that if they can maintain the beasts they purchase, then there are large profits to be made in the years following the drought, when livestock and livestock products are in short supply. During the 1960 drought, for example, the semi-nomadic groups of Misuratino were congregating in the oases, and livestock was beginning to move into the hands of the oasis farmers.

Table 37 - Distribution of Livestock-Arab Farms in Oasis of Homs and Sahel-By Phase:
Total 20 Farm Units

<u>Phase of Growth</u>	<u>CATTLE</u>		<u>SHEEP</u>		<u>GOATS</u>		<u>CAMELS</u>	
	<u>Adult</u>	<u>Young</u>	<u>Adult</u>	<u>Young</u>	<u>Adult</u>	<u>Young</u>	<u>Adult</u>	<u>Young</u>
Phase I								
Phase II (4)	6	10	46	18	36	20	10	18
Phase III (8)	8	24	18	42	30	52	22	34
Phase IV (4)	6	8	14	20	14	16	6	6
Phase V (4)	4	4	6	4	0	2	0	0
	<u>CAMELS</u>		<u>HORSES</u>					
	<u>Adult</u>	<u>Young</u>	<u>Adult</u>	<u>Young</u>				
Phase I								
Phase II	2	0		8	8			
Phase III	6	24		12	16			
Phase IV	2	4		8	8			
Phase V	2	0		0	0			

Figures in brackets indicate number of farms included.

In spite of the confusion surrounding livestock ownership, the over-all trend in livestock holdings may be seen in Table 37. In the traditional sector of the economy, the largest holdings were recorded on Phase III farm units, whilst the large livestock population associated with Phase II farms is readily apparent. The gulf between Phase II and Phase IV operators is particularly noticeable from Table 37 in relation to the respective holdings of sheep and goats; Phase II farms

food supply and a means of exchange. The location of animals in Phases I and II tends to be in the steppe grazing lands of the sabila, and rarely are they brought into the oases. The indigenous sheep are mainly Barbary fat-tail species, with great resistance to the arid conditions and a capacity to make the best use of the sparse grazing in the interior. Whilst they are greatly prized for the variety of use to which they may be put, yielding small quantities of wool, milk, meat and gut, they have no specialised value whatsoever in terms of export markets. In commercial farming, these animals are not important, in most cases being a residue of the original flock kept for milk and other domestic purposes. Under commercial farming the beasts are left to scavenge in the dune and waste areas around the oasis, or occasionally are tethered in the suaní.

The Camel, or more correctly the dromedary, is the specialised transport animal of the interior, and as such is associated with Phases I and II. As economic evolution progresses, so the dromedary loses its place as the indispensable beast of burden, and reverts to a status of general purpose work animal. Their particular use in the oasis is as traction power for the dalú well, although they are also used extensively for ploughing. All farms which were covered during the Questionnaire Survey of Misuratio reported having at least one dromedary.

Cattle are mainly concentrated on the oasis holdings, and associated with Phases III and IV and V. The Swiss-Brown

variety, which enjoys a wide distribution throughout Misuratio, is a general purpose animal, being used as much for farm work as for its produce. In many ways it may be regarded as commercial farm replacement for the camel. On most farms, the cattle were kept on the farming area and rarely scavenged with other animals.

Horses are kept by Arab farmers either as symbols of prestige, or in some cases as a means of investment. In the former case, they are finely bred beasts kept by the notables of the tribe for formal occasions and in no way represent part of the economic system of the farm. Small farmers at Phase IV often buy foals from the market, graze them on the fallow and harvested fields, with the eventual hope of selling them to Italian farmers who use the horse as the prime work animal on their farms.

Donkeys are the characteristic beasts of burden and means of transport for most of the small farms in Misuratio. They have the great advantage of cheapness of purchase and are maintained at very small cost.

The livestock holdings on Arab farms are significant sources of income at most Phases of development, although there is a marked trend for this proportional position to decline up the scale of economic growth. The animals are of paramount importance in assessment of the state of economic growth, in part because the number and type of holding offers a pointer to the economic bias present on any given farm, and in part

because the livestock population is the most potent factor in hidden capital, which may be revealed when traditional farmers are moving into the commercial sector.

(v) Farm capital

In the Questionnaire Survey of 1959/60, farmers were asked to evaluate the various component factors in their farm capital. To help farmers in this task, the question was broken down into the heads which appear in Table 38 with the major division between fixed capital and operating capital. The writer faced the immediate problem of establishing cash values for fixed capital in a climate where subsistence farming was general. In non-commercial Phases of activity the accumulation of farm capital in terms of fixed investment was more a matter of time and effort than capital purchase. To overcome this difficulty, the Arab farmers were asked to estimate what the sale value of their property was at the present day. Naturally, estimates of this kind must be treated with some reserve, but it is suggested that, in spite of anomalies, the pattern emerging from the answers given by the farmers gives a sound idea of investment in Misuratine.

Evaluation of land values proved difficult, since most of the farmers occupy land which was allotted to their family at the time of the dissolution of cabila ownership of land in the oases. The problem is increased further since the value of land varies over short distances, corresponding to the availability of water, the presence of dunes and access from the main

lines of communications. These variations in land appraisal for cultivation are associated with the fact that the state of development already introduced to a plot of land obviously affects the market price; Suani provided with water supply facilities offer a better proposition than those without, the actual inventory costs of fixed equipment apart.

The confused ownership of land in the steppe, which has been mentioned in the preceding chapter, tends to complicate the land value system. The Arabs have access to and use of the land, more or less on an exclusive basis within the limits of the cabila holding in the steppe. The value of the land cannot be assessed, since it does not belong to the individuals, nonetheless, the land represents a significant source of income and an integral part of the farm system. In the summary of findings returned in the Questionnaire Survey, the fixed capital appearing under the head of 'Land' excludes all estimates for steppe holdings (Vide Table 38).

Phase I operators, are semi-nomadic peoples and are thus outside the sphere of capital investment. In fact, many of the semi-nomads have oasis holdings, with a small establishment of trees, but the difficulties presented by their unsettled existence precluded their inclusion in the Questionnaire Survey.

Phase II farmers record the bulk of their investment in fixed capital, especially in farm buildings and plantations. The apparent high level of investment in trees results from the large holdings of date palms in the oases and the subsidiary

ginnan areas in the peripheral steppe lands. The significance of the high values set against farm buildings and trees is that they are accumulated legacies rather than conscious investments. In Chapter 6, the position of these two forms of 'invisible income' is examined in relation to the standard of living of the farm family (Chapter 6, p.718). Fixed capital investment represents more than twice the fluid working capital of the farm unit.

Table 38

Farm Capital Reported in the Questionnaire Survey for Homs and Sahel El-Ahamed by Phase of Growth-Average per Farm.--Sample of 20 Farms

	<u>Phase II</u>	<u>Phase III</u>	<u>Phase IV</u>	<u>Phase V</u>
<u>Fixed Capital Investment</u>				
Oasis Land	32.5	60.0	65.0	20.0
Farmhouse and other Builds.	300.0	900.0	1370.0	340.0
Trees (Productive & unproductive)	321.5	303.0	374.0	118.0
Fixed installations	67.5	276.6	289.2	465.0
<u>Total Fixed Capital</u>	<u>721.5</u>	<u>1539.6</u>	<u>2098.2</u>	<u>943.0</u>
<u>Working Capital</u>				
Livestock Holding	295.5	187.2	154.0	90.0
Farm Equipment	62.7	282.0	1279.0	-
Stores (Seed etc.)	27.5	114.2	110.0	15.0
<u>Total Working Capital</u>	<u>385.7</u>	<u>583.4</u>	<u>1543.0</u>	<u>105.0</u>
<u>Average Capital per Farm</u>	<u>1107.2</u>	<u>2123.0</u>	<u>3641.2</u>	<u>1048.0</u>
<u>Average Capital per Ha.</u>	<u>340.9</u>	<u>353.8</u>	<u>560.2</u>	<u>524.0</u>

Herding in the steppe lands is an important activity in early Phase farm units, and a large amount of time is spent by the farm family in tending the herds. Semi-nomadic life, indicated in the scheme of growth by Phase I, implies the use of all available labour, not intensively, but for long periods. Shepherds normally travel with their flock and use the family members to care for the segments of it when pasture is thinly distributed. Practice varies from cabila to cabila, but the normal routine under steppe conditions is for the males in the family to tend the flocks, whilst the women stay within the camp confines. Occasionally, semi-nomadic groups undertake the care of herds belonging to sedentary peoples, either for repayment in kind or in cash; in this case, man-labour is more intensively employed. Thus, Phase I Arabs would return a high rate of man days spent in active occupation.

Farmers at Phase II exhibit ~~many~~ characteristics of semi-nomadic peoples, especially in terms of time spent in movement from areas of shifting cultivation and grazing to the oasis lands. We shall suggest later that the time expended by the early Phase groups is inefficient and, with reference to the size of the farm business, it is relevant to observe that the total man labour days expended by the groups tends to be an inverse relationship, i.e. the less developed peoples record a high utilisation of labour, and the more developed groups, within well defined limits, record less man labour days per annum employed in the farm business.

Probably the least amount of labour is invested in the Phase III units, particularly by farm families with large land holdings in fertile areas. The standard of living of the self-sufficient farmers is easily provided by the production from the suani and from the herds. Lacking commercial drive, the Phase III operator, using simple irrigation techniques, can extract a comfortable living from the land and spends as short a time as possible in working the farm. There are many exceptions to this tendency in areas where brackish water or dune encroachment reduce the fertility of the soil and make living hard for the small farmer. Nevertheless, Phase III farmers present the most immovable obstacles to development enforced from above. Both the F.A.O., and the Nazara of Agriculture have experienced difficulty in spreading improved agricultural methods amongst the so-called 'rich' self sufficient farmers. The apparent conservative resistance to change by Phase III farmers is a transitory attitude. In the following paragraphs, the study of a case example of Phase III farming will show how the lack of application to farm work, which characterises this Phase, is in itself an important factor in bringing about change from traditional to transitional attitude to the farm business. The farmer in question is a member of the cabila Hasnun of the Sahel, having oasis lands in the fertile zone to the east of Wadi Hasnun in the region of the shrine of Sidi El-Fergiani.

The writer had opportunity to become acquainted with the farmer in 1958 and thereafter it was possible to keep a close

record of development on his farm. The farm unit consisted of 10.5 hectares, of which five and a half hectares were irrigated suani, two hectares dry cultivated, and three situated in the steppe. Irrigation water was supplied by means of one dal well which was situated central to the suani. In fact, the water supply provided sufficient only for poor irrigation of the fields, since a large surface area of the suani was in use each year (5 hectares in 1959/60). The dispersion of irrigation resulted from the high value placed upon the production of the date palms, of which there were 40 located on the farm. The Arab farmer felt the need to water all his palms, since his household was reliant upon date production for human and animal feed, wood, beer and spirits. Since the palms had to be irrigated, inter-cultivation of grains and vegetables was introduced into the suani as supplementary cropping. The cropping pattern in 1959/60 was as follows, all inter-cultivated:-

<u>Field 1 (1½ ha)</u>	<u>Field 2 (½ ha)</u>	<u>Field 3 (½ ha)</u>
Barley	½ ha. barley	½ ha. wheat
	½ ha. pepper	½ ha. carrots
	½ ha. fallow	½ ha. onions
<u>Field 4 (1½ ha)</u>	<u>Field 5 (½ ha).</u>	
½ ha. broad beans	½ ha. tomato	
½ ha. vetch	½ ha. <u>gasab</u>	
½ ha. ploughed	½ ha. broad beans	
½ ha. fallow	½ ha. fallow	

In addition to the field system mentioned here, a small 'kitchen garden' of approximately ¾/½ hectare was situated alongside the haush, with the following mixture cultivated haphazardly:-

'Kitchen Garden'

Prickly pear
5 olive trees
5 citrus trees
15 vines
1 seedling almond
1 fig tree

The year 1958 was a good year for farmers in the Sahel, and the farmer in point finished the harvest with a large surplus over his household and seeding requirements. In common with most farmers at this Phase of evolution, he was prepared to market the occasional fortuitous surplus in Homs. He made a cash profit of £200 on the market activities. In the same year, rainfall in Cyrenaica was poor, and several of the bedawin herds were brought west into Tripolitania through the Sirte market. The farmer in the Sahel, still with an interest in livestock, invested most of his capital in the cheap stock available from Cyrenaica.

The expenditure of man labour in the 1958/59 season exhibits an interesting distribution:-

<u>Oasis Man Labour Days</u>		<u>Steppe Man Labour Days</u>	
Men	220	Men	300
Women	320	Women	200
Children	150		
Operator	<u>250</u>		
<u>Total</u>	940		500

The total man labour days in-put amounted to 1640, of which 500 were accounted for by livestock activities in the steppe, and 200 by the employment of a dalu operator. Further analysis of the figures shows that labour in-put by women and children

in the oasis gardens equalled that by the male members of the family. Since women and children are normally confined to harvesting and animal herding, it is apparent that the labour expended upon the cultivation of the suan in that year was extremely low. This fact is reinforced by a brief break-down of the farmer's working calendar. He loses as many as 50 days at the time of Ramadan, partly through the rigour of the fast, and partly through the festivities which terminate the period. Visits to market vary with the season of the year, but in spring and autumn especially, he may travel to the markets at Homs, Suk El-Khemis and Misurata at least twice a week. Visits to market are much more than a commercial affair in the oases, and act as social gatherings, sabila meetings, and tax assessments. The time spent at market by any farmer is no indication of the commercial bias of his farm unit; the farmer in question spent five days in Homs market within a fortnight, his only transaction being the sale of a lamb. The more a farmer is concerned with livestock, the greater the necessity to travel to market, since each of the markets tends to specialise in different beasts. No work is done on Fridays, the holy day, except by the most menial of labourers.

The success achieved by the farmer with crop sales in 1959/60 led him to increase production from the suan in the following season. The dalu well, which had been adequate for the light irrigations required by inter-cultivation of the date palms, was unable to meet the demands of the intensified

cropping scheme inaugurated in 1960/61. The answer to the problem was to install a mechanical pump in the well. Thus, in the December of 1960, the farmer invested his time, previously dissipated in unprofitable market visits and semi-social activities, in part-time employment in Homs Village. The livestock holding in the steppe was sold at the same time before the drought fear spread through the area. His son, son's wife and child were brought in from the steppe to help with the increased amount of work required by the new interest in cropping. In the late spring of 1961, a diesel motor pump was installed in the well with financial credit from Barclays Bank DCO.

The wheel had turned completely within a matter of two years. From a position of contented self-sufficiency, the farmer had moved over to commercial production. Labour had been concentrated in the suani of the oasis, and the wasteful expenditure of labour on livestock and the working of the dalu had been terminated. The important element in the situation was the installation of the motor pump, which was only possible because the low in-put of labour by the farmer permitted him to take employment outside agriculture and thus guarantee the re-payment of the bank loan. The case we have quoted in the Sahel (Example 6) is by no means an extreme instance of changing attitudes to farm labour and the farm business as a whole by the conservative and rather indolent 'rich' self-sufficient operators. The pessimistic approach of the Nazara of Agriculture

and P.A.O. to these farmers is unjustified; the apparent gulf between subsistence and commercial operators is quite narrow and may be closed largely through the mechanism of growth intrinsic in the Phase III situation.

Under a commercial system of farming, the importance of family, unpaid labour falls away in the face of increased employment of hired workers. The main cause behind this trend may be attributed directly to the effect of response to market conditions. In self-sufficient agriculture, the timing of the harvest is a matter of convenience, whereas in commercial farming, the operator has to pay a close regard to the fluctuations in market prices at different periods of the harvest. In the Sahel, for example, farmers at Phase IV are aware that a tomato crop on sale in Homs before the bulk of the Jefaran production is distributed from Tripoli market will bring far better prices than a late crop. To cope with the intensive period of harvest and sowing, farmers are forced to turn outside the labour resources available through the family.

Movement away from the land by young people from Phase IV and V farm families further accelerates the trend from family to hired labour. As we saw with the case example of the Phase III farmer of the Sahel El-Ahamed, labour is concentrated in the oasis lands as the herds decline in relative and absolute importance. In Phase IV it is general for engine power to replace the animal power used for the well, a factor which reduces the wastage of labour in irrigation (Vide Hill, R.W. (9)).

Later, in Phase V, the entire reticulation system is rationalised in respect to the siting of the well and the plan of the distribution net-work.

The intensity of land utilisation necessitated in the oasis gardens, where horticultural techniques are more relevant than large scale methods, means that human labour will be an important part of the farm business. It has been noted by Hill in the Jefara, that development at the present day in hawaza units is based upon irrigation, and that the irrigated areas of Tripolitania are the soundest basis for agricultural expansion. In Misuratio we have pointed out the gravitation in land utilisation towards the oases. Thus, intensiveness of land utilisation in garden culture appears to be the future alignment in indigenous agriculture and will imply a heavy reliance upon human labour. To some extent, the demand for labour can be met from part-time work by small operators on larger units; there is also a latent source of labour which is released as livestock herding in the steppe lands decreases. The discernable drift of farming population from the land, which is discussed in earlier reference to social evolution, does present several problems of future labour availability which might not entirely be redressed by the release mechanism from herding. This problem is examined in more detail later in the Chapter 6.

(vi) The Arab Farm Unit - A Summary

Study of the indigenous farm unit in Misuratio illustrates and gives supporting evidence to the schematic plan of economic

growth. Each Phase of evolution of the farm business differs in all basic points from the preceding and succeeding Phases. We have seen that there are distinct groupings of farm business types within the framework of the oases, in spite of the recent emergence of society from nomadic occupation, and the over-all egalitarian distribution of land holdings. Each of the six measures we have used to assess the size of the farm business in Misuratio is closely inter-related with the others; growth is dynamic in the sense that advance in one sector is unimportant without movement in another, or that advance is a causative factor in the evolution of other sectors. Thus, progress from traditional to transitional economy is marked by the following points:- farm size is seen in terms of the oasis holding; land use becomes more intensive as a result of declining pre-occupation with the steppe lands; herding diminishes and releases capital for investment in farm equipment and fixed installations; increased capital for investment permits a rationalisation of techniques, especially in regard to irrigation; and increased availability of irrigation waters permits a steady surplus of production. There are other factors involved, but the component elements evaluated in this discussion are particularly significant to Phased economic growth and the farm business.

Chapter Five

Part Two - An Examination of Farm Management in Misuratio

II. Investment in the Farm Business in relation to the Phases of Economic Growth apparent in the Arab Sector of Agriculture in Misuratio.

- (i) Investment in Agrarian Land Development.
- (ii) Investment in Agricultural Equipment and Supplies.
- (iii) The Human Investment - Drift from the Land
during Economic Growth.

Summary - Indigenous Investment in Development.

PART TWO - An Examination of Farm Management in Misuratio.

(II) Investment in the Farm Business in relation to the Phases of Economic Growth apparent in the Arab Sector of Agriculture in Misuratio.

The evolution of society from a traditional basis to transitional growth is a compound of many factors. From the point of view of a geographer, the significance of prevailing influences of environment and human disposition cannot be underestimated. Nonetheless, account must be taken of the economic implications of growth. The key force behind economic growth in terms of economics is the rate and direction of investment into the component sectors of commercial activity. In this respect, the work of Rostow is most relevant.⁽⁶³⁾ Rostow suggests that there is a critical change in the rate of investment in the agrarian economy throughout the Phases of growth. In large scale units, he indicates the movement of investment in the traditional, the transitional, the take-off and mass consumption stages of development. The change of economic growth comes about through increased investment in production. In Libya, which is largely traditional in character, the increase in investment is concerned with the advance to transitional economy, the causative influence being a rise in the investment rate to about 5% per annum.

Rostow, and other economist and social historians have demonstrated these major movements in economy using broad geographical units, and a large time scale.⁽⁶³⁾ The principles emerging from the so-called Rostow Doctrine are important to

the geographer, not in the general context, but rather in local focus. Fundamentally, we are asking the question, untouched by economists and historians; what is happening to the farmer, and the farm unit in the climate of economic growth prevailing locally - in this case in the Oases of Misuratio ? In the following paragraphs we shall discuss the rates of investment apparent in the area under the three headings:-

- (i) Investment in Agrarian Land Development.
- (ii) Investment in Agricultural Equipment and Supplies.
- (iii) The Human Investment - the Drift from the Land during economic growth.

In each section it will be shown how the over-all trends in investment are affecting the oases and a case sample will be given to illustrate the movements at field level.

(i) The rate and direction of Indigenous Investment in Agrarian Land Development at the various Phases of Economic Growth.

Sedentarisation, which takes place during the early growth of traditional society, brings about a re-appraisal of land use and land values. Pastoral occupance of the steppe lands and the system of communal rights in land resulted in a non-differentiation of land use as between orchard or palmery and grazing land. The general application of communal land tenure throughout Tripolitania discouraged individual attempts to improve land as we pointed out earlier in Chapter 3. Thus the beginnings of land development in earnest may be dated to the late decades of the Nineteenth Century. The clear timing made possible by the move from nomadic to sedentary occupance helps the assessment of investment in the oases very considerably. From the writings

of the Europeans who visited the Karamanli Court at Tripoli and from subsequent work by European travellers, the pre-sedentarisation aspect of Misuratino was one of small palm oases scattered along the length of the littoral.⁽⁵¹⁾ Garden culture was limited to the immediate vicinity of the villages and carried on by small groups of Arbi peasants or by the static marabout cabila. Since that time the palmeries have been extended to form a more or less continuous strip along the littoral of Misuratino, and garden areas have expanded to include all the palmeries and some minor peripheral zones beyond. This radical change in the nature of the oases has been brought about by steady investment in development. Each Phase of economic evolution results from a movement in the direction and rate of investment in the preceding Phase. The gradation of Phases from a position of semi-nomadism to hawaza commercial farming, serves to give the impression of consistent growth; in fact, there are several critical breaks involved in the process, which result from modifications in the scale and alignment of investment. In the following paragraphs we shall analyse the type of investment characteristic of each Phase of growth.

Phase II.

The investments undertaken by Phase II farmers are limited by continued operation in the steppe lands. Whilst semi-nomadism tends to be replaced by seasonal transhumance in this Phase of growth, full sedentarisation has not taken place. At this stage of development there is a certain amount of mental resistance

by the Arabs to the idea of sedentary life. We quoted earlier (Chapter 4) a case where a member of the En-Neglahat cabila exhibited all the characteristics of sedentarisation, but regarded himself as a man of the steppe. This is an attitude common to many of the operators in this class and is important since it means a large scale investment in livestock on the one hand, and, on the other hand, a disinclination to invest money in the oases, which are thought of as temporary resting grounds.

The main classes of land investment are used in Table 40 to illustrate the direction of investment of farmers in the Sahel El-Ahamed and Homs Oasis. From the figures summarised here, it is possible to discern the major trends in investment at Phase II. As the Arabs move to the oases, so the necessity arises for basic reclamation of the garden areas, the greater part of which is accounted for by the enclosure of the hail or individual family holding. Thus, all Phase II operators record a high inventory value for walling, wind-breaks and fences, most of which are new and hold a higher value than the old enclosure systems used on later Phase farms. Reclamation of this nature usually implies an extension of the palmeries, which are associated with, or result from the construction of walls. Similarly, time and labour in the oasis lands is concerned with other features of reclamation such as levelling the land and providing access to the internal lines of movement within the oasis.

The great distinguishing factor of Phase II investment is the low capital out-lay for irrigation facilities. Of the four

Table 40 - Distribution of Farm Land Developments in the Oasis of Homs and Sahel El-Ahamed. Sample of 20 Farms.

<u>WELLS (Phreatic)</u>	<u>No. of Farms</u>	<u>Total No. of Wells</u>	<u>Total Value £L</u>	<u>Average Value/Farm £L</u>
(a) <u>Homs</u>				
Phase II	4	$\frac{1}{2}$ share (of well)	110	27.5
Phase III	4	6	588	147.0
Phase IV	2	4	412	206.0
(b) <u>Sahel</u>				
Phase III	4	12	1356	339.0
Phase IV	2	5	545	272.5
Phase V	4	-	-	-

IRRIGATION & RETICULATION SYSTEMS

	<u>No. of Farms</u>	<u>Total Value £L</u>	<u>Average Value/Farm £L</u>
(a) <u>Homs</u>			
Phase II	4	60	15.00
Phase III	4	61	15.25
Phase IV	2	40	20.00
(b) <u>Sahel</u>			
Phase III	4	136	38.00
Phase IV	2	100	50.00
Phase V	4	1860	465.00

FENCES, WIND-BREAKS & WALLS

	<u>No. of Farms</u>	<u>Total Value £L</u>	<u>Average Value/Farm £L</u>
(a) <u>Homs</u>			
Phase II	4	100	25.00
Phase III	4	30	7.50
Phase IV	2	30	15.00
(b) <u>Sahel</u>			
Phase III	4	42	10.50
Phase IV	2	30	15.00
Phase V	4	-	-

TOTAL LAND DEVELOPMENT - Homs and Sahel

	<u>No. of Farms</u>	<u>Total Value £L</u>	<u>Average Value/Farm £L</u>
Phase II	4	270.0	67.50
Phase III	8	2213.0	276.62
Phase IV	4	1157.0	289.25
Phase V		1860.0	465.00

farmers of this class who were interviewed in connection with the Questionnaire Survey, no individual farmer reported having ownership of a well. In all cases, water supply was obtained either by part-rights or by purchase from wells on lands adjoining the Phase II units. Two farms in Homs shared a common well which was also used by two other Phase II farmers in the adjacent area. In the other cases, water was obtained by purchase of a restricted number of days' operation of a well. Hence, the figures reported for the average values of wells per farm tend to reflect the value of the water to the farmer rather than the cash investment in the actual well. The wells in use on Phase II farm units were largely simple and shallow bores which had been constructed during the era of communal ownership, and which had devolved to use by various cabila fragments. The almost communal ownership of wells found in early developing areas reduces the value of the units in terms of cash equivalent and utility in the field. In several farm units not included within the scope of the Questionnaire Survey, dual ownership of wells was an expression of co-operative development, where limited irrigation water could be made available on previously dry-land. As capital accumulated the joint owners intended to construct further works, ultimately permitting a separation of water systems. Nonetheless, most of the part-share wells are inadequate, since the availability of water during the critical dry periods restricts agricultural activity to limited varietal specialisation. As we shall see in study of a case example of Phase II development,

the access to a well may be limited to one day in seven or eight, a factor which closely confines irrigated cropping to the 'kitchen garden' and the date rows.

The average investment per farm unit in irrigation and reticulation systems amounts to £L15.00 for those farms covered by the Questionnaire Survey. The presence of the irrigation distribution net-work on Phase II farms appears to be contradictory to the scheme of growth suggested by the writer. In fact, the occasional and irrational watering of palm rows cannot be regarded as irrigation in the true sense of the word; the use of irrigation proper implies the general and consistent use of water for agriculture. The general costs of reticulation in the Oasis of Homs vary between narrow margins from Phase II to Phase IV. This arises from the fact that the gedula system of basin irrigation is more a matter of hand labour than capital out-lay in the eyes of the farmers. In Phase II, the distance between the source of water and the fields belonging to any given farmer are greater than on more advanced units, since shared wells are sited central to the owners' areas. The extended lines of supply found on Phase II farms are inefficient and costly to maintain.

To supplement the information presented in summarised form in Table 40, we shall bring the problem of investment and the Phase II farmer into closer focus in discussion of a case example taken from the Homs Oasis. In the home haush of the interviewer, 23 people were resident, making a total of five

families. The farmer spoke some English and a little Italian. He was domiciled in the Leptis area of Mudiriyat Homs in a bait group outside the oases. The Shaikh of the group Amor was essentially nomadic in his outlook in spite of the ownership of land in Homs, and was living in the expectation of a return to the tribal lands in Cyrenaica. His son, who reported at the interview, was now sedentary, although he had spent much of his youth with the family herds in Cyrenaica. The son of the family, Iunes (who we shall call - the farmer -), had been granted part of the father's land in the oasis and had also acquired additional land in the oasis and steppe. The size of the farm under consideration is reported to be five hectares, with a third of this in the oasis and the residue in the steppe zone some two kilometres inland from the suani. All the land is fully owned by the farmer, and no sub-letting is undertaken. Of the land in the oasis, half may be irrigated each year. Three hectares of the steppe zone are dry-cultivated, one hectare with orchard crops and the other with barley (Vide Figure 39).

There are two wells situated near the oasis land holding, access to which is governed by the fact that seven operators have rights to water from the wells. The wells in question are both twelve metres in depth being shallow bores originating in the period of communal ownership. Thus the supply available from these sources is limited by the mechanical inefficiency of the old dalu framework and by the low rate of replenishment in the well, which merely pierces the upper level of the phreatic

water table. The result of the poor yield of the wells and the share system in use in the area is that each operator receives only three days withdrawal of water in each fortnight. The farmer reported in the Questionnaire Survey was able to irrigate his ten palms, a small plot of tomatoes and pepper of some three gedula, or twelve square metres, and intercultivate barley on a quarter hectare. Each well was valued at £150, but the average 'investment' for each farm unit was only £14.3. This is a typical instance of the Phase II situation.

The farmer's suani were situated close to the wells, hence his costs for irrigation channels amounted to £110, most of which was accounted for by a single latitudinal length of concrete ditch which had recently been installed along the boundary of the suani. In common with other Phase II operators, the farmer had recently enclosed his farm area. Purchase of land adjoining the land left to him by his father had also necessitated a realignment of the boundary walls. Thus, the recorded expenditure for walls, fences and wind-breaks totalled £140.

In the two years following his ownership of a small portion of his father's land, the farmer had expended £150 on land development in the suani. All of this investment had been directed to basic land reclamation. Many Phase II farmers finance their investment by their own time and labour, or by the sale of livestock. In the case of the Bait Iunes of Homs, the capital necessary for development had been acquired by work in Homs and employment with the British Forces. The steady inflow of money from extra-agricultural labour, and the impact of

commercial practice in the village and military camp tended to accelerate the rate of investment on the farm unit. Nevertheless, the case is not atypical since similar results are to be observed where Arab farmers have come into close contact with Italian farming, or have accumulated capital through labour abroad. In the Oasis of Misurata, many farmers have developed their farms by means of money earned in the mines of southern Tunisia.

Summary

The following points emerge from study of Phase II investment:-

- (i) The beginnings to substantial investment at Phase II are governed by the degree of sedentarisation exhibited by any given group. Prolonged maintenance of transhumance delays advance in the oases. Once the balance of economic activity moves to the oases and sedentary life prevails, for whatever reason, the rate of investment increases rapidly.
- (ii) The rate of investment by farmers at this Phase reflects the availability of time and labour. There are a large number of farms where non-agricultural labour in Libya, or emigrant remittances finance a rapid rate of investment.
- (iii) In the early stages of development, capital investment is directed to land reclamation and enclosure. During this stage, the existence of communal facilities, particularly in the case of wells, is important, since they allow a concentration of available capital upon other development schemes. In the case

example of the Iunes of Leptis, the operator has expended some £50 upon land development in the course of two years, when the total fixed capital investment in his unit amounted to £1400.

Phase III

Initial developments in land reclamation and enclosure which characterise Phase II investment are succeeded in Phase III by a logical move to more expensive and complex land improvements. From the figures illustrated in Table 40, it may be seen that the major sector of investment at Phase III is in water supply. In Phase II, cultivation is restricted by the limited amount of irrigation water available from shared wells. Once the provision of reticulation facilities has been effected in Phase II, a desire arises for the greater use of irrigation which can be met only by the construction of better wells owned and worked by an individual farmer. The forces moving a farmer to install a well on his farm obviously vary from one operator to the next, but the situation is exemplified by the case of Iunes of the Leptis area.

In the summer of 1960, he was hoping to plant a first crop of potatoes on his newly acquired land. The large amounts of irrigation water necessary for this scheme were to be drawn from the two wells near his suani, on the understanding that other operators having access to the source of supply would defer their rights for the duration of the summer crop season. In normal circumstances, the scheme would have progressed without difficulty, since the surrounding farmers are all of

Phase II, and not interested or conversant with the techniques of summer cropping. Unfortunately, drought conditions prevailed throughout the littoral during the spring of 1960, with the result that the farmers of Leptis brought in their livestock from the steppe to the oases, where they could be watered from the communal well. Thus, Iunes was faced with the loss of the tubers and the less direct loss of the use of his suani during the winter when it was lying fallow in preparation for the summer potato crop. In this situation, he was forced to recognise the impossibility of irrigated cropping without an exclusive source of water. He was adamant in asserting that his next move would be to install a well on the farm unit.

When a farmer recognises his need for a reliable supply of water for irrigation, he is fringing upon Phase III, for the actual installation of the well marks the end of Phase II and the beginning of Phase III. As farmers increase their knowledge of irrigated farming, so the water demand becomes correspondingly more pressing. In the Oasis of Homs the average investment in wells by Phase III farmers amounted to £L 147.0 per farm unit, although it should be borne in mind that two of the four farmers interviewed during the course of the Questionnaire Survey reported having two wells serving their farms. Investment in the Sahel El-Ahamed was more than twice the amount recorded in Homs Oasis. This results from the fact that each farm unit reported having two wells. The high

standard of cultivation and the advanced level of technical skill in the Sahel also mean that the well systems are more complex; they are deeper than wells in the Homs area, penetrating deep into the phreatic water table, and the superstructure of the daly tends to be more substantial and more efficient than those in Homs Oasis.

To cater for the increased use of irrigation water, the reticulation system is extended in Phase III, especially in advanced areas where two wells are general. In the Sahel, it was reported that £L 38.00 were invested in water distribution net-works per farm; in the same sector of investment in Homs Oasis, £L 15.25 was recorded. Expenditure on walls and other fixtures shows an appreciable decline from Phase II and in most cases represents a re-assessment of work completed at Phase II.

A case example for Phase III investment is provided by a farmer of the Ahamed cabila of the Sahel El-Ahamed. The particular interest of the case arises from the fact that the farmer reported that he had been resident on his lands for five years, thus it was more simple to assess the rate of investment apparent on the farm unit than in other cases, where occupation has been for a life time, and the differentiation between various stages of investment has been lost.

In the first year of occupation of the farm unit in the Sahel, the farmer constructed a new and deep well to supplement the water supply from a shallow well which existed when he took

over the land. The new well had cost a total of £1150. excluding the costs of labour supplied by the family, but it was sited more conveniently and offered a more consistent source of water than the old well. Expenditure on reticulation had been necessary in view of the re-siting of the main water supply. It was notable that the farmer had invested in permanent concrete distribution channels to feed water to the suani. Much of the walling around the suani has been built by the previous owner; the only addition made by the farmer was in the establishment of prickly pear hedge rows on the walls to prevent the incursion of stray animals onto the cultivated area.

Summary

(i) The significant factor in the rate of investment in Phase III farming is the availability of capital, which in many cases results from fortuitous surpluses of agricultural produce. The Phase III farm unit is self-sufficient in nature, hence the accumulation of capital tends to be through occasional market operations.

(ii) As we have seen previously, the Phase III situation is one exhibiting apparent conservatism, and is rapidly changed by the operation of internal and external forces, which may be different for each farmer. The drive to commercial farming and the rate of investment is illustrated earlier (Chapter 5, p.471).

(iii) In the case example quoted from the Ahamed cabila, the

rate of investment was £L 170 over a period of five years.

(iv) Following the construction of a well to serve the farm area which culminates Phase II farming, the direction of investment is mainly in consolidation of the fixed installations to provide an easy living under a self-sufficient economy. The deep entrenchment in non-commercial activity is terminated when the forces of growth bring about a change in land appraisal from provision for the family needs to exploitation for profit. In terms of capital investment, this change is signified by purchase of motor power for irrigation, or by a rationalisation of irrigation using pre-commercial equipment.

There is a great tendency for the officials of the Nazara of Agriculture to act on the principle that capital investment alone is the key factor in motivating the change from subsistence to commercial farming. It is widely believed in official circles that availability of credit facilities for farmers will solve the problems of Tripolitanian agriculture. It is worth re-capitulating at this juncture, that economic growth is a compound of forces, human, environmental and economic, which are mutually responsible for a dynamic chain reaction. Thus, as we noted previously, capital investment in wells and equipment is an expression of the individual's approach to his situation in the broadest sense and is a mechanism of advance - not the cause. (Chapter 5, p. 272).

Phase IV

Under a traditional economy, funds for capital investment

are accrued from earnings made from farm products in years of favourable climate, and from off-farm earnings, usually on larger Arab or Italian farm units. In the Misurata zone, it is true that remittance income is important, but in Misuratio as a whole, local sources of income constitute the main element in investment capital in Phases II and III; the figures for sources of income during 1959/60 illustrate this situation:-

Gross Income of Arabs in Misuratio - Sample 40 Farms

<u>Source of Income</u>	<u>Phase II</u>	<u>Phase III</u>	<u>Phase IV</u>	<u>Phase V</u>
Farm Unit	26.7	105.0	146.8	150.0
Off-farm Labour	60.0	23.8	11.3	0.0
Other sources (Non-agricult.)	12.4	45.5	228.3	30.0

In transitional economy, the first stage of which is represented by Phase IV, there is a clear change in the character of investment. Commercial operations in the oases offer a more or less certain capital return each year, some of which is available for re-investment in the farm unit. Hence there is a consistent rate of capital investment in Phase IV farming as opposed to the erratic expenditure on the farm unit in earlier Phases.

It was shown that in the case of Phase III farmers, the large scale capital expenses were financed in part by extra-agricultural labour. In later Phases of growth, the greater portion of capital used for investment in the farm business is gained from sources other than agriculture. This situation results from the normal working of the forces of growth, which prompt rationalisation within the farm business. Thus, the

installation of motor pumps for irrigation, specialisation of cropping for market, and the corresponding decline in the steppe and livestock holding leads to a diminishing reliance upon family labour. Furthermore, commercial farming implies the use, if only on a small scale, of cost accounting of labour. At this stage gradual appreciation grows of personal income and the necessity for retaining all the family on the land, which is characteristic of self-sufficient farming, fades in importance. This factor might not have been so influential in present day Tripolitania, were it not for the fact that the cycle of economic growth in the towns has been given stimulus by oil exploration. In a later chapter, we shall analyse the state of growth in the urban centres of Libya, and suggest that the wage levels offered in the urban sector are attractive. In the same context it is shown that the attraction of the urban areas to rural Arabs is on two separate planes; in the first place, to the poor and illiterate who have nothing to lose by movement to the towns; and in the second place, to educated rural Arabs whose services are constantly in demand with the civil administration and the oil companies. The supply of petty officials agents and school teachers to urban posts is composed in large proportions by sons of commercial farmers. The Questionnaire Survey in Misuratah showed that all Phase IV farmers were in receipt of funds from their sons who occupied urban posts.

The effects of this specialised move from the land have

been beneficial although some farms in the Sahel, where all the sons have taken up urban employment, have become dormitories after the death of the father. This is instanced by a family of the El-Ahamed, whose male members all live in urban centres, returning only for week-ends or national holidays. The farm is worked by a resident labourer who produces solely for the use of the household. (Vide Chapter 6, p.7²⁵). Much of the money earned in the towns finds its way into rural investment, since the attitude prevails that the farm is the home in spite of semi-permanent residence in urban areas. Survival of the joint family income, which prevailed in traditional society tends to be less important in Phase IV, but the strength of family ties is sufficient to ensure a steady flow of remittances from the town to the country. In the same climate of thought, investment in the farm business is security against the eventuality of urban employment coming to an end.

The rate of investment at Phase IV tends to be regular because commercial farming brings in a budgeted profit each year unless the climate is exceedingly unfavourable. In recent years, particularly since 1955, this flow of investment has been reinforced by monies earned in urban employment. The full effects of the investment are difficult to discern, but the manager of the Agricultural Bank estimated that indigenous mechanisation of farming activity, especially in respect to motor pumping was to be accounted a direct response to urban employment of rural Arabs.

The direction of capital investment in fixed installations at Phase IV is confined to rationalisation of irrigation facilities to cater for the extended use of water. It is usual for the well-head to be strengthened, and the water storage basin adjoining to be enlarged and sealed with cement. A similar process is applied to the reticulation system, where the lines of movement are re-adjusted and the channels lined for greater efficiency.

A case study of Phase IV investment is offered by a member of the Hasmun qabila of the Sahel, who farms a total of 17 hectares. The oasis holding amounts to 7 hectares, of which five are irrigated; the steppe holding is not used by the farmer. The family group is made up of four males, three of whom are resident on the farm. One son is employed in Tripoli in Government service, one son is taking over the farm business, and the youngest son is at secondary school. A motor pump was installed in the well three years ago (1957); since which time the farmer has produced a regular surplus of crops for sale at Home market. Investment in land development has been held in abeyance, since the farmer feels that the best way to reveal reasonable profits from the plentiful irrigation water made available by motor pumping is to be found in consolidation of his oasis holding. At present he holds three separate parcels of land in close proximity to his haush, but he is unenthusiastic about re-building the distribution canals on land which he hopes to exchange for an area nearer at hand. In the period

1957/60 he reported investment worth about £L 71 in fixtures for the farm business.

The following factors emerge from the situation:-

- (i) Capital investment in fixed assets shows only a small gain over Phase III. This results from the fact that commercial farming in the area demands a more fluid capital basis than traditional economic life.
- (ii) The rate of investment, supported by a consistent operating profit and an influx of extra-farm capital, becomes more even than in preceding Phases.
- (iii) The direction of investment is mainly to technical innovations, particularly in respect to the well-head and the reticulation net-work.

Phase V

The Phase V information represented in Table 40 is concerned solely with farm units on the Wadi Caam Settlement and bears no reference to those Phase V farms which exist in the oases. The schedule of water costs at Wadi Caam Settlement is analysed in Chapter 2, but it is pertinent to note here that the average value of water installations per farm was £L 465.0. The average presented under the head of 'irrigation and reticulation systems' includes the share cost per farm of all the water extraction and distribution fixtures constructed on the estate. Thus for comparison with other figures in the Table 40, the single total for Phase V under 'average values per farm' should be matched against the sum totals of 'Wells' and 'Irrigation and Reticulation Systems' entered for other Phases. Small Settlement farms, typified by Wadi Caam units, will become increasingly important within the Phase V range of indigenous farms as the ex-Italian estates

fall into Libyan control.

A key factor in this situation is the fact that investment is governed by Government policy and not by the forces of growth inherent in oasis agriculture. In the case of the ex-Italian farms of Misuratio, the investment has already been made. Hence, it may be noted again, that investment in the provision of farm facilities is a manifestation of deeper human and economic trends in Arab life; even in farm units where investment has been made by outside authority, the indigenous farmer cannot realise the situation for his own profit without the general, multi-fronted advance implied by Phased growth. The rate at which the existing Italian investment in agricultural fixtures will be realised is examined in Chapter 6 following. In this context it is germane to note that the investment rate in settlement farms shows a large increase over oasis Phase IV farm units. The direction of investment in Phase V settlement farms differs radically from oasis units, since the provision of joint facilities in the latter replaces the general distribution of private dalu wells in the former.

Phase V farm units in the oases were not covered in the Questionnaire Survey since the writer was unable to offer a complete examination of the many detailed aspects to these farms in the time available. Nonetheless, an attempt was made to study the major trends in investment present at this Phase. It must be remembered that Phase V units in Misuratio represent large farms of 25 hectares or more, and that the owners are

rich men in their own right. In the Jefara of Tripolitania, there has been a longer period of economic evolution than in Misuratio, which has permitted the rise of a 'middle class' group of Phase V farmers whose origins were relatively humble. In Misuratio, the delayed development of the economic and social sector has meant that the small but rapidly advancing section of farms has not yet emerged into Phase V farming. At present, then, large operators are represented by the influential cabila members who have been prepared to invest capital in their agricultural lands. As mentioned earlier in Chapter 3, there are few such families apart from the Naas and Latriche. Large land owners in Misurata Oasis have not been affected yet by developments in agriculture, and it may be said that the Sahel is the only area exhibiting indigenous Phase V farming outside the system of Demographic Settlement Schemes.

Unlike earlier Phases of economic growth, Phase V illustrates a general spread of investment in land development. The whole farm area is re-constructed to a level corresponding to the standards prevalent on the better European and Tunisian run farms in the Jefara. Thus, the direction of land development begins with re-organisation of the suani, and continues to embrace all aspects of the fixed capital holding. The Phase V farms in the Sahel El-Ahamed each maintain at least three diesel pumps; utilise integrated systems of concrete irrigation ditches and keep several dal wells available to supplement pumping in the summer cropping season. By an

'explosive' beginning to capital investment, the traditional pattern of indigenous farming, which persists throughout Phase IV, is broken completely and the gradual nature of transition visible in early Phases is left by an apparently clean break.

The rate of investment follows the same pattern of 'explosive' acceleration. No precise figures were available in Phase V farms in Misuratino covering the actual rates of investment, but the Agricultural Office at Homs estimated that investment in the Nass and Latrieh farms had proceeded at a rate of some £2,000 per annum.

The source of funds used for Phase V developments by the large land owners comes mainly from monies accrued through official office;- in the cabila, under the Italian administration and, since independence, in the Libyan administration. To some extent also, the large land owners were important stock holders and had this capital release mechanism at their disposal.

In the cases of Phase V farmers on Demographic Settlement Farms (Wadi Gaam or the ex-Italian estates) and Phase V farmers operating with capital gained other than from farm profits, the evolutionary trend of economic life is distorted. From evidence present in small indigenous Phase V units in the Jefara, it is possible to foresee a new class of advanced commercial operators emerging in Misuratino. Such operators will be products of the normal cycle of development, such as small Phase V farmers, who have maintained a high rate of investment through market operations and subsidiary urban labour, sufficient to bring

about a rationalisation of the farm business in terms of consolidated holdings of land, reliable and plentiful availability of water for irrigation, and modern standards of reticulation. In these cases, investment may not be regarded as 'explosive', but the quasi-geometrical progression of capital investment from Phase to Phase will cause the elimination of traditional trace elements in Arab farming which we observed in the nature of large units of the Naas and Latriche type.

The situation regarding investment at Phase V is complex, but there are several discernable trends present, which may be listed as follows:-

- (i) The amount of capital required to permit the smooth accession of farm units to Phase V is exceedingly large; but in present-day Libya, funds are available from three main sources - (a) Government investment in Demographic settlements, or the availability of ex-Italian farms, where capital investment in land development has already taken place; (b) Accrued capital resulting from tenure of cabila or public office; (c) Funds accumulated from consistent trading gains during Phase IV, usually supplemented by monies gained in urban employment by one or more members of the family group, consequent upon the recent emancipation of Libya from foreign rule and the exploration activities of oil companies.
- (ii) Capital investment is directed, in broad terms, to conversion of Arab farms into European standard production units.

(iii) The fate of investment in land development is infinitely variable:-

A - On the ex-Italian farms occupied by Arabs the capital investment in water installations amounts to an equivalent of £L 500 (Tummina) discounting depreciation.

- On the Wadi Caam Settlement capital investment in land developments amounts to £L 465.

In both cases, the initial investment represents a final total of capital expenditure in this sphere, since the farmers must pay off the mortgage from their farm profits, and have only small amounts of capital for further improvements.

B - Large farm units are able to maintain a large annual rate of investment of £L 2000 and more.

C - Indigenous farms in the oasis, emerging from Phase IV, offer a varying rate of investment commensurate with the availability of monies earned in urban occupations.

Thus, we may observe in all the Phases of economic growth an underlying scheme of investment trends. Each Phase appears as a separate entity, but we have seen that capital accumulation gradually builds up under pressures of growth to culminate in a major investment which signalises movement up the scale of evolution. As geographers, it is necessary to hold the sources of capital and the rates and directions of investment against the human and environmental possibilities of the area of Misuratio; our examination has demonstrated that investment in land development is a mechanism in, not a causative factor

behind the scheme of economic growth.

(ii) The Rate and Direction of Indigenous Investment in Agricultural Equipment and Supplies at the various Phases of Economic Growth.

(a) Agricultural Equipment

Any discussion of mechanisation in Libyan agriculture must take account of the fact that the basis of both large and small farm units, traditional and transitional farm businesses, is rooted in garden culture. Thus, most Arab farms in the oases do not make use of machinery, such as tractors, harvesters and other equipment which is normally associated with modern farming practice. Provision of horticultural machines for garden culture area is increasing, and may become important as technical improvements in this sphere gather force with accumulated experience. The position of the 'retorvator' motor driven plough, now in general use in minifundia areas in the Mediterranean region, illustrates possible lines of mechanisation which could be followed in Misuratine. As yet, equipment of this kind is restricted to Government experimental farms and the larger European farm units of the Tripolitanian Jefara.

The largest element in farm equipment recorded in the Questionnaire Survey was a motor truck owned by a Phase IV farmer in the Sahel, who used the vehicle for transporting materials to market, and who also hired it to convey goods to Tripoli. Only one other Arab farmer reported ownership of a vehicle, again in the Sahel. The datum contained in Table 41(A) reflects the ownership of motor vehicles rather than farm

machinery proper. Other items included within the main head of machinery (Table 41(A) were a small hand operated olive press, and, in Homs Oasis, two small flour mills worked by animal power, of which one was in use occasionally.

Table 41 - The Distribution of Investment in Farm Equipment
Sample of 20 Farms - Homs and Sahel El-Ahamed.

41(A) Machinery

<u>HOMS</u>				<u>SAHEL EL-AHAMED</u>			
<u>Phase</u>	<u>No. of Farms</u>	<u>Total Investment EL</u>	<u>Investment Per Farm EL</u>	<u>Phase</u>	<u>No. of Farms</u>	<u>Total Investment EL</u>	<u>Investment Per Farm EL</u>
II	4	160.0	40.0	III	4	88.0	22.0
III	4	458.0	129.0	IV	2	1200.0	600.0
IV	2	600.0	300.0	V	4	0.0	0.0

41(B) Implements

II	4	20.0	5.0	III	4	78.0	19.5
III	4	140.0	35.0	IV	2	140.0	70.0
IV	2	180.0	90.0	V	4	60.0	15.0

41(C) Hand Tools

II	4	15.0	3.7	III	4	26.0	6.5
III	4	20.0	5.0	IV	2	40.0	20.0
IV	2	60.0	30.0	V	4	2.0	1.0

41(D) Other Equipment

II	4	56.0	14.0	III	4	70.0	17.5
III	4	76.0	19.0	IV	2	16.0	8.0
IV	2	80.0	40.0	V	4	0.0	0.0

41(E) Motor Pumps

II	4	0.0	0.0	III	4	1300.0	650.0
III	4	0.0	0.0	IV	2	1400.0	700.0
IV	2	1400.0	700.0	V	4	0.0	0.0

Total investment in farm machinery increases with the degree of economic attainment, but in most cases this results from activity peripheral to farming activity such as milling or contracting for transport of goods. A point worthy of mention in this context, is that hired labour has been available in the cases in plentiful quantities, and the hire of labour has been inexpensive. Hence, there has been no cause for general mechanisation of farming processes. This state of affairs is coming to a close, and it might well be that the declining availability of labour, and the increasing availability of specialised horticultural machinery will produce a change at least amongst commercial farmers.

The distribution of investment in implements for use on the farm is illustrated in Table 41(B). Capital expenditure in this sector is low, since most implements are traditional in design, and simple in construction. Farmers were asked in the Questionnaire Survey to give as close a valuation as possible of their holdings of ploughs, carts and other goods of a similar nature. Traditional based farms reported capital purchases of small donkey carts as their major items of expenditure. Cheap wooden ploughs constituted the secondary line of investment. Most Phase II farms recorded two to three ploughs, made necessary by shifting agriculture in the steppe in which family members work dispersed areas within the cabila lands. No donkey carts were present at this Phase, since seasonal travel meant that the camel was a more suitable means of transport.

At Phase III two small developments are recorded by increase in capital holdings. More or less complete sedentarisation brings the donkey cart into prominence, and greater concern with oasis agriculture leads to the use of a more sophisticated plough. The normal Libyan plough is of wooden construction, bound with camel or other animal gut. Traditional ploughs are provided with an edge hardened by fire, but many Phase III farmers use a metal tipped plough to cope with the more fertile and compact soils of the oasis lands.

Commercial farming activity brings a broader connotation to the term 'implement' in respect to the indigenous farm unit. The expansion of irrigation facilities, which characterises Phase IV, brings in its train a corresponding need for supplementary equipment:- syphon pipes, and the tooling required for the maintenance of the pump machinery. A large number of farmers retained traditional ploughs at Phase IV, although they were metal tipped in all cases; more advanced farmers in the group owned all metal ploughs, which, built in traditional style, are nevertheless very efficient in oasis conditions. In the Sahel especially, donkey carts fall from significance and give way to motor transport.

The few large Phase V units in Misuratio exhibit similar characteristics to Hawaza and European Private Concession farming in the Jefara area, with large capital out-lays for irrigation equipment. In recent years, sprinkler irrigation has spread throughout the commercial cropping region

of the Jefara and is now in use for both orchard and field crops. Only one such system was reported by the Agricultural Office in Homs in the whole sphere of indigenous farming, but it can only be a matter of time before this innovation comes into use in Misuratio.

At Wadi Caam Settlement, where operators are mortgage holders and trainee commercial farmers, capital investment in implements is low, many farmers recording neither donkey-cart nor metal-tipped plough. The figures contained in Table 41(B) are not final assessments of the situation at the Settlement, since Mr. Dale Morrison, the estate manager, was in process of formulating a co-operative organisation, the terms of reference of which would permit the central authority of the Settlement to keep a stock of modern implements. By this means, the farmers at Wadi Caam could hire efficient equipment and avoid the evils of over-capitalisation of the small farm units.

Garden culture characterises all Phases of farming in Misuratio, hence the importance of hand tools remains undiminished throughout the scale of growth. The universal hand tool in Misuratio is the spade-hoe, which is a rectangular blade set at right angles to a long handle, and which is wielded in vertical strokes. The tool is made in a multitude of blade dimensions, varying from 6" x 6" to 9" x 3". Other tools used popularly throughout the oases are the small sickle and the machet. The sickle is used indiscriminately for wood-chopping, pruning and cereal harvesting, whilst the

machet is normally used by the palm specialists for pruning. In spite of the fact that hand tools are of great importance in oasis garden agriculture, the tools in use are exceedingly primitive and are badly kept. The lack of specialised tools in agriculture is largely a reflection of the fact that sedentary cultivation is only of recent growth. Nevertheless, many of the tasks on the farm are accomplished with the hands rather than with hand tools. Olive pruning, cereal harvesting, gedula work all tend to be matters for tedious and unskilled hand work. The writer was informed on several occasions by Italian farmers who recruited Arab labour for work on their farms, that there was no point in providing modern and efficient tools for the Arabs, since they would be left unused. As we shall see later in examination of education in Libya, rural enlightenment means a lot more than the ability to read and write. (Chapter 6, p.735). The distribution of investment in farm hand tools is shown in the data of Table 41(C).

Investment in other forms of farm equipment is illustrated in Table 41(D). In most cases expenditure under this head is to be accounted to stabling and other equipment made necessary by the use of animals for transport and work on the farm. The bridles and saddles utilised by the Arabs for every dāy operations are simple and inexpensive; since most farmers keep camels, donkeys, and horses, the total costs for this type of equipment become quite significant. Under the same heading, farmers were asked to include expenses incurred in the operation

of the dalū. In fact, the goat-skin bags used to draw water from the wells are made up by the women of the family group, and pulley systems built by the farmer. Both stable and dalū expenses tend to be associated with traditional farming, although it is notable that Homs is less developed in this respect than the Sahel El-Ahamed.

The importance of motor pumps for irrigation has been emphasised in II(i) section of this chapter. The capital outlay necessitated by the purchase of the motor pump has been ascribed to investment in working capital as it does not represent a non-exchangeable and immovable fixture in the same way as the well and well-head. In Homs Oasis, the distribution of motor pumps is confined exclusively to Phase IV farms, both the pump units being new, and therefore valued at cost price. In the Sahel, one farmer at Phase III reported ownership of a second-hand diesel motor valued at £1600, but probably worth less, whilst another Phase III operator claimed ownership of a converted auxiliary motor used in pumping from his second well. In most areas of Misuratio motor pumping is confined to commercial farms, since the over-heads of maintaining and fueling motors can only be justified by cash cropping.

The motor pump constitutes the largest single item of investment within the working capital of the farm (Vide Table 41(B)). It is likely that expenditure on diesel pumps will continue to dominate the investment pattern of farms at early stages of commercial development, since cheaper alternatives are

not available. The use of electrical pumps, which cost considerably less than diesel pumps, are excluded from Misuratio in the absence of a high voltage current and the presence of limited lines of electrical supply to the oases.

Summary

- (a) Farm equipment is the largest sector of investment in the over-all investment in working capital in Misuratio.
- (b) Nevertheless, the position of farm equipment exhibits a low level of development technically and educationally.
- (c) It is a sphere in which changes may be expected as hired labour becomes less plentiful and more expensive.

(ii)

(b) Farm Supplies

In the following chapter, analysis is given of the standard of living of farm families, and of the purchasing power of the economic groups in the rural community in relation to development of the urban industrial economy. To elaborate these comments, details are given here of the normal expenditure of indigenous farmers on farm supplies. The data were collected by means of the Questionnaire Survey, but represent a fair sample of farm budgets in Misuratio (Vide Table 42).

Farm supplies under the heads included in Table 42 are small proportions of the total farm capital of each farm as indicated in Table 38. At Phase II, of a total capital per farm of £L 1107.2, stores represent a value of £L 27.5; in more advanced conditions at Phase IV, of a total farm capital of £L 3641.2, farm supplies represent a value of £L 110.0

Table 42 - The Distribution of Investment in Farm Supplies-
Sample of 20 Farms - Homs and Sahel El-Ahamed.

<u>Phase</u>	<u>No. of Farms</u>	<u>Total Invest-ment £L</u>	<u>Invest-ment Per Farm £L</u>	<u>Phase</u>	<u>No. of Farms</u>	<u>Total Invest-ment £L</u>	<u>Invest-ment Per Farm £L</u>
<u>42(A) Seed</u>							
II	4	40.0	10.0	III	4	24.0	6.0
III	4	4.0	1.0	IV	2	70.0	35.0
IV	2	60.0	30.0	V	4	0.0	0.0
<u>42(B) Animal Feed</u>							
II	4	18.0	4.5	III	4	68.0	17.0
III	4	18.0	4.5	IV	2	160.0	80.0
IV	2	50.0	25.0	V	4	14.0	3.5
<u>42(C) Fertiliser</u>							
II	4	10.0	2.5	III	4	40.0	10.0
III	4	4.0	1.0	IV	2	14.0	7.0
IV	2	20.0	10.0	V	4	18.0	4.5
<u>42(D) Manure</u>							
II	4	40.0	20.0	III	4	32.0	8.0
III	4	32.0	8.0	IV	2	12.0	6.0
IV	2	24.0	12.0	V	4	0.0	0.0
<u>42(E) Insecticide</u>							
II	4	0.0	0.0	III	4	20.0	5.0
III	4	24.0	6.0	IV	2	8.0	4.0
IV	2	0.0	0.0	V	4	0.0	0.0
<u>42(F) Other Farm Supplies</u>							
II	4	0.0	0.0	III	4	38.0	9.5
III	4	240.0	60.0	IV	2	10.0	5.0
IV	2	12.0	6.0		4	3.0	0.75

Stocks of seed held on the farm unit are generally retained from the harvest of the previous year. Purchase of high grade seed is a practice confined to commercial farmers, and especially to those Phase V operators who are at present undertaking extensive mechanised barley cultivation in the peripheral steppe. Cereal variety trials at the experimental farms of the Nazara of Agriculture have not reached field level, but it is likely that introduced varieties will increasingly replace local barley and wheat on commercial farms.

Table 42(B) indicates the amount spent on animal feed by Libyan farmers. In large part such feed is green fodder purchased from the local markets and does not represent use of commercial compound feeds. The figures included in Table 42(B) demonstrate the primitive level of development in livestock improvement amongst the indigenous peoples. The extension services (to which further reference is given in Chapter 6) are attempting a gradual advance in the livestock standards in Tripolitania. At the present time, their efforts are centred upon breeding trials and improvement of cheap feeds. The natural problems of fodder production in the area (covered in detail in Land Use and Resources-(24)) especially in commercial farming will mean that increasing reliance will be placed upon commercial and veterinary feeds. Expenditure on animal feeds by farmers at Phase IV shows a large increase over Phase III, demonstrating clearly the fact that intensive varietal specialisation in cropping activity precludes the production of fodder crops.

The total amount of chemical fertiliser sold to farmers in Tripolitania under the Government Assistance Scheme in 1956/57 was almost 100,000 quintals. On a per hectare basis for the province, this amount can only be regarded as negligible. In later discussion (Chapter 6, p. 533) it is suggested that use of fertiliser in the Arab sector of the economy, and its consequent reflection in farm investment, will become appreciable when:

- (a) there is a consistent and heavy demand for agricultural produce from urban areas in Tripolitania.
- (b) rural education reaches the stage where the value of fertiliser and its most efficient use is understood.
- (c) cheap and plentiful supplies of fertiliser are available in the rural markets. At present fertiliser tends to be a commodity handled exclusively by large trading concerns in the capital.

In Misuratio the average consumption of fertiliser gave an investment per farm of £L 6.0 for the year 1959/60. The distribution of investment in fertiliser stores was erratic in relation to the Phases of growth, but the general trend was for more advanced farm units to hold greater supplies (Vide Table 42(c)).

All farms reported in the Questionnaire Survey, with the exception of one farmer at Wadi Caam Settlement, recorded purchase of manure during the year 1959/60. The average investment in this sphere was limited to two truck loads in the year, although one farm in Homs at Phase II reported four loads in the season. In this later case, the farmer was engaged in reclamation of two small gardens in the vicinity of the Wadi Zennad. The figures returned in Table 42(d) tend to reflect

the price of transport rather than the price of manure, since in a truck load priced at £L 5, three to four pounds would be needed for the hire of transport alone.

Investment in insecticide supplies is confined to those farmers who own olive plantations in the oasis areas and who are accessible to the influences of the agricultural extension services. Spraying of orchard and field crops is a technique outside the experience of most indigenous farmers, although many of the oasis farmers have seen the benefits of plant protection from the example of the Italian farms. In Misuratio, only eight from the total of 20 sample farms in the Oasis of Homs and the Sahel reported purchase of insecticides in the year 1959/60. The points mentioned previously in respect to fertiliser are equally germane in this context.

Summary - Investment in Farm Supplies

- (i) Arab operators tend to limit their holding of farm supplies to an absolute minimum, partly because there is a lack of fluid capital, but predominately because self-sufficient farming does not allow expenditure on specialised seeds and other goods.
- (ii) Rural education is in its infancy, hence there is a non-understanding of the benefits of intelligent use of chemical aids in farming.
- (iii) Investment in chemical products in the present climate of development is a matter of Government policy, which is tending to control of import and distribution. In this early stage of extension activities Government control has had the effect of

stimulating demand; but this influence has meant that consumption of this type of farm supplies is more a question of Departmental Budgeting than investment response by the Arabs in the oases.

(iii) The Human Investment - the Drift from the Land during Economic Growth.

Capital expenditure on labour in the oases of Misuratio remains rather an unknown quantity, since farmers answering the Questionnaire Survey of 1959/60 were unable to define the type and amount of labour they had utilised on their farms during the year. We have suggested that the relationship between the Phase of growth exhibited by any given farmer and the labour employed changes from Phase to Phase according to the degree of commercialisation or self-sufficiency. (Chapter 5, p.468). The following figures illustrate this trend in terms of cash expenditure by farmers in Homs Oasis and the Sahel El-Ahamed:-

<u>Type of Labour</u>	<u>Phase II</u>	<u>Phase III</u>	<u>Phase IV</u>	<u>Phase V</u>
Hired labour	0.0	21.2	105.0	0.0
Unpaid family labour	30.0	38.5	82.5	23.5

(Average of 20 Sample farms - Questionnaire Survey 1959/60).

The figures quoted here are intended to give an estimate of expenditure rather than an accurate summary.

We have noted earlier in this chapter that the value of family labour in self-sufficient farming is high in terms of hour in-put but that it is low in terms of value. Unprofitable effort spent in movement to areas of steppe grazing and cultivation, and long hours passed by segments of the family

group herding the flocks account for the large hour in-put of early Phase operators. The value of family labour increases up the scale of economic growth, as labour is used more intensively in the area of the suani, and as cost accounting of labour expenses is appreciated by the operators.

Hired labour is not confined absolutely to commercial farming. The availability of cheap labour in the oases has meant that self-sufficient farmers have been able to bring outside labour into the farm business at times of harvest. Similarly, Phase III farmers have recourse to use of specialised labour, particularly for building, galy-working and palm fertilisation. The hire of labour at Phase III depends upon the size and productivity of the individual farm units, but it should be noted that most payments made by Phase III farmers are in kind and not in cash.

Considerable employment of hired labour is reported at Phase IV, where, significantly, it accounts for a higher proportion of labour utilised than family labour. In Chapter 6 (p. 699) indication is given of the income of rural labourers and small farmers. It is suggested there, that the level of rural wages is low, totalling £L 3.60 per month for a rural labourer. For day-labour, a fellah might be paid something in the region of £L 0.10 - 0.15. This is exceedingly poor in relation to wage rates at present prevailing in urban areas, but wages earned by landless labourers or by Phase II operators on other farms represent a certain income, on which it is possible to survive without accepting any risks of crop failures.

The general climate of equality which characterises Misuratio in land ownership as a result of the late evolution of sedentary society and private rights to land has had the effect of restricting the numbers of landless labourers in the area. In Zavia area, Theodorou⁽³⁹⁾ reported that 'Many Libyan families do not have farms of their own', and P.A.O. experts attached to the experimental farm at Sidi Mesri report that conditions similar to those at Zavia pertain in many of the oasis areas surrounding Tripoli. This difference in the importance of the landless class exhibited between Misuratio and other littoral oasis zones is significant in the transitional economy which has developed since 1951.

Economic growth in urban areas and the expanded scope for employment in recent years has exerted a steady attraction of rural peoples to the cities and towns. There are two distinct planes of gravitation towards urban employment; the larger numerically being that of the landless labourer; the smaller numerically, but the larger in terms of income, being the young members of families at advanced stages of growth. We have observed previously, that Phase IV operators tend to employ hired labour for farm work to a value greater than that of family labour. Simultaneously, present conditions prevailing in urban areas have tended to attract the sons of these same Phase IV farmers. At the same time again, there is an increasing drift of landless labourers into urban employment; thus there is a loss of man-power at both ends of the scale, for which it is difficult to compensate. The peculiar balance

between economic growth and the availability of labour in Misuratio is made worse by the fact that egalitarian distribution of property in the area means the presence of only a small section of landless labourers, in any case.

The following factors summarise the important elements which are present in the situation today, and which will influence future trends:-

(i) Intensive horticultural land utilisation offers the best foreseeable future for the agrarian sector of the economy.

This implies intensiveness of labour application.

(ii) The drift from the land appears to be threatening the expansion of oasis gardening in terms of both the loss of educated members of the farming community and the loss of the relatively small labouring class.

(iii) On the other hand, there are several mitigating factors which indicate that the drift from the land during economic growth is a trend, and should not therefore be held in absolute importance. The absorption of rural peoples into urban employment will be confined within reasonably limited proportions, since the exploitation of oil will bring scope for future indigenous employment to a steady level. The speculative atmosphere of exploration for oil which has prevailed in recent years should be tempered by the realities of actual production. Ministry of National Economy estimates offer scope for 7-10% employment of active population in the oil industry five years after the beginnings of exploitation.

(iv) Economic growth in the towns, the rising purchasing power of urban peoples, and the internal transition to commercial production in rural areas should bring about a greater parity between urban and rural wage levels.

(v) Mechanisation of horticultural activity, improvements in education and increasing capital investment by Arab farmers will help to offset losses in labour availability.

SUMMARY - CHAPTER 5. Part Two. II - Indigenous Investment in Development.

We have seen that behind the apparent poverty and unruffled conservatism of oasis farming, there is a considerable movement of capital into agricultural investment at all levels of growth. The limited coverage of the Questionnaire Survey used by the writer to draw up a picture of trends in Misuratio precludes the imposition of an inflexible scheme of investment patterns upon the Phases of growth. It is an acceptable generalisation to say that traditional operators invest less than 5% per annum in their farm businesses, and that transitional farmers invest more than 5% per annum as W.W. Rostow suggests⁽⁶³⁾. Nonetheless, there are considerable variations in the rate of investment made by farmers at the same Phase of growth. As geographers, we may propose that 'rates of investment' are less important as a concept in growth in Misuratio than human and locationary influences; this is amply borne out by the fore-going discussion. Equally, evidence has shown that the source of funds for capital

investment and the direction of investment exhibit characteristics at least as important as those of the rate of investment.

The agrarian sector of the national economy, represented in part by Misuratio, is benefiting directly and indirectly from the present boom conditions in Libya. The velocity of investment from Phase to Phase of growth is accelerating under this external pressure, especially in commercial farming. This feature is limited in part to Homs and the Sahel El-Ahamed, since investment in the Oases to the east is lagging as a result of strong traditional influences, particularly in respect to the continuing strength of tribal institutions. Nevertheless, investment in fixed and working capital is a signal feature of agrarian evolution throughout the entire region of Misuratio, and offers supplementary field evidence for our schematic plan of economic growth in the agricultural sector of the economy.

In Chapter 6 following, we shall indicate the response of production in Misuratio to investment and other economic and human stimuli, in relation to national economic growth.