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Agro-Pastoral Systems in Cholistan

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Abstract

Cholistan is an extension of the Great Indian Desert and covers an area of 26,330 Km2. It lies within the southeast quadrant of Punjab province between 27o 42' and 29o 45' North latitude and 69o 52' and 73o 05' East longitude. The Cholistan desert has extreme summer temperatures (50oC plus) and prolonged droughts rearing is the only age-old profession of the nomad pastoralists of this desert. Pastoral system is characterized by mass migrations of animals and people throughout the year in search of water and forage. The onset of monsoon and the distribution of rainfall mainly dictate the pattern of movement of nomadic herders. Livestock are the main source of their survival and a number of cultural norms are linked with the animals. The major constrains to the nomadic system are very poor quality of drinking water and inadequate feed, both of which are acute during summer.

Introduction

Around 4000 BC Cholistan was a cradle of civilization commonly known as Hakra valley civilization, when Hakra River flowed through the region (figure 1). The river supplied water until 1200 BC, about 600 BC it became irregular in flow and consequently vanished. The Hakra civilization, which flourished was one of the longest in the course of world history. *Aryans* were the indigenous people and the earliest civilization of the Indian subcontinent. In cultural advancement it can be compared with the Mesopotamian, Egyptian and Harappan civilization. Probably a variety of problems such as hostile invading contributed to the ultimate disappearance of this great civilization (Ahmad, 1999a; 2005).

Cholistan was once green and prosperous land, where cultivation was practiced. The source of irrigation water was Hakra River (Akbar *et al.,* 1996). With the drying of the river, area was deserted through desertification processes and left only as grazing lands. Cholistanis live precarious existence, praying for rain. With a meager average annual rainfall varies between 100-250 mm and the high temperature scaling upto 50^{o}C plus, the evapo-transpiration rate in the desert stands at a high 300 centimeters a year. This is ten times the rate of rainfall, making large tracts of the area extremely arid and barely habitable. Nomads manage their mixed livestock in such a way that milking cows are moved nearby the urban centres where milk is sold readily while other animals like camels, goats and sheep are kept in the desert for grazing. Livestock are frequently used for meat, milk and gifts. Communal ceremonies like weddings, funerals and tribal celebrations include slaughtering and exchange of animals. A person's status in the desert nomadic life style is chiefly represented by the size of the herd one owns.

Silvopastoral system is the oldest system and occurs where forages and trees are cultivated and reared animal together on the same unit of land. This system is limited today though still found in the Mediterranean region and more widely in the tropics. There are several production concepts that should be considered in understanding silvopastoral system management (Ahmad, 1999). These concepts relate to the tree, forage, and animal components. Silvopastoral systems are deliberately, managed agroecosystems, opinions differ regarding the role of range management and extensive grazing under trees, but grazing under forests has a long history with the production of both animals and tree crops. Systems may seek to introduce or improve forage production and quality under tree plantations, or young trees may be planted into existing pasture.

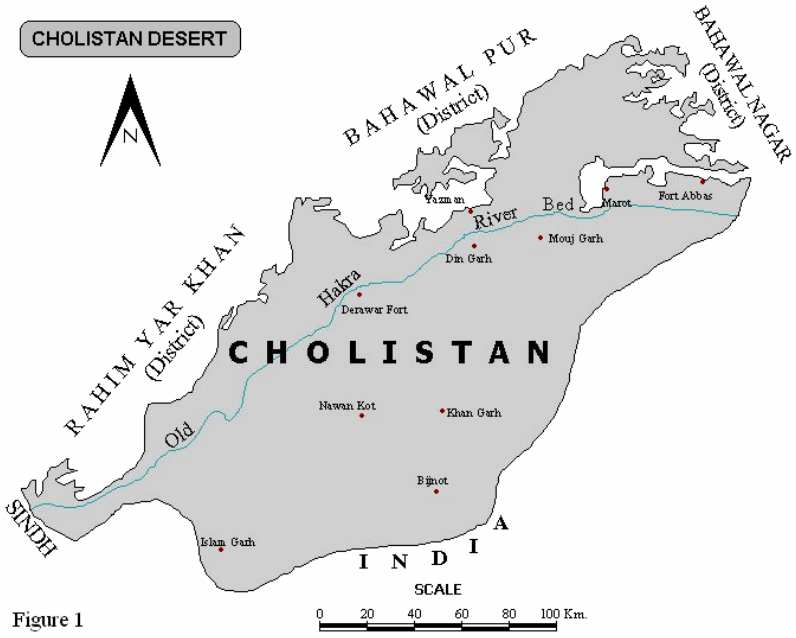

Figure 1

In Cholistan two systems, nomadic and transhumanie are observed. Pastoralists stay in the desert at rainwater harvesting sites during monsoon and migrate to semi-permanent settlements due to scarcity of water and harsh climate.

Transhumanie

Transhumanie system comprises the largest number of immigrating livestock and is characterized by mass movement, including people (Arshad *et al.,* 1999). Patterns of movement (figure 2) are location specific and dictated by a traditional system of land tenure. The timing of irrigation is determined by the onset of the monsoon and rainfall distribution:

July/August (monsoon): Movement is from the irrigated and riverine areas to traditionally owned *tobas* in Lesser or Greater Cholistan. The distances covered vary from 10 to more than 100 Km. Several *tobas* belonging to the same clan may be located within a 1Km radius. At the start of the season, livestock generally graze within a few kilometers of the *toba;* but this distance increases to around 15 Km. by the end of the season. October/November: as water or forage is depleted at the *tobas,* migration is to semi-permanent settlements having wells and *kunds*. March/April: Migration is back towards the fringe of the irrigated areas and after wheat harvest, to the Sutlej River for those with traditional, riverine rights. Irrigation canals are the water sources, but feed supplies are differentiated according to two sub-systems:

Pastoral sub-system herds are partly fed on dried forage, on vegetation along canal banks, roadsides, and partly on purchased fodder. Some stubble is available after the wheat harvest in May;

Agro-pastoral systems herds are partly fed on dried forage but depend heavily on fodder crops and residues since their owners possess irrigated land.

Transhumanie system, being heavily dependent on the timing and quantity of rainfall, can be severely disrupted by drought. For example, during a prolonged drought over the last 4 to 6 years preceding this study, most of the herders barely moved south, some staying only a few days or for a few months before being compelled to return.

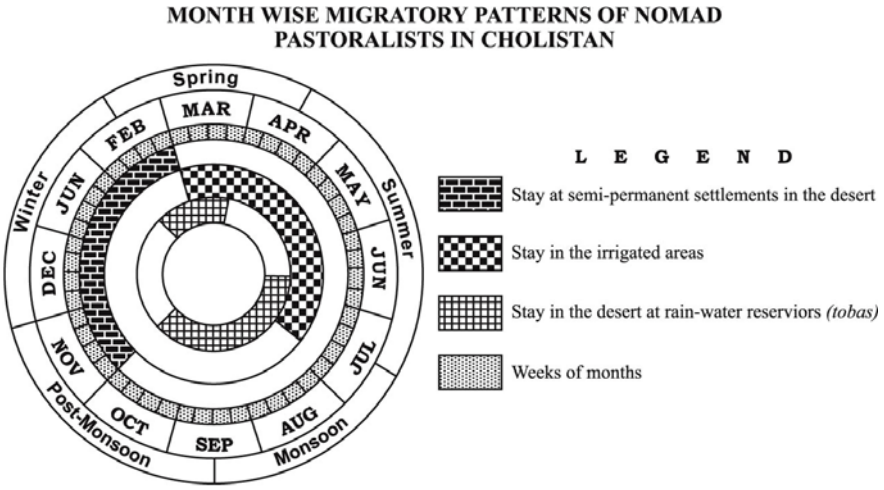

Figure 2:

Average herd sizes in the pastoral system were small with a total of 106 animal units consisting mainly of sheep (46%), cattle (34%) and goats (20%). In the agro-pastoral system disparity in herd sizes was variable, but the average herd size was much larger at 779 sheep units, with cattle, sheep and camels predominant (Ahmad, 2002).

Several constraints to productivity are identified by the socio-economic study in the transhumanie system, all of these being linked to water supply and its balance with forage and fodder:

The general constraint is inadequacy of water in the desert. This was compounded by the recent drought when *tobas* became silted in the absence of herders. Some 25 out of 43 *tobas* (Ahmad, 2002) seen in Greater Cholistan were filled with sediment.

In the eastern, arid region, *toba* water is of good quality but limited so that feed is still available when thirsty herds are forced to migrate. On the other hand, in the semi-permanent settlements, well water is adequate but of poor, saline quality. The wells are unlined and most to be re-dug each year because the surrounding sand collapses.

In the western hyper-arid region on the other hand, the quantities of both water and feed are inadequate. Feed is frequently depleted first so the sheep, whose walking range for pasture is confined to within 3 or 4 Km. of water, must be moved ahead of the rest of the animals to other *tobas* or to wells. All herds are kept for as long as possible in the well areas, or on the Sutlej floodplain. Many of the wells have brackish water which, together with the prolonged period of food shortage, results in poor body condition.

A major constraint for all land less pastoralists is the scarcity of free grazing during their sojourn on the irrigated fringe or the floodplain even though fresh water is abundant.

Nomadic system

This system applies to the larger herds of camels and goats which remain throughout the year in the desert of Lesser or Greater Cholistan. The size of such camel herds varies from around 4 to 150 animals, and goat herds are of variable sizes.

Depending on the size of the herds to be left in the desert, one or two members of each household will remain behind to tend the herds. In addition, a herdsman will be hired to assist if the herd is particularly large. The other members of the household will follow the normal transhumanie system and will return to the irrigated land, taking along one or two camels for transport. Households with only a few surplus camels *e.g.* less than

5 for their transport needs will leave these behind to be cared for the arrangement with the owners of the larger herds. During winter and summer these nomadic animals drink from wells at the semi-permanent settlements (Jowkar *et al.,* 1996). During the monsoon and post monsoon they drink from *tobas* like all the order animals. Natural grazing is the exclusive nutritional source for the nomadic animals living permanently in the desert (Ahmad, 2002).

The major constrains to the nomadic system are very poor quality of drinking water and insufficient feed, both of which are acute during summer. *Haloxylon salicornicum,* an evergreen shrub, provides most of the feed from late winter to summer. The most common plants used as supplement of cereals are *Cenchrus ciliaris, Cenchrus biflorus* and *Cenchrus prieurii.* These grasses are very widely distributed in Cholistan. During the famine and drought years, the seeds of these grasses are ground in flour and used as a supplement.

The grains of *Panicum antidotale, Panicum turgidum* are also consumed as food during the famine years. *Panicum antidotale* and *Panicum turgidum* are very drought resistant and found on the high sand dunes and perpetuate by their hardy rhizomes and seeds. They also protect themselves from overgrazing because of their hard and unpalatable stubble.

In Cholistan, a number of plants are used as vegetables. *Capparis decidua* locally called, *'Karir'* is important perennial shrub, leafless, much branched and evergreen plant used as vegetables frequently.

Prosopis cineraria locally called, *'Jandi'* is an excellent survivor of Cholistan desert. Camels, cows, goats and other animals browse it and give flowers and fruits during the month of March to May. Animals must travel long distances of upto 15 Km. to search for their food, which, in any event, is insufficient. Furthermore, well water salinity increases to very high levels over summer, especially in the western part. The combination of long distance travel, harsh temperature rising to 50^{o}C or more, under-nourishment and highly saline water all contribute to a reported high mortality rate.

Nomadic-sedentary conflict

A major threat to nomadic livestock husbandry in Cholistan is the alienation of rangelands for agriculture. While it would be wrong to claim that the past was an age of perfect harmony among different users of scarce resources, access to land and water was formerly regulated through local codes of tradition and diplomacy, and a nomadic group could be reasonably assured of adequate supplies of each during its semiannual transhumance between summer and winter grazing lands. Today, however, access to resources varies with social position in the status hierarchy of the area, and in this picture Cholistani herders are increasing shortchanged.

Incidents of conflict, especially those over trespassing livestock, are arbitrated by the *numberdars.* If their arbitration proves to be ineffective, the case is taken to the local police, who according to both farmers and herders extort money from both sides before finally taking the side of the party who pays a higher bribe (Ahmad, 2002).

Despite rampant incidents of conflict, farmers and herders provide each other valuable services. Post harvest residues of cotton and wheat are exchanged for livestock dropping on the fields, which fertilize the land and enhance its productivity. Local institutions reinforce this mutual dependency by providing contractual frameworks that reduce confrontation. Based on experience and trust, each year farmers and herders' pair up, and nomadic livestock browse on a rotational basis on segments of the farm land fenced and separated from the rest. This rotational arrangement assures that benefits accrue to both sides, while reducing the likelihood of conflict. Farmers monitor the animals to prevent trespassing onto fenced portions of their lands during the day, but herders are

held responsible for any such incidents happening overnight. Fertilization may be exchanged for wheat straw during the dry season, when post harvest residues are finished and fields are prepared for the next crop. Herders without relatives may even be offered food by farmers' families.

Socioeconomic aspects of land use

Livestock grazing is the most extensive land use in Cholistan desert. The economy of the desert dwellers primarily depends upon herding and grazing. Camels, cattle, goats and sheep are bred for sale and milked to prepare butterfat. Sheep, goats and camels are shorn for wool, their hides and shins are also marketed. Another class of dwellers trade in the hides and skins of wild and domestic animals. *Sajji* (carbonate soda) is obtained by burning *Haloxylon recurvuni* and *Suaeda ftuticosa* and sold (Arshad *et al.*, 1999). These two plants grow abundantly in the saline *dhars* of the area and their over burn has resulted in the degradation of the vegetation cover. In many parts of the desert sand dunes are being destabilized, aggravating wind erosion and the rate of desertification. Deterioration in the vegetation resources is also partially due to increasing demand for fuel, *etc.* largely originating from settled areas.

Conclusion

Pastoral nomadism is not only an environmentally sustainable way of managing the Cholistan drylands, but it could extend support to national dairy and meat consumption requirements. The likelihood of an increase in the number of livestock, by making feed supplement more accessible and affordable in the dry seasons, could be reduced by increasing off take through marketing of animals for urban consumption. Support for the livestock sector will automatically increase herders' income and increased off take through marketing, reduces the likelihood of overgrazing. It reveals that sustainable use of resources with the promotion of indigenous technology will benefit the local people. As with agro-pastoral system, silvopastoral systems can be designed to improve forage production and quality under tree plantations, or young trees may be planted into existing pasture. Research identified that tree planting patterns will impact forage yields and quality, and systems can be designed to maximize forage production with associated tree income. Thus, there are several production concepts that should be considered in understanding silvopastoral system management.

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