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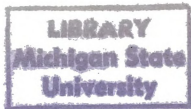
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THE FEASIBILITY OF AGRICULTURAL SETTLEMENT
PROJECTS IN THE JABAL AL-AKHDAR, LIBYA: AN
EXAMPLE OF THE WADI AL-KHARRUBAH
AGRICULTURAL SETTLEMENT PROJECT

presented by

Awad Yousef el-Haddad

has been accepted towards fulfillment
of the requirements for

Ph.D. degree in Geography

A handwritten signature in blue ink, appearing to read "David J. Campbell".

Major professor

David Campbell

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THE FEASIBILITY OF AGRICULTURAL SETTLEMENT
PROJECTS IN THE JABAL AL-AKHDAR, LIBYA: AN
EXAMPLE OF THE WADI AL-KHARRUBAH
AGRICULTURAL SETTLEMENT PROJECT

By

Awad Yousef el-Haddad

A DISSERTATION

Submitted to
Michigan State University
in partial fulfillment of the requirements
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Department of Geography

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ABSTRACT

THE FEASIBILITY OF AGRICULTURAL SETTLEMENT PROJECTS IN THE JABAL AL-AKHDAR, LIBYA: AN EXAMPLE OF THE WADI AL-KHARRUBAH AGRICULTURAL SETTLEMENT PROJECT

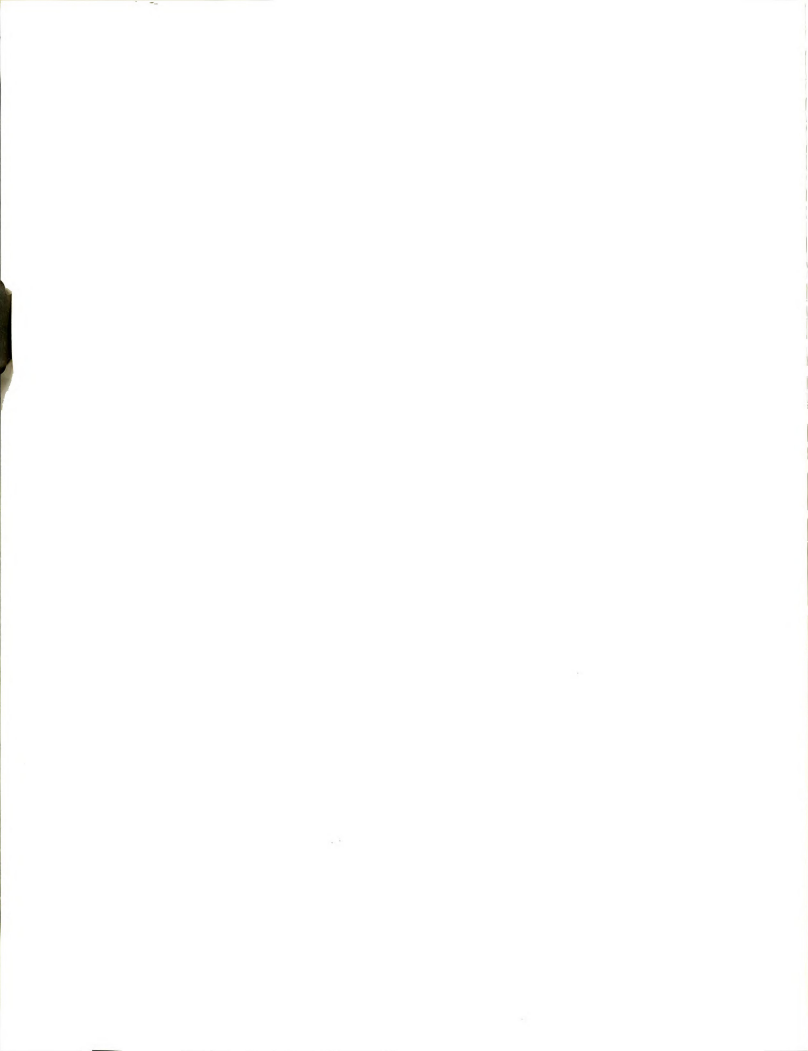
By

Awad Yousef el-Haddad

The Libyan government has initiated various strategies to develop the country's pastoral sector, including establishing agricultural settlement projects in tribal areas. One scheme is the Wadi al-Kharrubah pastoral settlement project in the Jabal al-Akhdar region.

This study postulated that the existing agricultural land use patterns of the area are not compatible with the government's proposed land use. The research emphasized that the proposed land use will disrupt the existing land use and socioeconomic and environmental characteristics of the Kharrubah area which would be the basis of future regional development planning.

Research objectives were to (1) determine the existing land use pattern and the government's proposed land use, (2) determine the compatibility between the two land use systems, and (3) identify components in the

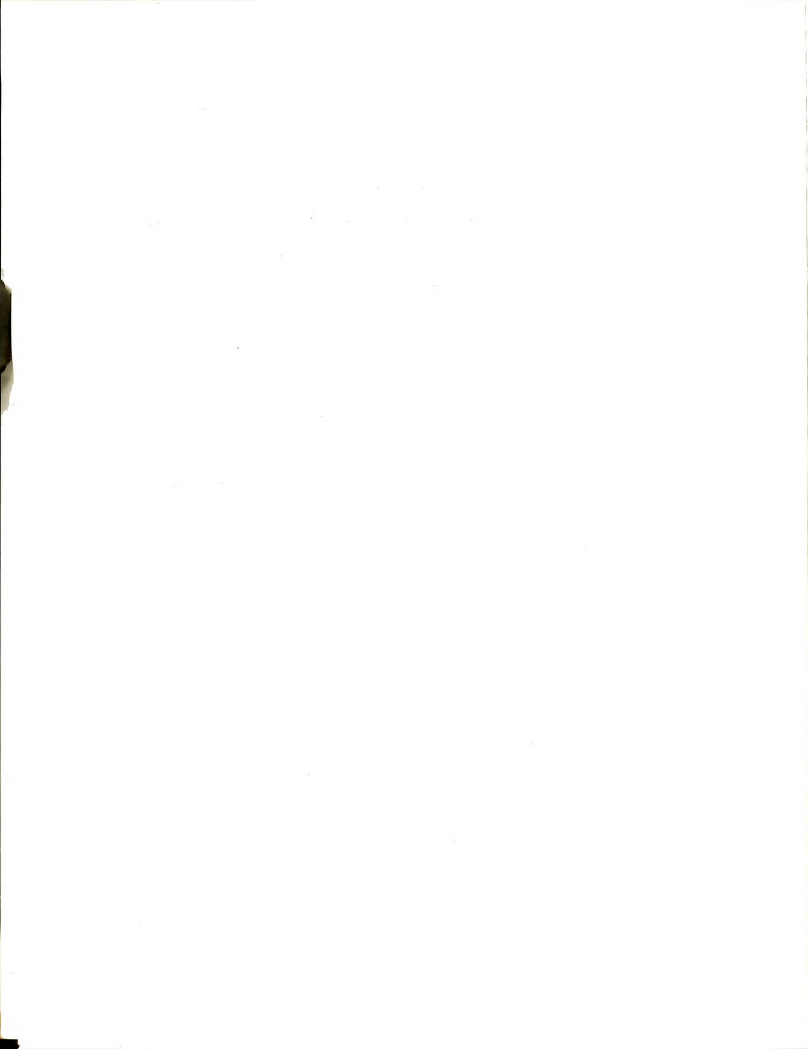


proposed land use that the pastoralists most likely would oppose and most likely welcome. To accomplish these objectives a field survey of the area's entire population (80 households) and of ten project administrators was conducted. Data were analyzed by Spearman correlation and chi-square techniques.

Major findings were that the government's proposed land use changes are not compatible with the existing land use. Nor are the changes compatible with the land use the pastoralists expect the project to provide in terms of size of landholding, crops to be cultivated, the accompanying rotation system, and disposal of livestock. As a result, the spatial effect of the proposed changes on the people and the land could be manifest in three major ways:

- 1 - The government's decision to dispose of the existing herds could disrupt the present economic system, which provides mutton for urban markets and high income to pastoralists.

- 2 - Individual ownership of the land, brought about by the project replacing common resource ownership patterns, would result in smaller and smaller farm holdings due to the Islamic inheritance law.



Awad Yousef el-Haddad

3 - Removal of the common dry season pasture as utilized by the current indigenous land use system, in addition to the pastoralists' expectations to continue herding activities, would increase the number of animals per unit of available grazing land and further deteriorate their rangeland.



DEDICATION

To my mother, who always encouraged me with love and blessings during my school years. Although she passed away before completion of this study, her inspiration provided the momentum to complete this research.



ACKNOWLEDGEMENTS

Grateful acknowledgement is given to many people who have assisted in the preparation of this study. It would be impossible to list all the individuals who provided help and support throughout this research effort. Much appreciation is extended to those individuals in the project administration, members of the People's Committee in the al-Marj municipality, the municipality branch of Jardas, and the research assistant.

A special debt of gratitude is owed to Dr. David J. Campbell, the chairman of the Guidance Committee. His advice and perceptive criticism of the various drafts of the thesis have been of immeasurable value.

Appreciation is also extended to the following members of my committee: Professor Lawrence M. Sommers, Professor Ian Matley, Professor Jack Williams, and Professor Assefa Mehretu. Their useful suggestions, constructive criticisms, and encouragement are deeply appreciated. Appreciation is also expressed to Professor Douglas Johnson of the Graduate School of Geography at Clark University for his critical review of the manuscript.



The author also wishes to express his deep appreciation to his wife Tahani and children, for the adjustment they made to his demanding graduate program and to the persistent encouragement received from them as well as from brothers, sisters, and friends during the course of study. Finally, the author wishes to express his sincere thanks to Gar-Younis University (formerly Benghazi University), the People's Committee for Libyan Students in the United States, and the Ministry of Education, Tripoli, for their financial support of his graduate education.

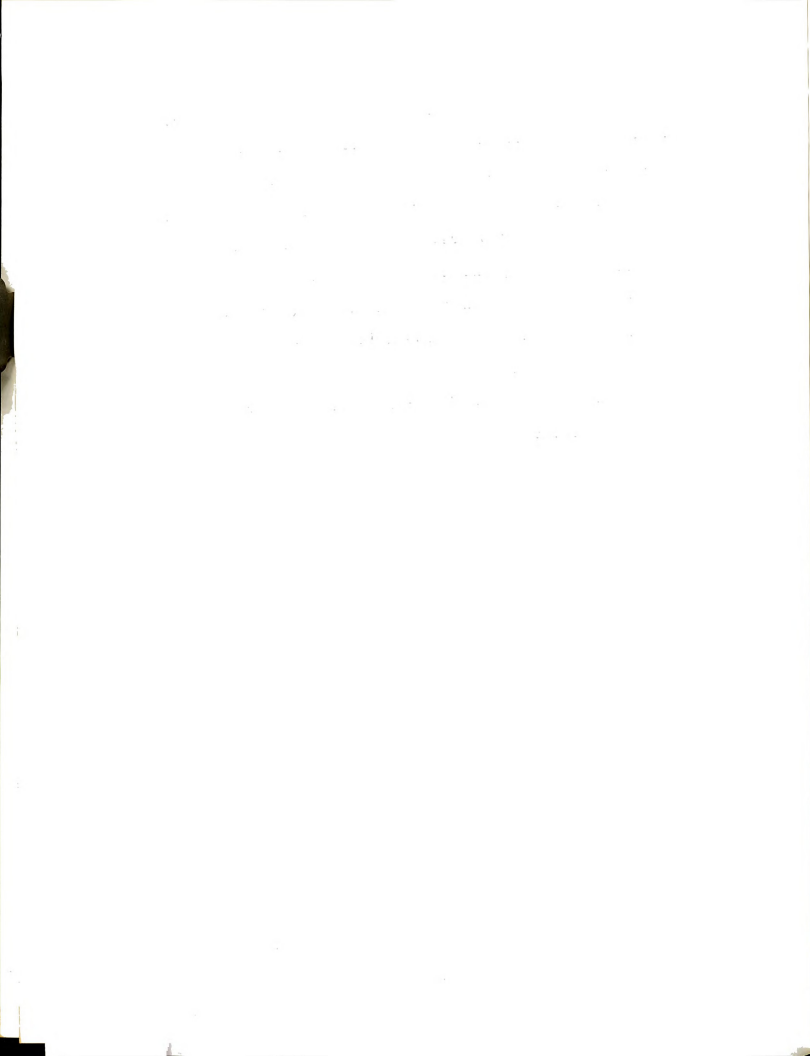


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CHAPTER I

INTRODUCTION

Within the past 35 years, Libya's economic situation has changed from its being one of the world's poorest countries to one of the richest, due to the discovery of oil in 1956 and its subsequent exportation starting in 1962. Before 1962, the majority of Libya's population was poor and had little education. The average national per capita income was under 50 dollars, and there was little, if any, skilled labor available or capital formation occurring (el-Wifati, 1977). This period was characterized by low levels of economic performance and dependence on foreign aid, mostly from Great Britain and the United States.

After 1962, Libya's economic situation improved dramatically because of the influx of oil revenues. As a result, the government initiated development strategies to improve the country's physical and social infrastructure. Initially the government development program had a notable geographical bias toward urban areas. The rural economy, and particularly the pastoral sector, remained largely beyond the planners' consideration.

Later, in 1969, the Libyan government began to place greater emphasis on improving the quality of life in rural areas. This development strategy was initiated, in part, in response to concerns about the pastoral sector of the population. One of these concerns has been the settlement of pastoralists, which was designed to provide the pastoral population with basic needs and to improve their standard of living. Further, herders were, and continue to be, perceived as the main cause of range-land deterioration through overgrazing and overstocking, and settlement was seen as a means of reducing this degradation. A final advantage of settlement was that it could promote greater offtake to meet the growing demands for meat (mostly mutton) in urban areas.

Among the strategies being employed by the government to address the development of pastoral areas has been the establishment of agricultural settlement projects in tribal areas. This study examines one of these schemes, the Wadi al-Kharrubah pastoral settlement project, to assess the compatibility¹ between the existing land use practiced by the indigenous population and the government's proposed land use in the form of the project. The potential of introducing settlement

¹Compatibility is defined as the accord between what the government proposes in land use changes and the indigenous land use pattern, including farm size, irrigation system, types of crops, and disposal of settlers' herds.

projects in grazing areas will disrupt both the existing land use and the socioeconomic and environmental characteristics of the region is examined. This study, therefore, contributes to the literature regarding the policy of settling pastoralists by assessing the effect of settlement on land use, as well as on environmental, economic, and social systems.

Need for the Study

The few studies that have been conducted on land settlement in Libya either have not mentioned at all or have discussed only in passing the degree of compatibility between the government's proposed land use in the form of an agricultural settlement project and the actual land use practiced by the population under study. When such consistency has been discussed, it has usually been for projects that have already begun productive operations. Few evaluations exist of such projects in the early planning phases, with emphasis on the similarities and differences between the two land use systems and the possible disruption of the socioeconomic and environmental setting of the project region. Because a settlement project's success depends on an awareness of the socioeconomic and environmental factors operating in the region under study, knowledge of these factors is important to those concerned with regional development in pastoral areas.

Statement of the Problem

A large part of the literature on land settlement suggests that many development projects in arid and semi-arid areas have failed to achieve their economic, social, and environmental goals because governments view these projects as closed systems and pay little attention to the socioeconomic and environmental factors working in a wider, open system. This situation often creates a state of incompatibility between the land use pattern brought about by these projects and the pattern already existing in the region. This has disrupted the wider system rather than strengthening it and increasing its productivity.

The purpose of this study, therefore, is to assess the compatibility between two land use systems: that proposed by the Libyan government in the form of an irrigated agricultural settlement project in an arid grazing area, namely at Wadi al-Kharrubah (Figure 1), and the existing land use of the pastoralists from whom settlers will be selected.

Location of the Kharrubah Project

The Kharrubah project is located on traditional grazing lands of the Abid tribe in the southern part of the study area. The elevation is less than 300 meters above sea level, and the annual average rainfall is less than 200 mm. The settlement project extends about 40

LOCATION OF THE STUDY AREA IN LIBYA

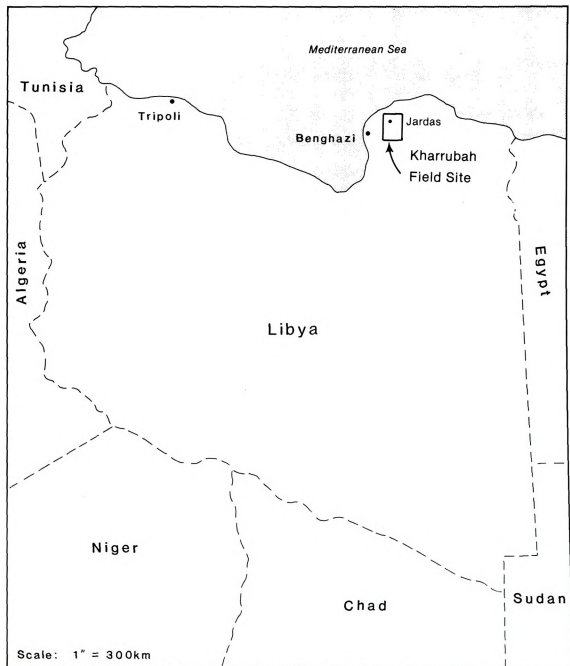
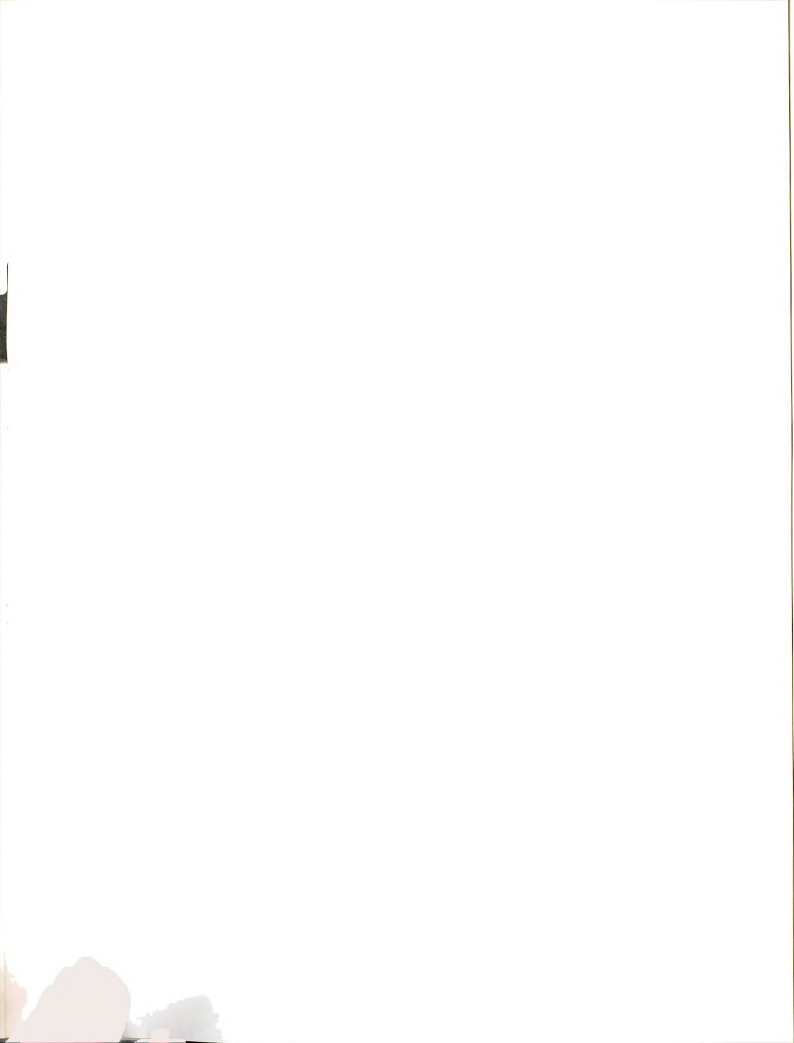


Figure 1



kilometers south-southeast of the small urban center of Taknis (1973 population = 1,250) and about 35 kilometers southeast of the urban center of Jardas (1973 population = 1,750). Paved roads connect the project with both Taknis and Jardas.

The project occupies the catchment areas of Wadi Thabit (about 14 kilometers long) and Wadi Kharrubah (about 12 kilometers long); the catchment of the project branches into a "Y" shape. The eastern branch of the "Y" is the Wadi Thabit, and the western branch is the Wadi Kharrubah. The project area is flat or gently rolling, with soils of alluvial origin belonging to the silty class. Mixed alluvial-colluvial deposits are found near the edges of the wadi beds.

The existing land use pattern of pastoralists in the study area has undergone a number of changes, especially in the past 20 years, because of various forces of change at work in the region. For example, although seasonal movements still follow the traditional pattern of north-south oscillation, the movements are less extensive. Herds are accompanied by hired shepherds rather than the families, who have settled near small urban centers where social services, government jobs, and opportunities for marketing their livestock are available. Changes in the settlement pattern are reflected by increased agricultural activity, mainly an increase in

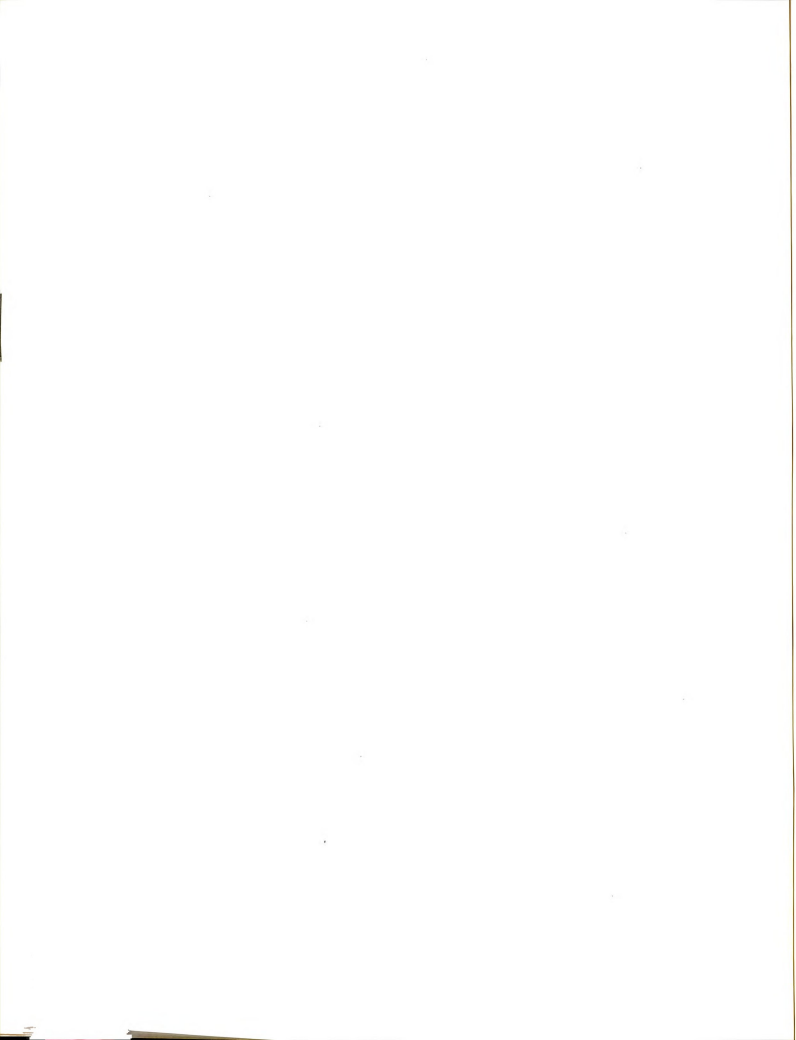
barley cultivation as a means to meet animal feed requirements. Herd sizes have increased because of improved water supplies, availability of concentrated feed, provision for veterinary services, and higher demand for meat.

Although this trend toward settlement may be desirable, it creates greater pressures on grazing areas through overstocking. To alleviate this pressure, the Libyan government has initiated a policy to settle pastoralists in agricultural projects and to have them cultivate fodder crops in arid zones of the region, where the annual rainfall is less than 200 mm.

The Kharrubah project is one of six such projects established in the southern flank of the Jabal al-Akhdar region. These six projects, all with the same land use policies, are designed to settle 250 pastoral families of the area. In the following sections, the Kharrubah project is examined as a case study of proposed government land use.

Proposed Government Land Use Changes in the Study Area

The most important land use changes to be introduced by the project are the irrigation system, the size of farm provided, types of crops to be cultivated, and disposal of herds of pastoralists who are selected to settle.



Irrigation System

Irrigation water will be conveyed from four wells to a reservoir about two kilometers from the irrigation zone. This reservoir is on the watershed of the two wadis (Kharrubah and Thabit) and equidistant from farms in the eastern and western reaches of the area.

The study by Lotti and Associates (1981) indicated that gravity irrigation is not possible for the entire project because the height of the reservoir above the surrounding area is not always sufficient to provide minimum water pressure. Therefore, pumps will be provided for farms located more than 278 meters above sea level. Sprinkler irrigation will supply each farm with water that is rotated among the farm's various fields.

The size of the irrigation project was calculated on the basis of peak requirements in the irrigation calendar (from March to May) and on the amount of water available from the aquifer. The study by Lotti and Associates (1981) indicated that the water table could provide an average of 128,000 cubic meters of water per year per farm, with an annual irrigation volume of 15,000 cubic meters. Thus an irrigated area per farm would be equivalent to approximately 8.5 hectares (Lotti & Associates, 1981). Flood runoff water is also incorporated into the irrigation system when available, permitting

another 0.67 hectare of irrigated area. The remaining 10.78 hectares of each farm will be rainfed.

To minimize the loss of water through evaporation and wind disturbance, the irrigation system will operate during the night. Each irrigated plot will have drainage provisions because of the larger irrigation volumes required to leach the saline soils found in the scheme.

Plot Size and Types of Crops

The project area will be divided into 60 farms of 20 hectares each. Each farm is to be cultivated by the head of the household and his family, without hired laborers, and divided into two types of land use, one using an irrigation system (8.55 hectares of sprinkler irrigation and 0.67 hectare of flooded irrigation) and the other one rainfed (10.78 hectares). Each farm is to be planted with grain and fodder crops on the basis of a three-course irrigated rotation that includes barley, alfalfa, and maize. The project management will decide the amount of land per settler, the crops to be included in the rotation, and the amount of irrigation for each crop. Product marketing will be governed by the agricultural cooperative to which the settler belongs.

The settlement authority estimates that each settler will receive an average annual income of \$28,570. In addition to this income, any settler who had a full-time job before settlement will receive an additional

subsidy from the Libyan government for the first six to eight years. This subsidy stems from the government's attitude that practicing agriculture on the project is a full-time job and that settlers who leave full-time employment to pursue settlement life should receive a subsidy equal to their former salary to insure a smooth transition to a new lifestyle.

Government concerns about the success of the project from an agricultural standpoint are evidenced in provisions of Law 123 of 1973, which include familiarity with and experience in agriculture as a priority for settler selection. Other individuals receiving priority will be those from the locality who work with the project and potential settlers with large families and low incomes.

Disposal of Herds

The settlement project's policy concerning whether settlers may own herds has fluctuated. In the project planning stages, the government decided to allow each settler to own between 20 and 40 animals. However, this policy was later changed to prohibit animal ownership by settlers. Since an official policy of not integrating animal raising with practicing agriculture has been adopted, a prospective settler must dispose of his animals to settle in the area.

The major changes outlined above will lead to a new land use system in the Kharrubah area. This research focuses on the spatial effect of these proposed changes on the people and the land in the study area.

Objectives of the Research

The objectives of this research are as follows:

1. To describe the traditional pastoral land use and the socioeconomic system associated with it, and to assess the effect of modernization and the processes of on-going change experienced by the system.
2. To analyze the existing pastoral land use and the government's proposed land use, in order to identify what is compatible and what is not compatible between the two systems.
3. To analyze the pastoralists' perceptions of and attitudes toward the government's proposed land use, in order to identify which components they are most likely to oppose and which they are most likely to welcome.

Research Questions

Based on the preceding objectives and a review of the literature, the following research questions were formulated to guide the research:

1. Will the land use system proposed by the government be adapted to the environment?

2. Will the change in land use disrupt the existing social system?
3. Will the change in land use disrupt the existing economic system?

Research Design and Methodology

The research for this study was undertaken in four stages. First, background library research was done on the study area and on the topic of agricultural settlement schemes. Second, interviews were conducted with the pastoralists who are candidates to settle on the Wadi al-Kharrubah project. Third, information from project administrators was obtained through self-administered questionnaires. Finally, data obtained from the field survey were analyzed.

Background Research

Background research was completed during the summer of 1981. During this time, the researcher visited the project headquarters in al-Marj and the project site in Kharrubah. At the time of this visit, houses on the project were being constructed and fences were being installed around the wadi grazing areas. The researcher also contacted a number of administrative officials in the area who were able to supply information and suggestions. These officials were associated with the Executive Authority of Jabal al-Akhdar Project Headquarters in al-Marj, the General Water Authority in

Benghazi, the Secretariat of Municipality in al-Marj, the Secretariat of Planning, and the Faculty of Education in Beida.

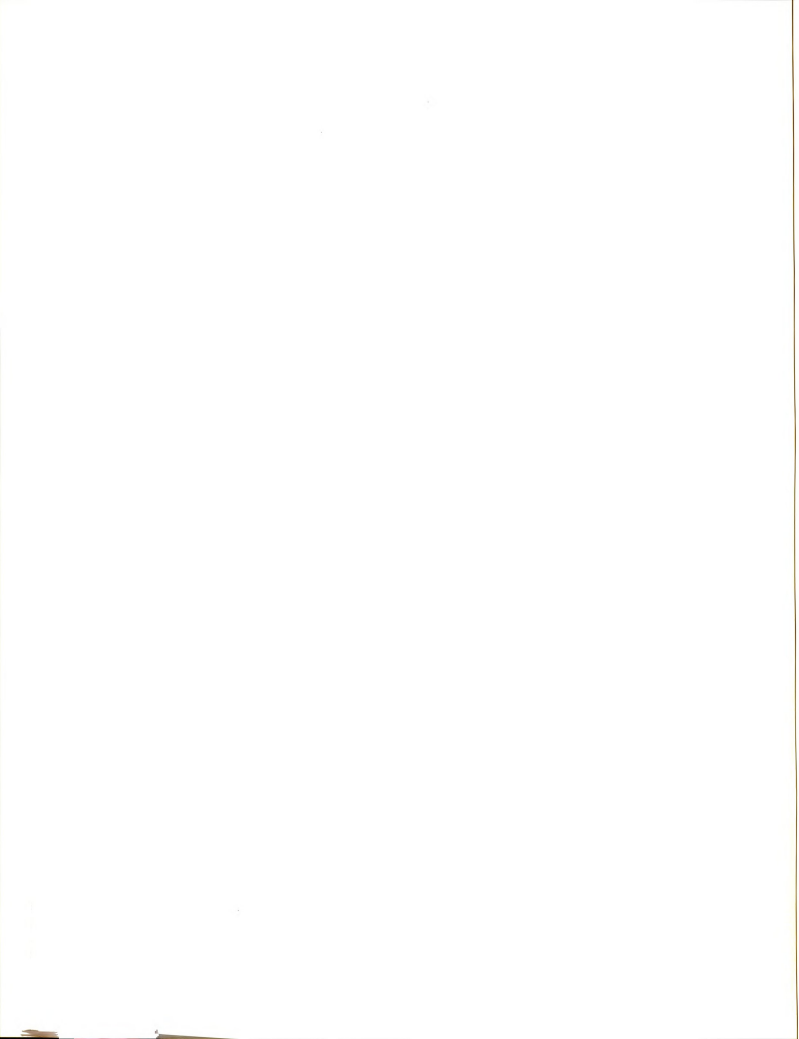
In preparation for the field work, much of the literature concerning topics related to this study was read and evaluated, including sources in English, Arabic, and Italian. No materials were found that dealt directly with pastoral land use in the Kharrubah area or the effect of modernization on the pastoralists.

Field Survey

The field study was started in mid-July 1983 and was completed by the end of September. Interviews were conducted throughout August 1983. Project administrators were very helpful in facilitating completion of the field survey.

The Questionnaire and the Interview Schedule

Two data-collection instruments were used in the field. Because the ten project administrators could read and write, they were given a self-administered questionnaire. (A copy of this questionnaire is found in Appendix A). The administrators' questionnaire included general questions dealing with the aims and objectives of the settlement project; questions related to project land use, such as size of farms and pasture areas allocated to the settlers; and questions concerning the farming

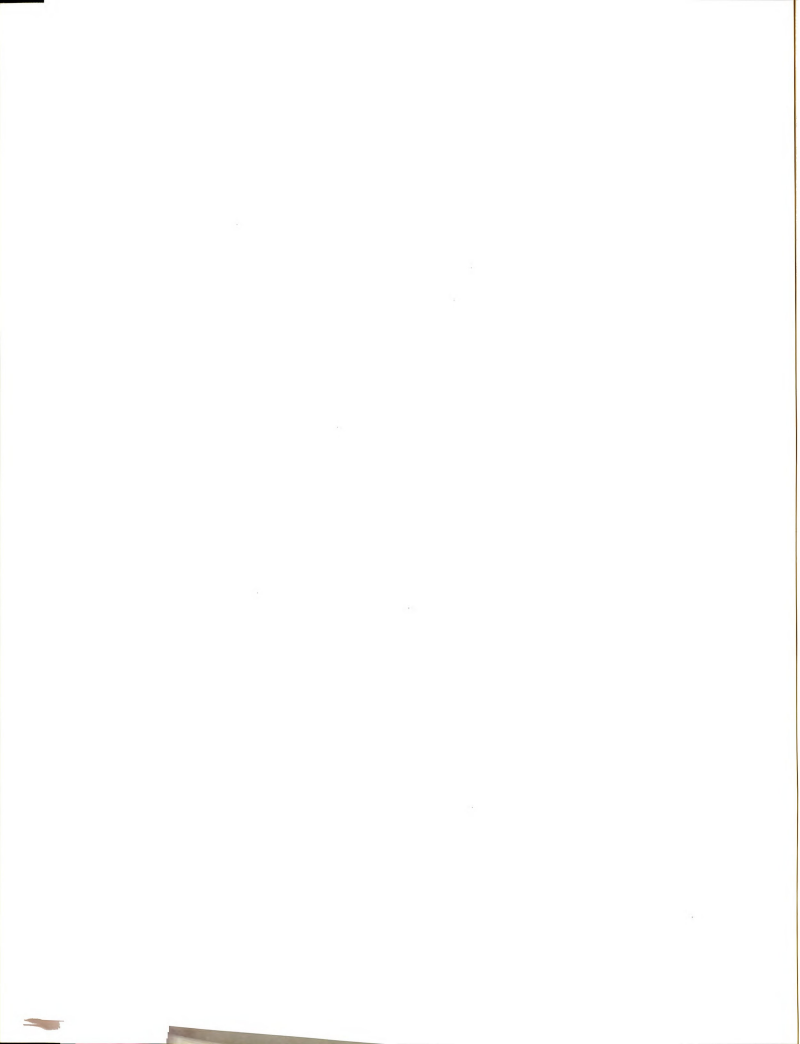


system, such as project organization and benefits to be provided to the settlers.

The second instrument was an interview schedule, which the researcher and an assistant used in questioning the 80 heads of household who constituted the entire population of the area. (A copy of the interview schedule is contained in Appendix B). The interview method was used with the pastoralists because many of them are illiterate. The interview schedule contained questions about general population characteristics, land use and socioeconomic aspects of pastoral life, and the pastoralists' attitudes toward settlement.

The Population

No sampling method was employed in this study because the entire population of 80 families in the Kharrubah area was questioned. To determine the total population of the Kharrubah area, heads of households were listed by name and location, as given in records available in the municipality branch at Jardas. These names were then cross-checked with records of the agricultural cooperative in the project and with project headquarters in al-Marj. About 80 percent of the Kharrubah population belong to the Abid subgroup, mainly the Yatama section, who have traditionally owned most of the land occupied by the project; the remaining 20 percent belong to Morabitin tribes.



Research Assistants

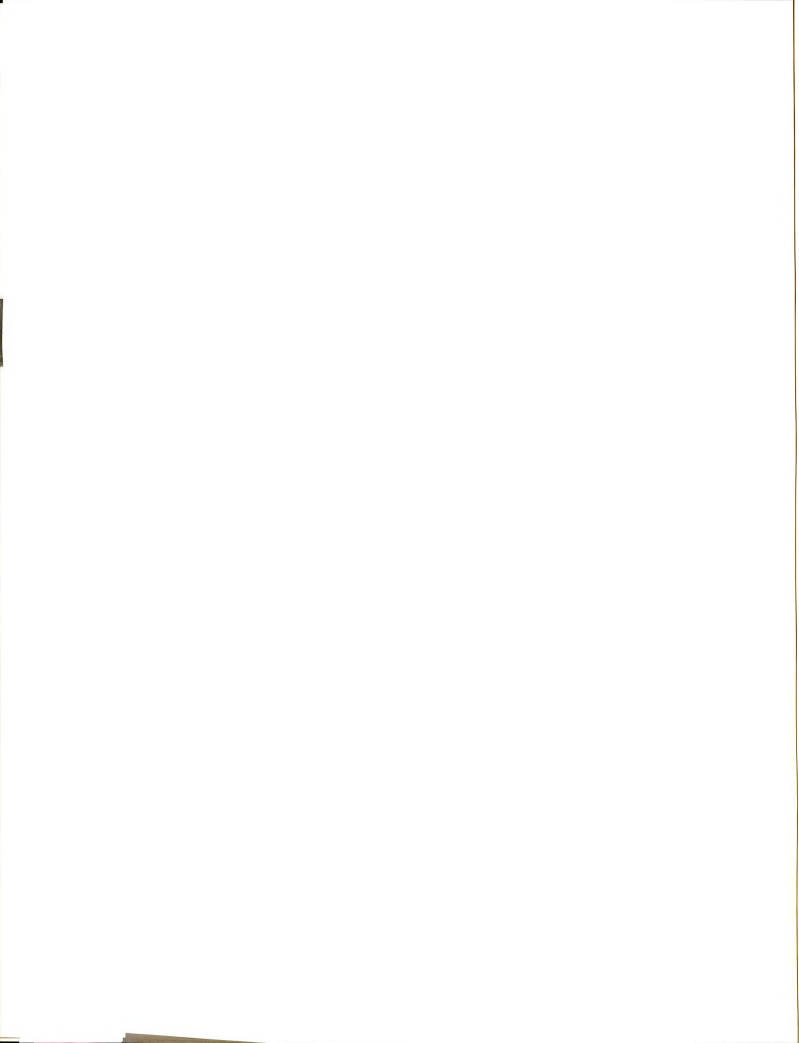
Because the study area and the population to be interviewed were relatively small, the researcher decided to conduct the field survey himself, with the help of one assistant. The research assistant was selected because of his previous experience in field surveys, willingness to devote large amounts of time to the research project, ability to speak the local Arabic dialect, and knowledge of the Kharrubah area.

Pilot Test

Before collecting the data, and to use the interview schedule most efficiently in gathering data for the research, a pilot test was conducted. This test helped achieve proper ordering and clear wording of questions, aided in eliminating and/or modifying items, and provided practice in recording responses. Various administrative officials and 15 pastoralists participated in pilot testing the instruments.

Data Collection

In conducting the interviews, the researcher had available the aid of district heads and other key staff members, as well as a guide to indicate the location of pastoralists in the wadis (valleys) of the area. The project chairman provided a car to cover the distance from the central location at the project rest house in the Kharrubah wadi to the home of each of the

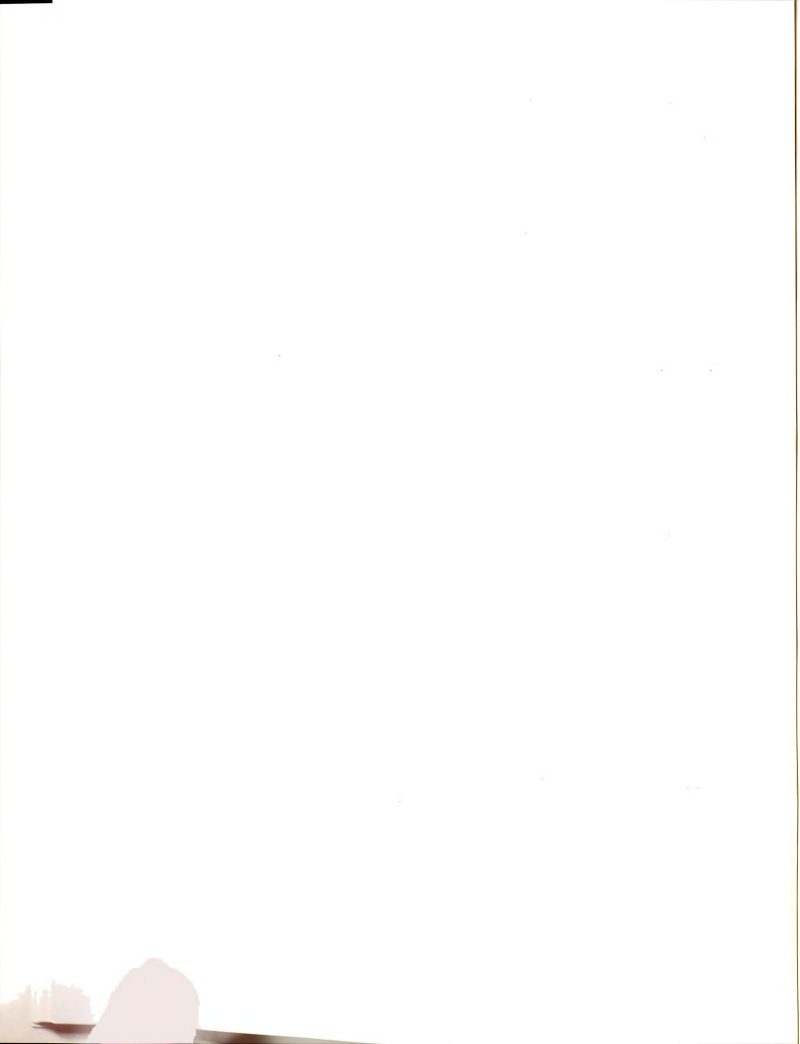


pastoralists scattered throughout the area. The maximum distance covered each day was more than 60 miles.

Interviews with the pastoralists began early in the morning and continued until just after sunset. The majority of pastoralists were interviewed in their homes. Others were met at the district headquarters in the town of Jardas, at the Umm al-Jawabi water point seven miles south of Jardas, or on the al-Marj plain, where some families rent farms for grazing their animals. All arrangements for meeting pastoralists were made in advance by Muktar al-Mahalla, who maintains the population records for the municipality branch in Jardas. Questionnaires were also distributed to ten administrators. These included the director of the project, the head of the technical department, and the three project supervisors. Cooperation from the pastoralists and project staff made it possible to complete the interviews in about six weeks. After the data were collected, questionnaire and interview responses were checked for completeness and consistency.

Method of Data Analysis

Determining the existing land use pattern of the Kharrubah area and the factors affecting this pattern were important objectives of this study because these were the initial steps in analyzing the compatibility between the existing land use system and that proposed by



the government. Analysis of the government's proposed land use was based on the formal management questionnaires and documents published by the government, by the project authority, and by foreign consulting companies.

To analyze the compatibility between the two land use systems, data from the interview schedules and questionnaires were tabulated (percentage and frequency distribution). Spearman correlation and chi-square analysis were used to analyze the factors affecting the existing land use and the expectations of the pastoralists concerning the government's proposed land use.

Limitations of the Study

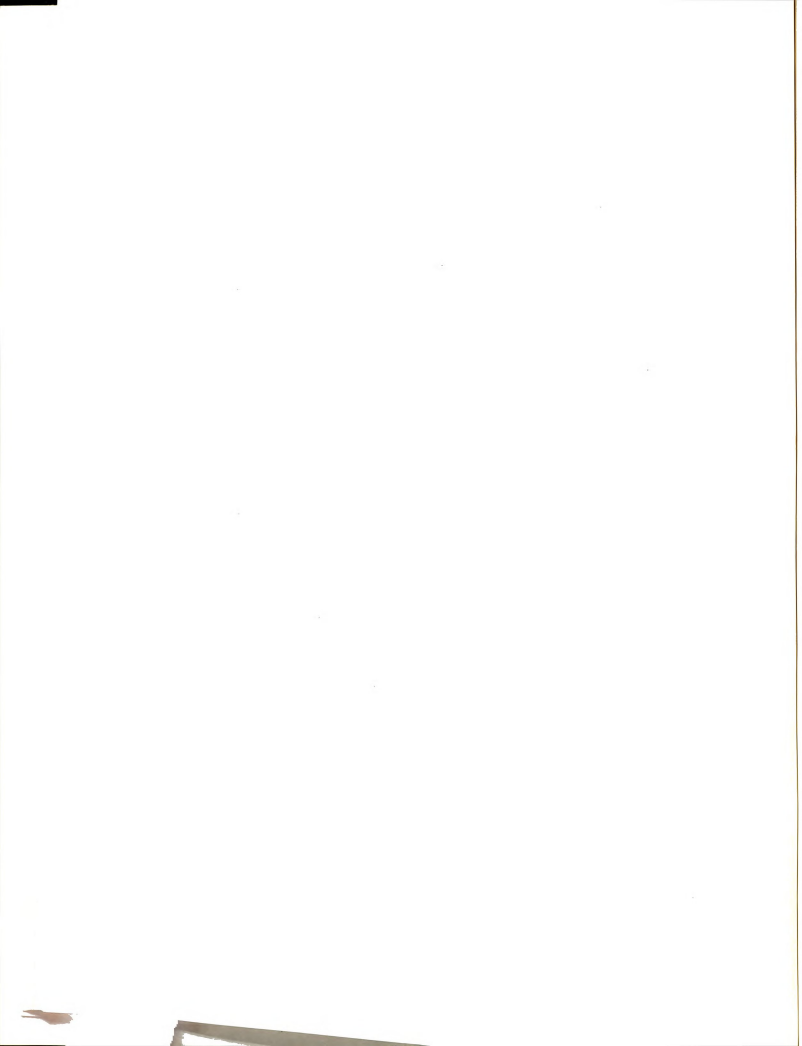
Conducting a field survey in a semi-arid region of a less-developed country such as Libya can present complications and limitations to the research process. Two types of limitations were encountered in the course of this research: data reliability and logistical problems.

Reliable data concerning agricultural settlement projects in pastoral areas of developing countries, including Libya, are difficult to obtain. Although various government ministries are responsible for maintaining such data, adequate records are rarely kept. Information retained by the government may not be current or complete, and it has limited usefulness. Because the

government does not encourage investigations of its projects, particularly by foreigners, any data that might be provided about these projects may reflect only government viewpoints.

The prevalence of a government bias in settlement policies was also reflected in the self-administrated questionnaire given to Kharrubah project officials, whose responses echoed both the views of the government and the project's director. Given this limitation on the data, interpretation of government land use patterns and their viability must be approached with caution.

The second limitation resulted from various logistical problems in gathering data. One complication was the difficulty of travel because of unpaved roads. A paved road between the project and the nearby urban center of Jardas has existed for several years, but there are no paved roads to the homes of pastoralists living in the Kharrubah area. Most of these homes are reached only by travelling on rough dirt tracks. The added travel time, as well as difficulty in reaching some of the more remote sites with inaccurate maps, complicated the data-gathering process. Related to this complication was the fact that the field work was conducted from July to September, the hottest time of the year in Libya, when the dry, hot Gibli winds from the Sahara make outdoor work uncomfortable.

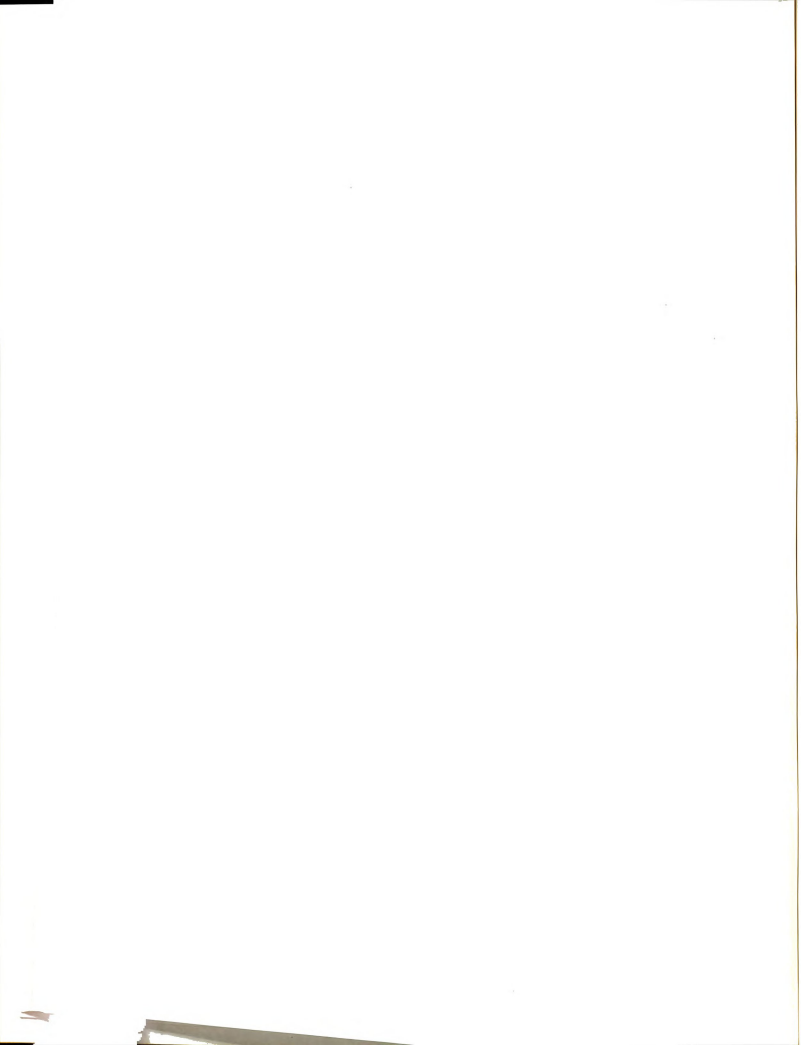


Another complication was the reluctance of some pastoralists to volunteer information about their herds. This reticence is due to widespread rumors that the government will limit the pastoralists' herd sizes as a part of national socialization, and to the misconception that results of field surveys will somehow be used for taxation, even though taxation in Libya was abolished in 1963. Such suspicion has been noted by those conducting research on pastoral systems in other parts of the world. Only after the pastoralists were convinced that such data would be used only for academic research would they indicate how many animals they owned.

In addition, pastoralists are very reluctant to divulge the ages of their sons, or the ages and names of their wives and daughters. Some refuse to provide the son's age because they fear that he will be drafted into military service. Concerning the ages and names of wives and daughters, it is considered a breach of etiquette to ask such personal questions. Thus, the researcher only asked the head of household for their own age and their family size. This information was freely given.

Organization of the Dissertation

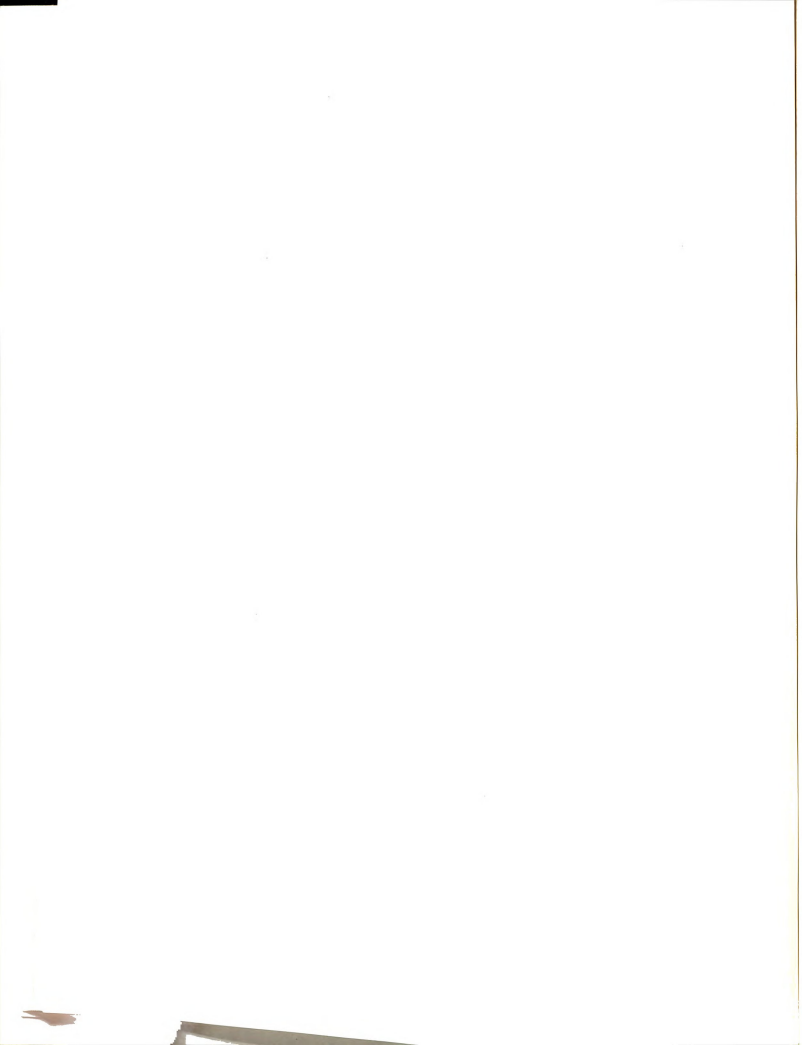
The remainder of this dissertation is divided into five chapters. In the first part of Chapter II, the traditional characteristics of pastoral societies are discussed. These economic, social, and political



features of pastoral societies are typical for many arid and semi-arid regions of the world. They provide a basis for comparing present-day pastoralism with its traditional counterpart. The second part of the chapter examines how pastoralism in general has undergone modernization in recent years, through both technological improvements and government development programs, specifically settlement schemes. Since the present research concerns one such settlement project, particular emphasis is given to the problems encountered in other settlement plans and the conditions necessary for a project to succeed.

Whereas pastoralism in general is examined in Chapter II, it is discussed in Chapter III from both a traditional perspective and in terms of its modernization, particularly in relation to the Jabal al-Akhdar region and the Kharrubah area. The Libyan government's development of water and pasture resources is discussed, and problems with Libyan settlement projects are summarized.

An analysis of the interview data is presented in Chapter IV. Also examined is the effect of modernization on the relationship between selected demographic and cultural attributes of the herders and the types of land use practiced in the area.



Chapter V contains an analysis of the compatibility of the two land use systems, based on responses to the interview schedule and the self-administered questionnaire. A summary of the study and conclusions based on the research findings are included in Chapter VI.

CHAPTER II

REVIEW OF LITERATURE

Several aspects of pastoralism that are pertinent to this study are covered in this chapter. Topics of major interest are the general characteristics of traditional pastoralism, the changes brought about through modernization, and the settlement of pastoral populations.

General Characteristics of Traditional Pastoralism

Pastoralism is an ancient way of adapting to arid or semi-arid environments. Sandford (1983) specifically defined pastoralism as an adaptation in which

sustenance is derived from keeping domestic livestock in conditions where most of the feed that the livestock eat is natural forage rather than cultivated fodder...and where working time and energy is devoted to looking after livestock rather than other economic activities. (p. 1)

Most of the literature on pastoral nomadism has been written by anthropologists, sociologists, and economists, such as Musil (1928) and Dickson (1951). Some authors, including Daughy (1920) and Assah (1965), have discussed pastoralism in the context of a larger

theme such as history, travel, or genealogy. Geographers have contributed to the literature on pastoralism with detailed and systematic studies of pastoral groups (Ford, 1954; Johnson, 1969; Jones, 1932; Matley, 1966). In the following pages the general characteristics of traditional pastoralism are discussed in terms of the physical environment, pastoral economies, and social and political structures.

Physical Environment

Pastoralists inhabit arid (annual average rainfall below 200 mm) and semi-arid (annual average rainfall 200 to 800 mm) belts of the world. According to Sandford (1983), arid and semi-arid areas constitute

35 percent of the earth's land surface with a total human population of 500 to 600 million people. Of this total some 30 to 40 million are believed to have animal-based economies, and the majority of these are pastoralists. Fifty to 60 percent are found in Africa, 20 to 30 percent in Asia, 15 percent in the Americas, and less than 1 percent in Australia. (p. 2)

Table 1 shows estimates of the pastoral populations of various countries; figures are only approximate because pastoralists are suspicious of authority and are constantly moving. Referring to the difficulty of counting pastoral populations, Sandford noted

These figures are subject to wide margins of error, since even in countries with well-developed statistical services different estimates vary very widely due to differences in definition of terms as well as difficulties in counting. (p. 2)

TABLE 1

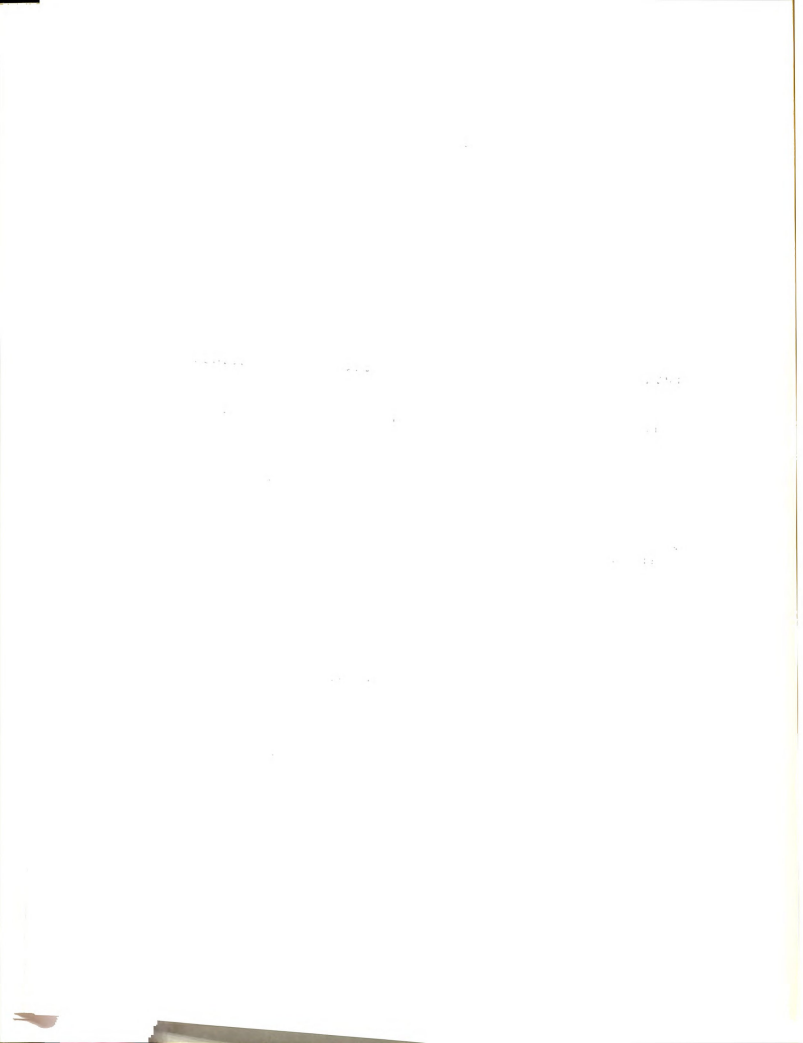
NOMADIC AND SEMI-NOMADIC POPULATIONS
OF VARIOUS COUNTRIES

Country	Nomadic Population	Semi-Nomadic Population
Afghanistan	2,000,000	4,000,000
Algeria	66,000	140,000
Botswana	...	14,000
Ethiopia	1,000	...
Iran	...	462,000
Iraq	66,000	40,000
Jordan	95,000	50,000
Kenya	150,000	...
Libya	150,000	200,000
Mali (north)	308,000	...
Saudi Arabia	2,000,000	50,000
Somalia	1,300,000	1,700,000
Sudan	1,400,000	...
Syria	200,000	...
Tanzania (Maasai only)	102,000	...
Tunisia	50,000	...

SOURCES:

Mohammed Ebrahim, "Problems of Nomad Settlement in the Middle East with Special Reference to Saudi Arabia and the Haradh Project" (Ph.D. dissertation, Cornell University, 1981), p. 42.

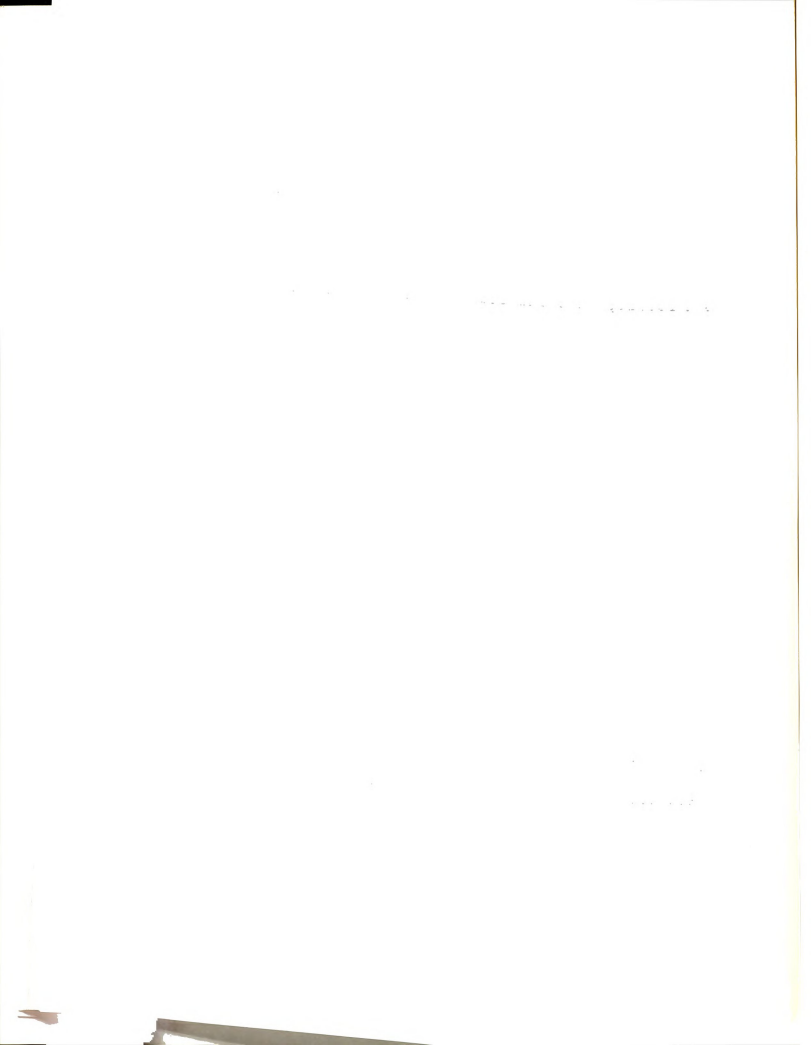
Bashir el-Wifati, "Some Socio-Economic Considerations in the Bedouins' Agricultural Settlement (an Example from Libya)" (Ph.D. dissertation, University of Missouri, Columbia, 1977), p. 49.



The most fundamental physical factors that influence a pastoral society's land use in these regions are the lack of rainfall during most of the year and inter- and intra-year variability in rainfall (Sandford, 1983). In turn, these variations in rainfall produce areal and seasonal variability in the location of pasture and water. As a result, pastoralists have evolved patterns of spatial movement that enable their livestock to exploit the seasonally available grazing.

Spatial location and flexibility in herd management are also important in dealing effectively with rainfall variations and grazing conditions. Johnson (1969) has emphasized that this type of spatial change is not a random or aimless behavior, but rather it is based on detailed knowledge of grazing conditions and probable climatic variations.

Spatial movements are also motivated by factors other than environmental variations. For example, Dahl (1981) cited the avoidance of disease-carrying insects as a reason for spatial movement. Political motives were examined by Sandford (1976), and Kates and others (1977) discussed spatial movement as a strategy for shifting accumulated capital reserves in the form of animals to areas less affected by adverse environmental conditions.



The Pastoral Economy

Swidler (1980) characterized the economic base of pastoralism as comprising three subsystems: dichotomized, mixed, and intersecting. In dichotomized economies, the possibility of combining pastoral nomadism with cultivation or wage work capable of sustaining local communities is minimal. In mixed economies, pastoral and agrarian activities are combined at the household and community levels. In intersecting economies, the relationships between pastoral and sedentary groups are based on contractual exchange.

In the pastoral economy, animal products are used on both a subsistence and commercial basis and are exchanged with neighboring agriculturalists for grain products. Pastoralists receive agricultural products from farmers in return for protection from raids, and there is lively trade between pastoral groups and local markets along the pastoralists' migration routes (Johnson, 1969). Traditionally, pastoralists have also been allowed to graze their animals on crop residues after harvests; the fields become enriched by manure.

The herds are the major means of production in pastoral economies, which are based on milk products rather than meat production (Galaty, 1981). Livestock products are also used as a form of currency and exchange in pastoral societies; monetary exchanges are largely

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absent. Other economic activities include handicrafts, smuggling, and raiding.

The main strategy of pastoral economies is to provide long-term rather than short-term security of production. Two methods for achieving such security are to choose animal species that are adapted to available resources and environmental conditions, such as camels in dry areas and cattle where water sources are more plentiful, and to choose a herd size that will minimize the effects of potential disasters (Sandford, 1983).

Social and Political Structures

Pastoral societies have different forms of social interaction. Capot-Rey (1965) discussed the importance of one of these forms, kinship, in his analysis of North African pastoralism. Each family unit is part of a lineage; lineages are linked through a common illustrious ancestor to form subtribes and tribes or clans. Kinship provides a powerful means of focusing the tribe's affairs and activities, enabling the social and economic systems of tribal society to function as an interrelated single unit.

Protection against adversity is the primary purpose of the social system. Writing on Kenya, Campbell (1981) noted that supportive activities exist within social units "designed to reduce the effects of inclement

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environmental conditions, disease, or external threats" (p. 43).

Some social ties are reinforced through the exchange of herd animals. Galaty (1981) referred to livestock exchange in Africa as "the primary medium of social relatedness." Herd animals also constitute a form of social currency for transactions such as bridal payments and are sources of prestige for their owners (Goldschmidt, 1981).

The traditional social system is characterized legally by the land tenure system, which forms a spatial organization in which territorial distribution is based on tribal divisions. Exploitation rights over land use are held collectively by kinsmen rather than individuals. Abou-Zeid (1965) noted that the kin group's consent is needed before land can be alienated; some cases require consent of the entire tribe or clan. In Libya, land access rights are collectively inherited through the male line of descent; distinct types of property are recognized (Behnke, 1980).

Modernization of Pastoralism

In the present century the pastoral societies of Libya have had to make significant adaptation to forces of modernization associated with their greater integration into the commercial economy of the country. Aspects of modernization which have had a major impact include

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economic opportunities such as the emergence of vigorous urban meat markets and technological innovations such as motor transport. Further, active efforts by the central government to integrate the nomadic sector into the national economic and political system have weakened the traditional autonomy of the pastoral groups.

The remainder of this section contains a discussion of the differences between modern pastoralism and the traditional aspects of pastoralism, and the effect of modernization efforts on pastoralism. One of these efforts, induced settlement, is discussed in greater depth in the third part of this chapter.

Colonial Influences

Colonization of countries with pastoral populations by European and other foreign powers changed the nature of traditional pastoralism. The aim of colonization was usually to use the resources of the colony economically and strategically. Some type of modernization of the pastoral populations often had to be undertaken to achieve this purpose. Political control had to be exerted on pastoral groups, and this control, often achieved through force, challenged the fundamental tribal authority.

Modernization efforts included water resource development, creation of a rural infrastructure, land reform, economic advancement, and settlement. One effect

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of colonial modernization has been the expansion of agriculture into pastoral areas, with a decrease in available grazing areas and increased distances to reach them.

Campbell (1977) noted that grazing areas for the Tuareg and Fulani of West Africa were reduced as a result of colonial modernization. In Libya's Jabal al-Akhdar, wells and cisterns were to be rebuilt and a number of new grazing zones were to be reserved for pastoral activities to compensate for the conversion of traditional grazing areas into farms for Italian colonists, but these efforts were not effective because pastoralists did not respect the boundaries of Italian farms located amidst seasonal migratory routes (Segrè, 1974). The Italian colonial presence in the Jabal al-Akhdar is further discussed in Chapter III.

Technological Changes

A number of innovations and technological changes that have occurred in the past several decades have affected pastoral economies and lifestyles.

Motorized transportation. One of the most important influences on traditional pastoralism has been the advent of motorized transportation in those countries where pastoralists can afford to own and operate vehicles. The availability of trucks has greatly reduced the distances and travel time traditionally involved in tending animals, allowing many pastoralists to manage their herds

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th a truck from a fixed location. Thus, many herders
ve abandoned the traditional lifestyle, in which
milies moved with their tents and herds to various
azing locations. Year-round transportation of water
d fodder to herds is possible, and herders now have
cess to urban markets that were once too distant.
liance on the camel as a mode of transportation and
ggage conveyance has also decreased. Bahhady (1980)
ted that camels on the Syrian steppe have been
mpletely replaced by cars and trucks.

The effects of the advent of motorized transporta-
on have often been positive, particularly the greater
cess to markets and some ability to compensate for
regularities in water and fodder supplies. According
Bates (1980), the success of animal production in
stern Turkey depends on access to distant markets
rough motorized transportation.

The advent of motorized transportation has also had
me negative outcomes. The ability to transport water
herd sites year-round permits early grazing and
creased herd sizes, which have sometimes resulted in
ergrazing. Another adverse effect can be seen in North
rica, where many nomadic tribes have lost the income
ey once derived from the trans-Saharan caravan traffic,
ch has almost completely disappeared since motor
icles have become available (Capot-Rey, 1965; Johnson,
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Veterinary activities. Additional technological changes have been the improvement of disease control in livestock through greater access to veterinary services, and the introduction of breeding programs. Animal mortality rates have been reduced and animal productivity increased, enabling pastoralists to derive larger incomes from their herds. Although many pastoralists generally find livestock disease control programs beneficial in decreasing animal mortality rates, they often accumulate more animals as a result. The increase in herd size through decreased animal mortality sometimes affects the environment through overgrazing. Campbell (1977) observed this in Niger, and Goldschmidt (1980) cited studies of overgrazing by the Meru tribes in Kenya and the Fulani of West Africa.

Agriculture. Technological changes also have occurred in agriculture, a traditional reserve activity for pastoralists. The availability of extension services, fertilizers, pesticides, and modern agricultural technology has enabled pastoralists to practice agriculture on a more substantial basis. Machines have replaced animals in many agricultural operations, and new areas have been opened for cultivation. In Libya, for example,

in recent years tractors rented by a group of neighboring families have made an appearance in the south and have expanded the bedouin's ability to plough more in the marginal districts. As much land

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as possible is planted taking into consideration available seed and an appreciation of the amount of return anticipated given past experience in the area. (Johnson, 1973, p. 53)

Economic Changes

The integration of pastoral economies into commercial markets, the availability of wage labor, and accompanying modifications in pastoralist-farmer economic relations are the major economic changes that have transpired in traditional pastoral societies.

Commercial marketing. The most important change in traditional pastoral economic activities has been the increased integration of pastoralism into commercial markets in some developing countries. In his study of Sahel areas, Bourgeot (1981) pointed out that "penetration of market relations in the nomadic world occurred during the 1960's and had become firmly established by the time of the drought of 1969-1974" (p. 117). Balikci (1981) reported that pastoralism among the Lakenkhel of Afghanistan "remains firmly integrated in the regional and national economies...and is essentially a capital generating activity" (p. 156).

Integration into the national and regional economies has resulted partly from the pastoralists' desire to benefit from increased national income and partly from the increased demand for meat in growing urban centers. Livestock sales have also increased

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because of the pastoralists' desire to acquire purchasing power for consumer goods. Pastoralists can now take advantage not only of regional and national marketing opportunities, but also of opportunities provided through foreign trade. For example, the increased demand for meat in oil-rich Middle Eastern countries has enabled Australian pastoralists profitably to provide meat products commercially. The effect has been a divergence from traditional strategies for avoiding risks and therefore less protection in times of hardship for the pastoral society's members (Swift, 1979).

In some areas, however, pastoralists have not been engaged in commercial marketing. In his study of Saudi Arabian pastoralists, Cole (1981) found that

although pastoralists are aware of the meat shortage and high prices of animals, they rarely sell their animals on a regular basis or in large numbers because they receive money from subsidy programs and from other activities (jobs, etc.) and they are not generally in need of extra cash at the present.
(p. 143)

In other countries, pastoralists have limited and restricted marketing policies because government prices have been too low to stimulate sales. The creation of a marketing monopoly in Tanzania drove pastoralists into the black market (Jacobs, 1973, cited in Goldschmidt, 1979, p. 114).

Wage labor. Economic development programs initiated by many governments have changed the traditional nature

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pastoralism by altering the labor supply. Wage labor and other economic alternatives have become more readily available, and pastoralism is often too risky or unattractive in comparison to these alternatives. In addition to providing employment, economic development projects also expose pastoralists and others in rural areas to Western cultural values and consumption practices.

In North Africa and much of the Middle East, since the discovery of oil, large amounts of capital from petroleum profits have been invested in rural development. One result has been a massive migration from rural pastoral areas into urban centers to seek lucrative employment opportunities (Birks, 1981; Johnson, 1969).

Pastoralist-Farmer Economic Relations

The economic relationship between pastoralists and agriculturalists has undergone several changes in recent years. Traditionally, pastoralists were allowed to graze their animals on crop residues after harvest, and the fields became enriched by manure. A number of products were traded between the two groups. Many of these changes are increasingly being absorbed into the modern economic system.

With added pressures on land resources as a result of modernization and population growth, several factors have altered the traditional pastoral-farmer

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relationship. One aspect is the change from collective to individual land ownership. Agriculturalists now own and exercise greater control over access to land once open to grazing. Farmers often graze their own herd animals on crop residues, thereby reducing the supply for pastoralists (SWECCO, 1982). Another factor has been the expansion of agriculture, often on a commercial basis, into grazing areas: this has decreased the available grazing space. In his study of Niger, Campbell (1977) found that

the nomadic pastoralists, with their larger herds, are excluded from the agricultural zone during the wet season and have been forced farther and farther northwards in their search for wet season pasture as the cultivated area has been extended northward. (p. 109)

Political and Social Changes

A number of political and social characteristics of pastoral societies have undergone changes in recent years. The patriarchal authority of the traditional family has declined as family members leave for wage jobs, and nuclear families are replacing extended families. The role of livestock as a form of social currency has diminished as a result of the increased commercialization of herding activities. Social changes once measured in terms of livestock are now measured in currency (Schneider, 1981).

Conflict reduction. One major political change in traditional pastoral society has been the reduction of

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conflict between tribes through military intervention. Raiding activities and intertribal conflicts, in addition to being a source of economic gain, were traditional methods for asserting autonomous tribal authority. Increasingly, such conflicts are being resolved in court, and police forces are replacing tribal authority. Among the Sarhardi tribesmen of Iran, for example, predatory raiding and rustling activities were terminated through military intervention, leading to a loss of revenue and diminished status of tribal authority (Salzman, 1980).

National borders. Concern over national security has been growing among developing countries. As a result, tighter restrictions have been imposed on border crossings. These restrictions have hindered pastoralists from taking full advantage of seasonally available pastures and have limited their access to foreign markets. Concerns over border security have affected pastoral groups along the Algeria-Mali border, which they are discouraged from crossing because of increased concern for national security (Swift, 1974).

Smuggling once flourished among pastoral groups located near national borders, and this activity is now greatly diminished. Pastoralists of the western Egyptian desert smuggled a variety of contraband items, especially alcohol, into Libya in exchange for luxury items. However, since the war between the two countries in the

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summer of 1977, smuggling has nearly ceased because of tighter border security.

Spontaneous Settlement

One phenomenon that has dramatically changed the traditional spatial patterns of pastoralism and involves a number of different technological, economic, social, and political factors is spontaneous settlement. This type of settlement can be defined as a way to exploit, either individually or collectively, the opportunities provided by a sedentary lifestyle, or as a response to the increasing difficulty of making a living through herding animals. If herd size drops below subsistence level, or labor and fodder become too expensive, or the government holds a favorable attitude toward agriculturalists, many pastoralists will realize that agriculture is more economically appealing than pastoralism and will settle in villages and work as farm laborers or shepherds. Salzman (1980) found that the Baluch of Iran voluntarily reduced spatial movement and engaged in agriculture when herding became too expensive.

Spontaneous settlement has also resulted from technological changes in the pastoral way of life. The availability of government-funded irrigation projects or of agricultural improvements such as fertilizers and seeds can encourage settlement in agriculture. The introduction of motorized transportation has provided

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easier access to organized markets, social services, and pasture and water and has replaced the need for family migration. The al-Fadl and al-Hassanna sheep-raising pastoralists of the Syria-Lebanon border region replaced camels with trucks in the mid-1960s to reduce spatial movement and permit a more sedentary lifestyle (Chatty, 1980).

Pastoral Development

An important aspect of the modernization of pastoral societies has been the role of central governments in pastoral development. Governments' roles in initiating these development projects are usually directed at conserving environmental resources and modernizing pastoral societies.

Government officials and scientists have often blamed the pastoralists for environmental degradation. It has been argued that because of the irrationality of the pastoral system, which relies on common access to pasture, spatial movement, and unrestrained mobility; a social system that equates large herds with social wealth; and a reluctance to limit herd size, overgrazing is resulting in desertification. Hardin (1968) noted that

The tragedy of the commons develops in this way. Picture a pasture open to all.... As a rational human being each herdsman seeks to maximize his gain. Explicitly or implicitly, more or less consciously he asks 'What is the utility to me of adding one more animal to my herd?' This utility has one negative and one positive component.

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1. The positive component is a function of the increment of one animal. Since the herdsman receives all the proceeds from the sale of the additional animal the positive utility is nearly +1.

2. The negative component is a function of the additional overgrazing created by one more animal. Since, however, the effects of overgrazing are shared by all the herdsman the negative utility for any particular decision-making herdsman is only a fraction of -1.

Adding together the component partial utilities the rational herdsman concludes that the only sensible course for him is to add another animal to the herd. And another.... But this is the conclusion reached by each and every rational herdsman sharing a commons.

Therein is the tragedy. Each man is locked into a system that compels him to increase his herd without limit in a world that is limited.

Ruin is the destination to which all men rush, each pursuing his own best interest in a society that believes in the freedom of the commons.

Freedom in a commons brings ruin to all. (p. 1244)

Similarly, Ferguson (1977, in Horowitz, 1981)

blamed overgrazing for environmental degradation:

It is generally agreed that overstocking and the lack of managed grazing patterns in the Sahel are the most important causes of desertification in the Region and that desertification is a symptom of more fundamental problems or rapid population growth and the inability of individuals and communities to adopt known land management and conservation technologies.

If current desertification trends cannot be reversed quickly, the countries of the region may permanently lose the capacity to feed themselves and the ability to support a growing population at even current subsistence levels.

For these reasons, the mastering of the critical problems is one of the keys to the medium- and long-term economic development of the Sahelian Region. (p. 67)

Many officials believe the solution to the problem of maintaining environmental quality must be found in changing pastoralists' traditional economic or social activities that underlie inappropriate land use.

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Particular blame is placed on collective land ownership, which is seen as one element of traditional pastoralism that has prevented modern technology from solving desertification problems (Horowitz, 1981).

Central governments also want to develop marginal areas of their countries to improve the national economy, and to incorporate pastoral economic products in foreign trade or use them to meet national needs. Niger, Upper Volta, and Somalia derive a considerable proportion of their non-mineral revenues from livestock products. Because some pastoral economic activities are conducted outside of commercial markets and monetary systems, and thus avoid taxation or tariffs, governments also want to bring these activities under greater central control.

A low standard of living among pastoral groups has been cited as a reason for pastoral development, usually in the form of settlement or ranching projects. An FAO study concluded that the quality of life of pastoral populations was in great need of improvement (el-Ghonemy, 1968). One of the objectives of the Central Rangelands Development Project in Somalia was to improve the education and health services of the pastoral population (Ebrahim, 1981).

Barth (1962) presented a different view in his study of pastoralists in Iran, Pakistan, and Afghanistan. He argued that pastoral groups have a higher standard of living than settled groups and that, for this reason,

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pastoralists are reluctant to settle. Although social services are designed to improve the pastoralists' standard of living, there is some doubt that this actually occurs, even where such services are readily available. Stauffer (1965) found the pastoral communities of southern Iran to be consistently more prosperous than their farming counterparts. Likewise, Darling and Farvar (1973) found standards of living among pastoralists in the Sahara to be higher than those of the sedentary population.

One of the primary reasons for pastoral development is central governments' desire to exert greater political control over pastoral groups, because of national security concerns, desire for national unity, or the belief that autonomous tribal authority is a threat to the central government's power. Bates (1973) cited the forced settlement of Kurdish and Turkmen tribes in Turkey as a case in which tribal autonomy was seen as threatening.

Governments attempting to modernize the state through national development find it difficult to incorporate pastoral societies because of their mobility, independent wealth, and low population density. Anxiety is often evidenced by administrators who are not from pastoral societies and who see pastoralism as a backward and irrational way of life. Some officials also believe

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that pastoralism is a political strategy for avoiding state control, as evidenced by resistance to government intervention and control among the Yomut Turkmen (Irons, 1975).

In response to the concerns listed in this section, governments have initiated pastoral development projects. These schemes usually involve policies for environmental management, such as water resource development, and plans for altering the traditional structures of pastoral societies.

Environmental management policies. The accessibility of water and grazing resources is controlled to some extent by government management policies relating to environmental and rangeland resources. To overcome the lack of water in arid lands, many African and Middle Eastern countries have provided wells, cisterns, mechanical pumps, or dams. Governmental development of these water resources can increase the availability of water in dry areas and decrease the spatial distance to these sources. Water-resource development may encourage pastoralists to increase herd sizes, to graze their animals year-round, or to shift to herd species such as cattle, which are more water-dependent but more individually productive. Even when water sources are readily available, there often is not enough fodder to sustain a herd in a particularly dry year. The installation of permanent water points in Saudi Arabia

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resulted in year-long grazing of desert vegetation and its destruction within a radius of 75 kilometers (Heady, 1973).

A number of difficulties have been encountered in attempting to maintain government water sources. The sites where water is needed are often remote, so that installation and maintenance expenses are high, especially if mechanical pumps are used. Operating these water sources can be complex, and when breakdowns occur the repairs often are not completed (Sandford, 1983). It has been estimated that, in Botswana, 40 percent of the boreholes never function (Hitchcock, 1978). In the Darfur region of Sudan, out of 145 boreholes, 28 had broken pumps and 44 had never worked at all (Hunting & MacDonald, 1977). A similar situation exists in the case of dams or hafirs, which often silt up or are breached after a few years of use. In Kenya, of the 100 hafirs built since 1969, many were silted up by 1979 (Axinn, Birkhead, Sudholt, 1979).

Another aspect of environmental management is the attempt to control herd sizes and the number of livestock grazing in a particular area, either through herd limitation schemes or the introduction of commercial ranches. In some cases, the limitation on herd sizes is constant both wet and dry years, so forage remains underused in both years. In other cases, the limitations are adjusted according to the availability of forage, which may result

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large herds overgrazing pastures in poor years. Campbell (1981) reported that, in Kenya, pastoralists actively opposed one grazing scheme because social relationships dependent on livestock were disrupted, families sometimes had to split their herds to comply with quotas, and herders felt little allegiance to schemes that cut across traditional clan areas.

Commercial ranching schemes have also been introduced, as in Tanzania, Kenya, Angola, and West Africa (Goldschmidt, 1981). Several scholars have been sceptical about the success of these ranches, seeing the traditional methods of pastoralism as better strategies for exploiting the resources of the respective areas. Cruz de Carvalho (1971, in Goldschmidt, 1981)

examined the relationship between ranching and native production in Angola, where European operated ranches are in competition with traditional pastoralism. His detailed examination argues for the traditional methods, claiming a relatively low land to animal ratio, a high reproductive ratio, a high slaughter rate, excellent female to male and young to old ratios, and a close adaptation to the environment. (p. 110)

In addition to controlling the number of livestock, schemes for controlling livestock rotation among grazing areas have also been devised, the aim being to schedule grazing based on the area's vegetation productivity. This practice is at odds with traditional pastoral activities, which were based on the effects of spatial movement on the livestock rather than on the vegetation

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(Sandford, 1983). Because herds are usually under close supervision, small areas can be efficiently exploited on a traditional basis and large areas are more or less evenly used. Wilson (1977, in Sandford, 1983), reporting on rotation schemes in Australia, expressed doubt that systematic rotation improves either animal productivity or the vegetative cover.

Policies for altering pastoral societies. Other aspects of pastoral development are concerned with altering the structure of pastoral societies and attempting to change the traditional characteristics of these societies. One means of fundamentally altering pastoral societies through development is to limit or change traditional patterns of spatial movement, such as in areas where spatial movements cross international boundaries. One means of deliberately changing spatial movement has been to assign pasture rights to individuals, who then assume responsibility for their area. The creation of ranching schemes can also alter traditional spatial movements. In his discussion of African pastoralism, Baker (1974) described how breaking up spatial movements through annexation of thousands of acres of land for ranching schemes has created much hostility among displaced herders; violence has erupted in some instances.

Spatial movement has also been limited both directly and indirectly. As an example of limiting

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In 1948 the Sudan government started a program for excavating hafirs and drilling boreholes in the dry and semi-dry zones of the country. The aim of the program was to delay the nomads from grazing in the south by about 2 months, so that grazing would last the summer. In the 1960's the goal was modified to contain the nomadic movement with a view of future settlement. (p. 309)

spatial movement is limited indirectly through increases in agricultural settlement projects and ranches, which often incorporate land once used for grazing. Khogali (1980) indicated that Humr ranches in Sudan were established across grazing routes used by area pastoralists. Spatial patterns are also disrupted by other types of development projects and infrastructure, where the presence of roads, irrigation ditches, power lines, and fences hinders the movement of herds (O'Keefe & Wisner, 1975).

Pastoral development efforts directed at land reform have included changing the land tenure system through legalization of private land ownership or nationalization of land resources. Nationalization of land rights may result in less control over pastoral activities because the traditional system of internal constraints has been removed, as has happened in Saudi Arabia. Legalizing land ownership may result in pastoralists losing access to traditional grazing areas, as has occurred for the Lakenkhel of Afghanistan and the Fulani of West Africa (Balikci, 1981; Frantz, 1981).

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Legalizing the pastoralists' land tenure rights can create problems when such action is not recognized by the pastoralists, who might still consider ownership to be within the tribe. This has happened in some parts of Syria and Egypt, where pastoralists rejected the idea of government-owned land (el-Ghoney, 1979). When individual land rights are assigned, it is expected that the land will be used as collateral for loans to modernize the livestock industry. In practice, as Davis (1971) and Omer (1976) reported in Kenya, it is often impossible to reclose on a defaulted loan when pastoralists are involved.

One of the reasons for modernizing the pastoral sector is distrust of the pastoralists. Government officials are often reluctant to recognize the importance of kinship in traditional pastoral societies. This may be because the authorities are not from pastoral cultures themselves, or because they see kinship as the cause of violence between clans. In either case, efforts have been made to change the traditional tribal social structure. One method has been to remove some of the authority of tribal leaders and to shift loyalties to national rather than tribal institutions. In his study of the Bedouin of Saudi Arabia, Cole (1981) found that identity as a "tribesman" is now more important than identity with a particular tribe.

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In addition to the social changes brought about by legalizing private land ownership, other methods of replacing kinship-based institutions have been attempted. There has been to register land holders and to base future land access or transfer of access rights on criteria other than kinship. Some of the commercial and model ranches that have been created have "memberships," which are assigned on bases other than kinship. Even in these ranches, however, kinship institutions usually persist; in Kenya, for example, Maasai groups divide their members among several ranches to minimize risk and diversify assets (Galaty, 1980).

Other efforts at modernizing pastoral societies have been directed at providing social services, such as schools, health clinics, and veterinary services. Furnishing these services to pastoralists is often a problem because pastoral groups are dispersed throughout remote rural areas. In addition to being difficult to reach, these services may be available only on a limited basis in poor countries.

Another aspect of modernizing the pastoral sector is the creation of settlement projects. Because the present study is concerned with one such venture, induced settlement is discussed at length in the next section.

Summary. Traditional pastoral societies have undergone dramatic changes in the past few decades due to

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chnological changes, economic development, and changes affecting their political and social structure. Governments of various developing countries no longer view some of the pastoralists' traditional practices, such as spatial movement and maintaining large herds, as appropriate land uses because of the problems they create. Some of these concerns are as follows:

- 1 - environmental degradation through
overgrazing
- 2 - a low standard of living
- 3 - a "backward" lifestyle inconsistent with
modern times and national development
- 4 - an economic system that makes taxation
difficult
- 5 - mobility that renders it difficult to
deliver social services
- 6 - spatial movements that sometimes cross
national borders
- 7 - a social system that produces intertribal
violence and conflict
- 8 - autonomous tribal authority that challenges
state control

To alleviate such problems, central governments have initiated efforts to "modernize" the pastoral sector and to integrate pastoral societies into the national

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onomy and political system. One favored solution is to settle the pastoralists through induced settlement projects.

Induced Settlement Projects

In this section, induced settlement projects are examined as a solution to the problems presented by the pastoral segment of the population. The discussion focuses on the definition of induced settlement, objectives of settlement, problems encountered in various settlement projects, and conditions for success.

Definition of Induced Settlement

Spontaneous settlement is one way in which pastoralists are voluntarily abandoning nomadism to exploit other economic alternatives. Induced settlement occurs in response to government efforts to settle pastoralists, either through force or persuasion. Sometimes pastoralists may be settled against their wishes through the use of force, as occurred in Iran in the late 1920s (Salzman, 1980). Induced settlement may also come about as a result of government persuasion and provision of minimal aid, as happened with religious settlements in Sudan (Ebrahim, 1981).

A third type of induced settlement is government-sponsored projects. These are usually designed by government officials with minimal pastoral participation and require a large initial investment. Most are irrigated,

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cultural undertakings because other economic sectors relatively weak, and large segments of many undeveloped countries are already engaged in agriculture (Mistodoule, 1965). The Wadi al-Kharrubah settlement project (the subject of this research) is one such government-sponsored agricultural plan.

Objectives of Settlement

The objectives of settlement relate to the environmental, economic, social and political problems posed by pastoralism. These objectives can be summarized as follows:

- 1 - to raise the pastoralists' standard of living
- 2 - to integrate pastoral economies into the national economy
- 3 - to develop the arid and semi-arid regions of the country so that these regions can contribute to the national economy
- 4 - to increase political control over pastoral tribes
- 5 - to prevent desertification through overgrazing

These are general objectives for settlement. Individual projects are usually based on more specific goals and objectives.

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Success of a settlement project requires consideration of a number of elements, including a clear understanding of settlement objectives and how they are to be accomplished, as well as careful planning, implementation, and administration of the venture.

Project Planning

Preinvestment surveys are important in planning a settlement project. These surveys should provide information not only on the physical resources, but also on pertinent social and cultural factors. Planning should emphasize site selection and project size, farm size, selection of settlers, attitudes of potential settlers, and tenure, spatial planning of project areas, and provision of services (El-Ghonemy, 1979; Lewis, 1954; Takes, 1979).

If a settlement project is to depend on agriculture, the site must be selected accordingly. Such physical factors as soil, climate, topography, and water resources, and such economic factors as access to markets must be considered. If the site is one where agriculture is not presently viable, the cost of making it suitable for agriculture must be considered (Takes, 1975).

The same physical factors involved in site selection may also determine what types of crops can be grown and how much irrigation is required. The farm must be large enough to provide the settler with a decent

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standard of living, but not so large as to be unmanageable. If laborers are to be employed on the project, this will also affect farm size. Takes (1975) recommended that planners should consider whether a variety of sizes and types of farms will be available for the settlers.

The success of settlement projects also depends on the selection of settlers and criteria used in selection. The purpose of a project usually determines the selection criteria. Some widely used standards for choosing settlers include good health, ability to perform project tasks, and desire to settle. Projects may require some experience or education, although Takes (1975) noted that, for agricultural projects, some experience in farming is often more important than education. In addition to the desire to settle, some consideration should be given to the potential reactions of settlers to how they view their role in the project.

At some point in project planning the spatial form of the project must be considered. This may vary from a village with concentrated housing to a project in which settlers are dispersed throughout the entire area. If livestock are to be part of settler holdings, the location of roads and pasture fencing are important factors. Other considerations are the provision of land for the settlers, the grouping of settlers to avoid

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Because large amounts of effort and money are being
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ct planners should also be concerned with absentee
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If a settlement is to function as a community, a
r of services must be present on the site, such as
ls, shops, churches or mosques, and recreational
ities. Planners should determine which of these
ces will be provided by the government and which, if
by the settlers themselves, and provide a schedule
ninstalling the services (Lewis, 1954).

Administration

Important factors in the administration of a
ement project include recruiting and training
icians to develop and oversee the project, estab-
ng administrative units for managing daily farm
tions, establishing some form of local government,
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ministering the project is desirable, although such
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Problems Encountered in Induced Settlement Projects

A number of problems have been encountered in using
 induced settlement schemes to solve pastoral problems.
 Some difficulties occur as a result of poor project
 planning, but other problems are encountered because of
 improper management or administration.

When a project's objectives are vague or improperly
 defined, problems and confusion can result. One of the
 difficulties encountered with the Haradh settlement in
 Saudi Arabia was a vague definition of settlement objec-
 tives and settlers' role in the project (Ebrahim, 1981).
 In Egypt, the Ras el-Hekima project was initiated to
 provide the Nile community with meat products, but com-
 mercial distribution also provided exchanges with other
 countries so the pastoral sector received a smaller share
 of production (Mahmoud, 1978).

Improper site selection, which may result from
 inadequate preinvestment surveys, has limited the effec-
 tiveness of some projects. According to Ebrahim (1981),
 the Haradh project was built in a remote area with no
 roads or telephone services. At the Wadi el-Sirhan
 project in Saudi Arabia, ten or more settlers had to

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In some areas, the location of projects on traditional grazing areas has caused a loss of grazing space for pastoralists. Khogali (1980) found that tribal conflict resulted when the Kababish settlement scheme was implemented in an area of Sudan belonging to a minority tribe, the Dar Kababish, but which was also used as a traditional pasturing area for the entire Kababish tribe. The problem of loss of grazing area has also been noted in the Wadi Kaam in Libya (McLachlan, 1960), the Awash project in Ethiopia (Mesfin, 1964), and the Khashm el-Sheikh project in Sudan (Heinritz, 1978).

A case in which environmental factors were not taken into account in planning a project is in the Fulani project in Upper Volta (Riesman, 1978). When the Fulani pastoralists settled near a well, desertification occurred as a result of overgrazing and the project was abandoned.

Environmental factors must be considered when irrigation systems are constructed as part of development projects. Although irrigation increases the amount of arable land, enabling grain cultivation in areas previously unavailable for any type of agriculture, it also affects the environment. These effects can be seen when climatic changes occur, not only where irrigation is implemented but also in the water-source area and zones adjacent to the irrigated area. Some changes, such as the

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appearance of vegetative cover, may be immediately apparent. Long-term effects, such as lowered water tables (Mascarenhas, 1977) and health problems resulting from standing water (UNESCO, 1976), may be less apparent.

Dividing an area into farms too small to provide a settler with a livelihood, without considering family size and composition, is another mistake planners make. Kafati (1977) noted the small size of farms in the early settlement projects of Wadi Kaam, Latrun, and Ras el-Ein and insufficient water for irrigation. These conditions led to high settler turnover because farm incomes were low. Similarly, the Sudanese schemes of Khartoum and Rahad, and some projects in northern Kenya were too small to provide a livelihood for a large portion of the settlers (Ebrahim, 1981; Migot-Adholla, 1981; Zaki, 1981).

Problems will be encountered if settlers are not carefully selected or if their attitudes are not considered. Chambers (1969) noted that settlers' initial attitudes are often at variance with official objectives. Leach (1963) found that settlers of the Kongwa project in Tanzania viewed the scheme as an opportunity to accumulate cattle and planned to leave once they had obtained enough livestock. Settlers in eastern Nigeria saw themselves as civil servants rather than farmers and demanded to be compensated accordingly (Apthorpe, 1966). Khogali

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81) found that even though 80 percent of the pastoralists interviewed favored settlement, almost all of them said they would resist efforts to deprive them of their herds.

Planners should recognize that pastoralists will retain some of their social values after settlement. Inadequate consideration of the social and economic processes at work in the area may cause problems. At the Ebrah el-Sarha project in Sudan, a tribe bordering the project claimed traditional access rights to project land and occasionally set fire to grazing areas inside the project (Ebrahim, 1981). In the Kashem el-Girba settlement in Sudan, settlers derived unstable and inadequate incomes from agriculture because of the introduction of improper crops and irrigation methods, and the disposal of their herds (Fahim, 1980; Heinritz, 1978; Hoyle, 1977; Thimm, 1979). This project was established to produce cotton, which the settlers had little interest in growing and which produced too little income (Ebrahim, 1981).

Project planners have not always recognized pastoralists' retention of traditional social values. Settlers in Jordan maintained their tents adjacent to the concrete buildings of the housing settlement (Gharaibeh, 1980). In North Africa, former pastoralists tended to settle near their clan areas (Abou-Zeid, 1965). Goldsmidt (1980) found that clans' regional unity persisted

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the Sebei of East Africa, where pastoralists preferred to be surrounded by clansmen as a form of mutual protection. Mahmoud (1978) reported that the Ras el-Hekima project in Egypt attempted to increase the productivity of grazing areas. But when grazing land within the project was fenced off, the pastoralists of the area, who traditionally recognized only collective ownership of grazing areas, opposed implementation of the scheme and the project was terminated.

Once a project is planned, sufficient capital must be invested to ensure that it operates as intended. In the case of the Khashm el-Girba project in Sudan, managers were not provided with sufficient funds to implement the entire scheme. Only a small portion of the land could be put into production because of insufficient machinery and fuel, resulting in poor yields (Ebrahim, 1971).

Conditions for Project Success

To avoid the problems encountered in settlement projects, a number of procedures must be followed. These are: (1) choosing a suitable site for the project; (2) carefully selecting pastoralists with a desire to settle; (3) providing the right size of farm so the settler can make a living without strain; and (4) providing adequate funding for the project (Takes, 1975).

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Although a number of studies have emphasized the importance of human factors in the success of agricultural settlements, few have analyzed the factors that can help pastoralists adjust to agriculture on a long-term basis. Upton (1973) mentioned that farmers' attitudes toward specific innovations, as well as toward change in general, should be examined. Sabry (1970) emphasized that planning and administering new projects or adjusting existing ones should be done in consultation with the settlers. Sandford (1983) said that "one way to find out pastoralists' objectives is simply to ask them" (p. 23) but he pointed out that the pastoralists may not have the political organizations to represent themselves collectively. He added that: "Attitudinal surveys or observation of their behavior and their culture and the institutions which bind their society together" are additional ways to help the pastoralists adjust to an agricultural way of life.

Views differ concerning the effectiveness of induced settlement projects. Brown (1965) was pessimistic about the future of such projects in Kenya, saying that the selected settlers did not have the skill or capacity for settlement work and that ecological factors affecting the viability of agriculture had not been considered. Khogali (1980) claimed that government settlement projects have not succeeded, although large-scale spontaneous settlements have been successful.

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aty and Aronson (1981) concluded:

Because there is good evidence that pastoralists will settle on their own when sedentarization is seen as desirable or appropriate by them, or when resources and technology permit, there is no technical justification for sudden or forced programs of sedentarization. (p. 21)

Summary

Pastoralism in arid and semi-arid regions of the world has undergone a number of dramatic changes in the last few decades. Some of these changes have come about in response to opportunities presented to the pastoralists by technological changes or economic development, and others have been a result of governmental efforts to develop the pastoral sector of the population.

Efforts to modernize pastoral societies have been undertaken to remedy a number of problems that pastoralism is thought to have created. Such problems include environmental degradation through overgrazing, a "backward" way of life inconsistent with national development goals, a low standard of living, and an autonomous tribal system that is a political threat to the state.

One apparent solution to these difficulties is induced settlement of pastoralists into agriculture, either through such indirect measures as government support of agricultural projects or provision of social services, or through more direct measures like enforced settlement. The objectives of these projects are usually

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improve the pastoralists' standard of living, to integrate them into the national economy, to prevent desertification, and to break up traditional tribal authority.

In attempting to reach these objectives, however, a number of problems have been encountered. Projects have often been formulated with vague objectives, they have been located on improper sites, farms have been too small or too large, inadequate funding has been available, and settlers' attitudes and cultural values have been ignored. To avoid these problems, some conditions for project success have been outlined. These include selecting the proper site, correct farm size, and appropriate settlers, and adequately funding the project.

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CHAPTER III

THE EFFECT OF MODERNIZATION ON TRADITIONAL PASTORALISM IN THE JABAL AL-AKHDAR REGION

The modernization of pastoral societies is also underway in Libya. Since 1960, with the expansion of economic development using oil revenues, pastoral relations have increasingly been incorporated into the process of social, economic, and technological modernization. Recently, the government has decided to take active measures to promote the economic development of pastoral areas by creating agricultural settlement schemes for nomadic herders, a number of them in the Jabal al-Akhdar. The purpose of this study is to assess the effect on land use of a project to be located at the al-Kharrubah.

As a background to the analysis contained in Chapter IV, this chapter is a discussion of how the traditional elements of pastoralism in the Jabal al-Akhdar region, which includes the study area, have been affected by modernization. After an overview of the physical features of the region and study area, aspects

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the traditional social and economic system are
 ented. The influence of modernization on the
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 ined, as are government responses to the problems of
 oralists in general.

Characteristics of Traditional Pastoralism in the Jabal al-Akhdar Region

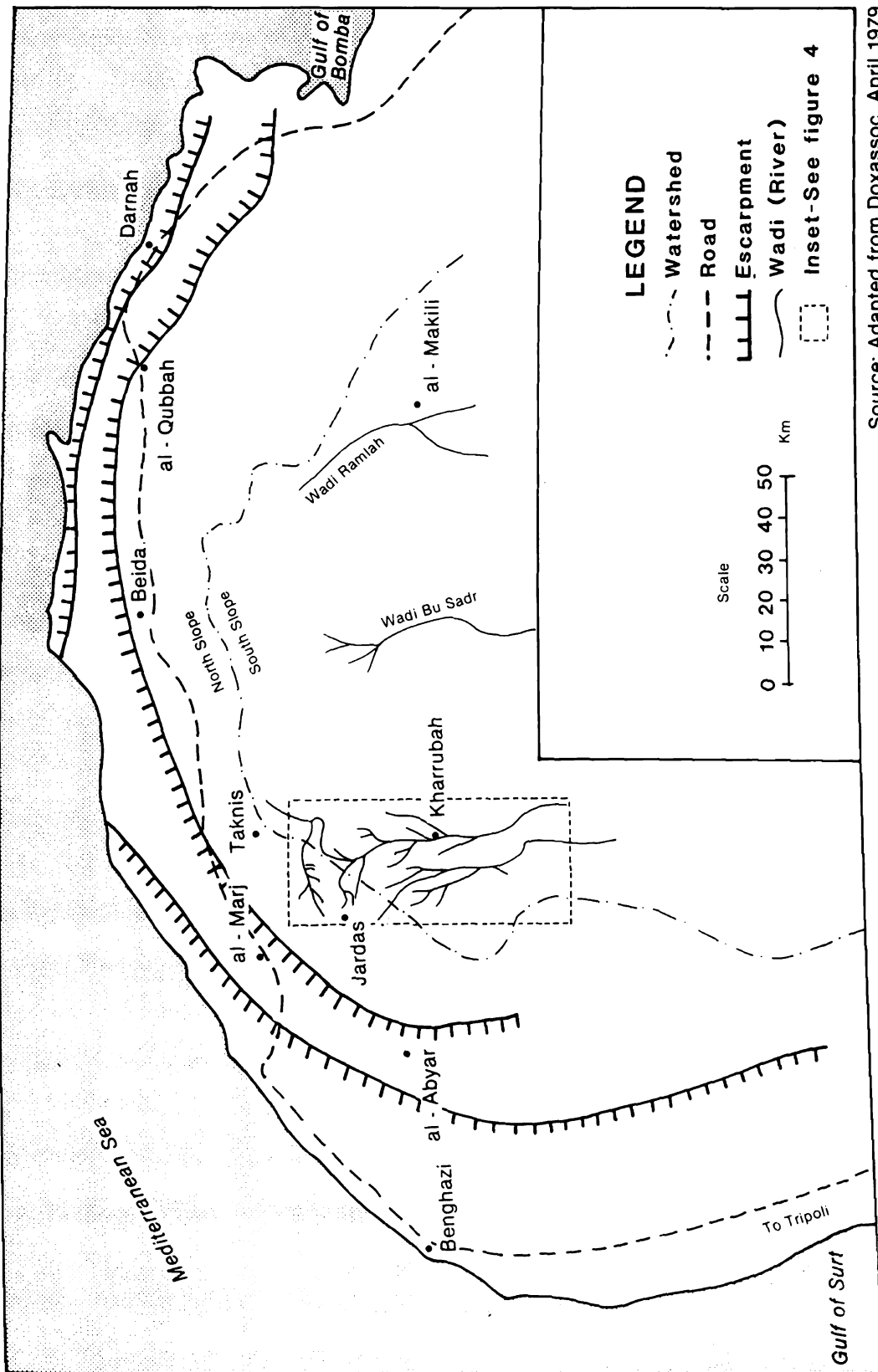
ical Features

The Jabal al-Akhdar (Green Mountain) region is the
 ontory of Libya bordered on the west by the Gulf of
 e and on the east by the Gulf of Bomba. From the
 terranean Sea, the region extends southward past the
 tain for about 150 kilometers to the Sahara Desert.
 highest elevations on the Jabal are about 850 meters
 e sea level.

A coastal plain bordering the Mediterranean Sea is
 s-crossed by a number of streams and leads through a
 es of steep escarpments to a central plateau or first
 ace. Basin areas such as the al-Marj plain, as well
 any wadis and gorges are found, on this plateau. A
 nd terrace is located to the north and west; a third,
 a number of springs, is found in the center of the
 eau (Figure 2).

In contrast to the northern slopes, the southern
 ines descend gradually to the desert through a series
 ecologically diverse areas. Generally, the higher

THE STUDY REGION: THE JABAL AL-AKHDAR



Source: Adapted from Doxassoc, April 1979

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elevations of the southern slopes are steppe terrain, which receives more rainfall than lower elevations; the lower portions are floodplains.

The climate of the Jabal al-Akhdar is generally Mediterranean, with a wet and a dry season. The wet season extends from September to May, while the extremely hot season is from June through August. Hot Gibli winds from the Sahara can cause crop damage in late spring and early summer. Annual rainfall varies from 50 mm in the southern part of the region to 500 mm in higher coastal elevations. These figures, however, conceal both temporal and spatial variations. Rainfall usually peaks in January, but this peak may vary by several months. Spatial variations can be so localized that a drought site is just a few kilometers from a much wetter one. In general, the higher the average annual rainfall, the more dependable it is (Johnson, 1973).

Spatial distribution of vegetation in the region is governed by elevation and precipitation. In the higher-elevation areas in the north, clay soils and greater rainfall support a Mediterranean type of forest consisting primarily of juniper trees. In the drier southern areas, annual and perennial types of vegetation provide excellent pasture in the spring, and drought-resistant trees can be found in the bottoms of the wadis.

Kharrubah area. The area under study is part of the southern slope of the Jabal al-Akhdar, part of what is

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Also known as Cyrenaica. The catchment area of the Wadi Kharrubah covers 218 square kilometers. The annual temperature and rainfall for Kharrubah are shown in Figure 3. Temperatures are high year-round, with peaks occurring in June, July, and August. Rainfall patterns show a marked seasonality; rain falls from November through April, with maximum amounts in December. Little or no rainfall occurs from May through October. Most of the Kharrubah Wadi basin is included in the climatic belt of the Jabal Plateau, which has an annual rainfall of about 200 mm and a peak of 350 mm.

The landscape of the area is a plateau that gradually descends from the north and northwest, where the elevation is more than 500 meters, to the Kharrubah Wadi, where the elevation is less than 300 meters (Figure 4). A number of seasonal wadis that drain the watershed area between Jardas and Taknis cut into the area and form the Wadi Kharrubah basin.

Vegetation and soil characteristics vary from the plateau and upstream areas to the wadis downstream. Upland areas with more rainfall and red clay soil support a plant cover year-round. This cover is mainly of the maquis type, such as juniper. In the east and southeast, where soils are of a lighter grey, semi-desert type, vegetation consists mostly of shih (Artemisia herba-alba) and its associates, matnan (Thymelaea suta) and halfa (Stipa tenacissima). This spatial

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KHARRUBAH AREA AVERAGE MONTHLY TEMPERATURE AND RAINFALL

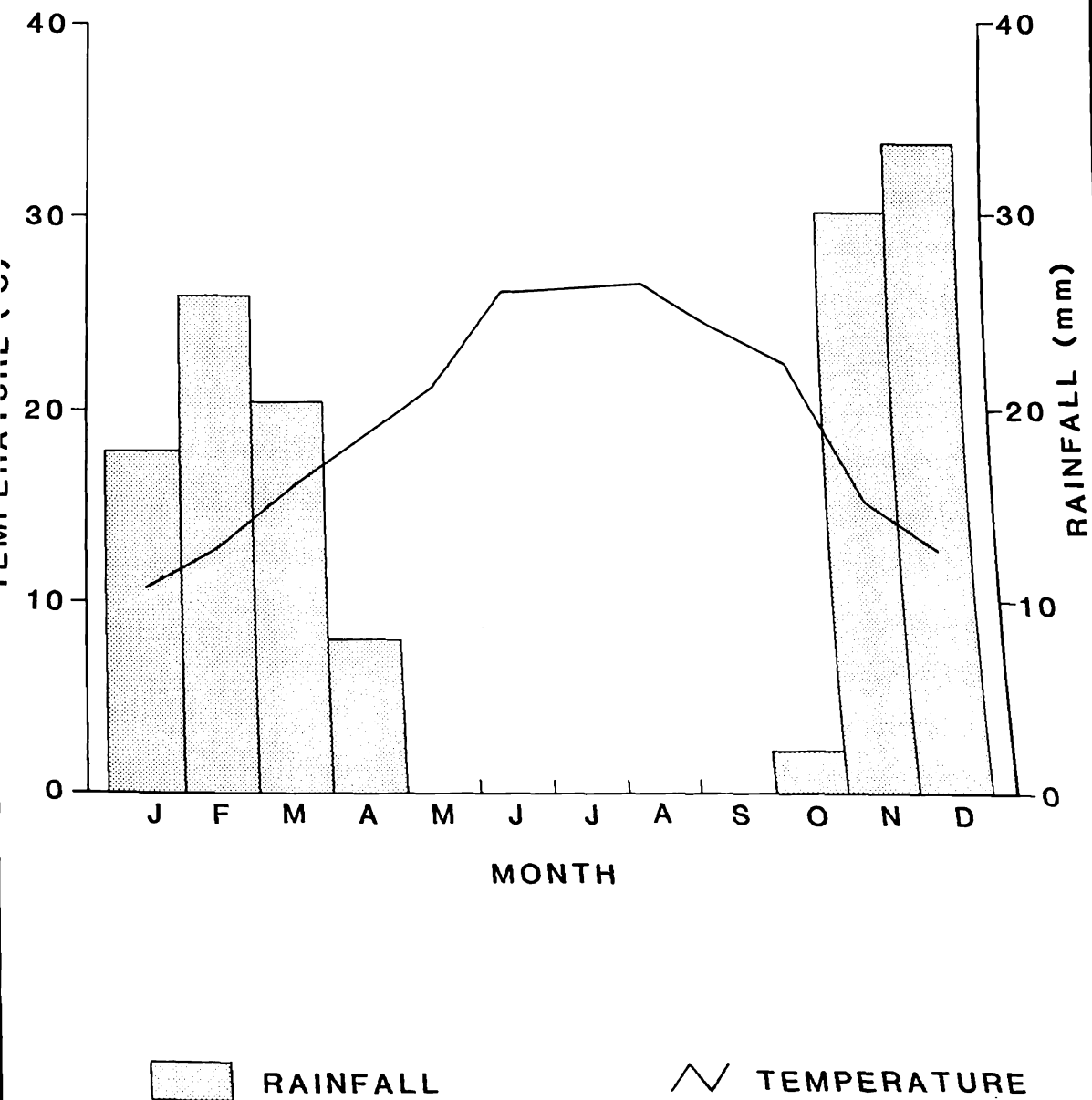


Figure 3



THE KHARRUBAH AREA

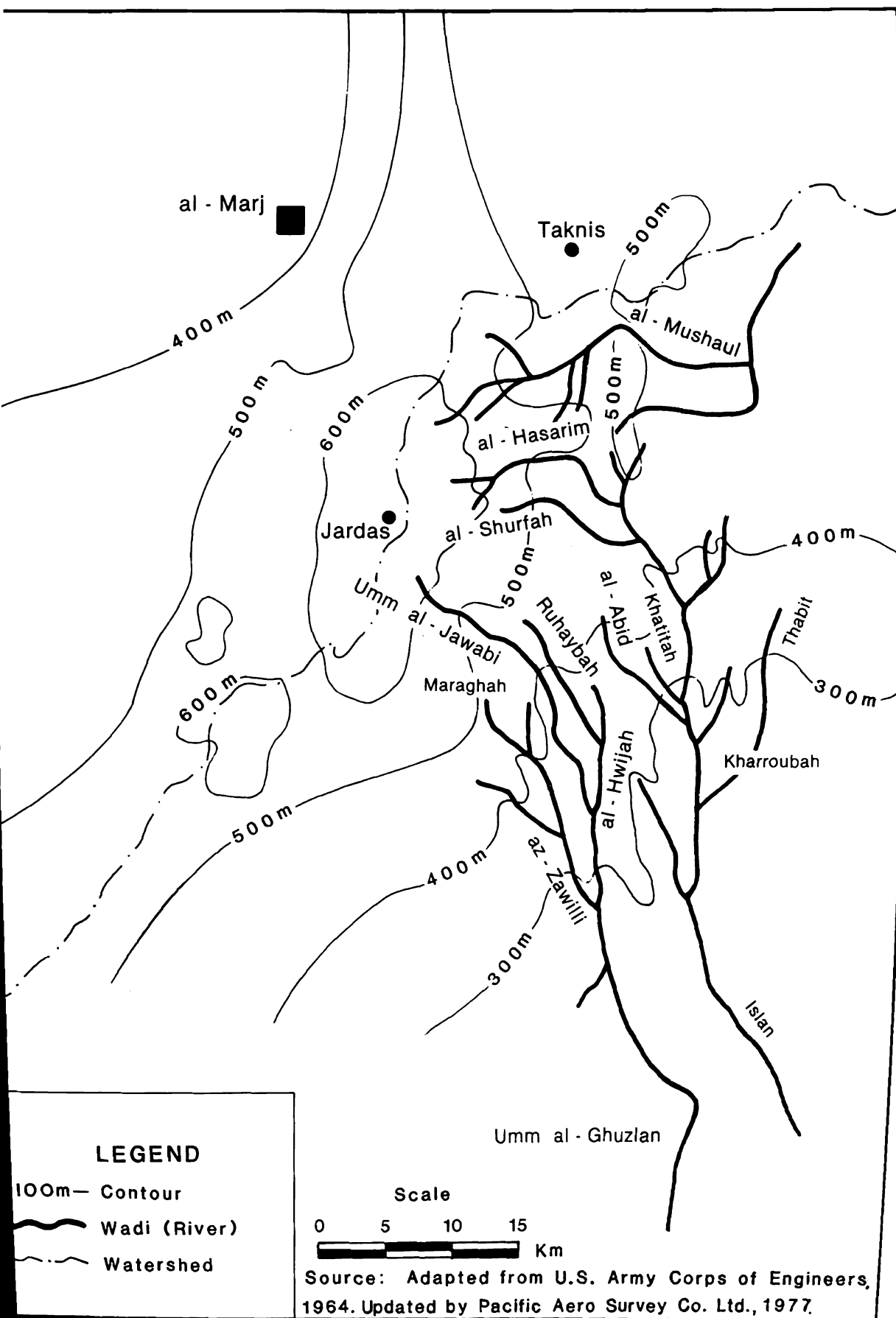


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variation in vegetation is indicative of the wide variety of factors that influence human activity in the region.

Additional Land Use

Pastoralists of the Jabal al-Akhdar have traditionally adjusted their activities to maximize the opportunities presented by, and to avoid the risks posed by, environmental fluctuations. Fisher (1971) noted that an extra week of winter rain will mean a more than corresponding lengthening of the spring pasture season, with great increase of flocks and herds during the ensuing year; and early cessation of rainfall means a long summer, with much hardship until the next spring. Under such conditions even a small climatic fluctuation can have a disproportionately large effect upon human activity. (p. 93)

Through the traditional land use system of the Jabal al-Akhdar, pastoralists have employed the various locally available resources and devised strategies to maintain the productivity of the land. They have recognized two major ecological zones:

Zone 1 - northern slopes (Jabal)

Zone 2 - southern slopes (steppe)

Zone 1 receives the most rainfall and has soil suitable for agriculture. Cereal cultivation is an important land use in this zone; barley is the primary crop because it is drought-resistant, and less wheat is grown as a dietary staple (Evans-Pritchard, 1949). Cultivation takes place on some of the less-steep hill-sides, in wadi bottoms, and in shallow alluvium-filled depressions where water collects. Most field work is

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ne by the male head of household with his relatives' assistance. The most important animals herded in this ne are goats and sheep.

Zone 1 also includes a narrow belt of juniper rest, which cannot reliably sustain agriculture and is minated by leafy shrubs. Pastoralists use this area imarily for goat herding because sheep or cattle cannot t the vegetation (Behnke, 1975; Johnson, 1973).

Zone 2 is important because water is available at s southern fringe (the floodplain), where there is cal rainfall as well as flood-water drainage from Zone

These water sources are dependable enough to sustain veral permanent settlements, including Kharrubah and -Makili, and also support intense cultivation (Behnke, 75). Sheep and camels are herded in this zone. The eppe area of Zone 2 consists of deep wadi beds and derate slopes. Most of this area is uninhabited on a ar-round basis and serves as a temporary grazing area r migrating herds.

Spatial movement. In the first section of this apter we examined the spatial distribution and seasonal ailability of water and pasture resources to the Jabal -Akhdar pastoralists. The pastoralists have responded these variations by devising land use strategies to ploy the resources as they are available and to avoid arcities.

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In general, spatial movement in the Jabal al-Akhdar is in three cycles. Goat herders in the northern zone usually move their herds to the southern fringes of Zone 1 where the juniper forest prevails. The length of this grazing period depends on the amount and duration of rainfall on the steppe. In late spring and summer when grass becomes scarce, the grazing area shifts to the south, where stubble from harvested fields is available for feeding.

In winter, sheep herders move into Zone 2 as far as the southern fringe (the floodplain area), where the animals graze on grasses and bushy vegetation in the dry season. By spring, the majority of the sheep herders have returned to Zone 1 where water is more plentiful.

While the pastoralists' start to draw back their camps to the steppe in winter, camel herders extend their movements into Zone 2 about 70 kilometers south of the steppe along a line extending from Msus in the west to Hakaïm in the east, where perennial species of vegetation prevail (Evans-Pritchard, 1949). When forage becomes scarce, these herders move north to the steppe in the summer.

Agriculture. The role of agriculture in the Jabal al-Akhdar is related to complementing animal wealth and providing variety to the diet. In most pastoral economies, accumulation of animals is regarded as a type of capital investment, not only as protection against

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tuating pasture availability but also as a means of increasing social prestige and personal wealth. The integrity of this form of capital is preserved by basing disposal of livestock on fertility and age factors, selling the young lambs and kids in spring and summer and retaining fertile animals for breeding. Family subsistence is derived mostly from renewable livestock products, primarily goats. Otherwise, animals are slaughtered for household consumption only for religious or special celebrations. The average pastoral diet, while very modest in meat, is high in milk products and grain.

In addition to its important role in the pastoralists' diet, grain is also traded in neighboring areas along with meat and subsidiary products. Still, the shifting type of cultivation afforded by the uncertain environment of arid and semi-arid areas is subject to crop failures whenever drought or flooding occurs, and crops are frequently damaged when herd animals trespass on cultivated areas. Thus, the overall emphasis remains on herding, and cultivation schedules are subordinate to grazing activities (Behnke, 1975). In the Jabal al-Akhdar, for example, in 1953, grazing extended over a one-million-hectare area, whereas shifting cultivation was possible on only about 500,000 hectares (Fisher, 1973).

In the Jabal al-Akhdar region, cereal is cultivated on the northern slopes where rainfall is more plentiful,

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in some of the floodplains and wadis of the southern region. One can obtain high-quality yields of barley and wheat, but they are low in quantity. The herder generally has his animals plow a large quantity of seed into all tracts of land; these tracts extend over as large an area as permitted (Wheatley, 1965).

Tribal Population and Social Structure

The basis of tribal structure in Cyrenaica is the Sa'adi tribes, descended from the famous Banu Sulaim and Banu Hilal tribes who arrived in Cyrenaica or Jabal al-Jabal from Egypt in the eleventh century. Today, the Sa'adi tribes divide the Cyrenaica region among themselves into territories known as "watans," which have traditionally been considered their own private land acquired through conquest. The western Jabal is occupied by the Jibarna descendants, consisting of the Abid, Arafa, and Awagir tribes; the eastern Jabal is occupied by the Ubaydat, Aylat, Darsa, and Hasa tribes. These tribal structures are further organized on both spatial and kinship bases.

Among these groups lives the Morabitin tribe, which is small and politically weak. Each clan from the Morabitin tribe is tied to a powerful Sa'adi tribe for protection. They have the Sa'adi tribe's permission to use the land but do not own land or water resources.

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No accurate census data exist on the tribal populations because censuses have been based on administrative rather than tribal units. In the study area, most of the population belong to the Yatama subsection of the Abid tribe (Figure 5); less than 20 percent belong to the Morabitin tribe. In 1949, Evans-Pritchard estimated the population of the Abid tribe to be 6,000.

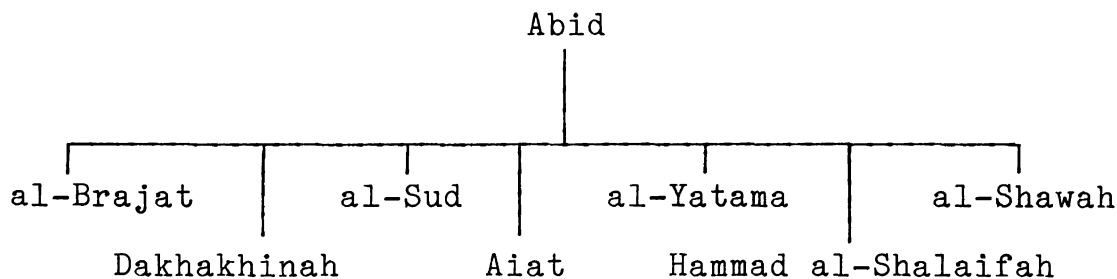


Figure 5 - Division of the Abid Tribe

(SOURCE: Abdulmola el-Horeir, "Social and economic transformations in Libya during the second half of the nineteenth century: the role of Sayyid Ahmad al-Sharif al-Sanusi" (Los Angeles: University of California, Los Angeles, Ph.D. dissertation, 1981, p. 19).

Spatial organization. In the Jabal al-Akhdar, tribes occupy strips of tribally-owned lands extending from the Mediterranean coast in the north, across the agricultural zone of the mountain area, deep into the semi-arid and arid grazing zones in the south. These strips are 10 to 15 kilometers in width and 70 or more kilometers long. This spatial arrangement is intended to control some of the natural resources and to allow

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various tribes access to the sea. Because the tribal lands are quite large, each tribe fragments itself into two or three primary divisions or subtribes so as to be located in a variety of ecological conditions (Johnson, 1973).

Traditional boundaries are drawn not only to separate regionally the land holdings of major tribes, but also to distinguish intraregional holdings within a tribe. Boundaries are usually drawn along topographical features such as hills, wadis, and dirt tracks, or along archaeological sites such as Roman wells and cisterns. The tribal brand or wisam is drawn on wells and rocks to designate tribal boundaries (el-Horeir, 1981). Tribes recognize these boundaries only traditionally; thus disputes arose among individual pastoralists. Also, because boundaries are imprecisely specified by consensus, arguments often occur, especially when the matter involves grazing areas or agricultural plots.

Kinship basis of tribal organization. Tribal organization is based on kinship as well as on spatial boundaries. Although the subtribes split into similar secondary, tertiary, and smaller units, members of each group claim descent from a common ancestor, who in turn is a descendant of a larger tribal unit. Individual members' land use rights, both preferential and exclusive, are determined by the lineage of a member's tribal

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group. Special lineage markings are given to each subdivision of the tribe.

The result of this division of the tribe into increasingly smaller units is a set of extended family groups, or the "biyut." The members of a biyut function as a single unit socioeconomically, and even assume joint responsibility for individual members' wrongdoings. Although the tribe technically owns land and water rights, in practice the extended families are the owners. The same grazing areas, agricultural lands, and water sources are used by members of the biyut, all of whom live within tribal boundaries.

Land tenure. The importance of lineages and kinship in tribal organization is reflected in the way land ownership is transferred through inheritance. At the tribal level, property rights constitute a land tenure system. On an individual basis, inheritance is through the male line of descent; collective ownership by male descendants evolves into a permanent homeland or watan. Property rights may be divided at either a tribal or an individual level; the basis for these divisions forms the pastoralists' land tenure system.

The land tenure system is a response to ecological constraints imposed on pastoralists of the region. The following description of the land tenure system is based on Behnke's 1975 study of Cyrenaica, in which he

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recognized three distinct types of real property:

grazing areas, agricultural land, and watering rights.

By custom, grazing areas throughout the region are open to all herders, regardless of descent. Because water for livestock must be used in accordance with the watering rights in effect for a particular pasture, grazing is not practical on the mountain, where watering is restrictive. Where grazing is feasible, herders and their families may camp where they please and use water for household purposes. Although a herder's camp site in late winter or early spring may not actually be within his watan's boundary, he usually returns to the same home pasture areas on the mountain for the summer. Free access to pastures benefits herders of all tribes, allowing everyone to exploit whatever good pastures can be found (Behnke, 1980).

Agricultural fields on the mountain are managed through annual reoccupation of the fields, a type of "squatter's right." Even though this right is longterm and inheritable, pastoralists still do not consider it private ownership, but rather collective ownership by the descent group. In theory, land cannot be sold because this would adversely affect the rights of other members of the descent group. In areas where several lineages are present, ownership is based on each group knowing where its land boundaries are located. There is general

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agreement on inter- and intra- watan boundaries on the mountain.

A different type of tenure applies in the steppe areas of the south. Here fields are not inheritable, but are said to belong to the first person to plow them in the spring. In contrast to the mountain area, inter-watan boundaries are the only ones generally observed on the steppe.

In the floodplain of the southern region there are two types of grain fields, each with a different type of ownership. Fields watered by local rainfall and runoff are owned the same as the steppe: the field belongs to the first person who plows it. Fields located in the alluvial fans of the major wadis, such as the Kharrubah wadi, are permanently owned and inheritable, similar to customs on the northern slopes.

Water is the most critical factor for pastoralists of the southern slope of the Jabal al-Akhdar. As previously mentioned, grazing and agricultural areas are restricted on the mountain and are freely exploited in the south based on the spatial distribution of rain. Watering rights generally are more restrictive in the southern regions than in the north.

The major type of water source also varies from zone to zone. Wells are found on the northern slopes, and water is free and plentiful. To the south, water sold or rented from wells is the major source. Wells in the

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northern areas are owned by private individuals, but ownership is by progressively larger descent groups as one moves southward into drier regions.

Wells are found throughout the southern region, but they are scarce and irregular in areas where rainfall- and runoff-fed agricultural fields are prevalent. These irregular wells are owned on a "first occupancy" basis for descent groups.

In the desert region of the south slope, only tribal boundaries are recognized. Because camels are the only animals with sufficient mobility to avoid localized drought, the widely scattered wells are owned by several large descent groups of camel herders (Behnke, 1975).

Traditional Regional Economy

The traditional economy of the Jabal al-Akhdar region was based on a number of products; economic value was derived from the four types of herd animals (sheep, goats, camels and cattle) found there. The following description of the regional economy is based primarily on Johnson's (1973) discussion.

In more subsistence-oriented times, milk products were obtained economically from all four animal species. Although sheep produced small amounts of milk, the high butterfat content of the milk made it valuable for producing cheese (Behnke, 1980). Both cattle and goats were used on a subsistence basis for meat and milk

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products, and wool and camel hair were regular market items.

Animal and agricultural products usually are not traded among other pastoralists because there is little specialization. Household members consume milk products and agricultural produce. An exception is in times of scarcity, when otherwise prohibitive transportation costs are minor compared to the product's value (Behnke, 1980). As in other pastoral societies, however, pastoralists trade with sedentary merchants and farmers.

Traditionally, most of the trade between pastoralists and sedentary farmers and merchants was conducted in several large markets, especially at Darnah, in the eastern Jabal al-Akhdar, and Benghazi (Johnson, 1973). Most years, only one or two trips were made to these markets for supplies, usually in the late spring and summer when pastoralists were moving toward the higher coastal elevations. Otherwise, supplies were either transported with the family or cached in underground storage areas. Just a few trips were made to the market each year because of the seasonal availability of pastoral products. Wool, for example, was sheared in April and May; surplus quantities were taken to the market only at that time.

Many pastoralists of the eastern Jabal al-Akhdar traveled to Darnah each spring to trade their wool, hides, and animals for coffee, salt, sugar, and other

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luxury items. Western Jabal pastoralists made similar trips to Benghazi. Merchants in Darnah specialized in exporting live animals to other Mediterranean countries. The alternative to selling animals in Darnah was to travel about 1,000 kilometers to markets in Alexandria, Egypt; the more mobile pastoralists could profitably undertake such journeys because prices were significantly higher in Egypt.

The same factors that led to the formation of markets in only a few urban centers, i.e., that most pastoralists planted grain and most farmers had a few herd animals, resulting in a system in which large deficits or surpluses were rare, also accounted somewhat for the relative self-sufficiency of pastoral groups. Such sufficiency was accomplished through intertribal trade based on marriage and kinship ties; that is, one segment of a tribe might have lived where they could produce a grain surplus and another where they could raise a surplus of sheep (Johnson, 1973).

Intertribal trade also provided a form of social sharing, whereby an individual herdsman who lost his herds through drought or disease could appeal to relatives for aid, either through a loan, a dowry owed him, or employment as a shepherd until he could rebuild his herd. Similar exchanges occurred on a group level when drought occurred throughout an area and help in the form

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of animals or grain was requested from a kinship group in an unaffected area.

Another characteristic of the Jabal al-Akhdar economic system is that it is a mixed agricultural-pastoral lifestyle. Pastoralists of the region grow their own grain, in contrast to other pastoral societies, such as the Kababish of Sudan (Asad, 1970), who do not grow or produce grain. This dual activity has led to a dietary self-sufficiency.

Summary

The activities of the pastoralists in the Jabal al-Akhdar region are regulated to some extent by a land tenure system that has arisen from tribal boundaries and rules of inheritance based on kinship. The pastoralists are largely self-sufficient in regard to diet and make infrequent trips to urban markets in Darnah and Benghazi.

Modernization of Pastoralism in the Jabal al-Akhdar

A number of factors that dramatically altered the nature of pastoralism in recent years have also affected pastoralists of the Jabal al-Akhdar. These factors include colonization, the advent of motorized transportation, the effect of oil revenues, new consumption patterns, rural-urban migration, spontaneous settlement, and government modernization efforts. Each of these factors is examined in this section.

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Colonization

Italy's colonization of Libya began in 1911 and was completed in 1922, when the Italians were able to control northern Tripolitania. By 1931, they had expanded their spatial political control beyond the coastal strips of Cyrenaica. Colonization was accomplished through a series of bloody conflicts with pastoralists of the Jabal al-Akhdar; almost half of the population of Cyrenaica was killed or left the country (Ghanem, 1982).

Objectives of the Italian colonization were to change the demographic pattern of the area by populating it with Italian nationals and to exploit the country for economic and strategic interests. In this section we will discuss the effect of Italian colonization as a force of modernization on pastoralists of the Jabal al-Akhdar, principally through land laws and settlement.

Land laws. To legitimatize colonization and acquire land for Italian nationals, the Italians issued several land laws and decrees starting in 1921. These laws provided for either outright confiscation of land or expropriation of land with compensation. The Italian Land Code of 1921 provided for registration of land titles, and a 1928 decree allowed the colonial government to take control of land, with compensation, for demographic colonization. Grazing areas were confiscated because they were considered unproductive as agriculture was not being practiced. These laws removed land ownership from

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tribal structures to a foreign government and limited the available grazing areas.

Settlement. At the same time the land laws were in effect, settlement schemes for Italian farmers were initiated; 1,900 farms were established in Cyrenaica between 1927 and 1938 (el-Wifati, 1966). Tribal people were excluded from settlement areas. Thus the best tribal land was taken for Italian families, and pastoralists were driven into more marginal areas where traditional pastoralism was less viable.

In addition to constructing a number of housing units, the Italians created a large infrastructure designed to modernize the rural areas with roads, railroads, telephones, and other services. It has been estimated that Italy's total nonmilitary expenditure on Libya was 10,175 billion lira, or about 880 million dollars (Ghanem, 1982).

When Italian colonization ceased in 1940 and British occupation began, the Italian settlement schemes were allotted to the Jabal al-Akhdar pastoralists who had claims on the land. However, allocation was not done by reforming the land laws, so tribesmen believed they owned what was actually government land. This led to much confusion and difficulty in government efforts to develop the area because the reoccupation was on a tribal territorial basis that strengthened kinship ties and the extended family system.

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Motorized Transportation

Technological change in the form of motorized transportation has affected pastoralists since World War II, when a number of roads were built in Libya for military purposes. The effects of truck and tractor use can be seen primarily in the rise and decline of periodic markets and in altered agricultural practices.

Traditionally, pastoralists made only a few trips each year to markets in Darnah or Benghazi. But after 1945, when trucks became available, merchants in Darnah and other large urban centers were able to purchase vehicles and travel into rural areas to conduct their trade. This led to the establishment of periodic markets in many rural villages, which merchants visited weekly. These markets were located at established villages in the Jabal al-Akhdar (Johnson, 1973), whereas in other parts of North and West Africa vending was conducted in the open. Hodder (1965) found that periodic markets in Yorubaland originated at rest areas along trade routes, and Fogg (1941) noted that periodic markets in Morocco later developed into villages.

Periodic markets served a number of other purposes, as well. Government business, such as tax collection, was conducted on market day, and most nonemergency medical care was given then. The market provided a setting for settling (and sometimes producing) tribal disputes and a

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means for establishing and renewing social and political contacts (Johnson, 1973).

By the early 1970s, as the number and quality of roads increased and motor vehicles became more pervasive, periodic markets had largely disappeared. Merchants from Darnah no longer make their weekly visits to rural villages, because there is ready access to the urban centers, and animals are transported to these centers by truck. In addition to Darnah and Benghazi, market centers such as al-Marj and Beida have recently received greater prominence in and provide market alternatives.

Trucks and tractors have largely replaced camels as a means of providing transportation and plowing fields. In 1973, Johnson reported that most rural or pastoral families owned a truck or four-wheel drive vehicle. Almost all pastoralists use tractors they either rent or own to plow the fields; camels are rarely used for this purpose any more. Mechanized farm equipment has been available since the late 1960s and has not only modernized plowing techniques but has enabled pastoralists to transform large tracts of land from natural pasture to cultivated fields (Johnson, 1973).

Oil Revenues

One important source of the changes in pastoralism in the past few decades has been the discovery of oil fields in Libya and the economic development of petroleum

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resources. In the Jabal al-Akhdar, changes are evidenced by the replacement of tented groups of pastoralists with villages of laborers and government employees and small settlements where commercial ranching is practiced. These alterations have occurred as a result of several factors related to the oil boom, including inflation, greater personal income, development of commercial pastoralism, and migration of the population from rural to urban areas in response to expanded employment opportunities.

Inflation. One effect of oil revenues has been price inflation, which has directly benefited herders by raising the prices they can obtain for animals. As a result, instead of raising animals for subsistence-oriented milk products, they now rear them for slaughter. For example, a sheep that cost four Libyan pounds in 1948 cost more than 150 Libyan dinar (\$500) in 1975; the value of a camel increased from LD 15 (\$50) to LD 500 (\$1667) in the same period (Peters, 1981). Sheep and camels are no longer used for milk products, but instead are purchased as consumer goods. Because family members have been freed from milking duties, they can seek outside employment and manage the herd from a fixed location by hiring a shepherd (Behnke, 1980).

Greater personal income. Some pastoralists have been employed directly by the oil industry in high-paying jobs, particularly in the 1950s and 1960s. However,

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instead of using the outside wages to free themselves of the need to maintain a herd of animals, people often used their earnings to purchase additional animals.

The expansion of foreign trade has also affected pastoralists' consumption patterns. Johnson (1973) noted that shops in local markets now stock such nonlocal items as tuna fish and Nestle's milk, and that such products have become dietary staples. The influx of foreign-made goods into rural markets has become so great that local craft industries are often adversely affected. The researcher observed this incorporation of imported goods in the study area's economy, especially near Jardas.

Demand for meat, especially mutton, rose substantially during the 1960s and 1970s. Food-consumption patterns changed, in that formerly poor families could purchase mutton, a highly prized meat product from local barbary sheep. Concurrently, the local population of foreign workers was also increasing; they often brought with them urban food consumption patterns. As a result of these changes, pastoral livestock production was taking the form of commercial pastoralism.

Commercial pastoralism. Oil revenues increased the value of pastoral products and provided supplementary incomes for pastoral families; therefore, herders had to sell fewer animals to meet household needs. Sale of animals had traditionally been a device for limiting herd growth; as sales decreased, herd sizes grew rapidly.

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Many herds reached 300 to 400 head of goats and sheep, a sixfold increase in what was formerly needed to support a household (Behnke, 1975).

The rapid increase in herd sizes allowed pastoralists to shift from domestically-oriented subsistence production to a form of commercial pastoralism geared to the marketplace. One example of this shift is the camel-herding Fwakher tribe of the southwest Jabal al-Akhdar steppe, who have switched to sheep-raising in response to market forces (Albergoni & Vignet-Zunz, 1982).

Rural-urban migration. Employment opportunities in urban centers have mushroomed since the oil boom. As a result, massive migration from rural to urban areas since 1959 has drained the rural sector of a large portion of its labor force. Peters (1981) reported that, in some semi-desert areas where there had been a dozen camps of five to ten tents each in 1950, only two camps with three tents each remained in 1969.

Rural-urban migration has not come about because labor-saving machines were introduced in agriculture, as has happened in some Western nations, but because real incomes were far lower than prevailing wages in urban areas. The migration process is also somewhat selective; the youngest and ablest workers are usually those who migrate (Treydte, 1973).

Although the oil industry has never directly employed more than 5000 Libyans at once, there was high

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labor turnover, especially in the early years of exploration. Because of a law requiring all unskilled laborers to be hired from the district in which the operation was taking place, at least half of the work force was discharged when a project was completed and the drilling rigs moved elsewhere. As a result, many pastoralists who had resorted to employment in the oil industry joined the ranks of temporary workers.

The high labor turnover rate decreased once initial oil-exploration activities ceased, but the rural population continued to migrate to the cities. As a result of the influx of settlers, several shanty towns were established outside Tripoli and Benghazi; many of their residents had no access to social services. By the mid-1960s, pastoralists were migrating to the cities, not to seek employment with an oil company, but rather a high-paying job in industry, construction, or transportation (Mukerji & Kataifi, 1970). The Libyan government encouraged migration by instituting a minimum wage law in 1960, which made unskilled workers' wages significantly higher than what a pastoralist could earn by herding. The government became the employer of last resort by creating redundant jobs primarily to reduce political unrest. By 1964, 30 percent of the labor force was employed by the government.

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Government development practices. The discovery of oil reserves also provided the Libyan government with large amounts of capital for use in developing agricultural and rural sectors of the country. Some of these development projects are discussed in a later section of this chapter.

Spontaneous Settlement

Another factor affecting changes in population distribution and land use in the Jabal al-Akhdar region is spontaneous settlement. Sometimes this has meant abandoning tents in favor of sheet-metal houses or tin huts, with clusters of houses often occupying a site where subsistence agriculture can be practiced and social services reached. For example, of the 704 households on the southern flank of the Jabal al-Akhdar surveyed in 1980 by the Faculty of Education, about 45 percent lived in sheet-metal houses, and about 7.7 percent in concrete houses.

Spontaneous settlement has also involved a number of farmhouses built during Italian colonization. Ownership of these farmhouses has reverted to the tribes, and they can now be rented by individuals for nominal fees. The pastoralists often attached little value to the dwelling itself, using it as a stable until additional construction or modification could take place. However, the attached well was a valuable water source and the

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farmhouse was located on the best agricultural land. The government has been active in restoring and upgrading some of these farmhouses for occupation by pastoralists (Johnson, 1973).

Pastoralist-Farmer Relations

Pastoral development projects in the Jabal al-Akhdar have been located on land traditionally used for pastoral grazing. The best grazing lands in the southern and western portions of the region have been converted to agricultural use, which has more severely affected pastoralists in the dry season than in the wet seasons. Pastoralists lost space because of the establishment and fencing of projects in the richest grazing wadis, and they have been prevented from gaining access to traditional grazing areas.

Government Programs

In the aftermath of Italian colonization, pastoralism was threatened with extinction because of mass migrations from the devastated rural sector. The situation worsened when oil was discovered, because of increased employment opportunities in the cities. Development of the pastoral population was initiated in the 1960s to reverse the factors militating against pastoralism and to bring the pastoral sector under control. A number of government projects aimed at

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pastoral development have been undertaken in the Jabal al-Akhdar region, including the provision of social services and creation of settlement projects.

Land use planning. In the late 1960s, the National Agricultural Settlement Authority developed plans, according to ecological conditions in the region, for delineating the Jabal al-Akhdar into forest, agricultural, and grazing zones. The forest area has been set aside for timber and charcoal production, but it is poorly protected. Pastoralists have been excluded from the agricultural areas, but are encouraged to settle elsewhere. Several studies have been conducted on the use of agricultural areas; it has been recommended that wheat production be given priority (United Nations, 1965). Pastoral activity has been planned only for the semi-arid steppe and subhumid regions.

Water resource development. Water resource development has been initiated in other semi-arid and arid regions of the world as part of pastoral development, as discussed in Chapter II. In Libya, the construction of dams and other water sources to increase permanent water supplies and open up new areas for agricultural use has increased. In some coastal areas, the level of sea water in the water table has increased because of overpumping (Allan, 1982b). Well-drilling and improvement of cisterns have also been planned for pastoral areas in the

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Jabal al-Akhdar, although progress in developing these resources has been slow. Johnson (1973) noted that the 14 cisterns built in the al-Qubbah region were intended for agricultural use, and only a few wells near al-Makili were provided for pastoral use.

Several government studies have indicated the limited water resources available in al-Marj and al-Abyār and have recognized the danger of lowered water tables or sea-water seepage because of overpumping. They have recommended that well-water use be regulated and that windmills be used instead of other types of pumps (Libyan Arab Republic, 1972).

Rangeland development. Large herd sizes and human activity have contributed to increasingly degraded rangelands throughout much of the Jabal al-Akhdar region. Many annual-plant species cannot properly regenerate because of goat and sheep grazing. Such plants, as well as perennial shrubs, have been severely depleted. The effect of camel herding in the area has been less drastic because they are found in smaller numbers, but their presence does contribute to the overgrazing problem. Cattle have had even less effect on pasture areas, as they are usually found only in small numbers in settled areas. Since large portions of the region are now under cultivation, hay and crop residues are providing an increasingly important source of summer feed.

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Several rangeland improvement programs have been implemented on the Jabal al-Akhdar. Since 1950 the FAO has conducted experiments with various forage species in seeding projects. The U. S. Technical Assistance Program, begun in 1955, provided for soil conservation, forage recovery, construction of boundary fences, and controlled grazing. In 1976 the Libyan Agricultural Research Center initiated basic research with forage analysis, seeding, and fertilizer trials at al-Marj, al-Abyār, Ajdābiyah, and the Benghazi plains. Government efforts to preserve some of the most valuable rangeland shrubs and indigenous plants were undertaken in 1977. Agronomic evaluation of several grasses and shrubs is continuing, and a seed-multiplication project is also planned (SWECCO, 1982).

Altering tribal structure. Some of the attempts to change the structure of pastoral societies so as to integrate them into the modern national state were outlined in Chapter II. Two important measures in Libya have been the abolition of sheikh status and abrogation of collective ownership.

The all-powerful office of sheikh was abolished in Libya during the 1969 Revolution; even before that, the sheikhs' power was slowly but continuously being phased out. The role of the sheikhs was not only political, representing tribal authority, but also economic.

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Because of increased commercialization, many economic decisions are now handled through groups of pastoralists and farmers, or through market forces. Since 1965, interest-free bank loans for the purchase of farm machinery have been available, so the sheikh no longer completely controls access to resources. The net result has been the collapse of traditional tribal leadership and an increasing shift to national loyalties.

Some of the changes in land laws that resulted from Italian colonization have also been discussed. Subsequent decrees resulted in a move from collective to private ownership. The earliest decrees, such as the Land Act of 1951, assigned land use rights to the tribes, but ownership remained with the state. The pastoralists traditionally construed "use" to mean ownership, and since the central authorities had little power to enforce statutes the traditional practices continued.

Subsequent land laws were passed in the decade from 1961 to 1971. The Civil Law Code of 1961 gave tribes the right to sell land to other tribal groups and individuals. The 1968 Land Act not only gave rights of agricultural exploitation to the tribes, but also asserted state ownership of the land and abolished the watan system of property relationships. Land could not be alienated without state approval. Another Land Act was passed in 1971; it reinforced government regulation of

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land transfer and provided for giving financial aid for farm development. This act also assigned ex-colonial land to landless people on the condition that it would be cultivated.

Many areas remained unaffected by government intervention for several years; changes in land ownership were often handled locally on a compromise basis that echoed the watan system. In recent years, however, the traditional social structure has continuously been eroding because of increased government involvement in land transfers and greater participation of pastoralists in modern commercial markets. The increase in private ownership has made it easier for the government to settle and govern pastoralists.

Provision of social services. The influx of oil revenues into the Libyan economy enabled the government to spend large amounts of money to provide social services. As a result, almost all Libyan villages now have water tanks, telephones, clinics, and other services. Education and school construction are facets of modernization that the government has particularly emphasized.

Settlement schemes. The primary aim of government pastoral development has been to concentrate pastoralists spatially so that services can be more readily provided, political control can be exerted, and overgrazing and

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overstocking can be alleviated. A 1971 study by the Libyan government recommended settlement and agricultural development as practical solutions to the problems created by rural-urban migration (i.e., the wage differential between rural and urban sectors and differences in services available). Such development was intended to increase the rural standard of living, create jobs in the rural sector, provide services, and encourage private land ownership (Libyan Arab Republic, 1972). An earlier study by the FAO also examined land settlement as a solution to the problems of tribal ownership of land and land tenure (el-Ghonemy, 1968). Planning for these settlements included establishing the type of land use: areas that received 200 mm of rain per year were limited to pasture use, whereas those that received more than 300 mm per year could be used in cultivating barley and wheat. Sizes of farms in these schemes ranged from 23 to 110 hectares.

As discussed in Chapter II, some problems have been associated with settlement projects in eastern Libya. The small size (two to three hectares) of the farms in the Latrun and Ras el-Hilel projects and insufficient water for irrigation led to their abandonment (el-Wifati, 1977). Many of the houses supplied through the Popular Housing Scheme of 1965 were never occupied because they lacked fenced areas where animals could be kept. Also,

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settlers from the same tribal units were not always selected, so pastoralists' cultural values were not recognized. In the same Housing Scheme, the site-selection process often disregarded physical resources, and housing clusters lacked water supplies. Problems have also been encountered because urban residents were placed on some of the ex-Italian settlements, and there were strong protests from area tribesmen who felt they owned the land (el-Wifati, 1966).

Pastoralism in Its Present Form

We have outlined how pastoralists of the the Jabal al-Akhdar have traditionally exploited available resources through the spatial movement of herds. They have practiced agriculture on a subsistence basis to complement herding activities. We have also discussed a number of forces at work in eastern Libya that are transforming pastoral societies, changing traditional structures and practices through modernization. As this dynamic process continues, pastoralism in its present form in Libya is a mixture of traditional and modern elements.

Pastoralism as traditionally practiced in the study region has now largely vanished and has been replaced by wage employment or commercial forms of animal husbandry. Today, most pastoralists live in settlement projects or villages or in fixed sheet-metal houses that are a

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transitional stage toward permanent settlement. The large descent-group tent villages are gone.

Although the relative number of pastoralists has declined, their wealth is increasing because of higher meat prices. A shift in political and economic activity from remote southern areas to the north is occurring because of herders' increased commercial involvement with the large urban centers in the north. This change, coupled with the increased value of mutton compared to camel meat, has diminished the political control traditionally held by camel herders of the south. The authority of the sheikh is no longer recognized; rather, political power comes from the central government through the villages. Collective land ownership has been eliminated and, with it, tribal boundaries.

Although many aspects of traditional pastoralism have been eroded, undergone radical change, or vanished entirely, some remnants still remain. In many cases, tents have become unnecessary because motor vehicles are available, although pastoralists sometimes choose tents over settlement in concrete buildings. Pastoralists are reluctant to relinquish their animals when settlement opportunities are available. Social ties through kinship are still evident, despite the collapse of tribal solidarity. The descent system has not entirely disappeared; it still functions as a means of identifying both land

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owners and herdsmen, as it has traditionally, even though its political functions have disappeared. Although the watan system of collective ownership and land boundaries has been officially abolished by the government, it is still part of the pastoralists' culture, and they consider traditional territory to be very valuable. Some of the traditional boundaries are still recognized because the same herdsmen are using traditional pasture areas, and distinctions between tribal and government ownership have yet to be made. A detailed discussion of the land use system that has emerged in response to new opportunities and constraints is presented in the next chapter.

Summary

The dramatic changes that pastoral societies in arid and semi-arid regions are undergoing due to modernization efforts and technological changes have also affected pastoralists of the Jabal al-Akhdar. For Libya, in particular, colonization, the discovery of oil, increased use of motor vehicles, and elimination of collective land ownership have had a profound effect on the pastoral way of life. The regional economy has become more commercially oriented, and pastoralists have altered their consumption patterns with the increased availability of foreign goods. Migration of the population from rural to urban areas in search of employment has increased since the oil boom, and spontaneous

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settlement in this region has been aided by the presence of farmhouses left from the Italian occupation. Access to traditional grazing areas has been affected by relations with agriculturalists and the occupation of land for government development projects.

The Libyan government has initiated pastoral development to modernize the pastoral sector of the population. The problems perceived by the Libyan government to have stemmed from traditional pastoralism are similar to the general difficulties listed in Chapter II:

- 1 - environmental degradation through
overgrazing
- 2 - increased strain on water resources
- 3 - depopulation of the rural sector due to
rural-urban migration
- 4 - the tribal status of the sheikh, which
challenges state control
- 5 - a collective land ownership system that
hinders development
- 6 - spatial movements that may cross national
boundaries or interfere with development
- 7 - an economic system that contributes
little to the national economy
- 8 - a low standard of living

The Libyan government's response to these problems has been to induce settlement of the pastoralists. In

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Chapter V we will examine the compatibility of the proposed government land use with the indigenous land use in the region.

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CHAPTER IV

CONTEMPORARY LAND USE IN THE KHARRUBAH AREA

In Chapter III it was argued that traditional pastoral societies of the Jabal al-Akhdar region have undergone changes due to modernization and oil revenues trickling down to them through three principal channels: (1) inflation, (2) greater personal income, and (3) commercial pastoralism. This chapter examines these changes, which have become manifest in the land use pattern of the Kharrubah pastoralists. The analysis presented in this chapter is based primarily on information obtained from the writer's fieldwork in summer 1983. Few detailed studies of the pastoralists' land use in the Jabal al-Akhdar region exist. Therefore, the present discussion depends on data provided by the fieldwork and writings of Evans-Pritchard (1949), Johnson (1973), and Behnke (1975, 1980).

General Land Use Characteristics

The fundamental factor dominating the land use system of Kharrubah pastoralists as well as those in the

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Jabal al-Akhdar is the inter- and intra-year variability of rainfall. These variations produce, in turn, a combination of areal and seasonal changes in the location of pasture and water. Therefore, pastoralists of the region have evolved a pattern of transhumant land use that involves several strategies designed to reduce the negative effects of rainfall fluctuations and recurrent drought. These strategies include seasonal movement, herd diversification, maintenance of herd size, and the practice of agriculture.

Seasonal Movement

One of the most important factors that determines the pastoralists' pattern of spatial organization is seasonal herd movement, regulated by the wet and dry seasons. The general pattern of spatial movement in the Kharrubah area resembles the north-south oscillations of pastoralists of the Jabal al-Akhdar region (Evans-Pritchard, 1949). Through this north-south shift, pasture growth in the south can be fully used, and water in seasonal streams and pools can be used to water the animals. Table 2 shows the importance of seasonal streams and pools in the wet season, and of wells and cisterns in the dry season.

This movement starts once the autumn and winter rains begin, which is usually in late September or early

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TABLE 2

SEASONAL SOURCES OF WATER FOR PASTORALISTS
OF THE KHARRUBAH AREA

Source	Wet Season		Dry Season	
	Abs.Freq.	Rel.Freq.	Abs.Freq.	Rel.Freq.
Well-borehole	7	8.8	27	33.7
Cistern	3	3.7	48	60.0
Pool	12	15.0	0	0.0
Seasonal stream	58	72.5	0	0.0
Other	0	0.0	5	6.2

SOURCE: Based on responses of 80 Kharrubah area
pastoralists

October in the northern part of the area, and when plowing and sowing have been completed. This southward move is usually carried out by the herdsman himself or, if he is too old or has a part-time job, with the help of a son (usually the oldest), relative, or hired shepherd. Table 3 shows that 50 percent of the respondents use laborers; 46.2 percent manage their own herds; 35 percent use relatives, usually their sons; and only 2.6 percent combine their herds with others.

The tendency toward using laborers differs from past practices, when the entire family unit moved southward, particularly if its animal wealth was based on sheep (Johnson, 1973). Today, this pattern of movement has almost completely disappeared as more and more family

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TABLE 3

FREQUENCY DISTRIBUTION - HERD MANAGEMENT

Individual Involved in Caring for Herds	Number	Percentage of Total
Self	37	46.4
Son	20	25.1
Brother	7	8.9
Other relative	1	1.4
Laborer	40	50.1
Other	2	2.6

SOURCE: Based on responses of 80 Kharrubah area
pastoralists

members settle in or near small urban centers such as Jardas to send their children to school and benefit from health and other services available in these centers. This suggests that families with more children would be more likely to reduce their spatial movements to send their youngsters to school. This tendency toward settlement can be seen in the study area, where 78 percent of the respondents live in permanent dwellings (64 percent in sheet metal houses and 14 percent in modern concrete houses).

This change in the settlement pattern has been accompanied by a growing tendency to hire shepherds to move the herds southward. According to the pastoralists interviewed, hiring a shepherd, who may be Egyptian,

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Sudanese, or Chadian, is costly. A shepherd's average monthly salary is about \$660, and he is also provided with basic foodstuffs. Two decades ago this was not the case, because the inflation rate was low and the free movement of labor migrants to Libya from neighboring countries (particularly Egypt) resulted in an abundant supply of shepherds available at low wages. The present tendency suggests that wealthy individuals would be more likely to hire a shepherd or have a relative take care of their herds.

Theoretically, any pastoralist in the region can graze and cultivate any area, regardless of ownership. Pastoralists claim that the areas are freely accessible to everyone (Johnson, 1973). This is the case in the study area, where almost all the respondents claim to graze wherever they want. In practice this is not the case. Most herders concentrate their activities in a group of wadis located in their traditional homeland or watan (see Figure 4), which they recognize as potential water and grazing resources in both wet (winter) and dry (summer) seasons (Table 4)(Johnson, 1973; Faculty of Education, 1980).

Most of these wadis, including al-Hasarim, al-Abid, al-Mushahl, Umm al-Jawabi, al-Shurfah, Khatitah, and Ruhaybah, can be reached in less than half a day's travel with the herds. Reaching other wadis, including Islan

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TABLE 4

GRAZING LOCATIONS IN THE DRY AND WET SEASON

Wadi	Absolute Frequency of Affirmative Responses		
	Dry Season	Wet Season	Both
al-Hasarim	3	5	9
al-Abid	3	6	3
Islan	-	9	-
Adwan	-	15	-
Kharrubah	22	10	5
Ruhaybah	3	7	12
Umm al-Jawabi	5	5	12
al-Shurfah	1	4	6
Marj Plain	14	-	-
al-Mushaul	8	-	-
Az Zawilli	1	8	1
Maraghah	3	4	1
Khatitah	1	7	-
Umm al-Ghuzlan	12	9	-
al-Hwijah	1	5	3

SOURCE: Based on responses of 80 Kharrubah area pastoralists

and Adwan, may require more than one day (Table 5).

Proximity to the wadis may not always be the case, however; Johnson (1973) wrote: "Provision must always be made for much more long-distant movement in drought years to reach subsidiary zones with adequate pasture and water" (p. 55).

For Kharrubah pastoralists, mainly those with large herds, the subsidiary grazing areas have traditionally been the Abyar plain, the Marj plain, and Wadi al-Bab. All of these areas are located in different tribal lands.

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TABLE 5

TIME TO REACH GRAZING AND WATERING WADIS

Time	Wet Season		Dry Season	
	Absolute Frequency	Relative Frequency	Absolute Frequency	Relative Frequency
Less than 1 hour	11	13.7	17	21.2
1-2 hours	8	10.0	10	12.5
3-4 hours	12	15.0	11	13.7
4-5 hours	4	5.0	2	2.5
5-6 hours	8	10.0	7	8.8
more than 6 hours	37	46.2	33	41.2

SOURCE: Based on responses of 80 Kharrubah area pastoralists

The expansion of government agricultural projects has limited pastoralists' access to these areas. Almost 83 percent of the respondents cited the lack of pasture area as a problem faced in herding animals, and 46 percent said they have no access to traditional drought retreat areas.

Today, when rainfall in the area is low, pastoralists must rent a farm from a farmer in one of these areas (usually the Marj plain) to graze the crop residues, buy concentrated fodder and water, or use government water points for grazing and water. Each alternative presents problems for pastoralists. For example, some 55 percent of the respondents feel the expense of concentrated fodder is a major problem related to herding: 100 kilograms

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(one quantar) of concentrated fodder costs about \$40 when purchased from an agricultural cooperative.

Pastoralists cited two problems with renting farms. First, when rain on the south slope is scarce during the wet season, farmers on the mountain and the Marj plain raise the farm rent or exclude pastoralists in the dry season. Renting a 50- to 80-hectare farm in the dry season would cost a pastoralist more than \$3,300. Second, in good years when rain on the south slope is plentiful, mountain farmers move their animals to these areas in the dry season to graze, which further increases overgrazing.

Pastoralists who cannot afford to buy fodder or water or a mountain farm must seek government water points. This often presents a problem because at some water points the government carries the water through pipelines to the growing urban centers in the region, and access may be limited because of infrastructure. An example in the study area is the Umm al-Jawabi water point, where the municipality pipes water seven kilometers to the urban community of Jardas; pastoralists have complained that the water point is not easily accessible.

In summary, current seasonal movements in the Kharrubah area are similar to traditional ones but are less extensive. Whereas traditionally the entire family

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unit moved southward with the herds in the autumn, families now tend to employ shepherds to move the herds while they settle in or near urban centers where social services are available. In the study area, 93.8 percent of the respondents have access to schools and 96.2 percent have access to health services. Seventy-seven percent of the respondents could reach a school in less than one hour, and 15 percent were one to two hours from a school. Similarly, 58.7 percent of the respondents could reach a dispensary in less than one hour, and 30 percent were one to two hours from a dispensary.

Changes in the settlement pattern are reflected in increased agricultural activity. In the study area, grain and hay crop residues provide an increasingly important source of summer feed as larger areas are cultivated. This change, together with improved water supplies, availability of concentrated feeds at subsidized prices, and the provision of veterinary services, is encouraging less extensive grazing in favor of more permanent settlement. Most of the respondents have access to veterinary services: 71.2 percent of the respondents can reach a veterinarian in less than one hour and 17.5 percent in one to two hours. Although this trend toward settlement may be desirable, it creates even greater pressures on areas that often are already severely overgrazed.

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Herd Diversification

A second major factor that determines the pastoralists' spatial organization pattern is the diversification of their livelihood. All but one of the respondents in this research own animals. The most important types of herd animals raised by Kharrubah pastoralists are sheep, goats, and cattle.

In the study area, sheep and goats are usually herded together; goats act as leaders for the sheep. Near Jardas, the researcher observed some herds consisting only of goats, but sheep herds without goats are rare. Many pastoralists with small herds join other families to form large combined herds. Those with larger-than-average herds often must hire shepherds.

Camels are the least important type of herd animal in the study area, primarily because the region is ecologically unsuited for camel herding. Ninety percent of the respondents in this study do not own camels.

Sheep. Sheep are the predominant animal in most of the study area because of the prevalence of steppe, which is ecologically suited to sheep (Behnke, 1980; Johnson, 1973). Because sheep cannot browse trees but can only graze, they are best raised in the steppe zones. They need to be watered only every three days in the summer and can survive on marginal pasture if water is available. The preferred foods of sheep are the annual

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grasses found on the mountain in the summer and the interior steppe grasslands in the winter. The sheep raised in the study area are of the Barbary breed found throughout North Africa.

Sheep are the most important animals in Kharrubah, as well as the Jabal al-Akhdar region. They are marketed for both meat and wool. Behnke (1975) pointed out that

as meat prices have been pushed progressively higher in recent years by the oil boom, sheep owners have decided that it is more profitable to let a lamb fatten by sucking all of its mother's milk than it is to milk the ewe and sell the lamb at a lower price. Thus most herds are no longer milked, and lambs are raised principally for sale. (p. 36)

For this reason, earnings from government jobs are frequently reinvested in sheep (Johnson, 1973). In 1983, when the study was conducted, the average lamb sold for \$151.

Because of their economic value, sheep are owned by almost every householder in the study area. Traditionally, sheep were used for milk and milk products such as buttermilk, cheese, and clarified butter. Today, as Behnke (1980) wrote, "the loss of these calcium- and protein-rich foods has been compensated for by the increased market values of young, male animals sold for butchering" (p. 31).

Table 6 shows the number of sheep owned by pastoralists of the area; only one pastoralist does not own sheep. About 74 percent of the households own sheep

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Number of
Owners

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940
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1000

Mean
Median
Standard
Number
Minimum
Maximum

TABLE 6

FREQUENCY DISTRIBUTION - NUMBER OF SHEEP OWNED

Number of Sheep Owned	Absolute Frequency	Relative Frequency	Cumulative Frequency
30	2	2.5	2.5
35	1	1.2	2.8
40	2	2.5	6.3
50	2	2.5	8.9
60	1	1.2	10.1
70	3	3.7	13.9
75	1	1.2	15.2
80	4	5.0	20.3
100	13	16.2	36.7
110	2	2.5	39.2
120	2	2.5	41.8
125	1	1.2	43.0
130	3	3.7	46.8
140	1	1.2	48.1
150	6	7.5	55.7
170	1	1.2	57.0
180	2	2.5	59.5
200	17	21.2	81.0
250	4	5.0	86.1
300	7	8.8	94.9
400	3	3.7	98.7
700	1	1.2	100.0

Mean = 166.9

Median = 148.75

Standard Deviation = 106.7

Number of Valid Cases = 79

Minimum Number Owned = 30

Maximum Number Owned = 700

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herds larger than 100 head, 40 percent of the households have more than 200 head, and 12.5 percent own the maximum herd size of more than 300. The minimum number of sheep per household was 30 and the maximum was 700, with a median of 148.75. The predominant pastoral activity in the Kharrubah area is sheep raising; thus these pastoralists can be classified as sheep herders rather than goat or camel herders.

Goats. Goats are hardy, agile, tough, and well-suited to the juniper forest conditions that prevail in the northern part of the study area because they require little water and can browse on a variety of shrubs and trees. The goat's short hair, however, is not suited to the cold winter conditions found in large portions of the northern part of the study area.

Goats are raised primarily for domestic use, but sometimes are sold when cash is needed. A comparison of the relative market value of sheep and goat products was provided by Behnke (1980), who stated:

Lambs for slaughter bring almost double the price of kids of comparable age and quality; wool, though its value is not great, does have a commercial value, while there is no market value at all for goat hair. Furthermore, it is highly improbable that the money brought into a goat-herding household by the sale of dairy products comes close to making up the difference in the sale price of lambs and kids. Only clarified butter can be sold, and even then, only surpluses above the needs of the family ever reach the market. (p. 32)

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At the time of this study, only 30 percent of respondents sold goats. The frequency distribution of goats in the study area shows that 95 percent of the respondents own goats, and 64 percent own more than 25 goats (Table 7). The average herd size (usually herded along with sheep) is 46, indicating the importance of goats as a valuable subsistence source of milk, meat, and hair. The minimum number of goats per household was 5, the maximum was 180, and the median was 39.67.

Cattle. The primary requirements for cattle are large quantities of water daily and reliable sources of fodder, especially barley. Because cattle cannot use more marginal grazing areas, there is no large-scale migration, as can be found in sub-Saharan Africa. However, there may be small daily movements within pasture areas. Most of the cattle in the study area are of the Libyan short-horn variety.

Cattle in the locale under study are less important numerically than sheep or goats and are valued primarily for high milk yields. The few cattle found in this area belong mostly to residents who have permanently settled in or around Jardas or at Wadi al-Kharrubah.

The frequency distribution of cattle in the study area indicates that 49 persons (57.5 percent) do not own cattle. Among owners, each household owns at least one cow; maximum ownership is eight and the median is 2.42 (Table 8).

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Number of
Owners

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Mean
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Standard
Number
Minimum
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TABLE 7

FREQUENCY DISTRIBUTION - NUMBER OF GOATS OWNED

Number of Goats Owned	Absolute Frequency	Relative Frequency	Cumulative Frequency
5	1	1.3	1.3
10	3	3.9	5.3
15	5	6.6	11.8
17	1	1.3	13.2
20	8	10.5	23.7
25	1	1.3	35.0
30	13	17.1	42.1
35	4	5.3	47.4
40	6	7.9	55.3
50	16	21.1	76.3
60	2	2.6	78.9
70	3	3.9	82.9
75	1	1.3	84.2
80	3	3.9	88.2
100	8	10.5	98.7
180	1	1.2	100.0

Mean = 46.145

Median = 39.7

Standard Deviation = 30.345

Number of Valid Cases = 76

Minimum Number Owned = 5

Maximum Number Owned = 180

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TABLE 8

FREQUENCY DISTRIBUTION - NUMBER OF CATTLE OWNED

Number of Cattle Owned	Absolute Frequency	Relative Frequency	Cumulative Frequency
1	5	6.3	14.7
2	13	16.2	52.7
3	3	3.7	61.8
4	9	11.2	88.2
5	1	1.2	91.2
6	1	1.2	94.1
7	1	1.2	97.1
8	1	1.2	100.0

Mean = 3.0 Median = 2.42
 Standard Deviation = 1.71
 Number of Valid Cases = 34
 Minimum Number Owned = 1
 Maximum Number Owned = 8

Maintenance of Herd Size

Another strategy pastoralists have developed to safeguard against environmental hazards and to meet their socioeconomic needs is maintenance of herd sizes. The minimum herd size required to support a pastoralist's family at a subsistence level has never been accurately established and differs across time and space. As Johnson (1973) pointed out in his study of Cyrenaica, "it is unlikely one will get a clear picture of the size of

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nomadic herds" (p. 45). Imprecise figures on herd size result because the herds are always located at some distance from the pastoralist's dwelling and because the pastoralists may inaccurately report herd sizes to avoid taxation and to be eligible for government assistance. The minimum herd size also depends on a society's level of economic development.

Several scholars have attempted to estimate the minimum herd size required for nomadic families in different parts of the Middle East and Africa. Barth (1964) estimated that 60 head of mature sheep and goats are required for the subsistence of an elementary family in southern Iran. Swidler (1973) estimated that Brahmin families in southern Iran require at least 60 sheep and goats to subsist. In Sudan, a herd of 40 to 50 sheep or 20 to 25 camels seems to suffice for the Kababish (Asad, 1970). In North Africa, Capot-Rey estimated that 25 sheep and goats are sufficient (Johnson, 1973).

In the eastern region of Libya, Kikhia (1969) reported that the average herd size for Bedouin families is between 100 and 150 head of sheep and goats (50 goats and 100 sheep). Johnson (1973) has reported that the average herd size observed in the region he studied was 100 to 200 sheep and goats or 30 to 40 camels; smaller herds were not considered to be viable enough to support pastoral activity. In the study area in summer 1983, the

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combined average herd size of sheep, goats, cattle, and camels was 232. For a nuclear family of six persons, the average was 227 (179 sheep, 45 goats, and 3 cattle). This means that pastoralists of the Kharrubah area are able to meet their herding expenses as well as socio-economic needs with herd sizes at current levels.

Agriculture

Another aspect of the pastoralists' diversification strategy is practicing cultivation as a supplementary activity to herding. Pastoralists in the Kharrubah area, as well as in the southern flank of the Jabal al-Akhdar, have practiced dry-land farming on a subsistence basis to provide their own produce and to complement animal wealth. This is in contrast to other arid and semi-arid areas, where pastoralists rely more heavily on trade with farmers (Behnke, 1980; Johnson, 1973). About 88 percent of the pastoralists interviewed practice agriculture; 61.2 percent of those individuals have spent more than 15 years cultivating the land (Table 9), and 50 percent are older than 40 years. This means that a high percentage of the population have considerable experience in agriculture. Such expertise is of benefit to the project planners, who will be using agricultural experience as one criterion for selecting settlers. Pastoralists in the study area practice agriculture as owner by inheritance (58 percent, n=47), sharecropper (1.2 percent,

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n=1), renter (3.7 percent, n=3), and on a "first to plow" basis (23.8 percent, n=19).

TABLE 9

LENGTH OF TIME IN AGRICULTURE

Time (Years)	Absolute Frequency	Relative Frequency (%)	Cumulative Frequency (%)
1-5	8	10.0	11.3
6-10	6	7.5	19.7
11-15	8	10.0	31.0
more than 15	49	61.2	100.0
Valid Cases: 71 No response: 9			

SOURCE: Based on responses of 71 Kharrubah pastoralists

Study respondents most commonly cultivate barley and wheat. Barley is grown by 85 percent of the individuals (Table 10) for its advantages as animal feed and drought-resistant qualities. Wheat is cultivated by 58.7 percent of the respondents, primarily for use as a dietary staple. As Behnke (1980) reported,

there is no way of estimating the relative caloric and nutritional contribution of these two food sources [wheat and meat], at least by volume, flour is the most important ingredient in almost all traditional cooking. (p. 47)

Johnson reported in 1973 that, for the population he studied wheat rather than barley was the major crop; he related this finding to improvements in the pastoralists' economic condition. This is partially true for the

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TABLE 10

FREQUENCY DISTRIBUTION - MAJOR CROPS CULTIVATED

Main Crop	Absolute Frequency	Relative Frequency
Barley	21	26.2
Wheat	2	2.5
Both barley & wheat	43	53.8
Vegetables	0	0.0
Maize	0	0.0
Other	0	0.0

SOURCE: Based on responses of 80 Kharrubah pastoralists

study area, as more than half of the respondents cultivate wheat. A possible explanation for the high percentage of individuals growing barley may be the need to feed large herds of animals. Also, grains, mostly barley, are cultivated for animal feed because cereal crops have a low market value compared to animal sales. This is supported by the fact that most of the respondents do not sell their crops, suggesting that landowners and wealthy individuals would be more likely to grow barley to feed their herds than to sell.

The rationale for growing barley as an animal feed rather than for the market can also be understood in the context of Behnke's calculation of the net profit from sowing five quantars (about 10 hectares) of barley. He estimated the income from barley sales as \$57 per

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quantar, compared to an average price in the study area of \$153 for five lambs. Hence pastoralists do not have sufficient motivation to cultivate cereals for the market because

the real value of barley in particular is not presented in its market price but in its utility within the context of the domestic economy, since the production of highly priced animal products depends in large measure upon a sufficient supply of fodder and feed grain. (Behnke, 1980, p. 47)

Since both barley and wheat have traditionally been grown without irrigation, some 86.2 percent of the respondents said they are not familiar with either irrigation systems or crop rotation. About 80 percent of the respondents stated they do not fallow their fields; only about 9 percent usually fallow from one-fourth to more than one-half hectare of their fields. Behnke (1980) noted,

a fallowing schedule is the exception rather than the rule. If early winter rains are insufficient or late or postpone the date of plowing, the chances of crop failure become greater. As winter sets in and the fields remain unplowed, a growing number of farmers decline to invest in what is rapidly becoming a risky enterprise. Most fields, then, are fallowed by default. (p. 42)

The spatial distribution of cereal fields in the study area depends on the amount of rainfall, as well as on the nature of the terrain. In the north, the fields are concentrated in wadi bottoms and less-steep hillsides close to the landowners' residences, where rainfall is dependable. In the south, the fields are concentrated in

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the floodplain of the major wadis, such as Kharrubah and Umm al-Ghuzlan, where the fields can benefit from local rainfall and floodwater produced by good rainfalls in the north.

Cereal fields in the area are usually large, and pastoralists may have plots of varying sizes. Table 11 illustrates the sizes of plots cultivated by the respondents. Because pastoralists graze their animals on crop stubble after harvest, this suggests that individuals with large herds are more likely to cultivate large areas. This is supported by the fact that a significant Spearman correlation coefficient was obtained between wealth and amount of land cultivated; 74.4 percent of the wealthy individuals cultivate large areas of grain, mostly barley.

In order to maximize yields and reduce the risks of crop failure, pastoralists often cultivate both large and small fields.¹ Large fields are cultivated partly because of an uneven distribution of rainfall throughout the area. In general, regions with higher and more regular amounts of rainfall, such as the northern part of the

¹ Pastoralists use the same measure when talking about the amount of grain and the size of their fields. For example, a pastoralist may report that he cultivates 5 hectares of grain, meaning that he planted 250 kilograms or 2.5 quantars of grain. According to an estimate by project supervisors familiar with standard measures of land area, one hectare is equivalent to about 50 kilograms of grain.

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TABLE 11

FREQUENCY DISTRIBUTION - AMOUNT OF LAND CULTIVATED

Amount of Land Cultivated (Ha.)	Absolute Frequency	Relative Frequency	Cumulative Frequency
1-5	8	10.0	11.3
6-10	10	12.5	25.3
11-15	7	8.8	35.2
More than 15	46	57.5	100.0

Valid Cases = 71

SOURCE: Based on responses of 71 Kharrubah area
pastoralists

study area, support intense cultivation on small fields, where the yields are dependable and modest and the risk of crop failure is minimal. In contrast, some areas with more erratic and less rainfall support less intensive cultivation on larger fields. In these areas there is a higher risk of crop failure in a given year, but a good year will produce an excellent yield (Behnke, 1980; Johnson, 1973).

Cultivation is completed by early December, after the first rains. Nearly all of the population plow their fields with their own or rented tractors. In contrast to plowing operations, harvesting is usually done by hand and involves a large number of laborers who manually haul grain to a centrally located threshing machine, bag the

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grain, and clear away excess particles that accumulate around the thresher (Behnke, 1980). Barley cannot be harvested mechanically because

the native variety of barley produces many heads on a single plant, and not all of these heads are equally well-developed or stand an equal distance from the ground. This barley cannot be mechanically harvested because the machine will either miss much of the grain or pick up too many stones, depending on how high the pick-up header is set. (Behnke, 1980, p. 44)

Table 12 demonstrates the importance of laborers in agriculture, mainly at harvesting time. About 19 percent of the respondents hire laborers for the harvesting operations, 9 percent get help from their relatives, and 7.5 percent receive help from their sons. Because harvesting involves much effort and 61 percent of the respondents cultivate their own fields, the younger elements of the population might be more likely than older ones to cultivate their own fields. This is supported by the fact that 78.9 percent of the younger respondents cultivate their own fields compared to 43 percent of the older individuals. The older respondents are more likely to have laborers or relatives do the cultivation.

In the study area, as well as in the Jabal al-Akhdar region, women do not participate in agricultural operations, a phenomenon related to the division of labor. Women are usually responsible for housework and some livestock activities, such as milking (mainly goats and cattle) or managing (with the help of children) a small herd of goats or cattle. Men are responsible for herding

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TABLE 12

FREQUENCY DISTRIBUTION - LAND CULTIVATORS

Category	Absolute Frequency	Relative Frequency	Cumulative Frequency
Head of Household	49	61.2	69.0
Laborer	15	18.8	90.1
Male Relative	7	8.7	100.0
Valid Cases = 71			

SOURCE: Based on responses of 80 Kharrubah area pastoralists

and watering the animals and for all stages of cultivation. This division of labor illustrates the importance of the male in the family structure, not only in the study area but throughout the Jabal al-Akhdar region.

Peters (1965) pointed out that the ideal family size in Cyrenaica is 12 persons--ten children (mostly male), a father and a mother. The male emphasis in families comes from the role men play in increasing the family's productivity:

Additional males in the family increase the productive possibilities of a family in a sense that more herdsmen become available and larger plowing commitments can be undertaken; an increase in the number of females has small effect on production since they are precluded from any direct participation in these activities. (Peters, 1965, 135)

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Summary. An interrelationship exists between agricultural and pastoral activities in the Kharrubah area. Agriculture serves primarily as a means to maintain and increase wealth in the form of herd size. Products from both agricultural and pastoral activities provide dietary staples for the household, and herd animals can graze on the stubble remaining on fields after harvest.

In addition to practicing agriculture, Kharrubah pastoralists use three other major land use strategies to minimize environmental fluctuations. Herds are moved seasonally, according to wet and dry periods, so that various pasture and water resources can be exploited. Herd diversification is a second strategy, whereby sheep are raised primarily for sale to markets and goats are raised mostly for household products. Maintaining large sheep herds to take full advantage of the demand for meat in urban centers is another strategy for avoiding economic adversity.

Marketing. Most individuals in the study area are involved in market activities. About 77 percent of the respondents sell their animals to commercial markets, whereas only 12.5 percent sell to traders who come to the area. Tables 13 and 14 summarize the average number and price of animals sold at the time of the study (1983). An average of 20 goats (median = 15) sold for \$96 each, and 64 sheep (median = 50) sold for \$153 each. One

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respondent reported selling camels for an average price of \$832; no cattle were sold. These prices are higher than in the past because of inflation but are not as high as those cited by Peters (1981). The small number of camel sales and the absence of cattle sales is due to the fact that camel meat is no longer as popular as it used to be, and cattle are used almost exclusively for domestic purposes, primarily as a source of meat and milk products. This market orientation in selling animals, mostly sheep, began in the 1960s as a result of oil exportation.

TABLE 13

FREQUENCY DISTRIBUTION - NUMBER OF ANIMALS SOLD

Number Sold	Absolute Frequency of Responses		
	Goats	Sheep	Camels
none	53	1	79
1-10	3	2	-
11-20	11	3	1
21-30	6	9	-
31-40	5	13	-
41-50	1	11	-
51-60	1	12	-
over 60	-	29	-

Mean = 19.1 (Goats) 63.6 (Sheep)
 Median = 15.4 (Goats) 49.7 (Sheep)
 Standard Deviation = 11.2 (Goats) 47.1 (Sheep)

SOURCE: Based on responses of 80 Kharrubah area
 pastoralists

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TABLE 14

FREQUENCY DISTRIBUTION - PRICES FOR ANIMALS

Price Obtained (\$)	Absolute Frequency of Responses		
	Goats	Sheep	Camels
none stated	54	1	79
66-86	4	-	-
87-102	9	-	-
103-119	11	8	-
120-135	2	15	-
136-152	-	24	-
153-166	-	19	-
over 166	-	13	1 (\$ 832)

Mean = 95.6 (Goats) 152.8 (Sheep)

Median = 99.2 (Goats) 150.2 (Sheep)

Standard Deviation = 13.6 (Goats) 28.0 (Sheep)

SOURCE: Based on responses of 80 Kharrubah area
pastoralists

In the last 20 years, since the discovery of oil, government revenues have greatly increased, enabling the Libyan government to initiate a wide variety of development projects and to create new jobs in tribal lands. Most pastoralists now find that government employment or raising sheep for commercial markets is more profitable than being a subsistence-level pastoralist. As a result, many pastoralists receive either wages or welfare benefits from the government, or have greater incomes because meat products command high prices.

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The oil economy has affected pastoralists in the study area in two ways. The first is by creating supplementary income sources, such as government jobs. Some 56.2 percent of the respondents receive government salaries in addition to income from selling animals. Ninety percent of the respondents reported that their main income comes from selling animals, mostly sheep. The second way in which the oil economy has affected the pastoral economy is by increasing the value of animal products, which has led to an increase in herd size (Behnke, 1980).

The creation of government jobs has resulted in two classes of government employees. First, there are individuals with below-average herd sizes who want to compensate for the loss in animal wealth by working as government employees, which suggests that individuals with fewer animals (wealth) are more likely to work for the government as unskilled laborers, such as custodians or night watchmen. This is supported by the finding that 76.3 percent of the less wealthy individuals have jobs with the government.

The second group comprises government employees who own larger-than-average herds. In fact, 38 percent of the wealthier individuals work for the government, and 14.3 percent of them work for the project itself. These herd owners, according to Behnke (1980), "were able to be

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committed between job, herd, and household on a daily or weekly basis" (p. 87).

The increased demand for meat products, particularly mutton, has brought about an increase in herd sizes from 60 head in the 1950s before the discovery of oil, to 232 head in 1983. Allan (1982a) wrote

the demand for meat had risen sharply throughout the 1960's and 1970's with the consequence that the livestock population, especially the sheep population, rose accordingly. The pattern of food consumption of the Libyan population was transformed by oil so that formerly poor families, as well as the prosperous, could purchase meat, and the most highly prized meat was the mutton of the local barbary sheep. At the same time the alien population rose steadily and since much of that population was urban and relatively prosperous, the pressure on food supplies, and on supplies of meat in particular, was progressively more intense through the 1970's. (pp. 208-209)

Table 15 illustrates the increase in the number of sheep as a result of growing demand for mutton; the number of goats has been relatively stable, and the number of camels has decreased.

The increased demand for meat products has been a result of growth in urban populations in large cities such as Benghazi (with a population over 250,000) and al-Marj (with a population over 20,000)(Table 16).

Because most of the pastoralists (87.5 percent) own motor vehicles, they are able to reach large urban markets. To take advantage of these markets, 81.3 percent of the respondents sell more animals, mainly in Benghazi, when prices are high. Traditionally, herdowners have sold their animals on the basis of the herd's seasonal

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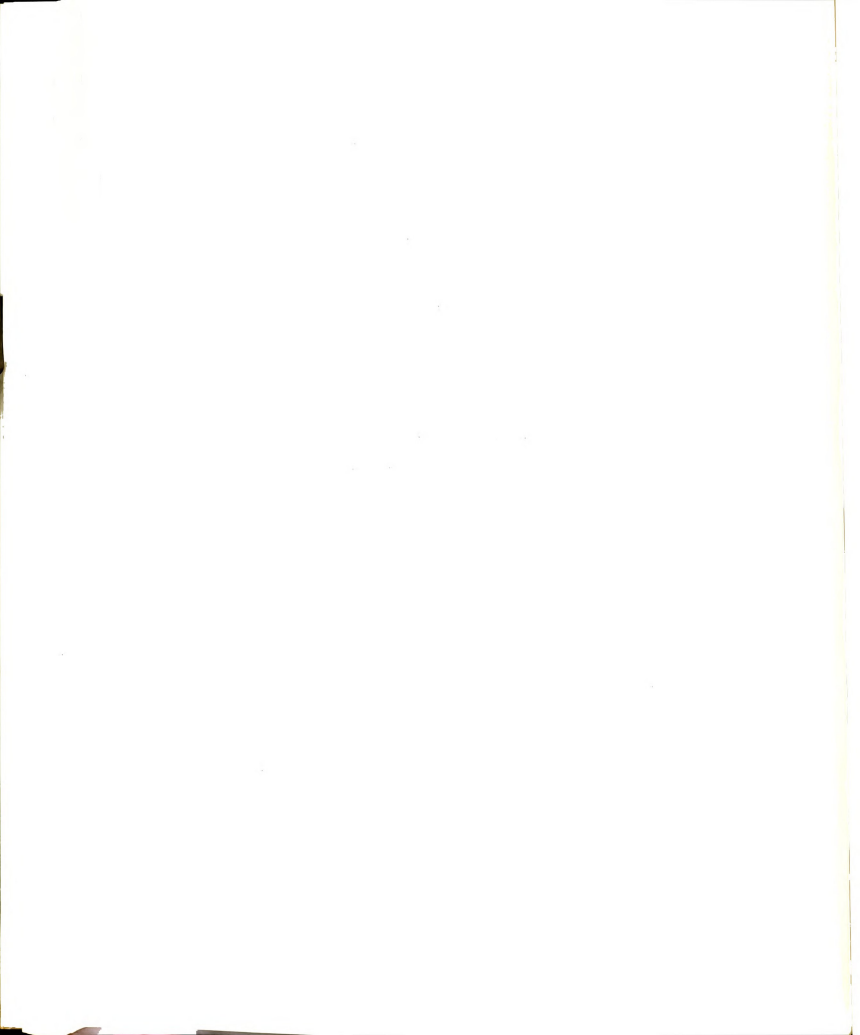
TABLE 15

LIVESTOCK NUMBERS IN LIBYA, 1961, 1974, AND 1982
(without cattle)(in thousands)

Year	Sheep	Goats	Camels
1961	1296	1224	249
1974	2861	1147	64
1982	5600	1500	135

SOURCES: G. Gintzburger and Mohamed Bayoumi, Survey of the Present Situation and Production of the Libyan Rangelands (Tripoli: Agricultural Research Centre, 1977), p. 17; FAO Production Yearbook, Vol. 36 (Rome: United Nations, Food and Agricultural Organization, 1983), pp. 214-217.

productivity cycle. This pattern has persisted, with adjustments to meet the demand for mutton in urban centers (Behnke, 1980). Most sales occurred in Benghazi and al-Marj; 95 percent of the respondents sell their animals in al-Marj (about 60 kilometers north of the study area) and 58.7 percent in Benghazi (about 160 kilometers west). As mentioned before, to take advantage of higher prices in urban centers, individuals with larger herds would be the first to take advantage of selling more animals, mainly sheep, in these large markets. This decision depends on receiving reliable current information about the market price of animals, which has been facilitated by the broadened social contacts of wealthier



people. This suggests that individuals with larger-than-average herds are more aware of price changes for animals in the large urban centers.

TABLE 16

POPULATION GROWTH IN TWO SELECTED LIBYAN CITIES
1966 AND 1973

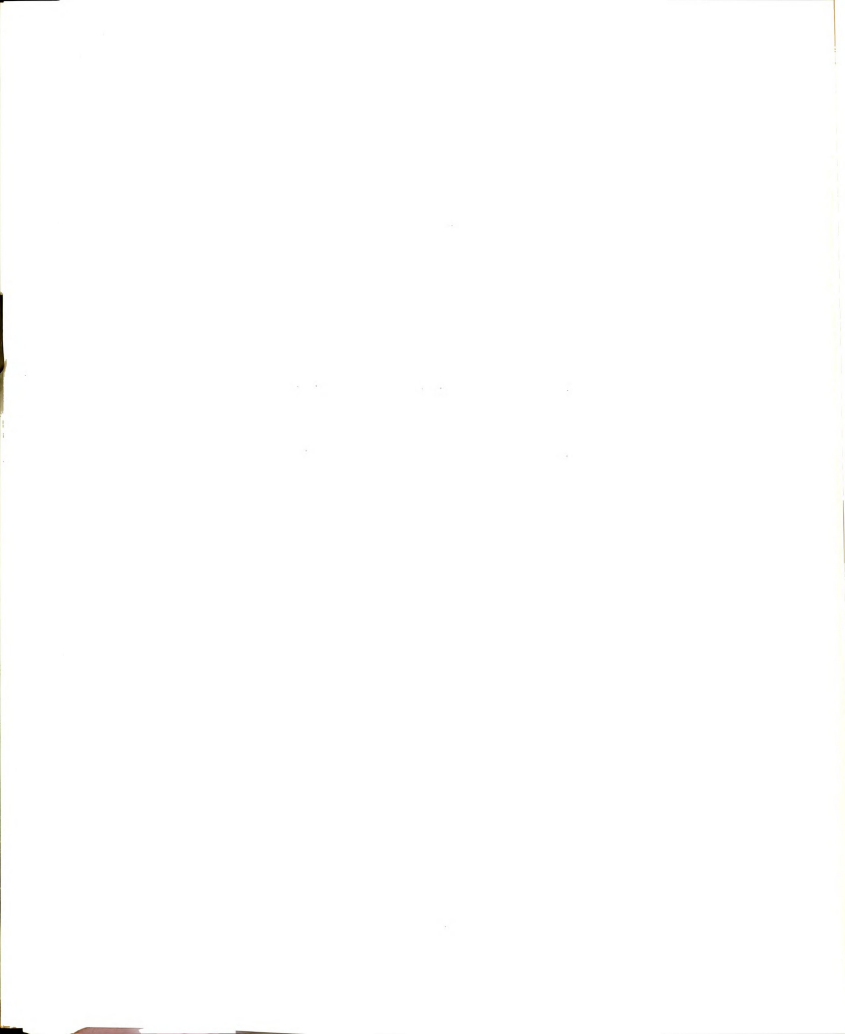
City	1966	Population 1973	1975
Benghazi	160,000	270,450	340,000
al-Marj	11,222	25,500	31,000

SOURCE: Italconsult, Settlement Pattern Study
Benghazi Region (Rome, 1975, 1976), pp. 57, 69

Summary

In this section, the actual land use of Kharrubah pastoralists was identified. This land use is characterized by seasonal herd movement, diversification of herd resources, maintenance of large herds and commercial marketing of animals, and cultivation as a supplementary activity to herding. Some possible relationships between this land use pattern and four demographic and cultural characteristics of the population were suggested in this section and are summarized as follows:

- larger families with more children are more likely to reduce their spatial movements

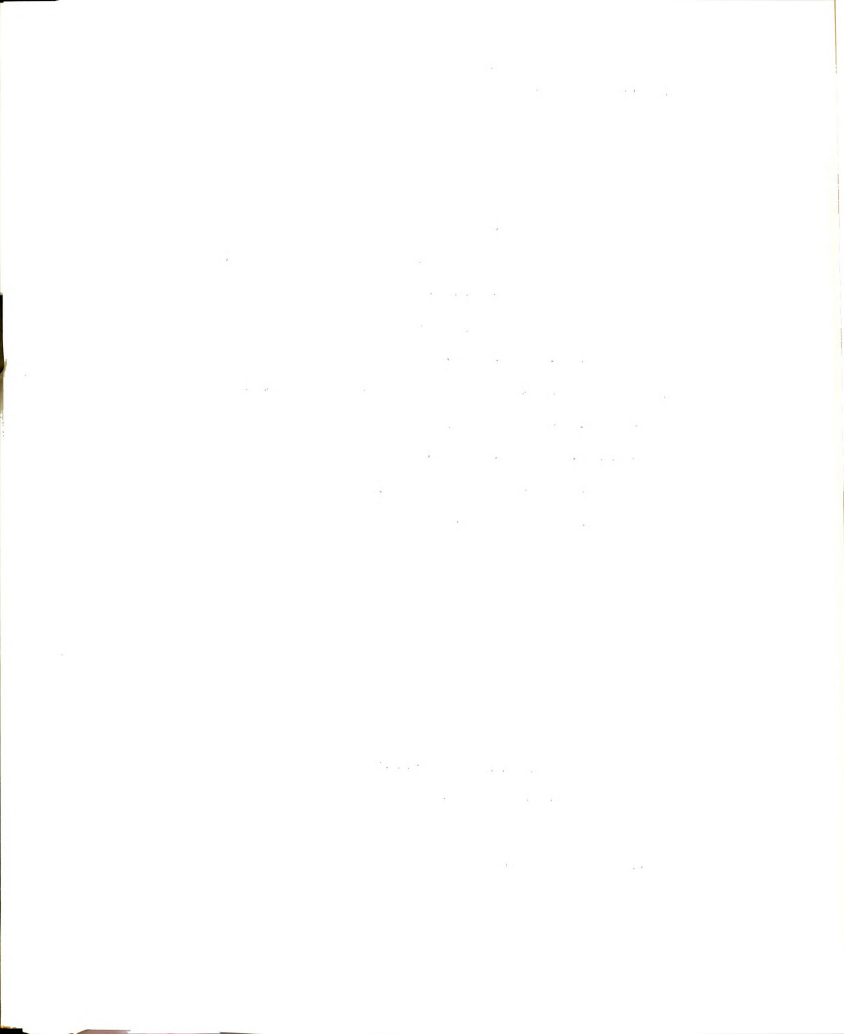


- wealthier pastoralists are more likely to have hired shepherds or relatives tend their herds
- landowners and individuals with larger-than-average herds are more likely to grow barley instead of wheat to feed their animals
- younger individuals are more likely to cultivate their fields themselves
- individuals with larger-than-average herds are more likely to cultivate large areas
- pastoralists with smaller-than-average herds are more likely to be employed by the government
- individuals with larger-than-average herds are more likely to sell animals, mainly sheep, in the large urban centers
- individuals with larger-than-average herds are more likely to be aware of price changes for animals in the large urban centers

These relationships are analyzed statistically in the next portion of this chapter.

Land Use Factors Related to Population Characteristics

In this section land use in the Kharrubah area is analyzed in relation to four demographic and cultural characteristics of the population. These factors are wealth of the pastoralist (in terms of animal ownership),



age, family size, and land ownership. Chi-square and Spearman correlation-coefficient nonparametric tests were used to analyze the relationships among these factors and the land-use-related variables.

Many of the variables were categorical rather than interval. The distribution of responses to each variable was examined, and some were found to be skewed. Two of the independent variables, wealth and landownership, were dichotomized near the median so that respondents with less of the relevant characteristic were placed in one group and those with more of the characteristic were placed in a second group. Responses to the dependent variables were dichotomized so as to maintain the ordinal qualities of the data. The resulting distributions allowed meaningful statistical tests to be performed while maintaining the integrity of the data.

Independent Variables

The four independent variables--wealth, age, family size, and landownership--are defined as follows:

Wealth. For this analysis, the wealth of the pastoralists of the Kharrubah area is defined as the number of sheep, goats, and cattle owned. All but one of the 80 families own animals, mainly sheep and goats, and 95 percent of the families derive their main income from selling animals. Further, 77 percent of the families sell

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their animals to commercial markets, with 90 percent of those individuals selling sheep. Some scholars (e.g., Johnson, 1973) who have studied the eastern region of Libya have suggested 200 head of sheep and goats as an average herd size; thus this number was used to dichotomize the independent variable of wealth. Individuals owning 1 to 199 animals ($n=38$) were placed in one group, while individuals owning 200 to 700 animals ($n=42$) formed the second group.

Age. This variable was the respondent's age at the time of interview. Respondents were asked to give or estimate their age. The minimum age was found to be 20, the maximum age 78, and the median age 48.5 years. Individuals 20 to 43 years of age formed the youngest group ($n=24$) and those 58 to 78 years old formed the oldest group ($n=24$). Individuals 44 to 57 years old formed a middle group ($n=22$). Only the extreme groups (youngest and oldest) were included in the chi-square analysis to insure actual age-range differences. Actual ages were used in calculating Spearman correlation coefficients.

Family size. This variable was measured by the number of individuals in the family at time of interview. All of the interviewees live in a household averaging eight persons; one individual is unmarried and three practice polygamy. Family sizes ranged from two to as many as 15 persons living under the same roof. Table 17

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shows that 28 percent of the respondents had families of between 11 and 15 persons, and 42.5 percent had families of between 7 and 11 persons. Three categories were formed: small families (six or fewer persons), mid-sized families (seven to ten members), and large families (11 to 15 members).

TABLE 17

FREQUENCY DISTRIBUTION - FAMILY SIZE

Family Size	Absolute Frequency	Relative Frequency	Cumulative Frequency
1	1	1.2	1.2
2	1	1.2	2.5
3	2	2.5	5.0
4	4	5.0	10.0
5	8	10.0	20.0
6	7	8.8	28.8
7	8	10.0	38.7
8	8	10.0	48.7
9	6	7.5	56.3
10	12	15.0	71.2
11	6	7.5	78.8
12	8	10.0	88.8
13	2	2.5	91.2
14	4	5.0	96.2
15	3	3.7	100.0

Mean = 8.625

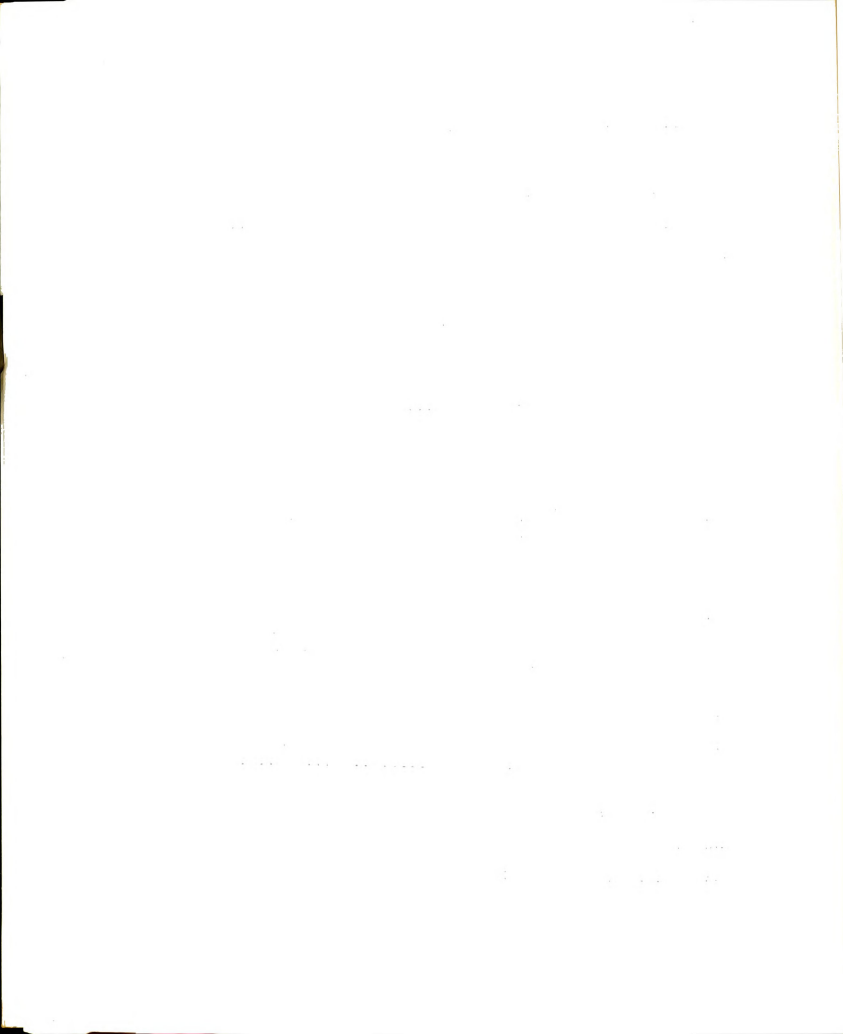
Median = 8.67

Standard Deviation = 3.29

Number of Valid Cases = 80

Minimum Family Size = 1

Maximum Family Size = 15



Landownership. The land tenure system in the Kharrubah area is the same as that in the southern flank of the Jabal al-Akhdar. Grazing areas are open to all herders, regardless of descent; this benefits herders from all tribes. Agricultural fields are managed on the basis of annual occupation of the fields, a type of "squatter's right," which is a long-term and inheritable right. Water rights vary from zone to zone in the area, but water is generally more restricted than agricultural fields because of the uneven spatial distribution of rainfall.

According to the frequency distribution of land tenure systems practiced in the study area, 92.5 percent of the pastoralists are not subject to restrictions concerning where they graze their animals, because "all grazing areas are nominally open to anyone who chooses to use them" (Behnke, 1980, p. 123). Also, 72 percent of the pastoralists own their own cistern on the basis of lineage or as a member of a descent group. Since there are no variations in grazing and water rights practiced by these pastoralists, the only variations occur in land holding rights.

The independent variable in this analysis was defined so that individuals who cultivate the land as owners by inheritance (58.7 percent, $n=41$) were in one group and those who cultivate the land as renters (3.7

percent), sharecropper (1.2 percent), or on a "first to plow" basis (23.8 percent) formed a second group (n=39).

Association Between Independent and Dependent Variables

Chi-square and Spearman correlation tests were used to analyze relationships between the independent variables and 20 land-use-related variables, as listed in Table 18. The results of the correlation analyses between each of the independent variables and the dependent variables are as follows:

Wealth. Chi-square and Spearman correlation tests were performed to determine if a statistically significant relationship existed between wealth and the land use variables. Three variables were found to be significantly related to wealth: (1) having a laborer care for animals, (2) selling sheep, and (3) amount of land cultivated.

Earlier in this chapter, it was suggested that the oil economy has created two classes of government employees. The first group comprises herd owners with below-average herd sizes. This is supported by the finding that 76.3 percent of the less wealthy individuals work for the government (Table 19). The second group comprises government employees who usually also own large herds. In the study area, 38 percent of the wealthy individuals work for the government, and 14.3 percent of them work for the project itself. These wealthy owners

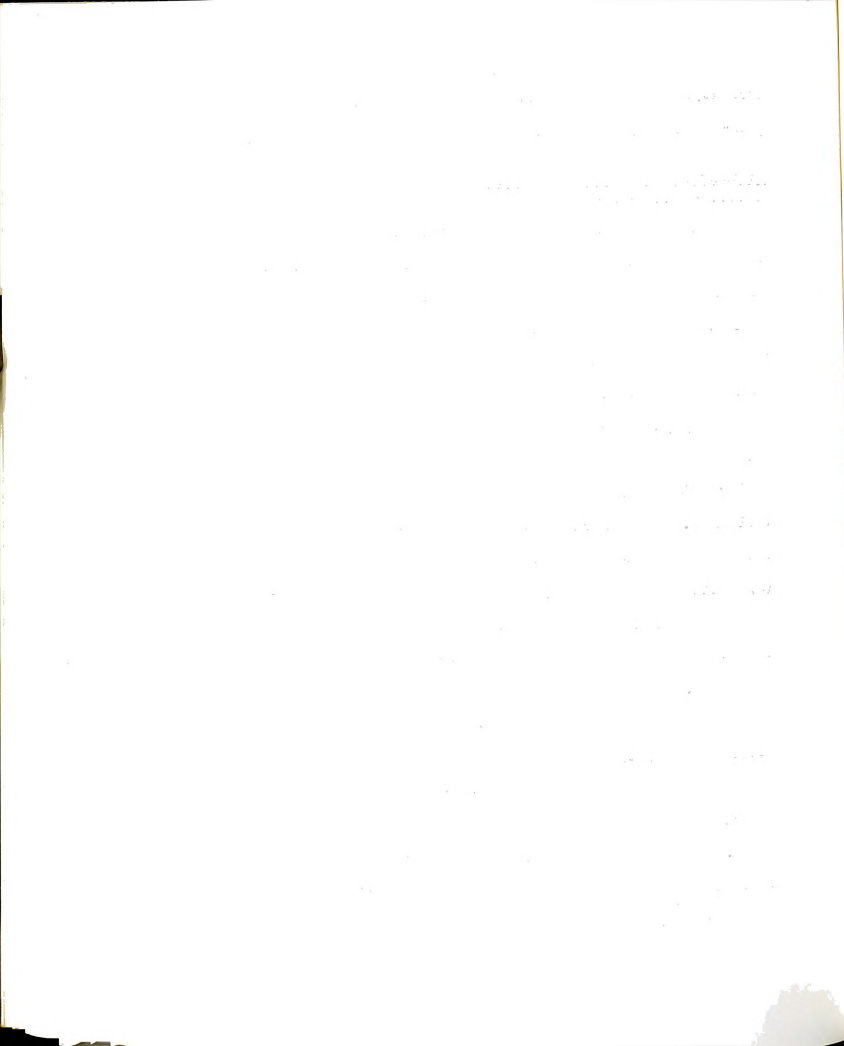


TABLE 18

LAND USE-RELATED DEPENDENT VARIABLES

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|------|---|
| 1 - | time to reach water in the wet season |
| 2 - | time to reach grazing in the wet season |
| 3 - | time to reach water in the dry season |
| 4 - | time to reach grazing in the dry season |
| 5 - | length of time practicing agriculture |
| 6 - | amount of land cultivated |
| 7 - | who cultivates the land |
| 8 - | grow wheat |
| 9 - | grow barley |
| 10 - | animals tended by laborer |
| 11 - | animals tended by brother |
| 12 - | animals tended by son |
| 13 - | animals tended by other relative |
| 14 - | number of sheep sold |
| 15 - | number of goats sold |
| 16 - | aware of animal price changes in past
five years |
| 17 - | highest prices obtained in Benghazi |
| 18 - | highest prices obtained in al-Marj |
| 19 - | send children to school |
| 20 - | level of education |
-

with larger-than-average herds, who are able to diversify their income, are more likely to hire a shepherd to care for their animals. This is supported by the finding that 66.7 percent of the wealthy individuals hire laborers compared to 31.6 percent of the less wealthy (Table 20). This relationship was expected because wealthy owners possess an average of 317 head of sheep, goats, cattle, and camels.

Traditionally, as Behnke (1980) noted, "herdowners left their herds to young boys in the family or a client

TABLE 19

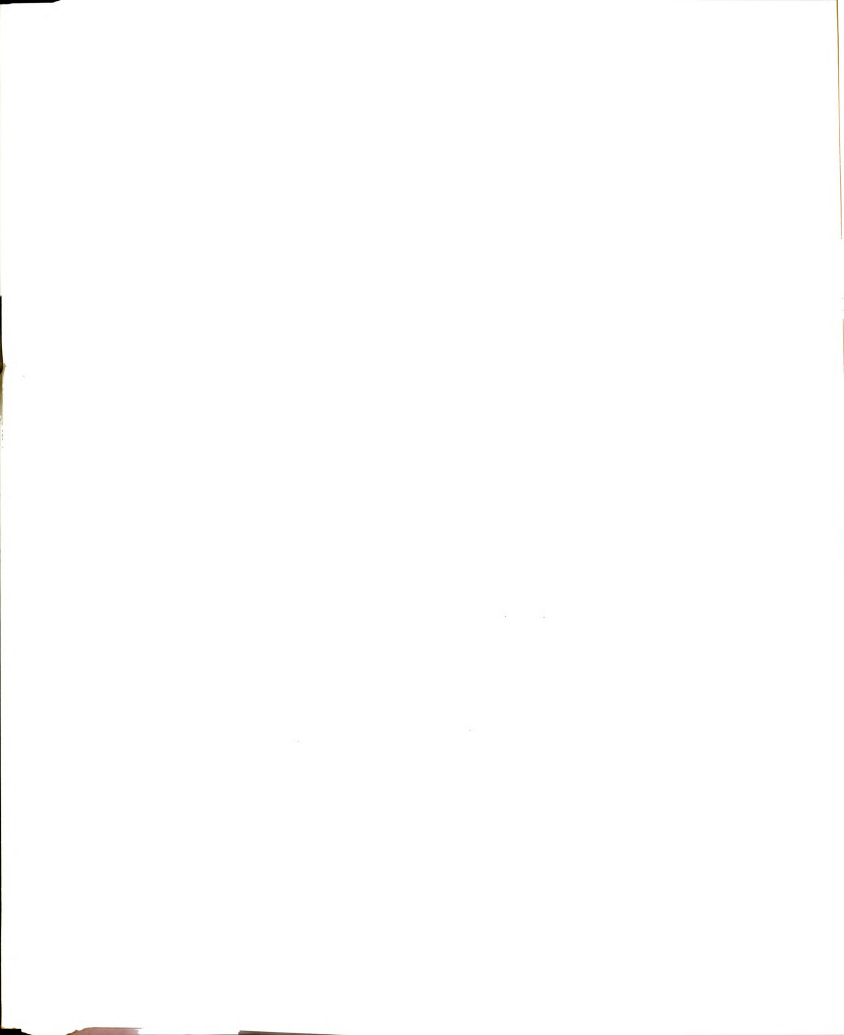
FREQUENCY OF RESPONSES SHOWING RELATIONSHIP
BETWEEN WEALTH AND GOVERNMENT EMPLOYMENT

Wealth	Government Employee		
	No	Yes	
Less wealthy	9	29	
More wealthy	26	16	
N = 80	$\chi^2 = 11.84$	df = 1	p = 0.05

TABLE 20

FREQUENCY OF RESPONSES SHOWING RELATIONSHIP
BETWEEN WEALTH AND USE OF HIRED SHEPHERD

Wealth	Use a Hired Shepherd Yes	No
Less wealthy	12	26
More wealthy	28	14
N = 80	$\chi^2 = 9.82$	df = 1
		p = 0.05



or impoverished kinsman" (p. 86). This pattern has changed, as indicated by the nonsignificant relationship between wealth and having a son or relative care for the animals. Today, with larger herds, the involvement of most herd owners in government jobs, and the increased tendency for most pastoralists to send their children to school (68 percent of the respondents send their children to school), the pattern has changed. Herds are now left completely in the care of one shepherd.

It was also suggested that individuals who own large herds will tend to sell more animals, mainly sheep, as long as there is a great demand for mutton in the urban centers. This is supported by the finding that 76 percent of the wealthy individuals sell sheep in large cities such as Benghazi (about 83 percent sell their animals in Benghazi), compared with only 24 percent of the less-wealthy herdowners. Table 21 illustrates that 40.5 percent of the respondents sell between 86 and 200 sheep annually, and 35.7 percent sell between 48 and 85 sheep. In contrast, the association between wealth and goats sold was not significant. This supports the view that goat meat is not as popular as mutton among the urban population and that goats are raised primarily for family consumption.

Since barley is cultivated mainly for animal feed, it was suggested in the first section of this chapter

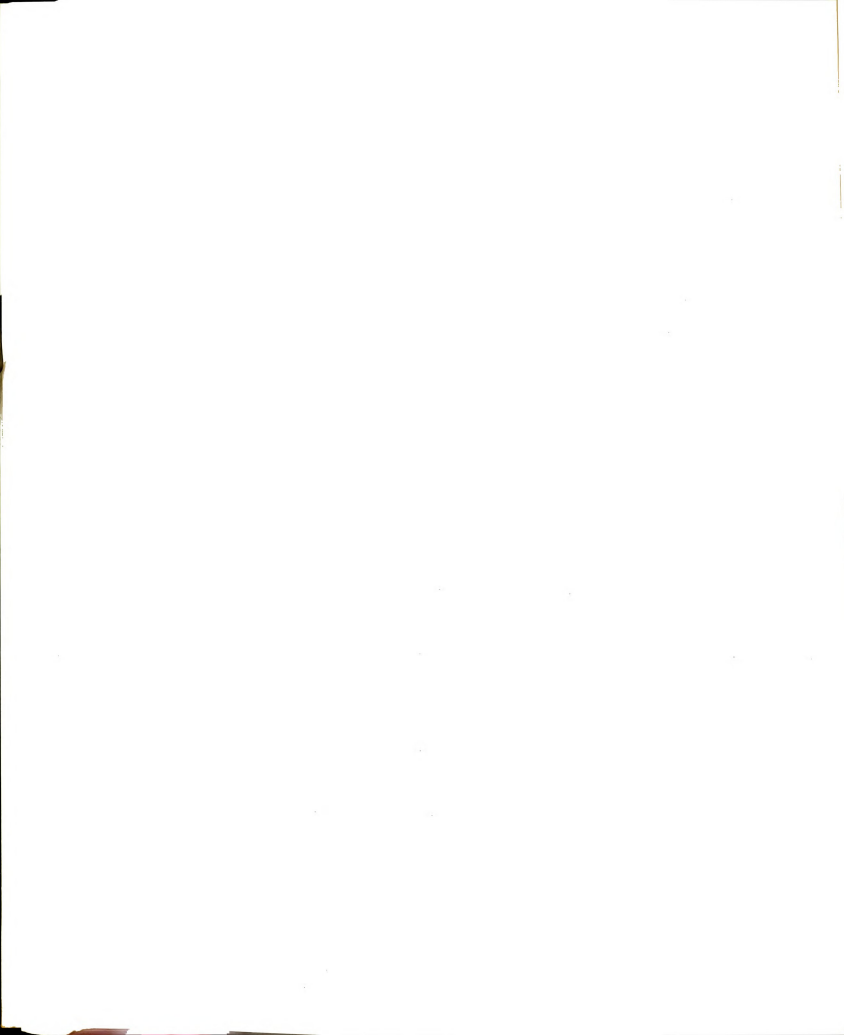


TABLE 21

FREQUENCY OF RESPONSES SHOWING RELATIONSHIP BETWEEN
WEALTH AND ANIMALS SOLD (SHEEP)

Number of Sheep Sold Per Household	Less Wealthy	More Wealthy
1-30	19	5
31-48	8	5
49-85	8	15
86-200	2	17
$N = 79 \quad \chi^2 = 22.61 \quad df = 3 \quad p = 0.05$		

that individuals with large herds would be more likely to cultivate large areas of grain, primarily barley, to feed their animals. This is supported by a significant Spearman correlation coefficient (at $\alpha = .05$) between wealth and amount of land cultivated; 74.4 percent of the wealthy individuals cultivate large areas of grain, mostly barley.

Age. Chi-square and Spearman correlation-coefficient analyses were performed to determine if statistically significant relationships existed between age and the land use-related variables. Two variables were found to be significantly related to age: (1) length of time in agriculture and (2) age of the person who cultivates the land.

In the first part of this chapter it was noted that a large percentage of the respondents have practiced agriculture for more than 15 years. A chi-square test showed a significant relationship between age and length of time in agriculture, indicating that the oldest individuals are more likely to have practiced agriculture for more than 15 years. This is supported by the finding that 96.2 percent of the respondents over 58 years of age have had more than 15 years of agricultural experience.

Since cultivation involves much effort, mainly in the harvesting stage, it was suggested that younger individuals would be more likely to cultivate their own land. This is supported by the finding that 78.9 percent of the individuals under age 43 cultivate their own land (Table 22).

Family Size. To determine if any statistically significant relationships existed between family size and the pastoralists' land-use-related variables, family size was categorized into small, medium, and large units. Associations between the independent variable and the dependent variables were calculated using chi-square and Spearman correlation coefficients. Two variables were found to be significantly related to family size: (1) time to reach grazing and water in the wet season and (2) sending children to school.



TABLE 22

FREQUENCY OF RESPONSES SHOWING RELATIONSHIP BETWEEN
AGE AND WHO CULTIVATES THE LAND

Age Group	Cultivator	
	Head of Household	Other
Youngest (20-43)	15	4
Oldest (58-78)	12	4
N = 45 $\chi^2 = 4.91$ df = 1 p = 0.05		

It was suggested that pastoral families have reduced their spatial movement to take advantage of social services available in small urban centers. This is supported by a significant Spearman correlation coefficient (at $\alpha = 0.05$) between family size and time to reach grazing and water in the wet season; 44.1 percent of the medium-sized families and 60.9 percent of the large ones have reduced their spatial movement to less than five hours. The reduction in movement may be in response to educational opportunities available for the pastoralists' children in these urban centers, mainly in Jardas. This is supported by the finding that 79.4 percent of the medium-sized families and 82.6 percent of the large ones send their children to school in Jardas (Table 23). The figures indicate that large families are



more likely to reduce their spatial movements to send their children to the schools available in Jardas and Kharrubah.

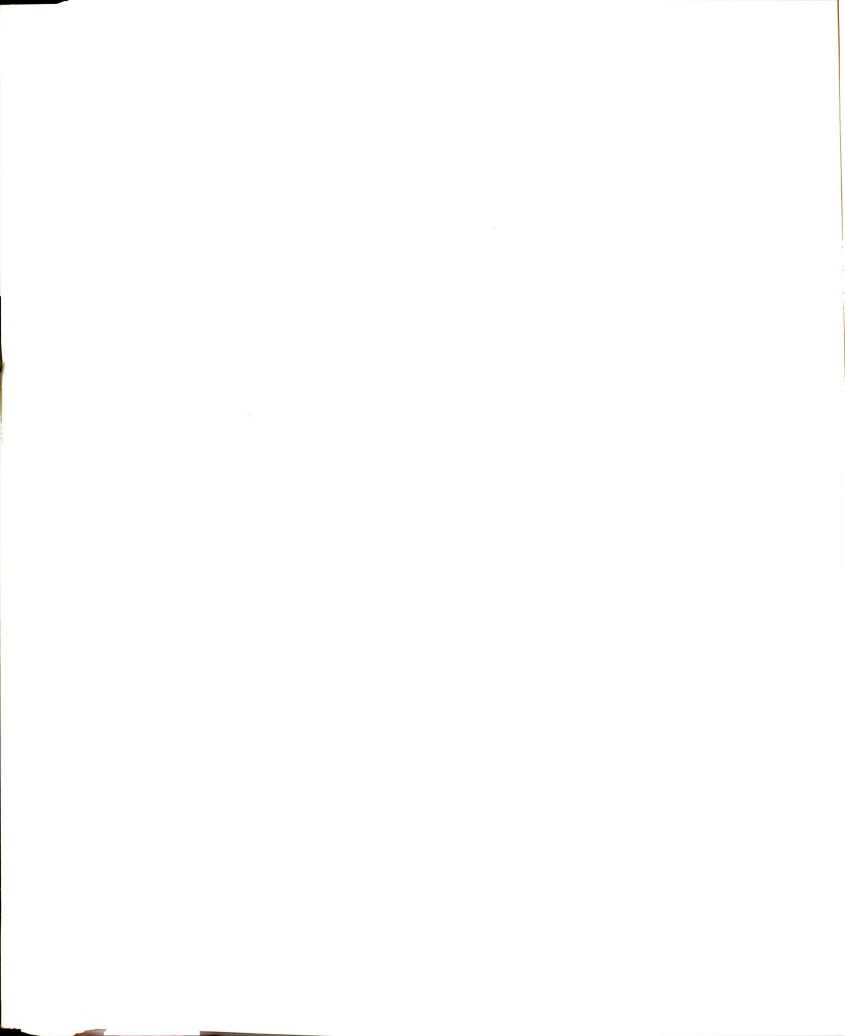
TABLE 23

FREQUENCY OF RESPONSES SHOWING RELATIONSHIP BETWEEN
FAMILY SIZE AND SENDING CHILDREN TO SCHOOL^a

Family Size	Send Children to School	
	No	Yes
0 - 6	14	9
7 - 10	7	27
11 - 15	4	19
N = 80	$\chi^2 = 5.22$	df = 2
		p = 0.05

^a For reasons previously discussed in Chapter I, only about half of the respondents gave the actual ages of their children, and the remainder gave an age range. About 77.5 percent of the boys in all households are of school age, and about 69 percent of the girls in all households are of school age.

Landownership. Associations between the independent variable and dependent variables were calculated using chi-square and Spearman correlation tests. Four variables were found to be significantly related to landowning: (1) length of time in agriculture, (2) cultivation of barley, (3) highest price for animals in Benghazi, and (4) price changes in the last five years.



The chi-square test showed a statistically significant relationship between landownership and length of time in agriculture. Landowners tied to their land are more likely to have been involved in agriculture longer than those who do not own land. This is supported by the finding that 78.7 percent of the landowners have cultivated the land for more than 15 years (Table 24).

TABLE 24

FREQUENCY OF RESPONSES SHOWING RELATIONSHIP BETWEEN
LANDOWNERSHIP AND LENGTH OF TIME IN AGRICULTURE

Landownership	Time in Agriculture	
	Less than 15 years	More than 15 years
Landowner	10	37
Non-owner	12	12
N = 80	$\chi^2 = 6.13$	df = 1
		p = 0.05

It was suggested earlier in this chapter that landowners with larger-than-average herds would be more likely to grow barley as animal feed. This is supported by the finding that 96 percent of the landowners grow barley compared to 70 percent of the nonowners (Table 25).

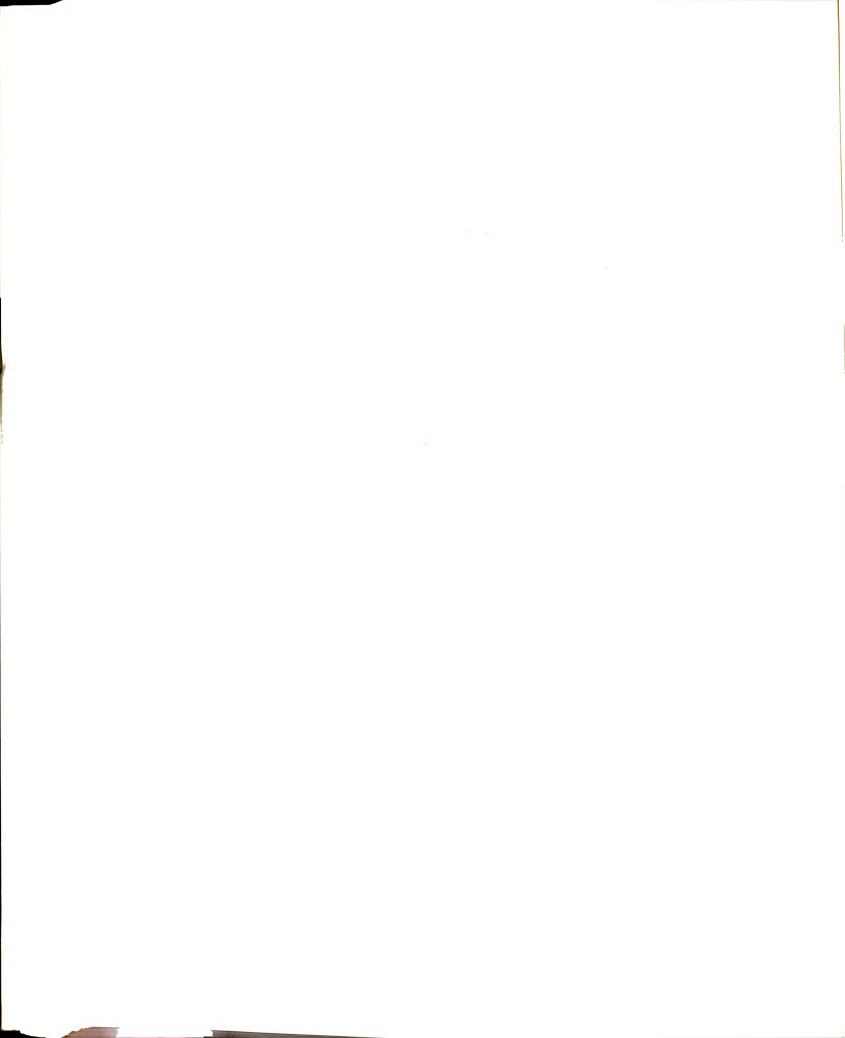


TABLE 25

FREQUENCY OF RESPONSES SHOWING RELATIONSHIP BETWEEN
LANDOWNERSHIP AND GROWING BARLEY

Landownership	Grow Barley		
	Yes	No	
Landowner	45	2	
Non-owner	23	10	
N = 80 $\chi^2 = 10.32$ df = 1 p = 0.05			

Because landowners with large herds might also have broader social contacts, it may be expected that they would be more aware of changing market prices for animals. This is supported by the finding that 80.4 percent of the landowners were aware of changes in animal prices in urban centers such as Benghazi (Table 26). Also, 83 percent of the landowners sell their animals in Benghazi, whereas 69.7 percent of the nonowners usually sell their animals in al-Marj (Table 27).

Summary

Flexibility and diversity best describe the overall strategy of Kharrubah pastoralists in the face of environmental fluctuations and economic opportunities. Their seasonal herd movements and agricultural activities

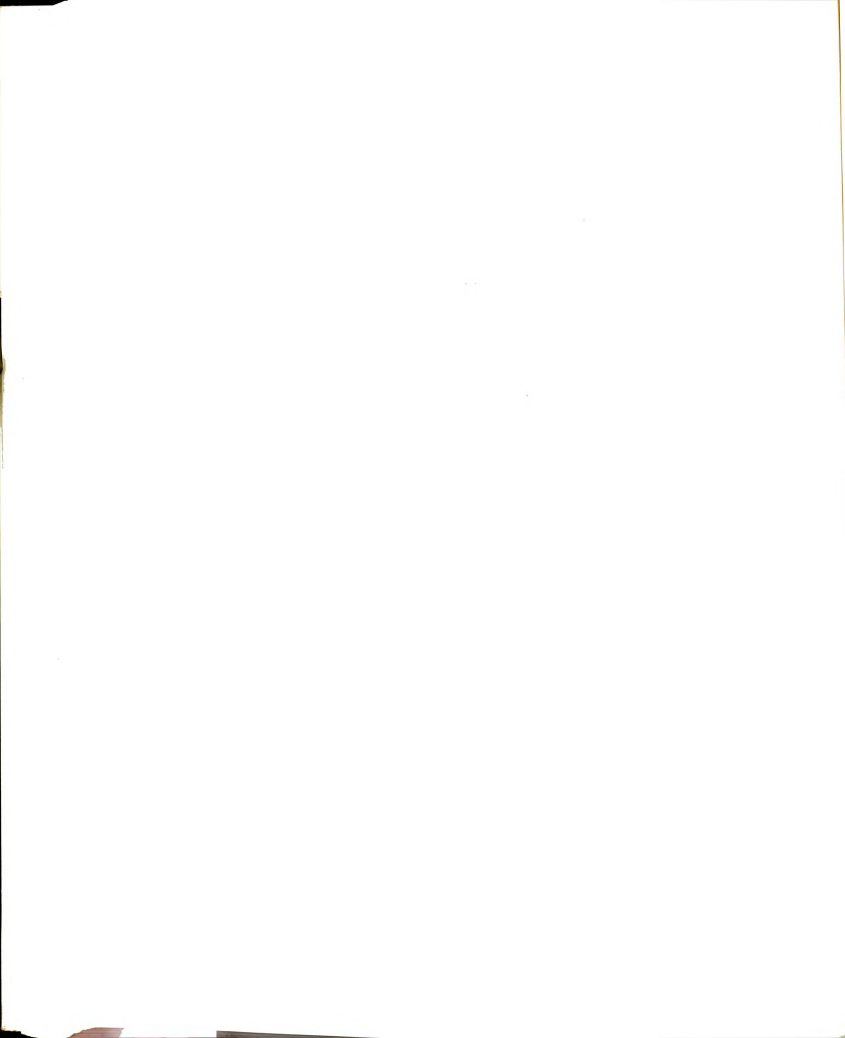


TABLE 26

FREQUENCY OF RESPONSES SHOWING RELATIONSHIP BETWEEN
LANDOWNERSHIP AND AWARENESS OF ANIMAL PRICE CHANGES

Landownership	Aware of Price Change		
	Yes	No	
Landowner	37	9	
Non-owner	19	14	
N = 79 $\chi^2 = 4.87$ df = 1 p = 0.05			

TABLE 27

FREQUENCY OF RESPONSES SHOWING RELATIONSHIP
BETWEEN LANDOWNERSHIP AND KNOWLEDGE OF
HIGHEST PRICES OBTAINED IN BENGHAZI

Landownership	Highest Price Obtained in Benghazi		
	Yes	No	
Landowner	39	8	
Non-owner	21	12	
N = 80 $\chi^2 = 3.87$ df = 1 p = 0.05			

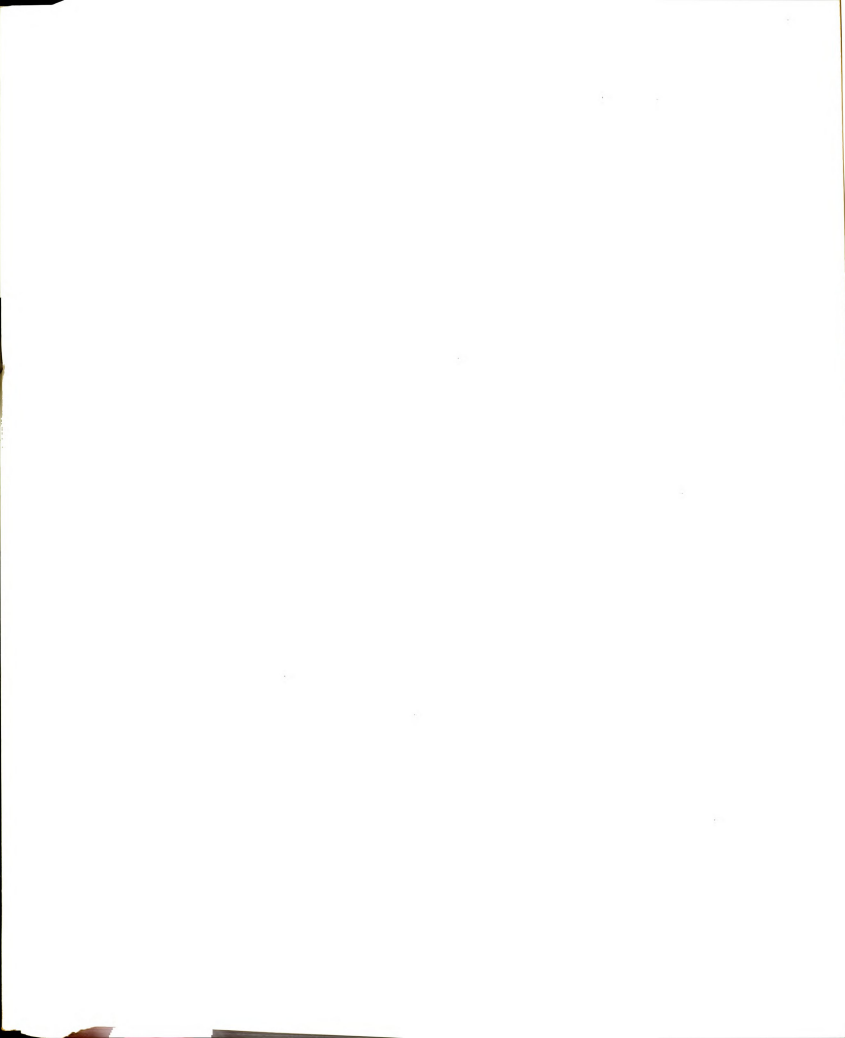
reflect the ability of this society to overcome difficulties. Many new economic opportunities have become available as the petroleum-based economy has grown and the pastoral sector of society has become modernized. Although some aspects of traditional pastoralism still exist, land use patterns in Kharrubah have nonetheless undergone changes in recent years as a result of modernization. The present land use system, which has emerged from the preceding analysis, can be summarized as follows.

The seasonal pattern of movement that traditionally prevailed when all family members moved with the herds has undergone changes. Today, because of increased spontaneous settlement in response to availability of employment opportunities and social services in small urban centers on tribal land, many families, especially large ones, have reduced their mobility to benefit from the social services. Most of the Kharrubah pastoralists now live in modern concrete houses or sheet-metal houses and can be considered partially sedentarized. The creation of many government jobs as a result of the discovery of oil has also transformed the Kharrubah pastoral society; many of the pastoralists, especially the less-wealthy ones, are now employed by the government. As a result, many families hire a shepherd to tend the herds, usually when pasture conditions are good in southern locations of

their tribal land. Wealthier herd owners are especially likely to hire shepherds.

As a result of this centrality, many animals remain in one space too long, more intensively using the grazing and water resources in the area, which has led to a depletion of these supplies. Although there is a lack of hard statistical evidence for this phenomenon, the pastoralists report that they now rely more on purchasing concentrated fodder from agricultural cooperatives and buying water for their animals, indicating the depletion of these resources.

Crop patterns have also undergone changes in recent years. Traditionally, pastoralists cultivated grain for family consumption. Today, barley is cultivated to feed the increasing number of herd animals, and wheat is grown only for household consumption. To provide enough barley to feed their animals, most wealthy pastoralists cultivate large tracts of land. The traditional function of the herds as subsistence capital no longer exists. Now, to exploit the marketing opportunities presented by the high demand and prices for mutton, the size of sheep herds has increased to the point where Kharrubah pastoralists are primarily sheep herders. In the last 20 years, the pastoralists have used a wide diversity of resources within their reach. They have taken advantage of government wages and increased herd sizes, mostly in number of sheep, to exploit marketing opportunities.



CHAPTER V

COMPATIBILITY OF INDIGENOUS AND PROPOSED LAND USES IN THE KHARRUBAH AREA

The existing land use of Kharrubah pastoralists and the proposed government land use were examined in Chapters I and IV. This chapter discusses the compatibility of these two land use systems through an evaluation of elements in the project plan that might reshape the existing pattern of land use and affect the project's performance. The discussion is supported by an analysis of the pastoralists' reactions to most of these elements and what they expect the project to provide them. Statistically significant relationships are reported, where appropriate, based on results of chi-square and Spearman correlation-coefficient analyses. Because the project is still under physical construction and production outputs have yet to be realized, the analysis presented here depends primarily on available data and information obtained from interviews with project administrators and inhabitants of the area, personal contacts, and reports from project headquarters and foreign consulting companies involved in the project.

To understand the context of these land use elements in project planning, the scheme's objectives will be discussed briefly. Objectives for the Kharrubah settlement project are not stated explicitly in the formal plan devised in 1973, which gives only a description of production targets and a timetable for implementation. Project objectives can only be obtained from the description of how much land will be cultivated, how many families will be settled, and the expected production.

To classify the project objectives, the writer asked ten administrators, including the project manager and four supervisors, open-ended questions about project objectives. The responses were classified into eight categories, as shown in Table 28. During interviews with the administrators, it appeared they were not aware of the project objectives. It was obvious that most of the information about objectives and the whole project would have to be obtained from the project manager. In the case of the Kharrubah project, even though the administrators generally reported that the objectives could be achieved simultaneously, misinterpretations can occur because such objectives are ill-defined. Evaluation of project success can often be severely constrained because of poorly defined objectives.

Ambiguous objectives for the Kharrubah project resulted from a lack of study before approving project

plans. Table 29 lists some of the important studies undertaken after plans for the Kharrubah project were approved. If this research had been completed before 1973, the results could have been used to define a set of project objectives.

TABLE 28

KHARRUBAH PROJECT OBJECTIVES AS REPORTED
BY PROJECT ADMINISTRATORS

Objectives	Number of Administrators Reporting the Objective
Settle nomads	10
Use land and water for expanding irrigated agriculture	8
Protect area from desertification due to overgrazing	4
Foster cooperative development	6
Help develop future projects	4
Increase fodder production	5
Prevent livestock raising on irrigated farms	4
Develop the region socioeconomically	6

SOURCE: Researcher's interviews with Kharrubah
project management

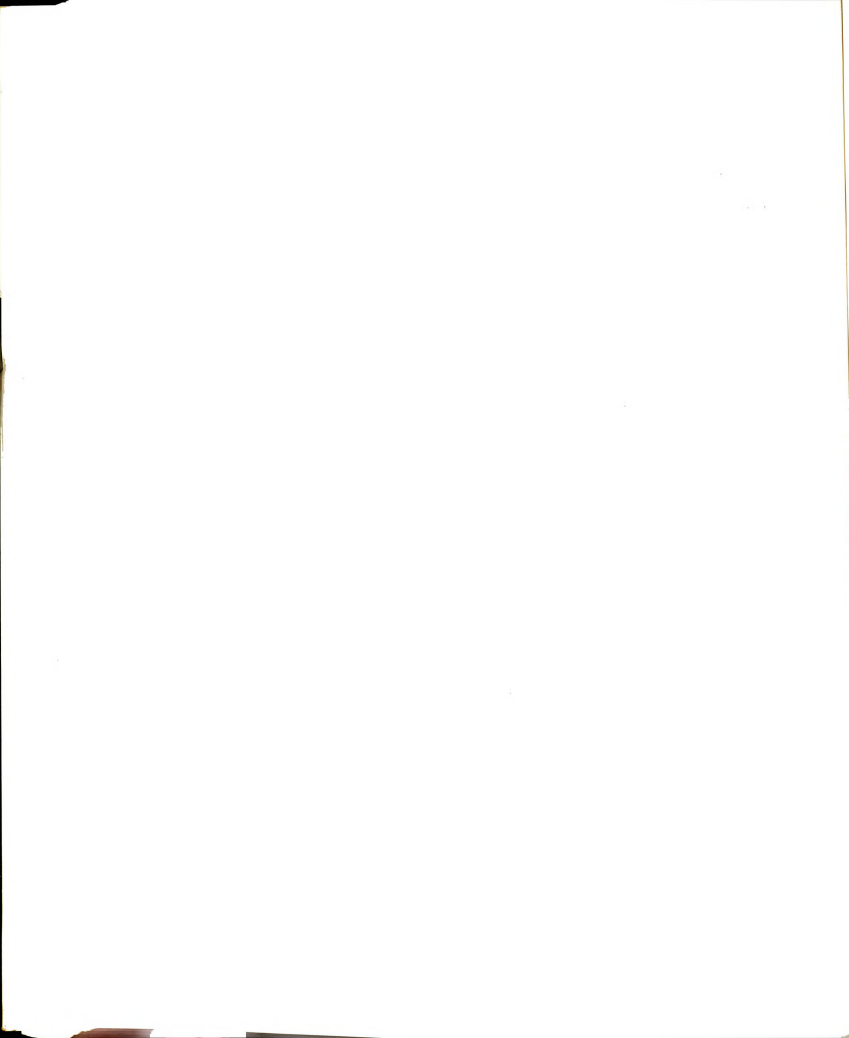


TABLE 29

STUDIES UNDERTAKEN AFTER APPROVAL AND DURING
IMPLEMENTATION OF THE SOUTHERN FLANK
OF THE JABAL AL-AKHDAR PROJECT
(including the Kharrubah project)

Study	Date (Month/Year)
Water resources	December 1975
Crops to be grown on project	January 1980
Study of irrigation network	August 1980
Socioeconomic survey	May 1980
Study of grazing areas	May 1980
Soil survey	August 1980
Study of land surface	July 1981
Land surface mapping	August 1980
Climatology study	May 1980
Report on south Jabal al-Akhdar project (including Kharrubah)	1982

SOURCE: Libyan Arab Republic. Report on Projects of the Southern Flank of the Jabal al-Akhdar. Tripoli: Executive Authority of the Jabal al-Akhdar, 1981, pp. 7-12.

Project Location

One important element in project-plan evaluation is assessing the location selected for the project. In Chapter I the location of the project was examined, and sound intention on the part of the planners was indicated. Questions have been raised, however, about the environmental consequences of the location.

The project is located on a common traditional grazing site recognized by area pastoralists as a potential water and pasture source in both the wet and dry seasons. It is within a reasonable distance from the pastoralists' traditional home area; for example, 25 percent of the respondents can reach the wadi with their animals in less than six hours. Introduction of an irrigation system in the wadi will claim land that has traditionally been part of the Abid tribe's grazing land, thus affecting all Kharrubah pastoralists who are members of that group. More than 80 percent of the respondents belong to the Abid tribe and about 65 percent of these belong to the Yatama subsection, which has traditionally owned most of the wadi and used it for a compatible system of agriculture and grazing.

No statistics are available on the total number of livestock permanently grazing the study area or on the number of animals coming from many outlying areas for temporary periods in both the wet and dry seasons.

However, survey data indicate that pastoralists consider the wadi the most important grazing area, mainly for use in the dry season (see Table 4). In the early stages of project implementation, the wadi remained accessible to the pastoralists' herds during the dry season, from April to June and July. Thus the project provided grass and water at the end of the dry season, which is a critical period in Kharrubah. But since the project administration started dividing the wadi into farms, pastoralists lost their land use rights.

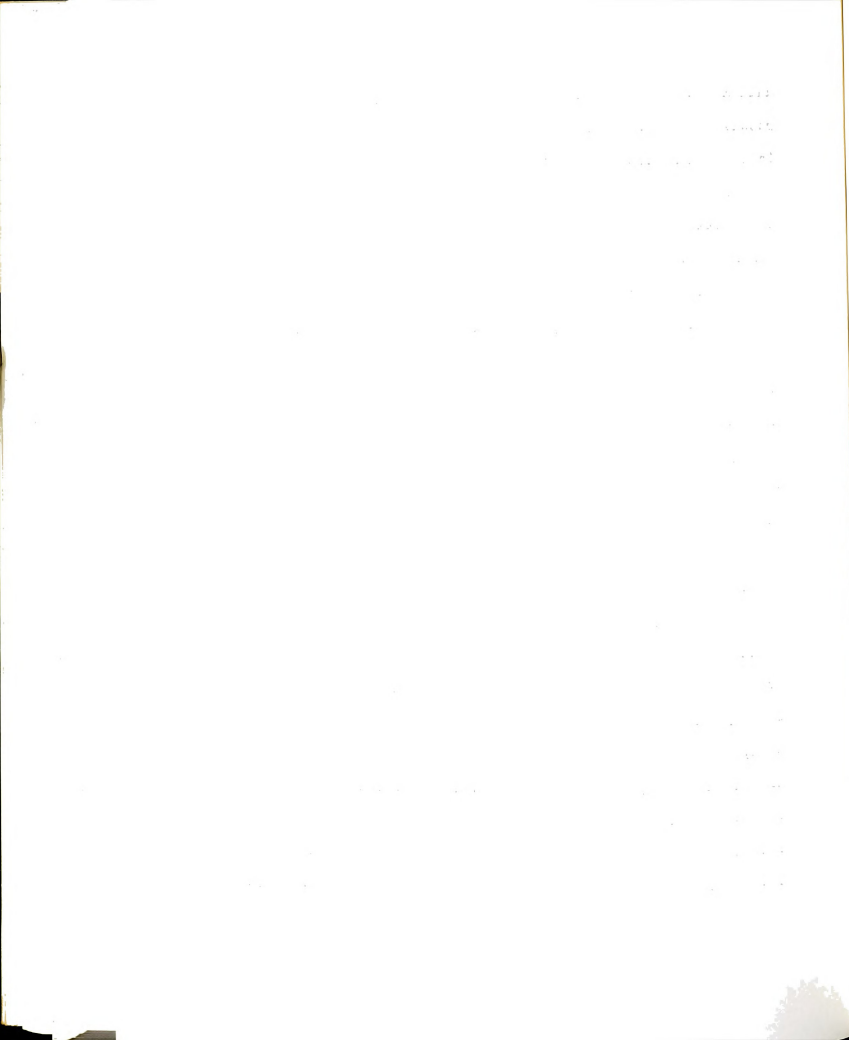
In addition to the loss of pasture, pastoralists have lost extensive space as a result of expanding barley, alfalfa, and maize cultivation in the wadi. This places further severe restrictions on pastoralists' movements and reduces the amount of available grazing.

As a result of this limitation, the pastoralists may have to redirect herd movements to different wadis in the area to compensate for loss of the Kharrubah wadi grazing. Most of the pastoralists stated that, to compensate for the loss of Kharrubah grazing space, they will continue grazing their animals in the region even if they do not receive a farm. This finding is consistent with those from a previous study of the region conducted by the Faculty of Education at Beida (1980), which indicated that 79 percent of the pastoralists will continue grazing their animals in the area and 77 percent will redirect

animal movements to adjacent wadis even if they do not receive a farm. Only 3 percent indicated a willingness to leave the area completely. Thus more animals will be pastured per unit of available land, and additional pressure will be placed on the pasture and water resources of the region.

This redirection of movement could further degrade the rangeland landscape, which is already overused. Two main factors will contribute to this state: an increase in the number of animals maintained by the pastoralists in recent years due to improvements in veterinary services, cisterns, and well-drilling; and an encroachment of government agricultural projects into traditional grazing areas. The growth in the number of animals requires a corresponding increase in grazing area in order to feed them.

Concerning the first factor, no statistics are available on the animal population grazing the study area or on the amount of grazing area available. However, Table 30 illustrates the expansion of the animal population, primarily sheep, in eastern Libya (where the study area is located) for the period 1970 to 1974. Increases in the number of sheep have resulted in grazing pressures that are focused on the particular rainfall zone used by sheep herds, namely the 50 to 200 mm zone (Allan, 1982b).



The amount of pasture space per animal then starts to decline both in quantity and quality.

TABLE 30
ANIMAL POPULATIONS IN EASTERN
LIBYA, 1970 TO 1974

Year	Sheep	Goats	Cattle
1970	540,300	354,100	30,700
1974	703,000	410,000	64,000

SOURCES: Bashir el-Wifati, "Some Socioeconomic Considerations in the Bedouins' Agricultural Settlement (an Example from Libya)" (Ph.D. dissertation, University of Missouri, 1977), p. 46; G. Gintzburger and Mohamed Bayoumi, Survey of the Present Situation and Production of the Libyan Rangelands (Tripoli: Agricultural Research Center, 1977), p. 29.

An examination of the present state of the rangeland in eastern Libya indicates deterioration. Specialists in rangeland management have calculated that the productivity of Libya's rangeland, similar to other Mediterranean areas, is 0.66 Scandinavian feed units per millimeter of rainfall where rainfall ranges from 50 to 200 mm per year. Annual feed requirements for sheep, goats, camels, and cattle were found to be approximately 300, 250, 2,000, and 1,500 feed units per year,

respectively (Gintzbürger and Bayoumi, 1977; LeHouéron and Hoste, 1976). On this basis, Gintzbürger and Baymoui found that the available grazing area in eastern Libya, with an annual rainfall in the range of 50 to 600 mm, is 4,810,000 hectares; they considered about 341,000 hectares to be good for agricultural use and the remainder for forests and rangeland. The estimated forage production is 358 million feed units per year, but the approximate yearly feed requirements for sheep, goats, camels, and cattle total 471 million units (Table 31), illustrating the overstocking that occurs in eastern Libya. The present situation is potentially serious, given that the estimated feed intake of animals on grazing land is about 2.3 times what it might be with improved management (Gintzbürger & Bayoumi, 1977).

The second factor related to overuse of the rangeland is the area's potential for arable agriculture, such as government cereal projects, and the use of tractors and disc plows, which has sometimes contributed to rangeland deterioration. Table 32 illustrates the expansion of some government agricultural projects in this area, which has always been considered only marginally suitable for dry land cultivation because of the scarcity and irregularity of rainfall. As Allan (1982b) wrote

By definition dry land farming is hazardous and especially in Libya when rainfed agriculture has to be carried on in an area which is everywhere marginal in some or all years through annual rain being lower than 200 mm. (p. 107)

TABLE 31

LIVESTOCK NUMBERS AND FEED REQUIREMENTS
IN EASTERN LIBYA, 1974

Animal	Number of Animals	Feed Requirement/ Year/Animal (FU/year)	Yearly Feed Requirement/Animal (FU/year)
Sheep	703,000	300	211,000,000
Goats	410,000	250	103,000,000
Camels	30,000	2000	61,000,000
Cattle	64,000	1500	96,000,000

SOURCE: G. Gintzbürger and Mohamed Bayoumi, Survey of the Present Situation and Production of the Libyan Rangelands (Tripoli: Agricultural Research Center, 1977), p.29

Although the actual amount of land lost to irrigated agricultural use is only a small fraction of the total grazing acreage, the loss is not insignificant.

Johnson (1977) noted that this area

plays such a critical role in the stability of the local land use system that its diversion to other (and when defined in a narrow sense, admittedly more profitable) uses can have a disrupting impact on a substantial part of the population. (p. 30)

The land resources of the region are thus subject to two competing pressures. One is the growing number of animals and their need for larger grazing areas. The second is the spatial expansion of government agricultural projects, which has limited herd movements and

TABLE 32

IRRIGATED FODDER CROP AND DRY FARMING PROJECT AREAS
IN THE SOUTHERN FLANK OF THE JABAL AL-AKHDAR

Project Name	Rainfall Zone	Total Area (Ha.)/Project	Number of Farms
Kharrubah		1200	60
Qlulud		300	15
W. al-Makili	50-200	840	42
al-Makili		1400	70
al-Azzyat		1000	50
Samalus		440	22
Ghot el-Sultan		4200	117
Wadi el-Bab		1000	150

Compiled by the writer from the following sources:

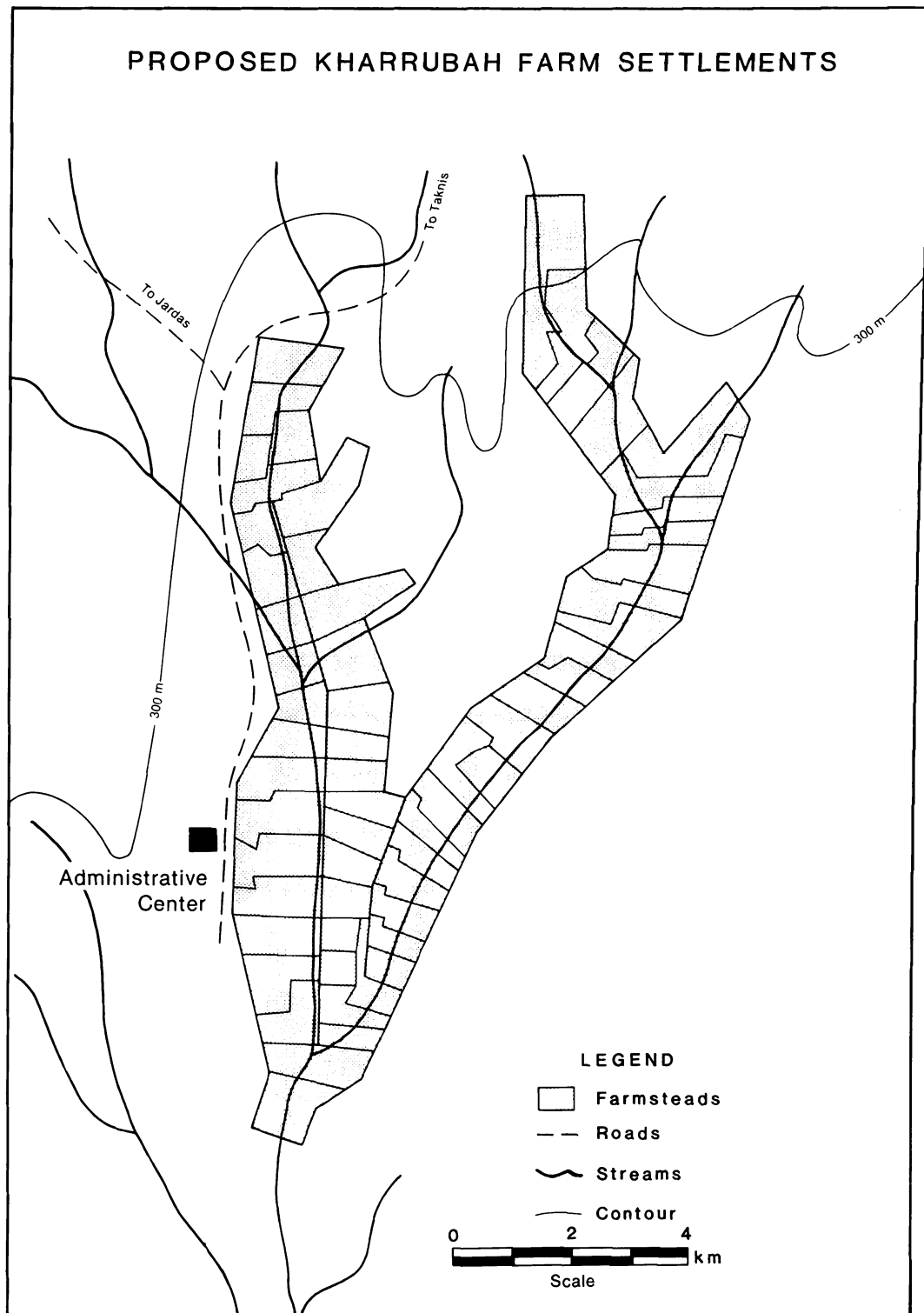
- 1 - Economic Analysis of the Jabal al-Akhdar Project, Prepared by Lotti & Associates (Tripoli: Executive Authority of Jabal al-Akhdar, 1982), p.6. (In Arabic)
- 2 - Libyan Arab Republic, Harvests in All Seasons in Jabal al-Akhdar (Tripoli: Executive Authority of Jabal al-Akhdar, 1978), pp.117-120.

denied pastoralists access to traditional grazing areas. Sixty-nine percent of the respondents stated that the existence of agricultural projects in the region has limited their herd movements and that both of the pressures mentioned above have hastened rangeland deterioration.

Farm Size

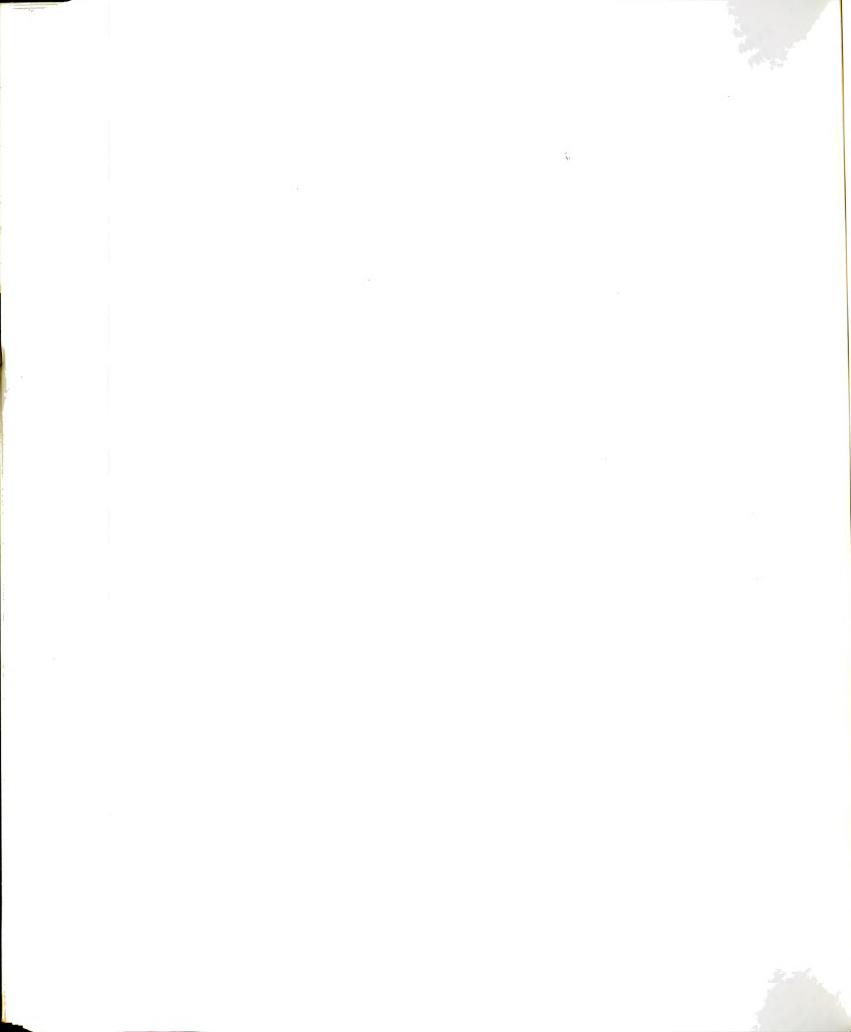
A second measure defined in the plan that might have implications for the existing land use pattern is the size of plots planned for the project. The scheme has been planned for 60 families, each receiving a 20-hectare farm (Figure 6). In proposing this plot size, project planners assumed the average household size is 6.91 persons. The settler-selection procedure favors large families, but gives each family, regardless of size, equal use of available land resources through equal farm sizes. According to the survey, the pastoralists' household sizes range from 1 to 15 persons (see Table 17).

Variations in family size and composition suggest that households have dissimilar amounts of available labor and thus different potential incomes from farming activities. Since the economic needs of a family may vary depending on family size, a fixed farm size may eventually force some householders to take jobs off the project, an action inconsistent with project objectives. The proposed fixed size might affect pastoralists' willingness to settle, as indicated by the finding that 57.5 percent of the respondents wanted a farm larger than 20 hectares and 87.5 percent of the respondents believed that the farm size provided by the project would be too small to support them and their families.



Source: Executive Authority of Jabal al-Akhdar

Figure 6



Furthermore, the amount of rainfed and irrigated plots provided by the project without the provision of raising animals, as indicated in the plan, might not be viable. Sixty-nine percent of the interviewees currently cultivate more than the amount of land allocated by the government for rainfed cultivation (see Table 11), and 51.3 percent stated that the irrigated plots provided by the project are not large enough.

It might also be argued that the amount of land under rainfed cultivation and sprinkler irrigation will not be sufficient to support long-term agricultural activity if the future beneficiaries are expected to rely entirely on farming in a marginal area with an average annual rainfall that is less than 200 mm and subject to large inter- and intra-year variations. In fact, 80 percent of the administrators ranked drought as a major environmental constraint that might be encountered in the project, and 60 percent ranked unreliable rainfall as the second most serious environmental problem (Table 33).

The unreliability of rainfall is apparent in meteorological data from Kharrubah for the wettest month of the year, December. Rainfall during December varied in recent years from 17 to 39 mm, while the annual average ranged from 69 to 94 mm (Table 34). Given the unreliable rainfall, it is possible there will be insufficient water for irrigation purposes in the long

TABLE 33

SERIOUSNESS OF ENVIRONMENTAL CONSTRAINTS
AS RATED BY PROJECT ADMINISTRATORS

Constraint	Rating (1 = most serious)				
	1	2	3	4	5
Drought	8	1	1	-	-
Unreliable rainfall	2	6	2	-	-
Soil erosion	-	2	4	1	-
Poor soils	-	1	1	2	-
Gibli winds	-	-	-	-	1

SOURCE: calculated by author

run. Data on water availability provided by the Arlab Company (Table 35) indicate a deficiency of water in the peak period of the irrigation calendar (March through May). Aware of these environmental constraints, most of the administrators considered the project's land use to be realistic and felt that the scheme can be self-supporting over a long period of time by providing loans to settlers in years of hardship.

The issue of farm size leads to the related social concern of farm ownership and land tenure arrangements on the project. Traditionally, consolidation of the land was manifested in open grazing areas. The land tenure system allowed free access to anyone wanting to use these

TABLE 34

RAINFALL AMOUNTS FOR THE KHARRUBAH STATION
(mm/year)

Year	December Rainfall	Year Total
1974-1975	39	94
1978-1979	31	89
1979-1980	17	69

SOURCE: Lotti and Associates, Topographical Survey, Soil Survey, Irrigation Network Design, al-Kharrubah Area (Rome, 1981), p. 11

TABLE 35

FARM IRRIGATION REQUIREMENTS AND WATER
AVAILABILITY FOR THE KHARRUBAH AREA

Month	Irrigation Requirement m^3/farm	Availability m^3/farm	Deficit m^3/farm
March	22,076	15,187	6,889
April	23,863	14,697	9,166
May	17,494	15,187	2,307

SOURCE: After Lotti and Associates, Topographical Survey, Soil Survey, Irrigation Network Design, al-Kharrubah Area (Rome, 1981), p. 26

areas regardless of his watan or lineage. In the Kharrubah project, the land is owned by the state according to Law No. 142 of 1970. Under that law, as el-Wifati (1977) noted,

all land that had not been previously registered as private land legally became part of the public domain. This step was meant to serve as an intermediate stage toward private ownership of that land. (p. 42)

Although the state officially owned the land, traditional use belonged to the Abid tribe, mainly the Yatama section. A settler on the Kharrubah project will secure a 15-year mortgage directly from the government, according to Law No. 123 of 1970, that will start the day he receives the farm. Income from farm production is expected to provide the first mortgage payment, and the settler will acquire legal ownership of the land and buildings when the mortgage is paid off. The government subsidizes this land tenure arrangement by providing the mortgages interest-free.

In the early stages of development, there should be no major problems with the land tenure system because it will take 15 years for the farmers to become legal owners. After that, the question of Islamic inheritance law undoubtedly will arise. McLachlan (1960) wrote,

In Moslem law a personal estate, however small, can be left to any number of people. The general rule is that brothers and sisters share the father's property in the ratio of two to one, provided that the father has left a will leaving it to the inner family. Rarely is an estate left to one beneficiary. If a man dies intestate his property is divided between

all relatives having a claim upon it. Thus, the tendency in any Moslem country is towards the division of private estate with resulting fragmentation of agricultural land. (p. 74)

There seems to be no immediate solution to this problem. Even Law No. 123 of 1970, which concerns the distribution of developed agricultural land owned by the government, did not provide an ultimate solution. For example, Section 7, Articles 29 and 30, stated that if the owner of the farm died his heirs should select one of them to run the farm. If the chosen person is not from the owner's family or the heirs cannot agree on someone, the government has the right to choose one of his heirs, who should be an adult practicing agriculture, to run the farm and represent the heirs, or to have the agricultural cooperative run the farm. This demonstrates the social disruption caused by an altered land tenure structure, that might lead to future fragmentation of the land.

Irrigated Farming

Another condition included in the project plan that might not be compatible with traditional land use is the sprinkler system of irrigation on 8.55 hectares of land in each farm. Irrigation of small plots may improve the pastoralists' standard of living and reduce the risks of an uncertain environment that are everpresent in their lives. However, since most of the pastoralists are

unfamiliar with irrigated farming, it may take some time for them to become accustomed to an irrigation system.

Introducing an irrigation system in this semi-arid area may also produce long-term environmental effects, such as an accumulation of salts in the soil. For example, a chemical analysis provided by the Arlab Company and the Ministry of Water and Dams of well water from the aquifer indicated a high rate of salinity in most of the wells. Allan (1982b) commented,

Availability of the groundwater to the south of the Jabal al-Akhdar is further limited by the proximity of the salinised reservoir to the south. Groundwater quality is also seriously degraded by the evaporitic sediments into which the groundwater must flow and that lie 30 or more kilometers south of the crestline [of the Jabal al-Akhdar]. (pp. 39-40)

Large quantities of water must therefore pass through the irrigation system to leach these salts from the soil, a consideration present in the project plan according to the study by Lotti and Associates (1981).

Choice of Crops

The types of crops to be cultivated and the accompanying crop rotation system are other important elements defined by the project plan that might be incompatible with existing land use. The expected settler will exercise no role in deciding which crops to grow on his farm, where on the farm the crops are to be grown, how they are to be rotated, or the number of working days. All of

these factors, as indicated by the survey, will be determined by the project management.

The plan has specified that fodder crops be cultivated, primarily barley, alfalfa and maize (Table 36). This requirement may be inconsistent with pastoralists' expectations about how they will use the land after settlement, as many expect to be able to grow cereals and vegetables for subsistence and/or cash income. Eighty-two percent of the respondents stated that after settlement they expect to grow cereals to earn money; 28.8 percent expect to grow vegetables for cash.

Under permanent irrigation, the plan has specified 40 percent of the land for alfalfa, 40 percent for barley, and 20 percent for maize. Under rainfed cultivation, the plan has allocated 60 percent of the land for barley and 40 percent for fodder. These crops are considered the most rational approaches to land use in arid and semi-arid areas, and their choice indicates the project planners' sound intentions. Gintzburger and Bayoumi (1977) enumerated the advantages of these crops:

Barley is drought-resistant and can tolerate saline irrigation water and salty soils. Barley crops can also produce two or three cuts of green fodder or hay in addition to grain, and dry matter yields of 3000 kg from forage and 1000 kg from grain can be obtained yearly per hectare. Alfalfa can produce six to eight cuts per year, or about 8000 kg, and contributes to better soil fertility and structure. The cultivation of maize as a fodder crop produces considerable quantities of dry matter in the summer. The drawback to these three fodder crops is that they become lignified quickly and lose their appeal to young animals being fattened. All of these drawbacks can easily be

TABLE 36

CROP DISTRIBUTION FOR THE WADI AL-KHARRUBAH PROJECT

Crop	Hectares/Farm	Percentage
Irrigated Crops		
Alfalfa	3.42	40 %
Barley	3.42	40
Maize	1.71	20
Total	<u>8.55</u>	<u>100</u>
Rainfed Crops		
Barley	6.87	60
Fodder	4.58	40
Total	<u>11.45</u>	<u>100</u>

SOURCE: Libyan Arab Republic, Economic Analysis of the
Jabal al-Akhdar Project, Prepared by Lotti and
Associates (in Arabic)(Tripoli: Executive
Authority of Jabal al-Akhdar, 1982), p. 6.

forestalled by a careful control of the cutting period. The green product can then be dried and then either fed to the animals or stored as hay. (pp. 42-43)

In addition to the agronomic advantages these crops offer, their cultivation brings economic benefits to the people of the region, as reflected in the project objectives (Table 28). Because these three crops are cultivated to provide feed when pasture is inadequate, the local economy is usually upgraded rather than disrupted as a result.

However, the survey showed that pastoralists have traditionally cultivated cereals, with emphasis on barley. For example, 85 percent of the respondents, mainly landowners, grow barley. Furthermore, a significant relationship existed between land ownership and cultivation of barley, with 95.7 percent of the landowners growing barley. Thus, including barley cultivation in the pattern of land use may benefit the landowners in the population. This view is supported by the fact that 91.5 percent of the landowners said they plan to grow cereal crops when they settle, compared to only 69.7 percent of the nonlandowners.

Wheat has been cultivated by 58.7 percent of the respondents but is not included in the project plans. A possible explanation for this decision is that previous experiences with projects growing wheat within the 200 mm

isohyet have been unsuccessful, as, for example, on the Gefara wheat project in western Libya. As Allan (1982b) noted,

the use of low rainfall marginal tracts of the Gefara Plain for grain production was not only unsuccessful, it was also costly in that it impaired the semi-natural grazing resources upon that the livestock population of the area depended. (p. 208)

According to the survey, pastoralists of the area are not familiar with cultivating alfalfa, maize, and fodder crops. The extent to which these crops can be incorporated into the agricultural activities of the pastoralists is unknown.

Another aspect of crop selection is the rotation system accompanying the crops. The survey showed that 86.2 percent of the pastoralists are unfamiliar with rotation systems and the rest have only limited experience. The pastoralists might be unprepared to confine themselves to a rotation technique because of the great effort involved in cultivating three crops on a rotating basis and the problems that might arise with each of the crops in the rotation.

According to the administrators, as soon as farms have been distributed to settlers meeting the specific criteria stated in Law 123 of 1970, an intensive program will be initiated to train them in the local rotation of alfalfa, barley, and maize for the first year of production. They will also be taught to operate and maintain

agricultural machinery. In addition, a number of capital-investment items will be provided by the project and agricultural cooperatives, as shown in Table 37. This table illustrates that production and marketing decision making lies with the project management and agricultural cooperatives. The role of the settler in farm management is limited because of his pastoral origin and lack of training in settled agriculture. However, new settlers do vary in terms of farming ability and agricultural background and experience. The survey, for example, indicated that older individuals and landowners have had more experience in agriculture than younger and landless individuals.

Livestock Disposal

The most critical element in the project plan, which may disrupt the existing economic system described in Chapter IV and prove to be inconsistent with settlers' expectations, is disposal of the prospective settlers' livestock. The respondents indicated they hope to raise animals, primarily sheep, after settlement. When asked about the importance of raising animals in deciding to settle, 90 percent mentioned raising sheep, 38.7 percent goats, and 28.8 percent camels. Some 65 percent of the respondents also indicated a desire for farms with more than 50 hectares of pasture available for grazing, and

TABLE 37

PROVISION OF CAPITAL INVESTMENT ITEMS FOR
SETTLERS ON THE WADI AL-KHARRUBAH PROJECT
(Number of Project Administrators Responding)

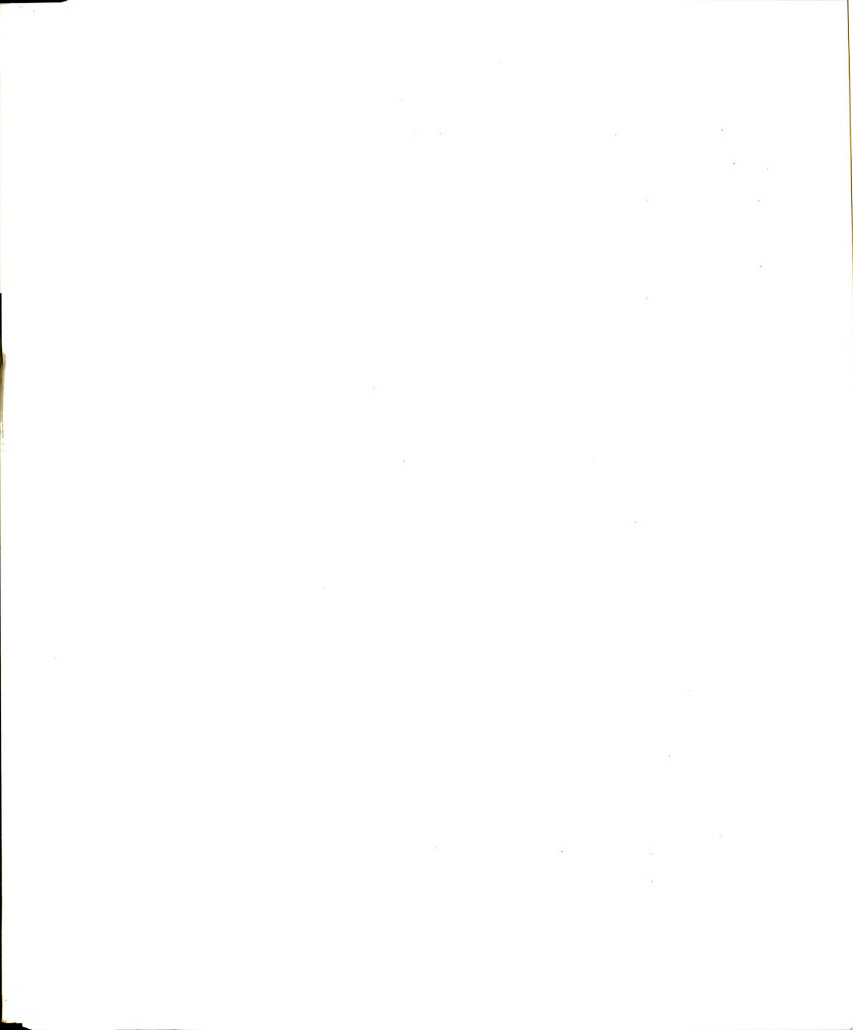
Item	Sold by Project w/credit	Given by Project	Obtained through Cooperative	Obtained Individually
Tractors	2	2	4	-
Harvesters	2	-	4	-
Plows	2	2	4	-
Fertilizer	2	-	6	-
Seeds	2	1	5	-
Pesticides	2	1	5	-
Produce				
Transport	-	-	6	1
Crop				
Storage	-	3	3	1
Input				
Storage	-	4	3	1

SOURCE: tabulated by author from project management
interview

78.7 percent said they would herd animals on the farm to raise money. This was true for landowners, as reinforced by the significant relationship between landownership and the expectation of herding on the farm; 91.5 percent of the landowners, compared to 60.6 percent of the non-owners, stated they would herd animals on the farm. This relationship was expected because landowners generally have larger-than-average herds.

Provision of water points and availability of grazing areas were also important considerations in pastoralists' expectations of what the project would furnish. Ninety-two percent mentioned the proximity of water points as an important element in deciding to settle, and 67 percent mentioned the importance of having nearby grazing areas.

As discussed in Chapter I, the official policy of the project authority on the issue of settlers owning livestock has fluctuated. In the project's early stages, the government decided to allow each settler to own a small number of animals (20 to 40 head), but this policy was later changed to a prohibition of animal ownership. The government's justification for this policy as stated by the administrators can be summarized in two points. First, as reflected in the project objectives (see Table 28), there is the desire to alleviate overgrazing pressures on the rangeland resulting from increased numbers of animals. The second justification is that previous experiences with allowing livestock on settlement projects engendered problems. For example, at the al-Marj project the farmers (originally from tribal backgrounds) tended to accumulate more animals than the number recommended by official policy, resulting in crop damage by the settlers' animals (Libyan Arab Republic, 1972).



The survey showed that the average herd size for a household was 232 head of sheep, goats, cattle and camels, that serves as a form of capital to insure against an unpredictable environment and meet social needs and economic opportunities, as discussed in Chapter IV. The survey also indicated that most of the pastoralists' monetary income is derived from selling animals. The government's decision to prohibit livestock on the farm will thus affect this income.

The effect of the prohibition can be seen if net income possible from cultivation is compared to returns from raising livestock. As detailed in Chapter I, the project plan estimates that the net annual income from cultivating crops will be \$28,570 (Table 38). An average-sized sheep flock of 167 head should produce an annual income of about \$9,500 (by selling 64 sheep), an average goat herd of 46 head should generate \$1,930 annually (by selling 19 head), and an average camel herd of 16 head should generate \$830 annually (by selling one camel). Thus, a total annual income of \$12,260 would not be negligible compared to the income possible from agricultural activity on the project, taking into account possible market fluctuations and partial crop failures.

Income from livestock sales could be attractive enough to prospective settlers that they would not want to completely relinquish their linkages with pastoralism.

TABLE 38

EXPECTED INCOME FOR KHARRUBAH SETTLERS

Type of Agriculture	Income
Irrigated	\$ 27,622
Rainfed	<u>14,701</u>
	42,323
Cost of Irrigation & Drainage	-13,753
Net Income	\$ 28,570

SOURCE: Libyan Arab Republic, Economic Analysis of the Jabal al-Akhdar Project, Prepared by Lotti and Associates (in Arabic) (Tripoli: Executive Authority of Jabal al-Akhdar, 1982), p. 6.

The strength of these ties is illustrated by the finding that 68.8 percent of the respondents expressed a willingness to give up 25 percent of their herds in order to settle, but they do not expect to dispose of their entire herds. Sixteen percent said they were not willing to sell even 25 percent of their herds so as to settle. Only 21 percent of the respondents (who owned an average of fewer than 100 sheep and 50 goats) were willing to dispose of all of their herds in order to settle. These figures are consistent with findings of a 1980 study of the region by the Faculty of Education at Beida--that only 12.7 percent of the pastoralists were willing to dispose of all of their animals in order to settle.

However, the pastoralists desire to settle as farmers because thereby they can readily obtain a house and a parcel of land. About 84 percent of the respondents indicated a desire to settle. Also, pastoralists perceive the project as a means of alleviating the problems they face in herding animals, including lack of water, grazing and drought; 80 percent of the respondents believed the project would help remedy these problems.

The desire to continue practicing pastoralism might be especially strong for those wealthy individuals who own a sheep flock of 235 head, sell an average of 87 sheep each year, own a goat herd averaging 61 head, and sell an average of 24 goats each year for an annual income of \$15,580. Wealthy individuals might be less willing than the less-wealthy to sell their animals in order to settle. This view is supported by the finding that 80.6 percent of the less-wealthy respondents, compared to only 22 percent of the wealthy ones, were willing to sell 25 percent of their livestock in order to settle.

Conclusions

In Chapters I and IV, proposed government land use for the Kharrubah area and the indigenous land use pattern were described. In this chapter the writer discussed the compatibility of several elements of both

land use systems, including project location, farm size, irrigation system, types of crops to be cultivated, and livestock disposal.

The Wadi al-Kharrubah was selected for this project because of the presence of ground water, soil suitable for cultivation, and seasonal flooding, as well as its proximity to several urban centers. However, possible long-term environmental effects of this location have not been considered. A discussion of environmental problems in the first part of this chapter suggested that environmental damage may occur given the project's location.

One major ecological disruption that might result from project establishment is further rangeland deterioration. The location of the project on traditional grazing areas may reduce the ability of pastoralists' grazing land to support their herds. Pastoralists might be forced to depend on less-productive pastures as the government's agricultural projects expand southward and shrink the rangeland landscape. This might intensify grazing pressures, which may contribute to further rangeland deterioration in eastern Libya.

A farm size of 20 hectares has been selected for each of 60 families, and the project authority has specified that fodder crops, primarily barley, alfalfa, and maize, be cultivated. Because family sizes vary, the

fixed farm size may force some householders to seek jobs off the project to meet family needs.

Traditional land use was based on a consolidation of the land, with grazing areas freely accessible to all pastoralists. The change in type of land tenure, with settlers having title to the farms, could disrupt the traditional social system and lead to fragmentation of tribal lands through changes in inheritance laws.

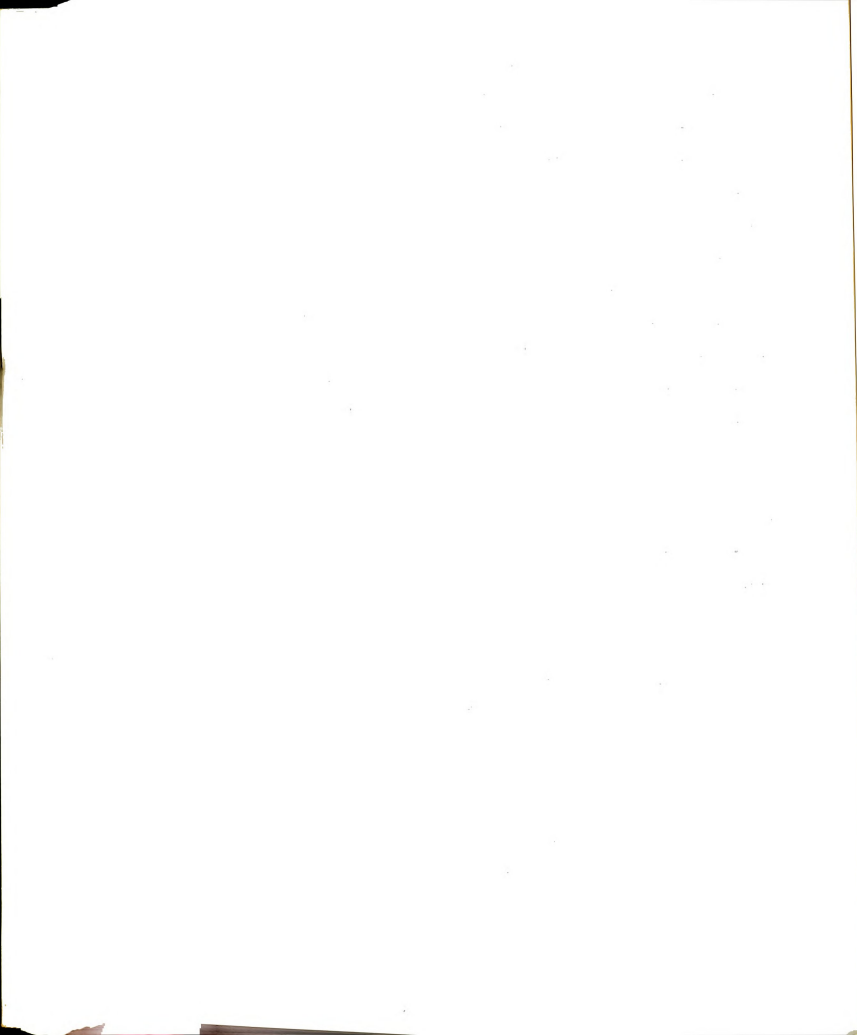
The types of crops to be grown on the project are considered to be agronomically advantageous for semi-arid regions, although pastoralists of the area have traditionally cultivated cereal crops and indicated they expect to continue this practice after settlement. However, project administrators have indicated that the settlers will have no role in selecting crops, where the crops will be grown, or the method of crop rotation employed. In addition, it was suggested that the amount of land under rainfed cultivation and sprinkler irrigation may still be insufficient to support long-term agricultural activity, given the marginal rainfall and high soil salinity.

The project will also have to train the pastoralists in crop rotation methods and irrigation techniques, as these agricultural practices are largely unknown in the pastoral society of this area. Much time and effort may need to be invested in such training because the

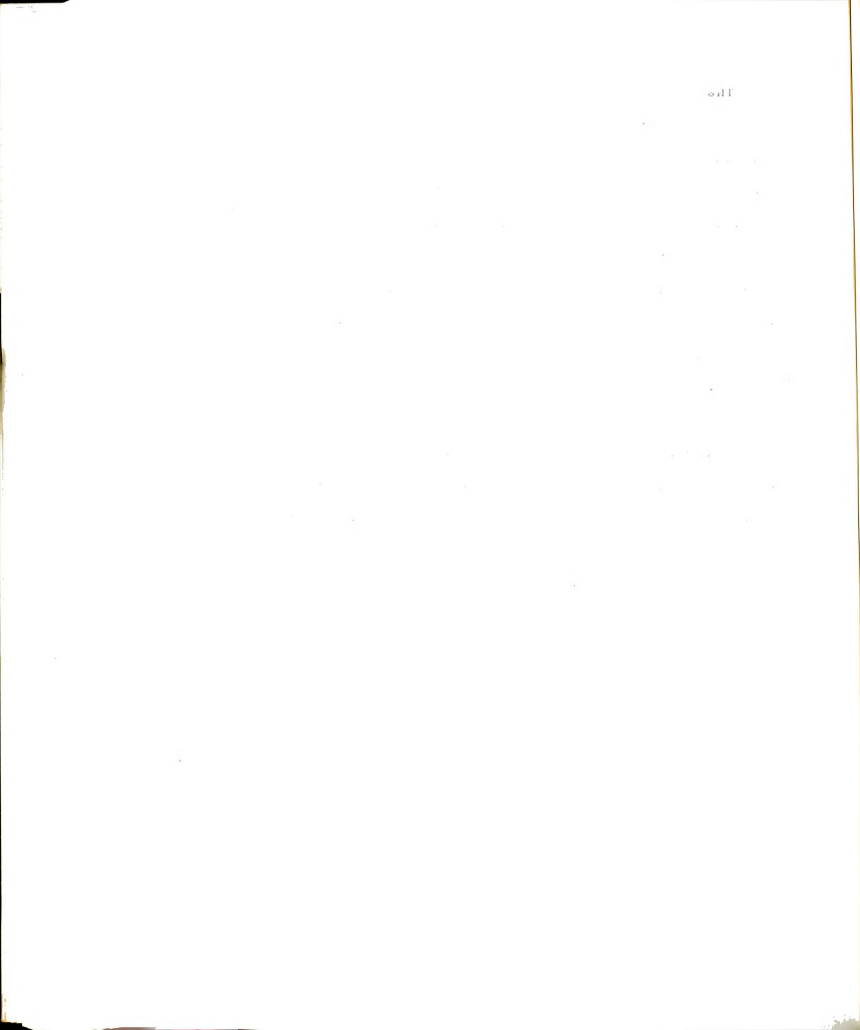
level of education among the population is low (84 per-cent have no formal education). Many of the pastoralists were born in the early 1930s, when Libya was still under Italian occupation. During this occupation, the indigenous population was not allowed to receive an education.

The most important incompatibility between the two land use systems is disruption of the economic system by disposing of the settlers' livestock under the government plan. From the government's viewpoint, pressures on grazing areas must be reduced to prevent rangeland deterioration, and disposing of the settlers' livestock is seen as one means to accomplish this. Most of the prospective settlers, however, indicated that they expect to raise animals on the project for sale to urban markets. The loss of this income, that could average about \$12,000 and is not insignificant compared to agricultural income, may force some families to seek jobs off the project or to keep animals on their traditional land. In fact, 41.3 percent of the respondents stated they would keep a second home on their traditional land in order to leave their herds and settle.

Related to these expectations for raising animals are the prospective settlers' desires for large areas on which to cultivate grains (mostly barley) for animal feed and for large pasture areas. The project, however, will only provide farms of 20 hectares each, with no provision for grazing areas.



The possible result of such incompatibilities between the government's proposed land use changes and the existing land use as identified by the survey may be a diversification of the pastoralists' activities by combining agriculture with pastoralism. Since livestock are the area's primary economic resource, potential settlers would tend to keep a sizable herd on traditional land as a precaution against an uncertain environment and as a means to exploit the high demand for mutton in urban markets. The absence of wheat cultivation in the proposed land use could also lead the pastoralists to cultivate this crop on traditional land. The survey further indicated that because rainfall is unreliable and water available for irrigation may be insufficient, cultivation may be abandoned for other economic alternatives such as government employment.



CHAPTER VI

SUMMARY AND CONCLUSIONS

In an attempt to explain the compatibility between the existing land use of Kharrubah pastoralists and the government's proposed land use, and the potential disruptions produced by the proposed land use on both the environment and socioeconomic characteristics of the Kharrubah area, it was necessary to analyze both systems. The discussion clarified what is compatible and incompatible between the two systems and examined the project's possible effect on the Kharrubah society. The main points that emerged from the foregoing analysis of the Kharrubah project's viability will be further underlined.

In Chapter III, a number of factors related to modernization that have been operating in the Jabal al-Akhdar region were discussed. It appears that the effects of modernization have become manifest in the Kharrubah pastoralists' existing pattern of land use. Thus, the existing land use system was analyzed to clarify the underlying factors that have led Kharrubah pastoralists to become more involved in sedentary lifestyles based on commercial pastoralism and government jobs.

The society of this region has traditionally employed several land use strategies, including seasonal spatial movement, herd diversification, and maintenance of large herds, to most effectively exploit the available grazing and water resources while providing some protection against a highly uncertain environment. Subsistence-oriented use of meat, milk, and other products derived from herd animals and cultivation of cereal crops, as well as periodic trips to a regional market, characterized the economy of this society.

Involvement of Kharrubah pastoralists in the modern sector has altered many traditional aspects of pastoral land use. Pastoralists have reduced spatial movement to take advantage of social services and schools, and often they employ shepherds to tend the herds rather than moving the family. In the study area, as discussed in Chapter IV, pastoralism in its present form is characterized by raising animals, primarily sheep, on a commercial basis for the large urban markets, using trucks and other motor vehicles to reach these markets, and seeking employment in government jobs. Spontaneous settlement is widespread among the area's population. For example, all but 22 percent of the pastoralists surveyed live in modern concrete houses or sheet-metal houses. This brings into question the validity of one of the main objectives of the project, to settle the herders (see

Table 26), and illustrates the lack of studies on the local population before project planning. Such studies were performed after the project was approved in 1973. Although traditional land use in the Kharrubah area has changed as a result of modernization, significant remnants of the traditional pastoral way of life still remain. For example, elements of the traditional social system, such as the extended family and the concept of collective tribal ownership of resources, are still evident in the study area.

The analysis then considered the government's proposed irrigated agricultural settlement project, which is to settle some of the pastoralists of the region and thus alleviate pressures on grazing and water resources resulting from increased animal populations (mostly sheep). The most important changes brought about by the government's proposed land use are the size of land holding, types of crops to be cultivated and the accompanying rotation system, introduction of an irrigation system, and disposal of the settlers' animals.

In Chapter V, the compatibility of the two land use systems was discussed. In many ways the proposed government land use is not compatible with the existing system. In fact, the environmental and socioeconomic disruptions might outweigh what the government hopes to accomplish by introducing new modes of production in tribal grazing

areas. One finding from the survey was that the fixed farm size provided by the government is not compatible with the size of the areas already cultivated by the pastoralists or with what the pastoralists expect to have available after settlement. Pastoralists' expectations regarding farm size are related to their traditional cultivation of large areas for cereal crops and their need for large pasture areas for their animals. In addition, the fixed size of the farms does not take into account variable family sizes and the possible variations in available labor from family members.

The selection of barley, maize, alfalfa, and fodder crops for cultivation on the project is a rational one from the perspective of general land use in a semi-arid and arid region. For this particular project, there is greater uncertainty about the selection of these crops. The pastoralists are experienced with cultivating cereal crops on a subsistence basis but have no knowledge of modern agricultural techniques such as crop rotation and irrigation. Whether they can successfully farm the chosen crops under these methods is not certain. In addition, the project management will completely determine which crops are to be cultivated and how the land will be used, which may affect farm output.

Another incompatibility found from the survey is the prohibition of settler ownership of livestock and a

shift in income source from raising animals to irrigation farming of fodder crops. Including disposal of the pastoralists' livestock as an element of project land use with the intention of reducing overgrazing may have exactly the opposite effect. Most of the pastoralists interviewed expressed a desire to settle but also indicated they would keep a large number of animals after settlement, even if they had to herd them in pasture areas off the project. Given the extended kinship ties that have traditionally existed throughout the region, it seems likely that a pastoralist would, after settlement, simply have a relative, clansman, or laborer tend his animals in another area.

The preceding arguments illustrate the fact that the planners seem to regard the project as an entity in itself and to ignore its consequences for the area's broader human and environmental systems. This leads to the second point of this discussion--namely, the potential environmental and socioeconomic disruptions to the existing land use system caused by the proposed government land use. From a planning perspective, the project may be viable for several reasons, including the presence of ground water, suitable soil for agricultural activity, and adequate present government funding. In the long-term, however, deleterious effects could be evidenced in changes in the land use system.

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In Chapter V it was shown that introducing the project might lead to alterations in land use, which, in turn, could result in degradation of land resources. The location of the project on the Abid tribe's traditional grazing land, while advantageous for marketing in nearby Jardas and Taknis, reduces the amount of pasture land available. This factor, coupled with the pastoralists' hope to continue raising animals, will probably result in more animals per unit of available grazing area and further rangeland deterioration.

Seasonal movement of the pastoralists might be restricted as agricultural projects expand and reduce available grazing and water resources in response to government measures to promote economic development in pastoral areas. As pastoralists' herds have been increasing in size due to improvements in veterinary services, the result may be that the best grazing areas are being converted to agricultural use at a time when the pastoralists' needs for pasture are increasing. In addition to this macroecological effect that could be brought about by possible changes in land use, the livestock-production potential for the Kharrubah region might be reduced because the project would remove the dry season pasture from the herding system. The overall effect of these pressures on the grazing area might cause pastoralists to

move from the Kharrubah region to outlying towns and contribute to further rural-urban migration.

Another possible source of environmental damage from the long-term perspective of the project is the expected heavy pumping of ground water for irrigation purposes, which may result in increased water salinity. Ground water in the area has been found to be excessively saline in nature. Study data cited in Chapter V indicated that the irrigation system will not be able to deliver sufficient water during a portion of each year, and reliance on rainfed irrigation in a drought-prone area subject to extreme rainfall variations is risky, at best. In addition, since the project will be depending on uninterrupted operation of the irrigation pumps, any mechanical problems with the pumping mechanisms or failure of components within the irrigation system might severely affect the productivity of the Kharrubah project. This is not to argue against the use of irrigation per se, but rather, as Johnson (1977) noted,

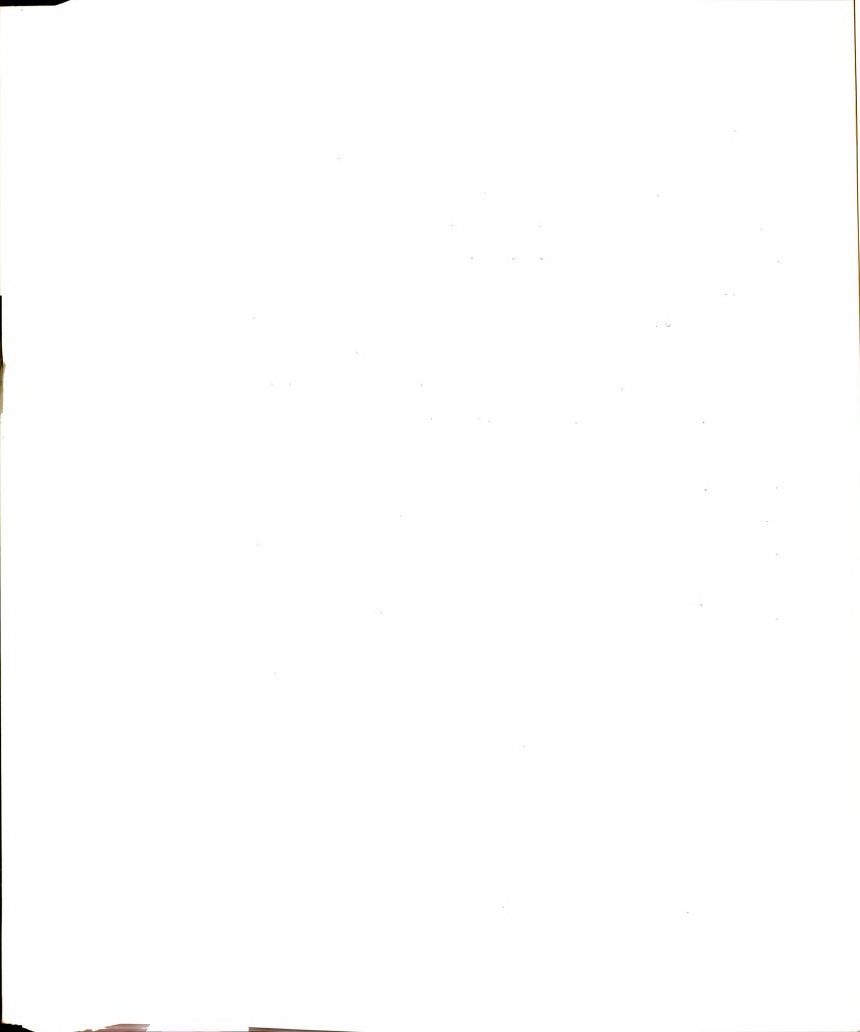
to stress the need to consider the interaction of a number of livelihood systems and to assess the possible gainers and losers before any development strategy is implemented. (p. 30)

The effect of introducing the project will not be limited to changes in the land use pattern. In Chapter V it was shown that project establishment might disrupt the social and economic characteristics of the area. The

traditional social system, for example, is based on a consolidation of land use, in which every member of the tribe can graze his animals anywhere on the tribal land. One possible long-term effect of the project, however, will be to present a possible conflict between three land-tenure-related laws operating in the same space at two different times: when the farms are distributed and when the settlers acquire land ownership 15 years later.

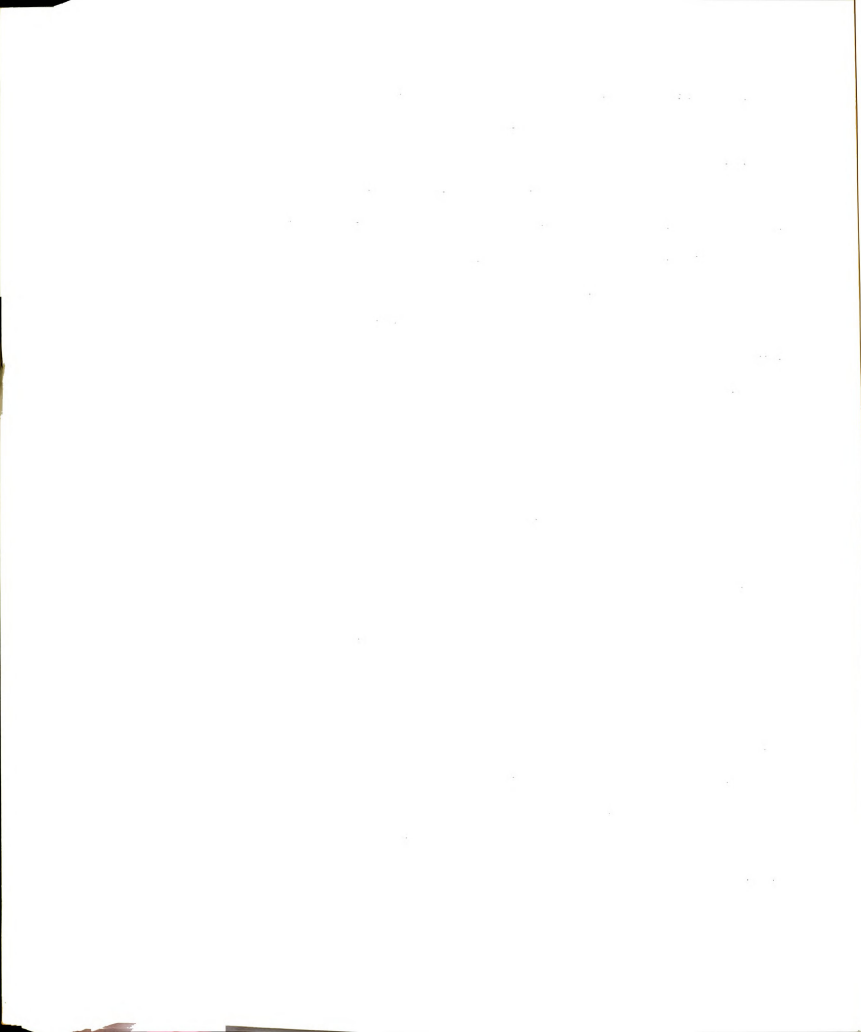
Two land tenure laws are already in effect in the Kharrubah area. One is the government land law of 1970, which retains land ownership with the state. Another is the traditional law which recognizes tribal ownership of the land. Before the project was introduced, these two laws seemed to enjoy a satisfactory equilibrium. But introducing the project, with its concept of individual ownership, will also bring into play the Islamic inheritance law, which could disrupt this equilibrium. This disruption could occur any time after the settlers acquire title to the land. A further source of conflict is that pastoralists who are not settlers on the project may not recognize private land ownership within the Kharrubah project and feel they have the right to use this area for grazing under traditional tribal law. Such conflict has arisen in Libya, as indicated in Chapter II.

Another possible source of conflict relates more specifically to the Islamic inheritance law. As



mentioned in Chapter V, this law, which relates to the spatial structure of farm holding, might result in a fragmentation rather than consolidation of the land since a personal estate can be left to any number of people. If the farm owner dies intestate, all relatives having a claim to the land receive a share of the property. Considering the life expectancy of 54 years, the average age of the respondents who may be selected for settlement (51 years), and the 15-year period needed to transfer land ownership to an individual, the question of land fragmentation may arise within the next 20 years. Major changes in the social structure of the Kharrubah pastoral society can be expected due to the fragmentation of tribal territory and a shift from collective tribal ownership, and the social customs and values associated with this type of land tenure, to private ownership of the land.

The existing economic system could also be disrupted by introduction of the project. Area pastoralists have oriented their livestock production toward the urban markets. Because livestock production is quite lucrative, pastoralists now receive more income from selling animals than farmers on agricultural settlement projects on the northern slopes of the Jabal al-Akhdar receive from agricultural activity. For example, el-Wifati (1977) found that about 86 percent of his sample of 120 new settlers on a Jabal al-Akhdar project received an



annual net farm income of about \$660; only 2.5 percent of the settlers received a net income of more than \$2,660. As indicated in Chapter V, a pastoralist settling on the Kharrubah project might lose an average of \$12,000 annually if no animals are sold to urban markets, and many of the pastoralists also hold government jobs to provide supplementary incomes. Although the government will be compensating settlers for loss of income from a job and has estimated that the average annual income from agricultural activity on the Kharrubah project will amount to more than \$28,000, this average assumes there will be no crop failures, no problems with the irrigation system, reliable rainfall, and a smooth transition from pastoral to agricultural life for the settlers. In actual practice, the average income could be much lower and more unstable than that derived from selling animals to urban markets.

At this point of project implementation, the question may arise as to whether the benefits of introducing agricultural settlement projects in the arid area of the Jabal al-Akhdar region outweigh the costs. From the preceding analysis, it appears that the costs outweigh the benefits from a number of environmental and socioeconomic standpoints.

The government claims that very serious damage of the rangeland landscape of the Kharrubah area, as well as

of the entire region, has been caused by overgrazing and overstocking. The irrationality of traditional land use, as stated by some project administrators, has led to increased herd sizes and overgrazing. But it is also apparent that settling the pastoralists on agricultural projects is not the only way to develop this sector of the population and to alleviate pressures on grazing land. For example, most of the pastoralists of the Kharrubah area are already settled, and spontaneous settlement among the pastoralists continues as a result of contacts with new ways of life brought about by modernization over the past 20 years. Most of the Kharrubah pastoralists now generate high incomes from selling animals and have a relatively high standard of living. Therefore, any attempt by the government to deprive them of their animals will be met with resistance. For example, when project administrators were questioned about the possibility of pastoralists' resistance to disposal of all or part of their herds, most of the officials reported that pastoralists would resist the attempt. If this is so, the question may be raised whether any more agricultural settlement projects should be implemented on grazing areas.

It may be too early to answer this question because the project is still being implemented, and its success is yet to be seen. From the findings of this study and

other countries' experiences with this top-to-bottom approach to development, however, several policies can be suggested. The current fashion in Libya, particularly in the Jabal al-Akhdar region, is to establish agricultural settlement projects to locate pastoralists on their traditional grazing land. But the pastoralists already have a favorable traditional grazing-bounded space that can be exploited nearly year-round (Johnson, 1973), as mentioned in Chapter IV. This is true not only for the Kharrubah area but for the entire southern flank of the Jabal al-Akhdar, as observed by Johnson (1973) and reported in the Faculty of Education survey (1980). It might therefore be beneficial if the Libyan government organized these traditional grazing areas in the form of cooperatives similar to those found in Syria and Mongolia (Johnson, 1978b), where traditional spatial movements and grazing resources are preserved and pastoral activities are organized to maximize production.

For the Wadi al-Kharrubah settlement project to be successful, the writer suggests that an alternative settlement model be implemented on the project, wherein the livestock component is integrated with agricultural activities. The pastoralists have indicated they are going to keep animals off the project if forbidden to have them on the project. As mentioned in Chapter I, some of the soil in this area was found appropriate for

grazing activities. If grazing were allowed on the project, off-project grazing pressures might be alleviated somewhat since the project could exercise greater control over livestock numbers. Incorporation of this element of the pastoralist's traditional lifestyle may result in their spending more time in agricultural activity on the project.

In light of this analysis of the compatibility of two land use systems and the expectations of future settlers, a number of research findings can be related to the literature on settlement presented in Chapter II, from which two different viewpoints of pastoral settlement emerged. One view is that pastoral societies are responsible for rangeland deterioration through overgrazing and overstocking, and that this has resulted from irrational land use. Hardin (1968) is the most prominent advocate of this viewpoint.

The other viewpoint regarding settlement is that pastoralists are voluntarily settling as a result of changes brought about by modernization, such as technological advances, availability of government jobs, and involvement of many pastoralists in commercial marketing of animals. This viewpoint has been supported by several scholars, who feel that government intervention in the form of settlement projects is not needed and that the

cost of these projects may exceed their benefit. Galaty and Aronson (1980) wrote:

Settlement programs should never be ends in themselves. Settling nomads and semi-nomads can exacerbate ecological deterioration, diminish pastoral productivity, deny producers vital resources at particular times or places, and otherwise radically disrupt the pastoral system. (p. 21)

Similarly, Sandford (1983) noted that "the design and management of new development cannot be viewed in isolation from those aspects of pastoral life which already exist" (p. 3). The analysis presented in this study produced several findings consistent with the second view of pastoral settlement. The relevance of these findings with regard to the literature on settlement is examined in the remainder of this chapter.

As discussed in Chapter IV, the phenomenon of spontaneous settlement is already widespread among the Khar-rubah pastoralists, mainly as a result of the economic opportunities created by the oil boom of the 1960s. This type of settlement is occurring not only in the study area, but also throughout the entire Jabal al-Akhdar region, as reported in studies by Johnson (1973), the Faculty of Education, Beida (1980), and Albergoni and Vignet-Zunz (1982). All of these studies concluded that Jabal al-Akhdar pastoralists are in the process of voluntary sedentarization without formal government efforts. They have begun to abandon the tent in favor of

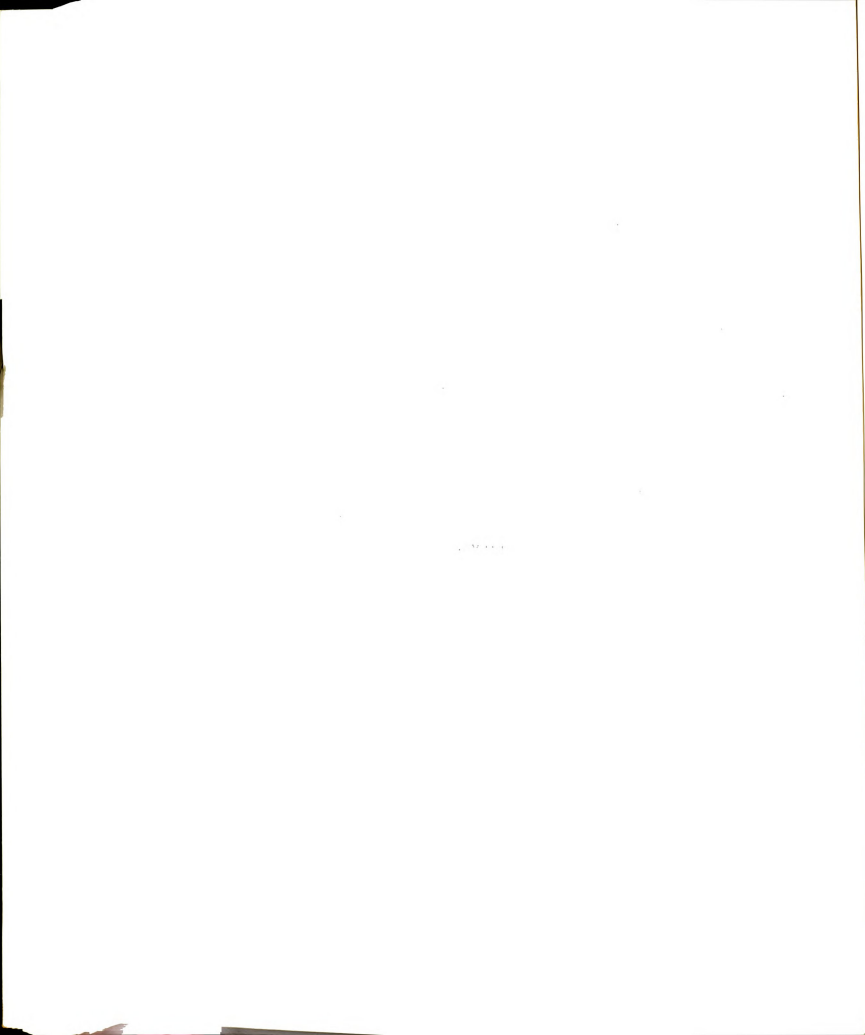
more permanent dwellings, in a fixed location close to a small urban center or around water points, to take advantage of the employment opportunities and social services available in these centers.

Pastoralists' involvement in government jobs is a relatively new phenomenon, and emphasizes the shift from living at a subsistence level and raising animals, mostly sheep, for household consumption toward commercial marketing. This market orientation was observed by Behnke (1980) in his study of the southern flank of the Jabal al-Akhdar:

Rapid growth in herd size has in turn allowed herding households to shift from a pastoral domestic economy oriented primarily to subsistence and producing occasional marketable surpluses to a pastoralism specializing in production for the marketplace. (p. 85)

The same tendency has been observed in other parts of the Middle East and Africa. Bourgeot (1981), for example, found this to be true for Sahelian pastoralists.

As a result of this market orientation, Kharrubah pastoralists are able to generate an income from selling animals and from government jobs that is higher than the earnings of their farmer counterparts in the northern Jabal al-Akhdar. This finding is similar to a previous one reported by Stauffer (1965) in his study of southern Iran and by Darling and Farvar (1973) in their study of Saharan nomads.



The question can then be raised: Why has the Libyan government initiated a strategy of settling the pastoralists when spontaneous settlement is already occurring and changing the pastoral society's spatial organization and socioeconomic characteristics? One claim made by the government, which also forms a basis for the viewpoint of Hardin, Ferguson, and other scholars, is that the pastoralists' irrational land use system and socioeconomic values related to it have led to overstocking and overgrazing of the rangeland.

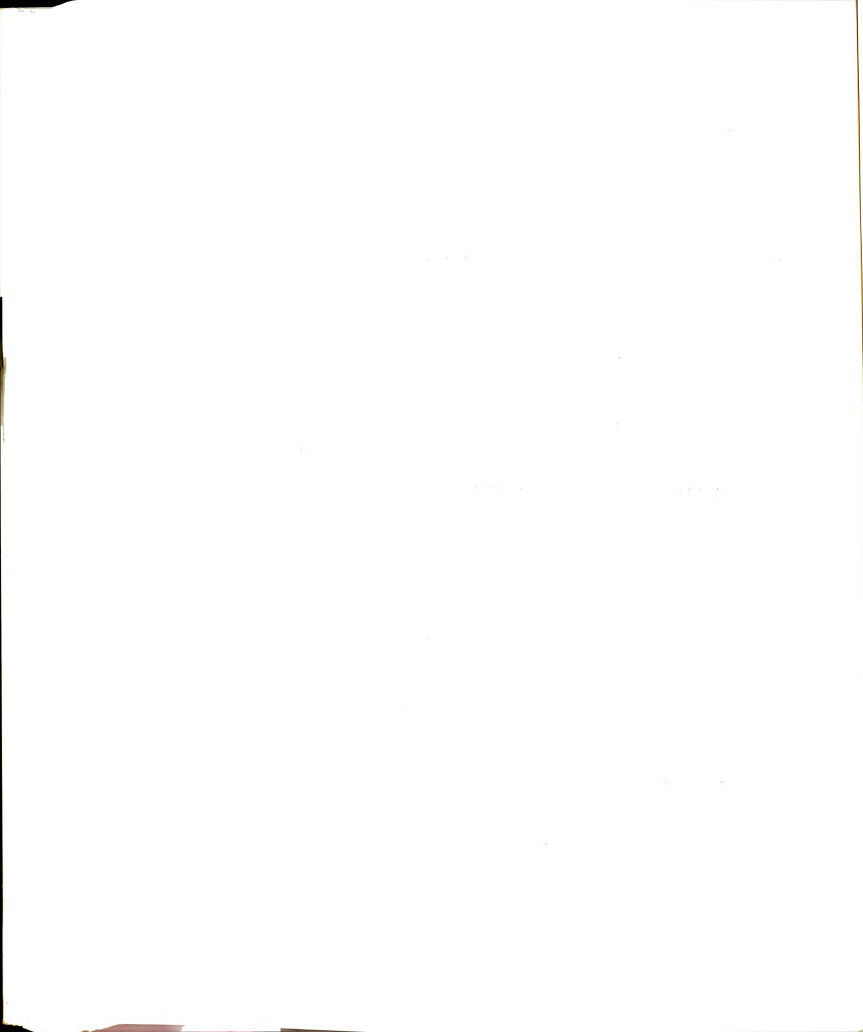
Induced settlement may not always solve the problems of rangeland deterioration and, as Galaty and Aronson (1980) reported, could lead to ecological deterioration as well as radical disruption of the pastoral system. The findings of this study support this view. In many respects, the proposed government agricultural settlement project is not compatible with the indigenous land use already existing in the region or with land-use-related expectations the pastoralists have about settlement. Possible disruptions to the socioeconomic and environmental characteristics may occur during the life of the project because of these incompatibilities.

One of the problems cited in the literature that could also be encountered in the Kharrubah project is fixed farm size. The established size of 20 hectares at Kharrubah might be too small, considering the amount of

land the pastoralists are now cultivating, their expectations for large farms, and the heterogeneity in size and composition of area households. Zaki (1982), in his study of the Rahad project in Sudan, found that the farm size of 22 feddan (about 9.25 hectares) was too small for large tenant households. Sabry (1970) found that farm sizes in the Gezira project in Sudan were too large, and many settlers had to become absentee landlords because there were insufficient family members to operate the farms.

Incompatibility of crops to be cultivated is another problem mentioned by scholars. Sörbo (1977), Hoyle (1977), and Heinritz (1978) all cited the Khashim el-Girba project in Sudan as an example of poor planning in this respect. The pastoralists were required to grow unfamiliar crops such as cotton, ground nuts, and wheat instead of the traditional sorghum.

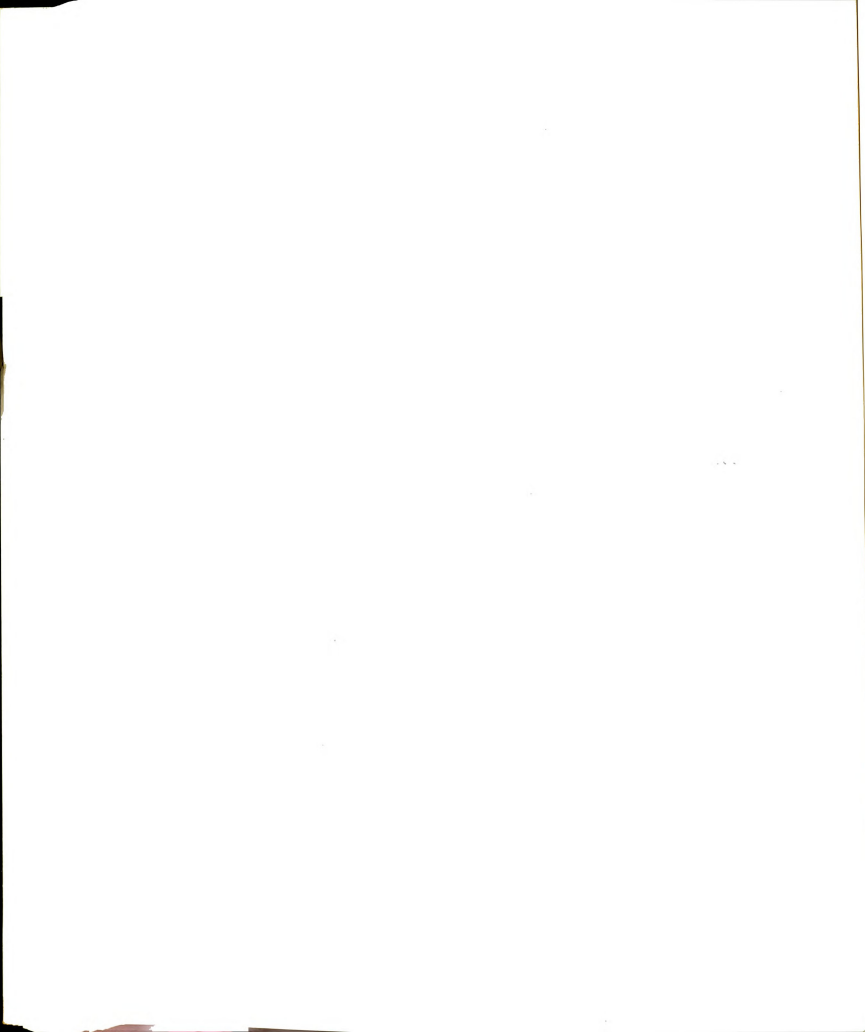
Kharrubah project planners have selected barley as the crop to be cultivated; it is traditionally grown by the pastoralists as an animal feed and it is not a major ingredient in their diet. The project administration has also chosen fodder crops, which are suitable to the arid environment of the region. The question arises, then, whether the settlers will confine their agricultural activity to these crops and the accompanying rotation system with which they are unfamiliar.



Another finding considered to be a potential problem is the government's decision to dispose of the pastoralists' herds and the possibility that the pastoralists will continue to keep animals in their traditional area. Both Sörbo (1977) and Hoyle (1977), in their studies of the Khashm el-Girba project in Sudan, found that although the government decided not to allow livestock on the project, the pastoralists continued to keep animals in their traditional area. Although the project administration did not plan this agro-pastoral approach to settlement, it was beneficial and illustrates the need for comprehensive planning strategies in such circumstances (Johnson, 1978a).

The location of the project on a tribal grazing area could create problems similar to those found in other projects. Khogali (1980), for example, found that locating a project on land belonging to a section of the Kababish tribe in Sudan caused conflict because the area was traditionally used by the entire tribe. The same situation exists in Kharrubah, where the project is located on an area belonging to the Yatama section but is used by the entire Abid tribe. The loss of grazing space is thus a potential source of tribal conflict.

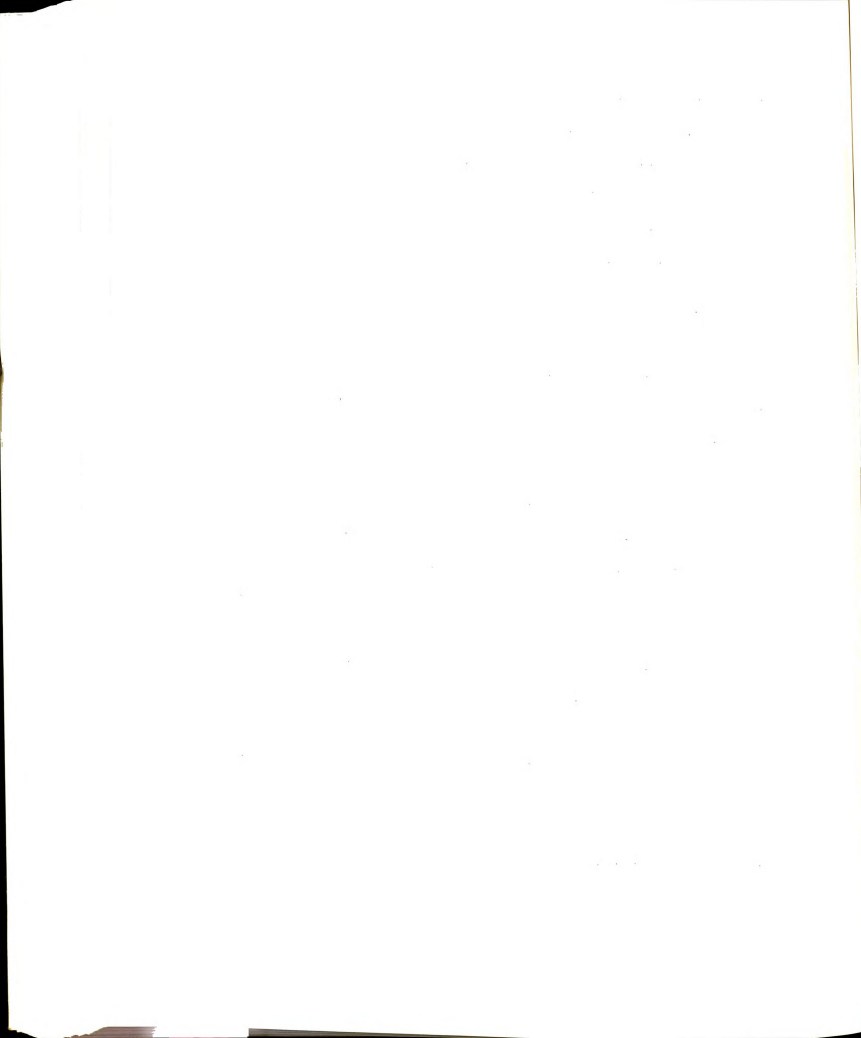
Problems could also arise if the project prevents communal use of grazing areas by legalizing land tenure on an individual basis. This concern is related to the



issue of recognizing of collective ownership. Galaty and Aronson (1980) stated:

Article 11 of Convention 107 of the International Labour Office, of which most countries are members, provides that 'the right of ownership, collective or individual, of the members of the populations concerned over the land which these populations traditionally occupy shall be recognized.' Neither planners nor social scientists, certainly not international development agencies, should lend their weight to any program that would diminish that right in fact or in law, at least until such time as pastoral communities decide for themselves that it may be wise to do so. (p. 22)

Not only should international recognition of common land be respected, but the Libyan government's concept of individual ownership should be examined with respect to potential problems. This dimension has been neglected in the literature on land settlement, particularly as it concerns Islamic countries. In these nations, one solution to deterioration of the rangeland is to settle the pastoralists, who are thought to be responsible for this decline, in agricultural settlement projects that provide them with different types of land ownership. Private ownership with varying degrees of assistance, such as cooperative services to help with production and marketing, is one type of ownership found in the Middle East. Leasing of the land for a limited period of time before granting titles, as found in Libya, is another type (el-Ghonemy, 1979).



Planners in these countries have not perceived the potential sociocultural problems related to the Islamic inheritance law that could result from individualization of land ownership. This law, which is concerned with the spatial structure of farm holding, might lead to fragmentation of the land rather than the traditional consolidation of land that has prevailed. According to King and Burton (1982),

Islamic inheritance laws require equal distribution of a patrimony among heirs upon the landholder's death. Fragmentation is exacerbated where heirs are able to demand equal shares of different types of land such as orchards, pasture and irrigated fields. A farm of, say, three plots with different land qualities or use would therefore be split into twelve fragments if there were four heirs. (p. 480)

Thus, private ownership in these areas may not present a better situation than what Hardin called "the tragedy of the commons."

The question of whether the Libyan government can overcome the above-mentioned land-use-related problems resulting from introduction of the project should also be raised. Problems that may face the Kharrubah project in Libya will be less severe than in other countries, such as Sudan, because the government can fund the project with oil revenues. But there still is concern about the long-term viability of such projects, as summarized by McLachlan (1982a):

The cost of agricultural development projects in the south [of Libya] appeared to have a capital cost at least eight times that of farms established in the

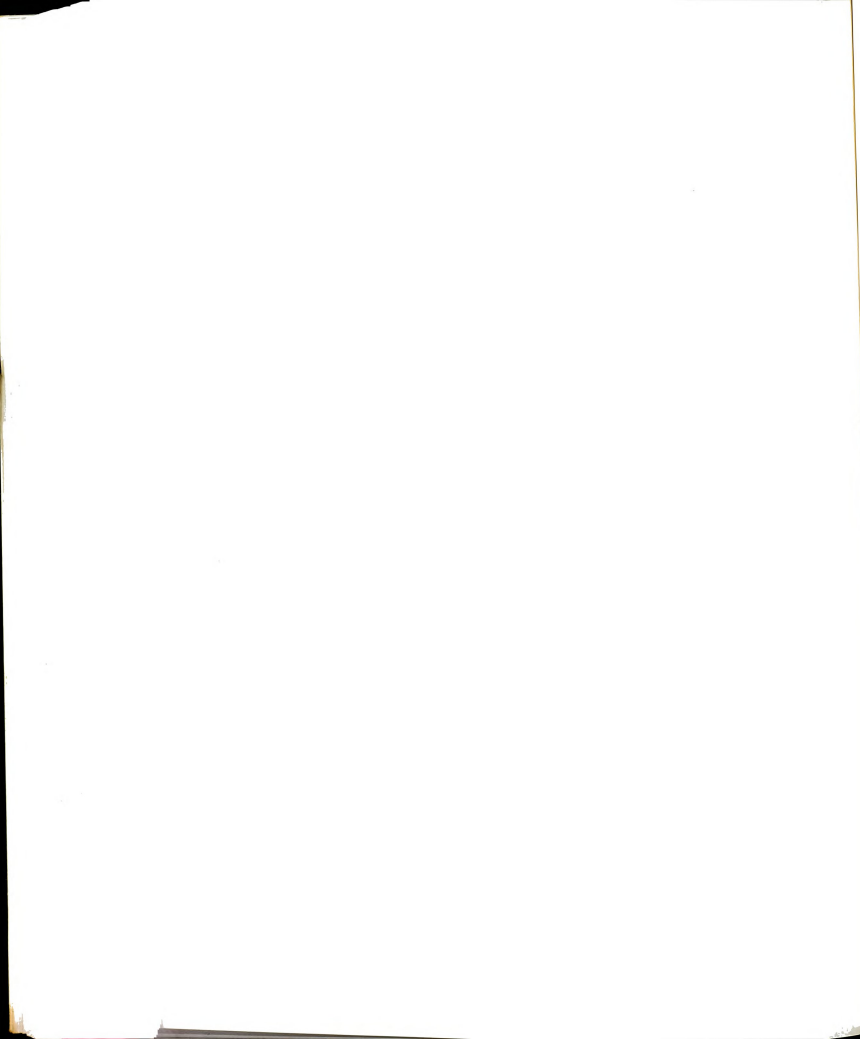
coastal areas....It is difficult to argue with the view that both settlement and production farms in the south would survive only for as long as the government was able to make available subsidies and that, once oil wealth began to fail, the farms would be economically unviable even taking the charitable view that farmers could be found to settle and would remain long-term in the south. (p. 21)

It is then a matter of how long the Libyan financial situation, based on nonrenewable resources such as oil, can support highly capital-intensive irrigation projects that require a large initial investment and great amounts of foreign exchange in the long run.

Given the findings of this study and the experiences of other countries whose governments have introduced highly capital-intensive settlement projects into their arid and semi-arid regions, it is suggested that a different model of pastoral development be investigated. Spontaneous settlement is occurring and represents a building upon the traditional spatial movements, grazing resources, and communal ownership to take advantage of altered economic conditions. Promotion of this indigenous strategy, for example, by providing fodder warehouses and social services instead of settlements, will perhaps be more fruitful than constructing agricultural settlement projects in these areas. In the absence of such policies, the contemporary trend of government encroachment on grazing space will continue. As a result, the conflict between pastoralists and the

government over access to land resources may be aggravated to such a degree that regional stability is threatened.

APPENDICES



APPENDIX A

APPENDIX A

SURVEY OF THE WADI AL-KHARRUBAH
SETTLEMENT PROJECT, LIBYA
SELF-ADMINISTERED QUESTIONNAIRE

July - September 1983

Part A Administrators

Case Serial Number _____

Computer card case number (ID) _____

Record of Visits

<u>Date</u>	<u>Day of Week</u>	<u>Time</u>	<u>Notes</u>
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Pastoralist's Name (optional) _____

Interviewer's Name _____

Comments

General

- 1 - What are the aims of the settlement program?
 - (a) _____
 - (b) _____
 - (c) _____
- 2 - What criteria are used in selecting settlers for the project?
 - (a) _____
 - (b) _____
 - (c) _____
- 3 - Why do people need to settle?
 - (a) _____
 - (b) _____
 - (c) _____
- 4 - What were (are) the major problems faced in the project's design?
 - (a) _____
 - (b) _____
 - (c) _____
- 5 - How were (are) these problems handled?
 - (a) _____
 - (b) _____
 - (c) _____
- 6 - What are the major problems to be faced in the project's implementation?
 - (a) _____
 - (b) _____
 - (c) _____

- 7 - How are these problems to be faced?
- (a) _____
 - (b) _____
 - (c) _____
- 8 - What are the major problems faced in administering the project?
- (a) _____
 - (b) _____
 - (c) _____
- 9 - How are they handled?
- (a) _____
 - (b) _____
 - (c) _____
- 10 - What are the major problems to be faced by the project's settlers?
- (a) _____
 - (b) _____
 - (c) _____
- 11 - How will they be solved?
- (a) _____
 - (b) _____
 - (c) _____
- 12 - What factors were instrumental in selecting this particular site as a settlement location?
- (a) _____
 - (b) _____
 - (c) _____

- 13 - Rank the following environmental constraints in terms of their seriousness:
- (a) drought
 - (b) soil erosion
 - (c) poor soils
 - (d) lack of sufficient ground water
 - (e) unreliable rainfall
 - (f) hot winds (Gibli)
 - (g) other (specify)
- 14 - Do you think that the land use is realistic given these environmental constraints?
- (a) yes
 - (b) no
- 15 - Do you think that the project can support itself over a long period of time?
- (a) yes (specify)
 - (b) no (specify)
- 16 - Is the government going to subsidize the settlers in any way?
- (a) yes
 - (b) no (go to 18)
- 17 - If yes, how will the government subsidize the settlers?
- (a) _____
 - (b) _____
 - (c) _____
- 18 - Do you think that the project in any way will reduce the settlers' ability to cope with drought?
- (a) yes
 - (b) no (go to 20)
- 19 - If yes, how does this reduce their ability to cope with drought?
- (a) _____
 - (b) _____
 - (c) _____

Project Land Use

20 - What size farms are you providing in this project?

(a) _____

(b) _____

(c) _____

21 - Will all settlers get the same amount of land?

(a) yes

(b) no (if no, why)

22 - Who will allocate land to the settlers?

(a) government

(b) first-come first-served basis

(c) other (specify)

23 - Will the farms be nucleated or scattered?

(a) nucleated (why)

(b) scattered (why)

24 - Do all the farms have land of equal quality?

(a) yes

(b) no (if no, why)

25 - Are you giving the pastoralists who settle title to their land?

(a) yes

(b) no (if no, why)

26 - Are you providing seeded areas of pasture for improved forage?

(a) yes

(b) no (go to 28)

27 - If yes, how large will these areas be?

(a) _____

28 - Will you use a rotation system?

(a) yes

(b) no (go to 30)

(d)

100-100

100-100

100-100

100-100

100-100

100-100

100-100

100-100

100-100

100-100

100-100

100-100

100-100

- 29 - If yes, what type of system?
(a) _____
- 30 - Are you providing irrigated pasture areas?
(a) yes
(b) no (go to 32)
- 31 - If yes, how large will these areas be?
(a) _____
- 32 - Do all the farms have equal access to water?
(a) yes (if yes, how)
(b) no (if no, why)
- 33 - What kinds of stock will be permitted on the project?
(a) camels
(b) cattle
(c) sheep
(d) goats
(e) none (why)
- 34 - What kind of pasture rights will the settlers have?
(a) common
(b) private
(c) both (specify)
(d) none (go to 41)
- 35 - Will the project forbid pasture access to those pastoralists who have traditional grazing rights to the land but who did not get farms?
(a) yes
(b) no
- 36 - Will the government allow the settlers to use other grazing areas outside of the project?
(a) yes
(b) no
- 37 - Would this be permitted in the case of drought?
(a) yes
(b) no

10/10/10

CC

10/10/10

10/10/10

10

10

10/10/10

10/10/10

10/10/10

10/10/10

CC

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10/10/10

10/10/10

10/10/10

10

10/10/10

10/10/10

10/10/10

10/10/10

10

10

- 38 - How will grazing be regulated within the project to avoid overgrazing?
- (a) access to each farm's grazing will be restricted to the owner himself
 - (b) the number of animals on each pasture will be strictly controlled
 - (c) both of the above
 - (d) other (specify)
- 39 - Who will restrict access to each farm's grazing?
- (a) _____
- 40 - What criteria are used in determining stocking rates?
- (a) _____
 - (b) _____
 - (c) _____
- 41 - If the authority of the project only allowed the pastoralists to keep three-fourths of their herds in order to settle, do you think the pastoralists would resist settlement?
- (a) yes
 - (b) no
- 42 - If the authority of the project only allowed the pastoralists to keep one-half of their herds in order to settle, do you think the pastoralists would resist settlement?
- (a) yes
 - (b) no
- 43 - Who will control the number of animals on each pasture?
- (a) _____

48 - Who decides which crops to grow?

- (a) the project
- (b) the settlers together
- (c) the settlers individually
- (d) other (specify)

49 - Who will cultivate the land?

- (a) settler and family
- (b) hired labor
- (c) other (specify)

50 - How will the land be cultivated?

- (a) by hand
- (b) by machine
- (c) by both hand and machine

51 - Which of the following capital investment items will be provided by the project?

	Sold by Project w/credit	Given by Project	Obtained through cooperation	Obtained by Individual
(a) credit/low-interest loans				
(b) tractors				
(c) harvesters				
(d) combines				
(e) plows				
(f) hand tools				
(g) fodder				
(h) fertilizer				
(i) seeds				
(j) pesticides				
(k) produce transport				
(l) crop storage				
(m) input storage				

52 - Which of the following are you providing or constructing as part of the project?

- (a) school
- (b) dispensary
- (c) clinic
- (d) veterinary service
- (e) mosque
- (f) police station
- (g) produce market
- (h) roads
- (i) water supply
- (j) agricultural extension
- (k) agricultural education
- (l) repair service and shop for machines
- (m) other (specify)

53 - Which of the following social services will be provided by the project?

- (a) education
- (b) welfare
- (c) cooperative extension services
- (d) medical treatment
- (e) veterinary treatment
- (f) other (specify)

54 - What portion of his livelihood is the settler expected to obtain from each of the following?

- (a) cultivation of crops for the market _____
- (b) raising animals for the market _____
- (c) subsistence holdings _____
- (d) commerce _____
- (e) wage labor _____
- (f) other sources _____

55 - Do you think that pastoralists should participate in the administration of the project?

- (a) yes
- (b) no (go to 60)

56 - If yes, in what ways should the pastoralists participate?

- (a) _____

- 57 - Do you think that pastoralists should have one or more representatives on the Board of Directors of this project?
- (a) yes
(b) no
- 58 - Do you think that regular meetings should be held in which pastoralists exchange views with those in the project's authority?
- (a) yes
(b) no
- 59 - What kind of contribution do you think the settlers of herder origin will make to the overall success of the project?
- (a) _____
- 60 - In which areas do you think their greatest impact will be?
- (a) _____
(b) _____
(c) _____
- 61 - Will these herders be capable farmers?
- (a) yes
(b) no (if no, why)
- 62 - What characteristics do you think the herders possess that may prevent them from successful settlement on the project?
- (a) _____
(b) _____
- 63 - Do you feel that consideration of the traditional nomadic economic and social system of the pastoralists is important for the success of this settlement project?
- (a) yes (why)
(b) no (why)

- 64 - What types of social institutions is the project going to bring?
- (a) cooperatives
 - ☐ 1. purchasing
 - ☐ 2. marketing
 - ☐ 3. production (manufacturing)
 - ☐ 4. transport
 - (b) aid during years of drought and/or poor harvests
 - ☐ yes (specify)
 - ☐ no
 - (c) legal support during disputes
 - ☐ yes (specify)
 - ☐ no
 - (d) education (a system of socialization that enables a person to become a productive member of society)
 - ☐ yes (specify)
 - ☐ no
 - (e) all of the above (specify)
- 65 - How will the project improve the settlers' ability to solve their problems?
- (a) _____
 - (b) _____
 - (c) _____
- 66 - How will the project worsen their ability to solve their problems?
- (a) _____
 - (b) _____
 - (c) _____
- 67 - Do you feel it is important for pastoralists to settle in their traditional homeland?
- (a) yes (if yes, why)
 - (b) no
- 68 - What do you think of the traditional land use system of the pastoralists?
- (a) _____

APPENDIX B

APPENDIX B

SURVEY OF THE WADI AL-KHARRUBAH
SETTLEMENT PROJECT, LIBYA
INTERVIEW SCHEDULE

July - September 1983

Part B - Pastoralists

Case Serial Number _____

Computer card case number (ID) _____

Record of Visits

<u>Date</u>	<u>Day of Week</u>	<u>Time</u>	<u>Notes</u>
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Pastoralist's Name (optional) _____

Interviewer's Name _____

Comments

Population Characteristics

1 - The person being interviewed is

- (a) head of household (man)
- (b) son

2 - What is the tribe of the person being interviewed?

- (a) Abid
- (b) Morabitin
- (c) other

3 - What is the age of the respondent?

- (a) _____

4 - How many people are there in your family, and what are their ages?

Family Member	Male	Age	Female	Age

5 - Is your family now with you on the project?

- (a) yes (go to 7)
- (b) no

6 - If no, where do those members of your family who do not live with you reside?

- (a) in a village (specify)
- (b) in the city (specify)
- (c) other (specify)

7 - What do you now do for a living?

- (a) work full-time for the project (go to 9)
- (b) work part-time for the project
- (c) other (specify)

8 - If you work part-time for the project, what else do you do?

- (a) herd
- (b) farm
- (c) trade
- (d) other (specify)

Ownership and Traditional Land Use

9 - Do you own any animals?

- (a) yes
- (b) no (go to 28)

10 - If yes, how many of each type of animal do you own?

- (a) camels _____
- (b) goats _____
- (c) sheep _____
- (d) cattle _____
- (e) other (specify) _____

11 - Who looks after your herd?

- (a) yourself
- (b) your son
- (c) your brother
- (d) other relative
- (e) laborer
- (f) other (specify)

12 - Where do you usually graze your animals in the wet season?

- (a) _____
- (b) _____
- (c) _____

13 - How long does it take to reach your grazing areas in the wet season?

- (a) less than 1 hour
- (b) 1-2 hours
- (c) 2-3 hours
- (d) 3-4 hours
- (e) 4-5 hours
- (f) more than 5 hours

14 - Where do you usually graze your animals in the dry season?

(a) _____

(b) _____

(c) _____

15 - How long does it take to reach your grazing areas in the dry season?

(a) less than 1 hour

(b) 1-2 hours

(c) 2-3 hours

(d) 3-4 hours

(e) 4-5 hours

(f) more than 5 hours

16 - How do you regulate pasture use?

(a) each clan has its own areas

(b) we decide each year, depending on pasture conditions

(c) we pasture where we want

(d) other (specify)

17 - Are the areas where you usually graze your animals adequate?

(a) yes (go to 19)

(b) no

18 - If no, why are the areas inadequate?

(a) _____

(b) _____

(c) _____

19 - Where do you usually water your animals in the wet season?

(a) well/borehole

(b) cistern

(c) pool

(d) seasonal stream

(e) other (specify)

20 - How long does it take you to get your animals to water in the wet season?

- (a) less than 1 hour
- (b) 1-2 hours
- (c) 2-3 hours
- (d) 3-4 hours
- (e) 4-5 hours
- (f) more than 5 hours

21 - Where do you usually water your animals in the dry season?

- (a) cistern
- (b) well/borehole
- (c) spring
- (d) pipeline
- (e) other (specify)

22 - How long does it take you to get your animals to water the dry season?

- (a) less than 1 hour
- (b) 1-2 hours
- (c) 2-3 hours
- (d) 3-4 hours
- (e) 4-5 hours
- (f) more than 5 hours

23 - How do you regulate water use?

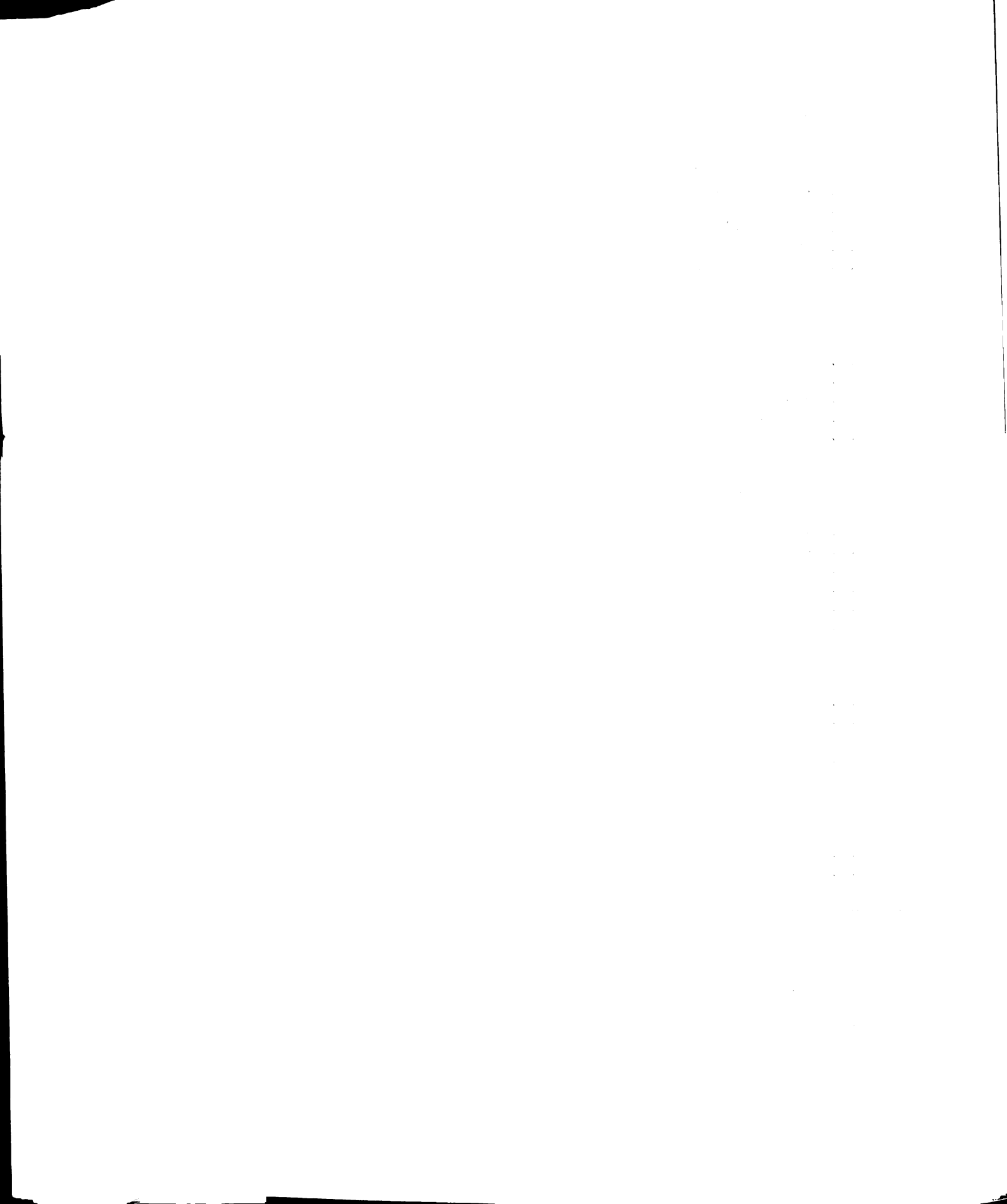
- (a) each clan has its own water
- (b) we decide each year, depending on water conditions
- (c) we use any wells we want

24 - Do you go to specific place(s) with your animals during drought?

- (a) yes
- (b) no (go to 26)

25 - If yes, where is this (these) area(s)?

- (a) _____
- (b) _____
- (c) _____



26 - Do you ever use motorized vehicles in your pastoral activities?

- (a) yes
- (b) no (go to 28)

27 - If yes, how are the vehicles used?

- (a) _____
- (b) _____
- (c) _____

Farming System

28 - Do you practice agriculture?

- (a) yes
- (b) no (go to 40)

29 - If yes, do you cultivate this land as

- (a) owner
- (b) renter
- (c) sharecropper
- (d) other (specify)

30 - How much land do you cultivate?

- (a) under 1 ha.
- (b) 1-5 ha.
- (c) 6-10 ha.
- (d) 11-15 ha.
- (e) more than 15 ha.

31 - How much of this land is under fallow?

- (a) none
- (b) less than 1/4 ha.
- (c) 1/4 ha.
- (d) 1/3 ha.
- (e) 1/2 ha.
- (f) more than 1/2 ha.

32 - Who cultivates the land?

- (a) head of household
- (b) wife
- (c) son
- (d) laborer
- (e) other (specify)

33 - How long have you been cultivating?

- (a) less than one year
- (b) 1-5 years
- (c) 6-10 years
- (d) 11-15 years
- (e) over 15 years

34 - What crops do you grow

- (a) for subsistence? (specify) _____
- (b) for sale? (specify) _____
- (c) for both subsistence and sale? (specify) _____

35 - Do you use a rotation system for your crops?

- (a) yes
- (b) no (go to 37)

36 - If yes, what is the

Irrigated Rainfed
crops crops

- (a) first crop
 - time of year planted
 - time of year harvested
- (b) second crop
 - time of year planted
 - time of year harvested
- (c) third crop
 - time of year planted
 - time of year harvested

37 - Do you use any of the following?

- (a) animal drawn plow
- (b) tractor
- (c) fertilizer
- (d) pesticides
- (e) animal manure

38 - If you use animal manure, where do you get it from?

- (a) my own animals
- (b) herders

39 - What are the major problems you face in your home area?

- (a) lack of pasture
- (b) lack of water
- (c) lack of farming land
- (d) drought
- (e) lack of schools
- (f) lack of dispensaries
- (g) lack of veterinary services
- (h) lack of transportation
- (i) lack of money
- (j) lack of animals
- (k) animal diseases
- (l) other (specify)

Trade and Marketing

40 - To which do you sell most of your animals?

- (a) traders who come to buy animals
- (b) markets to which I take my animals

41 - How many of each of these animals did you sell last year?

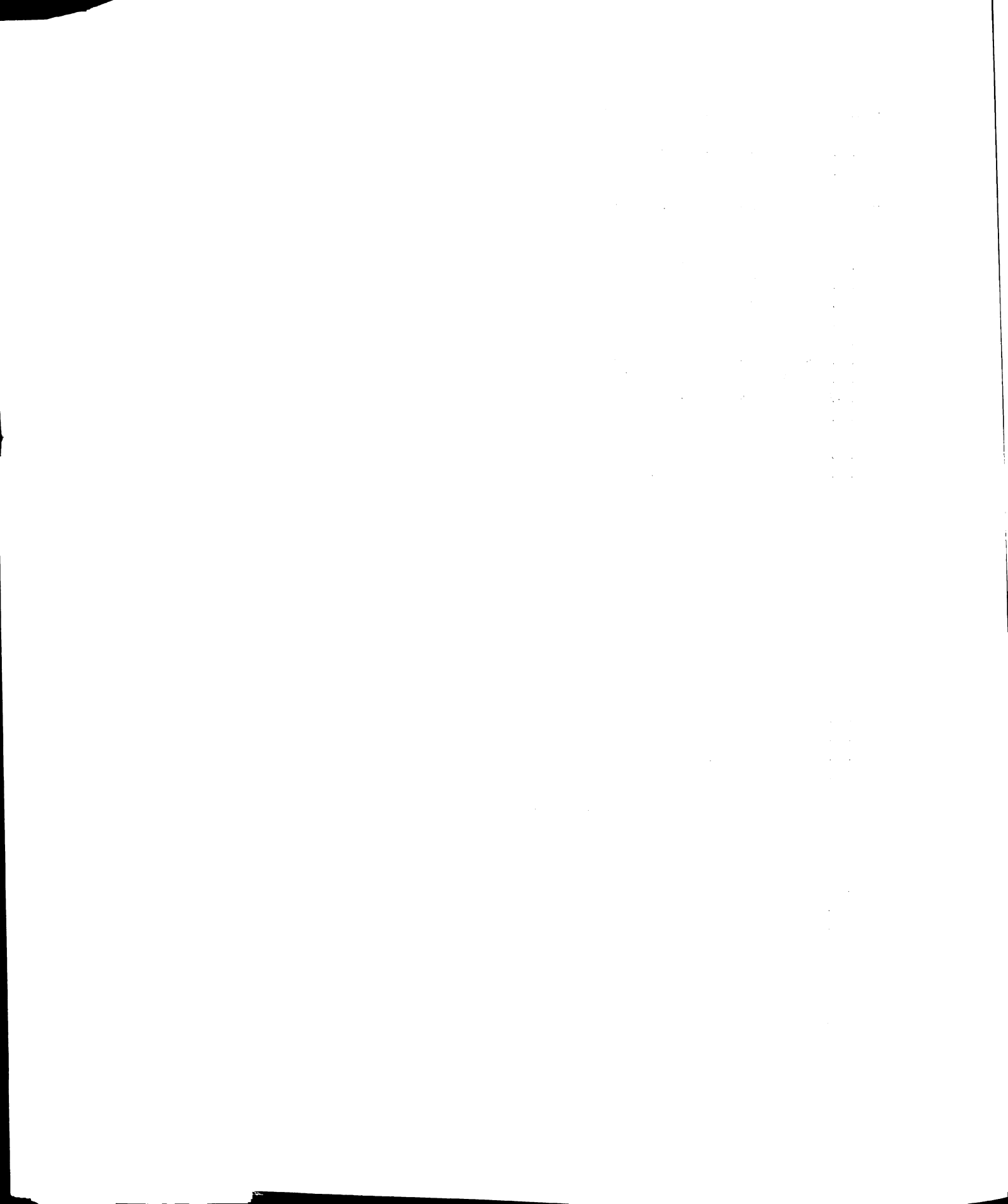
- (a) goats _____
- (b) sheep _____
- (c) camels _____
- (d) other _____

42 - What price did you obtain for each type of animal sold last year?

- (a) goats _____
- (b) sheep _____
- (c) camels _____
- (d) other _____

43 - Does the price vary from one time of the year to another?

- (a) yes
- (b) no (go to 47)



44 - By how much do the prices vary?

(a) _____

45 - When are the prices the highest?

(a) _____

(b) _____

(c) _____

46 - When are the prices the lowest?

(a) _____

(b) _____

(c) _____

47 - Has there been a change in prices over the past five years?

(a) yes

(b) no (go to 49)

48 - If yes, what has caused these changes?

(a) _____

(b) _____

(c) _____

(d) _____

49 - Do you sell more animals now than 5 years ago?

(a) yes

(b) no (go to 51)

50 - If yes, why do you sell more animals now?

(a) _____

(b) _____

(c) _____

51 - Do you sell more animals when prices are high?

(a) yes

(b) no

..... (a)

..... (b)

..... (c)
..... (d)
..... (e)

..... (f)

..... (g)
..... (h)
..... (i)

..... (j)

..... (k)
..... (l)

..... (m)

..... (n)
..... (o)
..... (p)
..... (q)
..... (r)

..... (s)

..... (t)
..... (u)

..... (v)

..... (w)
..... (x)
..... (y)

..... (z)

..... (aa)
..... (ab)

52 - Where do you obtain the highest prices for your animals?

- (a) al-Marj
- (b) Beida
- (c) Taknis
- (d) other (specify)

53 - Do you sell any of your produce?

- (a) yes
- (b) no (go to 55)

54 - If yes, which crops do you sell?

- (a) _____
- (b) _____
- (c) _____

55 - What were your main sources of income last year?

- (a) goat sales
- (b) sheep sales
- (c) sale of farm produce
- (d) other (specify)

Education and Health Services

56 - Do you have access to these services?

- (a) school
- (b) dispensary
- (c) hospital
- (d) veterinary services

57 - If yes, how long does it take you to get to each service? (specify time for each)

- (a) school _____
- (b) dispensary _____
- (c) hospital _____
- (d) veterinary services _____

- 58 - Do you send your children to school?
(a) yes
(b) no (go to 60)
- 59 - What type of education do your children receive?
(a) religious
(b) regular
- 60 - Do you have any level of education?
(a) yes
(b) no (go to 62)
- 61 - If yes, what is your level of education?
(a) elementary
(b) preparatory
(c) secondary
(d) university

Pastoralists' Attitudes Toward Settlement

- 62 - Where did you first learn of the project at Wadi al-Kharrubah?
(a) _____
- 63 - What did you learn about the project?
(a) _____
- 64 - Which farm size would you prefer most?
(a) less than 10 ha.
(b) 20-30 ha.
(c) 30-40 ha.
(d) 40-50 ha.
(e) more than 50 ha.
- 65 - What types of pastureland resources do you prefer most?
(a) like we have always had
(b) seeded areas of pasture to improve the forage
(c) irrigated and seeded areas for pasture

28 - Do you have your own car?

- (a) Yes
- (b) No

29 - What type of car do you have?

- (a) Reliance
- (b) Other

30 - Do you have any other cars?

- (a) Yes
- (b) No

31 - If you have other cars, what are they?

- (a) Other
- (b) Other
- (c) Other
- (d) Other

Pastor's Office

32 - Where is your office?

- (a) ...

33 - What is your office number?

- (a) ...

34 - What is your office address?

- (a) ...
- (b) ...
- (c) ...
- (d) ...
- (e) ...

35 - What is your office phone number?

- (a) ...
- (b) ...
- (c) ...

- 66 - What amount of irrigated pasture would most encourage you to settle?
- (a) less than 10 ha.
 - (b) 10-20 ha.
 - (c) 20-30 ha.
 - (d) 30-40 ha.
 - (e) 40-50 ha.
 - (f) more than 50 ha.
- 67 - How strong would your desire for settlement be if you were given a farm and a house on the project?
- (a) very strong
 - (b) strong
 - (c) weak
 - (d) no response
- 68 - If the project gave you more than 50 ha. of very good pasture to settle on, a house, and an area to cultivate, and said you could only keep three-fourths of your herd, what would you do?
- (a) sell the animals that were not permitted and settle
 - (b) pasture the extra animals somewhere else
 - (c) decide not to settle
 - (d) other (specify)
- 69 - If the project gave you more than 50 ha. of very good pasture to settle on, a house, and an area to cultivate, and said you could only keep one-half of your herd, what would you do?
- (a) sell the animals that were not permitted and settle
 - (b) pasture the extra animals somewhere else
 - (c) decide not to settle
 - (d) other (specify)
- 70 - If you settled on the project would you or your family do any of the following in order to earn your subsistence and/or money?
- (a) herd on the farm
 - (b) herd off the farm
 - (c) grow cereals
 - (d) grow vegetables
 - (e) sell goods (commerce)
 - (f) harvest someone else's crops for wages
 - (g) build someone else's house for wages
 - (h) look after someone else's animals for wages

71 - Rate the following items in order (1-9) of terms of their importance to you in deciding to settle:

- (a) a school
- (b) a clinic
- (c) veterinary services
- (d) dispensaries
- (e) big cement house
- (f) a mosque
- (g) a market for produce
- (h) a market for animals
- (i) regular truck and taxi service to urban areas

72 - Which of the following are most important to you in deciding to settle?

- (a) orchards
- (b) large areas in which to cultivate cereals
- (c) large irrigated pasture
- (d) areas in which to cultivate marketable crops
- (e) opportunity to earn money by working for others
- (f) raising camels
- (g) raising goats
- (h) raising sheep

73 - If you were to choose a farmstead, which of these are the most important in terms of their proximity to you?

- (a) relatives
- (b) friends
- (c) the city
- (d) markets
- (e) roads
- (f) mosque(s)
- (g) school(s)
- (h) dispensary
- (i) water points
- (j) grazing
- (k) other (specify)

74 - Do you think that the water provided by the project is enough for your needs?

- (a) yes
- (b) no (if no, why)

75 - Do you think the irrigated grazing land provided by the project is enough for your needs?

- (a) yes
- (b) no (if no, why)

76 - Do you think the unirrigated grazing areas are large enough for your needs?

- (a) yes
- (b) no (if no, why)

77 - Are the irrigated farming areas large enough for your needs?

- (a) yes
- (b) no (if no, why)

78 - If you did not obtain land after the project is distributed, what will you do?

- (a) go back home and join the rest of my family
- (b) go to a nearby city to find a job
- (c) other (specify)

79 - Is the project located on your tribal land?

- (a) yes (go to 81)
- (b) no

80 - How long does it take to reach the project area from your home area?

- (a) less than 1 hour
- (b) 1-2 hours
- (c) 2-3 hours
- (d) 3-4 hours
- (e) 4-5 hours
- (f) more than 5 hours

81 - Are you going to keep a house in your traditional area if you settle on the project?

- (a) yes (why)
- (b) no (why)

82 - Would you prefer to settle on your traditional homeland?

- (a) yes
- (b) no

83 - What are the advantages of an individual settlement farm?

- (a) can use the land as one likes
- (b) can have own title deed
- (c) availability of water
- (d) no overgrazing
- (e) can get loans easily
- (f) other (specify)

84 - What are the disadvantages of an individual settlement farm?

- (a) land may be too small for herds
- (b) can keep few animals
- (c) face problems alone
- (d) need money to function
- (e) land may not support children in future
- (f) no other place to go in case of drought
- (g) lose touch with neighbors
- (h) farms prevent access to traditional drought retreat areas
- (i) other (specify)

85 - What problems related to herding do you face?

- (a) drought
- (b) lack of grazing
- (c) lack of water
- (d) herders too young
- (e) disease
- (f) meat prices
- (g) other (specify)

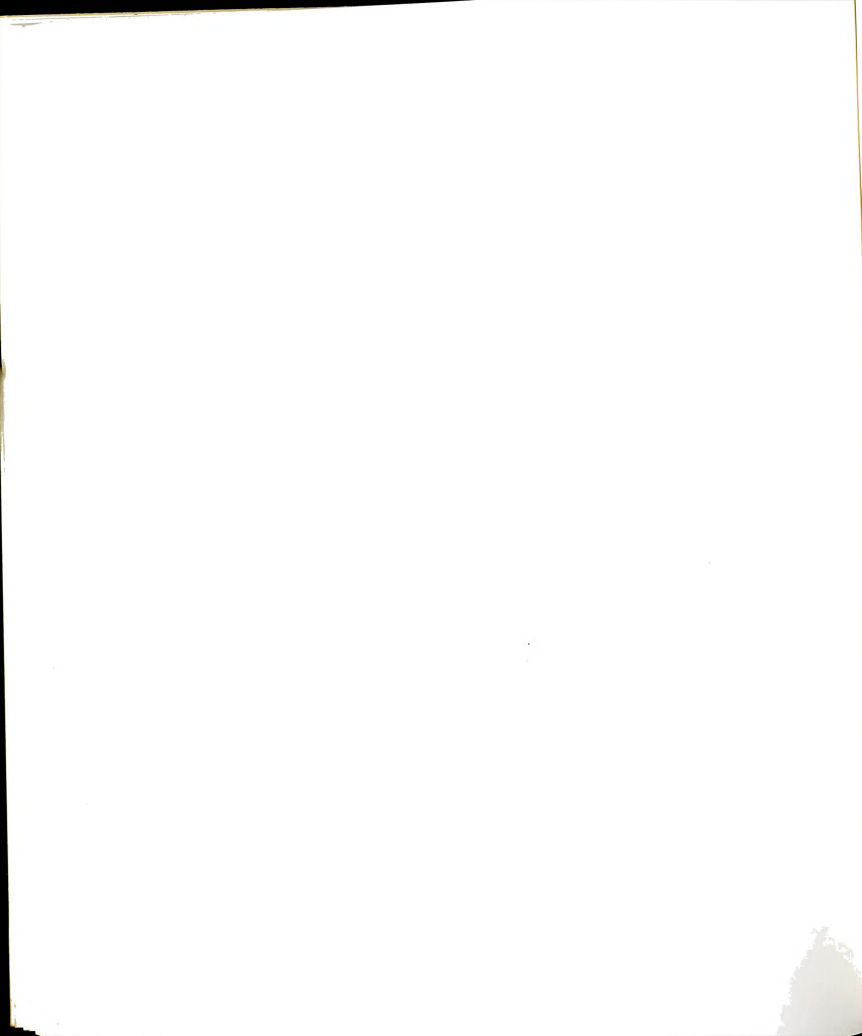
86 - Are you able to deal with them?

- (a) yes
- (b) no

87 - Will the project improve your ability to solve your problems?

- (a) yes
- (b) no

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