

CHAPTER 1: INTRODUCTION

In Cholistan Desert increased frequency of droughts and low rainfall is affecting the life of its inhabitants. Major source of livelihood in Cholistan is livestock but due to low rain fall, shortage of water and long droughts their number is continuously decreasing, leading to the economic instability and financial problems for nomads.¹ Water shortage is one of the major reasons of mobility of nomads. They move from one water sources (Toba)² to another for their survival. As the water scarcity is rising the livestock holdings are adversely affected putting the pastoral nomads in a critical situation in terms of their livelihood.

In order to improve the livelihood of nomads in Cholistan, Government distributed land among some desert residents. The land acquisition has resulted in seasonal migration between the canal area where land is allotted and the place of original residence. The land holders move to land in canal side during winter season, when the water shortage in desert area is acute. They cultivate the land which is provided by the Cholistan Development Authority (CDA). In summer they move back to desert with their livestock.

This work focuses on issues related to livelihood of the Cholistan people. The study, further, aims to explore factors underlying the migration (mobility) patterns of nomads. More importantly, the impact of seasonal mobility on the economic conditions of the people living in the Cholistan desert is also gauged.

1.1: Objectives of the Study

The objectives are to:

1. Study the livelihood sources of people in Cholistan Desert and examine their determinants.
2. Assess the correlates of seasonal migration of the Cholistani people and gauge the impact of land, given by government, on their income.

¹ A member of a group of people who have no fixed home and move according to the seasons from place to place in search of food, water, and grazing land.

² Local name for water source.

3. Devise the policy recommendations, based on the findings of the study, for sustainable development in Cholistan Desert.

1.2: Research Questions

This study envisages examining the environmental effects, migration and role of land provided to Cholistan people as a solution of environmental and economic crises. In this study we ask the following questions:

- How far the local population depends on livestock income?
- Given the increased water stress, how far the government's scheme of land provision reduces the economic vulnerability of local people?

In order to answer these critical questions, a multi-variable household survey, covering 109 households, was conducted to collect primary data on economic conditions and impact of migration on livelihood of nomad's pastoral of Cholistan desert during June to August 2011. The sample was drawn from four villages viz; Kala Pahar, Kheer Sir, Moujgarh and Jasser. Further, the published and secondary data from different sources were used to support the analytics. ³

1.3: Study Sequence

The rest of the study is structured as follows: Chapter two presents, a review of literature available on the topics related to the study followed by Chapter three detailing the livelihood issues in the Cholistan Desert. Chapter four discusses briefly the profile of the study area while Chapter five furnishes details on data analysis including descriptive result of nomad's pastorals in Cholistan Desert. Chapter six describes the methodology, the model, and selection of dependent and independent variables used in the model. The results are discussed in Chapter seven. Chapter eight concludes the study along with drawing some policy recommendations.

³ The sources include Pakistan Council for research in water Resources, Pakistan Economic Survey (Annual), Cholistan Development Authority (CDA) and Population Census.

CHAPTER 2: LITERATURE REVIEW

2.1 Cholistan Desert

Chaudary et. al., (1997) geologically the Cholistan desert is not ancient. Presumably, as supported by some evidence, North region of the “Ran of Kutch” and “East of Indus” in south of the Punjab was relatively fertile and lush green but which lost and it became a dry channel. Records of third century B.C are evident of the fact that the river Indus was flowing some 130 km towards east Ran of Kutch and its named was Hakra, Sotra (Ghaggar) (FAO, 1993).The channel of the vanished river is evident for some 1100 km from Ambala through Bhatinda, Bikaner and Cholistan in Bahawalpur to Sindh and that probably it is old bed of Sarsawati when it and the Satluj River flowed independently of river Indus (Wadia, 1987).

Akbar et al., (1996) Hakra River used to provide irrigation water to the agriculture fields in this area in the ancient times. Its supply was permanent until 1200BC and irregular until 600 BC and then, almost in next 100 years (FAO, 1993), it vanished completely. So now there is no permanent natural body of surface water in Cholistan. Rain water is the only source but the evaporation creates surface runoff. The rain water is collected in small artificial ponds called ‘Toba’ for household and livestock use.

Arshad et al., (1995) Climate of Cholistan is hot and dry; in summer temperature is often exceeding 50°C but the nights in Cholistan are very cool and pleasant even in summer as well. In winter the temperature ranges from 6 to 15°C. The annual mean minimum and mean maximum temperature is 20-40°C respectively.

2.2 Migration

According to Smita (2008), distress seasonal migration is an emergent phenomenon in almost all parched parts of India creating migration cycles. Due to drought in villages, mostly prolonged to several months, the entire families are forced to migrate for survival every year (different cities in India). Migrants are the most vulnerable section of Indian society. Children are accompanying

with their parents so number of children involved in the migration ranges between 40 and 60 lakhs (4 to 6 million). Mostly migration takes place in two sectors namely the industrial and agro industrial sectors. The author also states the patterns of seasonal migration in different sectors and geographies, which have high frequency of seasonal migration. The focused point of this study is the difficulties faced by the children because of migration in schooling on both places in villages and at migration place. In result the impact evaluation of the efforts made by the government and NGOs to address the problem are also undertaken.

Haan (2009) analyses the migration patterns in the developing countries improving livelihoods can come with alternative strategies including strengthening of agriculture, diversification and migration. Migrating is circular series of exchange between places. Study created a link to understand the livelihoods of dry lands and to improve policy options. Migration, in context of selection, can be voluntary as well as forced. Additionally, the author concludes that migration is strongly determined by the social and financial structures. The paper further concluded that migration is one of the livelihood strategies for households. However, migrant maintain a close link with their areas of region. Paper sheds light on the factors contributing to the outcome, gains and pains of migration.

In a very influential paper, (Leybourne et al., 1991) analyzed the changes in migration and feeding patterns among semi-nomadic pastoralists in northern Syria with main focus on the historical reasons for these changes. Three villages were taken from north Syria from 1978-1981 period and survey taken by International Center for Agriculture Research in Dry Areas (ICARDA). The author concluded that the migration is an action to cope with economic stress

Kumar et.al (2008), studied the positive and negative aspects of migration especially those related to migrant's health. Poor people, according to the authors, are forced to move on a chronic basis and consequences on health can be both negative and positive. In context of Rajasthan, a poor agrarian economy, strict social rules define woman's marital and reproductive roles and relationships; higher social pressure for producing children and a high infant and maternal mortality rate. So factors underlying migration affect the health and survival of infants and children of migrants. It is further concluded that migrants have especially moved from one

place to other in relation to economic concerns with objectives of securing employment and earning economic betterment

2.3 Climate Change and Livelihood in Desert / Environmental factors and Migration

Hunter (2007) described the Intergovernmental Panel on Climate Change (IPCC) report evaluated that warming of the earth's climate system is "explicit." The panels concluded that climate change vulnerability affects the less industrialized region especially in rural areas and that environmental change has immediate and direct effects on the health and well-being of millions of households that depend on natural resources for their basic livelihoods. Family livelihood options are reducing with the change in weather. Then people under thrust factor adopt migration and leave resource-dependent areas because here migration acts as a force of social change.

Migration is used as survival strategies by household in times of environmental stress. Other survival strategies are also used but once these livelihood options are exhausted, people often migrate to a new area. Rural household heavily rely on climate sensitive resources such as water supplies that affect their activities such as livestock husbandry and arable farming. Climate change can also reduce the availability of natural resources such as wild herbs and fuel wood limiting the options of natural resources for consumption or trade.

The report further explains that poorest region suffer more from climate shifts because they are least able to adjust to new condition. In African region rain-fed agriculture are expected to fall 50% in some African countries. Rural residents migrate in search of work and they remit portion of their salary back to home and family which uses these remittances to buy substitutes for goods previously produced or harvested from the local environment. Report shows link between migration and climatic factors such as temperature and precipitation showing that residents of dry, rural areas are likely to migrate to the region where rainfall is more. Only short-distance moves appear as a result of climactic factors, since international migration tends to be less common in a period of rainfall shortage because it requires investment. According to the report, Governments have taken policy action to reduce climate-related migration, particularly in rural regions of less developed countries. Such policies need not be climate-specific, but could serve

to enhance families' livelihood options. There are ethical dimensions to the link between climate change, poverty, and migration. In this way, development efforts and programs to reduce poverty will lessen livelihood vulnerability, ultimately reducing the need for families to migrate because of climate change.

As explained in Koubi, et.al. (2009), Various research studies by the scientist and policy makers argument that environmental degradation is an important driving force of migration While a range of studies predict large environmental migration flows due to climate change and other environmental stressors. The study contributes to the emerging empirical literature in this field by focusing on the micro-level by undertaking an assessment that how and why different types of environmental conditions may lead to internal migration. The analysis relies on survey data for both migrants and non-migrants in 16 countries. The results of the study indicate that it is important to consider the specific context in which environmental stressors could influence decision to migrate; environmental problems do not necessarily force people to migrate given they take environmental problem as a threat to their livelihood. The results further suggest that both sudden-onset and long term environmental events, such as floods and droughts, have no significant effect on internal migration. In contrast, individual perceptions of negative environmental conditions perceive environmental threats do not have close ties to their location or they are willing to accept the cost of migration can motivate people to move. The results also show that individuals tend to respond to long-term environmental problems with adaptation, rather than migration. People prefer adaptation over migration when facing long-term environmental problems, but only if they are socially bonded to their current location. These findings indicate that different types of environmental problems notably, natural hazards vs. gradual environmental degradation can create different incentives for people to migrate or not. The main implication, therefore, is that spectacular “climate refugee” scenarios are probably exaggerated, and that financial and technical support for adaptation to environmental degradation resulting from climate change or other causes is the most productive policy-option. In drought pastoralists survival is mobility, as they followed their herds in search of greener pastures. Presently, the movement of these traditionally nomadic peoples is severely delayed by agricultural settlement, conflict over grazing lands and water, and land degradation, even as climate change increases the stress on their herds.

Ndaruga (2010) undertook research on climate vulnerability in the biophysical impacts of drought, and its socio-economic consequences in pastoralist communities of Mandera and Northern Kenya.

The findings of study confirm that pastoral livelihoods are at risk of rising surface temperatures, more intense rainfall and frequent droughts. These droughts are occurring at the same time as rainfall has become erratic and sometimes heavy especially in recent decades because of severe drought occurring since 1980s. It reduces the vegetative cover that feeds livestock and protects soils against erosion and will lead to increase the conflict due to competition over scarce water and pastures. Paper finds that 80% of respondents feel direct impacts on the resources they depend on for their livelihoods e.g. less than a lack of access to markets for livestock and crop produce, limited access to health centers, and poor road infrastructure increase the vulnerability of pastoralists. Also they have no access of seasonal forecasting information. The study further concluded that men and women are directly but differently affected by climate stressors, and their coping strategies also differ from each other. Like Women, on which family depends, do not have voice in decisions that will affect the resources, while men are directly related to the conflict that create risk of depleted resources like water and grazing lands. But he hopes to see more institutional support to assist such local efforts. The study hopes that the institutions of government at the national and local levels give this issue more priority which it deserves and mainstreamed climate change in their programs and operations, also providing adaptation strategies for sustainable development because it's better for government ministries to also focus on outcome not just on outputs

2.4 Nomadic Livelihood

In rural area seasonal migration of labor is a durable component of livelihood strategies. Migration is a survival and coping strategy during the poor time for poor and non-poor in a similar way. Deshingkar and Start, (2003) explain why some groups of people succeeded and other have been excluded in entering accumulative migration. Paper describes important factors of Andhra Pradesh (AP) and Madhya Pradesh (MP). Livelihood and social exclusion is adopted and it helps us to understand migration patterns, people access to resources, the (institutional, market, policy) environment, intra-household relations and historical development of different regions, interlocked markets for credit, output and labor, marketable traditional skills, other

livelihood options that are complementary to migration, the availability of surplus labor within the household, cultural norms regarding the sexual division of labor, as well as decisions related to children's education. Caste emerges as an important determinant of who is excluded from positive migration streams. This is because of the strong correlation between belonging to a scheduled caste and being poor, illiterate and asset less as well as being discriminated against by employers and contractors. The study shows that people from poor areas can be on positive migration pathways and people from well-endowed areas can be on coping migration pathways. Indeed, one person's coping strategy is often another person's accumulation strategy. Paper defines migration stream as a specific combination of caste, origin, destination and type of work at the destination. Therefore, a change in any of these four factors would make a different migration stream. Conclude by identifying ways in which policy can enhance the positive outcomes of more accumulative migration and also provide support to reduce vulnerability in the case of the poor who migrate to survive.

Ahmed et al, (1976) explains some aspects of pastoral nomadic life in Sudan. The Fulani (caste) whose households move together with their animals and their family women can thus help with the herding while in case of Igessana, whose household dose not move together with their cattle herders, women do not travel with the cattle herders. Other caste had their own different ways like Hababin household are attached with the small number of animals, (for transport, cow milk, goat for meat and milk) are cared by woman and children, and while the larger herds are kept away from the village and herded by men.

Lois (1978) described the pastoralist in Iran in the Zagros Mountains. Male and female perform household tasks cooperatively. Woman engaged in household tasks like gathering wood, wild plants and water, caring children, spinning, weaving, and deriving prestige from these skills and man doing farming and herding mostly. Women interweave tent and some weave different object for sale. Household female member prepare animal and milk products for markets.

Goldstein and Beall (1988) analyze the situation of the nomadic pastoralist lives in the Western Tibet Plateau. The study, paying particular attention to the environmental condition of the Tibet nomadic livelihood, concluded that there are factors which for development projects for nomads to resettle them but they are no inducement for the pastoralist nomads.

(Deshingkar et al., 2006) The study shows that remittances provide a feasible livelihood dynamics and are source asset creation in pastoral areas. Migrant remittances play important role in sustainable livelihood solution for households in selected villages of semi-arid and drought prone districts of Andhra Pradesh, in India. It is further concluded that the remittances are utilized as productive investments to escape poverty. Remittances provide livelihood options and are utilized for several purposes, including, productive and social purposes. Both type of migration found in the village on long-term and short-term. The short-term migrations consist mostly of a single male migrant going in search of work while the family staying at home. The migrant returns home occasionally with remittances to provide for needs of the family social networks as channels for migration rather than the contractual system. The study shows that some major constraints limit their ability to send remittances home. Such as lack of adequate skill sets, clearing of old debts, irregular availability of work, lack of access to critical services such as water, sanitation, health, education and the lack of social security measures such as access to the public distribution system and ration cards, lack of awareness . Only a small portion of remittances gets invested in assets because remittances are utilized for micro-enterprises and non-farm investments. Persistent drought also failed such investment like in agriculture; buying land, boring wells and investing in agricultural inputs. Few households that have diversified their remittances investment into non-farm activities have had better returns on investments which have demonstrated sustainability, other family going back to poverty trap. Benefits are concentrated at the individual or household level and the spillover effects into the local economy are limited because of the absence of institutional, policy and market mechanisms appropriate to enhancing income generation potential at the destination or non-farm investment avenues at home. There is a felt need to improve access to services for the migrants at their destination, like extending the public distribution system, migrant workers access to health facilities that would enable them to lower expenditure and greater savings.

Samal (2006) stresses on the need to explore the multiple options such as vocational training, creating a social fund, rural investment opportunities, the provision of loans from financial institutions, developing market linkages for at least some selected non-farm products and services by Government and non-governmental agencies. Proactive thinking and action on the part of different agencies would go a long way to not only making migration a livelihood option

but also creating viable and sustainable investment. The concludes on the need of a policy that have to address some institutional factors dynamics that remittances turn into productive mechanism for households instead of just a way for plummeting poverty.

Arshad et al. (1999) explain detailed pattern of nomadic migration and livelihood in the Cholistan desert. The study elaborates the seasonal responses in migration pattern and reported migration period of nomads in Cholistan desert pre-monsoon (summer) ranging from June to August; spring February to April; and post-monsoon (autumn) from October to January in the Lesser and Greater Cholistan desert.

Ahmad (2006), in his paper, described the livelihood pattern in the Cholistan desert in context of agro pastoral system, repetitive in the Cholistan, that has as extreme summer temperature as 54C° and sometime accompanied by prolonged droughts rearing. So the agro pastoral is the only age-old profession of the nomad pastoralist in the desert. The study goes on saying that this system is characterized by mass migration of animals and nomadic of the Cholistani area in the search of water and forage. The monsoon and the rainfall distribution mainly dictate the patterns of migration from desert area to canal area and vice versa. Livestock are the main sources of their survival in Lesser and Greater Cholistan and especially in the Greater Cholistan. Herds of livestock linked with the cultural norms in the desert area specially. Water quality and quantity for drinking and inadequate feed are very poor in the nomadic system which becomes the major constraint in the nomadic livelihood mostly for those who live in the Greater Cholistan. Both the water and fodder become more acute during summer.

2.5 Environment and its Scio-economic aspects

Swift (1977) defined the climatic unpredictability as a kind of great character in pastoral communities because it creates a situation in which the relatively rich and poor household or communities may change places with each other unpredictably. However, the effects of climatic change are not random, particularly in the nomadic lifestyle because larger and smaller herders have different abilities to survive and convalesce from the periods of environmental stress.

Anil (1986) studied the ecological crisis in the environment due to the human irresponsible interference in the system of nature with special reference to water and soil systems.

Ajmal et al., (2001) described the problems and issues of the Cholistan desert community. As regards the issue provided the suggestion for obtaining sustainable development through various resources. i.e. vegetation, livestock, soil, herbs and water resources.

Ahmad et al., (2002) described the various impact of drought. The study evaluated the drought mitigation process in Pakistan with focusing on the current drought condition and its future options. The authors described that there is need to develop a policy frame work for information to access the stakeholders which are related in this process of mitigating the drought impact. The dissemination and sharing of available information to the civil society, government department and private organization are limited. To mitigate and formulate the drought impact, it is essential to formulate and adopt a National Policy for Drought on priority basis

Kepner (2002) introduced the interconnections of desertification with cultural, political, social and economic aspects in dealing with environmental problems. The study specially focuses on the consequences of degradation from these issues especially human migration in the backdrop of problems of food security, soil and vegetation, and water issues. Water related situation of resources scarcity in result human migration so basic root causes indentified that is population growth and climate change which contribute in the natural environment stress.

Siegel and Alwang , (1999) concludes that migration is used as the strategy to cope up with the condition of the desert area because of the environmental stress. Livelihood strategies classified on the basis of risk management. Such strategies are the planning process in a combination of risk mitigation and coping practiced in the responses of the event (gives sense of incomplection).

Dribe, (2003) observed the extent of the impact when migration as strategic measure dealing the economic stress by sending single family member away or the complete family reallocated using individual level data extracted from the southern Sweden rural community for 1829-1866 period. The results are suggestive that landless household members did not migrate in response(s) to financial stress. Lack of availability of substitutes and prohibitively high cost migration create the long-range migration. Although some time migration appear to have a negative effect on the way of life and its social livelihood style as in this study migration appears not the only effective way of dealing with economics stress in the rural community

2.6 Water Role in Desert Livelihood

Ahmad, (2008) studies the rainwater, harvesting technology inter linkages and its impact thereof on poverty alleviation. The characteristic of soil of Cholistan is different so the study tries to catch the best area for rainwater harvesting. The author documents the direct relationship between water availability and poverty reduction. Also highlights the strengths and limitations of modern harvesting technology, and water availability in reducing poverty. It is concluded in the study that the innovative technologies create positive impact on household income and mitigate drought. Further it minimizes the risk of water scarcity during drought. The study further concluded a policy framework to develop institutional mechanism of water harvesting on different levels like NGOs, local people institution and concerned government departments.

According to shah (2001), if water is the basic reason of migration its provision in the places of living the migration can not only be minimized but also the emotional problems that the family bears in the migration duration can also be avoided. Provision of water can further result into increased ratio of the education in the children because they can carry on their studies in their near future life that will not only enhance their lifestyle but it is very important for their emotion health as it will reduce the distances between the family members.

2.7 Water Shortage problem

(Khan, 1990) Unavailability of water is basic severity in Cholistan Desert. Primary source of water is rainfall; the average rainfall in Cholistan is 100 – 200 mm in the year. This is the only source of sweet water in Cholistan. Rainwater is collected in natural or man-made ponds locally called “Toba”. There are 598 Toba in Cholistan Desert part (CDA, 2010) where desert inhabitants collect and store rainwater from natural catchments. Dhars act as good catchment for rainwater for harvesting. Through evaporation from such ponds, water loss is increasing. .

2.8 Migration and Water

Shah (2001) Paper shows that all over the India the temporary migration of labors is on the increase perceiving migration as an opportunity. The study, further, shows that the relationship

between migration and Watershed Development (WSD) is complex and depends on a variety of factors ranging from rural-urban wage differences, personal aspirations to education levels. A large number of village studies from different parts of the India conducted in the last five years show a marked increase in temporary migration for work.

Rao, (2001) focuses on the seasonal migration and reported that it is often linked to debt cycles and the need for money for repaying debts, covering deficits created by losses in agriculture, and meeting expenditures of large magnitude on account of marriages, festivals, ceremonies etc. The author concludes seasonal migration to have become a routine.

(Deshingkar, 2004) In fact earning additional income for developing irrigation facilities has often been reported as the main reason for migration from the dry land regions. A reverse relationship between migration and watershed development (WSD) has also been shown to exist where migration adversely affects the incentives for community resource management and participation. Not many have examined the relationship in its entirety: the (positive) effect of additional income; the (negative) effect of labor depletion and reduced collective action and the effect of changing preferences and household behavior. The most important insinuation for policy is to be aware of that migration will continue and this does not represent a failure of watershed development programmes. Migration is not a perfect way to provide employment to the poor in rain fed area therefore urgent need to understand how through improving the resource base which creates a more conducive environment for investing remittances. WSD can become a part of efforts to support more diverse livelihood portfolios. The paper concludes that policy makers should be prepared to face increasing migration levels and embrace accumulative migration as a valid livelihood strategy that can be combined with WSD efforts to create win-win situations for the poor and overall economic development.

2.9 Livestock

Shfaiq and Kakar (2007), dry weather adequately prolonged due to rainfall shortage, to cause a serious decrease of water availability. It is not a single factor which prevalent drought affected near about all parts of Pakistan statistics show loss of life, particularly livestock which is likely to stagger further agricultural economy of Baluchistan. Due to drought and other factors, livestock of the country is on decline by about 2.6%, as against 2.8% growth in the preceding year (Annual Report, State Bank of Pakistan, 2003 - 04). The province of Punjab was also

greatly affected by drought as is evident from the Government's relief program for the drought-hit areas. According to the Government of Punjab, the livestock sector suffered a loss of nearly Rs. 5.5 billion annually. Mainly in Punjab, ten districts are arid, which were most affected by the drought.

Many major reasons i.e. the scattered population of the province, non-established infrastructure, water level in tube wells, lack of rainfall, livestock and agriculture dependency on rainfall is main obstruction in drought. In the execution of consolidated and well organized operation plane is needed to provoke this. Agro-pastoral societies have developed their own strategies for coping with drought. Traditional risk management strategies have proved to be effective in managing drought and have enabled pastoral societies to survive harsh environments for many centuries. Paper suggests that a separate ministry must be established for policy decision and resource mobilization regarding the livestock development. Need to make indicators for pre-drought planning during drought action plans and post drought management. Proper steps must be initiated for the management of water, as the lack of water has converted large tracks of land into wasteland; it needs fresh leveling of land, which is impossible for the animal grower to privately level the land in hilly areas. Installation and the rehabilitation of water facilities for the improvement of rangelands, extension of veterinary facilities, production of livestock feed, livestock loan must be provided, distribution of crop seed and soft loans to farmers are very important. Care has to be taken not to create people's dependency on gifts. Apart from immediate relief to people in genuine hardship, attention should be diverted towards creating sustainable solutions to public concerns on an early basis. Attention must also be paid on the use of solar energy for desalination and lifting of underground water both in coastal areas and where saline underground water is available. Digging and operation of tube wells in Baluchistan urgently need suitable regulation policy for the safety and protection of reserves of water lying in the beneath of land. Joint venture of public and private sector must be formed at national level with strong footings at provincial and district level for the development and sustainability of livestock in any circumstances.

Iqbal et al., (2000) collected data from the three mostly known desert of Pakistan namely Cholistan, Tharparkar and Thal. Due to bio-climatic variations, livestock farming is an important source of livelihood for the inhabitant in rangelands because of low crop cultivation and availability of grazing vegetation range in deserts. The study observed variations across the

deserts in Pakistan. The number of adults doing livestock farming was higher in Cholistan than other two deserts. The average herd size was much larger in Cholistan than Tharparkar and Thal. In Cholistan livestock farming is carried out by family members staying in “Greater Cholistan” and crop farming by the family members staying in “Lesser Cholistan”. Less per person land allocation in Cholistan is because of their agricultural lands are lying in Lesser Cholistan where seasonal canal irrigation facilities are available and at least one person on full time basis needs to be present there for caring crops and other household members. In other two deserts, the livestock and crop farming activities operate simultaneously.

Farooq *et al.*, (2008b) Related to Cholistan, the number of standard animal units managed by per person was about 26.8 in Cholistan and the mean operational holding managed per person was about 10.45 acres in Cholistan. But relatively more peculiar socioeconomic problems in Cholistan include limited supply of forage and fodders, poor health of the animals, more physical exertion of animals during grazing, frequent incidence of diseases and droughts, difficulties in getting health services and approaching all herders in vaccination campaigns, least opportunities of getting children’s education as the herders keep moving from one Toba to the other. Livestock are the most important element of all three deserts but largest in Cholistan. In Cholistan, goats were present in two, out of three herds while camels and sheep are kept by almost every second herder in the area. Second most kept animal in Cholistan and Tharparkar deserts is camel while in Thal it is quite low. The average number of sheep per household was much higher than goats in Cholistan as same result shown in the present survey.

According to Farooq (2010), for communication use of wireless telephones (V-Phone) and cellular phones was more common in Thal and Tharparkar deserts and same in Cholistan. Conclusion that slightest heterogeneity across deserts may be prevailing regarding utilization of communication facilities are apply on very limited area in the Cholistan Desert context.

2.10 Conclusion

Usually we found the literature on the dry land areas. Different studies were reviewed for this purpose i.e. on deserts of Iran, Egypt, Africa, Pakistan and India. Several studies are conducted by Amita Shah, Robbin, Kummar etc on Indian desert named Rajistan, Gujarat and Maharashtra. They worked on migration (short run and long run), environmental factors, land degradation and livestock. Literature showed that desert people take migration as survival strategy. This strategy

saves their lives and livestock but at the same time they are deprived from education, health and other facilities. They also have to face social isolation. Lack of communication facilities creates close communities. Mostly literature found described the lesser part of the Cholistan and discussed about the herbs, soil, livestock and water crisis. Generally studies are based on qualitative analysis or simple regression methods are used to quantify the results. There is a strong need to conduct the researches on livelihood issues of the desert people using mixed method technique. Ours is an attempt to fill the void.

CHAPTER 3: BRIEF OVERVIEW OF LIVELIHOOD ISSUES IN CHOLISTAN DESERT

3.1 Desert

There are 20 major deserts on Earth spreading over the six continents covering nearly 15% of the Earth's surface; almost equal to an area about the size of South America (ADB, 1993). No matter where they are located, all the deserts share one characteristic; they are very dry. Scientists define a desert as an area that gets less than 10 inches (25cm) of rainfall during a year and has a very high rate of evaporation; usually it is due to the high temperatures and/or strong winds. Increased desertification is threatening to add an additional 15 million acres into desert each year. This is due to several conditions: salination; the over use of ground water reserves; stripping of vegetation for fuel, lumber and by overgrazing. Scientists are worried that this may also be affecting the earth's atmosphere and overall ecology.

Pakistan covers 79.6 million hectare area and out of that area 11million hectares are counting as desert spreading in the four provinces. The area covered by each desert is given below

Table 3.1: Name and total area of Pakistan desert

Name of Desert	Province	Area(ha)
Thar	Sindh	4,300,000
Cholistan*	Punjab	2,580,000
Kharan	Balochistan	1,820,000
Thal	Punjab	2,300,000
Total		11,000,000

Sources: Pakistan council of research in water resources (PCRWR, 2003)

***Cholistan Desert:** The word Cholistan is derived from the Turkish word "Chol" which means Desert. Therefore Cholistan means Land of the Desert (locally known as Rohi). Cholistan is the largest desert of Pakistan. It covers about 26,000 km², which corresponds to 26% of the 110,000 km² surface area. On East it is surrounding by Bahawalpur and covers an area of about 15,000 square km, in South by the Thar Desert of Sindh province and on the East by the Rajasthan desert in India.

3.2 Basic Issues in Cholistan Desert

Basic environmental issues include water shortage, degradation of land, over grazing, droughts, short of precipitation in Cholistan desert which lead to economic constraints in the area. Due to climatic factors, rise in temperature was recorded and shortage of rainfall creates droughts. In Cholistan desert, in 1998 to 2006, rain shortage create the problem of drought, water shortage and aridness. The area which was not as much facilitated by government was mostly affected by this drought duration and caused deaths of both livestock and human. Water is the supreme problem of Cholistan. Average rainfall in Cholistan is 7.5 to 12.5 centimeters (PCRWA, 2003), Due to less rainfall, the water shortage problem is increased because in Cholistan desert the main drinking source, as discussed in previous pages, is rain water stored in “Toba”. To survive, people migrate from place to place in search of water. CDA (2006), reported that 1100 functional and non functional Tobas are available in Cholistan Desert, around 30 families living around the Toba. It serves as drinking water both for nomads and their livestock. Tobas are made in clay locally called “dahars” in catchments area to avoid heavy water percolation. Tobas belonging to the same tribe are generally located to each (often 1 Km radius).

Rain water is stored in “Tobas” and “Khuds” (water reservoir), which are the main sources of drinking water, both for human being and animals. Cholistani people are constantly moving in search of water. There are some permanent settlements by the side of old fort on the bank of old river Hakra. Underground water is salty and bitter and is sometimes found at the depth of about 80 to 300 feet.

Large flocks of sheep, goats and large herds of the camel and cattle are found grazing after rain. It is, indeed, a treat to visit a large Toba” (Kachha water tank) full of rain water, where different families set up their temporary migratory houses on various sand dunes. These houses are found everywhere in the area near “Tobas”, livestock graze within 1 or 2 Km radius of each “Toba”. Cholistan Development Authority tries to provide adequate drinking water at every 15-20 miles in the desert. In 1950 eleven wells have been dug in the area and efforts are being made to excavate “Toba” (rain water catchment pools and reservoirs).

From July to February the grazing is good due to rain but when the Tobas get dry and the grazing areas are depleted, the nomads move north words towards the irrigated tracts. The occupation of

the people is mainly rearing grazing of sheep, goats, cattle and camels, and by-products on which they depend for their living.

Cholistan soil has high sand and low clay content. Good crops are produced in the area of Fort Marot (due to better soil and water facility). Cottage industry is also found in the area. It consists of making woolen and shawls and Flassis” (Bedding Mats) from camel and goat hair. One of the main occupations of the area is making of “ Sajji” popularly known as “Khar “ gets one-fourth share while the remaining is collected by the Government through the contractors.

The majority of the people live on the periphery of the desert and the interior of the desert is thinly populated. The pastoral system is characterized by mass migration of animals. The beginning of monsoon and distribution of rainfall mainly dictates the pattern of movement of nomadic herders. Around the month of March to April, nomadic households move towards surrounding canal areas. Incentives for this movement include temporary laboring employment opportunity within the irrigated farming, grazing of livestock on wheat stubbles, drinking water for human and livestock. 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 camping of livestock on fallow fields. The nomads and their herds return back to the desert around July to August with the news of first monsoon showers. Distance traveled during this migration varies 10 to 100 Km and sometime 150 or 200 Km. The interior desert area is not connected by a modern mobility system and sandy desert tracks are used for travel by camels or jeeps. Local people use camels as a means of transportation. Habitations are small and extremely scattered. In the desert natural vegetation is the main source of feed for grazing livestock.

3.3 Socioeconomic Aspects of Pastoralist in Cholistan Desert

Pastoralism, well adapted to the challenges of maintaining productive and sustainable livelihoods, is an ancient way to use dry land areas. The total human population in greater Cholistan desert is around 120,000 (CDA, 2002) consisting of nomadic pastoralists. There are three traditional systems discussed one by one.

3.3.i Transhumance System

Transhumant system comprises the larger number of immigrating livestock and is characterized by people mobility and determined by the onset of the monsoon and rainfall distribution

July/August (monsoon). In this system pastoralists stay in the desert during monsoon time period at rainwater harvesting sites (Toba in local language) and moved from the irrigated and reverie areas to traditionally owed “Tobas” in lesser or greater Cholistan, The distance covered vary from 10 to more than 100 Km. At the start of the season, livestock generally graze within a few kilometers of the “Toba” but the distance increases to around 15 km by the end of the season. Migration occurs during October-November (post monsoon) as water and forage is depleted at the Tobas. Migration is undertaken to semi-permanent settlements having wells (Khoo and Kundin local dialect), as water or forage is available there. During spring (March-April), pastoralists migrate towards the periphery of the canal-irrigated areas. The economy of these nomads entirely depends on fragile and meager natural resources associated with inconsistent rain patterns. Job opportunities are limited to labor in agricultural fields or other minor activities due to lack of education or skilled training. Most of the nomads live below poverty line do not have basic human needs like clean drinking water or sufficient food, health and education (Ahmad, 2001).

3.3.ii Pastoral Sub-System

Pastoral sub-system herds are partly fed on dried forage, on vegetation along canal banks, roadside, and partly on purchased fodder. Some stubble is available after the wheat harvest in May; Agro-pastoral system herds are partly fed on dried forage but depend heavily on fodder crops and residues since their owners possess irrigated land. Transhumance/transhumances system, being heavily dependent on the timing and quantity of rainfall, can be severely disrupted by droughts. For example during a prolonged droughts spread over 4 to 6 years , most of herders barely moved south(Canal area for water) , some staying only a few days or for a few months before being compelled to return.

3.3. Iii Nomadic System

Nomadic system applies to the larger herds of livestock mostly camels and goats which remain throughout the year in the desert (Greater Cholistan). The size of such camel herds varies from 4 to 60 animals. Depending on the size of the herds to be left in the desert, female members of each household will remain behind to attend the herds. In addition, a herdsman will be hired to assist if the herd is particularly large. The other members of the household, who will follow the normal transhumant system, will return to the irrigated land, taking along one or two camels for

transport. During winter and summer these nomadic animals drink from wells at the semi-permanent settlements. During the monsoon and post monsoon they drink from “Tobas “like all the order animals. The combination of long distance travel, harsh temperature rising to 50° C or more, under-nourishment and highly saline water all contribute to a reported high mortality rate (Arshad and Roa, 1995). Under nomadic system, camels and goats remain in the desert throughout the year. During winter (December through February) and summer (May through July), these nomadic animals drink from wells and Kunds at the semi-permanent settlements. During the monsoon and post-monsoon, they drink from Tobas like all the other animals. Natural grazing is the exclusive nutritional source for the nomadic animals living permanently in the desert (Khan 2009, Ahmad, 2005; Nadiem, 2009).

3.4 Sources of Livelihood

People in Cholistan desert have limited sources of livelihood and those sources also depend on environmental condition. Inhabitants of Cholistan have two main sources to earn livelihood: one is livestock (camel, goat, sheep and cow) and other is land cultivation (allotted by the CDA). But only few families are blessed with the land ownership. The details of Livestock livelihood are given in table 3.2.

3.4. I Livestock

The camel, cow, sheep and goats are the main cattle wealth of the area. Total cattle heads estimated are around 1,200,000. Livestock population is different in canal area and desert area.

Table 3.2: Livestock Detail in Cholistan

Livestock Population	1.56 millions
Cholistani Cattle	0.667 millions
Camel	0.080 millions
Goat	0.350 millions
Sheep	0.450 millions
Existing Coverage of Animal Health Services	0.5 %
Average Number of Cattle per Family	50 – 100
Limitations for livestock productivity	Water, nutrition, non-domesticated, production system, marketing, animal health & production services

Source: Agriculture Census 2006

Cholistan is a home of livestock. The occupation of the Cholistani people is mainly grazing sheep, goats, cattle and camel, and there by-products are used as source of income. Cows provide plenty of milk which is use to make milk related products. Sheep is the most potential livestock which produces best quality wool twice a year. But only 5 percent veterinary services are available and there are lots of limitations in producing livestock production in the Cholistan area.

Table 3.3 below shows the number of livestock in both area of Cholistan Desert.

Table 3.3: Livestock population in Lesser and Greater Cholistan Desert

Category	Greater Cholistan Area	Lesser/Canal Area
Buffalo	130,165	463,367
Sheep	650,558	158,064
Goats	275,177	714,252
Camels	20,777	4,742
Horses	156	4,172
Mules	302	994
Asses	14,594	39,923
Poultry	190,594	796,645
Other Cattle	407,350	288,278

(Sources: By the District census report of Bahawalpur from 1998)

3.4. I.i Livestock production system

The decline of Cholistan desert commons is not well-documented. Livestock overgrazing and rainfall cap encroachment have clearly reduced graze in the region. Migrations of animals

occurred during crises situations but during interviews with pastoralist people of Cholistan they explained that they migrated with their animal but mostly animal died in the desert area due to shortage of water and fodder. One of the study areas, named Jasser Kho, is totally dependent on the sheep production and all the population of that area migrate in the winter season due to the drought problem. In particular years of drought all animal were died and they lost all their strength in the livestock herding. And now, to survive, they use to migrate in winter season in the canal area and they have to move back in the summer season and earn very low income for their survival. In canal area settled farmers also raise livestock in the small number especially small ruminants, stall-fed cattle and buffaloes. The mobility of herders from Cholistan desert to canal area is determined both by negative and positive factors. Negative factors include the rearrangement and dissolution of rule, bargain, and authority systems governing village landscapes. Positive factors include the benefits of migration to make stronger agricultural regions of canal area and provided fodder for their animal. These benefits are realized by increasing reproductive capacity of mobile herds when managed with sufficient resources. Livestock are the main source of their survival and a number of cultural norms are the frequently used meat, milk and gifts, such as 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 herds he owns (Arshed et al; 1999).

Livestock grazing is the most extensive land use in Cholistan desert. The economy of the desert dwellers primarily depends upon herding and grazing. Pastoral nomadism is not only an environmentally sustainable way of managing the Cholistan dry lands, but also it could extend support to national dairy and meat consumption requirements. The livelihood of an increase in the number of livestock, by making feed supplement more accessible and affordable in the dry seasons, could be reduce by increasing off take through marketing of animals for urban consumption. Support for the livestock sector will automatically increase herder's income and increased marketing, reduce the likelihood of overgrazing.

3.4. I.ii Livestock Farming in Cholistan Desert Area

Shadbad Modern Cooperative livestock farming project was established 2010 in rural Punjab . In the Noor Sar Balochan first Shadbad livestock farm was starting in Cholistan with a budget of

Rs 47.92 Crore. Five farms of modern cooperative farming established within in one year.

Location of farms is as follows:

1. Noor Sar Balochan
2. Mouj Garh
3. Chappu
4. Fort Mir Garh
5. Muttan Wali

This modern livestock farming will improve economic condition of Cholistan People. Total 2500 acres land has been allocated for five Shadbad cooperative livestock farms where drinking water as well as other facilities would be available. Other objectives of these farms are described in Cholistan Development Authority.

Box 3.1: Mission and Objectives

- To project Cholistan as primary 'Organic Food Producing Zone' in the country and abroad
- To showcase the modern livestock management and production techniques in Cholistan through the establishment of five modern farms,
- To translate in to reality the Chief Minister's vision of establishing modern farms that would be publically funded, professionally managed and community owned,
- To increase the sense of ownership and participation in the people of Cholistan towards the development initiatives in the area, Community mobilization to create awareness about the professional management of livestock in Cholistan,
- Poverty alleviation through modern Livestock Farming in Cholistan,
- To showcase the professional livestock farming in Cholistan in dairy and meat sectors for furnishing profitable model for the potential investors.

(Sources: Cholistan Development Authority 2010)

3.4.ii Land

Land plays an important role in the nomadic livelihood of Cholistan Desert by providing the economic reserve in winter season during migration period. Land income provides relief when Cholistan people face environmental crises like water shortage. It is a source of enhanced coping strategies for nomadic people. CDA provided land in 1970, but some land is situated in those areas where irrigation facilities are not available. In the survey result shows that land

ownership increases their income which can build their lifestyle better. A major difference is observed in the income of landed and landless people.

In the winter, young family members go to canal area and take part in the cultivation process and families (rent out and rent in) collaborate in working and also divide the share in ratio of 70 and 30. By agreement rule, livestock of the family, who rent in the land in the canal area, is taken care by the household who rent out the land.

In Cholistan Desert land allocation can be divided in two categories namely irrigated and non-irrigated land. The land is further divide land into cultivated and uncultivated land. If land is situated in non-irrigated area then normally it is uncultivated, only few families cultivate their land by their own efforts and using private system of water for irrigation i.e. turbine, tube well, supply line of water taken from CDA on payment) for which they meet all the expense.

3.4ii.a Land related information

In 1951, as for development initiative, Cholistan was very tough, inaccessible, far-flung, remote, hostile, and unsociable and remained largely ignored. In 1976, Cholistan Development Authority (CDA) was established. The one of the major responsibilities of the CDA is to allocate land to the Cholistani people, not only for people's betterment but for the land fertility because it will expand the land production quality and will be able to produce abundance of crop that will lead to grow agriculture and this will improve livelihood of Cholistani people. One important initiative of Cholistan Development Authority was to allot land to landless people. In this context first scheme was the "Shahi Muzarain Scheme" whereby two squares of land each were allotted to the landless people for cultivation in different parts of Cholistan in 1951-52 (before CDA established).

Land had been allocated in different year under different schemes which were introduced by CDA because CDA is the only organization in the Cholistan which is responsible for land allotment. The land was allotted to the native people of Cholistan through eight schemes at different time period. Detail of allotted scheme is as below in table 3.4:

Table 3.4: Detail of Land Allotment

Sr.	Name of Scheme	No. of Allottees	Area Allotted	PRS Granted	CDS Granted
1	Shahi Muzarian Scheme 1950-51(98+72=170)	170	8500 Acres	-	53
2	Grow More Food Scheme 1959-60	2091	31041 Acres	1072	892
3	20-Years Temporary Cultivation Lease Scheme 1970-71	2,038	25475 Acres	187	41
4	15-Years Temporary Cultivation Lease Scheme 1977-78	11,598	1,44,112 Acres	1029	453
5	5-Years Temporary Cultivation Lease Scheme 2000	4,566	57075/- Acres	319	111
6	Allotment to the persons whose balloting were made in 1983, and allotment order issued in 2005	245	3063 Acres	Nil	Nil
7	Area Reserved for Army Welfare Scheme	133	2390 Acres	Nil	36
8	Agriculture Graduate Scheme 2010	05	100 Acres	Nil	Nil
	Total	20,846	2,71,461	2607	1586

Note: - An area of 2500 acres has been reserved for five Model Co-operative Livestock Farms.

Sources: - Cholistan Development Authority

3.4. ii.b Land Allotment Detail

Usually it was the tradition, and still practiced, that land people are allotted land for specific time period to cultivate the land and to earn some income from it. In the early 1940s the first colonization of the Cholistan desert took place under the Sutlej valley project (CDA 1996) when Cholistan was the part of Bahawalpur State. Under the first official household round of land allocation, about 5,758 (8500) acres land was allotted. .

In the second round 31,041 acres land were allotted to the Cholistan people in the piece of 12.5 acres to each of the allotter. In spite of uncertain condition (i.e. political issues, water problem, rain fall shortage and poor transport system) of the area and system of irrigation, this offer attracted a large number of the Punjabis of the nearby area, because in these two schemes the land allocation was irrespective of ethnicity (CDA, 1996). Primarily native Cholistan people disdained the lifestyle associated with farming and only few applied for the lease deeds; therefore it settled the basis for their future subordinate status in the region ethnic hierarchy.

In 1970, in the third scheme, total 25475 acres land was allocated and each allotter was assigned 12.5 acres parcel. In this scheme only Cholistan native people were allowed to apply. For allotment it was necessary criterion to show evidence of Cholistan identity included records of grazing fee paid to the revenue officer by the herders. It is estimated that about 6500 Cholistan household were qualified. Those who did not qualify were all granted parcels of 12.5 acres regardless of their family size. It was the common activity for the settlers from the existing town like Bahawalpur and Yazman to get land allotted in the Cholistan because they were in power and had resources (Bakhsh, 1993) and it was supported by strong systems of biradari (caste) and was linking them with the Punjabis-dominated bureaucracy. The settlers occupied the high power status in the local hierarchy.

The distribution of land was continuing even after the Bhutto's Land Reforms and the deposing of the Nawabs from their stately position. In 1976, an estimated 22,375 acres of land, formally belonging to the Nawabs family, was distributed (CDA 1996). Under the land reform law, new limitations were created, allowing affluent farmers to accumulate very large holding. Large landlord sometime controlled holdings that were in fact registered in the name of illiterate farm worker, often without letters of acknowledgement.

In the last scheme (2010), substantial additional land was allocated, and an increasing number of Cholistan requested for this land, whose value was clearly raised and generated considerable income for the owners. Under this scheme any landless individual could apply but in response to Cholistan population was given first priority in the new distribution. In 1983, the year that the last plots were distributed, CDA, shifted its development policy from allocating allotments to

providing social services such as roads and water resources. CDA still accepts applications, and herders hope to become holders of land.

3.4. ii.c Ownership Arrangement

Land is given by CDA on lease basis for the duration of different time periods and it is monitored by CDA. CDA has the right to eliminate the lease ownership in of 5 years if respective farmer will not cultivate the land. Usually the mortgage time for the land is 25 years after that the land is permanently transferred / registered to farmer. The total amount they have to pay to become the owner of the land is approximately Rs. 150,000 to 250,000. After paying this amount in the given duration by cultivating the land they become the owner of the land.

There are two type of land cultivation process in the canal area. One is to rent out the land and the other is to rent in the land. Maximum people who take the land on rent in live in the canal area and they cultivate the whole area. The study is focusing on the desert area, so more information is related with desert area people who cultivated the land. Rent-out the land means to give the land on agreement. Usually the contract is for one year. The desert area people give the land on rent to the canal area people. The people who take the land on rent are responsible for everything (input) like irrigation, seed, fertilizers, taxes etc. The owner get the share of the output at the end of the harvesting in the form of cash Rs. (20000-25000) depend on the income of the land or crop of the area.

Sometimes families from desert area also take the land on rent from the Cholistan owner but then in this case only male members will migrate to the canal area to cultivate the land.

3.4. ii.d Seasons of Cultivation

In Cholistan the two main cultivation seasons are Rabi and Kharif. The most cultivated crops are cotton and wheat. The production range from 20 to 150 mounds . The crops are sold in to the market at the rate available in the market. But some time it happened that some people sale the crop at low rate because they don't have the proper knowledge about the market. Some amount of the production is taken for household personal consumption. This amount differs from household to household depending on the size of family. On average there are max 12 and min 6 persons per family therefore the total amount they kept for their consumption ranges from 15-25

mounds(per year). They store the wheat in the desert and used it in summer season. They sell the entire cotton crop (have no consumption in a house unit annually) and the money obtained is used on normal day to day expenses.

3.4. ii.e Land Input Cost

The other input costs fertilizers and agricultural tools. The expense to access the market is also there to bear for them. Annually they pay the amount of Rs. 1200 per year in terms of taxes on irrigating system use for cultivation. They also use pesticides for their crops. In spite of all expenses, land has its own benefits for them. One of the major advantages of the land is to improves their socio economic conditions. It enhances the total income of the household about from Rs. 20,000 to 40,000 but in most cases it ranges from Rs.15000 to Rs.22000. About 30 % of the household income is shared by the land and it might be the 2nd biggest share after the livestock. Usually the income of canal area land, where irrigation system is better higher than those area land, where there is lack of irrigation water, farmer use tube wells or turbines.

3.4. ii.f Landless People Livelihood

The people who don't have land, their main source of income is livestock and Khar⁴ cultivation. The land less people migrate to the city area and usually do labor work. But they don't move permanently and come back in summer season.

3.4. ii.g Irrigation System in Canal Area

For farming, landed household have the irrigation system developed by the CDA called canal system. There are six major canals in Bahawalpur Division: Eastern Sadiqia Canal, Qaim Canal, Upper Bahawal Canal, Mailsi Canal, Punjnad Canal and Abbasia Canal.

The canal which mainly irrigated the Cholistan is Eastern Sadiq Canal and table below shows the details.

⁴ Khar a shrub, cultivated in December to April and create "Sajji".

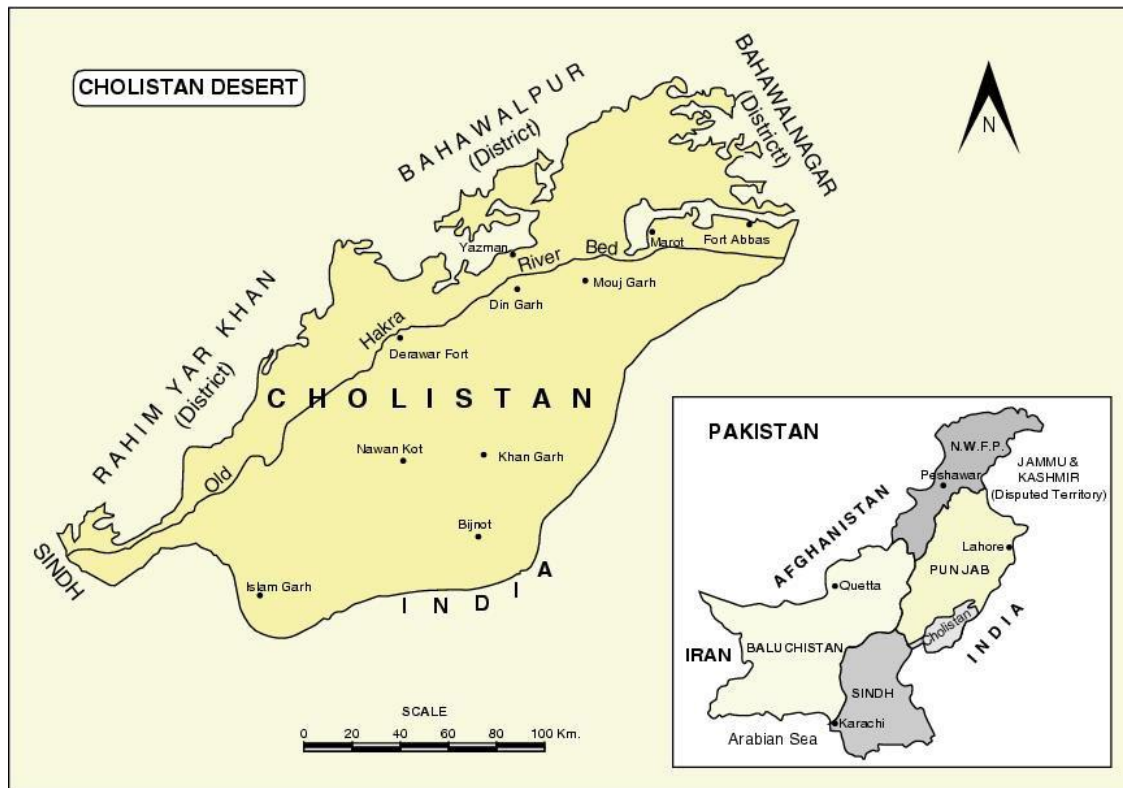
Table 3.5: Drainage Network of Eastern Sadiqia Canal (Bahawalpur Division)

Sutlej Left Bank (Fordwah Drainage Basin)						
Canal Command	Sub-Drainage Basin	Name of Drain	Outfall	Length (km)	C. Area (000 ac.)	Q. Des (cfs)
Eastern Sadiq Canal	Chistian	Chistian Drainage	Sutlej (L)	87.5	N.A	532

Sources: Irrigation & Power Department Punjab

In some places if allotter don't have irrigation facility and water crisis. In those areas they utilize their self-helped system like tube wells and in some area there are the turbine systems for their own farming system in the area. And in March 2010 the Chief Minister Muhammad Shahbaz Sharif announced waiving off the amount of markup on the extension of lease period of land. Also he demands from Cholistani farmers to cultivate their land with hard work for increasing the produce.

Map 3.1: Map of Cholistan



Cholistan Development Authority (1998)

3.4. Iii Khar Production in Cholistan Desert

Other minor sources vary across the area. Selling of herb called Khar which is a shrub, naturally cultivated in the area of Cholistan desert. Cholistani people make sajji from Khar plants. People burn it and making Sajji out of it, which is used for soap making. The cutter and maker of “sajji” popularly known as Kharroof, gets one forth shares while the remaining is collected by government (CDA) through the contractors. CDA started tendering for the Khar production at the rate of 300 per mound since last three years and people earn Rs. 4000 to 8000. Currently it is a slight but somehow effective mean of livelihood.

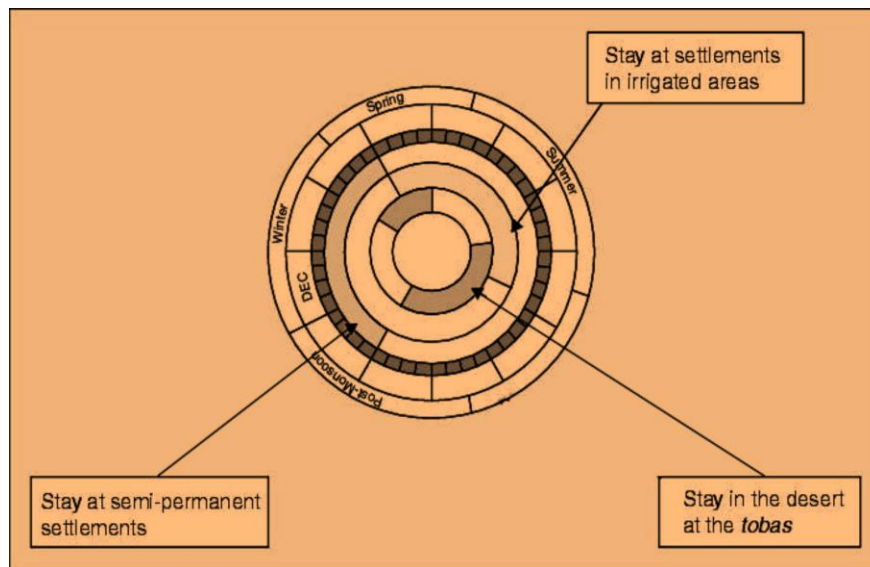
3.4. IV Handicrafts

Small scale homemade craft is another source of livelihood which is mostly done by the women in Cholistan mostly in the form of embroidery but the earning they got from it are very low. Buyers auction the artistic culture work expensively but buy from native people at extremely low-price rate.

3.5 Migration and Livelihood

The people of Cholistan are affected by the environmental hazards and it plays vital role in the economic status of the predigest nomads of the Cholistan desert. The production of the crop which is cultivated in the canal area is positively affecting the livelihood of the Cholistani people. There difference in resources of the landless and land holder people of the area. Their main source of livelihood is livestock and it affects their income with the changes in the environmental factors like rain. Income mainly changes with changes in environment of the Cholistan desert. They have less income and high consumption which accord negative saving in individual lifestyle.

Figure 3.1: Yearly movement pattern of pastoralists in Cholistan



Source: Akhter & Arshad (2006)

Table3.6: Movement schedule and activities of herders between Lesser and Greater Cholistan

July – August	Migration from irrigated areas of Lesser Cholistan, canal and riverbanks to the owned <i>Tobas</i> . Livestock generally grazes on the vegetation around <i>Tobas</i> .
September – October	Depending upon the size of <i>Tobas</i> and water available, generally, movement to temporary encampments at <i>Tobas/kunds</i> started. Livestock grazes distance from <i>Tobas/ kunds</i> increases.
November –December	Movement to <i>Tobas/kunds</i> in search of water and vegetation continues. Livestock grazes relatively at very distant places around <i>Tobas/kunds</i> .
January – February	Movement to <i>Tobas/kunds</i> in search of water & vegetation continue with slow retreat to Lesser Cholistan. Livestock grazes relatively at very distant places around <i>Tobas/ kunds</i> .
March – April	Return to irrigated fringes of Lesser Cholistan increases as wheat harvesting period arrives closer. Livestock grazes relatively at very distant places around <i>Tobas/kunds</i> .
May – June	Stay in villages/settlements and temporary congregation on wastelands. Livestock is fed by grazing and stall feeding of purchased or self-planted fodder.

Source: Farooq at al 2009

CHAPTER 4: PPROFILE OF STUDY AREA DISTICT BAHAWALPUR

4.1 History and Geography of Bahawalpur

The division “Bahawalpur” is named on “Amir Muhammad Bahawal Khan Abbasi”, the eldest son of Amir Muhammad Sadiq who was the founder of the city in 1162 A.H. (1748 A.D). It covers 45,911 km². Bahawalpur is the head quarter town of Bahawalpur district and Bahawalpur division. The town is spread within an area of ten square miles. Bahawalpur used to be a desert in the past, currently large part is under cultivation by canal irrigation system. Table below provide the division detail.

Table 4.1 Bahawalpur division detail

Districts	Name of Tehsil	Area	No of Unions
Bahawalpur	Ahmedpur Sharqia	888	31
Rahimyar Khan	Bahawalpur	22788	36
Bahawalnagar	Hasilpur	1372	14
	Khairpur Tamewali	2372	8
	Yazman	18,491	18
	Total	64,402	107

(Sources: 1998 District Census Report of Bahawalpur)

The territory of Bahawalpur district lies between the latitude of 27° - 48' to 29° - 50' north and between the longitude of 70° - 54' to 72° - 50' east. The district forms one of the southern parts of the province of Punjab and is situated almost in the center of the country at the eastern border at an elevation of 152 meters from the sea level. The general slope of district towards the sea is gentle, with an average gradient of 0.19 meter a kilometer and breath from east to west is 139 kilometer. The district Bahawalpur is surrounded by Multan and river Sutlej in the north, Bahawalnagar district in east, Bikaner Indian in south and Rahimyar khan and Muzaffargarh district in the west.

Total population is 2,433,091 computed in March 1998. The major occupation is agriculture. This includes cattle breeders and grazers as well. Others occupations are teaching, medical, banking, government service, fishery workers, shop workers, market sales workers and industry worker etc. The climate of Bahawalpur is suitable to grow fruits and plants like, mango, dates etc.

TABLE 4.2: Population percentage by religion in Bahawalpur Division

Religion	All Areas	Rural	Urban
Muslim	98.1	98.1	98.0
Christian	0.6	0.3	1.4
Hindu (Jati)	0.9	1.1	0.3

(Sources: 1998 District Census Report of Bahawalpur)

Siraiki is the predominant language being spoken in the district. Other language followed by Siraiki, are Urdu, Punjabi, Pushto, Sindhi, Balochi, and Dari etc. The proportion of people speaking Urdu, Punjabi, and other language except Siraiki are more in urban area than in rural area .Table below shows population in percentage by mother tongue being spoken in rural and urban area:

TABLE 4.3 Language percentage in Bahawalpur Division

Area	Urdu	Punjabi	Sindhi	Pushto	Balochi	Siraiki	Others
All Area	5.5	28.4	0.1	0.6	0.1	64.3	1.1
Rural	1.3	27.1	0.1	0.3	0.1	70.0	1.2
Urban	16.6	31.9	0.2	1.3	0.1	49.4	0.6

(Sources: 1998 District Census Report of Bahawalpur)

4.2 Topography

For agriculture, economic and other aspects the division can be divided in to three zones, each having different characteristic. First the riverine or Mahal area is inhabited by old settlers, second the plains / colony area is inhabited by immigrants (aabadkars) and third the desert area named Cholistan is inhabited by the nomads. The riverine area is closed to the Sutlej River which flows in the north along its boundary with Lodhran and Vehari districts, swamped in floods (1992). Plain area is mostly covered with irrigated track and the land is under cultivation. The desert area known as Cholistan contains sand banks sequence rising in some places to 150 meters height covered with the vegetation peculiar on sandy tracks.

4.3 Fauna and Flora

In the Bahawalpur division wolfs are found in the Cholistan. Lizards are numerous and are of various species. Bahawalpur Zoo contains variety of animal species, including lions, Bengal tigers, hyenas, leopards, and peacocks etc. The zoo has a collection of 130 animals and 700 birds from tropical regions, particularly those found in the Cholistan Desert. Lal Suhanra National

Park is located 35 kilometers east of the city, great number of animals including lions and rhinoceros, deer, black buck (Kala Hiran), blue bull (Neelgai). In Cholistan a very peculiar type of snake called “SahPina” is also found. Alligators and frogs are also in a large numbers in Cholistan desert. Important flora in Cholistan Desert is Jand, Kikar, Ber, Phog, Lana, Khar, Khavi, Khip, Seewan and fauna is Jackal, Fox, Rabbit, Tilor, Falcon, Wolf, and Deer & Blue Bull.

4.4 Irrigation Facility System

The River Sutlej is the longest of the five rivers that flows through the historic crossroad region of Punjab in northern India and Pakistan. At the three miles of the northern side, river Sutlej flows from the city Bahawalpur. Currently river bed is totally dry. Only in monsoon season, when India release water, the river has some quantity of water. Canals and tube-wells are the major source of irrigation in the division. Popular canals are Bahawal Canal, Qaim Canal and Abbasia Canal. Tube wells are operated by two sources i.e, electricity provided by government and diesel that is arranged privately.

4.5 Health and Educational Facilities

Bahawal Victoria Hospital is the Government hospital in the division. Other hospitals include Police Hospital, CMH, Mission Hospital and other district and Tehsil hospitals. Education facilities are available in urban area of division. Bahawalpur division has one university, The Islamia University Bahawalpur (IUB), along with the Quaid-i-Azam Medical Collage. Famous school system, Saddiq Public School (locates in Bahawalpur City). Literacy rate in division is 35% with 26% in rural and 57% in urban areas (Sources: 1998 District Census Report of Bahawalpur). Male literacy rate is 44% while it's is 24% for female populaion (Sources: 1998 District Census Report of Bahawalpur). Higher education rate in division is low i.e. 1.4% (1998 District Census Report of Bahawalpur). Literacy percentage in Primary, Middle & High grade is 5% 2% & 1% respectively in Cholistan desert area. Primary and some middle school are established but they are not working properly due to non-availability of teacher. Cholistani people are not very lucky in receiving even ordinary medical treatment and public health fatality. There are some dispensaries' but not in working condition.

4.6 Industries/Arts and craft

The most valuable raw material for industrial products in Cholistan is wool. In Cholistan people make shawls from camel and goat's hair. Cottage industries include darries, khussas, embroidery, and silver jewelry, pottery work (Ahmedpur is famous for fine pottery work), Printing, brass utensils and hand block printing.

4.7 Climate and Temperature

Climate of Bahawalpur is extremely hot and dry in summer. Usually summer duration is from April to October. In summer season dust storms are frequent. Winter is cold and dry and it spreads from December to February. In Bahawalpur May, June July are the hottest months, November, February and March are the pleasant months of spring or autumn season while December and January are the coldest months. In Cholistan Desert the climatic conditions are highly unfavorable to human and animal living. The entire region is a dry and thirsty desert region, with an average temperature of 52° C in summer. During summer season extremely hot winds blow, but fall down to 6C in winter season.

In Bahawalpur the average rain fall is 10 to 25 cm because Bahawalpur is situated at the tail of the monsoon region therefore sky usually remains cloudy but without abundant rain. Annual rainfall is from 125 to 200 mm which occurs usually in July and August in the monsoon months. Winter rains are expected in the month of January and sometime in February. In Cholistan Desert the average annual rainfall lies between 3 to 5 inches, which allows desert grazing for 4 to 8 months from July to February. The nights are pleasant and the environment becomes lush green after rainfall. The table shows below maximum and minimum mean temperature during the various month of summer and winter season

TABLE 4.4: Temperature during summer and winter season

Seasons	Max mean	Min mean	Average
Summer season (June, July and Aug)	50	28	33 °C (91°F)
Winter Season (Dec to mid-Feb)	22	6	18 °C (64 °F)

(Sources: 1998 District Census Report of Bahawalpur)

4.8 Rainfall

Rainfall in the Cholistan Desert is very stumpy, inconsistent and unpredictable. Annual rainfall is about 150-250 mm. Mostly the rainfall come udder the threshed category which does not create runoff, heavy rain is received during summer months from July to September in monsoon season. Below table shows the rainfall record of the last 13 years in Cholistan Desert.

Table 4.5: Rainfall data recorded at Deengarh in the Cholistan Desert

Months	1997 Mm	1998 mm	1999 Mm	2000 Mm	2001 Mm	2002 Mm	2003 Mm	2004 Mm	2005 Mm	2006 Mm	2007 mm	2008 mm	2009 Mm	2010 mm
January	-	-	5.4	-	-	-	-	4.0	-	-	14.0	-	6.0	10
February	-	4.0	6.4	5.4	-	-	50.0	-	56.6	-	25.0	-	-	-
March	25.0	-	-	-	-	-	3.0	-	15.0	26.0	6.0	27.0	2.0	-
April	14.0	10.0	-	-	5.4	-	-	-	10.0	-	-	-	-	-
May	12.0	-	-	-	26.5	-	1.4	-	6.0	-	-	-	42.0	2.0
June	30.0	18.0	9.0	-	4.0	2.0	11.0	23.2	2.0	28.0	63.0	28.0	22.0	7.0
July	58.0	55.0	4.0	71.0	82.5	-	56.0	5.8	36	20.0	19.0	20.0	44.0	180
August	-	20.0	-	50.0	28.5	-	108.0	50.0	-	70.0	13.0	70.0	38.0	236
September	16.0	65.0	-	-	2.4	-	-	-	13.5	-	42.0	-	32.0	-
October	46.0	-	-	-	-	-	-	2.0	-	-	-	-	-	-
November	-	-	-	-	-	-	-	-	-	-	-	-	-	-
December	-	-	-	-	-	-	-	13.8	-	13.0	-	13.0	-	5.0
Total Rainfall (mm)	201	172	25	124	146	2	230	99	133	157	183	297	186	435

Source: Pakistan Council for Research in Water Resources

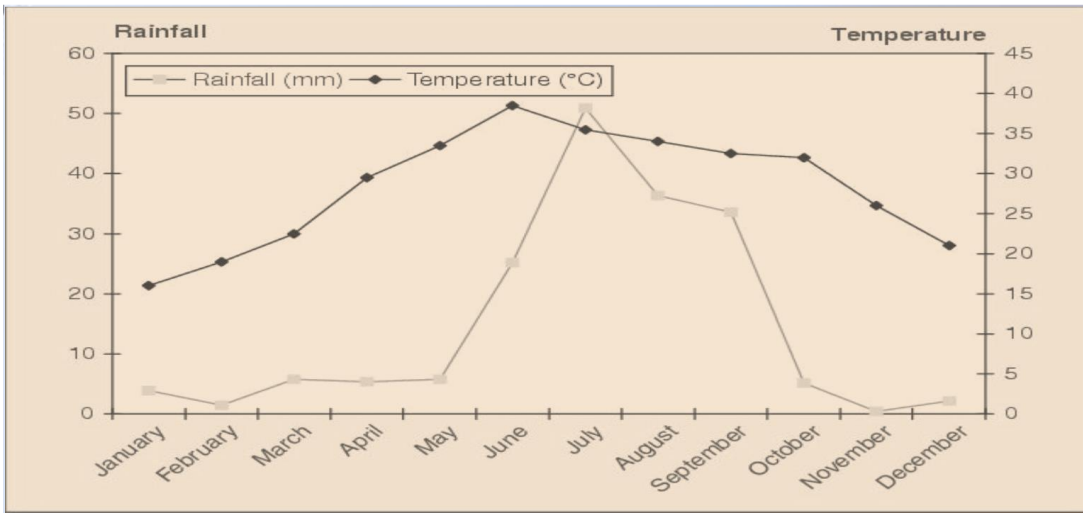
Table shows zero rainfall in November and April in winter seasons. In winter season nomads live in canal area in semi-permanent settlements and earn their income by cultivating the lands of their own or others. In winter season the nomads try to earn income from both sources i.e. from land cultivation and from livestock production.

4.9 Climatic Details

Cholistan is one of the hottest and driest areas in Pakistan. In summer mean temperature is 36°C and in winter 18°C, while average temperature of the area is about 28°C. Maximum temperature goes up to 53°C and minimum temperature falls down to 6°C. Sometimes maximum temperature during the year exceeds 58°C and minimum temperatures fall down to 1°C. In summer

temperature being rises rapidly from April onward and reaches its peak in late May or June. The mean relative humidity falls below 34% due to high temperature. Daily maximum temperature exceeds 45°C - 52°C in hottest month of June. In July and August daily temperature comes down due to rainfall in monsoon season. In desert area night temperature is abrupt. In summer days are hot and nights are cool.

Figure 4.1: Climate diagram of Deengarh station (PCRWR) in Cholistan



Source: Akhter & Arshad (2006: 2011)

Table 4.6: Climatic Data Recorded at Deengarh in the Cholistan Desert

Months	Monthly Average				
	Maximum Temperature	Minimum Temperature	Mean Temperature	Wind Speed(KPH)	Rainfall (mm)
January	25	7	16	9.5	3.86
February	29	9	19	14	1.45
March	31	14	22.5	16.5	5.73
April	38	21	29.5	15	5.37
May	39	28	33.5	18	5.77
June	46	31	38.5	19	25.2
July	41	30	35.5	20	50.9
August	40	28	34	17	36.34
September	38	27	32.5	12	33.57
October	37	27	32	13.5	5.11
November	34	18	26	10	0.4
December	29	13	21	14.5	2.17

Source: Pakistan Council for Research in Water Resources

In Cholistan desert (1) winds blow from the south during the summer months (May – October) - include SE and SW and (2) Winds blow from the north during winter months (November- April) -include NE and ENE. Usually summer winds are stronger than the winter winds. The data on above table shows the wind speed recorded in Deengarh village showed that winds in Cholistan blow throughout the year but in May- August winds blow in the form of storms in desert.

4.10 Cholistan

To get better and in-depth understanding of the area below table 4.7 shows brief and comprehensive facts about Cholistan Desert providing the complete view of the total area, region base total area, and the total population of the Cholistan desert and area related which include three different districts.

Table 4.7: Detail of Cholistan Desert

Total area of Cholistan	66,55,360 Acres
Area of Greater Cholistan	46,58,760 Acres
Area of Lesser Cholistan	19, 96, 600 Acres.
Total Length	450 Kilometers
Width	30 to 200 Kilometers
Temperature	Upto 52 Degree
District Wise Area (In Acres) a). Bahawalpur b). Rahim Yar Khan c). Bahawalnagar	40,28,160 16,16,000 10,11,200
Human Population	2.5 Million

Sources: - Cholistan Development Authority

The desert area, of Bahawalpur division is called Cholistan or Rohi. It is part of vast Indus Plains with no hills and mountains but in south it has sandbanks called the “Cholistan Desert”. In local dialect word “Cholistan ” means place with no water and grass. This desert area lies south of the irrigated tract and north of desert of Bikaner and Jaisalmir in India which reaches the Indian border, from east to west covering almost two-thirds of the district (16,000 km²). Cholistan desert spreads up to the Thar Desert of India. Cholistan is extended over 6655360 acres in the districts of Rahim Yar Khan, Bahawal Nagar and Bahawalpur. The large part of this desert is in Bahawalpur district.

Cholistan is divided in two major parts lesser Cholistan and greater Cholistan. It comprises lesser Cholistan within area of 8081 Sq. km and Greater Cholistan within the area of 18852 Sq.km. Lesser Cholistan is situated with irrigated area locally call canal area, while in further south lies greater Cholistan. Cholistan on the south is habitable and forts of Derawer, Din Garh, MaujGarh, and Marot were situated on the bank of the dried-up river called Saraswati, Hakra or Chaghra. The Population Density of Cholistan is 15 persons per square kilometers. Population includes

large number of nomads spread over the entire area in small communities. The 2.5 million people who live here lead a simple life herding and trading in camels.

During the wet season, the nomads built shallow reservoirs to catch rainwater to survive long spells away from their villages. Their culture is strong with many romantic legends and they have great value in the folk music. The desert festivals are simply out of this world, you may see camels dancing (except those with two left humps) who are even better dressed in dazzling costumes than their owners. The population is mostly Muslim. They are simple kind and generous. They are conservative and far from modernization. They are divided in main tribes and sub tribes in the Cholistan region which now spread in whole area. Main tribes of the region are Rajput and Jat. The sub tribes are Joiyas, Watus, Altanis, Bohars, Samejas and Bhacus. Baloach, Pawar, Bhati, Lark, Bhen, Dehr, Joiyas, Mehra, Khakars are inhabitant.

4.11 Study Site: Cholistan Desert (Bahawalpur Division, Punjab)

For this research work the regions selected as study areas are Kala Pahar, Kheer Sir, Moujgarh and Jasser Toba. These areas are adjacent to Yazman and are selected because:

- They are less developed areas among the three districts Bahawalpur, Rahimyar Khan and Bahawalnagar.
- Government is paying considerable attention to these areas.
- Households practice the migration in the area.
- Land allotted households are in these areas available.

Government is providing the proprietorship of land to the local residents of this area, farms are being built for livestock by CDA and PCRWR is providing water facility for the betterment of the native people of the area. Government also promoted the local shrubs like Khar; native people sell it which may increase their income. Study areas are discussed in details as follows:

4.11. I Kala Pahar

Kala phar, surrounded by desert, is a village under UC 75 Desert Branch (DB) of Yazman Tehsil, Bahawalpur division. It is. Total population of Kala phar is around 300 and total numbers of households (HH) are 50. Total 18 household (HH) were selected randomly to collect

the data for study. The main casts of the village are Balouch and Dahay. Dahay is the rich cast and usually have large number of animals while Balouch is the poor cast and their source of income is only livestock and they are not interested to do any type of work even that they are not agreed to sell the product produces by the livestock like milk, butter, and cheese. The myth in it is that if they sell the white product it will affect their production and their animals will produce less. But they sell meat, wool and others. They also sell their animals on Eid.

The basic reason to select this area for study is because this area is rich in livestock especially camel; the only water source for living is the natural “Toba”. The area is connected with the other parts of region by a metal road and has greater literacy rate as compare to other cholistani population. In this area the income of people is also high. The population contains of more male members. If government provides them support and god opportunities they could play a better part in economy and it will also help to resolves their problems to some extent. There is a forest in the near side and it used for grazing of the livestock especially camel. Therefore it is the major reason that this village has more livestock. In the sheds owned by the people the number of camel are greater or more here because of that forest where they grazed free whole day. In livestock they have camels, cows, and goats but very few families have sheep also. Camels are also used for transportation.

Though there are many Tobas in Kala Pahar but only two or three are in working condition and are in the use of people. People use the water of these Toba for drinking and other household works. In this area the people have separate Toba for their livestock but as it is very far for the residential area so sometimes smaller animals like goats also drink water from the human’s Toba. Clean drinking water is a very big issue for the people here. The Toba’s water they used for drinking is not clean and is unhygienic. It is contaminated and full of mud. The colour of drinking water is brown which people use for drinking, cooking, washing and other house hold chores.

There are not such social facilities available in the village. There is only one primary school for both boys and girls. As this village has a metal road and school is situated near the road therefore teacher is available in this school. Mostly man has got primary education. A boy in village is doing his graduation from the Yazman. One man has completed his intermediate, four or five

men have completed their matriculation. Some boys are in the intermediate and are living in hostels. The people of this village want to get more education. Even younger girls are also going in the schools. In the discussion they shared that they want to get benefits from the education so that they can get jobs in the cities. They run the school by their own. Some educating people are working in nearby cities as well like Yazman, Bahawalpur, Multan etc.

There is no health facility in this village. They have to go to nearby cities for treatment. For animal there is no health facility available. From the past few years government started a mobile health care veterinary service for animals once in a year.

The major source of income for their livelihood is the livestock, especially in Balouch cast the livestock is the symbol of their richness. Usually females do the household and livestock work. Men are not interested to do work but new generation is changing this concept. Marriage rate is very low in this village because they told that they are too poor that they could not afford. Cast system is also very strong in this village. Usually man from rich cast (Dahay) does not work. The one most important thing is that government has provided them the solar energy systems. About 15-20 houses bought this system.

4.11. Ii Kheer Sir

This village comes under UC of Chanan Peer. Its Tehsil is Yazman and District and division is Bahawalpur. Total population of this village is approximate 200 and total numbers of households (HH) are 40. This is the one of the inner villages of the Cholistan deserts and there is no proper road in this village. The metal road is passing from far away from this village. There is no public and social facility available in this village.

Life style of most of the people of this village is like nomads. They have to migrate in the winter season but some do not migrate. Usually people who do not have agricultural lands they migrated to the other near places in search of water and income. And usually men of the family migrate and there remaining member stay in the village. The people who have agricultural lands do stay in the village and try to cultivate the land if the facility of water is available. To irrigate the land "CDA" also provide the water facility and people also use some other natural and personal resources (like turbine and tube well) for cultivation.

The main source of household livelihood is livestock in desert area and in canal area but for some HH whose family member migrate towards city or canal area, they do the labor work too for earning more income. Another reason of migration and work in other areas is that their sheds are very small. The number of livestock in this village is less. The drought of 1990 had an intensive effect on the lives of native people especially on their livestock. In their sheds they have usually cow, sheep and goat are very common. Very few families have camels. The main sources of income in this village are livestock, labor in canal areas, agriculture. Another source is selling of local herbs like khar.

Water scarcity is one of the major issues of this village. There is very less rain fall in this village especially in the drought duration. Therefore local people dug Tobas to safe water. Currently with the collaborated efforts of the local people the village has 2 or 3 common hand pumps. Total cost for a hand pump is Rs.13000/-. Now when the drought season is over and average rain fall is better here but still they don't have any system to reserve that rain water. The Tobas are open and with the hot sun water evaporates. But now, because of hand pumps, this problem is resolved but still the problem of drinking water for animals prevails. The hand pump water is used only for humans. For animals only natural Toba system is used for drinking. Government provided the turbine in the drought season but either they are not in working condition or local people cannot afford the expense to use that facility. They used it by self-help in some major functions. There is one primary school for boys only mostly closed as teach does not turn regularly. No health facility is available for the Cholistani people in this village. Same holds true for veterinary services. .

4.11.iii Moujgrah

This village is a UC of Chanan peer of Bahawalpur district. Total population of this village is 983 and total number of household is 123. The sample of households selected for the study is 60. The average HH size in this village is 6. The village is a wide spread and has two different sides. One is called upper side and it is near to the fort and the other is called lower side which is near to the Toba. The study sample is taken from both the sides as per population ratio.

In this village many of the people have agricultural land and they have the possession rights of that land as well. Therefore in winter they migrate from the desert to the canal side to cultivate their land. In canal area they also do some other labor works to earn the income. Another important factor is that they also give their land on lease to the other people. In this case they charge an amount. The reasons behind this are: firstly they can't stay permanently to the canal area as they come back to the desert after 6 months, secondly most of the people don't like to work hard and mostly like to spend their time in leisure. Another reason to migrate to the canal side is their livestock. Because of the water scarcity they move with their animals. After about 6 months in rainy season they come back to the desert with their animals. They shared that because the desert herbs and environment is good for the health of their livestock. In this village some families also give their animals to other poor families for grazing.

One of the main sources of their livelihood is livestock and the kind of livestock they have cow, goat and sheep. In some families there are 3 to 4 camels too. Other source are cultivation of land (most of the families give their land on rent) and could get a maximum income of Rs 30,000 and selling of shrubs like khar commonly found in the deserts. Usually CDA persons go to the local people in desert and the "khar" is sold on the average cost of Rs 300/Mound). They also sell their livestock products and earn maximum Rs 6000 (six month).

Villagers obtain water for their daily use from the water source called Toba. Tobas are constructed by PCRWR. Local people use this water for drinking, cooking and other house hold chores. Some common hand pumps are also available. Livestock drinks from Tobas. The water in "Tobas" is available for the whole.

Though in this village there is a school facility. But only building is there. Teacher is not available in that school. Because this village is too far from the city and nobody is interested to come. No proper roads are constructed in this area. People shared that they are interested to get education as because of illiteracy they cannot fight for their rights. Further, having got education, they may get jobs in the other fields of life. Some of their children are studying in Yazman. There is no health facility available in the area for humans and livestock. No other social and public facility is available in the village like roads, school, hospital and market. Mostly man member of the family migrate to the canal area and the rest of the family stays in the

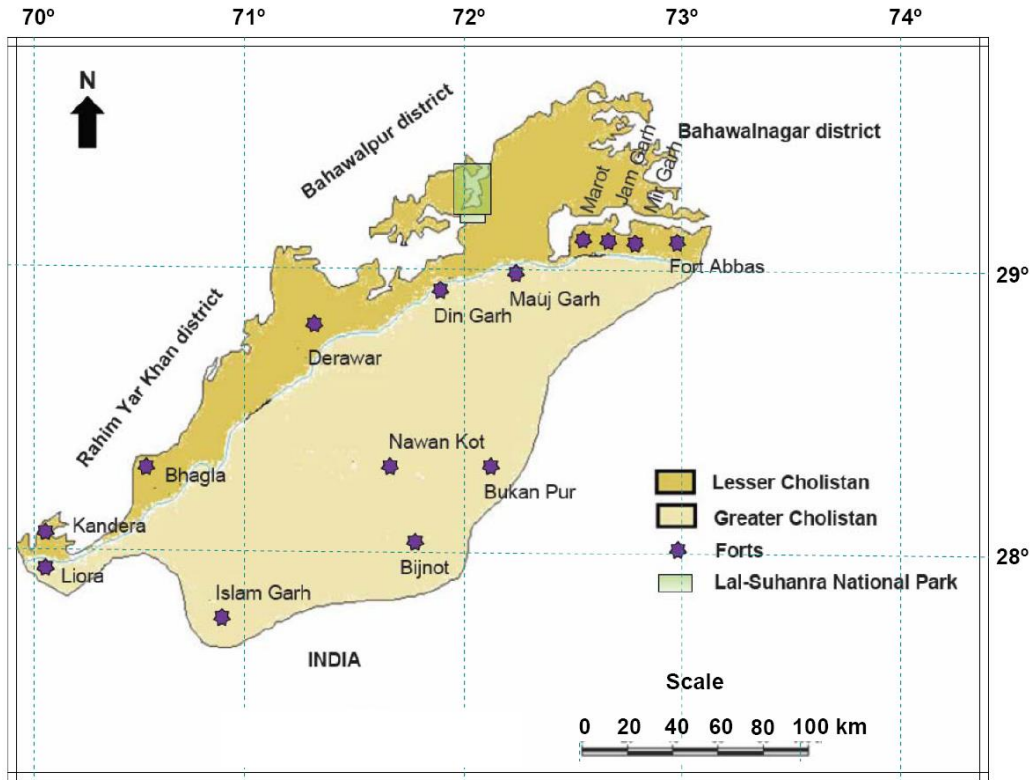
desert. The young family member average range is from 15-45 years who migrate to canal. For transportation the people usually use motor bikes and some families use camels as well. In this village the mobile network is also available.

4.11. IV Jasser

It is a UC of Chanan peer situated in tehsil Yazman of Bahawalpur district. Total population of this village is 287 and total number of household is 30. The number of selected sample for study from this village is 18 household. This is the most affected area in the drought of 1990. The drought has diverse and intense effects on this area. In this village all families migrate to the canal side in winter and come back in summer rainy season. The major reason for this is that there is no sign of water in this area in some months of the year. There is no Toba in this village. The only source of water is hand pump. The village has only one hand pump, installed by a lady who once visited the village, for the use of whole community. All human and animals drink water from that hand pump.

The only animal they have in their sheds is sheep. They don't have the ownership of the livestock. Mostly they are shepherd. The head of livestock give them monthly amount for their duty and it depends on the number of animals they grazed. They look after the animals day and night. The owner charged them in case of any misfortune with the animal like death or sickness. Grazing is the main source of their livelihood. Some people do labor work in other areas. There is a school building in this village. But it is broken and out of order. Children use this building as a playground. There is a dispensary here. But it is closed and no doctor is there. There is no proper road facility. Out of study areas, this area has highest shortage of water and remains the poorest area having very low income range. Their maximum income is Rs 4000/ (per month-. The average family size in this village is six.

Map 4.1: Map of the Cholistan desert



Source: Google Map

CHAPTER 5: QUALITATIVE ANALYSIS OF DATA

5.1 Selection Criteria for Study Area

Following four villages were selected for the survey, Kala Phar, Kheer Sir, Moujgarh, Jasser. Cholistan divided in to two parts as, Lesser Cholistan and Greater Cholistan. Greater Cholistan is studied because study focuses on two decisive factors namely seasonal migration and sources of livelihood of Cholistani nomads lived in desert area (i.e. livestock, khar, land for cultivation and laboring) which enhances annual income of households unit and improves their livelihood. The second area is where no migration takes place. In the context, taking villages in first criteria household migrated in three villages namely Jasser, Moujgarh and Kheer Sir. Finally for comparison (or control group) we take Kala phar. The households in Kala Phar do not migrate because these households do not have land as sources of livelihood in the canal area. They face shortage of water in desert. Their livelihood depends on livestock which is the sources of income.

5.2 Sampling Frame

We use stratified random sampling to make subgroup within the population. Total population (N) is equal to 1899 comprising 279 households in selected four villages. Sample is selected by random sampling. For that codes are assigned to the total households. By using excel sheet a sample command is drawn without replacement. The study collects information that is based on households, identified by geographical division of Cholistan Desert. Sampling frame consists of following Villages:

Table 5.1: Study Area Names and Their Distance from Bahawalpur

Sr #	Name of Villages	Distance of villages from Bahawalpur	Union Councils of Villages in Cholistan Desert	Tehsil/ District
1.	Kala Pahar	60 Km	75DB (Desert Branch)	Fortaabas/Bahawalpur
2.	Kheer sir	70km	Channa Pir	Yazman/Bahawalpur
3.	Moujgarh	3 75 km	Channa Pir	Yazman/Bahawalpur
4.	Jasser	80 Km	Channa Pir	Yazman/Bahawalpur

Sources: Election Commissions of Bahawalpur Division

As mentioned earlier in Cholistan total four villages were taken as study area. We have randomly selected 18, 14, 60 and 18 household subjects from Kala Pahar, Kheer Sir, Moujgarh fort and Jasser respectively. The details are reported in table 5.2 below.

Table 5.2: Describe the Detail of Sample from Population of Four Villages

Stratum	Kala Pahar	Kheer sir	Moujgarh Fort	Jasser	Total
Household Number	53	22	163	41	279
Population Size	322	245	987	345	1899
Final Sample Size	18	13	60	18	109

Sources: Election Commissions and Local Health Government of Bahawalpur Division

As nomads of Cholistan Desert are engaged predominantly cattle raising so, in search of fodder and water, they keep on moving from “Toba’ to “Toba’ in the desert and canal (irrigated) area. This makes it difficult to take information about their total population in the area and number of household in the Cholistan desert. The respected population of Cholistan is very low and scattered. There is no infrastructure as such, e.g. rainwater reservoir for harvesting, ground water storage, mettle roads, health centers, veterinary hospital, school or other common facility.

5.3 Sample Selection

During summer season the nomads of the desert area come back from the canal areas where they cultivate land along with the periphery of the desert area. Therefore, the survey was conducted at these settlements/villages of inner desert where nomads were coming back. The data is collected on various variables related to socio economic and environmental indicators. One hundred and nine households were selected. The households who own land migrate to their land in canal area in winter and to their other sources of livelihood in summer, i.e. into desert area due to rainy period.

5.4 Sources of Data

Primary data on socio economic factors of household and environmental condition of nomad’s pastorals of Cholistan desert was collected by interviews through structured questionnaires.

Survey schedule was a set of questions in a questionnaire (shown in Appendix) which was filled by the enumerator. This survey has been conducted in those areas of Cholistan desert where people adopted nomadic pattern and migrating from desert area to canal areas for securing not only their lives but also their livestock. Secondary data on rain and environmental condition is collected from Pakistan Council for Research in Water Resources, District Census reports (various years) and Cholistan Development Authority. Three major constraints in conducting this survey were time, resources and accessibility to the place.

5.5 Questionnaire

The questionnaire is largely concerned with qualitative and quantitative parameters of socio economic and environmental factors. The household survey was conducted in the month of May to August 2011 in the sample area.

5.6 Descriptive Assessment and Result

Numbers of stratum for four villages are shown in table 5.3 below.

Table5.3: Sample Stratum taken from sample Villages

Villages	Number of Household	Percent Ratio in Stratum
Kala Phar	18	1/2
Kheer Sir	13	1/2
Moujgarh	60	1/2
Jasser	18	1/2

Sources: Primary Survey in Four Villages of Cholistan Desert Bahawalpur Division

Table 5.4: Gender ratio of head of household and responder

Respondents as HH head (Num. in HH)	Respondents Gender (Num. in HH)	Gender Percentage in Sample	Marital Status (Num. in HH)
Male (89)	Male (94)	51	UN Married (08)
Female (20)	Female (15)	49	Married (101)
Total (109)	Total (109)	100%	Total (109)

Sources: Primary Survey in Four Villages of Cholistan Desert Bahawalpur Division

Table 5.4 shows that ratio of male – female as head of household indicating that 82% HH are male-headed against 18% headed by females in study area. There are only 20 households whose head are females it is about the 17% of total percentage of sample data. Interestingly in desert area, like in others areas the livestock herding is females activity.

Table 5.5: Household General Information

Caste (Num. of HH)	Respondents Age (Num. of HH)	Respondents Education (Num. of HH)
Jam, Balouch, Buoher (63)	15-45 (27)	Read & write (1)
Dehay,Pawar (33)	46-65 (43)	Illiterate (93)
Bhatti (13)	66-85 (34)	Primary (8)
	86 - > (5)	Middle (5)
		Matriculation (2)

Sources: Primary Survey in Four Villages of Cholistan Desert Bahawalpur Division

Table 5.5 shows general information related to households demography information such as caste of respondents, age in the sample population by arranging them in groups , 27% lies in 15-45,5% lies between 86 - >. Working respondent’s ages are ranges between 20 - 48 mostly and in some cases ranges between 15- 65 too ,and in most cases the total number of household members are ranges between 6 to 10, further explaining minimum 3 and maximum 14. Education status shows that mostly respondents are illiterates (93) and only 8 respondents have done primary and 2 are matriculation.

Table 5.6: Livelihood Sources Income and Acquiring Status in Cholistan Desert

Livelihood Sources	Average Income (Rs.)	Minimum Income (Rs.)	Maximum Income (Rs.)
Livestock	30000	5000	384000
Agriculture Land	25000	7000	45000
Handicraft	1650	250	3000
Herbs	6000	3000	8000
Other Sources*	2000	1000	8000

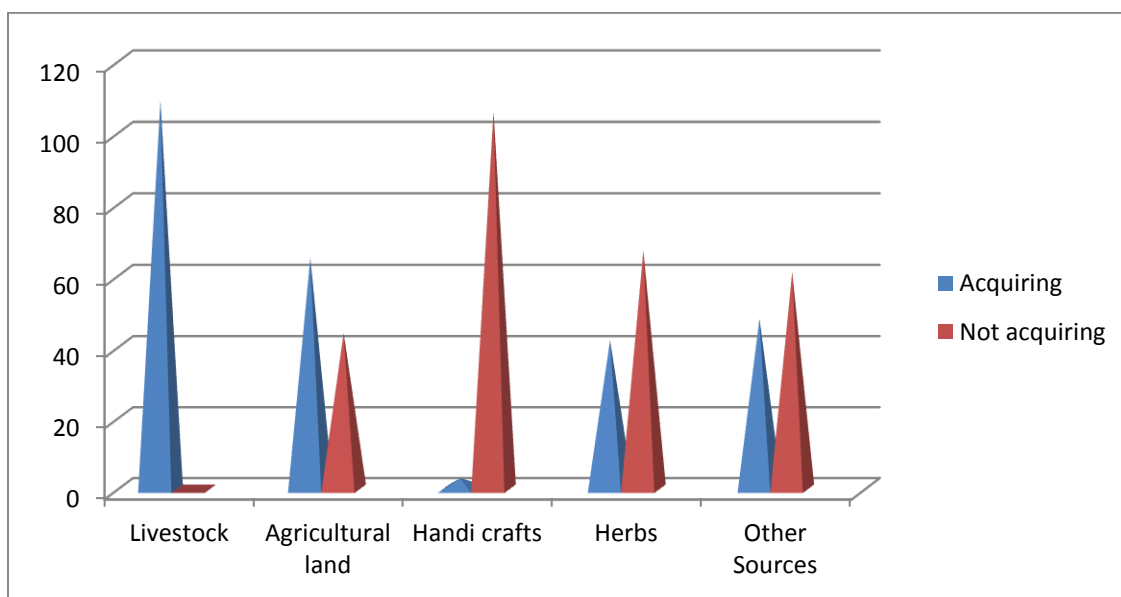
Sources: Primary Survey in Four Villages of Cholistan Desert Bahawalpur Division

*Other Sources like laboring in the farm or in some industry or government jobs.

Table 5.6 shows livelihood sources along with maximum and minimum income earned in one year from these sources by study population. There are three major sources of income in desert area i.e. livestock, crops and herbs (Khar)⁵. Results show that all the households in sample own herds and the minimum and the maximum range of income they earn from livestock ranges between Rs. 5,000, to Rs. 38,4000.

The nomads are very keen to increase their livestock population in order to increase their annual income. A second major source of livelihood is land cultivation. 65 household in the sample have land and their minimum income is Rs. 7000 and maximum income is Rs. 45000. The Khar income ranges from Rs. 3000 to Rs. 8000 per annum. The income from laboring (i.e. factory workers) ranges between Rs. 1000 minimum and Rs. 8000 maximum. Another source of income is handicraft but in survey only 3 household earn income from handicrafts; range of this income is minimum Rs. 250 and maximum Rs. 3000. People earn maximum annual income from livestock and minimum annual income is generated by embroidery. Nomadic people also responded that their sources of livelihood are affected by the environmental factors like rain, water, drought, land degradation, desertification and climate change. These factors affect the productivity of different means of livelihood in the different seasons differently. Season are spring, summer, monsoon, post monsoon and winter.

Figure 5.1: Livelihood sources in study area



⁵ Khar (Haloxylon Recurrum) plant in the desert area of Cholistan which founds in the winter season and usually females are involved in its cutting process.CDA is providing tenders for its production and cutting from 2010.

Table 5.7: Annual Income and Expenditure Detail of Households

Income / Expenditure Group	Num. of HH Income	Percent (%)	Num. of HH Expenditure	Percent (%)
0 – 30000	16	15	-	29
30001-60000	36	33	32	29
60001-90000	30	28	32	31
90001-120000	19	17	34	33
120001-150000	2	2	5	1
200001-300000	2	2	1	1
300001-330000	1	9	1	1
330001-360000>	3	3	1	1
Total	109	100	109	100

Sources: Primary Survey in Four Villages of Cholistan Desert Bahawalpur Division

The table explains yearly income and expenditure of households in the sample from the population in the Cholistan desert. Majority of the people earn income between the ranges of Rs. 11700 –Rs. 38, 4000. 33 percent of total sample population earns their income between Rs. 30,001- Rs. 60,000. Only 3 percent of the households earn their income equal to 300000 or above. As is evident from the table, expenditure range lies between Rs. 30,000 – Rs. 36, 0000. Most of the household are in the category of Rs. 30,000 – Rs. 90,000, only 1 percent households have expenditure in the range of Rs. 330001 – Rs. 360000.

Table5. 8: Social Facilities Detail of four Villages by Household in survey

Presences	Education Facility	Visit of Teacher	Health Facility	Health Status	# HH	CDA Support
Yes	109	31	0	No Disease	74	72
No	0	78	109	Any Disease	35	37
Total	109	109	109	Total	109	109

Sources: Primary Survey in Four Villages of Cholistan Desert Bahawalpur Division

Social facilities like education and health in the survey area are found to be critically low. There are no health facilities for humans and their livestock. School buildings are available in all four villages but mostly are not working. About 78 percent households are not availing the facility from these schools building. In health status, 74 percent of household respondent have no disease, only 35 percent of household respondents have any kind of disease.CDA supports them

in different way i.e. financial support from government, distribution of land and setting of water scheme which will enhance their income. Total 72.5 percent of household in the survey area received land support from government while 35.7 percent respondents, in the selected villages are not receiving any support from government. Jasser village is one of them.

Table5.9: WTP Share by Household in Health and education Facility in Survey Areas

Ratio of WTP (%)	In Health	In Education
0	24	18
2	1	1
5	17	11
10	67	79
Total	109	109

Sources: Primary Survey in Four Villages of Cholistan Desert Bahawalpur Division

Table 5.9 shows the willingness to pay (WTP) of households for health and education facility. It shows that 67 percent are WTP for education and 79 percent show their WTP for health. Mostly schools are for boys nearly 72 percent and are situated at the distance of 2Km. The reason behind it is that household don't have much income to spend on health and education and they consider it as luxury. Table shows that nomadic household in Cholistan deserts are willing to pay their shares if government starts proper attention on schools and hospital provide ions.

Table 5.10: Household Livestock Ownership in Cholistan Desert

Livestock	HH #	Percent (%)	Minimum Number of Livestock Own by HH (Num of HH)	Maximum Number of Livestock Own by HH (Num of HH)
1-50	24	22	16 (1)*	300 (2)*
51-100	53	49		
101-150	19	17		
151-200	8	7		
201-250	3	3		
251-300 >	2	2		
Total	109	100		

Sources: Primary Survey in Four Villages of Cholistan Desert Bahawalpur Division

(*Number of household are reported in parentheses)

Table 5.10 shows that 49 percent respondents have livestock in the range of 51-100. Twenty two percent respondents of household have livestock ranges from 1-50. Only 2 percent have their livestock ranging between 251- 300 or above it. In the desert area livestock is a main source of

livelihood. Income and expenditure is highly affected by total number of livestock in desert area. Herd reproductive performance is generally poor with low birth rate and high mortality rate. The basic reasons of this high mortality rate is poor provocations of nutrition, lack of animal health care center or mobile services in the desert area for majority of livestock and most importantly the climatic stresses in the form of water shortage. Veterinary health care center were not available in the all survey villages.

Table5. 11: Type of Livestock Own and their Ages in Desert Area

Cattle	Mim. Num. of LS (Num. of HH) (Percent (%))	Max. Num. of LS (Num. of HH) (Percent (%))	Num. of HH having no Cattle (Percent %)	Mim. Age of LS	Max. Age of LS
Cow	2 (1) [0.2]	100 (1) [0.2]	11 (10)	2	10
Sheep	2 (1) [0.9]	250 (1) [0.2]	29 (27)	2	3
Goat	6 (1) [0.9]	100 (3) [2.8]	17 (16)	2	3
Camel	1 (11) [10]	60 (1) [0.9]	26 (24)	2	10

Sources: Primary Survey in Four Villages of Cholistan Desert Bahawalpur Division

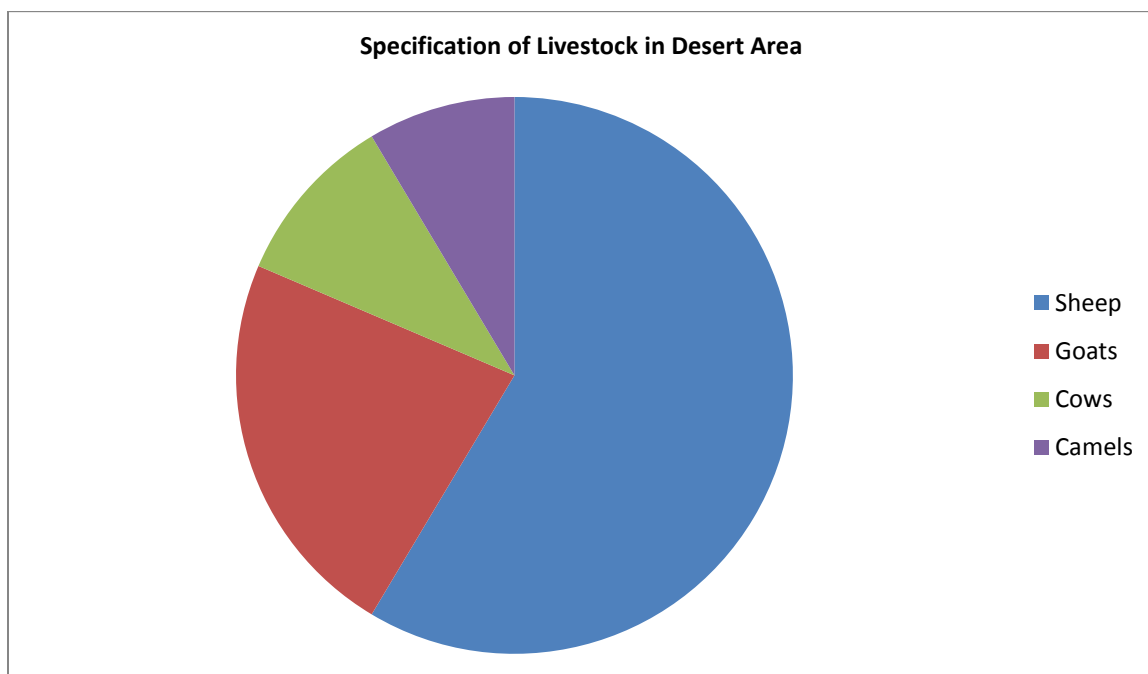
(Change any of these parentheses with bracket)

* First parentheses is number of household and second parentheses is percent of household in the table 5.11

Livestock in desert area includes cattle cows, sheep, goats and camels. Populations of livestock in desert an area is described in table above and figure 5.2 shows sheep are in maximum number while lowest number is observed for camels. Cow and goat are found in equal number. The maximum age limit is recorded 10 years for cows and camels while minimum age of 3 years is recorded for sheep and goats. These livestock provides benefit to the household of the desert area. Benefits reaped from livestock's include meat, feeding, milk and milk products, loading & mobility, wool, collection cow dung cake and desi - gee etc. The results also show that in desert area free grazing attracts nomads to move back their animal in desert areas form canal areas in the summer season. Health of livestock is good in the desert areas and livestock milk production also increases in desert as compared to that in the canal areas. Another problem is tax imposed

on number of livestock. It results into under estimation. As the tax obtain by per animal 30 to 40 Rs in desert area and it is collected by a worker come from CDA.

Figure 5.2:



Source: Primary survey

Table 5.12: Explain the Cost of Herding Livestock

Input Cost for LS	Average Cost (Num. of HH) (Percentage)	Maximum Cost (Num. of HH) (Percentage)	Minimum Cost (Num. of HH) (Percentage)
Fodder Cost	2000(26)[24]	5000(1)[0.9]	00(53)[49]
Medical Cost	1000(2)[99.1]	4000(31)[28]	12500(1)[0.9]
Feeding Cost	1000(2)[1.8]	-	4000(1)[0.9]
Hired Labor Cost	00(63)[58]	1000(12)[11.0]	6000(1)[0.9]
Other Cost	00(22)[29]	3000(64)[29]	5000(1)[0.9]
Total Cost	00(1)[0.9]	6000(10)[15]	19500(1)[0.9]

Sources: Primary Survey in Four Villages of Cholistan Desert Bahawalpur Division

Table 5.12 shows the input Cost borne by the livestock owners during livestock herding ranges from Rs. 1000 to Rs. 12500. It includes different type of herding cost. The maximum household cost range between Rs. 6000 is 10 and in the range of Rs. 19500 were only one household.

Table 5.13: Ownership Arrangement in All Kind of Livestock in the Cholistan Desert

Ownership Arrangement	Cows	Sheep	Goats	Camels
No animal	11	27	13	27
Own	86	59	55	67
Shared	1	1	1	7
Herding other Animal	11	22	40	8

Sources: Primary Survey in Four Villages of Cholistan Desert Bahawalpur Division

In Cholistan livestock is major sources of livelihood but the ownership arrangement are different. Mostly households own cows, in data there is only 11 households who don't have cows and one household family share the cow, sheep and goat herding. About 59 households own sheep and 55 household own goats. Table 5.13 shows 67 household owned camels and mostly in Kala phar village.

Table 5.14: Livestock Ownership and How Much by- Product Sale by Household

Livestock Ownership	Number of HH	HH # Sale by –Product (Percentage)	Livestock Consumption ways	Number of HH (Percentage)
Yes	90	36(33)	Farmer Users	18(17)
No	19	73(67)	Both*	91(84)
Total	109	109	Total	109

Sources: Primary Survey in Four Villages of Cholistan Desert Bahawalpur Division

* Farmer uses and give others too such as gifts

Table 5.14 shows the household livestock ownership in the survey areas. About 90 household are the owners of the livestock and 19 households don't own the livestock which they are herding mostly these household belongs to Jasser area. Table 5.14 also explains that when household produce by-product which they own they sell these products. Total 36 (33%) number of household sell these by-products. Livestock is consumed and gifted by households. The exchange of gifts in communal ceremonies like weddings, tribal celebrations, and on childbirth is quite common. In Jasser, where household own only sheep's mostly they don't sell the livestock because they don't own livestock. In two villages Kala phar and Cha Jasser household mostly

refuse to sell their livestock production because they have believe that if they sell their livestock it will negatively affect their income.

Table 5.15: Livestock by Products Detail in the Cholistan Desert

By-Product Sale Earning Detail			By- Product Price	
By Product Earning	Number of HH	Percent	Products	Prices/Weights
0- 2500	46	42	Milk	16 to 25 /Per kg
2501-5000	48	47	Wool	40/Per sheep
5001-5500	1	1	Goat Hair	30/Per goat
5501-10000	14	12	Dessi Gee	250/Per Kg
Total	109	100	Better	200/Per kg

Sources: Primary Survey in Four Villages of Cholistan Desert Bahawalpur Division

Livestock products i.e. milk, wool, goat hair and meat generate an income source for nomads of the Cholistan Desert. Marketing values of these products is described in above table 5. 15. Nomad's sell these livestock products mostly by a middleman or in local markets at very low rate as compared to markets located in cities. Sale of milk is in the range of Rs. 16 to Rs. 25 per Kg but it is sold in cities in the range of Rs. 30 to Rs. 45 per Kg. Similarly the wool of goat is sold at very low rate at Rs 30 to Rs. 35 per animal, but the market price is between Rs.1000 to Rs. 2500. With the time, as development of infrastructure is taking place in Cholistan desert, some nomads manage to sell milk-production, animal near the road side and earn more money because the milk purchasers hesitate to go deep in the desert area for the collection of milk. Earning obtained from the selling of by-product of livestock ranges between Rs. 2500 to Rs. 10,000 per month. Mostly households are in the range of Rs. 5000 to Rs. 10,000 about 42 percent

Table5.16: Livestock Market price and Price Nomadic People Take

Cattle	Market price of Animal		Price in Cholistan	
	Minimum	Maximum	Minimum	Maximum
Cow	32000	45000	27000	42000
Sheep	3000	4500	2500	4000
Goat	3000	5000	2500	5000
Camel	40000	75000	28000	68000

Sources: Primary Survey in Four Villages of Cholistan Desert Bahawalpur Division

During the drought period (environmental stress) the nomads of Cholistan desert sell almost half of their livestock for their survival. They get more income when they sell cow or camel.

5.7 Water Related Information

Table 5.17 below shows the utilization of rain water stored in the Toba. Toba lays in different location some area near to household position some are far from them. The Toba for human use and animal are different. The distance from the drinking water source for human ranges between 20 yards to 2 Km and for livestock the range is between 20 yards to 5 Km. Nomadic people drink rain water which they store in Toba so they do not have to spend money to buy water. Time consumed in fetching drinking water in round trip is about 15 to 60 minutes for humans and to two hours for livestock. Table 5.17 also describes the quantity of water used in summer (10 to 30) buckets per day and in winter (10 to 20) buckets per day.

Table 5.17: Water Related Information of Household in Cholistan Desert

Water Uses	HH #	Distance		Time		Summer		Winter	
		Min	Max	Min	Max	Min	Max	Min	Max
Drinking ,washing ,cooking	109	20 Yards	1+ -- 2 Km	1 - 15 Min	60 - + Min	1 to 10 Bucket	21 TO 30 B	1 to 10 Bucket	11To 20 B
Livestock	109	20 Yards	2+ - 5 Km	1 - 15 Min	60 - + Min	1 to 10 Bucket	21 TO 30 B	1 to 10 Bucket	11To 20 B

Sources: Primary Survey in Four Villages of Cholistan Desert Bahawalpur Division

Table 5.18: Distance for Drinking from Water Sources

		Drinking	Washing	Cooking	Livestock
Valid	Inside House	2	16	2	2
	Outside House 0 - .5 Km	53	43	46	11
	.5 - 1Km	52	46	58	13
	1+ -- 2 Km	2	4	3	69
	2+ - 5 Km				14
	Total	109	109	109	109

Sources: Primary Survey in Four Villages of Cholistan Desert Bahawalpur Division

Table 5.19: Time Consumed in Fetching Water

Consume Time	Total Number of Household			
	Drinking	Washing	Cooking	Livestock
1 - 15 Min	7	21	7	5
16 - 30 Min	37	23	28	3
31 - 45 Min	53	50	52	5
46 - 60 Min	11	15	21	31
60 - + Min	1		1	65
Total	109	109	109	109

Sources: Primary Survey in Four Villages of Cholistan Desert Bahawalpur Division

5.8 Migration

In Cholistan Desert pastoral nomadic system is set apart by a mass movement of humans and livestock throughout the seasons in a year. The movements is around water and fodder within the desert and outside the desert area. Nomadic movement pattern are mainly dictated by the monsoon rain distribution. In the winter seasons around the month of March or April, resources of water and forage deplete in the interior of the Cholistan desert. It forces nomadic households and their herds to move towards close proximity of canal area. Table 5.20 shows the migration percentage of nomadic household to canal area from Cholistan desert. Normally two type of migration is observed in Cholistan desert namely temporary migration and permanent migration. Permanent migration is a process of long term. Some households in Moujgarh village migrate temporally seasonal mostly in dry land areas.

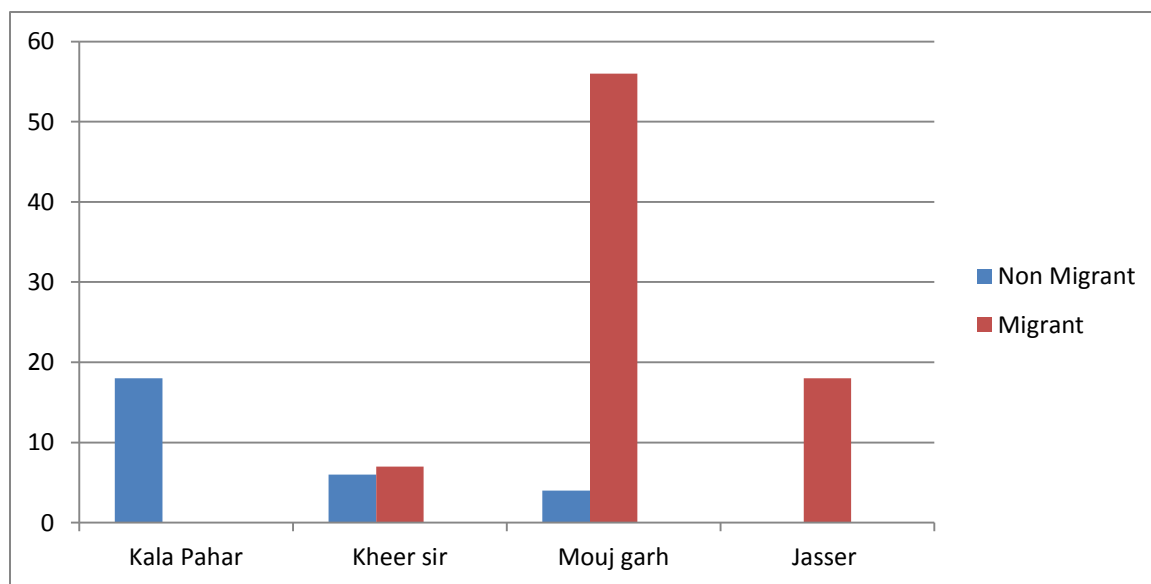
Table 5.20: Migration Status in all Villages of Survey Area in Cholistan Desert

Village	Non-Migrant	Migrant	Total
Kala Phar	18	0	18
Kheer Sir	6	7	13
Moujgarh	4	56	60
Jasser Kho	0	18	18
Total Migrant	28	81	109
Total Percent	26%	74%	100%

Sources: Primary Survey in Four Villages of Cholistan Desert Bahawalpur Division

The results show that 81 households undertook seasonal migration and 28 household stay in desert area for the whole year. Table 5.20 illustrates the details of the study area like in Kala Phar no household migrates and in Jasser all household migrated with their families towards canal area. In Moujgarh 56 household were migrant and 4 were non-migrant and in Kheer Sir 7 were migrants and 6 were non-migrants. Percentage of migrant and non-migrant is 74% 26% of the sample respectively.

Figure 5.3: Migration Status in Study Area of Cholistan of Desert



Source: Primary Survey

Table 5.21: Household Migration Detail Information

	Place of Migration		Type of Work		Duration of Migration		Gender in Migration	
	Canal side	City Side & Canal side	Herding & Farming	Herding & Laboring	Less & Three Month	Six Month	Male	Both
Household #	78	3	30	51	4	77	54	27

Sources: Primary Survey in Four Villages of Cholistan Desert Bahawalpur Division

Cholistani people migrate towards canal side, city side or both (the city and canal side). About 78% of HH migrate towards canal for land framing and only 3% migrate towards city area.

During migration period in winter they usually work for herding & farming and herding & laboring. Total 30 households are involved in the occupation of herding and farming and 51 households are involved in herding and laboring (mostly at farm and factories). Migrants were mostly male members of the family and total 54 household migrant member were male and 27 households, out of them, migrate towards canal area. In Jasser whole family migrate toward canal area and in Moujgarh only male members migrate to canal area.

Table 5.22: Household Migration Detail Information

Num of Member Engaged	Household	Migration Income Group	Num of HH
0	28	1000 – 3000	27
1	46	3001- 5000	44
2	24	5001-7000	8
3	4	7001-9000	2
4	7		

Sources: Primary Survey in Four Villages of Cholistan Desert Bahawalpur Division

Table 5.22 shows the number of members migrates in each households and additional income they earned through unskilled laboring in city area and land farming in canal area. Mostly one person has migrated from the household and the number of households with one person migrating is 46 and income they earn is between 1000 to 9000.

Table 5.23: Remittances Income, Wage Rate in Migration and Ages of Migrant

Wage Rate	Num. of HH	Migration Income (Annually)	Num. of HH	Migrant Age	Num. of HH in Age Groups
100-200	25	10000 - 20,000	23	15 – 30	23
201-300	37	20,001- 30,000	45	31 – 45	34
301-400	12	30,001 – 40,000	8	46 – 55	16
401-500	7	40001-50,000	4	56 – 65	1
		50,001-60,000	1		

Sources: Primary Survey in Four Villages of Cholistan Desert Bahawalpur Division

The wage rate they get at destination during the six month of winter ranges between Rs. 100 to Rs. 500. 25 households earn wage of Rs. 100- Rs 200. The expenses during the migration period range between Rs. 1000 to Rs. 8,000. . The income earned during migration in survey area varies

between Rs. 10,000 to Rs. 60,000. Mostly migrant are young in the age group 31 – 45 (34 household) and 15-30 (23 household).

5.9 Land Related Information

In the canal area irrigated agriculture field provides benefit for both the pastoralist nomads and farmers in canal area. In the canal side pastoralist nomads have drinking water for human and livestock, free grazing of livestock on wheat stubbles and markets for their livestock and by-products. Farmer, on the agriculture land, obtains sufficient partner and labor for land cultivation and crop harvesting. And animal manure to enhance soil fertility through camping of livestock on fallow fields (Shoreward, 2009).

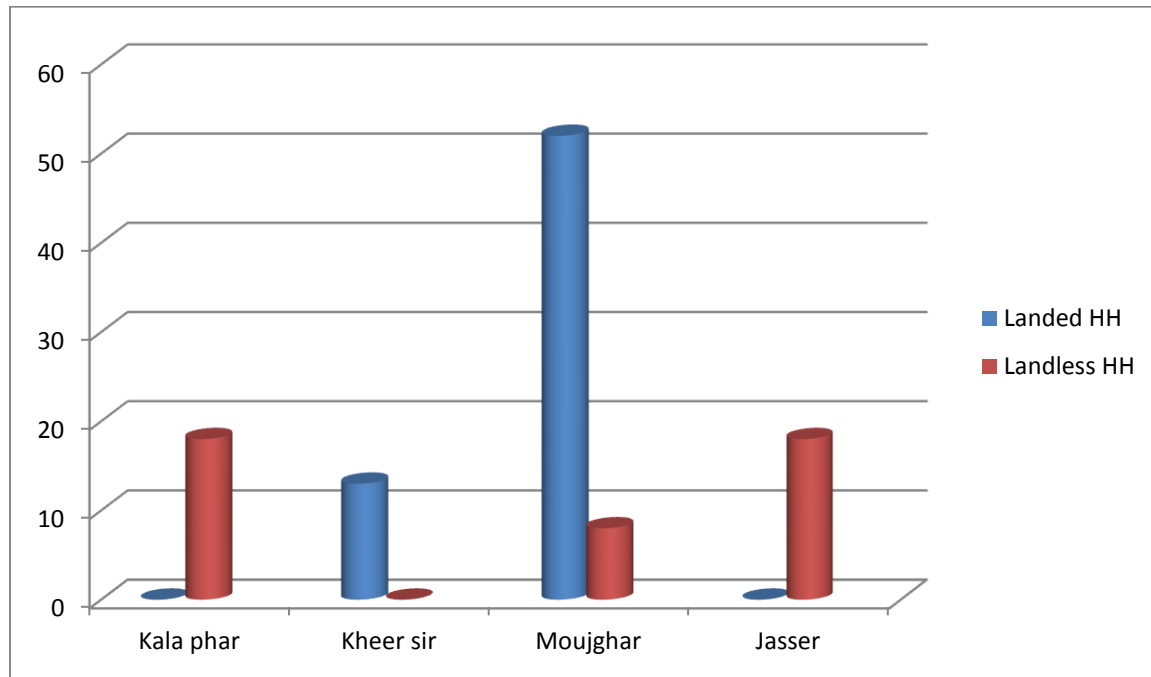
Table5. 24: Land Detail in Study Area

Villages	Own Agriculture Land		Total
	Yes	No	
Kala Phar	0	18	18
Kheer Sir	13	0	13
Moujgarh	52	8	60
Jasser	0	18	18
Total	44	65	109

Sources: Primary Survey in Four Villages of Cholistan Desert Bahawalpur Division

Table 5.24 illustrates the number of household who obtained. Mostly land is acquired households. In the Moujgarh village and in Jasser and in Khala Phar no one obtained land. In Moujgarh the income of most of the households is high. About 52 land owners are in Moujgarh, and 13 are in Kheer Sir.

Figure 5.4: Ownership of Agricultural Land by HH in Study Area



Source: Primary Survey

Table 5.25: Land Related Detail in Canal Area

Land Ownership	No of HH Own	Acquired from CDA#	Farming Parities	Irrigated Land	Irrigation Facility	Have Transfer Tendency	Land Tax Pay
Yes	65	65	60	55	56	64	64
No	44	44	49	10	9	1	42
Total	109	109	109	65	65	65	10

Sources: Primary Survey in Four Villages of Cholistan Desert Bahawalpur Division

On land holding of household, (in acres) 59 % have 12.5 acres while 0.9 % households own 6 acres. In study area, 65 households are found to be land owners while 44 households are landless. Out of 65 land owners, 55 own land in irrigated area and 10 own non-irrigated land. About 4 farming household are cultivate based on self-help (turbine, tube well and supply water on payment).

Table 5.26: Land Cultivation Details

Type of Land Ownership	Number of HH	Area Under Cultivation	Number of HH	Sources of Irrigation	Number of HH
Rent in /Rent Out	1/29	Half	6	Local irrigation system	52
Own Cultivation	30	Full	54	Self Help	8
No Cultivation	5	Not Yet	5	No One	5
Total	65		65		

Sources: Primary Survey in Four Villages of Cholistan Desert Bahawalpur Division

Cultivation of land in canal area is of three types. Normally they rent the land because they have fewer resources to cultivate the land on their own. Mostly the economics reason and in some cases number of male member are not working. Others do their own and take more benefit of this as it increases their income. If they had no facility of local irrigation they use others sources (turbine water, supply lines) of on their own.

Table 5.27: Crop Production Detail

Season/Crop	Number of HH	Minimum Production in Unit (Sold) (Income)	Max production Unit (Sold) (Income)	Price/40 Kg
Kharif/Wheat	59	100(70)(10,000)	200(180)(40,000)	900
Rabi /Cotton	6	50(50)(10,000)	70(70)(20,000)	1100

Sources: Primary Survey in Four Villages of Cholistan Desert Bahawalpur Division

Second major source of income in irrigated areas is crop production. Major crops grown in the area detailed in figure 3. Table 5.27 shows that major crop cultivated in irrigated area is wheat and 59% people of the area are directly involved in the production of wheat. Other crop grown in the canal area is cotton (6% household). Market value of wheat and cotton is also shown in table which is commonly grown in canal area and nomadic people of Cholistan earn their income and consume it in desert areas. These prices are close to the prices prevailing in the other markets sited in cities. Therefore nomads get almost better profits by the production of crops but due to water shortage and lower soil fertility the yield of crops is lower resulting in lower income as compared to livestock keeping.

Table 5.28: Production Input Cost in Canal Area

Input Cost	Min	Max	Total Cost	Number of HH
Fertilizer	1500	8000	1000 – 5000	3
Pesticide	1000	8000	5001 -10,000	17
Water Tax	1200	1200	1001 – 15000	30
Employment of Labor	2000	3000	15001 -20,000	10
M & T	0	2000	Total	60
Agriculture Tool	0	4000		
Total Cost	3000	20,000		

Sources: Primary Survey in Four Villages of Cholistan Desert Bahawalpur Division

In the land cultivation some respondent shared the input cost, which ranges between of Rs. 1000 to Rs. 8000 and total cost ranges between become Rs. 3000 and Rs. 20,000.

5.10 Difference in Livelihood Economy of Nomads in Survey Area of Cholistan Desert

Table 5.29: Livelihood status of migrant and non- Migrant Household

Economy of Non- Migrant Household			Economy of Migrant Household		
Livelihood Status	Total Income	Total Exp	Livelihood Status	Total Income Annually	Total Expenditure
Average	62,000	90,000	Average	90,000	120,000
Minimum	35,000	60,000	Minimum	32,000	58000
Maximum	90,000	120,000	Maximum	150,000	152,000

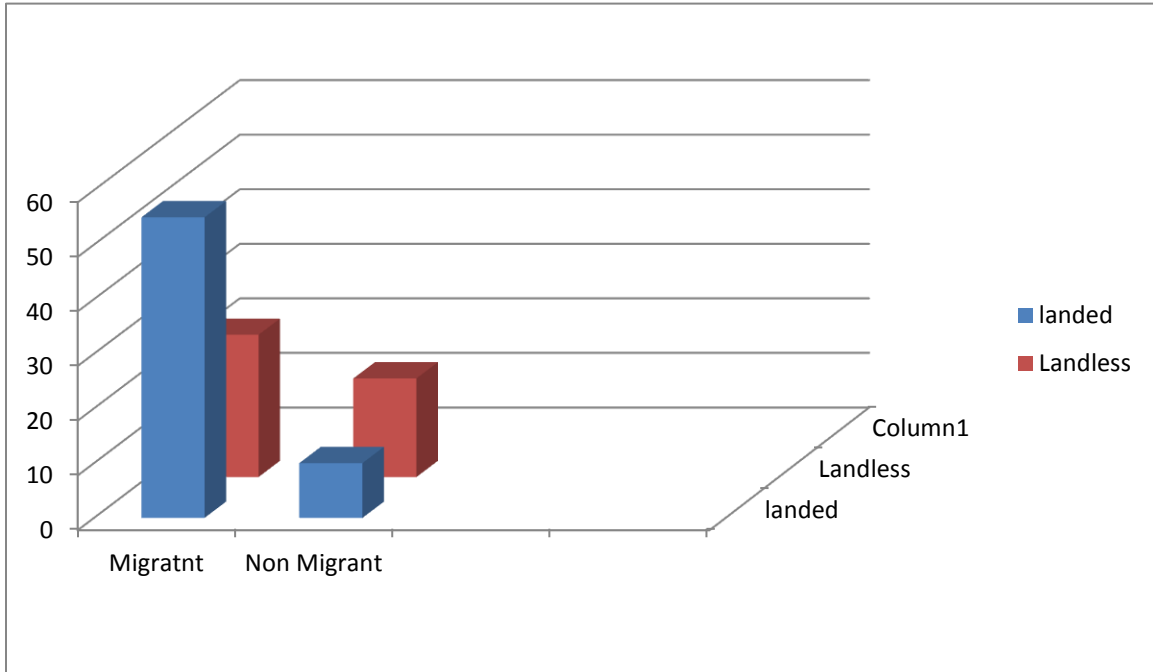
Sources: Primary Survey in Four Villages of Cholistan Desert Bahawalpur Division

Economic conditions change because of the difference of land which provide them a place and sources for migration and earns income. Because the migrant people have benefited from the land they have canal area for cultivation and in desert area they have their own “Toba”. Resources on land enable them to cultivate land in canal area. This enhances their income sources and their annual income becomes larger than the income of household who do not migrate due to landlessness. Non-migrant nomads had only one sources of income and that is livestock production. Livestock production is the common source of income by both the groups which they benefit; either they are migrant or non-migrant. Some are also producing Khar

production i.e. in survey area Moujgarh households producing “Khar” production. Migrant nomad’s income is better than that of non-migrant and expenditure are also higher as shown in table 5.29 above. As livestock is a major source of income for both the groups so migrant get back in summer season towards greater or lesser Cholistan for free grazing of livestock because it is highly nutritious and grasses and shrubs are available in greater Cholistan which also increase the health of the animal that lead to increase in production. Migrants also benefit from income for both sources that increase their income like when they are in lesser canal area they grow fodder crop which becomes a bigger sources of income and in greater Cholistan area they just sell their livestock or in some quantity produces ‘ Khar ‘ when they need money for their expenses.

Land income in canal area has been found positively affecting livelihood of the household in the same environmental situation. Household are better off in daily life and have better access to assets like mobile, motorbike etc. It also has positive effect on education and health of the households. Better income in canal area depends on type of crop producing like wheat and cotton , total land holding , total number of month spend in canal area and total number of livestock. The expenditure of non-migrant having no land in canal area depends on total number of livestock, gender, more male member willing to work and support from government in different time like in winter or during drought years. Household income is affected by livestock holding and by herding only sheep due to shortage of water for example in Jasser village. Household having large number of livestock are found having higher income as compared to others who have less number of livestock if they do not own the livestock

Figure 5.5: Graphical Representation of Correlation between Migration and Land



Source: Primary Survey

CHAPTER 6: METHODOLOGICAL FRAMEWORK AND MODEL

6.1 Introduction

In this chapter methodology of regression analysis is furnished. Sample of hundred and nine household (109) was selected from Cholistan desert for the analysis of the study. Statistical package of SPSS is used for descriptive, (reported in previous chapter) and econometric analysis.

6.2 The Model

Given the nature of data, qualitative response models are appropriate to study the issue. In the model, where dichotomous variable “Y” is qualitative, the objective of this variable is to identify the probability of something happening in which we were interested. It can take only two values 0 or 1 i.e. When $Y = 1$, the event is happening and when $Y = 0$, the event is not happening. Hence qualitative response models are also known as probability models.

Like in sample villages the household having two status which are migrant and non-migrant and land owner and landless respondents.

$Y = \{1 - \text{if household (or a member migrant)}$

$Y = \{0 - \text{if household (no member migrant)}$

The Probit and Logit models are most commonly used. In such type of situation a numerical dependent variable can be obtained as the response in the sample computed relative frequencies of one of the two possible choices.

With the migrant and no migrant decisions, a relative frequency can be obtained as the proportions of sample of migrants who undertake migrate, with yes responses.

Assuming there are n replicated samples and that in each the relative frequency is positive and less than one, then, letting p_i be the frequency for i th sample,

$$0 < p_i < 1, i = 1, 2, 3 \dots n$$

If the relative frequencies are influenced by variables $x_1, x_2, x_3, \dots, x_n$, one approach to estimating the relationship would be to specify the linear model

$$p = \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \dots + \beta_k + u = x\beta + u \dots \dots (A)$$

to estimate coefficients $(\beta_1, \beta_2, \dots, \beta_k)$ from the observed values of p_i and x_i with this approach it is possible, however, for a predicted value of p to be negative or larger than one, violating its interpretation as a relative frequency. So usually the alternative specification is employed. One such alternative specification is the Probit form of regression analysis, of the form

$$\ln\left(\frac{\rho}{1-\rho}\right) = x\theta + v = z + v$$

Where

$$\text{Var}(v)_i = \frac{1}{r_i p_i (1-p_i)}$$

Where r_i is the number of observations in the i th sample and

p_i is the i th sample relative frequency

Thus for estimation used the GLS estimator, where

$$V = \ln\left(\frac{\rho}{1-\rho}\right) - \ln\left(\frac{p}{1-p}\right)$$

Where p is the observed relative frequency and p is the true probability. Setting $v = 0$ implies, by taking antilog, that

$$\left(\frac{\rho}{1-\rho}\right) = e^z$$

Where $p(1-p)$ can be interpreted as the odds ratio in favor of the choice represented by the dependent variable. Thus

$$p = (1-p)e^z = e^z - pe^z$$

Combining the terms involving p and solving yields

$$p = \frac{e^z}{e^z + 1} = \frac{1}{1 + e^{-z}}$$

p determine as a function of z ,

In particular for estimates $\hat{\theta}$ and predicted value \hat{x} , the predicted p would be

$$p = \frac{1}{1 + e^{-\hat{x}\hat{\theta}}}$$

No matter what value is assumed by \hat{z} , it is always the case that $0 < \hat{p} < 1$.

6.3 General Variables Used in the Model

6.3.1 Dependent variable

❖ Migration from Desert(for six month) (MIG)

Total number of household who's migrated from the desert area of Cholistan to canal (irrigated) areas. Migration is taken as dependent variable. Migration shows different relationship with different independent variable illustrate negative as well as positive role in the livelihood of the Cholistani people.

For the use in logistic or Probit regression model migration was categorized as follows:

- If migrate from desert area of Cholistan then = 1

- If not migrate from desert area of Cholistan then = 0

❖ **Total Income**

Total income is taken as dependent variable. It includes income from livestock and from land income. If desert people have more and healthy livestock they will sell it in the markets on good prizes and earn money. Similarly if the people have more land they can cultivate it and generate more income and as a result their total income will increase. As income increase its positively affect the total income and it increases their livelihood standers. Thus it enhances the socio-economics of the household unit lives in the desert area.

6.3.2 Independent Variables

Independent Variables are socio-economic characteristic of households. These are:

❖ Gender of Responder/Head (RG)

Gender of head /respondent of household is recorded and taken as independent variable. It is defined as:

- If male then = 1
- If female then = 0

Cholistani people practices their traditional norms so gender shows that the male member of the household mostly migrate in the winter season because females are bound for the households work in the desert area. There is one village e.g; Jasser where whole families migrate. Since male members are more likely to migrate. The expected sign of the coefficient is negative.

❖ Age of Respondent/Head of Household (RA)

Age of respondent/head of household is taken as independent variable. It is recorded as number of years. It is expected to have negative relation with migration as age increase trends to migrate in winter decrease. Because old age member of a family stays at home and spend leisure time with doing nothing. In some cases they manage livestock herd in desert area.

❖ Total Income in Desert area (TID)

Total income (annually) in desert area is taken as independent variable in migration model. More income may lessen migration towards canal area from desert area, because households having large herd size in the desert may not prefer to migrate. So migration creates negative relation with income from livestock in the desert area.

❖ Type of Work in Migration (TWMIG)

Mostly two types of work are done in the migration period i.e. farming in canal area and laboring in the city side. Both type of work shows positive change in migration income and increase the total income of household especially in the case of households having low income.

❖ Place of Migration

In the migration period mostly households migrate towards canal area for cultivating the land and landless households migrate towards city side for searching jobs in factories or some other places.

❖ Total number of Livestock in Desert area(TLS)

In selected sample total number of livestock is included as independent variable. Livestock is a major source of livelihood and positively affect the livestock income specially the herds having camels and sheep. It is the total number of animals in the herd own by the household in the desert area. During migration people keep their livestock with them and it shows positive result on livestock income, as number of livestock increases income earn from livestock increase significantly.

❖ Land holding(LH)

Land holding in the canal (irrigated) area by the household is taken as independent variable.

It is described further as follows:

If land is owned by the household then = 1

If not owned by the household then = 0

If households have cultivated land in the canal area then they migrate and it will increase the income as well. Land holding shows positive effect on the livelihood of the nomadic people of Cholistan because it increases their income.

❖ Land characteristics (LC)

There are two types of land; irrigated and non- irrigated. People holding irrigated land, cultivate it and it provides a support system in migration. Irrigated land increases the income and it shows positive results on annual income.

❖ Land Area Under Cultivation (LAC)

It is taken as independent variable and is measured in acres. It showed the total cultivation area. Large area under cultivation means more income for the household and vice versa. It is the second major source of income.

❖ Type of Land Ownership (LOW)

Types of land ownership are categorized as rent-in and rent-out, cultivate and uncultivated land due to less water or in some cases unavailability of water. Land ownership shows positive effect on income because a household who owns the land and cultivates it by self gets all the increase their income, if there is any, but if households take the land on rent and cultivate then the income divides.

❖ Financial support from Government (FSG)

It is the most important variable which affects the income of household members during migration as well in desert area because land given by CDA is the second major source of the livelihood and it increases the income of the household. Financial support from government shows positive contribution to total income.

It was further explain as follow:

- If any work done by CDA then = 1
- If no work done by CDA then = 0

❖ Desert Duration (DD)

Stay of nomadic pastoralist varies from area to area in the study and it depends on village characteristic and basically on the water availability.

❖ Canal Duration (CD)

Stay of pastoralist varies between three to six months in canal area. It depends on the preference of household and on the village characteristics from which the pastoralist belongs.

6.4 Income Model

Dependent Variable

Livelihood is shown by the total income of the household in the desert area by all sources of livelihood.

Livelihood: LH: Livelihood of the individual household in the village= **Total Income=TI**

1). **Livestock income = LSI**

2). **Cultivated land income =**

The general equation of livelihood of household in the desert area become

LH= total income of the household=TI=LSI+LI (A)

Dependent Variable

Livestock Income: Livestock income of the HH in the survey area.

Independent Variable

- 1) LOW: Type of Land ownership by the household in the canal area.
- 2) Caste: Caste of the responder in the survey area.
- 3) Gender: Gender of the responder of the HH in the survey area.
- 4) TLS: Total number of Livestock in the desert area adds all type of animal in the herd as a separate variable sheet like Cow, Goat, Sheep and Camel.
 - (i) TNC: Total number of camels in the household herds of the study area.
 - (ii) TNS: Total number of sheep in the household herds of the study area.

Draw equation become

$$\text{LSI} = \alpha + \beta_1 \text{LOW} + \beta_2 \text{Caste} + \beta_3 \text{Gender} + \beta_4 \text{TLS} + \beta_5 \text{TNC} + \beta_6 \text{TNS} \dots \dots \dots (1)$$

(I) Now the second independent variable and its further equation become

Dependent Variable

LI: Land income of the responder

Independent Variables

- 1) LC: Land characteristics of the land which owned by the individual household in the villages like is it irrigated or not.
- 2) LOW: Type of land ownership by the household in the canal area.
- 3) LAC: Total area under cultivation of the land in the type of ownership by the individual household in the survey villages.
- 4) CD: Canal duration period of the individual household in the villages

$$+ LI = \alpha + \beta_1 LC + \beta_2 LOW + \beta_3 LAC + \beta_4 CD \dots\dots\dots (2)$$

6.5 Migration Model

Dependent Variable

Migration income: Migration income of the household I the survey area.

Independent Variables

- 1) MC : Migrant Caste
- 2) MA : Migrant age
- 3) MG: Migrant gender
- 4) TI : Total Income of the individual household in the village
- 5) TWMIG: Type of work in the migration duration.
- 6) PMIG: Place of migration of the migrant in the migration duration
- 7) WRMIG: Wage rate in migration Education status of the migrant.
- 8) MD: Migration duration period of the individual household in the village.

Migration equation of the household in all four villages which are selected for the survey from the Cholistan Desert

$$+ MIG = \alpha + \beta_1 MC + \beta_2 MA + \beta_3 MG + \beta_4 TI + \beta_5 TWMIG + \beta_6 PMIG + \beta_7 WRMIG + \beta_{11} MD \dots\dots\dots (3)$$

CHAPTER 7: RESULTS AND DISCUSSION

7.1 Econometric Analysis

First Model

The impact of different livelihood sources on annual income of households in Cholistan desert areas are described here by using regression analysis. Income is used as dependent variable and it includes two major sources of livelihood i.e. livestock and land income. Other different related factors are taken as independent variables that create positive and negative effect on income of land and livestock.

7.2 Total Income Model

For estimating the livelihood taken total income as dependent variable and livestock income, land income and village characteristic taken as independent variable in the model. But these independent variables have some predicted variables so first estimate the individual effect of the all three variable then combined them as general.

❖ 7.2.1: Livestock Income Model

Taking livestock income as dependent variable and Independent variables are: (LOW) Type of Land ownership of household in the canal area, (Caste) Caste of the responder in the survey area, (Gender) Gender of the responder of the HH in the survey area, (TLS) Total number of Livestock in the desert area adds all type of animal in the herd as a separate variable sheet like Cow, Goat, Sheep and Camel, (TNC) Total number of camels in the household herds of the study area, (TNS) Total number of sheep in the household herds of the study area.

Table 7.1: Regression Estimates of the Determinants of Livestock Income

Model	Variables	Un standardized Coefficients		T	Sig.	95% Confidence Interval for B	
		B	Std. Error			Lower Bound	Upper Bound
1	(Constant)	9.651	.331	29.186	.000	8.982	10.320
	LOW	1.668	.532	3.135	.003	.592	2.744
	GENDER	.040	.336	.119	.906	-.640	.719
	CASTE	.460	.485	.950	.348	-.520	1.441
	TLS	.005	.002	2.880	.006	.002	.009
	TNC	.143	.135	1.063	.295	-.130	.416
	TNS	-.167	.357	-.469	.642	-.888	.554

Dependent Variable: Livestock income, Adjusted R Square: .381

C.I: 95% Confidence Interval for B, S.E: F Value: 5.616, Sig.000

Income of the livestock in desert area is dependent on the total number of livestock; greater the number of animals in the desert area greater the income from livestock and vice versa but it further dependent on the variety of animal in herd size i.e. cow, sheep and camel. For instant in survey area Kala Pahar income from livestock is high because of greater number of camels in herd size and in Jasser the life stock income is low as compared to other survey areas because they only herd the sheep. Income of life stock is also dependent on the ownership of irrigated land in canal area because in winter season through seasonal migration they can survive their livestock in the duration of rainfall shortage. Some other factors like total cost (which normally includes medical cost) of producing livestock is high then it decrease the livestock income so it shows negative effect. But in most cases due to illness and lack of health facilities life stocks die and it reduces the income. In some cases caste of household also affect the number of livestock which affects the income. For example high castes have more camels and sheep in their livestock and they have greater income and vice versa.

❖ 7.2.2: Land Income Model

In this study land income is taken as a dependent variable and independent variables are; (LC) Land characteristics of the land which owned by the individual household in the villages like is it irrigated or not, (LOW) Type of land ownership by the household, (LAC) Total area under cultivation of the land in the type of ownership by the individual household in the survey villages, (CD) Canal duration period of the individual household in the villages.

Table 7.2: Regression Estimate of the Determinants of Land Income

Model	Variables	Un standardized Coefficients		T	Sig.	95% Confidence Interval for B	
		B	Std. Error			Lower Bound	Upper Bound
2	(Constant)	9.959	.268	37.183	.000	9.421	10.498
	LC	-.006	.148	-.039	.969	-.304	.292
	LOW	.652	.371	1.758	.085	-.093	1.398
	LAC	-.145	.449	-.322	.749	-1.047	.758
	CD	-.058	.656	-.089	.929	-1.376	1.259

Dependent Variable: Land Income, Adjusted R Square: -.011

C.I: 95% Confidence Interval for B, S.E: F Value: .875, Sig.: .495

Results of land income shows that the land area under cultivation and type of land ownership positively affect the land income and as cultivation area increases income received from land increased also. Land characteristics have a significant effect on the total land income. It includes all types of HH; HH who owns cultivated land and those who don't have land.

7.3: Migration Income Model

Migration income in a month is taken as a dependent variable and independent variables are (MC) Migrant Caste, (MA) Migrant age, (MG) Migrant gender, (TI) Total Income of the individual household in the village, (TWMIG) Type of work in the migration duration, (PMIG) Place of migration of the migrant in the migration duration, (WRMIG) Wage rate in migrated area, (MD) Migration duration period of the individual household in the village.

Table 7.3: Regression Estimates of the Determinants of Migration Income

Model		Un standardized Coefficients		t		Sig.	
		B	Std. Error	B	Std. Error		
4	(Constant)	-302.728	406.822	-.744		.459	
	MC	220.465	182.912	1.205		.231	
	MA	-3.232	11.086	-.292		.771	
	MG	-121.127	176.176	-.688		.493	
	TI	.000	.002	-.090		.929	
	TWMIG	491.361	263.560	1.864		.065	
	PMIG	-310.461	333.450	-.931		.354	
	WRMIG	4.648	1.561	2.978		.004	
	MD	995.812	421.900	2.360		.020	

Dependent Variable: Migration income, F Statistic 37.605, Sig: .000

Gender of migrant and place of migration shows negative effect on migration. If number of male members in a household is less then rate of migration is low which, in turn may lead to a decline their income because more members migrate from the household will generate more income. High wage rate shows spurs migration rate. Migration income plays positive effect on total income. Migration duration shows positive relationship with income long the migration period more income they earn and it shows significance result. Caste of household shows less significance but shows positive effect because as some caste in the study area doesn't willing to migrate due to many reasons like landless, no male member in family and male member do not want to work etc.

7.4: Probit Model

Table 7.4: Migration Status of the household in Cholistan Desert

	Parameter	Estimate	Std. Error	Z	Sig.	95% Confidence Interval	
		Lower Bound	Upper Bound	Lower Bound	Upper Bound	Lower Bound	Upper Bound
PROBIT(a)	Age of Migrant	.006	.004	1.713	.087	-.001	.014
	Gender of Migrant	.050	.061	.819	.413	-.070	.171
	Occupation of Migrant	.140	.084	1.675	.094	-.024	.305
	Land Acquired From CDA	.198	.134	1.482	.138	-.064	.460
	Intercept	-2.938	.263	-11.193	.000	-3.201	-2.676

PROBIT model: PROBIT (p) = Intercept + BX Chi-Square: 16.311, Sig.: 1.00

Migration status is dependent on the different variables which affect the migration decision. Table 7.4 presents the estimates of the migrants' decision to migrate or not to migrate. Gender of migrant and place of migration shows negative effect on migration. If number of male members in a household is less then rate of migration is low and they are bound to spend life in low income consequently they fall in low income group, because traditionally only male members of the family in the age of 18 or younger migrate while woman and children do not migrate in the winter season to the canal area. On the other hand high wage rate, in the migrated area, has a positive effect on migration and encourages male members to migrate. Households' caste also affects the migration, wherein some high castes do not like migration.

CHAPTER 8: CONCLUSION AND POLICY RECOMMENDATIONS

8.1: Conclusions

Cholistan desert is one of the most under developed region of Southern Punjab in Pakistan. Population is mainly nomadic pastoral and livestock production is the major sources of livelihood. The nomads lack even basic amenities of life. Their major constraints are scarcity of water, lack of infrastructure facility, lack of communication system, electricity, and other social needs (i.e. health and school). Lack of transportation facility is one of the main factors hampering the development of this area because it makes the accessibility of the area very difficult for the people and officials.

Climate of Cholistan desert is very intense. Low rainfall, high temperature and wind erosion are creating an environmental stress in the desert area. When this environmental stress affects the area in the form of drought the livelihood becomes a big question mark for the nomadic people of Cholistan and it create the economic crises. To combat this crisis nomads use migration as their survival strategy.

Results show that migration trend is more often in landed household than among landless households. They migrate to canal area to cultivate their land and generate more income. Therefore there is a strong connection in migration and land cultivation. Cholistani people also migrate to save their livestock production from the adverse environment of the desert.

Major sources of income in desert are livestock and land in canal areas. There is a huge difference in the income of landed and land less household. Crop production is another major source of income for nomadic pastoralist after the allotment of land by government. The study also focuses on the household that are badly affected by drought in the near past and they don't have their own land for cultivation. It is observed that they also migrate to canal area with their livestock for survival but they earn comparatively very low income. When landless household migrate they do not earn too much income because the strong reason is that they don't have lands in canal area (i.e. Jasser village). They earn labor income.

Study highlights that scarcity or non-availability of water in the canal area also creates problems in land cultivation. Due to this reason they cultivate some parts of land and most of the land is uncultivated. Further a little use of tube wells, turbines for cultivation is documented.

The findings of the study are reflective of the fact that in different areas of Cholistan there is variation in time duration nomads spend in Cholistan. In Jasser (survey area) they spend four to six month in desert in summer while six to eight month in canal area during winter season. In Moujgarh and Kheer Sir household spend almost equal month in canal and desert area that are six months. However, in Kala Pahar the people do not move.

Results show that all the migrated households return back to desert area in summer season with their livestock. In summer season, due to rainfall, Tobas are full of water and there are herbs everywhere for livestock grazing. But if there is no rain fall, as it happened in past years, then many households try to live in canal area or move Toba to Toba in search of water.

Study shows that income of nomads depends, to a large extent, on number of animals and on the consumption of herd. More number of animals in the herd results in more income specially if there are camels in herd. For better production and survival of livestock the households adopt nomadic pastoral lifestyle in search of water and fodder for their herds.

Life style of Cholistani people also varies from area to area. The people living in Kala Phar are enjoying more facilities then the people living in interior. They have comparatively high education rate, have solar systems for electricity and better ways of transportation and communication. In other study areas the people were uneducated. Mostly Cholistani people are enjoying good health but there is no health facility available. They do not have teachers in schools. Study shows that male members are dominant and they are the head of households. The family having more male members has more opportunities to earn because mostly male members migrate.

Study shows that people also get support from government (CDA) except Jasser. It is mostly in the form of land allotments (and water schemes (turbines, Tobas in Moujgarh). But in the Jasser area which was majorly affected by drought the financial support was provided at that time but

not at a major scale and now they don't have any support from government. Further they don't have their land and also has no facility of water in the area.

8.2: Policy Recommendations

Based on the results and the observations about living conditions of people of Cholistan during survey, we recommend the following:

1. There should be permanent body for the Cholistan desert that could train and help the local population to enhance the use of water efficiency and take steps like improving the rain water harvesting techniques (in summer season) and reduce the rate of evaporation. These steps will assure the economic development of the nomads living in the Cholistan desert. There should be the construction of more Tobas in the villages like Moujgarh
2. Proper distribution of resources could preserve the livelihood of Cholistani people like land distribution. More land allotment schemes should be introduced in canal area.
3. There is need to arrange other coping strategies that could play positive role in livelihood like encouragement to local handicrafts, small home industries etc.
4. Introduce efficient technology factor with respect to the cost and climate conditions of Cholistan that could reduce hardships of the inhabitants.
5. There is a need to formulate research studies to determine the land roles in seasonal migration and to measures and manage the problems of the environmental crises and degradation.
6. The most important initiative that has to be introduced in different schemes for drinking water for human and livestock to reduce the environmental crises like droughts faced in the years of 1998 to 2003. Construction of water sources for the nomadic people of Cholistan is necessary in those villages where there is no water at all. These areas are commonly difficult to access like Jasser where there is no source of drinking water. Safe drinking water should be provided because in all study areas people are forced to drink unhygienic and contaminated water as there is no option available.
7. The grazing pasture is increased as time passes so there is a need to manage them and create some new ways especially in growing season. Better management of grazing pastures would affect livelihood positively because livestock is essential for nomadic people and are in large number because the environment is unique for livestock herding

and it is also a tradition among nomads to enhance the animal population as a symbol of richness and pride.

8. The institutional credit facilities should be provided to the farmers in the cultivation areas for installing tube wells where underground water is available for irrigation. To improve feed and fodder security, the cultivation of appropriate varieties of fodder crops should be introduced in the area. Local communities should be mobilized for re-plantation of multipurpose and fast growing fodder trees, shrubs and grasses in order to fulfill the feed, timber and fuel needs of the dwellers of the deserts.
9. Government should facilitate to explore the new resources for the healthy livestock production for desert dwellers. It will increase their income in Cholistan. There should be farms for livestock and construct infrastructure like roads to provide access to open market selling the byproducts.
10. There is an urgent need to design some regulatory framework for livestock to increase due returns to the nomads of Cholistan like Shadbad livestock Farm in Cholistan.
11. Strategies should be adopted to improve health, education, and transport and communication system in the Cholistan desert and also make a plan to maintain and monitor these facilities time to time. Existing health center and schools for boy and girls need more attention and improvement especially in the context of human resources like teacher and doctor and medicines, equipment and other facilities. Various incentives may be offered to the staff posted in the desert area like providing scholarships to the children, awarding high scores in posting periods in deserts during departmental promotions, etc
12. Mobile dispensaries for human and livestock, that could cover long area, may be more effective in improving the living conditions and livelihood in the desert.

REFEREENCE

- Ahmad, F. (2008). Runoff Farming in Reducing Rural Poverty in Cholistan Desert. *Sociedade and Nature* , Uberlandia , 177-188.
- Akram, M., & Abdullah, M. (2005). *Wind Erosion and Sand Dunes Stibilization in the Cholistan Desert* . Bahawalpur: PCRWR Bahawalpur.
- Ahmed A. and M. Ghaffar 1979. Some Aspects of Pastoral Nomadism in the Sudan Khartoum, Sudan: Sudan National Population Committee/The Economic and Social Research Council.
- Ahmad F. 2002. Socio-economic dimension and ecological destruction in Cholistan PhD. Thesis, Department of Geography, University of Karachi, Pakistan.
- Akbar G, Arshad M. Developing sustainable strategies for Cholistan desert: opportunities and perspectives. *Science Vision* 2000; 5: 7785.
- Akbar G, Khan TN, Arshad M. Cholistan desert, Pakistan. *Ranglands.*; 18 (4): 124-128 1996
- Arshad M, Akbar G, Rashid S. Wealth of medicinal plants of Cholistan desert, Pakistan: conservational strategies. *Hamdarad Medicus* 2003; XLV: 2534
- Arshad M. Rao AR. Flora of Cholistan desert (Systematic list of trees, shrubs and herbs). *J Econ Tax Bot* 1994; 18: 61525.
- Arshad M, Rao AR, Akbar G. Masters of disaster in Cholistan desert, Pakistan: pattern of nomadic migration. UNEP
- Ahmad, Farooq (1999b). "Ecological restoration in cholistan" UNEP: Desertification Control Bullentin 35, pp.50-54.
- Ahmad, F. 2006. Agro-pastoral System in Cholistan
- Anil K. G. Seminar on Control of Drought Desertification and Famine – 17-18th May 1986, India International Centre, New Delhi.
- Arshad, M., A.R. Rao and G. Akbar 1999. Master of Disaster in Cholistan Desert, Pakistan: Patterns of Nomadic migration UNEP Desertification Control Bulletain, 35:33-38.

Beck, Lois. 1978. Woman among the Qashqa'I Nomadic Pastoralists in Iran. In *Woman in the Muslim World*. Lois Beck and Nikki Keddie eds, Cambridge, MA: Harvard University Press. Pp. 351-373.

Cholistan Desert (Pakistan) Case Study.

Department, I. a. (2007). *SURFACE WATER QUALITY MONITORING PLAN*. Lahore: Government of the Punjab.

Deshingkar, P. (2004). Improved Livelihoods In Improved Watersheds: Can Migration? *Watershed Management Challenges* (pp. 1- 10). New: Indian Council of Agricultural Research- International Water Management Institute- International Crops Research Institute for the Semiarid Tropics(IWMI).

Deshingkar, P., & Start, D. (August 2003). Seasonal Migration for Livelihood in India : Coping, Accumulation and Exclusion. *Overseas Development Institute* , 4 - 31.

Farooq, U., Ahmad, M., & Saeed, I. (2010). Livestock Productivity in the Desert Ecologies of Pakistan:. *Livestock Productivity in the Desert Ecologies of Pakistan:* , pp. 1-27.

Food and Agriculture Organization (FAO), Pakistan–Cholistan Area Development Project. Report No. 59/53 ADBPAK 58 (Final version), Rome: FAO, 1993.

Goldstein, M.C and C. M. Beall. 1988. Change and Continuity in Nomadic Pastoralist on the Western Tibetan Plateau.

Hunter, L. M. (2007, June). *Climate Change , Rural Vulnerability and Migration* . Retrieved from Population Reference Bureau.

Jowkar F., M. Ajmal. M. and M. Khan. 1996. Socio-economic dimensions of resources management in Cholistan. Institute for Development Anthropology (IDA), Binghamton, New York.

Khan, A. and R. Anania. 1996. Productivity Constraints of Constraints of Cholistan Farmers. *The Pakistan Development Review*, Pp. (35) (4).

Kaka, M. S. (2007). Effects of Drought on Livestock Sector in Balochistan Province of Pakistan. *International Journal of Agriculture and Biology* , 657-665.

Kniveton, D., Smith, C., & Wood, S. (2011). Agent - based model simulations of future changes in migration flows for Burkina Faso. *Global Environmental Change* , 1 - 7.

Koubi, Vally; Schaffer, Lena; Spilker, Gabriele; Bernauer, Thomas. (2009). Environmental Degradation and migration. *Center for Comparative and International Studies/Institute for Environmental Decisions* , 1 - 29.

kumar. (2008). Circular migration in Madhya Pradesh: changing patterns and social protection needs. *The European Journal of Development Research* , 612-628.

Leybourne M., M. Jaubert and N. Tutwiler. 1991. Change In Migration And Feeding Patterns Among Semi-Nomadic Pastoralists in Northern Syria.

Martin, d. 2003. Department of Economic History. *European Review of Economic History*, 7:271-299.

Ndaruga, A. M. (2010). *Reducing vulnerability among pastoralists in northern Kenya*. Canada: IDRC CRDI.

Pakistan Council of Research in Water Resources (PCRWR). 2004. Pre-project

PCRWR. (Publication No. 130/2004.)

Pakistan Council of Research in Water Resources (PCRWR). 2009.

PADMU (1986), Desertification Process in Cholistan desert,"PCRWR publication No. Pakistan Desertification Monitoring Unit 7/86, PP.155.

Swift, J. 1977. Sahelian pastoralists: underdevelopment, desertification and famine *Annual Review of Anthropology*, 6:457-78.

Samal*, C. K. (December 2006). Remittances and sustainable livelihoods. *Asia-Pacific Development Journal* , Vol . 13 72 - 92.

Socio analysis of 25 selected settlements in Cholistan desert. Islamabad,

Sharif, C. I. 2003, An Empirical Analysis of the Determinant of Rural Poverty in Pakistan: A case study of Bahawalpur District with special reference to Cholistan. PhD. Thesis, Bahaddun Zulkriya University, Multan.

Smita. (May 2008). Distress Seasonal Migration . The Consortium for Educational Access, Transitions and Equity (CREATE) , Page 1 to Page 43.

Warde, A. (1992). *The Unplanned Society*. New York: Columbia University Press.