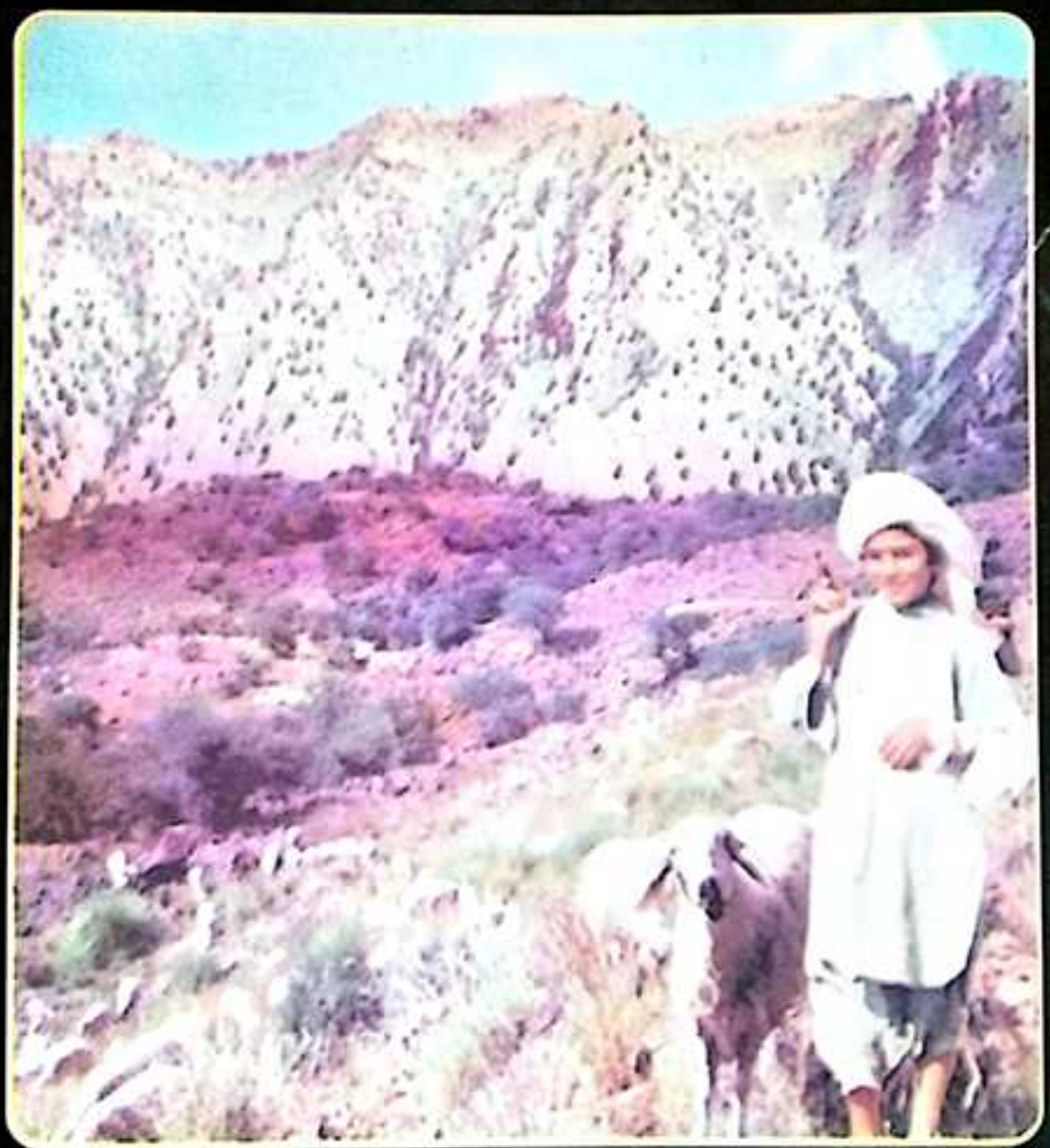
THE SHEPHERDS OF KOH-I-SULAIMAN IN BALOCHISTAN

A SOCIO-ECONOMIC PROFILE

Nek Buzdar, Ph.D



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PREFACE

This book is the outcome of a study of the socio-economic life of a group of Baloch tribes living in the Koh-i-Sulaiman range of the Balochistan province of Pakistan. An overwhelming majority of the Balochi and Pashto speaking tribes of the Sulaiman mountain range lead a semi-nomadic life and manage to eke out a bare subsistence living by raising animals, mainly sheep and goat. Life in these mountains has never been luxurious and never enviable to outsiders. But, those who live here truly love their rugged mountains, their pristine natural environment, and the freedom to live their lives according to their customs and traditions. They believe that their cherished Baloch values could only be preserved in the safety and security of the mountains. A mountain Baloch is proud to call himself a Koh Baloch which translated in English implies, "A mountain man always lives free". However, during the past few decades changes with important and far reaching consequences have taken place in the general Sulaiman mountain region. Both human and animal populations have increased, external market influences have penetrated, and the rangeland resources, the mainstay of the local economy, have greatly degenerated. As a consequence people of the area are faced with unprecedented levels of poverty, deprivation, and suffering.

I was born and spent my early childhood in Andarpur-Maari section along the western slopes of the Sulaiman mountain range. For a few years in the 1940s, I accompanied my family in their nomadic movements in search of better pastures. I ended up living in some of the most beautiful places in the United States of America, but my intense love for the mountains and the nomadic Baloch way of life have always stayed with me. While a Ph.D. student at the University of Hawaii, U.S.A., I returned to my native tribal land for my doctoral dissertation research. I had originally planned to study the purely economic factors behind rapid depletion of the Koh-i-Sulaiman tribal rangelands and deterioration of the living standards of the tribesmen. I soon discovered, however, that the local tribal economy was an inextricable part of the local culture and society, as Dalton had earlier discovered. (Dalton, 1967). I, therefore, decided to study the entire tribal economy, with particular emphasis on the impact of social institutions and economic forces on resource use, productivity and economic growth.

With its peculiar topographic, rainfall, and climatic conditions, and under the technology of production currently available in Balochistan, range

animal raising is probably the most efficient and potentially rewarding economic activity that can be undertaken. Balochistan, thus, has a comparative advantage in animal raising over any other economic activity and millions of the people of the province derive at least a part of their income from activities related to animal raising. The comparative advantage is entirely based on the availability of millions of acres of rangeland spread over the length and the breadth of the province. The problem that is identified in this book is that the rangelands of Koh-i-Sulaiman are being rapidly depleted and many species of grasses and other vegetation are fast approaching the stage of extinction. Because the Sulaiman mountain range is partly covered by summer monsoon rains, its rangelands have always been recognized to be among the best natural rangelands in Balochistan. If range resource depletion in Koh-i-Sulaiman is so bad it must be far worse over the rest of the province's rangelands.

In my opinion it is not only the rangeland resources of the Koh-i-Sulaiman and the rest of Balochistán that face extinction, but it is the culture, the language, and the ways of life of hundreds of thousands, if not millions, of the mountain (and desert) Baloch that face a similar fate. During the recent decades hundreds of thousands of the Baloch from the Sulaiman and other regions of Balochistan left their mountain abodes and settled in the foothills and deep into the plains of Sindh and Punjab. Most of them have lost their language, their culture, and their ways of life. If nothing is done to improve the living conditions in the mountains, more and more tribal people will be forced to migrate to other places of the province and the country, just to escape starvation. The living conditions can improve only if comprehensive programs of range improvement including reseeding, reforestation, and better water storage are implemented.

It is my hope that this book will contribute towards a better recognition of the grave problems of resource depletion and poverty in the animal raising areas of Balochistan in general, and in the northeastern Koh-i-Sulaiman region in particular.

Nek Buzdar
July, 1, 2008

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CHAPTER I

INTRODUCTION

1.1. Balochistan

Balochistan is one of the four provinces of Pakistan. It is bounded on the west and north-west by Iran and Afghanistan, on the north and east by the Pakistani provinces of North West Frontier, Punjab and Sindh, and on the south by the Arabian Sea and the Persian Gulf. Balochistan is an extension of the Iranian plateau and consists of barren mountains, intermountain valleys and ravines, deserts, and a four hundred mile long Arabian Sea coast with adjoining coastal plains. The province has an area of 134,000 squire miles (347,000 square kilometers) about 44 percent of the total geographical area of Pakistan being the largest of its four provinces in this respect. On the other hand, Balochistan with an estimated population of a little over six million (2006) comprises only 3-4 percent of Pakistan's total population, and is thus the smallest and least populated province of the country. Most of Balochistan's landscape and settlements are inaccessible to outsiders due to lack of roads, extremely difficult terrain, and harsh living conditions. Thus, no reliable information on the socio-economic conditions of the interior of Balochistan are available and the following statements are based on personal surveys and the best available estimates.

Admittedly within Pakistan, the people of Balochistan are among the least developed economically, the least literate and the most deprived of the basic necessities of life. Balochistan's per capita annual income of about 300 US dollars (2006 estimates) is only about one third of the Pakistan average and real unemployment rates stand at 80 percent of the labor force. Over 95 percent of the villages and settlements in Balochistan have no access to clean drinking water and over 90 percent have no drinking water whatsoever available within their homes. Illiteracy rates outside of a handful of cities and towns remain over 90 percent, maternal and infant mortality rates are over 200 per 1000 and more than half of the children die before they reach the age of 5 years.

Traditional economic pursuits of animal raising, dry farming, and subsistence fishing still provide a living to the majority of the population of Balochistan. Increased population, primitive technology of production, and deteriorating environmental conditions have, in recent years, resulted in further poverty, deprivation, and suffering among the local population. Water remains to be the number one limiting factor as annual rainfall varies between 2-16 inches and there are areas in western Balochistan where, on average, it rains once every four years. Other factors limiting economic growth are lack of basic physical and economic infrastructure and non availability of preliminary educational and health facilities.

Balochistan, however, is rich in exploited and unexploited natural resources. Coal deposits were discovered during the period when Balochistan was under colonial rule in 19th century and huge quantities are still being mined at different locations in Balochistan. Once extracted almost all of the coal is taken in raw form to other provinces of Pakistan and no direct or indirect benefits accrue to the people of Balochistan. Huge reserves of natural gas, the first ever discovery in Pakistan, were found in Sui area of Balochistan in 1950s. Sui gas, the name by which natural gas is commonly known in Pakistan, was soon supplied to industrial and household consumers in all the provinces of Pakistan except to those in the province of its origin, Balochistan. Sui gas mainly for household use was supplied to the provincial capital of Balochistan in late 1970s. The gas supply is still limited to a handful of cities and towns and over 99 percent of the villages and settlements in Balochistan have no sources of energy within their homes and have no access to electricity and natural gas. In the absence of any sources of energy available to the households, people resort to cutting the sparsely growing trees and bushes causing widespread depletion, and further barrenness and desertification. A reading of the District Gazetteers of Balochistan written by British and Indian researchers and surveyors around the turn of the twentieth century reveals that all the districts of Balochistan contained relatively large forested areas, had trees, vegetation and wild life that have since become extinct, and had rangelands with far higher carrying capacities than today. Minerals including iron ore, marble, gypsum are being extracted since mid-twentieth century; and gold and copper deposits in Sandak-Riko Dik/Chagai were discovered in 1970s and are being exploited ever since. Again no direct and indirect benefits are reaped by the ordinary people of Balochistan, as all are extracted and taken in raw form to other provinces where they are directly consumed or processed to convert them into

finished products. Unfortunately Balochistan's natural resources afford very few employment opportunities to the local residents of Balochistan. In most cases even menial unskilled workers including coal miners, guards, and drivers working in the extraction and transportation of the minerals come from other provinces of Pakistan.

1.2. Area of Study and Resources:

The area selected for studies is situated in the northeastern part of Balochistan along the western slopes of the Sulaiman mountain ranges and includes the tribal territories of two administrative districts of the province namely Musakhel and Barkhan. Koh-Sulaiman is one of the most important bordering mountain ranges between the Iranian plateau and the Indian sub-continent. It has a north-south axis extending from the Indus plain in the south to Afghanistan in the north. Various ranges of Koh-i-Sulaiman are known by various local names as they pass through different ethnic and tribal communities. The Arabs who conquered the adjoining areas of today's Sindh and Punjab in 7th century AD, found Pashtun tribes to be the main inhabitants of the Sulaiman mountain ranges. Today various Balochi speaking tribes inhabit most of the ranges that separate Balochistan from the plains of Sindh and Punjab while Pashto speaking tribes live along the ranges extending further north. An almost similar topography with stony hills, rugged mountains and narrow valleys exists over most of the Sulaiman mountain ranges including the Marri-Bugti hills to the southwest of the area of study and Waziristan hills to the north. Takht-e-Sulaiman, the highest peak of the Sulaiman mountains (3,487 m (11,437 feet), lies less than 100 miles to the north. Valley bottoms and plateaus in the area of study vary from 2,500 feet to 3,500 feet in elevation while the hills and mountain elevations range between 4,000 and 8,000 feet above sea level. There exist many mountain passes, ravines, and gorges and generally passage from one ravine or valley to the next is very difficult, time consuming and at times dangerous. The eastern slopes of the Sulaiman mountains drain directly into the Indus river, whereas surface runoff in the remainder of the area is discharged towards the southwest into the plains of Sibi-Kachhi. Some drainage from the western slopes of the Sulaiman mountain range runs northward to the rive Gomal eventually joining the Indus river system. Main seasonal rivers are Zhob, Sihan/Anambar/Nari/Beji, Luni, Kingri, Rakhni/Kaha, Cheel, Sanghar, Karer, and Sirin.. Hundreds of seasonal streams and creeks flow into these rivers. Only some of the rivers have a perennial flow which frequently

disappears beneath stony beds. Rainfall is irregular and light, and in the area of study it is estimated to be between 12-16 inches a year. Winter rainfalls coming from the Mediterranean Sea occur less frequently and most of the rainfall occurs in spring and Summer. The summer rainfall comes at the end of the monsoon in July, August, and September and is sporadic in distribution and falls in the form of torrential thunder showers. The area has a mean temperature of 76 degrees F (24 degrees C) but the temperatures vary with altitude. In lower valleys and hills, temperatures in summer go as high as 120-130 degrees F, while at higher elevations summer temperatures remain between 60-80 degrees F. In winter the mountains and occasionally the valleys receive some snow and become very cold with temperatures below freezing point.

Vegetation cover tends to be distributed altitudinally. At the higher altitudes are found scattered stands of pistachio, wild almond, wild olive, wild pomegranate and certain varieties of acacia. At lower elevations and valleys are found dwarf palm (Nannorhops ritchieana/Balochi:Peesh, Pashto: Mizir) acacia (Acacia arabica and Acacia modesta, Balochi: kaur, kaheer, Karitkokh, Chagird), tamarix (Tamarix indica, Balochi: Gaz/Ganz), and Zizyphus (zizyphus jujuba, Balochi: Kunar). A partial list of local Balochi names of the trees, shrubs, and grasses is given below.

Trees and Bushes: Anar, Baagh, Chagird, Dramar, Gadarashk, Gargool, Geeshtar, Gun, Gunkaseer, Hat, Hinjir, Hum, Jaur, Kaheer, Kandi, Karitkokh, Kaur, Konar, Kontor, Maiwar, Matreek, Shaag, Sharoo, khofren, Paner, Pheer, Taali, Tolag-konar, Tuli, Zamur

Grasses: Chabar, Chofar, Gasht, Gorkha, Jagarsum, Jhalli, Khik/Kash. Nadig, Onhar, Peetaar, Samukh, Seefar, Sivar, Washbo, Zandan,

1.3. The People and Their Means of Subsistence

Various tribes living in this northeastern corner of Balochistan are of Baloch and Pashtun origin, their main groups spreading over the rest of the province and over large parts of Iran and Afghanistan. The semi-nomadic tribes and sub-tribes have historically practiced common tribal ownership rights over cropland as well as rangeland, although in recent years, privatization of both types of lands has taken place in many areas. By far the most widely practiced occupation in the area of study, as over large parts of the province, is animal, mainly sheep and goat, raising on

mountain rangelands. A typical Baloch animal raising family produces most of the output including mutton, milk, wool, and hides for its own consumption, although some animals and animal by-products may be sold or bartered in exchange for grains and cloth in the neighboring agricultural settlements. The nomads' staple food, besides milk, butter milk or whey (Turshen Sheer), and cheese (Paner), is bread made from wheat grains. Output and productivity are low because of severely depleted rangelands, technological limitations, rigid social institutions, and the absence of communication and marketing networks connecting the tribal areas to markets in urban centers of the country. Capital investment is minimal and land and labor are the principal factors of production.

It seem that, in the general region, the law of diminishing returns is in operation as more labor is applied to ever dwindling flocks and depleted rangelands. Labor is underemployed for most of the year, although workers may be fully employed at seasonal peak periods, such as the lambing period in the spring. The local economy with the above characteristics enables the people to scratch a bare minimum subsistence living for themselves and their families. Without doubt the animal raising nomads in the areas of study and elsewhere in Balochistan, are economically among the poorest of the poor in Balochistan.

1.4. A Glimpse of Life in a Typical Sulaiman Mountain Village

People work hard, yet they are very poor and have very few objects of comfort in life. People live literally by bread alone and only the relatively rich can afford wheat bred, the rest survive on sorghum or millet bread once or twice a day. All members of the family, adults and children, men and women, young and old work all day long and throughout the year. Starting an hour or two before morning prayers, the women and female children grind grain into flour, bake bread, fetch water and firewood from long distances, clean, wash, and take care of the children. Men and boys guide the flocks to the best pastures and to the watering points keep a close watch on animals and protect them from predators and thieves, and in the evening bring home a load of hay or twigs and branches for animals that are being cared at home. At night a man must sleep in the goat or sheep pen to protect the animals from wolves and thieves.

All families live in movable tents made of dwarf palm leaves in summer and in huts made of tree trunks, twigs, branches and reed in winter. To make fire a person strikes a piece of stone (probably flint) against a piece of steel to produce sparks and then uses a tinder (purz in Balochi) for catching the sparks to make fire. In a typical traditional settlement this is the only way to make fire and the fire-making kit called Aasgezh is one of the most prized possessions of a family. The main source of drinking water for both human and animal populations is the rain water collected in ponds or cisterns. Water borne diseases are abound particularly in summer and particularly if it does not rain for more than a month to six weeks.

Most of the women and children in the village wear no shoes and walk barefoot to do their daily chores. Only about half of the adult men wear shoes made locally from cowhide, the other half wear shoes made of dwarf palm leaves. The dwarf palm made shoes called Peesho or Sawas, do not last for more than a few days thus requiring frequent replacement. Only in the villages close to the road system people have access to aspirin, quinine or other modern medicine. One of the two main systems of treating sicknesses is the Post, where the sick person is encased up to 12 hours in the skin of a freshly slaughtered sheep or goat. The other system is Taweet, where an amulet obtained from a Mulla is worn by the sick person until he gets well.

1.5. The Problem

1.5.1. The Depleted State of Rangelands in Balochistan

There are solid reasons to believe that most, if not all, the natural rangelands in Balochistan are overgrazed and depleted. Some of the common reasons are as follows. (i) Due to the general conditions of low rainfall, scarce vegetation growth, and lack of other employment opportunities, it is highly likely that overgrazing and depletion would be occurring. (ii) Most animal raising tribes practice annual closing periods and rotational grazing, and enforce tribal and religious requirements that limit the number of animals raised in a tribal rangeland. These practices and limitations indicate that an overstocking problem exists and that these systems have been devised to avoid further overstocking and depletion (iii) Presence of gullies, widespread erosion, and drying up of streams and other sources of water obvious to a casual visitor to the areas are an indication of overstocking and depletion of the rangelands. (iv)

Widespread presence of invader plants and large proportions of unpalatable and invaluable vegetation species in the rangelands of Balochistan are possible indications of overstocking of the rangelands.(v) Poor conditions of animals, extremely low productivity, and low per capita incomes in the area are, most probably, the result of overstocking and thus depleted conditions of the rangeland resources. (vi) Some research and studies on rangeland productivity, and stocking rates relationship carried out in different areas of Balochistan (Bhatti, 1970, Ali, 1968) show that, generally, stocking rates are many times higher than the carrying capacity of the rangelands in the province. (vii) Finally, a system of common property rights exists among most of the semi-nomadic tribes of the area. According to the traditional economic thinking this type of property rights system provides incentives to individual resource users to maximize their gains through overstocking. The above reasons lead one to believe that most rangelands in Balochistan in general, and in the Sulaiman mountain ranges in particular, are being utilized above their grazing capacities and are being depleted.

1.5.2. Range Utilization Beyond Carrying Capacity

It is generally true of all rangelands that their maintenance, depletion or conservation, and general productivity depend, to a great extent, on their levels of utilization. The level of rangeland utilization is a more crucial factor in Balochistan where the growth of vegetation is scarce and entirely dependent upon the rainfall which is as scant as a mere two inches a year in some areas. No artificial irrigation, fertilizer or any other inputs are added and no reseeding or replanting is done to improve the productivity of the rangelands. At any given level of range utilization, the possibility exists that variations in stocking or utilization rates will lead to variations in future forage and animal productivity. Normally it is recommended that utilization levels should not exceed the carrying capacity of the ranges. If the current levels of utilization exceed the carrying capacity, production in subsequent years will be reduced, because the vegetation has lost its ability to produce leaves, roots and seeds at the same rate as before. At levels beyond the carrying capacity, therefore, any increase in stocking rates should normally lead to a decrease in productivity, and conversely any reduction in stocking rates should normally lead to an increase in productivity.

If it is true, as argued in the previous section, that the stocking rates in the tribal areas of Balochistan generally exceed the range carrying capacity, then it must also be true that stocking/utilization rates and rangeland productivity normally would have a negative relationship. In other words, in the rangelands of Koh-i-Sulaiman in Balochistan , normally an increase in animal numbers per forage acre would result in a decrease in range productivity. Studies on rangelands in the United States of America and elsewhere indicate clear relationships between stocking/use rates and productivity of rangelands. Marion Clawson (Clawson, 1950) refers to various experiments by J.T. Sarvis (1941), W.G. McGinnies (1946), and E.H. McIlian (1947). These experiments showed that within any reasonable limits of rates of stocking, the more animals per unit area, the less the gain in weight per animal. This is true even though a substantial part of the native forage is ungrazed at the end of the season. James Gray (1968) refers to some other experiments conducted by Merrill and Miller (1961) over a twenty year period. These experiments show that pastures studied in Texas yielded a return of $44 per acre when cattle were grazed at the lightest rate and $28.65 at the heaviest rate. In case of sheep these returns were $52.60 and $30.01 per acre at the lightest and heaviest rates respectively. On the basis of their experiments it was determined that when the level of utilization of a range is 20-30 percent of the current annual growth of the major species present at the range site it is considered light grazing, 30 –50 percent is considered moderate grazing and over 50 percent is considered heavy grazing.

1.5.3. Social Institutions, Resource Use Incentives, and Productivity

It is normal to assume that individual tribesmen, with animals as their main means of living, strive to maximize their utility, or satisfaction and profits as consumers and entrepreneurs. It is also well known that different societies impose restrictions and guiding rules on their members which provide them with different incentives as far as their production decisions and resource uses are concerned. This phenomenon of imposing restrictions and limiting freedom may be called the assignment of property rights or decision making rights (Bromley, 1992). Such attenuated property rights or decision making rights are defined and regulated by the social and political institutions. It is also assumed that the economic behavior of an individual tribesman is determined by external and internal economic and social incentives. External incentives involve the trade and

economic relations of animal raisers with producers of other goods. This requires examining prices of the pastoral products and of the products that the pastoralists buy as well as other external factors affecting costs and revenues involved in animal raising. The internal incentives involve assignment of property rights and their definition, enforcement and regulation by the family system, tribal organization, and religious institutions. These two types of incentive systems are considered to be the main determining forces behind an individual tribesman's behavior and actions. Decisions made on these bases result in different levels of stocking and resource utilization and thus range productivity and economic growth.

Economists agree that economic forces such as income, prices, and taxation influence individual behavior towards resource use. But considerable disagreement exists over what these influences really are and how they affect changes in behavior towards resource use. For example, Doran, Low, and Kemp (1979) conclude on the basis of some of their recent studies that animal price increases induced resource users to further overstock the already depleted commonly owned grazing lands in Swaziland. Lovell Jarvis (Jarvis, 1980) on the other hand contends that long run price response of slaughter (or sales) of animals was positive meaning that price increases do not lead to further overstocking. Similar disagreements exist over the role of institutions and property rights systems. In their well known theoretical works Wantrup and Bishop (1975), Dahlman (1980) and Runge (1981) contend that common property rights systems and related institutions have, in the past, effectively prevented the resource overuse and destruction and that they continue to play an important role in resource conservation. These views are contested by Scott (1954), Hardin (1977) and Livingstone (1977), who believe that the common property rights system inevitably leads to resource overuse and depletion.

1.5.4. Institutional Change, Resource Use, and Productivity

Although the tribal rangelands in the area of study have similar physical features and most tribes follow their centuries old socio-economic institutions, changes in certain aspects of institutions have taken place among some tribes of the area in relatively recent years. Changes in aspects of traditional institutions seem to be the result of absorption of outside influences, by different tribal groups living in the area.

Institutional changes could have positive or negative consequences for traditional societies such as those living in these remote areas of Balochistan. Brian Spooner (Spooner, 1967) who carried out his studies among the Baloch tribes in the Iranian Balochistan has made some important observations with regard to outside interest and influences in case of Baluchistan as a whole. His remarks seem to reflect past as well as present realities. He says, "Balochistan is a marginal area in the sense that at a given level of technology it can support fewer people per unit area in poorer circumstances than is the case in surrounding areas. It is generally true of such marginal areas...that economic development of them is difficult except as the result of direct interest from an external power, but that unless they are important for communications, mineral deposits or other strategic considerations, such interest is not exerted. The investment required to achieve or maintain political control is not justified". As explained below, mainly because of its inhospitable physical environment, historically outsiders have intervened in Balochistan only for strategic purposes and for purposes of safeguarding the interests of the empires to the east and the west. Economic development and well being of the Baloch people has never been the intention of anyone. British invasion and occupation of Balochistan was purely for purposes of securing the borders of the British Indian Empire from rival expanding empires. Unfortunately in the process, traditional Baloch resource use related institutions which were relatively more conducive for economic growth and well being, were weakened and not replaced by any other institutional arrangements to this day.

Until about the middle of 19th century Balochistan (then included the present Pakistani province of Balochistan, Iranian province of Seestan-o-Baluchistan, and all of Nimruz and parts of Helmand, Farah, and Kandhar provinces of Afghanistan) was independent, inaccessible, isolated, and mostly free from outside influences. The First Afghan war (1839-42) between the British Indian Empire and Afghanistan was a watershed event as far as exposure of the people of Balochistan to outside influences is concerned. The British wanted to establish and maintain safe means of communication, transportation and supplies between India and Afghanistan through the country of Balochistan. The Baloch tribes, particularly Jakhrani, Dombki, Marri, Bugti, and Brahvis under Ahmadzai Khans, fiercely resisted invasion of their land and for many years held the British at bay. However, by the end of the century the British succeeded in concluding agreements with individual Baloch Sardars (chiefs) whereby

the Sardars would be responsible to protect the British lines of communication and other interests and will be rewarded for their services by the Raj with money, land, jobs, and titles.

The government built two main roads and a railroad system connecting British India with points at the borders of Afghanistan and Iran. Two things with important and far reaching consequences happened. First, the Baloch chiefs were no more dependent on their fellow tribesmen for their leadership and power, so they did not need to follow tribal traditions and customs including those that restricted their personal use of commonly owned tribal land and range resources. The tribal chiefs appropriated some of the best and most productive parts of the common rangelands for their personal use. The chiefs also tried to use government power against their own tribesmen if they objected to their excesses, and used tribal power against the government, if, at times, it was not accommodating enough. This resulted, among other things, in the long run overuse and depletion of now contracted rangeland resources, emergence of inequality in the traditionally egalitarian Baloch tribal society, and disappearance or weakening of group solidarity. Second, the Baloch animal raisers particularly those living in areas adjacent to the newly built means of communication and transportation, were exposed to outside economic and social influences. Such influences required raising animals for market, avoiding traditional restrictions on number of animals raised in a particular tribal rangeland, and relaxing requirements of annual closing periods. This, in turn, resulted in less animals being available for traditional kin help and tribal solidarity, greatly weakening the traditions of cooperation, dispersion of wealth, and egalitarianism in the tribal society. Jeremy Swift (1979) talks, among other things, about the consequences of penetration of market economies into the previously subsistence nomadic economies. He thinks that important changes have taken place after the switchover from one type of economy to another. One change is the increase in sale of animals and hence a decline in the number of animals available for loans and gifts to those in need. Other changes include the general loosening of traditional social and economic networks and reorientation of economic activity towards the market.

The tribes and the territories most affected by these changes were those that lived in the vicinity of roads, railways, and other means of transportation and communication. Today, different tribes are at different levels of change and socio-economic transformation. But, a certain line

can be drawn between two categories of tribes; those which for the most part follow traditional institutions of resource use and management and those who, for the most part, do not. To distinguish and for analytical purposes, we will call the former category of tribes as traditional and the latter as non-traditional. Most of our analysis of institutions and resource use (stocking rates) relationships, and resource use and productivity relationships are based on the above definition of traditional and non-traditional tribes and tribal rangelands.

On the basis of the above discussions, the problem can be summarized as follows.

1. Because of the topographic and rainfall conditions, rangelands in Balochistan are, in general, sparsely vegetated, overgrazed and in a depleted state.
2. Because the rangelands are generally depleted and overgrazed, an increase in stocking/use rates would normally result in a decrease in rangeland productivity.
3. Traditional tribal institutions of property right ensured that use rates were not excessive, limits on use rates were practiced, and a certain minimum level of range productivity for survival was maintained.

Recent changes in property rights and related institutions and control mechanisms seem to be causing widespread depletion of resources and poverty among the resource users.

A tribal rangeland of Koh-i- Sulaiman

Rangelands include hills and dry rive beds.

Edible cactus called pheetag some times the only food available

The Author during his research in Koh-i- Suliman

CHAPTER II

LITERATURE REVIEW

As the nature of the study requires, the literature cited in the following pages has, for the most part, been selected from the works of range scientists, anthropologists, economists, and ecologists. The literature review is divided in three parts. In the first part studies, views and comments offered on the subject by economists, ecologists as well as range scientists, with respect to general problems of range carrying capacity, use rates and renewable and exhaustible resource depletion, are reviewed. In the second part some selected comments of economists and other social scientists regarding the effects of institutional factors on economic behavior and decision making of the resource users are described. The last part of the literature review deals mainly with discussions of economic efficiency and performance of the institution of common property rights. As far as is known, absolutely no institutional or range productivity studies have been carried out in this remote area of Balochistan. However, a smaller number of, mainly anthropological, studies were carried out elsewhere among the Baloch tribes in Iranian and Pakistani parts of Balochistan and some range management studies were carried out in areas near Quetta, the provincial capital of Balochistan. Brief reviews of these studies are included in the literature review. However, most of the literature review consists of works and studies conducted either in arid and semi-arid areas similar to Balochistan or among nomadic and pastoral people similar to the Baloch. Efforts have been made to include studies and views of writers and scientists with opposing views on different aspects of the problem under study. The literature review is provided as part of an effort to clarify the nature of the problem and also the importance of the present study.

2.1. Institutions and Resource Use

Institutions affect resource use decisions in all societies, but in the tribal areas of Balochistan informal traditional institutions probably

control every social, economic, and political aspect of life. To understand the impact of institutions on resource use, particularly in the traditional Baloch society under study, it is important to refer to what anthropologists and economists have said about the economies of similar societies. In the first part of this section views of economists and anthropologists regarding the applicability of economic theory to nomadic and other such societies are reviewed. In the second part, views and comments of both these groups of scientists regarding the consequences of institutional change are examined.

Goodfellow (Goodfellow, 1939) thinks that the principles of economic theory apply to individuals in all types of societies. He says that the suggestion that there should be more than one body of economic theory is groundless. He says that if modern economic analysis, with its instrumental concepts, cannot cope equally with all types of societies and people then not only economic theory, but the whole of social sciences may be discredited and meaningless. Godelier (Godelier, 1972) has different views about the applicability of the laws of economics to different types of societies. He writes that to contend that political economy applies to every economic system because the theory of price applies to every such system means reducing political economy to the theory of prices. This involves cutting off from the political economy a number of important developments like Keynes's theory that full employment does not automatically prevail in a market economy. He adds that in reality everything that is known of ethnology and history shows that, in all societies, individuals and groups have tried to maximize certain objectives, the content and order of priority of which expressed the dominance of certain social relations such as kinship and religion. Since incomes in primitive economies are not derived from and dependent upon sale of products in markets, the maximizing of money gains by individuals is not the only rational attitude possible. He concludes that such economic rationality is the product of special historical evolution and is characteristic of developed capitalist societies. Ciriacy Wantrup (Wantrup, 1976) talks about the role of social institutions in traditional societies. In his view customs and traditions, "habit patterns" are very important in influencing

individual behavior. He thinks that under such situations a conservation policy should attempt to bring the social institutions affecting the state of conservation into agreement with each other and with changing economic conditions. Wantrup feels that achieving such an objective may require the weakening or elimination of some social institutions and strengthening of others.

George Dalton (Dalton, 1967) in writing about traditional production in primitive African economies notes that because of the absence of market exchange as the dominant economic organization among these societies, the production process takes forms which are different from those of the western countries. He explains that production in these societies is controlled socially by kinship, religion, and political heads. In dealing with the problem of colonial impact on the traditional economies, he states that the destructive aspect of colonialism was not economic exploitation because these societies were already poor economically. In his opinion colonialism destroyed the culture and society of which the local economy was an inextricable part. It destroyed ways of life where the economic and social processes were mutually dependent and reinforcing. Sahlins (Sahlins, 1972) also points out the differences in traditional and modern industrial societies by saying that most African and other traditional societies belong to an economic order very different from that of the West. This economic order is characterized by subsistence form and no accumulation of wealth. Any accumulated wealth gets rapidly dissipated and therefore no permanent class divisions arise. Sahlins notes that in nomadic societies distinctions of rank, status or occupation operate independently of differences of wealth. B.S. Yamey (Yamey, 1964) also writes about the differences in traditional versus modern westernized societies. He states that economists should be more closely acquainted with the works of anthropologists. A knowledge of anthropologist's works will help economists to be aware that different social arrangements, value systems, and personal motivations and aspirations may have an important influence on economic performance. However, he also cautions against too much emphasis on such differences to the point of ignoring the fact that in some cases, such as price formation, the differences are negligible.

Jeremy Swift (Swift, 1979) talks, among other things, about the consequences of penetration of market economies into the previously subsistence nomadic economies. He thinks that important changes have taken place after the switchover from one type of economy to another. One change is the increase in sale of animals and hence a decline in the number of animals available for loans and gifts to those in need. Other changes include the general loosening of traditional social and economic networks and reorientation of economic activity towards the market. He says that because of these changes, there has generally been a shift away from risk avoiding strategies and a reduction in the ability of the pastoral economy to protect its members in times of crisis. Helen Ware (Ware, 1979) writes about recent changes in nomadic areas in Sub-Saharan Africa. She says that two factors which were actually intended to help nomads have served to worsen the environmental situation of nomadic groups. One was the introduction of improved veterinary medicine and animal disease control and the other was the provision of an increasing number of wells. She thinks that the provision of improved veterinary medicine and wells without also providing additional pasture facilities only serves to increase animal pressure on already depleted lands. She agrees with Dalton (Dalton, 1967) about changes in these societies when outside influences penetrated nomadic lands. She believes that the effect of colonial "peace making" was to destroy the political authority of the chiefs who had the power to enforce conservation measures with respect to pastures. She gives examples of the deposed chiefs of the Northern Upper Volta (called Burkina Faso since 1984) who could decree that after each grazing season certain wells or watering points should not be used until the vegetation in the vicinity regenerates itself. She notes that because of the decline in the chief's power some of the most nutritious grasses and herbage have disappeared. She concludes: "...an essential feature of the way of life of the nomadic pastoralists is that the pressure of man and beast upon the environment is neither ubiquitous nor permanent. Nomads have been able to survive over thousands of years because they have learned to maintain a balance with nature".

Philip Salzman (Salzman, 1976) who carried out field research for his doctoral dissertation among some Baluch (Baloch) tribes in

Iranian Baluchistan during 1967-68, 1972-73, and 1976 thinks that the traditional ways of life were equalitarian in terms of resource allocation and distribution. He points out that in the traditional tribal system of the Yarahmadzai (name of the Baloch tribe he studied) there existed no political domination, economic exploitation, or tyranny among members of the tribe. He argues that the reasons for such equality were that oppression was impossible because the control of means of coercion, production and administration were distributed throughout the tribe and not concentrated in the hands of a small segment of the tribe. The wide and equal distribution of the means of coercion was the result of a limited military technology at the local level; of the mobility of the capital resources, residences and people; and the absence of external coercive sources. In talking about the Iranian government efforts to integrate the tribe (and other Baloch tribes) into the national mainstream he says that since "pacification" (final occupation of Balochistan by Reza Shah Kabir of Iran after defeating Mir Dost Mohammad's independence seeking Baloch forces during 1928-1930) the tribe has been gradually integrated into the national state system of Iran. In spite of this, many of the traditional tribal patterns remain characteristic of tribal life. He says that one major difference is the change in the role of the chief, which has become that of a middleman between the tribe and the government. The position of tribesmen, as a result, has been converted from that of independent followers, to dependent clients. The chief and members of his family have been able to accumulate economic resources. Another difference is an increased degree of individualization resulting from new constraints on the role of the tribal organization and new opportunities open to the members of the tribe.

2.2. Resource use and Rangeland Productivity

Many range management experts and government officials with knowledge or work experience in Balochistan have concluded that stocking rates in Balochistan are generally far in excess of the carrying capacity of the rangelands. In discussing excessive rangeland uses in Balochistan, M.Y. Bhatti (1970) concludes that in

Balochistan as a whole, the stock density stands at an average 17 acres of range area per sheep or goat while the carrying capacity of the ranges in Balochistan is about 100 acres per sheep or goat per year. Zulfiqar Ali, Chief Conservator Forests, Balochistan (1966) agrees with this assessment and mentions some government experiments conducted in the different rain zones of Balochistan. On the basis of these experiments he concludes that in the 5 inch rainfall zone, 125-150 acres are required for the maintenance of one sheep for a year. This area requirement is reduced to 60-80 acres in the 5-9 inches rainfall zone and 25-30 acres in 10-14 inches rainfall zone. His estimates show that the normal requirement in Balochistan is about 200 acres for one sheep for one year, but actual area available in Balochistan is about 11 acres per sheep per year.

As discussed before, the overstocking problem is always implied when reductions in stocking rates increase the productivity of the ranges. In a Pakistan journal of Forestry report (October, 1965) the following research results were mentioned. The protection of rangelands from grazing for two years at Rakh Mari Dhurnal (Attock District) resulted in the increase of vegetative cover from 15.8 to 68.2 percent. Simultaneously the herbage production increased from 32 pounds per acre to 190 pounds per acre. Similarly the closure of 4,000 acres of range land under Kohistan Range Management Scheme for three years (1961-64) resulted in increase in the carrying capacity from 179 acres per animal unit to 54 acres per animal unit.

Overstocking is a widespread problem in most of the arid and semi-arid areas in the part of the world where Balochistan is located. For example Lester Brown (Brown, 1978) cites a U.N. report on the Middle East prepared for the conference on desertification in 1977. The report reveals that although the natural rangelands in north of Iraq are theoretically able to support 250,000 heads of sheep, in actual use they contain about one million head. Similarly the arid and semi-arid natural rangeland zones in Syria contain 3 times the amount of livestock they can support. Brown agrees with the author of the report that the heavy pressure on the natural range lands is one

of the main reasons for the deterioration of the plant cover and the rapid progress of desertification.

The problem of overstocking has historical, economic, social, and political roots. But for any meaningful economic study of rangelands it is imperative to know the resource availability and utilization situation in a particular area first. This requires the use of some quantitative measures. Sampson (Sampson, 1953), Stoddart and Smith (Stoddart and Smith, 1943), Gray (Gray, 1968) and others have used the concept of carrying capacity to measure the forage productivity of the ranges. All of them agree, however that obtaining accurate measurement of range productivity is extremely hard. Economists are more concerned with economic productivity of the ranges. Various studies have been carried out in the United States and elsewhere with regard to this aspect. Marion Clawson (Clawson, 1949) points out that while determining the most economical rate of stocking, consideration needs to be given to the effects of stocking rates on factors such as gain in weight of animals, lamb/kid crop and death losses and the effect upon the range itself. He refers to experiments conducted by J.T. Sarvis (Sarvis,1941), W.G. McGinnies (McGinnies, 1946), and E.H. McIlvian (McIlvian,1947) which show that except at very low levels of stocking, the more the animals per unit range area, the less would be the gain in weight per animal. This is true even though a substantial part of the vegetation is ungrazed at the end of the season. He observes that the gain per animal decreases steadily as the rate of stocking increases but gains in weight per acre increase until a point is reached at which more animals mean a smaller total production of meat. This point is far above any rate of stocking that could be considered reasonable. Clawson also mentions experiments on a Colorado national forest area, where in a four year period forage production on moderately and lightly grazed ranges decreased from 10 to 20 percent because of unfavorable precipitation, but decreased 50 per cent on heavily stocked ranges.

James Gray (Gray, 1968) similarly, talks about the difficulties in measuring range productivity and determining optimal stocking rates. He says that although there are no scientific measures to

determine correct stocking rates, certain rules of thumb can be useful. Some of these rules are: (i) At least 20 per cent of the current annual growth of vegetation should be left ungrazed (ii) presence of unpalatable species and low value invaders indicates that ranges are being overgrazed (iii) Healing of gullies and thrifty conditions of animals indicates that ranges are being used properly. He mentions three levels of utilization approved by the American Society of Range Management. If level of utilization is 20 to 30 percent of the current annual growth of the major species present at the range site, it is considered light grazing, 30 to 50 percent is considered moderate grazing and over 50 percent heavy grazing.

2.3. Common Property Rights and Resource Use

Dahlman (Dahlman, 1980), while discussing the importance and functions of the institution of property rights remarks that ownership and decision making rights are economic choice variables. They are not imposed on an economic system from outside but are developments within that system and are designed to fulfill very specific economic functions. He says that different property rights provide different incentives and that some types of incentive systems yield better economic results than others. Furubotn and Pejovich (Furubotn and Pejovich, 1972) similarly contend that property rights do not refer to relations between man and things, but to the relations among men. They say that Property rights assignments specify the norms of behavior with respect to things that each and every person must observe in his interaction with other persons or bear the cost for non-observance. The prevailing system of property rights in the community can be described, then, as "the set of economic and social relations defining the position of each individual with respect to the utilization of scarce resources" Ciriacy Wantrup and Bishop (Wantrup and Bishop, 1975) think that the institution of common property rights has been misunderstood by economists. They contend that common property is not "everybody's property". The concept implies that any persons or groups that are not members of the group who owns the resource in common are excluded from their use. They explain that, among traditional societies such institutions were

effective in managing resources on a sustained yield basis. Such societies are capable of existing over long periods in equilibrium with their resources unless disturbed by influences from outside. They point out that the most important outside influence was contact with the market economy. Garrett Hardin (Hardin, 1977) explains what happens when the grazing resources are owned in common. He says that as a rational human being each herdsman having a share in the common grazing land seeks to maximize his gains. He compares his positive and negative utilities of adding one more animal to his herd. He receives all the proceeds from the sale of the additional animal but the costs of overgrazing are shared by all the herdsmen and he pays only a fraction of these. So he concludes that the only sensible course for him is to add another animal to his herd. Hardin concludes that because of this situation any commonly owned grazing land is bound to be overstocked and depleted. H. Gordon Scott (Scott, 1954) writes mainly about fisheries, but his analysis is also applicable to such common property resources as grazing lands. He says that in sea fisheries the natural resource is not private property therefore the rent it may yield is not appropriable by any one. Each fisherman is free to fish wherever he likes. The result is competition among fishermen which ends in the dissipation of the rent of the fishing grounds. Muhsam (Muhsam, 1977) agrees with Hardin and Scott and uses a game theoretic approach to prove that resources in commonly owned grazing lands are bound to be overused. He thinks that the incentive system is such that it leads to the depletion of the range resources. He explains the strategy of an individual herdsman. He assumes the situation as a non-zero sum two-person game. The two players are (A) one of the herdsmen (B) all other herdsmen. Each player has one move to make and he has two choices. The individual herdsman, those of adding or not one head of cattle, and all the other herdsmen, those of adding one head of cattle each, or of not adding any cattle. His analysis shows that whatever the action of all the other herdsmen, the individual herdsman will always have an advantage in adding a head of cattle to his herd. If all other herdsmen add a head of cattle each and he does not, he incurs losses. To decrease his losses he must go on adding more and more animals.

Runge (Runge, 1981) believes that the common property problem has been wrongly formulated through the game theoretic approach as an externality associated with the famous, "prisoner's dilemma". He thinks that it is actually an assurance problem where individual strategy is not dominant and therefore a different game theoretic approach should be used. Like Wantrup (Wantrup, 1976) he distinguishes common property from free and open access resources. He compares the prisoner's dilemma" and " assurance" problems. First he explains the "prisoner's dilemma" and implied consequences using the following payoff matrix:

First prisoner	Second prisoner	
	Not confess	Confess
Not confess	(1,1)	(10,0)
Confess	(0,10)	(5,5)

"Confess" or "Not confess" represent the choices (strategies) open to each of the two prisoners. The ordered pairs indicate the number of years in prison which will result from a particular co-incidence of choices. The prisoners are interrogated independently. Both know that, based on the evidence the police already possesses, if neither confesses they will receive short sentences each spending a year in prison (1,1). If one confesses and turns state's witness, he will be released and the other will receive a heavy term of ten years (0,10), (10,0). Finally, if both confess each gets 5 years (5,5). Runge says that assuming a competitive situation, the most reasonable course of action, represented by the pair (1,1) is unstable. Each prisoner must serve his own interests and, therefore, must confess whatever the other does. When each of the prisoners makes a rational decision, it makes both the prisoners worse off. He says that even if both agree to observe choice (1,1) both have an incentive to break the agreement. Therefore, they will chose pair (5,5) which is a pareto-inferior equilibrium. Runge points out that when "prisoner's dilemma" is applied to grazing lands then each individual will chose independently to overstock and this leads to a situation in which all are made worse off. Each individual will make decisions independently and even if agreements are reached regarding a specified limited number of animals to be raised by each individual.

it is an unstable equilibrium and each will have an incentive to break it.

Then Runge formulates what he terms as a correct formulation of the commons problem (with the existence of traditional institutions) and calls it "assurance problem", the problem of cooperation in game theoretic terms. The assurance problem is an amended version of the game called, "The Battle of the Sexes". This two person cooperative game has the following pay-off matrix.

Man	Woman	
	Ballet	Dogs
Ballet	(1,2)	(-1, -1)
Dogs	(-1, -1)	(2, 1)

The man wishes that they go together to the dog races, the woman wishes that they go to the ballet. But each of them prefers to go together. This game of pure strategy pairs has two equilibrium points; both going to the ballet or both going to the dogs. This game is not one of conflict. It is a cooperative game, because there is no dominant strategy for either individual. Hence agreements once made, contain no incentive to defect; both parties gain from adhering to the rules. The problem is assurance regarding the other person's intended action. The man and woman must correlate their expectations and cooperate through some rule which assures them that wherever they go, they will go together. Runge argues that coordinated strategies evolve inside the structure of the game. They are the institutional rules which provide assurance. Institutions provide security of expectations so that when each individual expects everyone else to limit his stocking rates, he will limit his own numbers too. Runge says that unlike in case of "prisoner's dilemma", cooperative solutions offer no incentive to break the agreements. The institutional rules provide complete assurance and there is a total lack of uncertainty regarding the grazing behavior of others. Runge remarks in the conclusion that individuals (in commons with institutional controls) cannot afford to ignore the rules for fear of sanctions.

Doran, M.H., Low, A.R.C. and Kemp, R.L. (1979) attempt to determine the motives of individual herdsmen in raising different sizes of flocks in commons. They contend that in most traditional societies cattle are held as a store of wealth. In their paper they use regression analyses of slaughter against price and rainfall in Swaziland and find inverse relationships (as prices go up sale and slaughter of animals goes down) which they argue supports their contention that Swazi herders hold cattle as a store of wealth apart from their productive value. They believe that the store of wealth motive induces herders to maintain animals beyond the age of optimum slaughter for beef purposes and to increase the herd beyond the size which would maximize beef production. Since production improvements work in the same direction as price increases; they increase the growth of the value of animals between two time periods, therefore recent production improvement programs have had a negative effect. These programs have exacerbated, rather than alleviated, the overgrazing problem, including an increase in the national herd greater than the increase in forage. They conclude that where overgrazing exists and in the absence of direct controls on the number of animals which individual herders will be permitted to graze, it is illogical to expect production improvement measures to result in a lasting increase in the level of technical efficiency. Lovell S. Jarvis (Jarvis, 1980) in his comments on the above observations of DLK (Doran, Low, Kemp) disagrees with their argument and thinks that the principal production problem in Swaziland is the communal grazing system used by the Swazi herders. He says that this factor (communal rights system) by itself is capable of explaining the overgrazing, advanced age of slaughter and other herd characteristics cited by DLK as being the evidence of store of wealth motive. The production of store of wealth benefits, and also beef, will induce producers to accept a rate of return on the capital invested in cattle lower than it would be if beef were the only product. He thinks that an increase in beef price will make cattle herding and holding more profitable, therefore inducing an increase in herd size. He concludes that in the commons contrary to the case of private range management, without collective action no increase in total feed resources will occur in response to a higher price. Any increase in

the herd size will further reduce the average feed ration resulting in yet lower herd technical efficiency.

The literature reviewed above may be summarized as follows: There is agreement among scholars and experts that in the semi-arid areas of Balochistan, as in other similar areas, rangeland resource use is generally excessive. The fact that rangelands are being used beyond their carrying capacity is evident in extremely low range and animal productivity. Stocking rates and range productivity experiments have shown that, generally, in most rangelands lower stocking rates result in higher productivity. Economists, anthropologists and other scientists have conflicting views about whether principles of economic theory apply to individuals in all types of societies and whether people, in non-western societies, respond differently to economic incentives. Equally conflicting views are expressed with respect to the performance of the common property rights system. While some scholars view the common property rights system as inherently inefficient resulting in depletion and misallocation of resources, others consider it preferable and more efficient than alternative systems, under certain institutional arrangements. Also conflicting views by economists are expressed with regard to the effect of prices on rangeland stocking rates and productivity.

CHAPTER III

DATA COLLECTION, THEORETICAL MODELS, AND ANALYTICAL TECHNIQUES

3.1. Data Collection

Each of the twenty tribal rangeland was studied with respect to the following: (i) Aspects of institutions of property rights, family, tribe, and religion that seem to influence resource use and productivity. (ii) Forage production/carrying capacity, stocking rates, flock composition, annual closing periods, direct and indirect limits on animal numbers raised, and resource use regulations (iii) productivity indicators of animal birth/survival rates, animal death rates, returns per animal, returns per acre of rangeland, and returns per rupee invested.

The data were collected through surveys, interviews, and direct observations. Some historical information regarding institutions, resource availability and uses are based on oral accounts of local residents and confirmed by late 19th century and early twentieth century government of India documents and travel accounts written by European military and intelligence officials. The country of Balochistan by Hughes (1877) and Baluchistan District Gazetteers by Major C.F. Minchin (Minchin 1907) contain particularly important information about the natural resources including rangelands of the general Sulaiman mountain region. The original continuous field empirical data on vegetation growth were obtained during August 1980 to July, 1981. During the year surveys of rangelands were conducted and monthly observations with regard to vegetation growth and carrying capacity in each rangeland were recorded. Data regarding incomes, interest rates, prices, and taxes were obtained for the current as well as preceding year(s) through interviews.

The tribal rangelands purposively selected for studies had the following characteristics. (i) In all the twenty rangelands range animal mainly sheep and goats raising was the primary, the predominant, and in most cases, the only economic activity

undertaken. (ii) In ten of the twenty tribal rangelands a traditional system of common property rights along with affiliated institutions existed. In the other ten tribal rangelands, resource use related aspects of traditional institutions seemed to have weakened or largely disintegrated. The ownership system in these tribal rangelands was a mixture of and varied between common ownership without regulatory mechanisms and private ownership by extended families or clans (iii) Most of the tribesmen raised animals, mainly sheep and goats, for their subsistence needs. Animals, for the most part, were sold or bartered only to obtain products including grains, cloth, and other necessities which were not produced locally. (iv) The twenty tribal rangelands studied spread over an area exceeding a thousand square miles, had similar rainfall, temperature, altitude, soil, vegetation types, and general topographic conditions. (v) Tribal rangelands selected to be the non-traditional rangelands were located in the vicinity of the only main road that was constructed in the latter part of 19th century and where the tribes were exposed to outside cultural and market influences. All the ten tribal rangelands included in the traditional group were located at a distance of at least twenty miles from the main road, had no modern means of communication and transportation available to them, and the remote and difficult mountainous areas were exposed to minimal outside influences. (vi) Absolutely 100 percent of the animal raising population was illiterate and could not speak any language other than a local dialect of Balochi. Generally they could count only up to 20 (Geest), and they knoew that 5 twenties make a hundred (Sadd) and that ten 100s make a thousand (Hazaar). So although the use/stocking rates, prices, incomes and other such figures reported by the animal raisers were close approximations, they were by no means precise. (vii) All the prices used in the study were local prices and sometimes local prices differ significantly from prices in towns and cities. Average prices of different categories of animals like a six month old lamb, a year old lamb, a three year old goat and so on, were well known to the local population and after checking the prices in different tribal areas, such average prices were recorded and used in the study.

3.2. Theoretical Models Used

To achieve the objectives of the study we need to construct or adopt models which would enable us to determine relationships between

(i) institutions and range utilization rates (ii) range utilization rates and physical productivity or range carrying capacity (iii) range utilization rates and economic productivity. The three theoretical models used for this purpose are as follows:

3.2.1. The Range Productivity Measurement Model

H.R. Hochmuth (Hochmuth, 1952) has remarked that one of the basic problems in applying economics to the range management science is the discovery of an economically meaningful quantitative measure of range output. It is even more difficult to measure variations in output associated with various levels of rangeland utilization. One measure of range productivity widely used by range management scientists and economists is the carrying capacity. The grazing capacity/carrying capacity as defined by Gray (Gray, 1968) refers to: "The number of livestock a range will support without materially reducing plant vigor, the vegetative cover, and soil productivity, while maintaining range plant compositions and conditions of grazing livestock at satisfactory levels". To estimate the productivity of the ranges, the concept of carrying capacity with the above definition is used. In the field the following method was used to empirically determine the forage acreage and carrying capacity of the ranges.

A survey of each rangeland was carried out, and a technique known as the "Ocular Method" was utilized to determine the carrying/grazing capacity of the ranges. Data regarding the following items was collected (i) total range area in acres. (ii) percentage surface covered by vegetation (iii) density of vegetation (percentage). (iv) vegetation palatability percentage. The product of percentages of items (ii), (iii) and (iv) constitutes what is called the "use factor" which when multiplied by the total range acreage ("i" above) gives the total range forage acreage. Suppose total range acreage is 1000 acres, the surface covered by vegetation is 20 percent, percentage density of vegetation is 40, and the palatability of vegetation is 15 percent. Then use factor= 0.2 x 0.4 x 0.15 = 0.012 and, therefore, the range forage acreage =1000 x 0.012 = 12 Acres. The forage acreage is an imaginary acreage completely covered by vegetation and completely edible. Forage acreage is merely a standard measure of comparison like a ton of fodder. The forage acreage obtained through this method when divided by the

forage acreage requirement per animal gives the carrying capacity of a given rangeland in animal units per time period, i.e. Carrying capacity= Forage acreage/forage acreage requirement. The forage acreage requirement is defined by Stoddart and Smith (Stoddart and Smith,1943) as the range land that has, over a long period, shown a certain capacity to feed animals. For example " if 10 cows grazed over a 50 forage acreage for one year without injury to the range, then it means that five forage acres per cow per year are required". They also state that "allowances now in use vary from less than 0.1 to 1.2 forage acres per animal unit month (animal unit=one cow=5 sheep or goats, so forage acres per sheep per month would be 0.02 to 0.24 forage acres per sheep per month).

Considering that rangelands in Balochistan are, for the most part, of lower quality than most in United States, three levels of forage acreage requirements have been taken, that is, 0.4 forage acres, 0.24 forage acres, and 0.13 forage acres per sheep or goat unit per month. The carrying capacity of the rangelands in Balochistan is calculated on the basis of the average requirement per sheep/goat per month which is determined to be 0.257 (0.4+0.24+0.13)/3) forage acres. The carrying capacity of each tribal rangeland calculated in this manner is compared with the actual use rates or actual number of animals being raised in the tribal rangeland. A rangeland will be considered overstocked when actual use rates exceed the carrying capacity, under-stocked when use rates are lower than the carrying capacity, and optimally utilized when use rates are equal to the carrying capacity of the rangelands.

Carrying capacity is a measure of biological productivity. Economists employ various methods to measure economic productivity of the ranges. Gross and net returns from the animals in the range, annual percentage lamb crop production, and annual death losses, due to malnutrition, are some of the indicators normally used. In this respect some empirical experiments conducted in the United States are explained below: (i) Merrill and Miller (Merrill and Miller, 1961) conducted experiments to establish relationships between stocking rates and productivity. In their studies gross returns per acre were related to stocking rates. Gross returns were calculated with three grazing rates over a twenty year period. They found that the pastures in Texas yielded a return of $44 per acre when cattle were grazed at the lightest rate (utilization up to 25

percent of the current annual growth), and $28.65 at the heaviest (utilization over 50 percent of the current annual growth). For sheep the values were $52.60 per acre for the lightest and 30.01 for the heaviest use. Results of studies on seven selected western range areas showed that gain per head (sheep or cattle) usually was largest for light grazing and the least for heavy grazing (Gray, 1968). James Gray and H.W. Springfield (Gray and Springfield, 1962) developed a model to determine the stocking rate which yields the highest return. In this model the lamb yield (value in dollars) is related to the number of ewes per five acre pasture. They found out that the marginal value product curve intersected marginal factor cost line at slightly over 12 ewes per five acre pasture. This also indicated that on the basis of the relationship between ewe numbers and utilization, the economic optimum level of grazing was in 64-68 percent utilization range.

In case of the areas under study the use of family labor, commonly owned range lands, and the subsistence nature of the enterprises rule out the possibility of precisely estimating costs and returns to obtain comparable data.

Data on stocking rates and forage productivity or carrying capacity can be compared and analyzed. In the field, forage productivity or carrying capacity of rangelands were estimated through field surveys over a three year period , while actual use rates or total number of animals raised over the rangeland during each of the previous three years were determined through interviews. Similarly, the stocking rates in terms of animals per forage acre in each tribal area are be compared with the following productivity indicators. (i) gross returns per animal per year (ii) Gross returns per acre/year (iii) Gross returns per Rupee per year (iv) average annual percentage birth/survival rates of lamb/kid (v) average annual percentage adult death/losses. Included in the gross returns are returns from animal growth in value, lamb/kid births, value of wool/mohair/milk/butter.

3.2.2. Institutional Behavioral Model

In standard economic theory it is assumed that ownership of the initial endowments is well known and un-controversially distributed among people. All institutions are considered as given exogenously. But Dahlman (1980) developed a model taking institutions as endogenous choice variables. Dahlman studied the open field system

in England. His model of open field village has been adopted to the common tribal range lands of Balochistan as follows: A tribe or clan has four main variables affecting its economic activity and organization. These are the natural resource endowments, the technology of production, the ownership rights, and the institutional structure. The variables of natural resources and technology are considered as exogenously given. The property rights and institutions are endogenous choice variables. Dahlman defines property rights as decision-making rights and institutions as actual decision makers. The property rights or "attenuated decision-making rights" determine what can be done or what cannot be done with any specific economic asset. Therefore different property rights and related institutional structures produce different economic, allocational, and distributional results. Carlisle Runge (Runge 1981) developed a similar model using a game theoretic approach. According to his model common grazing land problem is not an externality of the type normally associated with "prisoner's dilemma" because in this case individual strategy is not dominant. No individual tribesman can choose independently to graze at an exploitative level. Runge formulates what he calls, "assurance problem" which is an amended version of the game called "The Battle of the Sexes" This is a cooperative not a competitive game and agreements once reached, contain no incentive to defect and all parties gain from adhering to the rules. The institutions provide assurance and security of expectations. Therefore each individual tribesman limits his grazing rates with the expectation and assurance that all others will do the same. The models developed by Dahlman and Runge provide a basis to analyze the performance and influence of traditional and non-traditional institutions on economic productivity in the tribal areas of Balochistan.

3.2.3. Conservation-Economic Behavioral Model

The economic forces and their expected influences on individual decision making, mentioned in the previous section, are based on assumptions many of which may not hold in case of the tribal areas of Balochistan. Absence of regular markets, non-availability of long term data and other factors limit the analytical value of the data. Yet, the data recorded on economic variables gives valuable insights into the general economic organization of the semi-nomadic tribal people. Any variations in interest rates, taxes, prices, and income in

different tribal lands can be related to the variations in general state of conservation and higher and lower productivity in the two institutionally different tribal areas.

The absence of regular markets, the mainly subsistence economy, the nature of property rights, and non-availability of long term data limit the direct application of any existing conservation economic model in this case. But the model first developed by Ciriacy Wanthrup (Wanthrup, 1952) and later followed by James Gray (Gray, 1968) and others may be useful in detecting certain trends and finding out how animal raisers respond to economic incentives under the constraints, or otherwise, of social institutions. The model is only partly applicable because although, in most cases, the range resources are owned in common, the animals are owned privately and stocking/use rate decisions are made by individuals. The Wanthrup/Gray model postulates that economic forces like income, interest, prices, insurance and taxes influence an individual resource user's behavior in ways that lead to either depletion or conservation of the resources. The influences of some important economic forces and their expected outcomes are stated below:

Interest

A rise in interest rates tends to encourage or force a heavier use rate of range resources for two reasons. First, when money is borrowed at a high interest rate, the animal raiser will need greater returns from his enterprise to be able to pay back the principal and interest and still be able to retain a satisfactory return for his management and labor. The method mainly used to increase returns is to increase the stocking rates. Second, higher interest rates mean lower present value of future streams of returns. To maintain the present value at the current levels, there is an incentive to move uses towards the present, that is increase stocking rates. A system of lending and borrowing of animals, similar to the share-cropping system elsewhere in the world, is prevalent among the animal raisers of Balochistan. Under this system profits and losses in loaned animals, calculated at the end of the year, are equally shared by the borrower and the lender. This system is called Nimsudi in Balochi.

Income

In case of income, as income increases, the animal raisers are in a better position to lower their use rates. If income decreases animal raisers may attempt to increase their stocking rates. Also lower incomes mean higher time preference rates and higher current use rates.

Prices

If future prices of products (animals) are expected to rise, the animal raisers will normally stock heavily and retain marketable livestock as long as possible. If there is an atmosphere of general uncertainty in prices, the animal raisers hold on to the livestock, they would have sold otherwise, hoping for a price recovery. Uncertainty or increases in prices of products that the animal raisers buy also encourages overstocking. Increases in prices of depleting products (animals) may lead to substitution of depleting animals for non-depleting or less deleting animals. Sheep and goat are the two main animal types raised in the area.

Insurance

By reducing the risk and uncertainty, the holders of insurance policies (insurance provided by social institutions in case of tribesmen) are encouraged to practice conservative use of the rangelands.

Taxes and Contributions

Generally higher taxes encourage overstocking and depletion of rangeland resources. Progressive taxes discourage overstocking and regressive taxes encourage higher use rates. There are no government levied taxes but the tribesmen pay various contributions to fulfill their tribal, religious, and social obligations.

3.3. Analytical Techniques

The theoretical and empirical analyses are performed to determine the following; (i) Effects of tribal institutions of family, tribe, religion, and property rights on an individual tribesman's behavior

towards range resource utilization (ii) Effects of various range resource utilization or stocking rates on physical productivity or carrying capacity of rangelands. (iii) Effects of range resource use or stocking rates on economic productivity of the rangelands. Resource use related aspects of the institutions of family, tribe, religion, and property rights are theoretically analyzed to determine their influence on an individual tribesman's behavior towards resource use. To determine relationships between stocking rates and physical and economic productivity simple correlation analysis techniques are used. Simple difference between means tests are performed to find out the significance of differences in productivity and stocking/use rates between the two types of rangeland areas. Economic factors such as income, interest rates, prices, insurance, and taxes are theoretically and empirically examined with regard to their impact on resource use, productivity, and the state of conservation of the rangelands.

CHAPTER IV

A THEORETICAL ANALYSIS OF RELATIONSHIPS BETWEEN SOCIAL INSTITUTIONS AND RANGELAND PRODUCTIVITY.

In this chapter the role of institutions with respect to the resource use rates is theoretically analyzed. Institutions are formal and informal relationships among people that define rights, obligations, and exposures thus establishing secure expectations with respect to resource use and actions of individuals (Bromley, 1977). Sheep and goat raising on natural and mostly common mountainous rangelands is the mainstay of the local economy in the area of study. Here institutionalized traditions, customs, and tribal codes of conduct govern all aspects of people's lives, including access to economic resources, production, and distribution. Weakening or even disintegration of some of the traditional institutions has occurred in areas that were exposed to outside social, economic, and political influences over the past decades. As a result of the outside influences including those of the market forces clear distinctions in resource use related aspects of institutions and practices among tribes or sub-tribes have emerged. Based on these obvious differences it is possible to divide the tribes and tribal territories into those that follow traditional resource use related institutions and those that have at least partially abandoned them. In the analyses that follow the term traditional is used to mean the original institutions and institutional regulations which governed and guided the economic decision making behavior of resource users. Non-traditional tribes are those that have either completely or partially abandoned the traditional institutions of resource use and in many of their territories previously common rangelands have turned into privately owned rangelands for all practical purposes.

4.1. Traditional Institutions, Rangeland Use, and Productivity

Explained in the following pages are the traditional social, political, and economic institutions that influence an individual tribesman's

behavior towards resource use and resulting productivity in the tribal areas of Balochistan.

4.1.1. The Institution of Common Property Rights

In the traditional tribal areas the property rights in the common rangelands are distributed in a way that all the tribesmen, including the chief, are co-equal in their rights to use the resources. A tribesman's ownership and use rights are not lost through non-use. An individual tribesman does not have the right to separate and sell or transfer his share of ownership or use rights in the commons. The actual amount of resource use is based on the principle of "to each co-owner according to his need". A tribal family with larger animal wealth and larger family size enjoy the use of larger amounts of resources, while a poorer co-equal owner with fewer or no animals and a smaller family size uses smaller amounts of the common rangeland resources. The tribal boundaries are clearly demarcated and all resources including pastures, trees, and even water cisterns and springs are guarded by armed tribesmen in order to exclude members of other tribes from using any of the tribe's resources. Collective tribal action is taken to expel intruders from other tribes and, at times, their animals are confiscated for trespassing. Within the tribe, institutional regulations like closing periods, rotational camping grounds and various indirect limits on animal numbers are enforced. Some of these relatively resource conserving institutional regulations associated with common property rights and followed in the traditional areas are as follows:

Annual Range Closing Periods

The annual closing period, along with other means of limiting animal numbers in the ranges, is a very old institutionalized practice among the tribesmen of Balochistan and has traditionally been observed in all areas where common property rights over rangelands existed. Such closings have many objectives. First, to allow the grass and other vegetation a chance to grow to a stage where, when grazed, it is not completely uprooted or destroyed. Second, to ensure that there is enough saved grass and other vegetation for the harsh and dry winter months ahead. Third, to prevent long term and permanent depletion from setting in. Fourth, to avail, to the maximum extent possible, the vegetation in the open fields that are

available for use by all tribesmen. All members are required to vacate the rangeland on a specified day and for a specified period of time. The local chief (Malik/Mokaddam/Safed Rish)) enforces the decision of closing the rangeland and ensures that all tribesmen and their animals leave and return on the same day. In most areas there exist some open access grazing lands which traditionally do not belong to any particular tribe, and any individual or tribe can use them as and when needed. It is generally during the summer monsoon season that most tribes close their own rangelands for a few weeks to a few months and take their animals to the open access lands for grazing. Generally, the requirement of annual closing periods and limited availability of open rangelands force animal raisers to limit the number of animals in their flocks. Within a rangeland, the closing periods result in relatively lower annual stocking/utilization rates per forage acre and, thus, increase its productivity.

Rotational Grazing and Camping Grounds

The practice of establishing camping grounds in different sections of the common rangelands and following a rotational grazing system exists among all the traditional animal raising communities. Because of the severe winters and the permanent nature of animal and humans wintering shelters, no movement takes place during the winter months from November to February. For the rest of the year, except when the rangeland is closed, the animal raisers are in constant move from one camping ground to another within the tribal rangeland. The entire rangeland is divided into different sections and each sub-tribe or clan and sometimes extended family moves with family members and animal flocks from one section to another. Clans and individuals cannot choose their camping ground themselves, a decision to this effect is taken, fairly and equitably, by the council of the tribal elders (Jirga). The decisions with regard to allocation of camping grounds and sections of the common rangeland to different groups are reviewed every few weeks and amended if necessary. This practice improves the carrying capacity of the rangelands by spreading animal manure throughout the rangeland and by allowing grass and other vegetation to regenerate.

Indirect Customary Limits on Animal Numbers Raised

Although there are no direct limits on the number of animals raised (use rates), there are many indirect limitations imposed by the institutions and by the environment, that result in lower stocking/use rates per area of rangeland. Some of the limitations are as follows:

First, due to sparse vegetation, the animals need to cover long distances away from home every day and must come back in the evening. Additionally, the animals must be protected from wolves and thieves and the young and disabled must be given additional care. Because of these and other factors, large flocks are generally uneconomical to raise because of less mobility and relatively higher labor costs.

Second, obligations towards the family, the tribe, and the religion grow as the flock size grows. The obligations include such things as providing free food and clothing to the needy kin sometimes for long periods of time, helping kin to pay for their brides, tribal contributions not only to the chief but also ransoms paid collectively to other tribes, and providing food to passer-by guests (Mehmandari). Other obligations include contributions for the mosque, to the religious people- the Mulla and the Taliban, and sacrifices of animals on all religious and tribal festivals and events. Also, to gain and maintain prestige, power, and prominence a rich animal owner must pay higher contributions. Tribal and social compulsions are extremely powerful and normally one cannot afford to live in the tribal areas and not fulfill the various obligations. All the above obligatory contributions are progressive in nature and should, under normal conditions, discourage larger flocks or overstocking.

Third, it is customary among all the animal raising tribes of Balochistan that a man must pay for his bride. The more animal wealth a man has, the more wives he is capable of paying for, and most of the time those rich in animal wealth do have many wives. In the long run each additional wife adds to the animal wealth of the husband by herself adding to the labor power of the husband's household and by producing children for increased future production. Considered this way, having more wives is an investment which pays off in the long run. But in the short run,

before children grow up, or if no children are produced, the animal wealth paid for a bride is very high. So in this manner the rich continuously lose their animal wealth and this imposes another limit on the number of animals an individual household can have at a certain point in time.

Fourth, few outside contacts and so less access to veterinary medicine, the dry semi-arid conditions, diseases, epidemics, wolves, thieves, and droughts all inflict losses on animal numbers in general and on large flocks in particular.

Fifth, Large numbers of animals alone do not give an individual tribesman a respectable and prestigious position in society. He can achieve such a position by generously contributing for tribal and religious causes, standing up for family and tribal dignity and honor, and by being hospitable and charitable to relatives, fellow tribesmen, and strangers. Thus, when a tribesman has large numbers of animals, he does not continue to accumulate more, but rather expends them by sacrificing more animals on tribal and religious festivals and by serving more food to the kin, tribe fellows and strangers. He also pays large contributions to the tribal chief and religious men, and pays a larger proportion of ransoms imposed on the tribe. These expenditures not only provide him future security but also give him the respect and prestige which he may use for future economic, social, and political gains. Another way of having an assured future, large support, and security is to marry many wives which one can afford only by having larger numbers of animals. As mentioned earlier, the wives not only increase the productive capacity of the household themselves, but are an investment in the sense that any daughters produced bring future bridal wealth and any sons increase the productive labor of the household, assist a father in old age, protect his wealth and are a political and military asset in all tribal matters.

All the above impose indirect limitations on animal numbers raised in a commonly owned rangeland.

4.1.2. The Family System

A family in the tribal areas of Balochistan, generally, plays the same role as in other societies at similar levels of economic development.

Here, as elsewhere, the family has its primary function of raising children to adulthood. The family provides life-long employment to its members, gives contributions to the chief and religious men and cooperates with others in productive enterprises such as building houses, digging of new and dredging of old water cisterns, and shearing of animals for wool and mohair. The family also gives feasts and provides food to kin and strangers. In all the above mentioned situations and in other economic and non-economic activities a family is guided by customs and traditions or informal institutions, more so than in urban societies.

Certain aspects of the family system which seem to have an impact on resource utilization are further explained below. Marriages generally, take place between members of the same tribe and between close kin preferably first cousins and only rarely between the members of different tribes. A man must acquire brides for his sons in the order of their birth using a portion of his livestock for each bridal payment. Bridal payments are normally high, and during the original year of study (1979-80) such payment consisted , on an average, of 60-70 sheep or goats, 6-7 camels, or 10-20 cows. During the year 2005, a bridal price was about the same in terms of sheep and goats, but cost less in terms of camels and cows because the prices of the latter types of animals had increased more relative to the former. Most families must work for a number of years in order to put together a bridal payment and many are left, at lest temporarily, impoverished after acquiring a bride. After the bride moves to her father-in-law's house, there is an increase in the labor resources available to the groom's father, as mentioned earlier, and a similar loss to the bride's father. The gain in labor available to the groom's father is considerable, since a man marries normally at about 16-18 years of age and establishes a separate household only when he is 35-40 years old. Sons are allowed to establish their own independent households in the order of their birth and at the time each son is given a patrimony. In accordance with the Islamic law of inheritance, as interpreted in the tribal areas, father's herd and other property are equally divided among the male living members of the family. Among the Baloch of Sulaiman mountain ranges a daughter receives no share of father's animal and other property in inheritance.

Until the sons establish independent households, the family normally has one house made of tree trunks, palm fronds, reed, and grass and one room or hut for animal wintering. It is important to note that the flock size under the local economic and environmental conditions has an upper and lower limit. Below about 50 sheep or goats it is uneconomical to raise a flock of one's own. It pays to get employment with some other animal raiser as a shepherd rather than continue with a flock size which does not provide subsistence. Similarly above 200-250 animals the flock becomes an inefficient and costly unit of operation.

Large flocks require high labor costs, as larger numbers need to be cared and to be protected. Also under semi-arid conditions the ability to move fast is essential to avail the sparse vegetation, and large numbers do not allow such mobility. Therefore, beyond about 200-250 animals the costs increase rapidly and the animal raisers are aware of this. At this stage labor and other resources of the family are expended on improving the quality rather than the quantity of animals in the flock, as expanding flock size beyond this level means less careful herding and more frequent losses. The larger the total number of animals the less effective is the owner's supervision and greater is the decrease in the level of income.

With all the above considerations the extended family owns just one flock of sheep or goats with maximum number of 200-250 animals. The household also has just one hearth as the household cooks and eats in one place. This is important in terms of economies of scale, because all their energy sources come from the range itself and many times the animal and human uses are competitive. The joint/extended family also has just one set of household utensils and equipment. Fixed capital like camels, donkeys as well as minimal non-productive capital necessary for their type of life such as summer tents, grain and water containers and storage bags (Gualag, Mashk) are shared by the members of the household. At the bare minimum subsistence level of life these objects are not trivial as a large portion of a herder's total income is expended on them.

4.1.3. The Tribal System

The Baloch Tribes of Koh-i-Sulaiman

Baluchistan is inhabited by hundreds of large and small tribes each with its own geographical territory and some form of social, political, and economic organization. In the area of study, the need to organize in tribes and clans is evident from the fact that government law enforcing agencies are almost non-existent. At the same time, most property is movable by nature, rangelands and other common resources must be protected from intruders and personal protection must be ensured. It is also absolutely necessary to have a tribal organization to settle disputes between tribesmen and among sections of the tribe as they arise in their interaction and in their use of common resources. For centuries the Baloch nomadic tribes wandered in vast areas of Central and South Asia in search of grazing pastures for their animals. However, after a long period of inter-tribal wars over pastures, different tribes occupied different rangelands as their own and excluded all other tribes from their use.

The 11th century historian, geographer, and traveler from present day Turkmenistan (Khwarezm), Al-Biruni wrote of Sulaiman mountain in his memoirs as being the western frontier mountain of India and the homeland of the people known as Pashtuns. The 14th century Moroccan Berber explorer and traveler, Ibn- Battuta also mentioned Sulaiman mountain as the border between India and Central Asia-Middle East. The main 250 mile long Sulaiman mountain range from its southern proximity near Kashmore in Sindh to the South Waziristan agency on the Afghan border, is occupied by Balochi and Pashto speaking tribes. At some stage in history, ten major Baloch tribes including Mazari, Lund, Gorchani, Leghari, Bugti, Marri, Khetran, Khosa, Buzdar, and Kaisarani, occupied and settled down in different parts of the Sulaiman mountain ranges. In the beginning, the entire area of a tribal territory, sometimes as large as 5000 square miles, belonged in common to all the members of the tribe. As time passed and as the tribe populations increased each sub-tribe grew to become a full-fledged tribe by itself as far as the property rights over commonly owned resources were concerned. Different sections of the tribe claimed areas where they lived, as their exclusive common property and excluded all other sections by force from their use. At

times different sections of the tribe divided the whole tribal territory peacefully among themselves and agreed not to infringe on each other's territories. The tribes have historically been, and in most cases still are, internally independent and run their affairs under tribal customs, traditions, and a code of conduct.

The Tribal Organization and Leadership

The Baloch tribes have a hierarchical leadership with Sardar or Tumandar as the overall and supreme leader at the top followed by sectional heads (Malik, Mokaddim, or Wadera) down to the clan or extended family head (Safed Rish). The Sardar, the Malik, and the Safed Rish of the tribe together constitute a tribal council of elders called Jirga which is responsible for administering tribal affairs. The tribal Jirga makes all important decisions concerning dispute settlement and matters of war and peace within the tribe and with other tribes. Jirgas or councils of elders are also formed at the sub-tribal or sectional level within the tribal territory. These local Jirgas settle disputes between individual members of the section and decide about the allocation of commonly owned resources within their respective areas of jurisdiction. The Sardar, just as the Malik and the Safed Rish, is co-equal to all other tribesmen, in rights to use the commonly owned resources and, in case of violations, is subjected to the same kind of punitive action and sanctions as ordinary tribesmen. The Sardar himself must abide by and ensure that all tribal laws and regulations are followed by everyone in the group.

Tribal Organization and Enforcement of Property Rights

The local Jirga under the Sardar, Malik or Safed Rish also decides about day to day and season to season matters with regard to common resource utilization. These include matters like the maximum number of trees a tribesman can fell in a year for building a house, the season of the year when a particular resource could be used, and the amounts of each resource that can be availed by an individual family. The local Jirga takes decisions with regard to time and duration of annual closing periods and rotational camping and ensures their enforcement. It nominates members who will guard the sacred trees within the range and guard the range from tress passers from other tribes or sections In case of drought or even during normal years the Jirga also decides about the tribe's

movement and duration of stay in the open lands when their own rangeland is closed. Decisions with regard to the amount of annual and periodic taxes including tribal and religious contributions and ransoms paid to other tribes, are also taken by the Jirgas.

Sanctions Against Violators

Punitive actions against the individual defaulters for violating resource use laws include forced eviction during the closed periods, fines for overuse of particular resources, and suspension and sometimes rescinding of the use rights permanently. Social sanctions are applied for not contributing animals for the customary and obligatory tribal and religious causes like ransoms, contributions to the chief and the Mulla and serving food to the strangers (Mehmandari). Social sanctions involve not being invited to social and political gatherings, not being helped in collective jobs which an individual tribesman cannot do by himself such as the shearing of the herd of sheep/goat and building of houses, no bridal exchanges, and no customary support and protection in case the individual has any problems with members of some other tribe. The severity of the last mentioned sanction can be seen in the light of the fact that in the tribal areas there is a complete absence of government agencies that protect life and property of individuals. A man living in the tribal areas needs cooperation of his tribe fellows for his own survival and makes every effort to contribute to the tribal solidarity. He follows the tribal laws of cooperation and the Jirga members make sure that this is done by everyone. If an individual commits a crime like a murder, kidnapping or robbery in neighboring or other tribal areas, the entire tribe of the culprit is held responsible and has to pay for the crime. The privileges as well as obligations are shared by the whole tribe and by all individuals in the tribe. The tribal laws do not allow an individual to cause costs to the whole tribe, whether it is with respect to his personal conduct in relations with other people or his resource utilization practices.

Tribal Organization, Productivity, and Equality

The tribal organization has historically played an extremely important role in maintaining rangeland productivity and in avoiding resource depletion. By enforcing laws with regard to closing periods, rotational grazing, and payment of contributions, the tribal

organization helps lower animal pressure on rangeland resources. By enforcing the equal use related laws of the common property rights system, the tribal organization discourages unequal and exploitative use by stronger or richer segments of the society. In numerous other ways the tribal organization encourages equality, social and political stability, and egalitarianism in the community.

The traditional Baloch tribal system contains strong elements of democracy and rule of law. It is relatively democratic because the chief rules only with the consent of the tribe, and if he violates the tribal code of conduct and any traditional customs and laws he could be subjected to removal. Although the Sardar's position is normally hereditary, all appointments must be ratified and agreed upon by the lower echelons of the tribal leadership i.e. the Maliks, Mokadam, Wadera, and the Safed Rish. Normally the elder son of the chief succeeds him on his death, but the tribal elders have the right to deny the elder son's appointment in favor of his younger brother, a cousin or even sometimes in favor of an unrelated Malik or Safed Rish. The Jirga, can even remove a Sardar if he proves his incompetence in running the tribal affairs, causes humiliation to or lets the tribe down or is ineffective in dealing with other rival tribes. Violating the tribal code of conduct and honor, and failing to provide justice to individual tribesmen could be other reasons for the removal and replacement of the chief. In the history of Balochistan there are numerous examples of the chief being removed, replaced, or even executed (honor killing) through collective or individual tribal action when he violated the tribal laws, customs and traditions. So generally, although the rule of the chief is seemingly authoritarian, he derives his power strictly from the tribe i.e. local sources. He rules under the tribal codes, traditions and customs and cannot defy or violate them.

4.1.4. The Economic System

The Baloch nomadic economic system is characterized by subsistence form, equal access to the means of production, no accumulation of wealth, and no permanent class divisions in the society. In the traditional tribal areas, animals are raised mainly for subsistence and not for market. Physical, social and economic conditions and rules do not allow accumulation of surpluses. A large part of the food and other needs of life come directly from within the range and from the animals raised. Only a small portion of the

animals are sold or bartered to obtain the few necessities of life which are not produced locally and have to be purchased from areas outside of the tribal territories. The animals that are surplus to the immediate requirement, are used for economic purposes as insurance systems through the loaning of animals and for social purposes as sacrifices and contributions towards the tribe and the religion. In these areas the animals most suited for purposes of subsistence are animals like goat and camel.

Risk and Security

Animal raising is a risky enterprise under most circumstances, but the type of environment in which the tribesmen of Balochistan live makes it even more risky. Uncertain rainfall, droughts, loss of animals due to consumption by wolves and other predators, and occurrence of epidemics and diseases are some of the risks involved. Additionally, a murder ransom or a bridal payment could also take away all or a major portion of one's wealth in just a short period of time. The traditional institutions of family, tribe and religion are adopted and designed to take these risks into consideration. Kin and tribal assistance to the needy, animal sacrifices and food distribution, and the custom that food must be served to the stranger passers-by, provide a great degree of future security to an individual and ensure him against risks of starvation. Under the umbrella of the system and by himself following the institutional requirements, an individual is provided more security, than any economic means such as raising excessive numbers of animals.

Wants

Wants in the traditional tribal areas are few and mostly limited to the basic necessities of life: A large portion of these wants is fulfilled from products obtained within the rangelands including animals and their by-products. Since there is more or less equal distribution of wealth within the tribal society, no class structure exists and no internal and external demonstration effects, influence to any significant extent, or change people's wants. Thus, there is no adverse pressure on the rangeland resources. Also, since animals are mainly raised for subsistence needs, not for the market, prices in remote markets and fluctuations in the same do not affect the animal raisers in a significant way. With a more or less stable want

structure, changes in external demand conditions are not able to force the tribesmen to change their stocking rates to adversely influence range productivity.

4.1.5. Religious Institutions

All the people in the tribal areas are Muslim by faith. However, they have interpreted and adjusted certain aspects of the religion and religious laws in such a way that serve the purpose of either conserving or depleting the resources. It would seem that the environment and the resource base in the area necessitated incorporation of beliefs that are not found among most settled and non-nomadic Islamic communities. Breaking tribal laws of personal conduct and resource utilization involves punitive action and sanctions by the tribe, but violating any religious laws involves punishment by the God in the after-life. The following religious practices and beliefs, which the tribesmen have institutionalized in their societies affect the state of conservation of the resources by limiting or otherwise of animal numbers and take-offs.

(i) Rains will not fall unless the tribe gives animal sacrifices from time to time (ii) Human and animal diseases are caused by bad spirits - the "Jin", and those possessed by these spirits will be able to get rid of them only if animal sacrifices are offered to God (Khairat). (iii) Besides the yearly compulsory give-away of a portion of animals called "Zakat" as charity required of every Muslim by Islamic laws, animals must be donated to the religious Imam or Mulla. The Mulla teaches the holy Quran to the children, leads prayers, and performs religious rites on the occasion of births, deaths, and marriages. Mulla's help is also sought whenever any family member or an animal gets sick. The Mulla, in such cases, writes some words from the Quran on a piece of paper which is wrapped in cloth and the sick person wears this amulet (Taweet) around his neck or in case of the animals, it is hung where the animals are sheltered at night. The Mulla gets a number of animals for his services depending on the affordability of the owner of animals. (iv) It is considered a religious duty by the tribesmen to sacrifice animals on the birth of children, particularly sons, as well as on the death of any family members, and then annually at the death anniversaries of grandparents, parents, brothers, sisters, and sometimes other close relatives. (v) Certain trees and, sometimes,

whole sections of rangelands are considered sacred. Trees and other vegetation in these areas, therefore, must not be harmed, cut or otherwise used. Also, at times, it is known to the whole tribe that bad spirits (Jin) reside in certain grass patches or on certain trees therefore animals should not be grazed in the vicinity and the trees should not be touched (vi) Trees and other plants are considered living things and God's creation, taking their lives (felling or cutting them) is nearly as bad and sinful as taking any animal or human life, particularly so when the trees are young and during the spring and summer rainy seasons when they are green and growing (vii) Lastly, if a man has animal wealth beyond a certain level he must perform a pilgrimage to Makkah (Mecca in Saudi Arabia) at least once in his lifetime. Along with Zakat, already mentioned, this is one of the five pillars or basic requirements of Islam. This costly trip involves disposing off a large portion of animal wealth of the owner. The religion inspired beliefs and practices mentioned above directly indirectly effect lowering the stocking/use rates in the rangelands.

4.2. Non-Traditional Institutions Affecting Use and Productivity

4.2.1. The Institution of Common Property Rights

In the non-traditional tribal areas the institution of common property rights does not exist in its original form. In some cases the system has completely broken down and the rangelands are privatized for all practical purposes. In most situations, however, certain significant deviations from the original institutional arrangements have taken place due to exposure to outside influences. The weakening or disintegration of the traditional institutions of property rights and enforcement mechanisms have resulted in the following changed environment greatly increasing pressure on the rangeland resources.

The traditional closing periods in the year are, generally, not observed as the local Sardar, Malik, or Safed Rish does not follow the tradition himself and does not enforce it on others. The approximate closing period in the year in each of the 20 rangelands is given in table one of the appendix. The table shows that the average annual closing period in the ten privately owned areas was only about ten days, while this average was over three months in the commonly owned tribal areas. The same table also shows that, in

general, the longer the closing period in a particular rangeland, the higher the long term and short term range carrying capacity or productivity.

Movements within the tribal rangelands or rotational grazing either do not take place at all or take place to a very limited extent depending on the number of flocks and flock size. The surveys results shown in table 1. indicate that only three of the ten non-traditional tribal lands observed some form of limited rotational grazing, while 100 percent of the traditional tribal rangelands observed such a practice of grazing. The table shows that productivity or range carrying capacity is higher in rangelands where rotational camping is practiced.

Economic considerations like flock mobility under conditions of sparse and scarce vegetation still impose some limitations on the number of animals raised. But the effects of such limitations are far outweighed by the effects of disintegration of other aspects of traditional institutions that used to impose more effective limitations on flock size.

4.2.2. The Family System

Some important changes have taken place in the family system. In many cases the traditional extended family system has been replaced by nuclear family system. It is not to say that people have become individualistic the same way as in urban industrialized societies, but some changes have taken place. Sons and brothers still live in the same locality and they still help each other in times of need. But unlike farming communities where the fixed landed assets keep the families together, in case of the Baloch animal raising communities there is no such thing to closely bind them together. An important difference from the traditional system is that, whereas in the traditional system the sons either never established an independent household of their own as long as the father lived, or did so at an age of 35-40 years. Now, in most cases, a son after getting married at the age of 16-20 years immediately receives some patrimony and establishes his own flock and household and leaves his parents' home. This necessitates each son building a house of his own, which is done by felling a few dozen timber wood trees. The son also buys or borrows more animals to add to the patrimonial flock to have a

more economic unit of a flock, and buys his own animals like camels and donkeys which are a basic capital requirement for each household. Among some tribes no bridal wealth is paid, thus no dispersal of animal wealth takes place any more. The above changes greatly increase pressure on rangeland resources from man and his animals.

4.2.3. The Tribal System

Historically sovereign tribes with their own social, economic and political organization lived in the Sulaiman mountain ranges of Balochistan. Each individual tribe had a hierarchical social organization, livestock based economy, and its political leader; the Sardar recognized no government and owed allegiance to none. Rivalries, wars, and alliances were almost always within and between the various Baloch tribes. The Persian and Indian empires to the west and east respectively had no lasting interest in this part of the world called a "modern terra incognita" by the European travelers of early 19th century. The British empire of India developed interest in Balochistan because of its interest in gaining influence in Afghanistan and in order to be able to stop Russian advances south towards the Arabian Sea and the Indian Ocean. The start of the First Afghan war between the British and Afghans in 1839 was also the beginning of the Baloch contact with the outside world in modern times. In order to send their land forces from India to Afghanistan the British needed to pass through Balochistan. Over the next fifty years the Baloch resistance to British incursion was overcome and a mutually beneficial relationship between the British government and the tribal chiefs of Balochistan was established. The chiefs would be responsible for law and order and security of the government means of communication and transportation within their tribal territories. In return, the British government would recognize them as "official chiefs" who would be eligible to payments, jobs, titles, and rewards. The new contacts and arrangements had far reaching social, economic, and political consequences for the people and the land.

The tribal chiefs, for the first time, started deriving their strength from a source other than the tribe that they headed. Checks and balances were always in place under the traditional system and consequently the chief could not violate tribal laws with impunity.

Under the new circumstances and once the tribe was no longer the source of power and authority, the chief's attitude towards the tribal laws, including the laws of resource use, was bound to change. Not only that he was not interested in any resource use regulation and enforcement of laws like closing periods, but, when possible, he also started appropriating the best parts of the common rangelands for his exclusive use. Thus, the chief violated with impunity the most important law of common ownership of rangelands where each tribesman including the chief was a co-equal owner and no tribesman could be excluded from the use of any part of the common tribal rangelands. This violation of traditional laws caused further overgrazing and depletion of rangelands as increasingly larger numbers of animals were raised on ever contracting rangeland areas. In addition chief's family members, other relatives, and friends as well as sub-chiefs, started following the chief's example, grabbing important resources of the commons at the cost of the impoverished ordinary tribesmen. Under the changed conditions the chief assumed dictatorial powers and, supported by the government, engaged in brutalizing and oppressing his fellow tribesmen.

Although the disintegration of the traditional tribal institution alone cannot be blamed for the poor state and low productivity of rangeland in Balochistan, it certainly is one of the very important causal factors. As mentioned in the literature review, Helen Ware (Ware, 1979) in her work lamented the devastating impact of colonialism and outside influences on the natural resources of traditional nomadic societies. It is similarly true that the effect of colonizing the previously nomadic Baloch society was to destroy the Sardar and tribesman relationship and Sardar's responsibility to enforce conservation measures with respect to rangelands. Under the changed environment the Sardar is no more interested in following the resource use related rules like annual closing periods or rotational grazing, and thus has no authority over Mokadams, Safed Rish, and ordinary tribesmen to force them to follow traditional conservative methods of resource use. Under such conditions, the range vegetation is overgrazed and is unable to regenerate itself, and in extreme cases many nutritious grasses and herbage have already become extinct. The outside market and political influences have resulted in disturbing the conservative balance that the Baloch nomads were able to maintain in their rangelands for hundreds of years.

4.2.4. The Economic System

Switchover from Subsistence to Market Oriented Economy

The phenomenon of disintegration of traditional institutions and the penetration of market economies has been universally experienced by the previously nomadic subsistence economies in the arid and semi-arid regions of the world. Balochistan is no exception. The outside influences affected the local economy by setting it on the path of a gradual switchover from subsistence to a market economy. Under the traditional subsistence system animals were mainly raised for subsistence while under the changed market oriented system animals are mostly raised for sale and profits. There is also a general weakening of traditional social and economic networks and a reorientation of all economic activities towards the market. The non-traditional areas of Koh-i-Sulaiman in Balochistan have thus experienced a general shift away from risk avoiding strategies and there is a reduced ability to protect its members in times of crisis. The drought conditions of 1998-2002 over most of Balochistan, have exposed this weakness of the changed tribal economy. The drought caused unprecedented suffering, in loss of human and animal life, and in out-migration of hundreds of thousands of Baloch nomadic families. Production for market has also necessitated raising more market oriented sheep than subsistence oriented goats. At least for the past few decades, sheep and wool have had far greater market value because there has been increased demand for these products in remote (national and international) markets. The result is an increase in the numbers of intensive grazing and depleting sheep, and a decrease in the numbers of extensive grazing and relatively resource conserving goat.

Economic Modernization and Resource Use

The breakdown of the traditional system of property rights and enforcement mechanisms have resulted in a changed environment greatly increasing pressure on the rangeland resources. (i) The number of artificial watering points, including ponds and cisterns, sometimes with the help of the government and international donor agencies, has increased in recent times. This has encouraged increased number of animals and flocks. (ii) Increased human

populations, ever contracting wild animal habitat, and easy availability of firearms are some of the factors that have resulted in reduced levels of animal thefts and predator hazards (iii) The availability of modern veterinary medicine has reduced epidemic occurrences to some extent (iv) Drought conditions are alleviated through supplemental feeds. (v) Obligations towards the kin, the tribe and religion are less fulfilled as these are regarded more as an individual act rather than a social necessity. (vi) Other social contributions are limited and few, and no strong sanctions exist for not fulfilling the same. (vii) The custom of serving food to strangers is not as strong a social obligation and not as common as before. (viii) Resources from timber trees to dwarf palm are not only used at will, but are also cut and transported for sale outside of the tribal areas as firewood and as raw material for baskets, mats and rope making etc. The net result of the above mentioned changes due to weakened traditional institutions of controls and limits has been overstocking and depletion of the rangeland resources.

Risk Avoidance

Under the non-traditional changed circumstances, because of disintegration of institutions and disruption of the traditional systems, an individual animal raiser cannot expect the same level of security as before. An individual does not expect the family and tribal security systems any more, so he looks to other means of future security for himself and for his family. The easiest and most practical means, from an individual's point of view, is to increase his stocking rates, so that even if a portion of his animals is lost due to the risks some can still survive and provide sustenance to the family members.

Increased Wants

Wants of the tribesmen in the non-traditional tribal areas have changed due to external influences and emulation. While only a few decades ago commodities like sugar, tea, and tobacco were unknown, today, among some tribal communities, they have become necessities. A larger proportion of the local wants is fulfilled from products not produced within the rangeland and thus imported. Increased demand for imports requires increased stocking rates which results in increased depletion and lower productivity. Because

non-traditional areas are more exposed to outside influences, external demonstration effects also have a great deal of influence on increasing people's wants and putting adverse pressure on their resources.

Institutional Change, Poverty, and Inequality

Traditionally, the rangelands were equally shared by all and the chief had as much use rights and no more than an ordinary tribesman. Thus the chief was, generally, not in a position to accumulate more wealth than an ordinary tribesman. The introduction of outside influences was also the beginning of the appearance of economic and social differentiation among a thus far egalitarian tribal society. Due to external influences the traditional tribal solidarity has diminished. The chiefs and other privileged members do not need any tribal solidarity and are therefore not interested in contributing to it. The poor are no more able to call upon traditional tribal and section or clan solidarity and are less able to escape their poverty and suffering. Also, in the changed institutional tribal areas of Balochistan, there seems to be a significant increase in sale of animals and hence a decline in the number of animals available for loans and gifts to the needy kin and fellow tribesmen.

Empirical data from surveys and interviews reveal that the areas most exposed to outside influences are also the ones facing the worst poverty and inequality. It is possible that availability of modern medicine for human and animal diseases and a host of other factors might have caused overpopulation, overstocking, overgrazing, and thus deterioration in the tribal living standards. But the importance of disintegration of traditional institutions in causing poverty and inequality in the non-traditional tribal areas of Balochistan cannot be overlooked. As Sahlin (Sahlin, 1972) pointed out about nomadic traditional societies that generally the traditional nomadic economic order is strictly subsistence oriented, therefore no accumulation of wealth takes place and no permanent class divisions arise. Under the changed conditions outside economic and political influences have penetrated, the chiefs and Mokdams/Maliks do not follow traditional tribal laws of resource use and ownership, wealth accumulation by the chiefs and their relatives and friends has increased , and oppression of the ordinary tribesmen has worsened.

The Sulaiman mountain ranges where this study was conducted form the eastern most boundary of the historical Balochistan of Naseer Khan Nuri (Khan-i-Azam), who ruled Balochistan from 1749 to 1795. Philip Salzman (Salzman, 1976) carried out field research for his doctoral dissertation among some Baluch (Baloch) tribes in Iranian Baluchistan, a thousand miles to the west, during 1967-68, 1972-73, and 1976. Salzman's analysis of the traditional tribal system and the impact of externally induced changes among the Baloch of Iran seems to be equally applicable to the Baloch of the Sulaiman mountain ranges. Salzman opined that the traditional ways of life among the Baluch were equalitarian in terms of resource allocation and distribution. He pointed out that in the traditional Baloch tribal system there existed no political domination, economic exploitation, or tyranny among members of the tribe. He also talked about the changes that are taking place after the Baloch tribes were subjugated and integrated into Iran. Salzman says that the chief no more depends on the tribe for his power and authority and manipulates both the government and the tribe for his own opportunistic purposes. The chief and members of his family are now able to accumulate economic resources and poverty and inequality within the tribe has increased.

4.2.5. The Religious Institutions

As elsewhere, modernizing influences have weakened the hold of religion to a certain extent. Taboos and beliefs regarding the use of resources have, for the most part, disappeared. Animal sacrificial and dispersal aspects have also changed to some extent as modern medicine became available to cure human and animal diseases. Smaller number go to the Mulla for human and animal ailment cures, they instead go to the nurses and doctors in some farming or roadside village. In most cases, an area's previously sacred trees, patches or parcels of the rangelands are not considered sacred any more. The net result of these changes is more animals per unit area of rangeland and more severe depletion of the resources.

The main points discussed in the chapter on theoretical analysis of the relationships between institutions and rangeland utilization rates are summarized as follows: (i) Annual closing periods and rotational

grazing practices observed in the traditional tribal rangelands result in lower rangeland utilization rates compared to non-traditional areas where the same are not observed. (ii) The tribal organization still alive in the traditional areas enforces range use practices and limits on animal numbers raised thus lowering overall use rates compared to the areas where the tribal organization has disintegrated or weakened. (iii) The traditional overextended Baloch family system utilizes less rangeland resources compared to a situation where the family has become less extended and more nuclear (iv) Resource use related religious practices and taboos followed in the traditional areas are relatively more conducive to lower utilization rates (v) The traditional subsistence orientation of the economy is more favorable to lower utilization rates and conservation compared to the non-traditional market orientation of the local economy.

Two tribal elders on their way to a Jirga

Two little shepherd girls

Hope for a better future for a grand child.

Little kids amused by the sight of the camera.

A little Baloch nomad with his donkey.

A women fetching firewood.

A typical shepherd camp in Koh-i-Sulaiman.

A typical shepherd village in Koh-i-Sulaiman.

A khalli (small goats skin water container) a cock (Dough wrapped around a preheated stone) and sajji (a feast in preparation)

Tribesmen embarking on a chase to retneve their stolen camels

Women fetching water in goat-skin containers (Mashk)

Fetching water is always an uphill task

A Baloch faithfully clings to his centuries old gun

A shepherd shears his sheep.

Summer tent made of dwarf palm leaves and jub made of tree trunks and reed are main types of residences in Koh-i-Sulaiman

Nar-o-sur music for entertainment

CHAPTER V

A THEORETICAL ANALYSIS OF RELATIONSHIPS BETWEEN ECONOMIC FORCES AND RANGELAND PRODUCTIVITY

As discussed under the conservation economic model in chapter three, changes in economic factors influence a renewable resource user's behavior in important ways. In this chapter economic variables such as income, interest rates, prices, insurance, and taxes are theoretically examined to determine their impact on resource use and productivity and on conservation or depletion of rangeland resources. Resource user behavior is particularly important in this case because most of the rangeland resources are owned in common while the animals raised on these rangeland resources are owned in private. Thus, individual behavior expressed in excessive stocking rates may result in social costs that must be borne by the entire tribal community. Since animals in both the traditional and non-traditional areas are owned individually the profit maximization motive expressed in the maximization of stocking rates is common among all the animal raisers. However, one would expect that traditional social institutions provide some disincentives for such profit and stocking rates maximization and encourage the tribe members to limit the number of animals raised. This chapter presents a theoretical analysis of economic factors that influence an individual animal raiser's behavior towards resource use and productivity. The following chapter will present some empirical data and analysis with regard to the relationships between economic factors and rangeland productivity.

5.1. Interest Rates and the Credit System

Normally a rise in interest rates tends to encourage or force a heavier use rate which in turn may lower the productivity of rangeland resources. The reason is that when money or animals are borrowed at a high interest rate, the animal raiser will need greater returns from his enterprise to be able to pay back the principal and interest and still be able to retain a satisfactory return for his management and

labor. To payback higher interest rates and principal a tribesman would be expected to increase his returns by increasing his stocking rates. As further explained in the next section, in the non-traditional areas the real interest rates tend to be, in general, higher and therefore it is expected that the animal raisers in these areas would, in relation to traditional areas, increase their stocking rates resulting in overgrazing and more depletion.

In the tribal areas of Koh-i-Sulaiman all local lending, borrowing and interest charges are in animal terms and no actual monetary transactions take place. In fact the local credit system is nothing but a form of share-cropping or profit-loss sharing arrangement. This arrangement is partly necessitated by the fact that payment or receipt of fixed interest is strictly prohibited among the Muslim tribesmen of the area. The system of borrowing and lending animals is called "Nimsudi" and involves profit-loss sharing of animals and their off-springs. There is another less important and less prevalent system called, "Zarsari" which involves lending animals with a fixed shadow value in the beginning of the year, and sharing the gains in shadow values, or actual values if animals are sold, at the end of the year.

Under the Nimsudi system, animals, mainly ewes and female goats, are loaned with the condition that at the end of the usual one-year period, net gains in offspring will be equally shared by the lender and the borrower. The borrower tends the animals and bears all input costs during the year. The input costs mainly involve the borrower's labor and entrepreneurial costs, as the ranges, in most cases, are commonly owned and generally no other inputs are used to increase the productivity of either animals or the resource base. The following example may help understand the concept of share-cropping as prevalent among the Baloch animal raisers of the Sulaiman mountain ranges. Suppose 100 mother ewes were advanced by the owner as principal/capital in the beginning of the year and the borrower/herder cared after the sheep and fed and bred them for one full year. During this one year period, say, 80 new lambs were born, but 10 of the mother ewes died, fell victim to predators, stolen or otherwise lost in circumstances beyond the borrower herder's control. At the end of the year the profits or gains and losses are shared by the borrower and lender as follows. First, 10 out of the 80 newly born lambs are selected as substitutes or compensation for the lost principal ewes

and given to the owner so that he gets his principal of 100 animals back. The remaining 70 lambs are equally divided between the lender and the borrower so that each gets 35 lambs in gains. The share of gains or returns received by the owner is considered annual interest earnings of 35 percent on his capital of sheep in the above example. The actual interest rates would, of course, be lower because the money value of a mother ewe (assumed principal) is higher than a few months old lamb (assumed interest). The real interest rates could more realistically be 17.5 percent.

In general, this system of share-cropping in animals provides insurance against risk to both the lending and the borrowing parties and, therefore, positively affects the state of resource conservation and productivity. It is easy to see that a rational borrower would be able to maximize his gains which are equal to the interest payments to the lender, if rangelands are less overgrazed and the health and higher survival and conception rates of animals are maintained. The current credit system in the tribal areas of Balochistan is founded on the traditional Baloch tribal as well as Islamic egalitarian principles. The widespread system over most areas of Balochistan seems to incorporate considerations of economic efficiency and social welfare as welfare. Considerations might have been redistribution of income from the rich to the poor and conservation of ranges in the interest of both the borrower and the lender as the lender and borrower maxima are the same. Seen this way, the credit system does not provide any incentive to the resource user, the borrower, to overgraze the rangelands.

However, in the areas where traditional institutions have weakened or disintegrated, the traditional credit system has also undergone some changes. Here the so called "Amanat" system requires the borrower to tend and care for a certain number of owner's animals without receiving any wages or compensation in any form. The real interest rates that the borrower herder pays to the owner are therefore higher, sometimes significantly, than the nominal interest rates calculated in the above manner. In this case, particularly in the absence of traditional institutional controls and limits on animals raised, there is a high probability that the borrower will strive to increase his stocking rates in order to be able to pay the higher real interest and the principal. Here, the economic principle that higher interest rates mean lower present value of future streams of returns,

areas there is no such assurance and an individual tribesman thinks that in order to maximize his profits he must strive to maximize the number of animals in his flock as he believes that all other tribesmen would be doing the same. Such incentive systems result in the non-traditional areas being more overstocked, overgrazed and depleted than the traditional areas.

Another aspect of the insurance problem involves risk avoidance through the share cropping arrangements prevalent among the tribes. Under the share cropping arrangement, as explained, the net annual benefits are shared equally by the borrower (tenant) and the lender (owner). An animal raiser is faced with an environment of risk and uncertainty , low output and incomes levels, and in poorer years he and his family face the very real danger of starvation. In such circumstances, the main motivating force in a borrower herder's life would most likely be the maximization not of income but maximization of his family's chances of survival. It seems that the share cropping system makes the best out of an inherently uncertain and risky situation faced by both the lender and the borrower. If the animal owner pays the shepherd/borrower a fixed wage or a fixed number of animals for his services, it would be efficient only if the animal borrower always worked hard and it did not cost the owner anything to monitor his work. On the other hand, if the borrower pays a fixed amount of money or a fixed number of newborn offspring to the owner as rent for the borrowed animals, he faces the risk that there will be a particularly bad year caused by a drought, epidemic, or another natural hazard, and there will not be enough animals left over for his family's survival.

Thus, a compromise must be found between the risk to the animal owner; that the borrower will not work hard, and the risk to the borrower; that a fixed payment of animals will be catastrophic for his family during years of drought and other natural hazards. Share-cropping thus is another situation of assurance and adaptation to the environmental conditions. In general, this system of share-cropping provides increased assurance and thus no incentives to increase the stocking rates. But if the animal borrower is somehow made to pay a higher proportion of the output (say, 60 percent) to the owner, it may result in higher stocking rates and depletion of the rangelands. Unfortunately in the non-traditional areas a borrower is, in fact, forced to pay a higher share of output through the 'Amanat' system.

resulting in relatively higher stocking rates and on average a lower productivity.

5.4. Prices

Prices affect the state of conservation and productivity of rangelands in many important ways. Economic theory indicates that as the prices of depleting products rise it leads to depletion of resources and as the prices of conserving products rise it leads to conservation of resources. Goat and sheep are the main types of animals raised by the tribesmen in Balochistan. Goats fulfill important subsistence needs of those who raise them, while the sheep are less capable of doing so. On the other hand, the market price of a sheep in this area has always been higher compared to a goat of the same age and weight because sheep meat and wool are highly valued by consumers outside of the tribal areas. Because of the above considerations, the non-traditional tribes whose production is more market oriented raise more sheep and less goats, the situation is just the opposite in the traditional areas where production is more subsistence oriented. With intensive grazing, particularly in lean years, the sheep completely remove the vegetation cover and expose the soil to erosion. On the other hand the goats are extensive grazers, more mobile, and less depleting under the arid environmental conditions of Balochistan.

According to economic theory, if future prices of animals are expected to rise, the animal raisers will normally stock heavily and retain marketable livestock as long as possible. Through interviews it was determined that most tribesmen thought that the sheep prices as against goat prices were expected to rise further in the future, as they did in the past. This was therefore an important reason for the non-traditional area tribesmen to substitute depleting animals (sheep) for non-depleting or less depleting animals (goat). Also because of the expectation factor, the better marketable animals (sheep) particularly in the non-traditional areas were retained for longer periods of time thus causing overstocking and overgrazing. Uncertainty and price fluctuations affect animal raisers as the main markets for animals as well as markets where the animal raisers buy their necessities including grain, lie outside of the tribal areas. If there is an atmosphere of general uncertainty in prices, the animal raisers hold

on to the livestock, they would have sold otherwise, hoping for a price recovery or improvement.

Future price expectations and uncertainty affect the traditional and non-traditional rangelands differently because of the following two factors. First, a larger proportion of animals is raised for market in the non-traditional than in the traditional areas. Expectations that sheep prices will increase more than goat prices provide an incentive, to the mainly sheep raising tribesmen in the non-traditional areas, to overstock and overgraze. Second, household expenditure on basic necessities of life is larger in the non-traditional areas than in the traditional areas as is shown in the following section. This latter factor is more likely to force the non-traditional area animal raisers to increase their stocking rates in order to be able to make their ends meet.

A related factor that impacts rangeland productivity is the prices of products that animal raisers buy relative to their own product - the animals. Many studies in the general region (Swift, 1976, Salzman, 1976 Spooner, 1967) have shown that the pastoralists' terms of trade in relation to producers of grain (bread made of wheat grain is the staple food for the tribesmen of Balochistan) have been deteriorating over the last many decades. Such a deterioration of terms of trade has forced animal raisers in the traditional as well as non-traditional areas of Balochistan to raise higher number of animals in order to be able to purchase their basic necessities of life. This may be another factor behind the general overstocking, overgrazing and depletion of rangeland resources witnessed all over Balochistan. But, since expenditure on necessities that are bought from outside the area is higher in the non-traditional areas, overgrazing problem is expected to be more serious in these areas compared to the traditional tribal areas.

5.5. Income Levels

According to our conservation economic model of chapter three, higher incomes enable animal raisers to lower their stocking rates, and lower incomes force animal raisers to raise their stocking rates. This is particularly true in case of subsistence oriented animal raisers of Balochistan. As is shown in table 4. of the appendix, gross returns or income levels and stocking rates are negatively correlated

in the tribal rangelands of Balochistan. Because the traditional area animal raisers average income levels are higher compared to the non-traditional area average income levels, it is expected that the non-traditional area herders will resort to overgrazing and depletion more often than their traditional area counterparts.

5.5.1. Income Levels and Interest rates

In a free enterprise economy and under most conditions, people with lower incomes must pay higher interest rates for the borrowed capital. In the Koh-i-Sulaiman area of Balochistan, settlements are dispersed, borrowers and lenders may not live in the same locality, and close monitoring of animal losses and gains is generally difficult. Thus, the whole system of borrowing and lending is based on the trust that the borrower is honest and that at the end of the year he will not hide from the owner any facts about the losses and gains. If the animals die, fall prey to predators, or are stolen or lost due to no fault of the borrower herder, the Nimsudi system provides that the losses are borne equally by the lender and the borrower. A poorer animal borrower is more likely to have the need to sell or consume animals during the year and state at the end of the year that the same were lost due to natural and other hazards mentioned above. Therefore, lenders are less prepared to lend animals to low income people compared to those with high incomes. As shown in table 4 of the appendix, average income levels in the non-traditional areas are lower than in the traditional areas. This may be one of the reasons behind the fact that in the non-traditional areas some kind of conditional animal loaning system is practiced. Under this conditional loaning system the usual profit-loss sharing arrangements are allowed to prevail, but the lender requires that during the year, the borrower must tend a certain number of animals belonging to the owner for free. The system locally called the Amanat system essentially forces the borrower to agree to a higher interest rate payment. One would expect that individuals and groups paying higher interest rates would also tend to have higher use/stocking rates resulting in depletion of resources.

5.5.2. Income levels and Time Preference rates:

Income also affects use rates through time preference rates. The time preference rate has been defined by Wanthrup (Wanthrup, 1968,

p.105) as " the ratio between the present marginal utility of money in more distant future intervals and the present marginal utility of the same amount of money in intervals nearer to the present". According to Wanthrup and other economists, people with low incomes tend to consume higher proportions of their incomes at present and save less for future. Thus people with low incomes have high time preference rates than people with high incomes. As presented in tables 4 of the appendix, the average income levels in the areas where traditional institutions have disintegrated are lower than the areas where the traditional institutions are still in tact.. Therefore we expect that individual animal raisers in the non-traditional areas have high time preference rates and they have a tendency to overstock their rangelands and deplete their resources more rapidly than their fellow tribesmen in the traditional areas. Thus, even if the tribesmen knew that high use rates will decrease future productivity and future revenues they may still continue to have excessive uses to receive high revenues at present due to high time preference rates since they have lower incomes. Also high time preference rates for the tribes in non-traditional areas means that their social saving and investment rates will be lower. On the other hand, in the traditional areas where the institutions empower the tribe as a whole to control the uses of the resources, the tribe collectively will have a tendency to conserve or save resources for future. Also it is more likely that the tribes in the traditional areas will invest more to enhance future productivity of the rangelands. On the basis of the above it can be argued that economic growth objectives can be achieved more easily under conditions of social ownership of the rangeland resources (as in traditional areas) than under private ownership.

5.6. Expenditure on Basic Necessities of Life

In the end it is the net income of an individual animal raiser that influences his decision-making with regard to conservative or depletive uses of the rangeland resources. This necessitates looking into a tribesman household's expenditure on basic necessities of life, knowing that higher expenditure on necessities means lower net income. In general, it is expected that higher expenditure on basic necessities of life, and a lower net income, will result in higher stocking/use rates and thus in the depletion of the rangeland resources.

CHAPTER VI

AN EMPIRICAL ANALYSIS OF RELATIONSHIPS BETWEEN INSTITUTIONS, ECONOMIC FORCES, AND PRODUCTIVITY

It was explained in the introduction chapter that because of environmental and other factors rangelands in Balochistan are generally being utilized at levels which are at or above their actual carrying capacity. At such levels of utilization an increase in stocking rates is expected to result in a decrease in range productivity and a decrease in stocking rates is expected to result in an increase in range productivity. Theoretical differences between institutionally traditional and non-traditional tribal areas with regard to range utilization rates were discussed in the previous two chapters. The most important outcome of the theoretical discussions was that both social institutions and economic forces have some theoretical relationship or association with rangeland productivity through stocking rates. According to the foregoing analyses, the stocking rates per forage acre are expected to be lower in the traditional tribal rangelands and higher in the non-traditional areas. Accordingly, and as a result of varying utilization rates, the range productivity would be higher in the traditional rangelands and lower in the non-traditional rangeland areas.

In this chapter empirical and quantitative data are analyzed to determine the effects of institutions and economic forces on range utilization rates and range utilization rates on biological, animal, and economic productivity. In section one, simple correlation analyses are performed to determine relationships or associations between stocking rates and range physical and economic productivity. A difference between means test is performed o see the significance of productivity and stocking rate differences between the institutionally traditional and non-traditional rangelands. In section two the impact of economic forces of income, taxes, and prices on resource utilization and productivity are analyzed and interpreted.

6.1. Institutions, Stocking Rates, and Rangeland Productivity

6.1.1. Property Rights and Carrying Capacity Relationship

Some institutionalized practices that influence physical and economic productivity of the rangelands are annual range closing periods, rotational grazing, and the economic orientation of the tribal economy. Annual closing periods and rotational grazing have a direct impact on rangeland productivity while the market or subsistence orientation of a particular tribe determines whether relatively resource depleting or resource conserving animals are raised.

Grazing Practices and Range Carrying Capacity

Table 1. of the appendix shows relationships between various grazing practices and rangeland productivity or carrying capacity expressed as total area/forage acreage ratio. The table shows that the average carrying capacity of rangelands following traditional and non-traditional institutional systems is respectively 56.93 and 87.169. Generally higher ratios in any particular rangeland indicate lower productivity and vice versa. Stated differently it takes on average, a mere 56.93 acres of actual rangeland area to produce one forage acre in the traditional rangeland areas. On the other hand, it takes 87.169 actual rangeland acres to produce a forage acre in the non-traditional tribal rangelands. A forage acre as defined in. chapter three is an imaginary acre completely covered by vegetation and completely edible. This makes it obvious that the traditional rangelands are, on average, more productive than the non-traditional rangelands.

Annual Closing Period

The approximate closing period in the year in each of the 20 rangelands is given in table 1 of the appendix. The table shows that the average annual closing period in the ten privately owned areas was only about ten days, while this average was over three months in the commonly owned tribal areas. As is also shown in table one of the appendix, the observance or otherwise of closing periods affects

the stocking rates and the general forage productivity or carrying capacity of the rangelands. The average carrying capacity of common rangelands is 56.93 (total area to forage acreage ratio) while the average carrying capacity of the privately owned rangelands is 87.169. On average and in general, the longer the closing period in a particular rangeland, the higher the long term and short term rangeland productivity. The mean carrying capacity of the rangelands where closing periods are not observed is only 65 percent of the mean carrying capacity of the rangelands where closing periods are observed.

Rotational Grazing

Rotations within the tribal rangelands are also observed in traditional tribal areas and, generally, not observed in the non-traditional tribal areas or are observed to a limited extent. Such rotations have the objectives of balanced grazing within the rangelands by allowing a rest period for the vegetation to grow in one area while other areas are being grazed. Such rotations have obvious positive effects on the state of conservation of the rangelands. While 100 per cent of the traditional tribal areas practiced some form of rotational grazing, only 33 percent of the non-traditional tribes engaged in some limited rotational grazing. Table 1. of the appendix shows that the carrying capacity of the rangelands where rotational grazing takes place is higher than the rangelands where it is less frequent in occurrence.

Sheep/goat ratio

The sheep/goat ratio can be used as a proxy for the subsistence or market oriented production because of different relative prices and subsistence value of the two types of animals. In a subsistence economy goats are hardier animals and require less feed and care but fulfill important needs of human nourishment, equipment making and general subsistence, but sheep are less capable of fulfilling these subsistence needs. In a market economy where production is mainly for the market not for self-consumption, higher sale prices and profitability are the main consideration. Thus, data from the areas of study show that institutionally traditional rangelands raised more goats than sheep while the non-traditional rangeland areas raised more sheep than goats. Under overstocked and dry conditions the sheep completely remove the vegetation cover and expose the soil to

the eroding forces of wind and water. The goats, on the other hand, usually pick up leaves of thorny bushes and trees like acacia without damaging or hindering the growth and future productivity of the trees and bushes and new leaves are produced after each rainfall. Further, since the vegetation, in general, is sparse and the rangelands are spread over large areas with only a few watering points, the goats are faster and more mobile hence a range with more goat herds than sheep herds will be more balanced in grazing. The opposite means that the areas near the watering points and camping areas will be overgrazed and areas farther away in the range remain un-grazed.

So it is only expected that there would be a positive relationship between market orientation and sheep/goat ratio, and a negative relationship between sheep/goat ratio and rangeland productivity. Table 1 of the appendix shows that this ratio is significantly and vastly different in the two types of tribal areas. The average sheep/goat ratio for the 10 non-traditional areas is 12.1 compared to an average ratio of 0.085 in the traditional tribal areas. The table also shows that a higher sheep-goat ratio is associated with a lower carrying capacity and vice versa.

6.1.2. Stocking Rates and Range Carrying Capacity Relationship

It is obvious that the more a rangeland area is grazed the less forage will remain and the lower the productivity would be for the rest of the season. But overgrazing also affects next year's and all future years' productivity because grasses and trees might have been damaged permanently and rendered unable to regenerate and re-grow. Table 2 of the appendix shows data on stocking rates (animals per forage acre) and the carrying capacity (total area/forage acreage ratio) in each of the 20 rangelands studied.

Although carrying capacity and forage acreage measures adequately represent the range productivity, total area/forage acreage ratio is considered to be a better measure of relative biological productivity. Generally higher ratios in any particular rangeland indicate lower productivity. This ratio when related to animals per forage acre /stocking rates is expected to show relationships between general range forage productivity and stocking rates. To achieve this

objective a simple correlation analysis is performed. The correlation coefficient "r" between stocking rates and the total area/forage acreage ratio (carrying capacity) is found to be 0.91. This shows a high correlation between the two variables. From this sample correlation coefficient a statistical inference about the population correlation coefficient "p" can be drawn. A 95 percent confidence interval for "p" is as follows: $0.55<p<0.89$. The null hypothesis that $p=0$ or equivalently that the sample correlation coefficient "r" is not significantly different from 0 may be rejected at the 5 percent significance level since the interval does not include 0. The test of significance of the sample correlation coefficient can also be performed as follows: $t= r/(1-r^2/n-2)^{1/2} =9.30$ and $t0.025$ (18df) $=2.101$. The t value shows that the sample correlation coefficient is significantly different from zero.

Stocking or utilization rates effect long term as well as short term productivity of the rangelands. The original data on both stocking rates and the total area/forage acreage ratios were 12 month averages. The stocking rates as well as forage acreage and carrying capacity in any particular rangeland differ from day to day, month to month and year to year. For purposes of this study only monthly figures have been used assuming no significant changes take place within the month. The significant correlation between stocking rates and forage productivity indicates that, in general, range productivity and stoking rates are negatively associated (increased stocking rates associated with decreased productivity) as expected.

6.1.3. Stocking Rates and Animal Productivity Relationship

It is known that if a rangeland is overstocked and overgrazed so that less grass and other vegetation is available for animals to feed on, returns from the enterprise will decline. Animal malnutrition can cause disease and death among animals as well as low conception, birth, and survival rates. Table 3. Of the appendix shows data on stocking rates and animal productivity indicators of animal birth/survival rates, and adult death rates. A simple correlation analysis is performed to find evidence of general relationships between the stocking rates and the animal productivity indicators. Simple correlations are calculated to see any relationships between

the stocking rates (animals per forage acre) and the two economic productivity indicators.

The correlation coefficients in each case are as follows:

Stocking rates/birth-survival rates r= -0.674

Stocking raters/adult death rates r= 0.018

A test of significance of the correlation coefficient in case of stocking rates/birth survival rates shows a t value= -3.807 which is significant at the 5 percent level. The t value in case of stocking rates/adult death rates, however, is insignificant (0.0764). This demonstrates that although death rates show no significant correlation with stocking rates, the birth survival rates are significantly correlated with the stocking rates. The negative correlation is as expected in case of birth/survival rates. One would expect the birth/survival rates to be higher in ranges with relatively higher forage productivity and lower stocking rates. The insignificant correlation between stocking rates and death rates is perhaps due to the fact that death rates, more than any other productivity indicators, are affected by factors not related to malnutrition. Diseases and epidemics play an important role in this respect. It is possible that the effects of the lower forage productivity/carrying capacity and thus malnutrition and death in the non-traditional areas were neutralized by the availability of better veterinary medicine and services as compared to the traditional areas.

6.1.4. Stocking Rates and Economic Productivity Relationship

Table 4. of Appendix shows data on stocking rates and productivity indicators of gross returns per acre, gross returns per animal, and gross returns per rupee invested. Simple correlation analyses are performed to determine relationships between stocking rates and the productivity indicators. The gross returns/gross income include the shadow values of the gains during the year i.e. new additions during the year due to birth, growth in animals during the year (age and weight value); value of wool, mohair and hides; and value of milk and butter. Locally prevailing (1980-81) prices were used to determine the total shadow value of the flock or the enterprise in the beginning and at the end of the year. The difference between the beginning and end of year shadow values plus shadow value of wool/mohair, hides, milk, cheese and purified butter (Roghan)

obtained during the year, constitutes gross annual returns to the owner which is also approximated to be equal to annual gross income.

To find associations between stocking rates and various economic indicators of gross returns per acre, gross returns per animal, and gross returns per rupee invested, the correlation coefficients are determined to be as follows:

Stocking rates/returns per acre. r=0.112
Stocking rates/returns per animal. r= -0.675
Stocking rates/returns per Rupee r= -0.648

Very low correlations are evident between stocking rates and returns per acre. The correlation coefficient " r" is not significantly different from zero in this case, since a 95 percent confidence interval (-0.3<p<+0.45) includes 0 and the test of significance of "r" shows a "t" value=0.478. The insignificant correlation between stocking rates and returns per acre may be due to the fact that increased stocking rates will increase returns per acre as long as the animals survive even at the starvation levels. It is possible that relatively higher returns per unit area of less depleted traditional rangelands are cancelled out by higher numbers per unit area in more depleted ranges. The use of supplemental fodder for animals in the non-traditional areas and the fact that sheep have a higher market value and the sheep/goat ratios, in general, are higher in the non-traditional areas also might have affected the returns per acre and stocking rate relationships. The stocking rates and returns per animal show a high level of correlation and a test of significance of "r" shows a t value = -3.807, which is significant at the 5 percent level and the hypothesis of no significant linear relationship may be rejected. In case of the stocking rates and returns per rupee invested again a high negative correlation is shown. The significance of "r" test shows a t value = -3.62 and the null hypothesis that the coefficient of correlation is not significantly different from zero may be rejected. The above may be interpreted as a demonstration of the fact that higher stocking rates are, generally, correlated to lower returns per animal and to lower returns per rupee invested. This along with the already established correlation between stocking rates and forage productivity, provides a basis for the conclusion that, on average, higher stocking stocking/use rates are associated with lower biological and economic productivity.

6.1.5. Institutions, Stocking Rates, and Productivity Relationship

As discussed in chapter three, the forage acreage requirement per sheep/goat/month under Balochistan conditions is 0.257, which translates into 3.89 (1/0.257) animals per forage acre. Thus, a stocking rate equal to 3.89 animals per forage acre is considered as the optimal level of range utilization, or utilization according to carrying capacity in the rangelands of Koh-i-Sulaiman in Balochistan. Extent of overstocking or understocking in each individual rangeland and mean overstocking or understocking in the traditional and non-traditional rangelands are presented in table 5. of the appendix.The table shows that mean overstocking in the non-traditional tribal areas is over 6 animals per forage acre while it is only slightly more than 1 animal in the traditional tribal rangelands. The figures also show that generally both traditional and non-traditional rangelands are overstocked. But overstocking problem is more severe in the non-traditional tribal areas.

6.1.6. Institutions and Productivity: A Difference Between Means Test

It was determined in sections 6.1.3. and 6.1.4. That stocking rates were significantly correlated with productivity indicators of animal bi.th/survival rates, gross returns per animal, and gross returns per rupee invested. In order to determine statistically significant or otherwise differences between traditional and non-traditional rangeland areas "Difference Between Means Test" is utilized. Data on overstocking, animal birth/survival rates, gross returns per animal and gross returns per Rupee invested are represented in table 6 of the appendix. In the table, data for the traditional and non-traditional tribal areas are compared to see if the differences in the two areas are significant. A simple "difference between means test" is performed and means and "t" values are reported. The null hypothesis is that the mean of overstocking, birth/survival rates, gross returns per animal, and returns per rupee invested in traditional and non-traditional areas are not different i.e. mean of tribes A=mean of tribes B. The "t" values in the table demonstrate that this hypothesis may be rejected in all cases. The difference between means in case of birth/survival rates and returns per rupee invested are highly

significant even at 1 percent level of significance. The difference between means in case of overstocking is significant at 5 percent level and that in case of gross returns per animal is significant at 10 percent level. From the results of the tests it can be concluded that the extent of overstocking is significantly higher in non-traditional areas and the animal birth/survival rates, gross returns per animal and gross returns per rupee invested are significantly higher in the traditional areas. This demonstrates lower overstocking and higher productivity in areas where traditional institutions exist. The results mean, by implication, that traditional institutions might have played an important role in maintaining the productivity of resources at some levels consistent with a higher state of conservation and survival. Also that changes in institutions might have played some role in the general decline in the productivity of the rangelands of Koh-i-Sulaiman in Balochistan..

6.2. Economic Forces, Resource Use, and Rangeland Productivity

In a market economy economic forces of prices, income levels, taxes, interest rates and insurance significantly influence an individual's behavior towards resource use and productivity. But, it is not certain if the tribal economy under study is sufficiently market oriented for economic forces to influence a tribesman's behavior in this regard. It is, however, true that market influences have deeply penetrated in at least some of the tribal areas and such influences are spreading to others. In this section, an attempt is made to define various economic forces and terms in the context of the local tribal economy and then analyze their impact on resource use and productivity.

6.2.1. Interest Rates

Table 7. of the appendix shows that mean interest rates in the traditional tribal areas (27.8 percent) are about twice those in the non-traditional tribal areas (13.8 percent). This is contrary to our expectations, since according to conservation economic theory, higher interest rates are normally associated with lower productivity and vice versa. The main reason behind higher interest rates in the traditional tribal areas is the non- existence of regular credit markets and the use of the prevailing profit loss sharing system for interest

rate calculation. Under the profit-loss sharing system higher economic returns mean both higher productivity and higher interest rates. Therefore under these special circumstances and due to the peculiar method of interest rate determination, higher interest rates are associated with higher range carrying capacity and productivity. In this situation changes in interest rates do not cause changes in resource use and range productivity as conservation economic theory would suggest, but rather changes in productivity cause changes in interest rates.

6.2.2. Taxes and Contributions:

As is shown in Table 7 of the appendix, average annual amount of taxes and contributions paid in the traditional areas (Rs. 1671.7) are about three times those paid in non-traditional areas (588.9). The conservation economic theory tells us that generally, higher taxes encourage overstocking and depletion of rangeland resources. In case of the Baloch of the Sulaiman mountain ranges, the customary taxes and contributions are higher in the traditional areas simply because productivity and returns are higher in such areas. As in case of interest rates, it seems that the higher taxes are the result of higher productivity not vice versa. Many non-monetary and non-economic benefits, for example social and political status and prestige, are also gained when higher taxes and contributions are paid.

6.2.3. Prices and Insurance

The sheep/goat ratio in table 7 of the appendix represents the closest approximate effects of prices as well as insurance. The table shows a sheep/goat ratio of 12.1 in the non-traditional tribal areas as against a ratio of only 0.885 in the traditional areas. The huge difference between the two areas is partly explained by the fact that the traditional and non-traditional rangelands were purposively selected for studies. But high sheep prices relative to those of goat have, undoubtedly encouraged the tribesmen, particularly in the non-traditional rangelands, to raise more sheep than goat. It was explained earlier that higher sheep/goat ratio in the non-tribal rangelands means more degradation and depletion of the rangeland resources in these areas.

6.2.4. Income Levels and Expenditure on Basic Necessities

According to our model, as income increases, the animal raisers are in a better position to lower their use rates and as income decreases animal raisers may attempt to increase their stocking rates. Table 7 of the appendix shows that the income of an average family in the traditional areas (20,118) is 27 percent higher than the income of an average family in the non-traditional areas (15.838.1). This leads to the conclusion that since the average income levels are lower in the non-traditional areas, animal raising families will have a tendency to overstock, overgraze, and deplete their rangeland resources more rapidly than their counterparts in the traditional areas.

As indicated earlier, higher expenditure on necessities normally leads to higher stocking/use rates and thus in the depletion and lower productivity of the resources. In order to compare the traditional and non-traditional areas with respect to expenditure on necessities of life data from the two areas are presented in table 8 of the appendix. The table shows that average annual expenditure on necessities per family of six amounted to Rs. 6,604.1 in the non-traditional areas and Rs. 4,752.3 in the traditional areas. An average family in the non-traditional areas incurs relatively higher expenditure on basic necessities. This is expected to provide an incentive to to a family in the non-traditional areas to increase stocking/use rates in order to meet the expenditure on basic necessities. One important reason for a traditionai tribal area family to have lower consumption expenditure and thus higher saving and investment may be as follows. Living in remote inaccessible areas, the traditional area families have less knowledge of or demonstration effect on, as far as goods beyond their bare necessities of life are concerned. The traditional area tribesmen save more, their savings are immediately reinvested and result in more capital accumulation in the form of more breeding animals.

A Baloch Shepherd before leading his sheep to the pastures.

Sheep must be led to greener pastures

A herd grazing in a rangeland.

Four shepherd boys ready for day's work

A shepherd boy with his herd of goats.

The "Ghulamani Laag" is a famous breed of donkey.

Called otag or tarai the cisterns are used for drinking purposes by both animals and humans beings.

This rangeland is located at an altitude of about 7 thousand feet above sea level.

CHAPTER VII

LOCAL SURVEY RESPONSES TO QUESTIONS OF RANGE PRODUCTIVITY

So far, we have analyzed relationships between institutions and resource utilization and between resource utilization levels and economic productivity. In this chapter the tribal resource users' own ideas with regard to the state of conservation and depletion of their resources, resource use and productivity relationships, and ways to improve the productivity of the rangelands, are discussed. For this purpose, random surveys and interviews among the animal raisers of the twenty purposively selected rangelands were conducted.

7.1. Causes of Low Range Forage Productivity

More than 300 shepherds, animal owners, and tribal elders were interviewed either individually or during tribal gatherings. It is of interest to note that, in general, when asked directly, most of the animal raisers did not believe that any depletion of their rangeland resources was actually taking place. The interviewees admitted that trees and other vegetation in their rangelands were more abundant even a mere 10 to 20 years ago than these days, but they thought that given better conditions and rainfall the same levels of vegetation growth will return. Signs of depletion like the presence of gullies, decreasing quality of the grasses, and overall range deterioration, although obvious in some tribal rangelands did not cause much concern among the animal raisers. However, a majority of the interviewees did seem to agree that resource uses were excessive and that the vegetation and water resources in any particular year or season are quickly depleted and more trees are cut during a given year. The questions asked were mostly indirect and were framed in such a way that they implied depletion, for example questions as," Do you think that your animals are less healthy/malnourished and underfed now than a few years ago? Do you wait longer, now compared to ten years ago, for your turn to water your animals on the pond, spring, or water hole each day? Or do you often times find it more difficult to find greener pastures for your animals this year compared to years past? Some interviewees thought that there were no worldly causes for more or less grasses and other vegetation - it

was all "God's will". Others thought that these days people were less pious and sinned more so less of God's blessings in the from of rains are bestowed upon them. After rejecting some interviewee responses for various reasons, 210 interviewee responses are summarized in table 9 of the appendix.

As is clear from the table, the most important reason indicated as the cause of depletion or less vegetative growth, is rainfall. Slightly more than 34 percent of the animal raisers indicated that low rainfall was the most important reason why less trees, bushes and grasses grew in their range lands. One reason for this overwhelming response seems to be that the topographic and soil conditions prevailing in this semi-arid region of the world are such that immediately after a rainfall all types of grasses and smaller plants mushroom in large numbers and the animals, generally, have enough feed until it is grazed or it rains again and a new round of vegetative growth takes place. The subsistence oriented Baloch animal raisers live from day to day and are more concerned with the immediate problem of feeding their animals. Also, the animal raisers seem to attach far more importance to the grasses and vegetation of seasonal and short duration which the rain causes to grow instantly, than to the trees and bushes which take years to grow.

Rainfall also constituted the second most important cause of depletion or less growth. During interviews it was noticed that if not sufficiently explained most of the animal raisers thought that rains, which are God's blessing, were the only cause of good or bad years and of the abundance or scarcity of vegetation growth. Only when it was explained to them that the range vegetation was of better quality and more abundant during their father's time, which they themselves admitted, or that there were better ranges in the neighboring tribal areas with similar environmental conditions, did some realize that there could possibly be other causes of lower or higher productivity of rangelands. Many would still say that the reason that the ranges were better decades or centuries ago is because their forefathers led more pious and purer lives and God was pleased with them, so plenty of rains fell. Also, they believed that there were better ranges in their neighboring tribal areas because the people there were more God fearing and generous or that some saint (Pir) had prayed for their welfare.

Second place in the most important reason category was that of the common property rights (18.095 percent). The animal raisers attached real importance to the common property rights institution and the institutions which regulated animal numbers. Even in areas where most of the traditional institutions had disintegrated in the recent past, people would talk about the importance of institutions like closing periods and rotational grazing, which had significant positive effects on the rangelands. The tribesmen would say that these days animal productivity is low because there are no institutional controls, people raise animals without limits, and make excessive use of trees and bushes for timber and firewood. In areas where the regulations and controls still existed tribesmen thought that depletion and overuse of the resources was prevalent because there were less controls now than there used to be and that there were less stringent limits on the number of animal raised, number of trees cut, and the amount of other resources utilized. It is clear that majority of the tribesmen do attach great importance to traditional controls and limits on the use rates, without sometimes directly expressing the same. Many individual animal raisers, particularly in the traditional tribal areas, complained bitterly about the members of other tribal sub-sections sharing the same rangeland, saying that they raised excessive numbers of animals and were not following the traditional tribal controls. The next important categories immediately following the common property rights without controls were those of excessive population and lower income. In the most important category 9.524 percent of the respondents thought that human and animal population increases were the main cause of overuse of resources. 9.048 percent indicated that they raised more animals, and according to them most of the other people did the same, because with smaller numbers of animals and smaller incomes they cannot make their ends meet. In the category of the second most important cause for resource overuse and depletion, after rainfall the second highest percentage (18.095) attributed increased animal numbers and thus overgrazing to the rising costs of living, more specifically to the ever increasing costs of necessities they bought from outside the tribal areas. The animal raisers terms of trade in relation to the grain producers, for instance, have been deteriorating for a long period of time. As the third most important cause of depletion and resource overuse, the respondents named the costs of living as the most important one (18.571 percent), rainfall came just after it (17.143 percent), followed by the common property rights without

regulations. Taxes and contributions, indebtedness, price increases and common property rights with regulations did not make much difference according to animal raiser's responses. Not a single respondent considered interest rates (benefit-loss sharing arrangement) to be of any consequence as far as resource use and depletion are concerned.

7.2. Range Productivity Improvement

As indicated earlier, the semi nomadic animal raising tribesmen of the area are among the poorest of the communities in Balochistan, while Balochistan itself is the poorest province of Pakistan. The abject poverty of the tribesmen is a reflection of the extremely low productivity of rangelands and animals, since range animal farming is the only means of living and income for the vast majority of the population of the area. In general, the tribesmen of the area are also illiterate, fatalistic, and most believe that poverty and suffering as well as other human conditions are predetermined and God's will. Yet, it is important for our analysis and conclusions to take the tribesmen's own views with respect to range and animal productivity as well as improvement in their living conditions.

184 animal raisers were interviewed and asked about their opinions and suggestions with respect to range productivity improvement measures. In each case the question asked was whether a possible measure or action would directly or indirectly improve the physical and economic productivity of the rangelands. Table 10 of the appendix shows the measures and corresponding responses.

As shown in table 10 of the appendix, 32.06 percent of the interviewees considered more rainfall or water availability as the most important factor to improve range and animal productivity. This is understandable because water, coming mostly from direct rainfall, is the most scarce and precious commodity in semi-arid Balochistan, and the animal raisers duly recognize its importance. The second most important factor named as a determinant of higher productivity and higher living standards (income) was reduction in animal losses. Preventing animal losses due to disease and other causes is important because a tribal family must have a certain minimum number of animals in his flock for subsistence. Higher losses require higher stocking rates so that even if some animals die

the family can still avoid starvation. There are not enough animal disease control facilities available in the traditional or the non-traditional areas. The most common practices of finding cures for animal diseases, particularly in the traditional areas, are religious and cultural cures like amulets. Yet, it is well known in both types of rangeland areas that at least some diseases like anthrax and foot and mouth disease are controllable through modern medicine. The question asked was that if less animals died due to disease, would the individual raise fewer, more or the same number of animals. 21.09 percent responded by saying that they would raise lesser number of animals if they knew that not as many were going to die of disease etc. during the year. When asked what they thought the government should do to help improve their rangelands and living conditions, an overwhelming majority answered that the government should provide them with facilities for more water and veterinary medicine (over 53 percent). This concern for water provision and veterinary medicine is in accord with animal raiser's individually rational strategy of maximizing their animal numbers/stocking rates. The third most important range productivity improvement measure indicated as first response, was an increase in annual range closing periods. Even in areas where the closing period is either very short or no closing period is observed at all, animal raisers thought that it would help if there were some closing periods in the year. Most of the areas where the annual closing periods were observed, animal raisers thought that it would help if such periods were prolonged.

The tribal organization has political, social, and economic aspects. No questions were asked about the political aspects of the organization. The animal raisers were asked questions only about those aspects of tribal organization that regulate resource use one way or another. A certain percentage of the respondents (6.522) indicated that the existence and continuation of the tribal organization to regulate resource use rates and practices was important for the maintenance and preservation of their rangelands. The tasks that the tribal organization should perform, according to the interviewees, were enforcement of annual closing periods, payment of tribal and religious contributions, and limiting number of trees felled by an individual family. Water availability concern was also indicated as the highest second response (22.28 percent), followed by the desire that there should be some types of controls and regulations through the tribal organization (19.02 percent). Increase in annual closing

periods and availability of veterinary medicine followed the tribal organization and as a second response. 11.957 percent of all interviewees indicated that they would raise fewer animals if their animals fetched higher prices so that fewer animals would be needed to be sold or exchanged for the basic necessities that they buy from outside their tribal areas. A lower percentage (4.348 as a first response and 7.065 as a second response) thought that if they could buy grains (for their own consumption) at lower prices they would raise lower numbers of animals so that rangeland productivity could improve.

There was also the universal tendency of blaming the other sub-group or other person in the rangeland for not observing closing periods, not observing limits on animal numbers and not contributing enough for the tribal obligations. These problems seem to be more severe in the areas where the traditional systems of settling disputes between members of the tribe have broken down, and the chief or headman (Sardar, Malik, Safedrish) himself does not follow traditional tribal rules and regulations particularly with respect to resource use.

Undoubtedly, the views expressed are indicative of the grave problem of a breakdown of traditional institutions and not being replaced by other institutional arrangements. Despite the fact that constant feuds among members and sub-groups over the use of resources existed, very few people thought that privatization of rangelands will solve their problems. Only 1 percent of the interviewees responded in affirmative when asked if, in their view, privatization of the commonly owned rangelands should take place. This shows that the animal raisers were well aware of the economies of scale in grazing obtainable under common property rights system. Also they are well aware of the transaction costs which would be involved if commonly owned lands are privatized. Smaller numbers of respondents considered increased prices for their animals or decreased prices for the wheat grains, their main staple food, was an incentive to change their utilization rates. The opinion concerning government loans is mixed in the general area. In general, the area people consider payment or receipt of any kind of interest on money strictly un-Islamic and prohibited. Some thought that government's making loans available was a sort of welfare measure for the poor, something which did not need to be paid back, and were strongly in favor of it. Others thought that if interest free government loans were available

they could replace their dead or lost animals. Very few thought that loans would help ease pressure on the rangelands. Not a single respondent thought that the government either had the right or any business to take over their rangelands and to control their management. According to the government officials positioned in roadside villages and urban areas, the rangelands in the vast mountainous areas are rightfully government or public property, but no such claim is recognized by the tribes. Also a smaller number (about 2 percent) thought that it was due to tribal organization that the rangelands were being depleted or overused and that if the system is completely abolished there would be less depletion. Most of those who considered abolishing the system completely were from those non-traditional areas where the system is almost non-existent any way. In such areas the tribal chiefs, who still have some political and economic power, have appropriated parts of the common tribal lands for their private and exclusive use. Sub-chiefs and their relatives have followed the example of major chiefs with the result that rangeland areas have contracted, ownership has become private for all practical purposes and depletion has become widespread in such areas.

CHAPTER VIII

CONCLUSIONS AND RECOMMENDATIONS

8.1. Conclusions

The tribal pastoralists of the Sulaiman mountain range of Balochistan, face declining animal productivity and deteriorating living standards, mainly because of the extremely poor state of their rangelands. In these areas, all aspects of tribesmen's lives including ownership and management of rangelands and other resources are controlled through informal institutional arrangements. It was therefore natural to look into their socio-economic institutions to find reasons behind and solutions to the problems of resource degradation, poverty, and underdevelopment. In the preceding chapters, answers to the following questions were sought. (i) Whether the tribal social institutions influenced an individual animal raiser's behavior towards resource use or stocking rates? (ii) Whether the economic forces influenced an individual animal raiser's behavior towards resource use? (iii) Whether different levels of resource utilization/stocking rates influenced the forage, animal, and economic productivity of the rangelands?

Theoretical analyses of the institutions of property rights, tribe, family and religion revealed that these institutions did influence behavior towards resource use and productivity. Through persuasion, sanctions, and sometimes coercion, the institutions discouraged behavior that could result in excessive grazing of the rangelands. Analysis of the quantitative data showed that mean stocking/use rates per forage acre were lower in areas where the tribesmen followed the traditional institutions compared to the the tribal areas where they did not. Following their traditional institutions of resource use, the animal raising communities have, in the past, succeeded in maintaining their resources at levels consistent with the sustainability of the rangelands and with their own survival. Theoretical and empirical analyses also showed that economic forces influenced individual animal raiser's behavior towards resource utilization. Higher income levels, lower expenditure on basic necessities, lower interest rates, and better social security encouraged traditional area animal raisers to follow more conservative and less depleting resource use practices.

Further empirical data analysis showed a high and significant negative correlation between stocking rates and range carrying capacity. This means that, on an average rangeland of Koh-i-Sulaiman, adding more animals to the flock, generally, results in lower range carrying capacity or forage productivity. Analysis of relationship between stocking rates and the productivity indicator of annual animal birth/survival rates showed a negative correlation, indicating that lower stocking rates were associated with higher birth/survival rates. A correlation between the use/stocking rates and returns per animal showed a high level of negative correlation. This means that on an average Koh-i-Sulaiman rangeland, an increase in animal numbers actually results in lower returns per animal. Similarly, in case of stocking rates and returns per rupee invested, a high negative correlation is shown. This, again, indicates that as animal numbers in an average range increase, the returns per rupee invested in animals decline and vice versa.

8.2. Recommendations

8.2.1. Institutions

Through the theoretical and empirical analyses, it has been shown that under the prevailing conditions of Balochistan, the original tribal institutions which controlled and regulated resource use, were more conducive for economic growth. But in the areas where these institutions have changed, probably, there is no going back to the old institutions. Reviving old institutions in all their aspects is neither feasible nor necessarily desirable, because such institutions have many aspects which may hinder development rather than accelerate it. However, all indications and trends show that a certain degree of disintegration of institutions is slowly taking place even in the most traditional areas and as time passes there would probably be more of these changes. The same forces which brought about changes in today's non-traditional areas are making inroads into the traditional areas, and there is no reason to believe that such changes would be resisted for long.

It is recommended that new institutions may be developed on the basis of those traditional concepts of cooperation and constraints which have made the system viable for such a long period of time.

The government could play an important role in encouraging the formation of some type of production and service cooperatives within the tribal rangelands. Such cooperatives would be consistent with the customs and traditions of the tribesmen and perform the age old functions of regulating resource use according to the carrying capacity of the rangelands. The cooperatives, could, at the same time provide a minimum future security for individual tribesmen and their families, through a system of credit and other security arrangements. A cooperative or a similar organization, could also perform such functions of the old tribal organization as enforcement of closing periods, rotational grazing, and imposing limits on flock size.

8.2.2. Economic Forces

Economic forces such as income, interest rates and taxes are important tools to change the behavior of resource users with respect to their use rate decisions. Under the prevailing conditions none of these tools can be utilized, but possibilities for their use in the future exist. Some years back there used to be a government tax of some kind on animal raisers. It does not exist in the areas studied any more, but may exist elsewhere in Balochistan. Currently the government does not provide any services and has no legal or moral right to impose any taxes. But, if the government provides basic services like drinking water, roads, schools and hospitals, then it will have a right to impose taxes on animal raisers. Once the government succeeds in imposing taxes, it can also use the taxes as a tool to influence animal raisers decisions with regard to resource use and stocking rates. On the local tribal level, the tribesmen, through the tribal organization if it still exists, or through some cooperative body so constituted, can be encouraged to impose some type of grazing tax on the animal raisers. Such taxes could be highly progressive so that beyond a predetermined level, a level determined for the whole tribal rangeland on the basis of its carrying capacity, the tax progressiveness increases. For example a tax system could be devised where a tribesman raising beyond 120 sheep pays taxes equal to 15-20 percent of the value of added animals. Similarly taxes on animal raising could be value based, so that raisers of high valued but resource depleting sheep pay a higher tax rate compared to the raisers of low valued but relatively resource conserving goat. This may encourage animal raisers to raise more goats and less sheep, resulting in less depletion and more conservation of the rangelands.

One main reason behind overstocking and overgrazing is that no employment opportunities other than in animal shepherding business exist in the tribal areas. Years ago the government established some carpet making and hand embroidery related small scale industries in several towns and cities of Balochistan, some may still exist. Establishment of more of such industries makes good economic sense because of the following reasons. First, if locally produced wool and mohair are used as raw material, then increased demand for the same would mean increased prices and increased incomes for the animal raisers. Second, if such industries are established close to the main animal raising areas, as Kingri, Rakhni, Barkhan, Kohlu, and Dera Bugti in the Koh-i-Sulaiman region, many of the unemployed tribesmen could be gainfully employed in them. Such employment opportunities will certainly lower pressure on the rangelands, because currently increased unemployment among tribesmen means increased number of animals per area of rangeland. Third, at present many tribesmen who can afford to save and invest do so in animals, mainly because of lack of alternative investment opportunities. Establishment of industries using raw materials coming from the tribal areas themselves could provide opportunities for both alternative employment and alternative investment and thus a decreased pressure on range land resources.

8.2.3. Range Improvement Measures

The government run animal husbandry department is one of the oldest departments in the province and has been working for over a century now. The main job assigned to the department has traditionally been providing veterinary services, although in recent years it has also provided some other services. One would expect that the government expends resources in a most beneficial and efficient way and gives higher priority to those projects that the target populations are absolutely unable to undertake themselves. Two main areas where government help is needed the most are as follows. First, over most of the Sulaiman mountain range, the animal raisers dig ponds or cisterns (Otag, Tarai) where the rain water collects which is used for drinking purposes by both the animals and humans. In low rainfall years hundreds of tribesmen die of water borne diseases like cholera and many more are forced to take their animals and families elsewhere to avoid thirst and

starvation. Currently there are no possibilities of raising irrigated fodders anywhere in this water scarce region. The best solution to overcome water scarcity in the Sulaiman mountain range, or anywhere in Balochistan, seems to be the construction of small dams to store rainwater for drinking and possibly irrigation purposes. Because dam construction work is unskilled labor intensive, undertaking such projects will greatly alleviate the serious problem of high unemployment in the Sulaiman mountain region and throughout the province. Production of more animal feed and lower tribal unemployment rates will result in lower pressure on the existing rangelands, as indicated before. The second area of recommended government intervention involves the introduction of fast growing and drought resistant varieties of grasses and other vegetation. Such varieties have successfully been introduced in neighboring India and even in parts of Pakistan. Afforestation and reforestation programs should always take locally adopted and acclimatized bushes and trees into consideration. Different varieties of a particular berry bearing tree called Kunar in Balochi and zizyphus in English.(zizyphus Jujuba) grows over most of the Sulaiman mountain range and beyond in Balochistan. This tree is fast growing, drought resistant, the goats and sheep prefer grazing its leaves, and its wood is valuable when used as timber for building purposes. Inclusion of Zizyphus tree in any afforestation programs is highly recommended. The tree will grow in all areas of Balochistan except in the few high altitude cold areas of the province.

8.2.4. Education

Finally, it is never out of place to talk about the importance of education while discussing problems of poverty and underdevelopment. Although illiteracy levels are high among all groups in most areas of Balochistan, close to 100 percent of the mountain and desert dwelling animal raisers are known to be illiterate. Studies in less developed countries and even in the United States have shown a negative correlation between poverty and levels of education Most of the economically advanced and prosperous countries of the world, have followed systems of compulsory elementary education for their populations for more than one hundred years. The countries without such a system today include the countries of the two most poverty stricken regions of the world i.e. Sub-Saharan Africa and South Asia. Many countries including

some in the general neighborhood of Balochistan, have followed policies where special arrangements were made to provide education to the nomadic populations. In Turkmenistan for many years special arrangements were made to ensure that the nomadic Turkmen children received the same quality education as the children of the residents of the Turkmen capital. In the Sulaiman mountain region most animal raisers are not even true nomads and move short distances, generally, within their tribal rangelands. This makes it less difficult for the government to arrange for the education of the tribal children. The fact of the matter is that the government, so far, has not made any determined efforts to educate the children of the animal raisers. A few government sanctioned schools remain without teachers and without pupils. The tribesmen themselves are not particularly interested in educating their children either, because of many reasons. First, in the past going to school has not been beneficial to the children or to the parents. Most of the teachers, appointed not on qualification but on recommendation of a minister or bureaucrat, could not impart any knowledge that they did not possess. Second, the teachers generally remain absent most of the year and the children end up wasting time that they could have spent helping their parents to increase their incomes. Third, as elsewhere in the province, parents send their children to school so that they receive a degree or diploma which qualifies them for a government job. But government jobs are given to those who are either rich to offer bribes or are connected to high bureaucrats and/or politicians. A poor animal raising tribesman has neither money nor connections, so for him sending a child to school involves losses that outweigh the gains. The losses incurred due to sending a child to school include the foregone income the child could have made working for the family enterprise or for some other animal raiser. Finally, the children that go to a school end up having no meaningful education and are no more able to do as good a shepherding job as they would have, had they not gone to school. All the above factors make a tribesman think twice before sending his child to school.

Economic growth and prosperity in the Sulaiman mountain region and in the rest of Balochistan cannot be achieved without radically reforming the failed education system in the province. A few recommendations with regard to improving the education system in Balochistan are as follows. First, a system of free and compulsory elementary education needs to be introduced in the province with

immediate effect. This is probably the only way to bring Balochistan at par with the other provinces of Pakistan and into the twenty first century. This may require use of force or punitive action against parents in some cases and the provincial government needs to be prepared for that. Second, an incentive system that has successfully been implemented in many less developed countries including Brazil, should be considered for introduction in Balochistan. Under this system the poor parents who send their children to school are paid a monthly allowance as compensation for the loss of income involved. This allowance paid for each child sent to school continues until the child graduates from high school. Third, the government should provide free lunches to all the children of elementary schools throughout the province. Fourth, it is unfortunate that in the past corrupt bureaucrats and politicians of the province have caused a huge loss to the people by hiring uneducated elementary teachers. The loss is evident as hundreds, possibly thousands, of graduates including doctors and engineers remain unemployed and probably unemployable. The department of education needs to reeducate and retrain the teachers where possible, and get rid of them where it is not possible. Salaries and benefits of qualified teachers need to be elevated to the highest possible level, possibly at par with doctors and engineers.

BIBLIOGRAPHY

Aggrawal, R.M. (2000). Possibilities and Limitations to Cooperation in Small groups: The Case of group Owned Wells in Southern India" World Development, 28, 1481-1497.

Baden, J.A. (1998). "A New Primer for the Management of Common Pool Resources and Public Goods". In: J.A. Baden and D. Noonan (eds.), Managing the commons, Indiana University Press.

Barth, Frederik, Nomads of South Persia: The Basseri Tribe of the Khamseh Confederacy. Humanities Press, New York, 1965.

Barth, Frederik. "Nomadism in the Mountain and Plateau Areas of South-West Asia" in Paris Symposium on the Problems of Arid Zones, May, 1960.

Berkes, F. (ed) (1989). Common Property Resources – Ecology and Community Based Sustainable Development, London: Belhavan Press.

Berkes, F. and Taghi Farrer, M. (1989). Introduction and Overview. Common Property Resources: Ecology and Community-Based Sustainable Development. Belhaven Press, London, WC2E9DS.

Berkes, F. and Folke, C. (1994) Investing in cultural Capital for the Sustainable Use of Natural Capital: In: Janson, A.M. et al.(ed) . Investing in National Capital: The Ecological Economics Approach to Sustainability. Island Press, Washington, D.C.

Berkes, F. and Folke C. (1998). "Linking Social and Ecological System for Reliance and Sustainability" In: Berkes, F. and Folkes, C (eds). Linking Social and Ecological System : Management Practices and Social Mechanisms for Building Reliance Cambridge University Press, UK.

Birner, R. and Wittmer, H. (2000). Co-Management of Natural Resources : A Transaction Cost Economic Approach to Determine the Efficient Boundary of the State". In: Proceedings of International Symposium of New Institutioonal Economics, 22-24 September 2000, Tubingen, Germany.

Brazel, Y. (1989). The Economic Analysis of Property Rights. Cambridge University Press, New York

Bromley, D.W. (1992). The Commons, Property, and Common Property Regimes. In: D.W. Bromley (ed.), In: Making the Commons Work: Theory, Practice and Policy. Institute of Contemporary Studies, San Francisco.

Bromley, D.W. (1991). Environment and Economy: Property Rights and Public Policy. Oxford, UK, Oxford University Press.

Cheung, S.N. (1969). Transaction Cossts, Risk Aversion, and the choice of Contractual Arrangements. Journal of Law and Economics, 18, 535-554.

Cheung, S.N. (1970). The Structure of a Contract and the Theory of a Non-Exclusive Resource. Journal of Law and Economics, 113, 49-70.

Chopra, K.C. Kadekodi, and Murthy, M. 1989. "Peoples Participation and common Property Resources" Economic and Political Weekly, 24,189-195.

Ciriacy-Wantrup, S.V. and Bishop, R.C. (1975). Common Property As a Concept in Natural Resource Policy". Natural Resource Journal. 15, 713-727

Ciriacy-Wantrup, S.V. (1976). Resource Conservation, Economics and Policies. Division of Agricultural Sciences, University of California, 4th Printing.

Coase, R. (1960) the Problem of Social Cost. Journal of Law and Economics, 3, 1-44
Cox, S.J.B. 1985. No Tragedy on the Commons". Environmental Ethics, 7, 49-61

Crocker, T.D. (1971) Externalities, Property Rights and Transaction Costs: An Empirical Study. Journal of Law and Economics.14, 451-462.
Dahlman, Carl J. (1980). The Open Field System and Beyond: A Property Rights Analysis of an Economic Institution. Cambridge University Press, Cambridge.

Dahlman, C.J. (1979) The Problem of Externality. Journal of Law and Economics. 22,141-162

Dalton, George. (1971) Economic Anthropology and Development. Basic Books Publishers Inc. London, England.

Dalton, George (1967) Tribal and Peasant Economies. The Natural History Press.
Dasgupta, P.S. and Heal, G.M. (1979). Economic Theory and Exhaustible Resources. Cambridge University Press

Demsetz, H. (1967) Towards a Theory of Property Rights. American Economic Review. 52, No.2, 347-379

Doran, M.H., Low, A.R.C. and Kemp, R.L. (1979, Feb.) Cattle as a Store of Wealth in Swaziland: Implications for Livestock Development and Overgrazing in Eastern and Southern Africa. American Journal of Agricultural Economics.

Dove, M.R. (1993). A Revisionist View of Tropical Deforestation and Development. Environment Conservation, 20, 17-24

Eggertsson, T. (1990). Economic Behavior and Institutions. Cambridge, UK, Cambridge University Press

Falconer, K. (2000). Farm Level Constraints on Agri-Environmental Scheme Participation: A Transactional Perspective. Journal of Rural Studies. 16,379-394

Furubotn, E.G. and Pejovich, S. (1972). Property Rights and Economic Theory: A Survey of Recent Literature". Journal of Economic Literature. 10,4.

Gibbs, J.N. and Bromley, D.W. (1989) Institutional Arrangements for Mangement of Rural Resources: Common Property Regimes. In F. Berkes (ed) Common Property Resources: Ecology and Community Based Sustainable Development. Belhaven Press, 25 Floor Street, London, WC2E9DS.

Gibson, C.C., Ostrom, E. and McKean, M.A. (2000). Forests, People, and Governance: Some Initial Theoretical Lessons. In: Gibson, C.C. and McKean, M.A. and Ostrom, E. (eds.) People and Forests, Communities, Institutions, and Governance. The MIT press, Cambridge.

Godelier, Maurice. (1972). Rationality and Irrationality in Economics. English translation. Monthly Review Press, New York

Goodfellow, D.M. (1939). Principles of Economic Sociology, George Routhledge and Sons Ltd. Broadway House, London.

Gray, James R. (1968). Ranch Economics. The Iowa University Press, Ames, Iowa.

Griffin, R.C. (1991) The Welfare Analysis of Transaction Costs, Externalities, and Institutional choice. American Journal of Agricultural Economics. 73, 601-614.

Grima, A.P.L. and Berkes, F. (1989) Natural Resources, Access, Right -to - Use and Management. In: F. Berkes, F. and Folke, C. Linking Social and Ecological system: Management Practices and Social Mechanisms for Building Resilience. Cambridge University Press, UK.

Hanna, S. (1995) Efficiencies of User Participation in Natural Resosurce Management. In: Hanna, S. and Munasinghe M. (eds.) Property Rights and the Environment: Social and Ecological Issues . The Beijer International Institute of Ecological Economics and the World Bank.

Hardin. G. (1968). The Tragedy of the Commons. Science, 162.
Hardin, Garrett. (1977) Managing the Commons. Freeman and Company, San Francisco, California.

Jodha, N.S. (1986) Common Property Resources and the Rural Poor in Dry Regions of India. Economic and Political Weekly, 21, 169-181

Johnson, O.E.G. (1972) Economic Analysis, the Legal Framework, and Land Tenure systems. Journal of Law and Economics. 15, 259-276

Kant, S. (2000) A dynamic Approach to Forest Regimes in Developing Economies. Ecological Economics. 32, 287-300

Leffler, K. and Rucker, R. (1990) Transaction Costs and the Efficient Organization of Production: A study of Timber Harvesting Contracts. Journal of Political Economy. 99, 1060-1087.

Libcap, G.D. (1989) Distribution Issues in Contracting for Property Rights. Journal of Institutional and Theoretical Economics. 145, 6-24.

Libcap, G.D. (1991) Contracting Property rights. Cambridge University Press.
Livingstone, Ian (1977) Economic Irrationality Among Pastoral People: Myth or Reality. Development and Change. 8, 209-230

McCay, B.J. and Acheson, J.M. (1987) The Question of the commons: The Culture and Ecology of Communal Resource. University of Arizona Press. Tucson
Molians, J.R. (1998). The Impact of Inequality, Gender, External Assistance and Social Capital on Local Level Collective Action. World Development, 26(3),413-431.
Muhsam, H.V.(1977). An Algebraic Theory of the Commons. In Managing the Commons. Freeman and Co. San Francisco, California.

North, D.C. (1990). Institutions, Institutional Change and Economic Performance. Cambridge University Press.

Ostrom, E. (1987) Institutional arrangements for Resolving the Commons Dilemma: Some Contending Approaches. In: McCay, B.J. and Acheson, J.M. (eds.) the Question of the Commons. University of Arizona Press, 250-265.

Ostrom, E. (1990) Governing the Commons: The Evolution of Institutions for Collective Action. Cambridge University Press.

Pehrson, Robert N. (1965). The social Organization of the Marri Baloch, Viking Fund Publications in Anthropology. No. 43 New York.

Randall, A. (1972) Market solution to Externality Problems: Theory and Practice. Americal Journal of Agricultural Economics. 54, 175-183

Reddy, V.R. (1999) Valuation of Renewable Natural Resources User Perspective. Economic and Political Weekly, 34 No. 23..

Richards, M., Kannel, K., Marjhan, M. and Davies, J. (1999). Towards Participatory Economic Analysis of Forest User Groups in Nepal. Overseas Development Institute, ODI, London.

Room, J. (1980) Assessing the Benefits and Costs of Social Forestry Projects. The Indian Forester, 106(7), 445-455.

Runge, C.F. (1984) Institutions and the Free Rider: The Assurance Problem in Collective Action. Journal of Politics, 46, 623-635.

Runge, C.F. (1981). Common Property Externalities: Isolation, Assurance, and Resource Depletion in a Traditional Grazing Context. American Journal of Agricultural Economics
63, 595-606.

Sahlins, Marshall. (1972) Stone Age Economics, Aldine Atherton Inc. Chicago and New York.

Salzman, C. Philip.(1978) " The Study of complex Society in the Middle East; A Review Essay" International Journal of Middle Eastern studies. 9.

Salzman, C Philip (1972). Multi Resource Nomadism in Iranian Baluchistan" Journal of Asian and African studies Vol. VII No 1-2.

Salzman, C Philip.(1980) When Nomads Settle. Praeger Scientific, J.F. Bergin Publishers, Inc. Brooklyn, New York.

Salzman, C. Philip (1980) Process of Sedentarization Among the Nomads of Baluchistan. Praeger Scientific, New York, 1980

Salzman, C. Philip (1977). Ideology and Change in Middle Eastern Tribal Societies. Paper presented at the annual meeting of the American Anthropological Association, Houston, Texas.

Salzman, C. Philip (1976). "Inequality and Oppression in a Nomadic Society: Pastoral Production and Society: Proceedings of the International Meeting on Nomadic Pastoralism, Paris, 1976

Sampson, Arthur W. (1953). Range Management: Principles and Practices. John Wiley and sons, Inc. London.
Sampson, Arthur W. Range and Pasture Management, John Wiley and Sons. Inc. London 1923

Schumacher, E.F (1973). Small is Beautiful. Blond and Briggs, London.

Scott, Gordon H. (1954). The Economic Theory of a Common Property Resource - The Fishery. The Journal of Political Economy.

Smith, R. (1981). Resolving the Tragedy of the Commons by Creating Private Property Rights in Wild Life. CATO Journal, 439-468.

Snidal, D. (1985). Coordination Versus Prisoner's Dilemma: Implications for International Cooperation and Regimes. American Political Science Review, 79.

Spooner, Brian A. (1967). Political and Religious Leadership in Persian Balochistan. Ph.D. Dissertation, Oxford University.

Stevenson, G.G. (1991). Common Property Economics: A General Theory and Land Use Application. Cambridge University Press.

Stoddart, L.A., and Smith, A.D. (1943). Range Management. McGraw-Hill Book Co. Inc. New York.

Sugden, R. (1984). Reciprocity: The Supply of Public Goods Through Voluntary Contributions. Economic Journal, 94.

Swidler, W.W.(1972). Some Demographic Factors Regulating the Formation of Flocks and Camps Among the Brahvi of Balochistan, Perspectives on Noamdism, Leiden, Netherlands.

Swift, Jeremy (1979). Pastoral Development in Somalia- Herding cooperatives ad a Strategy Against Desertification and Famine" In: Glantz, M. (ed.) Desertification and Environmental degradation in and Around Arid Lands. West view Press, Boulder, Colorado, 1979.

Wade, R. (1987). The Management of Common Property Resources: Collective Action as an Alternative to Privatization or State Regulation. Cambridge Journal of Economics, 11, 95-106

Ware, Helen (1979). Desertification and Population in Sub-Saharan Africa" In: Glantz, M. (ed.) Desertification and Environmental Degradation in and Around Arid Lands. West view Press, Boulder, Colorado.

Williamson, O.E. (1979). Transaction Cost Economics: The Governance of Contractual Relations. Journal of Law and Economics, 22, 233-261

Williamson, O.E. (1981). The Modern Cooperation. Origins, Evolution, Attributes. Journal of Economic Literature, 4, 1537-1568.

World Bank Discussion Paper, 57(1989) The Management of Common Property Resources: Some conceptual and Operational Fallacies. Washington, D.C. Bromley, D.W. and Cerna, M.M.

World Bank (1991) The Environment and Emerging Development Issues. Proceedings of the World Bank Annual conference on Development Issues, 1990. Washington, D.C. Dasgupta, P. and Maler, K.G.Yamey, B.S.(1964). The Study of Peasant Economic Systems" In: Firth, R and Yamey, B.S. (eds.) Capital, saving, and credit in Peasant Societies .Aldine Publishing Company, Chicago.

Appendix
Table 1. Relationship Between Property Rights and Carrying Capacity

Tribe	T.area/FA Ratio Carrying Capacity	Closing Period Months/Year	Sheep/Goat Ratio.	Rotations
Non-Traditional Ranges				
1	74.380	0	10	0
2	36.418	0	11	0
3	75.712	0.5	10	1
4	142.500	0	12	0
5	114.500	0	19	0
6	50.770	1.5	9	1
7	112.850	0	13	1
8	112.960	0	17	0
9	92.187	0.5	8	0
10	59.413	1.0	12	0
Mean	87.169	0.35	12.1	0
Traditional Ranges				
1	41.02	2.5	0.100	1
2	68.97	2.5	0.030	1
3	41.66	3.3	0.050	1
4	13.13	3.5	0.020	1
5	101.07	3.0	0.100	1
6	60.54	4.0	0.025	1
7	45.04	3.5	0.050	1
8	54.05	3.0	0.300	1
9	64.42	2.0	0.080	1
10	79.40	3.0	0.100	1
Mean	56.93	3.03	0.885	1

*Rotational Grazing: 1=yes, 0=no

Appendix.
Table. 2. Relationship Between Stocking Rates and Range Carrying Capacity

Range	T. acres	Forage acres	Total area/ FA ratio	Animals Per Acre	Stoking Rate
Non-traditional Areas					
1.	14,782	198.724	74.380	0.0962	7.156
2.	10367	284.664	36.418	0.1689	6.151
3.	16120	212.912	75.712	0.0977	7.397
4.	19258	135.139	142.500	0.1618	23.057
5.	25598	223.558	114.500	0.1152	13.191
6.	9675	190.564	50.770	0.0802	4.072
7.	11325	100.353	112.850	0.1132	12.774
8.	4516	39.976	112.960	0.1127	12.733
9.	5614	60.898	92.187	0.1042	9.606
10.	24598	414.018	59.413	0.0896	5.323
Mean	14185.3	186.081	87.169	0.1397	10.146
Traditional Areas					
1.	16462	401.309	41.020	0.0523	2.145
2.	17138	248.479	68.970	0.0912	6.290
3.	12468	299.269	41.660	0.0950	3.966
4.	17774	1353.429	13.132	0.0840	1.103
5.	13757	136.103	101.070	0.1054	10.654
6.	9306	153.712	60.540	0.0692	4.190
7.	15512	344.374	45.040	0.0751	3.387
8.	15404	284.968	54.050	0.0866	4.681
9.	22408	347.829	64.420	0.0910	5.800
10.	16163	203.543	79.410	0.1019	8.092
Mean	15639	377.302	56.931	0.0852	5.030

Appendix.

Table.3. Correlation Between Stocking/Use Rates and Animal productivity

Range	Herd Size	Breeding animals	Young Born and Survived	Birth. Rates	Death Rates	Stocking Rates Animals/FA
Non-traditional Area						
1.	121	106	69	65.09	0.05	7.156
2.	145	118	73	61.86	0.07	6.151
3.	128	110	72	65.45	0.04	7.397
4.	114	104	57	54.80	0.03	23.057
5.	143	122	76	62.29	0.06	13.191
6.	97	89	58	65.17	0.03	4.072
7.	152	136	95	69.85	0.05	12.774
8.	88	82	48	58.54	0.02	12.733
9.	81	75	50	66.67	0.02	9.606
10.	133	114	71	62.28	0.06	5.323
Mean	120.2	105.6	66.9	63.20	0.04	10.146
Traditional Areas						
1.	132	122	113	92.62	0.03	2.145
2.	115	102	69	67.65	0.10	6.290
3.	129	114	102	89.47	0.02	3.966
4.	156	140	128	91.43	0.03	1.103
5.	140	127	72	56.69	0.06	10.654
6.	109	98	87	88.77	0.03	4.190
7.	117	106	91	85.84	0.03	3.383
8.	118	100	82	82.00	0.03	4.681
9.	105	97	72	74.22	0.08	5.800
10.	146	132	83	62.88	0.05	8.092
Mean	126.7	113.8	89.9	79.16	0.05	5.030

Appendix.
Table 4. Correlation Between Stocking Rates and Economic Productivity

Tribe	Herd Siz.	T.Acrs.	Gross Ret. /acre	Gross Ret. /animal	Gross Ret. /Rupee	Stock. Rate Animal/FA
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Non-traditional Areas						
1.	121	1258	14.57	151.50	0.63	7.156
2.	145	858	22.87	135.37	0.59	6.151
3.	128	1310	11.95	122.30	0.49	7.397
4.	114	705	16.69	103.19	0.40	23.057
5.	143	1241	16.15	140.10	0.61	13.191
6.	97	1209	12.97	161.65	0.65	4.072
7.	152	1343	12.83	113.38	0.45	12.774
8.	88	781	12.65	112.30	0.46	12.733
9.	81	777	16.19	155.26	0.53	9.606
10.	133	1484	11.85	132.20	0.52	5.323
Mean	120.2	1096.6	14.87	132.73	0.53	10.146
Traditional Areas						
1.	132	2524	11.54	220.60	166	2.145
2.	115	1261	11.08	121.48	0.66	6.290
3.	129	1355	17.42	182.93	1.14	3.966
4.	156	1857	16.29	193.88	1.50	1.103
5.	140	1328	9.48	89.95	0.50	10.654
6.	109	1575	11.81	170.64	1.02	4.190
7.	117	1558	14.39	191.58	1.33	3.383
8.	118	1363	13.32	153.90	0.94	4.681
9.	105	1165	13.42	148.90	0.89	5.800
10.	146	1433	11.74	115.25	0.70	8.092
Mean	126.7	1541.9	13.05	158.91	1.03	5.030

Appendix.

Table 5. Extent of Overstocking in the Non-Traditional and Traditional Rangelands

Tribe (1)	Forage Acreage (2)	Forage Acre. Req./An/Mo. (3)	*Optimal. No.An/FA. (4)	Actual No.An/FA (5)	Overstocking No. An/ FA (6)
Non-traditional Area Ranges					
1.	198.724	0.257	3.89	7.156	3.266
2.	284.664	0.257	3.89	6.151	2.261
3.	212.912	0.257	3.89	7.397	3.507
4.	135.139	0.257	3.89	23.057	19.167
5.	223.558	0.257	3.89	13.191	9.301
6.	190.564	0.257	3.89	4.072	0.182
7.	100.353	0.257	3.89	12.774	8.885
8.	39.976	0.257	3.89	12.733	8.843
9.	60.898	0.257	3.89	9.606	5.716
10.	414.018	0.257	3.89	5.323	1.433
Mean	186.081	0.257	3.89	10.146	6.256
Traditional Area Ranges					
1.	401.309	0.257	3.89	2.145	-1.745
2.	248.479	0.257	3.89	6.290	2.400
3.	299.269	0.257	3.89	3.966	0.076
4.	1353.429	0.257	3.89	1.103	-2.787
5.	136.103	0.257	3.89	10.654	6.764
6.	153.712	0.257	3.89	4.190	0.300
7.	344.374	0.257	3.89	3.383	-0.507
8.	284.968	0.257	3.89	4.681	0.791
9.	347.829	0.257	3.89	5.800	1.915
10.	203.543	0.257	3.89	8.092	4.202
Mean	377.302	0.257	3.89	5.031	1.141

*Optimal Number of Animals/FA=1/FA Requirement per animal per/ month=1/0.257

Appendix

Table 6. Stocking Rates and Productivity in Traditional and Non-Traditional Areas (Difference Between Means)

Tribe	Overstocking per FA	Percent Birth/ Survival Rate	Gross Returns Per. Animal	Gross ret. Per. Re..
Non-Traditional Tribal Areas				
1	3.266	65.09	151.50	0.63
2	2.261	61.86	135.37	0.59
3	3.507	65.45	122.30	0.49
4	19.167	54.80	103.19	0.40
5	9.301	62.29	140.10	0.61
6	0.182	65.17	161.65	0.65
7	8.885	69.85	113.38	0.45
8	8.843	58.54	112.30	0.46
9	5.716	66.67	155.26	0.53
10.	1.433	62.28	132.20	0.52
Mean	6.256	63.20	132.73	0.53
Traditional Tribal Areas				
1	-1.75	92 62	220.60	1.66
2	2.40	67.65	121.48	0.66
3	0.08	89.47	182.93	1.14
4	-2.79	91.43	193.88	1.50
5	6.76	56.69	89.95	0.50
6	0.30	88.77	170.64	1.02
7	-0.51	85.84	191.58	1.33
8	0.79	82.00	153.90	0.94
9	1.92	74.22	148.90	0.89
10.	4.20	62.88	115.25	0.70
Mean	1.14	79.15	158.91	1.03
T value	2.58	19.79	1.83	9.934

Appendix. Table 7. Effects of Economic Forces on Rangeland Productivity

(Average of five herders and average flock size= 129 sheep/goat)

Tribe/Range	Interest Rates	Taxes /contr.	Av. Family Income	Ret/Income /Animal	Sheep/Goat Ratio
Non-traditional Tribal Areas					
1	0.175	921	18333	151.50	10
2.	0.080	762	19629	135.37	11
3	0.173	862	15657	122.30	10
4	0.090	700	11764	103.19	12
5	0.130	452	20036	140.10	19
6	0.135	402	15681	161.65	9
7	0.167	542	17234	113.38	13
8	0.130	397	9883	112.30	17
9	0.153	495	12557	155.26	8
10	0.150	350	17588	132.20	12
Mean	0.138	588.9	15838.1	132.73	12.1
Traditional Tribal Areas					
1	0.335	1872	29127	220.60	0.1
2	0.220	1133	13971	121.48	0.03
3	0.330	2091	23598	182.93	0.05
4	0.280	1625	30246	193.88	0.02
5	0.265	1440	12593	89.95	0.10
6	0.290	2020	18600	170.64	0.025
7	0.365	1911	22415	191.58	0.050
8	0.340	1571	18165	153.90	0.300
9	0.117	1700	15639	148:90	0.080
10	0.240	1354	16826	115.25	0.100
Mean	0.278	1671.7	20118	158.91	0.885

Table 8: Annual Expenditure on Necessities (Average Family of Six Members)

Tribe	Grains	Clothing	Sugar/Molasses	Tea	Total
Non-traditional.					
1.	4,608	960	480	240	6288
2.	4,840	741	600	220	6,401
3.	5,376	1,120	512	300	7,308
4.	4,200	882	720	320	
5.	4,700	790	440	260	6,190
6.	4,580	920	550	220	6,891
7.	5,100	1,041	500	250	6,891
8.	5,402	812	710	275	7,199
9.	4,900	900	530	300	6,630
10.	4,872	890	800	180	6,742
Mean	4,857.8	905.6	584.2	256.5	6,604.1
Traditional					
1.	4,300	940	340	90	5,670
2.	3,700	700	450	62	4912
3.	3,375	810	390	30	4,605
4.	3,080	1,200	400	35	4,715
5.	3,272	1,050	230	72	4,624
6.	3,385	880	290	64	4,619
7.	3,000	1,000	332	48	4,380
8.	3,600	925	250	24	4,799
9.	4,000	970	400	32	5,402
10.	2,500	885	380	32	3,797
Mean	3,421.2	936	346.2	48.9	4,752.3

Appendix. Table 9. Causes of Low Rangeland Productivity

Survey Responses on Causes of Low Range Forage Productivity.

Causes of overuse and depletion	Most Important No.	percent	Second most important No.	percent	Third most important No.	percent
Closing period (non observance)	15	7.143	12	5.714	9	4.286
High sheep/goat ratio	15	7.143	25	11.905	6	2.858
Interest rates	-	-	-	-	-	-
Indebtedness	-	-	3	1.492	3	1.492
Low levels of income	19	9.048	10	4.762	10	4.762
Taxes and Contrib.	2	0.95	11	5.238	18	8.571
Cost of living	11	5.238	38	18.095	39	18.571
Prices	-	-	5	2.381	8	3.809
Population increase	20	9.524	18	8.571	20	9.524
Disinteg. of Inst.	12	5.716	8	3.809	21	10.0
Lack of rainfall	72	34.286	49	25.714	36	17.143
Com. Prop. w/reg	6	2.857	13	6.191	5	2.381
Com.Prop. w/o reg	38	18.09	518	8.572	35	16.666
Total	210	100	210	100	210	100

Appendix.

Table 10. Improvement of Range and Animal productivity: Survey Responses

Measure	First Response		Second Response	
	No.	Percent	No.	Percent
More annual closing periods	32	17.391	28	15.217
Reduced sheep/goat ratios	8	4.348	6	3.261
Subsidized grain prices to lower pressure on ranges	8	4.348	13	7.065
Strengthen tribal control systems or introduce similar systems	12	6.522	35	19.022
Increase/support animal prices	10	5.435	22	11.957
Govt. control and management-	-	-	-	-
Privatize rangelands	2	1.086	5	2.717
Abolish tribal system	5	2.717	8	4.348
Easy credit facilities	11	5.978	4	2.174
Reduce animal losses (disease control)	37	21.09	22	11.957
More rain/water facilities	59	32.065	41	22.283
Total:	184	100	184	100


Pakistan
AFGHANISTAN
CHINA
IRAN
INDIA
PUNJAB
SINDH
BALOCHISTAN
Arabian Sea


Province of
BALOCHISTAN
Pakistan
China
GILGIT
BALTISTAN
NORTH WEST FRONTIER
Peshawar
Islamabad
Afghanistan
AREA OF STUDY
ROAD
Sari Range
Lahore
Thal Desert
PUNJAB
0 50 100 150 200 Km
India
Iran
BALOCHISTAN
Thal Desert
Sibi
Hyderabad
Karachi
Chaman
Quetta
Khost
Loralai
Zhob
Chagai Hills
Chagai
Nok Kundi
Dalbandin
Ras Koh Range
Kalat
Khuzdar
Hamun-i-Mashkel
Centre Makran Range
Mand
Turbat
Panjgur
Gwadar
Pasni
Ormara
Kharan Desert
Lasbela
0 50 100 150 200 Km

Dr. Buzdar was born and spent many years of his life in the Andarpur-Maari section of the main Sulaiman mountain range in Musakhel district of Balochistan. He received his elementary education in Loralai and earned an M.Sc from Sindh Agricultural University at TandoJam and a Ph.D. in Agricultural and Resource Economics from the University of Hawaii, Honolulu, Hawaii, U.S.A. For over 20 years, Dr. Buzdar served as a Consultant with various international economic development organizations, including the United States Agency for International Development (USAID), German International Technical Assistance Program (GTZ), and Japan International Cooperation Agency (JICA). More than half of his consultancy work involved management and implementation of economic development projects in the least developed regions of Balochistan. Dr. Buzdar currently teaches Economics, at the California State University, Fullerton, California, U.S.A. Dr. Buzdar takes keen interest in the economic development of his native Balochistan and, in various capacities, contributes towards it.

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