BIO-SCIENCES AND AGRICULTURE

NATURAL RESOURCES AND THEIR UTILIZATION, WITH SPECIAL REFERENCE TO CHOLISTAN DESERT, PAKISTAN

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ABSTRACT

Cholistan desert is a vast area that is mainly used as grazing ground and is endowed with a variety of natural resources. The local inhabitants are mostly nomads, leading pastoral way of life, with a few (two or three) permanent settlements in the whole desert. The main source of earning is rearing of livestock, while for livelihood they mostly depend upon whatever nature can provide them from the surroundings. Being unaware about the way they can properly use the natural resources, they usually extract the God-given commodity without any check, and unknowingly harm the ecosystem.

In the present article we use the interviewing technique to know the views of the local inhabitants about a specific natural source. Through the present study, it has come to light that the knowledge of local dwellers about natural resources varied according to their need and occupation. For example, hunters have more knowledge about the wildlife behavior than those who earn through rearing of livestock. The present article presents the general picture of what kind of natural resources are present in Cholistan desert and how the local people are taking advantage of them.

INTRODUCTION

The arid habitats of Cholistan desert cover an area of about 2.6 million hectares, constituting the southern part of Bahawalpur Division. It is located between latitudes 27° 42` and 29° North and longitudes 60° 57` East. The length of the desert is about 480Km and breadth is from 32 to 192Km (Akbar, et. al., 1996).

The climate is tropical and continental, characterized by low and sporadic rainfall (176 – 250mm per annum), high temperatures, low relative humidity, high rate of evaporation and strong summer winds (Akram, et al, 1986).

According to 1981 census, the total population of Cholistan is about 118,000 individuals, out of which 51% are male and 49% are female. This structure of population is prevalent all over the desert, distributed in the form of small hamlets or semi-settlements. The size and site of settlement depends on the availability of water from "Toba" in the vicinity. The people of Cholistan are pastoral nomads. Their social, cultural, religious and spiritual activities are mostly bound to this area. Any climatic change influencing their live-stock also affects their living status Either directly or indirectly, all the natural resources in the pastoral ecosystem are used for productive and non – productive purposes. In order to give a clear picture of the natural resources found in the Cholistan, a flow-chart has been given (Figure-1).

The present article presents the overall perspective for the utilization of natural resources used by the nomads/local inhabitants, based on the partial studies of Local Knowledge Management System (LKMS) project (Cr, 2410-Pak) being funded by the Environmental Cell of WAPDA, Pakistan, and carried out by Mascon Associates (PVT.) LTD. Lahore.

The study was initiated with the following objectives:

i) To know the level of awareness about the natural resources of the local nomads.
ii) To asses the management types that the local population is using for the maximum utilization of natural resources around them.
iii) To understand the way local inhabitants describe, perceive and categorize their environment.

METHODOLOGY

The present study was conducted in the area of lesser Cholistan desert, from Dosste Wala Toba towards Bajnit Fort. This comprised about 10,000 square kilometers encompassing 25 water-points and 5 semi-settlements of nomads. Semi-interview and group-

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discussion techniques were adapted. A total of 100 respondents were interviewed, out of whom 25% were between the ages of 25 & 30, 55% between 30 & 45 and 20% between 45 & 70 years. Group discussions (5) were arranged with the help of local Numberdars, where possible, in order to develop more insight in LKMS.

It was felt that most of the respondents hesitate to give correct information while talking about the numbers of livestock heads. This may be due to the tax imposed by the government per animal per annum (rupee 1 for sheep and goat, rupee 5 for cow and camel).

NATURAL RESOURCES

The most precious and venerable resources of pastoral ecosystem are vegetation, land, water and wild-life. Out of these, vegetational and wildlife resources are the most over-exploited, the land-resources are

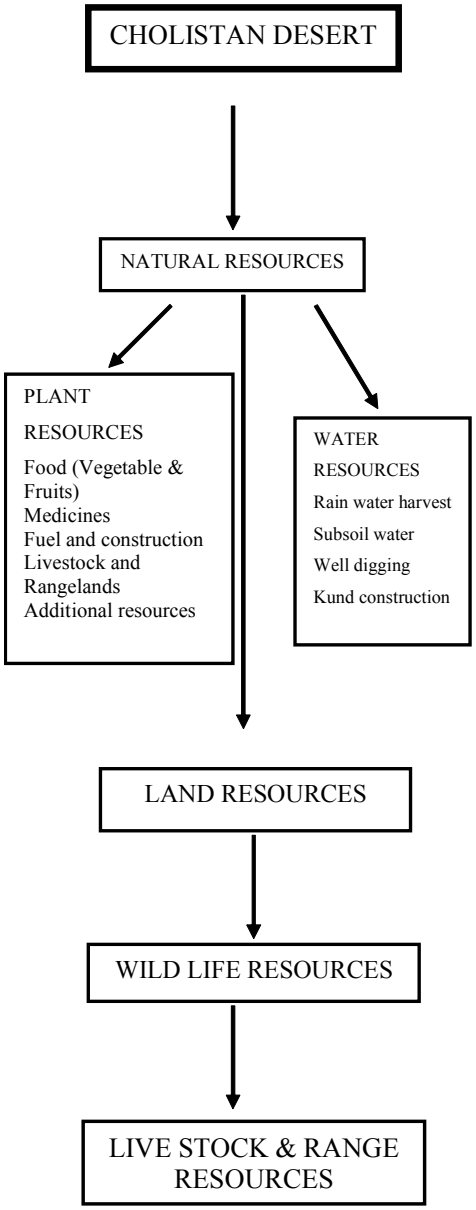

Figure - 1: Flow-Chart Showing the Natural Resources Found in the Cholistan Desert

hampered by the sacristy of water, while the water-shortage itself imposes intricate limits to the production of other natural resources.

LIVESTOCK RESOURCES AND PRODUCTION

The natural vegetation of Cholistan rangelands is typical of arid tract and is composed mainly of the xerophytes. The flora is well adapted to the extreme seasonal temperatures, moisture changes and to the edaphic conditions. The principal adaptation is, however, governed by the availability of moisture and soil chemical composition. From the range point of view, natural vegetation can be characterized based upon the palatability and growth-pattern. The most palatable species are the first to suffer and consist of grasses such as *Cenchrus ciliaris, C. setigerus, Cymbopogon jwarancusa, Eragrostis barrelieri, Lasiurus scindicus, Panicum and Sporobolus species*. Some plant species are grazed by the selective livestock, e.g. camel-favorites are Haloxylon and Suaeda species. Under the severe drought-conditions, goat and other livestock may browse on young leptadenia pyrotechnica plants, which are usually left alone due to the higher fiber and silica contents, under the normal rain-fall years, and due to ample availability of fodder. The poisonous or thorny plant-species with stunted biomass, such as Capparis decidua and Calotropis procera are not grazed by any kind of livestock (Chaudhry and Nasim, 1995; Chaudhry and Iqbal, 1999).

The livestock-population has direct relationship with the type and condition of ranges found in the area (Baig, et al., 1980). The data on the livestock-population from 1985 to 2000 revealed that animal population had undergone numerical changes for various livestock-species over a period of 15 years, but total animal-population has not undergone a noticeable change. Slight decrease in the livestock-numbers may be the result of overall deterioration of grazing lands. The decrease from 52.09 to 42.33% of sheep and gradual increase from 29.31 to 42.33% in the goat-population over the last 15 years may be attributed to the drought-conditions from 1997 to 1999 and the omnivorous feeding-habit of goat. Similar is the case with cattle population; except for the years from 1985 to 1990, there is continuous decline in the population (Figure-2). The local inhabitants were also of the same viewpoint i.e. decline in the cattle-population is mainly due to drought and less availability of fodder. Some of the respondents were of the opinion that, while moving from one water-point to the other, the feeble and weak cattle often do not survive and die during the way if no help is provided.

KEY-FINDINGS ON PRODUCTION-SYSTEMS

The pastoralists of Cholistan can be divided into three main groups:

Transhumant: The first group relates to those whose livestock have full or partial mobility, i.e. transhumant and agro-pastoralists, who send their livestock on transhumance in the monsoon season when there are enough rains in the desert. They migrate along with their households and livestock, mainly cattle, sheep and goats, between the desert, irrigated areas and river flood plains. They usually explore more distant pastures in the desert. Their mobility from desert to irrigated areas is principally dictated by the availability of water and fodder in the desert. Acute shortage of water and forage, due to extreme dryness and high temperatures in the desert, compels them to migrate towards the irrigated areas.

Village Bound: The second group relates to those who transhumance their livestock all the year round in the nearby areas of the village. They may return to the village every night, or may camp on the periphery of the village/pastures for short periods.

Nomadic: The third group of pastoralists relates to nomadic system that may be purely opportunistic, with no regular timing or location of movement-pattern of pastures. They are the trines/clans who possess large herds of livestock, mainly camels and cows. They usually move within the Cholistan desert from Toba to Toba and do not prefer to go to irrigated areas. They scan large area and may seek the help of other tribe/clan to get water and rangeland, whenever facing troubles due to shortage of water and fodder.

No doubt, quantity, quality, and availability of forage, and how to meet the demands of their animals, are the paramount concern of pastoralists but other factors also determine their movement-patterns. These include excessive heat, lack of shade, avoiding pests and diseased areas, being close to the market, availability of labor and social/ritual relations.

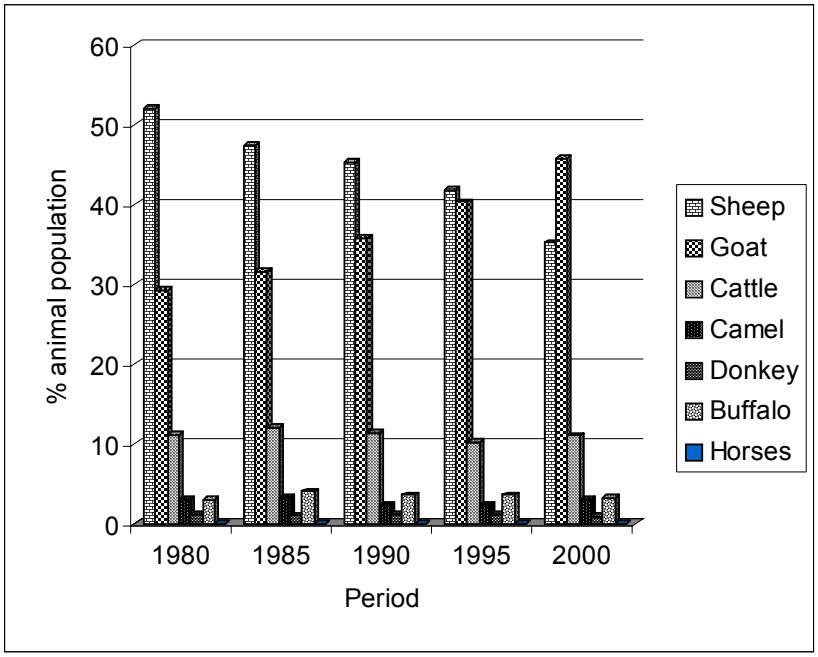

Figure - 2: Percentage of Different Livestock Species in the Total Population of Cholistan Desert (15 years data)

At present the Cholistan ranges are supporting about 2.0 million heads of cattle to their maximum capacity, which is major source of meat and wool to the country (Rao, et al., 1987). In the normal rainfall (i.e. 150 – 200mm per year) the green fodder remains short and overgrazing without any range-management is practiced. The problem becomes more severe when the animal herds from adjoining settlements and cities also join the desert's endogenous animal population. This imposes immense pressure on the grazing lands. Quick extraction of vegetation of ranges has many detrimental affects on the soil-compatibility and ecosystem. The years with rainfall above-normal are exceptional and bring a message of delight; the fodder exceeds the demand, giving good health to the livestock and the pastorals enjoy the taste of profit and prosperity.

PLANTS FOR FOOD AND MEDICINE

Plant resources are also used for purposes other than livestock. It may be envisaged that the collection of plants for food and medicine is usually not as important a component of local people's diets as the milk and meat. Since agriculture is hampered by non-availability of water, plant-production for food is insufficient to satisfy the needs of the local people. In order to cope with this shortage in their diet, they have developed the habit of collecting handsome amount of air-dried seeds and pods of trees and shrubs for the preparation of curry and other food dishes. Wild plants do not provide full nutritional support, but they do provide relief-package during the drought and economic stress.

Depending upon the season and availability, the seeds of Acacia senegal, fruit of Capparis decidua (Karir) and pods of Prosopis cineraria are collected for food and for selling them in the local market for earning. The floral buds of both the plants are cooked as vegetable, while unripe fruits are used to make pickles. Calligonum polygonoides locally called as "Phog" is a common bush of the Cholistan desert. Its flower buds, either fresh or sun dried, are used to make a very delicious dish locally called as "Phugusi". One can safely state that all the fruits of Zizyphus numularia (ber) growing in the accessible parts of the Cholistan desert are harvested for human consumption. Seeds of Panicum turgidium, Panicum antidotale and Cenchrus ciliaris are mixed with flour for "Chapatti" preparation, especially during famine years. In addition to this, gums obtained from various plants, such as *Acacia nilotica, Prosopis cineraria, Prosopis juliflora and Acacia jacquemontai,* are used as mixed food-additives. Apart from that, the native ants, birds and

other wildlife are dependent for their survival on the indigenous plant-resources.

Cholistan desert is rich in drug-plant resources. Various seasonal and perennial plants are used for medicines; especially the "Hakeems" collect many wild herbs and shrubs to make medicines. For example, Cymbopogon jwarancusa is used to make syrup to reduce thirst during summer. The species of Cyprus are used as diuretic, diaphoretic, stomachic, in febrile infections, derangements and disorder of the bowels. Alhagi maroum is used as laxative, diuretic, expectorant and in coughs. The crude extracts of flowers, stalks and branches of Chorchorus depresses are used as sex-tonic and Fagonia is used for curing dysentery. Calotropis procera is considered to be a wonder plant in the desert, as every part of this plant is used to cure some disease. For instance, all parts of the plant are considered to have valuable atherosclerosis properties when taken in small doses. Its roots and bark are said to promote secretions and are useful in skin-diseases, enlargement of the abdominal viscera, intestinal worms, cough, ascites, anasarca. The milky juice is considered as purgative and caustic. The flowers are considered digestive, stomachic tonic and useful in cough, asthma, catarrh and loss of appetite. The milk itself is a favorite application to painful joints, swellings, and relief of toothache. In large doses, calotropis causes vomiting and purging, acting as an irritant emeto-cathartic. Apart from these plants, the medicinal value of many other plants is yet to be explored. A list of most important medicinal plants is given in the Table -1.

PLANTS FOR FUEL AND CONSTRUCTION

Cholistan desert is poor in tree-resources. The most common ones that are used as fuelwood by the local inhabitants are Prosopis cineraria, Tamarix aphylla, and Salvadora oleoides. Depending upon the size of the settlement, large amount of wood is extracted from the nearby area. Capparis decidua, Zizyphus species, Calligonum polygonoides, Acacia nilotica, Salsola baryosma and Capparis decidua are the main fatalities to be used as firewood. The nomads not only use the wood for cooking their own food, but large numbers of plants are dug up to sell in the nearby cities as fuel-wood. This digging of plants up to the root-level loosens

Table - 1: Most Important Medicinal Plants of Cholistan Desert

Family	Plant species
Cyperaceae	Cyperus rotundus
Poaceae	Cymbopogon jawarancusa, Panicum antidutale
Amaranthaceae	Aerva persica
Asclepiadaceae	Calotropis procera, Leptadenia pyrotechnica
Capparaceae	Capparis decidua, Capparis spinosa.
Chenopodiaceae	Haloxyone recurvum, Sasola baryosma, suaeda fruticosa
Convolovulaceae	Convolvulusmicrophyllus, Creassa cretica
Cuscutaceae	Cuscuta reflexa
Malvaceae	Abutilon muticum
Menispermaceae	Coculus pendulus
Mimosaceae	Acacia nilotica, Prosopis cineraria
Neuradaceae	Neurada procumbens
Paplionaceae	Alhagi maurorum, Crotalaria burhia
Polygonaceae	Calligonum polygonoides.
Rhamnaceae	Zizyphus mauritiana
Salvadoraceae	Savadora oleoides
Solanaceae	Solanum suranttensa
Tamariceae	Tamarix aphylla.
Tiliaceae	Corchorus depressus.
Zygophyllaceae	Fagonia cretica, phagonum harmala, Tribulus longepetalus, Tribilus terrestris.

the soil, thus accelerating the process of desertification. It has been observed that digging up of plants to the root-level imposes many long-term detrimental effects, not only on the particular plant-species but also on the overall ecosystem as well. The tree-species may assume the shrubby or even prostrate growth habit. The authors have observed that large stands of Acacia nilotica and Prosopis cineraria, once present at various localities in the Cholistan desert, has now vanished due to continues cutting by the coal-making industry.

The annual quantity of plant-extraction has not yet been estimated, but the level of destruction around the semi or permanent settlements speaks for itself, due to the severe depletion of vegetation. The houses, "Gopas", are constructed with mud walls, reinforced with branches of Capparis deciduas, Calotropis procera and Dipterygium glacum. A single straight middle trunk of a tree supports the thatched roof; usually the trunk of Prosopis cineraria or Acacia species, suggesting that one roof costs one desert tree.

LAND RESOURCES

Land capability of a piece of land can be judged based on its ability to produce sustained common agricultural crops, grazing capacity and forestry suited for a particular area. Keeping in view the above definition, the Cholistan soils have been classified into eight major classes.

Soils placed in the class-I have least limitations for agriculture, and relatively little efforts are required to produce high yields of a variety of crops provided that enough agricultural water is available. Such lands are usually located at the fringes of the desert, where canal water can be approached through ditches and "nallas". The soils in the classes II and III fall in the category that need relatively more effort to produce high yield crops, as compared to the first one. The class IV soils put forward higher limitations on the agricultural production but, with efforts, marginal crops can be produced. Soils placed in classes from V to VII are not fit for any kind of agriculture; however these can be used as rangelands and for forest. Class VIII soils are those which are totally unproductive (Akram, 1986).

WILDLIFE RESOURCES

In the biological circle, Cholistan desert is uniquely known as the host of a great variety of wild-life. The fauna of Cholistan desert has become specialized in living with the climatic extremes. Natural vegetation provides food and shelter for wild animals and birds. The wildlife of Cholistan has not been studied systematically; however, a few surveys of Houbara bustard and Lizard have been conducted by the WWF-Pakistan, Punjab Wildlife Research Institute and Pakistan National Museum Islamabad. Table-2 represents the list of more important wildlife found in the Cholistan desert.

It may be envisaged here that the Black Buck, once abundant and the pride of this desert, is now at the verge of extinction. Based on the observations by local inhabitants, hunters and wildlife officials, it is estimated that there has been 50 to 80% decrease in the wildlife population over the last decade. Many reasons can be attributed, but the most obvious seems to be the habitat-loss due to vegetation-depletion and excessive hunting. It is also true for many other wildlife species. Realizing the situation, the Government of Pakistan has established a Lalsohanra National Park near Bahawalpur for the conservation of Black Buck and other wild-life of the area.

As regards knowledge of behaviour of different wildlife species, common desert-dwellers have very little expertise; however, hunters/skin gatherers belonging to a particular clan or cast will tell you a lot about the specific wild animals for which they have specialized. The preference for hunting of different animals among different ethnic groups varies. For example, "Gatheries" have developed the habit to eat Porcupine, Jackals, Pigs, Snakes and Lizards; therefore, they are well conversant how to catch and where to find these animals. Similarly, another group namely "Chachans" have specialized in many techniques to capture deer and desert foxes alive.

WATER RESOURCES

There are two main sources of water in Cholistan desert, sub-soil and the surface water. The sub soil-water is mostly found at the depth of 30 – 40 meters and in most of the cases, it is highly brackish, containing 9000 – 24000 ppm salts. Such high contents of salts

Table - 2: The Notable Wildlife Species of Cholistan Desert

S. No.	English name	Scientific name
1	Indian Caracal	**Felis caracal**
2	Jungle Cat	*Felis chaus*
3	Indian Mongoose	*Herpestes edwardsi*
4	Desert cat	*Felis libyca*
5	Jakal	*Canis aureus*
6	Fox	*Vulpes vulpes*
7	Hedgehog	*Hemiechnus auritus*
8	Chinkara	*Gazella bennetti*
9	Nilgai	*Boselaphos tragocamelus*
10	Honey Badger	*Mellivora capensis*
11	Porcupine	*Hystrix idica*
12	Hare	*Lepus nigricolis*
13	Wolf	*Canis lupus*
14	Wild boar	*Sus scrofa cristatus*
	Birds	
1	Grey partridge	*Francolinus pondicerianus*
2	Indian Desert Finch - Lark	*Ammomanes deserti phoenicuroides*
3	Common Indian Starling	*Sturnus vulgaris*
4	Hobara bustard	*Chiamydotis undulata*
5	Great Indian bustard	*Choriotis nigriceps*
6	Imperial sand grouse	*Pterocles orientalis*
7	Indian gray shrike	*Lanius excubita*
8	Spotted owl	*Athene brama*
9	Lagar falcon	*Falco biarmicus jugger*
10	Saker falcon	*Falco biarmicus cherrug*
11	Desert buzzard	*Buteo buteo vulpinus*
12	Indian sparrow hawk	*Accipiter nisus melaschistos*
13	Tawny eagle	*Aquila rapox vondhiana*
14	Harrier	*Circus macrourus*
15	Indian ring dove	*Streptopelia decaocto*
16	Little egret	*Egretta garzetta*
17	Pond heron	*Aredeola grayii*
18	Golden backed wood pecker	*Dinopium benghaleuse*
19	Warblers	*Sylvia nana nana*
	Amphibians and Reptiles	
1	Tiger bull frog	*Rana tigrina*
2	Spiny tailed lizard	*Uromastrix hardwicki*
3	Spotted Indian house geko	*Hemilacytylus brooki*
4	Indian monitor lizard	*Varanus bengalensis*
5	Black cobra	*Naja naja*
6	Common crate	*Bungarus caereleus*
7	Saw scaled viper	*Echis carinatus*
8	Sand boa	*Eryx conicus*
9	Brahminy blind snake	*Typholops braminus*
10	Brahminy blid snake	*Typholops braminus*

in the water make it unfit for human or livestock consumption, though some shallow-water pockets with low salt-contents ranging from 2000 – 4000ppm are present at some places in the Cholistan desert. (Muhammad, 1997).

The surface water is the primary source and is received only from rain. Rainwater is collected in Tobas (ponds) and Kunds, while the subsoil water is obtained through dug wells and tube wells. In the Cholistan desert, rain is the only source of fresh water. During rainy season, the rainwater is collected in natural depressions or man – made ponds, locally called "Tobas". According to an estimate compiled by the Pakistan Council Research in Water Resources, Regional Office, Bahawalpur (PCRWR), there are more than fifteen hundred tobas in the Cholistan area.

Factors such as amount of precipitation, location and size of toba, time for which the water is available and prevailing condition of the range, collectively affect the staying period of nomads at a particular water point. With few exceptions, water in most of the tobas does not last for the longer periods (i.e. up to 3 – 4 months), due to high rate of evaporation and seepage. It has been observed that the inhabitants are very well conversant with the water-shortage and hygiene values. They usually try to practice such watering techniques for livestock that prevent the water from becoming polluted. For example, a channel is constructed with mud-plaster beside the toba and water is filled in with the help of some container for watering the livestock, while the water for human consumption is directly taken from the toba.

Kunds are constructed by using pucca material (bricks, cement, etc.) in the shape of a well above the ground-water depth, to store water for longer period. Kund water-supply is very important when there is great shortage of water due to drought. Kund construction is such that its mouth is two to three feet above the ground-level and, at the ground-level, four to five holes are made in the walls to receive rainwater, while the mouth is kept closed with a lid. The water in the kund can be retained for much longer period, due to much less evaporation and blocked seepage, but these have less water-storage capacity, as compared to toba. The major drawback of "kund" stored water is that it becomes smelly and foul, due to longer storage without any ventilation (FAO, 1993).

As already described, the subsoil water is mostly brackish and not fit for livestock or human consumption; a few wells are present at places where water has relatively less salt-contents and can be used only for survival. The water of wells is used only when water in the Tobas is exhausted and there is no other option.

During the recent years the government allots land at the fringe of the desert for agricultural purposes. In such cases, some tube-wells have been installed for cultivation.

DISCUSSION

Local knowledge of natural resources is made up of three types of information: 1) accumulated cultural knowledge, 2) knowledge modified through contact with other cultures, and 3) progressive learning of the environment (Knight, 1974a). Descriptive LKMS depends on what they can see and remember, without the aid of microscopes, journals and historical records, etc. But their strong memory and incorporation of the knowledge into songs, stories, and daily proverbs allows the information to be passed down, generation after generation (Bernus, 1981a).

Pastoral management-systems range from simple to complex strategies. On one side of the continuum, simple management-systems often rely on the low population-pressure, high dispersion and mobility characteristic of pastoral societies to keep a long-term ecological balance and to check over-use. On the other side, complex systems are often tagged with elaborate social controls that regulate and coordinate the action of individual managers. Although there are examples of both cases but, by and large, the pastoral groups fall somewhere in between (Maryam Niamir, 1990).

Our studies in Cholistan desert revealed that the pastoral population is heterogeneous in its objectives, strategies, needs and management-style. This heterogeneity is obvious, not only between clans but also between individual managers. Management-strategies also vary with time and demand, even for the same manager. For example, spells of rain and area at which the sky-shower occurred affect the decision of a household head in which direction they have to move where they can find water and fodder for longer period. Around the months of March and April,

when there is severe depletion of feed, and water with rising temperature, Nomadic households move towards surrounding irrigated areas. The incentive for this movement includes temporary employment-opportunities within the irrigated farming community, grazing of livestock on wheat stubbles, drinking-water for human and livestock and readily available markets for livestock and livestock byproducts. Farmers in the irrigated areas, in turn, obtain sufficient labor for crop-harvesting and other farming operations and animal-manure to enhance soil-fertility, through the camping of livestock on fallow fields (Akbar, 1996).

If not all, then most of the group have informal and formal rules that regulate their use of natural resources. However, these rules are idealized norms, and the day-to-day decisions taken by each manager usually deviate from these norms, according to local physical and social circumstances. Beliefs about the ideal rules and customs may be voiced in interviews, but they are not necessarily observed every time.

Livestock Management: Very interesting picture emerges while discussing about the livestock-management. Different ethnic groups seem to have their own preferences for rearing different livestock-species. For instance, Rajuts and Jats prefer to rear cows and manage large herds. To them, possessing large number of livestock is the sign of wealthiness. They go after quantity, rather quality. According to them, periodic drought may induce high mortality-rate, which may be balanced due to large numbers of livestock but to us, natural selection among feeble and strong animals infact sustain a crucial balance between the livestock-population and the grazing-resources. Other groups, such as "Chachans" and "Balochi", prefer to have a mixture of animals, but more number of sheep and goats rather than cows or camels.

Pastoral systems, like farming system, rely heavily on detailed monitoring of their natural environment. They do not have sophisticated technologies for monitoring, but they have a holistic set of indicators, each tuned to one or a few aspects of the productivity and health of the natural environment. Lot of patience and time is required to follow up on the changes in the indicators. Some researchers have criticized the accuracy of individual indicators; for instance variation in the milk-yield may be due to the environmental stress, and has the ability to dampen seasonal fluctuations (Western, 1982). It may be kept in mind that a single observation cannot be taken as an indicator for the change in the environment, but pastoralist puts together pieces of information from a set of indicators on the performance of his animals and the state of the pastures.

Plants for Food and Medicine: Concerning the using of plants for food and medicine, it is common to collect flowers and pods of various plants for food and curry preparation; more or less every respondent was conversant with them. However, only the specialized persons like "Hakims" and "Siyane" were able to admire the plants using as medicine knowledge about diseases and their cure; otherwise common people do not have much knowledge about them.

The knowledge of soil-types and their quality and potential for agricultural use is quite high among the "Cholistani" people. In many cases the soil-classification system is very close to used in the formal science. However, it is very much linked to the land-use potentials. For example, local inhabitants are very much conversant that soil in the "Dahers" (large clay flats) is very fertile and productive, as compared to the normal soil in between the dunes or soil of sandy flats. Another important aspect is the knowledge about the type of pasture, according to the vegetation. In most of the cases, the respondent was able to classify the pastures based on the vegetation-types i.e. grassy, bushy or shrubby.

Hunting: Animals and insects are used for food, tools, and indicators of ecological dynamics (Itani, N. 1996). The knowledge of wildlife-ecology can be quite high. However, their consumption is very limited as compared to plants. Hunting is the occupation of some groups, but they usually hunt animals for their own food but not to sell. The hunting of black buck however, brought some valuable money by selling its skin. The killing and consumption of certain species is limited to certain groups of people. For example, the Gathri usually hunt Porcupine, Jackals, Pigs, Lizards, etc., for food, but not a single other clan or group would eat meat from any of these animals.

CONCLUSION

In conclusion, the knowledge of natural resources among the inhabitants of Cholistani has been found to be quite thorough. This knowledge enables them, to make full use of the resources around them, for their daily work and survival. The value and use of natural resources is relative to what is available and what is required. Good examples are plants that are noxious and abundant in one area, but rare and desirable in another area. The natural resources are being used unchecked and are mostly overexploited, specially the vegetational and livestock resources.

The important aspect that has emerged is that one cannot assume that all knowledge is shared equally by everyone in the local community. Variation in knowledge is due to age and sex differences, aptitude, economic and social class, etc. Older people usually know more than the younger.

Water scarcity is the main constraint for normal agriculture. Rainwater, harvested in the "Tobas", mainly provides the fresh water. The location, availability of water points and amount of precipitation, dictate the mobility-pattern for rearing of livestock.

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