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RAINFED AGRICULTURE IN HIGHLAND BALOCHISTAN: A FARMING SYSTEMS PERSPECTIVE

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by

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INTRODUCTION

1. Importance of Agriculture in the Highland Rainfed Areas of Balochistan

Balochistan is the largest province of Pakistan comprising an area of 34.7 million hectares, over 45 percent of the total geographical area of the country. But it is the smallest with respect to population as less than 5 percent of Pakistan's population live in the province. Most of Balochistan inhabitants belong to various Baloch and Pushtun tribes, although minority ethnic groups of Iranian, Sindhi and Punjabi origin are also found. While Pushto is the main language spoken by the Pushtun tribes, Balochi and Brahui are the two main languages spoken by the Baloch population of the province. Balochistan has an arid to semi-arid climate with annual rainfall varying between 50 mm in the western region along the Iranian border to about 400 mm in the northeastern regions bordering the Punjab and NWFP provinces. It is an extension of the Iranian plateau and general topographic conditions are characterized by mountainous and inhospitable terrain. Most inhabitants have a subsistence life-style dependent on meager agricultural and rangeland resources.

A general characteristic of the terrain is that in between the mountain ranges there are valley systems, which have good potential for agricultural production given irrigation water. The province has a range of climatic and ecological zones. Most of the north and northeast lies in a temperate zone, while most of the south and southwest is sub-tropical. The soils of most of Balochistan are classified as lithosols (very shallow) on the mountain slopes, and strongly calcareous alluvial yermosols in the valley bottoms. The soil textures in the valley bottoms vary from sandy loam to loamy clay (Rees, et al. 1987).

The MART/AZRI project has, for agricultural research purposes, defined seven districts in the center and northeast of the province as highland rainfed areas. These districts, namely Quetta, Kalat, Pishin, Loralai, Zhob, Kachhi and Khuzdar have a total geographical area of 14.9 million hectares, a little less than 43 percent of the total geographical area of Balochistan. The hectarage under crops in the highlands of Balochistan in 1985-86 constituted 37 percent of the total cropped area of Balochistan. Over 75 percent of the total cropped area in the highlands is under food grain crops, the rest being under fodders, pulses, oil seeds and other minor crops. In 1986, 78 percent of the area under food grain crops was wheat, the main staple of the people of Balochistan. Similarly, 64 percent of Balochistan's estimated 11.1 million sheep and 56 percent of the estimated 7.3 million goats are raised in the highland

rainfed areas of the province. As is evident from these data, the main economic activities in the highland rainfed areas of Balochistan, employing an overwhelming majority of the province's labour force, are the production of wheat and small ruminants.

AZRI has been actively involved in agricultural research in the dry areas of Pakistan, in particular, in Balochistan for the last ten years. During this time it has become evident that one of the main constraints to AZRI's development of an effective research program has been the almost complete lack of primary data on the farming systems of Balochistan. Therefore, one priority AZRI activity has been to collect baseline information on local farming systems. Particular emphasis has been placed on the socio-economic aspects of production.

The Household Agricultural Production Systems Survey of the highland rainfed areas of Balochistan is a primary example of such work. The study was undertaken with the objectives of understanding the physical, biological and socio-economic environment of the highland rainfed areas in which farmers practice subsistence agriculture. Balochistan in general, and the highland areas in particular, are not only less endowed with productive land and water resources than Pakistan as a whole, but also are largely devoid of the type of infrastructure which is conducive to successful agricultural production and marketing operations.

2. Objectives of the survey

The specific objectives of the survey were as follows:

a. To describe the existing farming systems in the highland rainfed areas of Balochistan (over 1000 meters).

b. To comprehend the farmer's decision making process, particularly with regard to decision making in marginal and uncertain conditions.

c. To identify the factors responsible for farmer's reluctance to adopt "modern, improved technology" to raise productivity.

d. To obtain background information and baseline data for use by AZRI and provincial researchers attempting to raise farmer's living standards in the economically less developed areas of Balochistan.

The main subjects covered by the survey were (a) household composition and demography, (b) household income, (c) land and land tenure, (d) crop production, (e) agricultural inputs and technology use, (f) agricultural production relations, (g) livestock production, (h) rangeland use and mode of livestock production, and (i) use of animal products.

3. Survey Methodology

(a) Secondary data

Secondary data available from provincial agriculture, planning and development departments and federal government organizations were compiled and reviewed.

(b) Informal survey

An informal survey was conducted in the rainfed highland areas of Balochistan to collect preliminary data on the existing farming systems, cropping patterns, crop rotations, use of inputs, etc. Interviews of an informal nature were conducted with individual farmers, groups of farmers and village leaders. The informal survey helped not only in the framing of a more realistic and comprehensive questionnaire, but also provided evidence for the selection of an appropriate sample size. Key informants were pinpointed and the location of farmer groups with similar characteristics of ownership, tenure and use of agricultural technology and practices were recorded.

(c) Formal survey

A questionnaire for a formal survey was composed in early 1987. Efforts were made to include questions relating to different aspects of the socio-economic life of farmers and animal raisers living in selected locations in highland Balochistan. The questionnaire was pretested in the Dasht and Kovak areas and necessary changes and improvements were then made. A stratification of the area based on farm size, technology use or other socio-economic characteristics was not possible owing to a lack of initial information. Yet, some level of stratification was obtained in the sample selected as areas with Baloch and Pushtun ethnic groups, and areas with different physical and environmental conditions were chosen. The survey was carried out in June/July 1987 and included 200 households, 40 each from Dasht (Kalat), Ferozabad (Khuzdar), Tomagh (Loralai), Kovak (Kalat) and Zarchi (Kalat). Efforts were made to cover as large an area within each location as possible.

THE SOCIO-ECONOMIC ENVIRONMENT

1. Agricultural Villages in Highland Rainfed Balochistan

Agricultural villages in Balochistan are small, and dispersed generally lacking communication links with other settlements. They often lack the basic amenities of life. Since most agricultural land in any particular area was, at some initial stage, owned in common by a tribe or sub-tribe, the agricultural villages are normally inhabited by members of the same tribal and lineage group. Also, because of the initial equal distribution of land, its low productivity and the Islamic inheritance system, different economic classes are generally absent. If the tribal chief happens to be from that specific area, he may own more land. During the Household Production Systems Survey, the farmers in various villages were interviewed about the availability of the basic amenities of life. The following table summarizes the results of the survey.

Table 1. Access to Basic Amenities and Social Services

Amenity	Percent of Households with Access				
	Khuzdar	Zarchi	Kovak	Dasht	Tomagh
Electricity	45	15	0	28	20
Water	88	100	0	63	93
Schooling	40	53	38	50	65
Dispensary	13	13	0	100	3

The availability of the basic amenities of life seems to be, to a great extent, a function of the distance of villages from the main towns and administrative centers. Villages in Dasht seem to be relatively better endowed, mainly because of their proximity to Quetta, the provincial capital. Khuzdar, likewise is the administrative capital of the Kalat Division and villages benefit from the availability of many of these amenities at Khuzdar. The average drinking water hauling distance was found to be 1.2 km in Khuzdar, 6 km in Dasht, 1.6 km in Tomagh and as much as 13 km in the case of the Kovak valley in Kalat District.

Many village communities are seasonally migrant particularly in the Quetta/Kalat areas, and villages are largely abandoned every winter and in years of drought. The bulk of the inhabitants of these villages take their entire families to the lowlands of the Indus valley (Kachhi and Sind), to find feed for their animals and casual employment. They return to their villages at the onset of spring, given that sufficient winter rains have fallen to ensure adequate availability of range grazing.

2. Social Organization, Leadership and Decision Making

The Baloch and Pushtun tribal organizational structures are very similar and for the most part functions at each hierarchical level are the same. The following table summarizes the tribal structures of the two groups.

Table 2. Baloch and Pushtun Tribal Organization

Group Title	Baloch	Pushtun
Tribe	Qaum/Toman	Kaam
Clan	Tak/Takkar/Shakh	Shakh
Section	Taal/Shalwar	Pesha
Lineage	Khalk/Tabar	Khel
Sub-lineage	Ora/Log/Kahol	Zai/Kahol/Kor

With the growth in population, external influences and inherent difficulties in maintaining contact, sections and lineages of some larger tribes have, in recent times, become tribes unto themselves with specific behavior patterns. There is no complete break away from the mother tribe, but the tribe level solidarity is only expressed when dealing with other tribes and outside groups.

The following table shows leadership at different hierarchical levels among Baloch and Pushtun tribes.

Table 3. Baloch/Pushtun Leadership Patterns

Title	Leader among Baloch	Leader among Pushtun
Tribe	Sardar/Tomandar	Sardar
Clan	Takkari/Mokaddam	Malik
Section	Takkari/Mokaddam	Malik
Lineage	Motabar/Safed Rish	Spin Zhiray
Sub-lineage	Mastar/Balla	Mashar

Decisions involving conflicts between individuals within the tribe are settled through a council of elders system (Jirga). For petty matters the village elders constitute the Jirga, while for relatively serious matters decisions are taken by Jirgas of Maliks/Takkaris. The Sardar or chief presides over the high level decision making of tribe level Jirgas but the presence of Malik/Takkari or Safed Rish/Spin Zhiray officials of the clans or sections, which are party to the conflict, is essential for the ruling to be accepted as just.

3. Systems of Cooperation and Solidarity

A basic feature of tribal organization is cooperation between the individual members for the common good. This cooperation is a necessity of the physical and socio-economic environment in which the people live and work. The common rangeland, other resources and the life and property of the tribal members need to be protected from other neighbouring tribes and regional invaders. For example, the following are the main areas of traditional cooperation.

(a) Agricultural operations, particularly in rainfed areas often need to be carried out within a short period of time. After a rain and flood each farmer has to repair breached embankments, prepare land for sowing and complete sowing operations within the short period in which crop germination and emergence is possible. There is a tradition among all the Baloch and Pushtun tribes of helping each other on such occasions. All the farmers of the locality bring their bullocks/camels and equipment to work jointly on each farmer's land in turn until work on all the fields is completed. On sailaba or flood irrigated land larger embankments are constructed on the river or stream bed from which ephemeral water is then diverted and conveyed to the fields for irrigation. The embankment and the conveyance channels are cooperatively constructed and repaired by all the farmers of the locality. Similarly in some areas the harvesting operations (Ron/Laab) and threshing are also done on a basis of mutual cooperation.

(b) If a natural disaster occurs such as an epidemic in a particular farmer's flock resulting in mass mortality, or complete crop failure, then it is the duty of all the tribal neighbours to offer help until such time that the afflicted person recovers economically.

(c) Rangelands are owned in common by a clan or section of a tribe and in normal years flocks from other clans/sections are excluded. However, in years of severe need the rules are changed. People from drought hit areas are allowed to graze their flocks on rangeland areas where feed remains available.

In the Household Agricultural Production Systems Survey farmers were asked about their participation in various cooperative activities and labour exchanges. The following is a summary of their responses. Seventy-three percent of the farmers in Khuzdar, 98% in Zarchi, 100% in Kovak, 98% in Dasht and 85% in Tomagh revealed that they participated in labour exchanges as a traditional and social obligation and considered it in their own interest to continue to do so. The main activities in which labour exchanges routinely took place included harvesting, bund repair, land preparation, threshing and sowing. Forty-five percent of farmers in

Khuzdar, 50 percent in Zarchi, 65 percent in Kovak, 45 percent in Dasht and 40 percent in Tomagh participated in bund reconstruction and ploughing operations. The corresponding figures were 35, 10, 13, 5 and 43 percent for sowing; 65, 98, 95, 93 and 45 percent for harvesting; and 25, 48, 43, 53, and 28 percent for threshing work. In all five locations the greatest cooperative activity seemed to be in the area of harvesting. When asked about the people with whom the labour exchanges regularly took place, most farmers indicated members of the same lineage groups as the most likely people. The following table summarizes farmer responses in this connection.

Table 4. Farmer Labour Exchanges in Upland Balochistan

Category	Percent of Farmers Engaged in Labour Exchange				
	Khuzdar	Zarchi	Kovak	Dasht	Tomagh
Brother	21	22	23	26	29
In-laws	10	13	5	12	20
Reltvs	37	28	40	38	25
Frnds	27	37	29	23	23
Out of village	5	0	3	1	3

The highest degree of labour exchanges seems to have taken place between blood relations. The results are confirmation of the continuing importance of cooperation and labour exchanges among farmers in the rainfed areas of Balochistan.

4. Land Ownership and Size of Holdings

Since all the Baloch and Pushtun people were originally organized into tribes that led a nomadic and semi-nomadic life style, the accumulation of large land holdings was not possible. Once it was decided to convert portions of rangelands to agricultural land, the tribal common lands were distributed equally among the various clans, sections and lineages. Later differences in the size of holdings developed as a result of the different rates at which section or clan populations grew and distributed their inheritance. The average sizes of land holding revealed during the Household Production Systems survey are summarized in the following table.

Table 5. Average Land Holding in the Highland Rainfed Areas of Balochistan

Category	Location				
	Khuzdar	Zarchi	Kovak	Dasht	Tomagh
Khushkaba (ha)	12.6	27.1	17.4	27.1	2.8
St.Dev.	21	68	17	45	3
Sailaba (ha)	1.2	0	2.4	0.8	1.6
St.Dev.	1	-	2	-	2

Compared to other agricultural areas in Pakistan, the size of land holdings may seem high, but considering the low productivity of the land, the holdings are only sufficient to provide a minimum subsistence livelihood. A large land holding is required in highland rainfed areas as rainfall is erratic and the risk of crop failure is higher than in the other areas of Pakistan. As the table shows, Dasht, Zarchi and Kovak farmers have the highest holding sizes. These areas are not only the driest of all the locations surveyed, but also have other adverse climatic factors such as less summer rainfall and extremely cold weather in winter. So a larger holding size (27.1 ha) would be needed to provide for the minimum subsistence needs of the family.

5. Land Tenure Systems

(a) The System

The land tenure systems found in Balochistan have their origin in the social organizations that have traditionally existed in the region. The following table shows the main land tenure systems found in the areas of the survey.

Table 6. Land Tenure Systems in Upland Balochistan

Percent land by tenure	Location				
	Khuzdar	Zarchi	Kovak	Dasht	Tomagh
Ten. operated	0	42	12	35	31
Own. operated	83	50	56	42	54
Ten. cum own.	17	8	32	23	15

As is shown, most of the land in the survey area is owner operated. This is an indication that the land is very low in productivity, and in spite of an average land ownership of 17 ha in Kovak, for instance, about 33 percent of the farmers there need to work both on their own land and be a tenant to make ends meet. In the survey areas there are no big landlords or very poor tenants, most of the people make a similar subsistence living. A land owner may consider it more economical to spend his own and family labour on animal raising while renting out his land to tenants. Another farmer may consider it preferable to hire

a shepherd to tend his animals, while he tills his own land and works on his neighbour's field in a tenancy arrangement.

(b) Tenurial Arrangements/Share Cropping Systems

In the study areas there are a variety of tenurial arrangements, ranging from the very simple to the very complicated. The two most common tenancy arrangements found were those known as hereditary and tenants at will. In the Household Production Systems Survey, the tenants were asked about the prevalence of these two types of tenancy arrangements. The results are summarized in the following table.

Table 7. Types of Tenancy Arrangements in Highland Balochistan

Type of tenant	Percent of tenants				
	Khuzdar	Zarchi	Kovak	Dasht	Tomagh
Hereditary	36	97	81	93	0
Ten. at will	64	3	19	7	100

These results indicate that in the areas of Khuzdar and Loralai, where greater summer rainfall is experienced and the lands are more productive, the majority of the tenants are temporary. One explanation for this could be that in the 1970s when land reforms were introduced by the government there were tenant related disturbances, particularly in the Khuzdar area. In general, those land reforms which granted ownership rights to landless tenants were not implemented. However, one result of the disturbances was that many hereditary tenants were replaced by tenants-at-will. In the Dasht, Kovak and Zarchi areas, in contrast, not only are there no big landlords, but those employed as tenants, generally belong to the same tribe and thus the tenancy relationship is part of a wider lineage and group relationship, which is least affected by outside influences. The tenants were asked about their contractual arrangements and the duration of these contracts. There were, as expected, no written contractual arrangements anywhere. Only 5 percent of the tenants in Khuzdar, 2 percent in Dasht and 2 percent in Kovak had specific oral contracts with the land owners, the remainder had a more general understanding.

Rent is almost always paid in kind and a division of the total produce of the crop is made between the landlord and the tenant in accordance with the contribution of the inputs made by each, namely the land, seeds, animal traction and labour. The share cropping/rent rates depend on the supply of, and demand for, land; on the soil fertility and rainfall conditions; and other factors

prevailing in a particular area and season. The most common system prevailing in the Baloch areas is what is known as Shashak. Under this system the land owner receives 1/6th of the produce and does not contribute any inputs other than the land. An advantage of this system is that the tenant has decision making power in agricultural operations and the landlord does not interfere. In most cases the tenants of this type, by tradition, can not be evicted and can transfer their tenancy rights to their heirs.

In the areas of Kachhi and Kalat, where a tenant supplies all the inputs and cultivates fields which are already embanked by the landlord, he pays 1/4th to 1/3rd of the net produce as rent. But if he has to embank the fields himself, the rates of rent are about 1/5th of the produce. When the seeds are supplied by the tenant and the landlord in the same proportion, and the tenant provides labour and animal traction, then the rate of the rent is 1/3rd of the produce. In areas where government taxes, religious donations, craftsmen charges, and casual labour wages need to be paid, these are taken out of the common pool and the balance is equally divided between the landlord and the tenant, the latter providing plough, animal traction and labour.

In some areas of Quetta and Loralai, the tenant provides all the inputs and the rent is paid at the rate of 1/3rd of the net produce. When the tenant provides animal traction and labour and the owner provides seeds then the rate is 1/2 in some areas and 3/4th in others. Again in portions of Kalat and Kachhi, when a tenant reclaims a wasteland and brings it under cultivation, he obtains a right of occupancy (lathbandi) for a term not exceeding seven years. The rent payable to the landlord is 1/7th of the output, 1/6th, 1/5th, and 1/4th, respectively, during the first four years and 1/3rd of the output during the remaining years.

In the Household Production Systems Survey data were collected only on the main share cropping system, i.e., when all the inputs, except land, are provided by the tenant. The following table shows the results of the survey.

Table 8. Share Cropping in Upland Balochistan

Inputs except land provided by	Percent Share Paid to Landlord				
	Khuzdar	Zarchi	Kovak	Dasht	Tomagh
Tenant	52	17	28	26	60

An explanation for the large variations between Tomagh and Khuzdar on the one hand and Zarchi, Kovak and Dasht on the other, could be differences in land productivity. In the latter three locations summer rainfall is low, winters

are severe and the probability of crop failure in any given year is very high. No tenants would work on the land, unless they received the incentive of a greater share of the produce.

6. Land Reforms

During the past decades various attempts have been made by the government of Pakistan to provide security of tenure to tenants. There have been several phases of land reform legislation including the Tenancy Rights Act of 1950, the Land Reforms of 1959 and the Land Reforms of 1972 and 1977. The main purpose of land reform was twofold, to increase agricultural productivity and to achieve a more just land ownership system. For both these objectives it was necessary to fix a ceiling on land holdings and to provide ownership or at least security of tenure to those actually working on the land. Unfortunately the land reforms mentioned above were not as successful as they were intended to be. In many cases land was transferred to the names of children, relatives and fellow tribal members. In the highlands, excess land, if any, was owned by tribal chiefs and elders and most tenants were either from the chief's own tribe or from related tribes. In either case, the social pressures were such that, even if the government decreed reforms, the tenants were not able to take formal possession of the land nominally granted to them.

THE FARMING SYSTEMS OF THE HIGHLAND RAINFED AREAS OF BALOCHISTAN

The farming systems of the highland rainfed areas of Balochistan have in common characteristics of (a) dependence on erratic and uncertain rainfall, (b) frequent crop failures, (c) farmer efforts to diversify crops and enterprises to minimize risk and ensure continuing subsistence, (d) farmer readiness to move out of the area in seasons of restricted animal feed supply, and (e) the farming community's cooperative mechanisms as insurance against personal economic disaster.

1. Soil and Cultivated Land Types

In general most cultivable lands in highland Balochistan lie in valleys surrounded by mountain ranges or hills. The most predominant soil types are clay loam, loam and sandy loam; gravel fans are also common. Generally the soils are deeper towards valley centers. Fertility is adequate in areas where rain water deposits new layers of silt each year. Even when rainfall and other conditions for cultivation are considered to be favorable, farmers do not generally apply fertilizer. A large proportion of the bunds or embankments constructed each year are washed away

by floods. These breaches result in loss of silt deposits, depletion of soil and occasionally severe land erosion.

The two main types of crop land, based on the type of moisture supply system, are known by the farmers as khushkaba and sailaba.

(a) Sailaba land

These are lands irrigated by flood water and ephemeral streams. Generally embankments are constructed on the main seasonal river beds to divert the flood waters and lead them to fields for irrigation. In the Baloch areas, particularly in the lower Kachhi, Kalat and Khuzdar districts, formalized arrangements by the local farmers to construct and repair these main bunds on a cooperative basis exist. In other areas like Loralai and Zhob no such formal organization is known to exist. There, individuals are responsible for construction, repair and maintenance of the bunds in the main stream and conveyance channels. In Loralai a farmer has the right to take all the ephemeral stream water he needs before passing it on to his neighbours down stream. In contrast, in Kachhi and Kalat there are two systems; in one case, each farmer upstream gets all the water he needs at each flood before allowing it to go to the farmers downstream. In the second case, at each flood the first farmer at the stream head fulfills his irrigation needs before allowing water to flow downstream. When the next flood arrives the Warabandi or turn starts from where it had ended the previous time. The person or persons who were able to get their share of water during the last flood, will not get it again until such time that everybody under the system has irrigated his lands. The main difference between the areas in the northeast and those in central Balochistan is based on the catchment area and the length of the seasonal rivers. In Loralai most of the farmer fields and bunds are constructed so as to be near or on the side of a stream, thus runoff or flood waters can be diverted along the whole length of a valley. The vicinity of fields in Loralai is closer to the source of water and there is more summer rainfall, this allows most farmers access to water for dryland farming without the need for formal organization. Whereas, in the areas of Kachhi and Kalat, formal organizations are needed simply because the work required to construct or repair the main dams is beyond the capacity of an individual farmer. There are fixed times in the year when these main dams are constructed on a cooperative basis, and whenever the bunds are breached the whole community pools its resources to repair the breaches.

(b) Khushkaba Land

Khushkaba lands receive their moisture directly from rainfall or from very localized runoff. The main feature of khushkaba lands distinguishing them from sailaba lands is that the catchment area is very small and sometimes is not bigger than the field enclosed by the embankment or bund. Embankments are made facing the hills, so that the natural gradient within the bunded area helps the runoff to collect above the embankment. The area inside the bunds is sometimes deliberately left uneven with the areas closest to the bund being the lowest. This is done, so that in the case of light rainfall, the runoff from the areas upslope collects near the embankment and provides enough moisture to at least grow crops in the lower half of the field.

The proportion of khushkaba versus sailaba land as revealed by the Household Production Systems Survey is given in the following table.

Table 9. Proportion of Khushkaba and Sailaba Cultivated Land in Upland Balochistan in 1987

Type	Location			
	Khuzdar	Zarchi	Kovak	Dasht
		%		
Khushkaba	46	72	69	88
Sailaba	54	28	31	12

These data are contrary to the normal belief that in any given year, the area under sailaba cultivation is higher than the area under khushkaba cultivation. The farmers revealed that this year (of the survey) was one of the worst drought years in living memory; that could be a plausible explanation for the apparent inconsistency. The data for Loralai have not been included because the findings were considered to be dubious.

2. Land Preparation

In rainfed areas, time for agricultural operations is a most crucial element in good husbandry, as after each rain or flood, the land needs to be ploughed to conserve moisture. Then leveling, ridging and sowing must all be completed before the moisture is too deep in the profile to permit crop germination or successful emergence. For winter crops preparations are started immediately after the harvest of the previous year's crop in April through June. Top priority is attached to repairing breaches in embankments. This is generally done by using animal power, but recently tractors are being increasingly used for this purpose. Second priority work is ploughing and leveling in the fields

in expectation of summer rains. If it rains in the summer the farmer has to conserve the moisture until the sowing time in September through November. After summer rains he waits for about a week to allow infiltration and then he ploughs and levels the field again and waits for the sowing time or the next rainfall. The main winter crops are wheat and barley, and they are drilled in most areas as only a drill can place the seeds deep enough to reach moist soil thus permitting germination.

In the Household Agricultural Production Systems Survey, data were collected on the use of various types of ploughs being used for land preparation by the farmers. The responses are shown in the following table.

Table 10. Plough Types Used in Upland Balochistan

Plough type	Percent of Farmers Using				
	Khuzdar	Zarchi	Kovak	Dasht	Tomagh
Springtine	30	100	60	36	100
Moldboard	70	0	40	64	0

As the data in the table show, in both the Khuzdar and Dasht areas, a higher percentage of farmers were using Moldboard ploughs. Because of its deeper penetrating and thus moisture conserving qualities, the Moldboard is considered an improvement in technology over use of the local single tine ploughs. Farmers near the larger towns have relatively more exposure to improved technologies, and in the case of Khuzdar, there is also a limited, private sector business involvement in agricultural extension for the farmers of the area.

The farmers were asked about the number of times they ploughed their lands before sowing. The following table summarizes their responses.

Table 11. Number of Ploughings Before Sowing

Plough passes	Percent of the Farmers				
	Khuzdar	Zarchi	Kovak	Dasht	Tomagh
One only	0	26	20	0	0
Two only	90	74	80	100	68
Three	10	0	0	0	32

As the data in the table show the farmers of Tomagh gave the highest number of ploughings to their fields. The reasons might be differences in soil conditions or the farmer realization that more ploughings produce better results. Tomagh is followed by Dasht, Kovak and Zarchi in declining order. In response to the question, which type

of lands required more cultivation, the farmers had the following responses. In the four locations of Khuzdar, Zarchi, Kovak and Dasht they considered more than one ploughing to be necessary as far as khushkaba cultivation was considered. In Tomagh only 64 percent thought it was necessary. Further questions were asked about their ploughing practices. Asked about the area that a pair of bullocks or a camel was able to plough per day, the answers were similar in all locations - 0.4 ha per day, except in the case of Tomagh where the figure given was 0.7 ha per day. The difference in response, most probably, expresses the general land condition and texture; less crusting soils requiring less time. When asked, how many hours a day they made the animals work, those in Khuzdar said 4 hours, in Kovak, Zarchi and Dasht 5 hours and those in Tomagh 7 hours. The differences could be based on the work conditions, on the soil and field conditions and on the condition of animals employed.

3. Cropping Patterns, Rotations, Fallowing and Cropping Intensity

The cropping patterns in the highlands have been developed by farmers in response to climatic conditions, to their own subsistence needs and to the risk avoidance strategy of diversification and the need for complementary enterprises. Wheat, barley and lentil are the main winter crops while sorghum and maize (grain and fodder) and beans (mainly mung), are grown in summer. Wheat, being the staple food of the people of Balochistan, has always been the main component of the cropping systems. Sorghum is grown in Khuzdar district and in the eastern tehsils of Loralai district. Cumin (Zeera) is a recently introduced cash crop and is grown in Quetta and its neighbouring districts of Kalat and Pishin. The main barley growing area is Khuzdar district and although still grown in limited areas, it is gaining in popularity among the farmers in the highlands of Balochistan.

Normally farmers with rainfed enterprises do not follow any planned crop rotation. Firstly the farmers do not seem to be aware of the value of crop rotation. Secondly, even if the farmers understand that crop rotations can maintain and increase the fertility of their fields, they are not convinced of the value of better fertility. Thirdly, the basis of possible rotations is rather restricted through lack of adapted crops. Some of the most important crop rotation systems followed in the highlands are (a) wheat or barley--fallow--wheat or barley--fallow (b) wheat or barley--sorghum or maize/beans mixture--wheat or barley--sorghum or maize/beans mixture (c) wheat-fallow-wheat-fallow.

Regarding fallowing of land and related issues, the farmers were asked various questions. In answer to the

question of why farmers had grown crops over an area smaller than they had wanted to 98 percent in Khuzdar, 100 percent in each of Zarchi, Kovak and Dasht and 83 percent in Tomagh, pointed to shortage of rainfall as the main reason. The farmers were also asked about their decision to leave part of their land fallow. The reasons the farmers cited for leaving land fallow were the following of tradition, unaffordability of inputs such as seed and insufficient rain. Twelve percent of the farmers interviewed at Khuzdar, 10 percent at Dasht and 3 percent at Tomagh said that they followed tradition when leaving fields fallow. By far the largest percentage, 70 percent in Khuzdar, 80 percent in Zarchi, 88 percent in Kovak, 83 percent in Dasht and 18 percent in Tomagh said that the main reason for leaving lands fallow was lack of rainfall. In Tomagh, where the summer rainfall is relatively higher, unaffordability of inputs was cited as a greater problem and the main reason for leaving land fallow. Unaffordability of inputs as a reason was also cited by 18 percent of the farmers at Khuzdar, 20 percent of those from Zarchi, 12 percent of those from Kovak and 7 percent of those from Dasht. No farmers thought that fallowing land might be good for its fertility. This may be related to the farmer's perception that their lands do not need any inorganic fertilizer or animal manure. In fact, in most situations inadequate rainfall forces fallowing of land. The farmer's perception of their lands being already sufficiently fertile and requiring no more fertilizer may not be completely misplaced. Under most situations, a limited number of rainfall or flood events bring with them, from neighbouring hills and mountains, quantities of silt which is then deposited in the fields. This may be a positive addition to soil fertility and NPK response trials conducted by AZRI, have not shown substantial and consistent responses to applied fertilizer. (ICARDA, 1989)

The cropping intensity in each district is dependent upon the amount of rainfall that it gets and on whether sailaba or khushkaba cultivation is practiced. While in the relatively high summer rainfall areas of Loralai, Zhob and Khuzdar, where mainly sailaba cultivation is practiced, the cropping intensities exceed 200 percent; in the mainly khushkaba areas of Quetta, Kalat, Kachhi and Pishin the cropping intensities do not even reach 50 percent in most years.

The Household Production Systems Survey revealed the following cropping intensities for the five locations studied.

Table 12. Cropping Intensities in Highland Balochistan

Intensity	Percent of farmers in locations				
	Khuzdar	Zarchi	Kovak	Dasht	Tomagh
50 percent	75	100	98	98	38
100 percent	25	0	2	2	62

As the data in the table show, among the study locations, Tomagh farmers had the highest cropping intensities, followed by those at Khuzdar. It should be noted that cropping intensities do vary widely from year to year depending on rainfall.

4. Use of Agricultural Inputs

(a) Seeds

In the majority of cases, local varieties of seed are used which are adapted to the environmental conditions and, fulfill the local taste criteria. Most local varieties have a higher straw production than "improved" varieties, which is important for farmers as they are almost always raising animals as a complementary activity to crop production. Normally wheat and barley are sown by drill and sorghum and maize are broadcast.

The Household Production Systems Survey revealed the following with respect to the methods of sowing.

Table 13. Methods of Sowing in Highland Balochistan

Method	Location				
	Khuzdar	Zarchi	Kovak	Dasht	Tomagh
Drill	61	62	30	20	53
B/cast	16	28	40	15	18
Both	23	10	30	65	29

The main reason for drilling winter crops is to place seeds at depths in contact with residual soil moisture. For summer crops, particularly fodder sorghum and maize, broadcasting may be appropriate for summer soil moisture conditions and as a result some labour costs are saved.

(b) Manure and Fertilizers

Most of the rainfed farmers in highland Balochistan do not use fertilizer or animal manure to improve their soil's fertility status.

(c) Agricultural Labour

(i) Availability and Use

The tribal organization, segmentary lineage and joint family systems (necessitating shared privileges and obligations), the Islamic system of inheritance and the lack of alternate employment opportunities all result in too many people depending on too little productive agricultural land. Some economists believe that the marginal productivity of agricultural labour may be zero or even negative. If this type of situation actually exists then there is every likelihood that labour engaged in rainfed agriculture in the highlands may be a good example. But farmers in the rainfed areas of highland Balochistan have always adopted defensive mechanisms against the risks associated with harsh environmental conditions and uncertainties. One such mechanism has been to move the entire family, or at least the working members, to the lowlands in the slack time of winter. This occurs when in their own areas no agricultural activities are possible and there is a demand for labour in the warmer lowlands. Another mechanism has been for the family to raise animals itself or to send certain members of the family to become shepherds. Yet another recent phenomenon has been to send young, male members of the family to work in the Middle East.

(ii) Migration of Agricultural Labour

The Household Agricultural Production Systems Survey covered several areas related to aspects of rural labour and migration. The data in the following table show the number of families whose members had migrated during the year of the survey.

Table 14. Extent of Migration in the Highland Rainfed Areas of Balochistan

	Percent Families Whose Members Migrated				
Location	Khuzdar	Zarchi	Kovak	Dasht	Tomagh
	28	23	23	10	10

The places to which the migration takes place varies according to survey location. For those migrating from Zarchi, Kovak and Dasht (all in Kalat district) the destination is generally the lowlands of Kachhi district or the adjoining areas of Nasirabad and Sind. Those in Khuzdar make their winter move to Kachhi and Sind, while from Tomagh (Loralai) residents go to the adjoining districts of Punjab for work. Smaller numbers of residents from all these locations also go to the Middle East for work. The length that the migrants stayed away from their areas is probably

the best indication of the places to which they have migrated. The survey data showed the following results in this regard.

Table 15. Migrant Agricultural Labour's Length of Stay Away from Home

Duration	Percent Staying Away from Home Location				
	Khuzdar	Zarchi	Kovak	Dasht	Tomagh
1 month	0	56	11	25	75
2-6 months	36	22	33	0	0
6-12 months	9	11	12	0	0
over 1 yr	55	11	44	75	25

Those spending just one month away from home are probably temporary wage workers working in the neighbouring Punjab and Sind areas during the winter. Those remaining away for periods ranging between 2-6 months, are probably a mixed group of migrant labour and nomadic/semi-nomadic crop/livestock raisers going to the towns and to the warmer areas of Sind in winter. It is very common in Balochistan that blue as well as white collar workers with jobs in towns leave their families behind, even when the distances are small. The group of migrant workers staying away for 6-12 months is probably dominated by this category. Lastly the migrants staying away for more than a year seem to be predominantly those working in various Persian Gulf countries.

(iii) Use of Family Labour in Agriculture

The data in the following table show the extent to which family and non-family labour are engaged in agriculture.

Table 16. Family/Non-family Labour Engaged in Agriculture

Type	Percent Engaged in Each Location				
	Khuzdar	Zarchi	Kovak	Dasht	Tomagh
Family	87	83	95	80	83
N/Fam.	13	17	5	20	17

The data in the table reveal that a vast majority of the farmers in all the five locations were small, subsistence oriented, and dependent on family labour. The very small numbers of farmers using non-family labour were interviewed about the number of days for which they had hired labour. The average period was 90 days in Khuzdar, 7 days in Zarchi, 13 days in Kovak, 22 days in Dasht, and 54 days in Tomagh during the preceding agricultural year.

(iv) Role of Women and Children as Agricultural Labour

As elsewhere among subsistence oriented societies, women and children play a very important role in rainfed agricultural production systems of highland Balochistan. During the survey farmers were asked if all family members participated in agricultural activities. The results are shown in the following table.

Table 17. Family Members Participation in Agricultural Labour

Extent	Percent of Farmers in Location				
	Khuzdar	Zarchi	Kovak	Dasht	Tomagh
All	78	93	98	95	83
Not all	22	7	2	5	17

It can be noted that among the five locations, Kovak is economically the most depressed and the farmers are the most impoverished. Accordingly, family members' participation in agricultural activities is highest at Kovak, although it is substantial in all locations. As far as women and childrens' participation in agricultural activities is concerned, the survey gave the following results.

Table 18. Women and Childrens' Participation in Agricultural Labour

Category	Percent of Labour Participating in Agriculture				
	Khuzdar	Zarchi	Kovak	Dasht	Tomagh
Women	25.0	34.8	34.0	25.3	23.5
Children	28.3	31.5	33.0	35.2	17.7

Women mostly participate in seed preparation, weeding, harvesting and most of the work related to animal feeding and care. Children help in land preparation and sowing, in protecting crops from birds and animals and in herding and caring for the domestic and draft animals.

(d) Draft power

In general, in the highland rainfed areas of Balochistan, bullocks and camels are by far the most commonly used animals for draft power for all types of agricultural operations. In areas around Quetta and Kalat, camels are the principal draft animal, while in Loralai and Khuzdar, where the environment is more sub-tropical, oxen serve as the main draft animal. In recent years, throughout Balochistan, there has been an increased use of tractors in agriculture. A main reason for the very rapid increase in the use of tractors as draft power has been the fact that, maintaining draft animals, particularly oxen is

very costly. Camels are hardier animals than oxen and can survive on less feed by browsing on range vegetation.

The results of the Household Production Systems Survey with regard to the use of animals for traction, are shown in the following table.

Table 19. Use of Animal Traction for Ploughing

Animal	Percent Use in Location				
	Khuzdar	Zarchi	Kovak	Dasht	Tomagh
Camel	0	33	95	74	0
Bullock	97	45	0	14	89
Cam.+Bul	37	21	5	11	11

Kovak and Dasht areas have the highest use of camels as draft animals, while Loralai and Khuzdar are the main bullock using areas. The use of camels in Pakistan in general and in Balochistan in particular is widespread for all types of agricultural, non-agricultural and human transportation. It is only in the highland areas of Balochistan where camels are used for ploughing and other farm operations in a substantial way. The average costs of hiring draft animals per day were recorded as Rs. 29 in Khuzdar, Rs. 44 in Zarchi, Rs. 40 in Kovak, Rs. 63 in Dasht and Rs. 70 in Tomagh. The large differences in rates between the areas, particularly those between Khuzdar and Loralai, are inexplicable, unless it is a short term variation due to local conditions. During 1986-87, besides drought conditions, there were also some cattle epidemics reported in the northeastern regions of Balochistan. It is also known that since the early 1980s there has been a shortage of draft animals in Afghanistan and high prices in that country have affected the bordering areas of Pakistan.

In the Household Agricultural Systems Survey, tractor use was separated from animal traction. The following table shows the extent of tractor use in the different locations studied.

Table 20. Use of Tractors in Agriculture in Highland Balochistan

Location	Khuzdar	Zarchi	Kovak	Dasht	Tomagh
% Tractor Use	25	50	13	28	62

For the four locations of Khuzdar, Zarchi, Kovak and Dasht 100 percent of the farmers questioned indicated that they used tractors only on khushkaba lands. In Tomagh they also used them for other lands including sailaba. Such a

high use of tractors on khushkaba lands points to the main uses of tractors in Balochistan as a whole, construction and repair of bunds and embankments. It is not clear from the data why there is less use of tractors in the case of sailaba lands, since the need for embankment construction and repair in the case of sailaba lands is greater than in the case of khushkaba lands. In fact, the reconstruction and repair of the embankments over the stream and seasonal rivers beds and the construction and maintenance of the main and branch conveyance channels, in sailaba lands require the use of tractors more than in the case of khushkaba lands where only the construction and repair of individual embankments is involved. A possible reason for this odd finding in the survey is that the sailaba fields in Kalat/Quetta districts are small, thus making it difficult to use tractors for various agricultural operations.

Regarding tractor ownership, 9 percent of the farmers in Dasht and 16 percent of those in Tomagh indicated that they either presently own a tractor or have owned one during the course of the previous year. As far as renting the services of a tractor is concerned, the following information was gathered. One hundred percent of the farmers interviewed at Khuzdar, Zarchi and Kovak, 91 percent at Dasht and 84 percent at Tomagh indicated that they had used rented tractors during the previous agricultural year. The tractor rents varied between Rs. 50 and 67 per hour depending upon the location, availability and season of the year. The average rates were the lowest at Khuzdar and highest at Tomagh.

(e) Agricultural Credit

Traditionally the farmers of Balochistan have been adverse to any kind of lending or borrowing which involved interest payments, as this is considered usury which is strictly forbidden under Islamic laws. However, the farmers, especially those engaged in rainfed agriculture, need to borrow and they do that from friends, relatives, neighbours and well to do farmers. The traditional Hindu moneylenders, particularly those in the districts of Kalat, Kachhi and Khuzdar, have always played a key role lending to the farmers. The Hindus have no religious restrictions on lending and the farmers either had no other choice or convinced themselves that only receiving and not paying usury was prohibited. During an informal survey in the areas of Kachhi and Khuzdar it was discovered that local Hindu businessmen still lend money to poor farmers and charge high rates of 10 percent per month. In many situations, the Hindu as well as Muslim shopkeepers who provide the necessities of life to a farmer on loan, buy portions or all of his produce long before it is mature and at lower than city market prices. In some Pushtun areas of Zhob and Loralai districts a system of land mortgaging called Garaue is in existence. Under this system two types

of arrangements are made. First, money is lent to the farmer, his land is mortgaged to the lender but the farmer retains the land and raises crops. At each harvest he pays a certain fixed amount of the produce, which does not count towards the principal, to the mortgagee. This the farmer continues to pay until he has returned the principal in full. In some extreme cases, the mortgagee receives all the farmer's produce, without being counted towards the principal, at each harvest until such time that he has paid back all the loan.

5. Crop Production and Input Decision Making

Since decision making in sailaba and khushkaba situations is tantamount to decision making in an uncertain environment, it is an important function and has serious consequences. A most common scene while visiting sailaba/khushkaba cropped areas is finding good, medium and bad crop fields standing side by side. One wonders how crop conditions can be so different when the amount of rainfall, the most limiting factor for production, remained constant for neighbouring fields. These differences are, in fact, vivid testimony of each farmer's decision making abilities. Rainfall is not only scarce, but also unpredictable and mostly untimely. The farmer needs to be prepared and to keep his lands ready for ploughing and sowing operations as soon as a rainfall occurs. Within a very short time after a rain or flood event the farmer has to make decisions about ploughing certain fields to conserve moisture for the next season's crop, sowing certain crops in the current season, and repairing embankments that might have been breached so that waters from the next rainfall can be impounded. These decisions need to be prioritized and implemented without delay.

Farmer decision making depends, to a great extent, on his tenure situation. In general, if he is wage tenant and share cropper, then the owner makes most of the important decisions regarding crop production and input uses, etc. If he is an owner-cultivator or owner-cum-tenant, he and his family make most of the decisions.

During the Household Production Systems Survey, farmers were asked questions about decision making processes. The data in the following table show the results of the survey.

Table 21. Agricultural Production Decision Making

Person	Percent of Farmers				
	Khuzdar	Zarchi	Kovak	Dasht	Tomagh
Farmer	88	78	83	93	48
L/lord	0	0	0	0	10
F/fam.	7	20	13	2	25
F/frds.	5	2	4	5	17

As is shown, in the majority of cases the farmer himself makes decisions regarding the use of inputs and the raising of crops. Family and friends were consulted, more so in the Pushtun area of Tomagh than anywhere else. As in almost all cases where a system of share cropping exists, the tenant has every incentive to make the best possible decisions to ensure good yields.

Next the farmers were asked on what they normally based their decisions for growing or not growing a crop. Eighty-five percent in Khuzdar, 80 percent in Zarchi, 100 percent in Kovak, 98 percent in Dasht and 81 percent in Tomagh indicated that rainfall was the basis of their decisions. The remainder's decision making was determined by financial considerations.

6. Production, Yields and Marketing

Realistically, khushkaba and sailaba crop raising can not be considered an adequate subsistence activity, because in most years even the farmer's minimum subsistence needs are not fulfilled by his cropping enterprise. To fulfill subsistence needs the family must engage in some supplementary enterprises like animal raising or otherwise have some off-farm income by engaging in trade or selling family labour.

In the Household Agricultural Production Systems Survey, it was found that the average area under khushkaba wheat was 4.7 ha in Khuzdar, 1.9 ha in Zarchi, 3.4 ha in Kovak, 5.6 ha in Dasht and 2.5 ha in Tomagh. The average area cropped under sailaba was 2 ha in Khuzdar, none in Zarchi, Kovak and Dasht and only 0.8 ha in Tomagh. The per ha yields estimated by farmers are shown in the following table.

Table 22. Major Crop Yields in Khushkaba/Sailaba Areas of Upland Balochistan

Crop	Mean Yields at Location (kg/ha)				
	Khuzdar	Zarchi	Kovak	Dasht	Tomagh
Wheat	203	498	530	400	465
Barley	262	482	297	241	357
Lentil	--	--	--	583	--
Cumin	--	174	234	809	--
Sorghum	--	125	--	58	278

As the table shows, the yields are extremely low. The portion of the produce marketed would thus be insignificant. The farmers were interviewed about the amounts of their produce that were consumed and kept for next year's seeds. The figures averaged over all crops are presented in the following table.

Table 23. Use of Produce for Consumption and Seeds

Use	Percent Used at Location				
	Khuzdar	Zarchi	Kovak	Dasht	Tomagh
Consum.	81	72	76	81	89
Seeds	19	28	24	19	11

As would be expected in any subsistence oriented society, most of the produce is consumed at home. Small amounts when sold to local shopkeepers to buy the necessities of life are also considered part of family consumption. There was no commercial marketing in any of the localities studied.

7. Off-Farm Income

The farmers of the highland rainfed areas of Balochistan, even in the best of years, need off-farm income to supplement their meager income from the land. Some of the sources of their off-farm income are as follows:

(a) Normally each farm family must raise some animals to supplement its income. In the past the rangelands surrounding the agricultural villages in the valleys were able to support relatively large flocks of animals mainly sheep and goats. Although the rangelands are much depleted now, they are still able to support some grazing so that the farmers can raise smaller numbers of animals and receive some income.

(b) Most of the farmer families traditionally left the uplands in winter and migrated to the plains of Kachhi, Nasirabad and neighbouring districts of Sind. There the

families engaged in paid labour and were able to get feed for their animals. In recent years, although the migration patterns have changed, Kachhi, Sind and in some cases areas of Punjab, still provide opportunities to dryland farmers to earn off-farm income. In most cases, the entire family does not migrate any more. Young men are sent to engage in agricultural labour and shepherds take animals for wintering in the warmer areas.

(c) As previous villages and towns develop into larger business, commercial and government centers, more job opportunities become available. More members of farm families now go to the nearby towns of Quetta, Loralai, Mastung, Kalat and Khuzdar to find jobs.

(d) In recent years there have been job opportunities in the Persian Gulf region. Many young men from dry farming families have been going to various Middle Eastern countries and earning relatively good wages and making remittances to their families at home. This not only supplements the farm income, but also in some cases results in young men bringing back large amounts of money and investing it in rainfed agriculture.

The data collected by the Household Production Systems Survey reveal that in poor agricultural years 33 percent of the farm family income in Dasht, 65 percent in Kovak, 64 percent in Zarchi and 56 percent in Khuzdar comes from off-farm activities. The corresponding numbers during medium years are 18 percent, 38 percent, 34 percent, and 24 percent respectively. Even in a good agricultural year, 10 percent of the total family income in Dasht, 15 percent in Kovak, 13 percent in Zarchi and 11 percent in Khuzdar comes from off-farm sources.

CONCLUSION AND RECOMMENDATIONS

The Balochistan government statistics show that the rainfed cultivated area under the three major cereal crops of wheat, barley and sorghum, vary between 34 and 60 percent of the provincial total. The total production likewise varies between 16 and 28 percent of the provincial total. Yet, rainfed agriculture is a high risk enterprise, yields are extremely low, and farmers generally have a very low standard of living. The main objectives of the survey, whose results have been summarized in this paper, were to understand and describe the socio-economic conditions of the farmers and existing farming systems in the highland rainfed areas of Balochistan. The farmers surveyed, in general, are not necessarily unaware of modern techniques in agriculture and use technology whenever they consider it to be useful and rewarding. They use tractors for various agricultural operations and know how to conserve scarce soil moisture in their fields. As far as the use of new improved crop

varieties are concerned, the farmers have sound reasons for not adopting them. They say that many improved varieties require too much water and their straw output is very low.

The following recommendations pertain mainly to research in the dry highland areas of Balochistan.

a. Improvement is needed in water harvesting practices. The embankments/bunds/small dams constructed throughout Balochistan for sailaba as well as khushkaba cultivation do not seem to be good quality structures. Close to 80 percent of the farmer labour and draft power are spent on construction, reconstruction and repair of the bunds. Different reasons are given for the poor quality and non-durability of the bunds. There have been suggestions that the farmers do not lay enough emphasis on, or do not have the resources for compacting the structures when they are built. Others feel that the location, height and breadth, in fact the whole design of the spillways, may be defective, resulting in frequent breaches of the bunds. Still others feel that rodents make holes in the bunds thus making them easy to breach. There needs to be more research in these areas by AZRI.

b. In Balochistan, for many years now, a process of conversion of rangeland into agricultural land has been taking place. This is based on people's need for cropland which they believe provides economic security and social prestige. It is now slowly becoming clear to the people that the possession of land alone does not guarantee any of the above privileges. There is enough evidence from elsewhere which shows that converting rangeland into agricultural land results in rapid deterioration of soil conditions. In fact, when such lands are returned to their previous use of range animal raising there is usually permanent deterioration. There is a need for more research in this area under Balochistan conditions, and if the situation is as bad as is believed, there is an urgent need to start educating farmers in this regard with the collaboration of the provincial agricultural extension department.

c. Related to the above point is the question of raising more fodder crops and forages. So far, among the farmers of Balochistan, the main emphasis has always been on producing cereal/grain crops for human consumption. Within highland Balochistan, lentil in some rainfed areas and mungo and mash beans in others are already being produced successfully. Sorghum, when grown as a fodder, can produce well under rainfed and sailaba conditions. There is a need for further research in these areas.

d. Balochistan farmers firmly believe that their lands do not need any fertilizer or manure under present

conditions. On the other hand research carried out by ICARDA in Syria has clearly demonstrated that fertilizer use increased production, particularly when coupled with improved water harvesting systems. There is a clear need for further research in Balochistan in this area of study.

REFERENCES

DEL CASTILLO, C. (1987). Community Profiles: A Set of Cultural Sketches of Five Regions in Baluchistan. MART/AZR Res. Rep. 11. ICARDA, Quetta.

NAGY, J.G. (1987). Range Livestock Production Constraints, Diagnosis and Potential Research Opportunities in Balochistan. A Farming Systems Perspective. MART/AZR Res. Rep. 3. ICARDA, Quetta.

NAGY, J.G. and G. FARID SABIR (1987). Household Agricultural Production Systems Survey Results. MART/AZR Res.Rep. 7. ICARDA, Quetta.

NAGY, J.G., G. FARID SABIR and J.M. STUBBS (1989). Descriptive and Diagnostic Studies of Sheep and Goat Production in the Farming Systems of Upland Balochistan. MART/AZR Res. Rep 28. ICARDA, Quetta.

REES, D.J., J.G. NAGY, S.H. RAZA, K.M. MAHMOOD, B.A. CHOWDRY and J.D.H. KEATINGE (1987). The Dry Arable Farming Systems of Upland Balochistan: A Case Study. MART/AZR Res. Rep. 5. ICARDA, Quetta.