

Comparison of Income and Expenditures of Nomads Pastoralists in Irrigated Areas and Desert Areas of Cholistan under Varying Environmental Conditions

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Introduction

Based on topography, parent material, soil and vegetation, the whole Cholistan desert can be divided into two geomorphic regions i.e. Lesser Cholistan and Greater Cholistan. The Lesser Cholistan borders canal irrigated areas to the bed of abandoned river “Hakra” in the desert and covers an area about 7770 km². Greater Cholistan which borders with India in south covers an area of about 18130 km² (Akhter and Arshad 2006).

The Lesser Cholistan consists of large saline alluvial flats locally called “dahars” alternating with low sandy ridges. The clayey flats of lesser Cholistan are generally saline or saline-sodic, with pH ranging from 8.2 to 8.4 and from 8.8 to 9.6, respectively. Homogenous to a depth ranging from 30 to 150 cm. These soils are classified as either The Greater Cholistan is a wind resorted sandy desert and comprised of river terraces, large sand dunes, and less depressions (Arshad et al., 2006).

The Climate of Cholistan desert is characterized by low and sporadic rainfall. The mean annual rainfall varies from less than 100 mm in the west to 200 mm in the east. Rain usually falls during monsoon (July through September) and in winter and spring (January through March). Monsoon rains occur mostly in heavy showers. Cholistan is one of the hottest regions in Pakistan. Temperatures are high in summer and mild in winter. The mean summer temperature (May, June) is 34°C with highs reaching more than 51°C. Aridity is the most striking feature of Cholistan desert with wet and dry years occurring in clusters. The annual rainfall may occur during as few as 11 days, although the spatial variation among the rainfall zones may be greater from year to year for entire area (Akhter and Arshad, 2006).

Pastoralism is an ancient way to use dry land areas, well adapted to the challenges of maintaining productive and sustainable livelihoods. Pastoralists, both nomadic and transhumant are a large and significant minority in the region. Because their cultures and land management systems are poorly understood, they are subject to myths and misconceptions.

The pastoral system is characterized by mass migration of animals and people throughout the year in search of water and forage. The onset of monsoon and distribution of rainfall mainly dictates the pattern of movement of nomadic herders. Around the month of March to April, nomadic household move towards surrounding irrigated areas faced there by rising temperature in the desert and depleted feed and water resources. The incentives for this movement include temporary employment opportunities with in the

irrigated farming community, 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.

Pastoral nomadism is not only an environmentally sustainable way of managing the Cholistan drylands, but it could extend support to national dairy and meat consumption requirements. The likelihood of an increase in the number of livestock, by making feed supplement more accessible and affordable in the dry seasons, could be reduced by increasing off take through marketing of animals for urban consumption. Support for the livestock sector will automatically increase herders' income and increased off take through marketing, reduces the likelihood of overgrazing. It reveals that sustainable use of resources with the promotion of indigenous technology will benefit the local people.

Objectives

The pastoral nomads of Cholistan desert keep large flocks of sheep, goats, camels and cows. Livestock produce meets their daily food needs and surplus livestock and livestock products are sold to get money for other domestic uses. Today these pastoral nomads are passing through a critical situation because of the economic and ecological changes that have been taking place in the region. Due to environmental stresses such as regular or prolonged droughts, the economy of the desert dwellers is severely affected. Therefore keeping in view the sufferings of nomad desert dwellers of Cholistan desert the present study is being envisaged with the following objectives:

1. To evaluate economic analysis, including income and expenditure of nomadic pastoralists of Cholistan desert.
2. Compare income and expenditures of nomadic pastoralists in irrigated areas and desert areas separately.
3. To find out reasons of migration form irrigated areas towards desert areas and from desert areas towards irrigated areas.

Literature Review

Starr (1987) reported that the apparently reduced ability of the pastoral sector in central Niger to deal with environmental variability is considerably more complex than arguments emphasizing only exogenous forces would suggest. It is impossible to deny that increasing aridity, demographic pressure on a fragile resource base and colonial efforts to dismantle indigenous institutions have contributed to the increasing difficulties experienced by the pastoral sector in the past two decades. At the same time, as we have shown, analysis of the internal dynamics of the pastoral sector - particularly in terms of producers' differential abilities to bear risk, and flows of people and resources into and out of this sector – is equally important in understanding the nature and causes of the difficulties.

Goldstein and Beall (1988) evaluated the change and community in nomadic pastoralism on the Western Tibet Plateau. Nomadic pastoralism on the Tibet changtang flourishes. This paper gave an overview of the situation of Tibet's nomadic pastoralists and pays particular attention to ecology and traditional subsistence economy. Severe environmental conditions preclude farming. Livestock products earn substantial portions of the Tibetan foreign exchange. These are factors encouraging nomadic pastoralism. The impact of direct Chinese control in 1959 is also dealt with. Pastureland is not being expropriated from

the pastoralists. In spite of ill thought-out development projects there has been no inducement for nomads to resettle. A net effect of the Chinese "reform" policies has been revitalization with increased economic independence since 1981 in spite of potential problems.

Arshad et al. (1999) described the pattern of nomadic migration in Cholistan desert. The authors elaborated the seasonal responses and graze able periods along with the migration of nomads of Cholistan desert during pre-monsoon (summer), post-monsoon (autumn), winter and spring with in the desert.

Roy (2006) reported lack of response and action to climate change in South Asian Region is limited by the availability of information about the balance between economic cost of damage and benefits of reduction of damages in the short run. It was direct assessment of climate variability prediction on income, human development and the environment in the context of countries in South Asia.

Economic indicators of Nomads of Cholistan Desert.

Economy of nomads of Cholistan Desert is influenced by a large number of economic indicators. Fifteen indicators are taken in this paper.

1. Sex: Male-female ratio is taken there as independent variable, means who are the head of household.
2. Age: Age means number of years after born. Age of head of household is taken as independent variable.
3. Total Cultivated Land (TCL): Total cultivated land means total area used for cultivation of crops. This indicator is very important for the analysis of income because mostly nomads have land but all land is not cultivated due to unavailability of water and unfertile soil. This indicator is taken as independent variable.
4. Total Number of Livestock in Irrigated Areas (TLI): Total number of livestock means livestock holds by respondent in irrigated areas of Cholistan Desert. It is taken as independent variable.
5. Health Status (HS): Health status means health of respondent, it is measured as respondent have any disease or not. It is taken as independent variable.
6. Education Status (ES): Education status means education of respondent and it is measured as respondent can read and write or not. It is taken as independent variable.
7. Total number of Livestock in Desert Areas (TLD): Total number of livestock means livestock holds by respondent in desert areas of Cholistan. It is taken as independent variable.
8. Financial Support from Government (FSG): Financial support from government was taken as independent variables. It was the most important independent variable which affected the income of respondent during the drought period.
9. Cultivated Crops in Irrigated Areas (CCI): Crops cultivated in irrigated areas were considered as independent variable.
10. Total Land of respondent (TL): Total land of respondent was taken as independent variable. It was the total land owned by respondent in the irrigated areas.
11. Total months in Irrigated Areas (TLM): Total months stay of nomads in irrigated areas was considered as independent variable. Stay of nomads in irrigated area varied between six to eight months.
12. Income in Irrigated Areas (y1): Income in irrigated areas means annual income of respondent earned from different sources in irrigated areas of Cholistan Desert. It is taken as dependent variable.
13. Income in Desert Areas (y2): Total income in desert areas was taken as dependent variable.

14. Expenditures in Irrigated Areas (y3): Total Expenditures in irrigated areas was taken as dependent variable.
15. Expenditures in Desert Areas (y4): Total Expenditures in desert areas was taken as dependent variable.

Materials and Methods

An overwhelmingly large part of study is based on the primary source of data. The present study is primary based on the household survey data as collected by the author during April-September 2008. The household survey was conducted and information recorded from two hundred household in a cluster sample of Cholistan consisting on ten villages (Chaks). A two-stage Area sampling was used, at first stage households was selected and at the second stage the male as a head of household was interviewed.

Primary data on economic conditions of nomad's pastorals of Cholistan desert was collected by interview technique by going door to door in Cholistan desert and the interview schedule was a set of Questions in a Questionnaire form which has been filled by the interviewer. In this study, major emphasis is on the analysis of economy of nomad pastorals by econometric analysis of income of nomads in irrigated areas of Cholistan Desert.

Logistic Regression Analysis

The dependent variable in logistic regression is usually dichotomous, that is, the dependent variable can take the value 1 with a probability of success Θ or the value 0 with probability of failure $1-\Theta$. Consider a collection of k independent indicators, thus the general form of the Logistic regression is

$$\theta(x) = \frac{e^{(\alpha + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_k x_k)}}{1 + e^{(\alpha + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_k x_k)}} \quad (1)$$

Where α = the constants of the equation and β = the coefficient of the predictor variables. The log odds has the linear relationship

$$\text{Logit} [\theta(X)] = \text{Log} [\theta(x)/(1-\theta(x))] = \alpha + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_k x_k \quad (2)$$

Logistic regression calculates the probability of success over the probability of failure, therefore, the result of the analysis are in the form of an odds ratio.

Results and Discussion

Economy of the nomads of Cholistan desert can be divided in to two parts economy of the nomads when they stay in the desert and economy of the nomads when they are at irrigated areas. In irrigated areas nomads have their own land and in desert they have their own "Tobas". Sources of income in irrigated areas are more like Crops production, livestock production, embroidery, job in different sector etc. But in desert areas the nomads have only two sources of income i.e.' Khar' Production and livestock production. Livestock production is the same source of income by which the nomads benefits, either they are in irrigated

areas or in desert areas. There all the income of nomads in irrigated areas is better than that of desert areas and expenditures are higher as shown in table 1. As main source of income in irrigated areas is livestock and for free grazing of livestock nomads move towards desert there livestock on highly nutritious grasses and shrubs. When these are at irrigated areas they fed fodder crop and become a bigger source of income and boost the economy of nomads staying at irrigated areas. Where as when they are in the desert area they just sell their livestock when they need money for their expenses. No doubt the income of nomads of Cholistan desert is less when they are in the desert but at the same time they have less expenditure for their household management.

Income in Irrigated areas is positively affected by better education and better health of respondent. It is notified that respondent have more area of cultivated land earn more income. Expenditures of respondents in irrigated areas are affected by types of crops cultivated, people cultivate different types of crops and it is observed that expenditures on wheat and cotton are more than any other type of crop. Expenditures in irrigated areas also depend on total land holding by respondent, total number of months spends in irrigated areas and total number of livestock. Rather than income in desert areas is highly effected by the variables like sex, total number of livestock in desert and financial support given from government during drought years.

Expenditures in desert are affected by total number of livestock. Respondent holding more number of livestock bear higher expenditures as compared to others, who have less number of livestock.

Table 1 Income and Expenditures in Irrigated Areas and Desert Areas of Cholistan

Economy of Irrigated Areas(12 Months)					Economy of Desert (Six Months)			
Statistics	Total Income	Total Exp.	Exp. on Livestock	Exp. on Household	Total Income	Total Exp.	Exp. on Livestock	Exp. on Household
Average	133600	45000	8035	28050	40000	3550	1500	1500
Minimum	600	4260	0	2180	0	150	0	100
Maximum	2751100	1551700	125150	800000	1100000	87600	62000	60000

Econometric Analysis**Table 2 Logistic Regression Model**

Model	Variables	Co-efficient	S.E	P-Value	OR	C.I	
						Lower	Upper
Income in Irrigated Areas	TCA	0.069	0.034	0.042	1.072	1.002	1.146
	HS	-1.169	0.392	0.003	0.311	0.144	0.669
	ES	1.159	0.32	0	3.187	1.703	5.964
	Constant	-790	4.29	0.038	0.454		
Income in Desert Areas	SEX	-6.828	14.209	0.631	0.001	0	1.35E+09
	TLD	1.034	0.314	0.001	2.813	1.519	5.206
	FSG	1.018	0.328	0.002	2.769	1.455	5.269
	Constant	4.538	14.216	0.75	93.54		
Expenditures in Irrigated Areas	CCI	0.092	0.055	0.095	1.096	0.984	1.221
	TL	-0.101	0.043	0.019	0.904	0.831	0.983
	TMI	-0.269	0.148	0.069	0.764	0.572	1.021
	TLI	0.098	0.042	0.02	1.103	1.015	1.197
	Constant	1.273	1.035	0.219	3.57		
Expenditures in Desert Areas	TLD	.009	0.003	0.001	1.009	1.004	1.015
	Constant	-0.485	0.242	0.045	0.616		

OR : Odd Ratio, S.E : Standard Error C.I : Confidence interval

The results of the Logistic regression analysis showed that most significant predictors that influence economic status in Cholistan desert are health and education status of respondent followed by total cultivated land, total number of livestock and financial support from government. Income of educated people in irrigated areas is 3.0 times more than uneducated people. People have cultivated land endure 1.0 times more expenditures than those who have not cultivated land. In desert areas income of people who received financial support from government is 2.7 times more than those who do not receive financial support from government. People who have large number of livestock in desert areas earned 2.8 times more income than those who have less number of livestock. People in irrigated areas have livestock endure 1.1 times more expenditures than those who have not livestock. People who cultivated different types of crops endure 1.0 times more expenditures than those who cultivated same type of crops. People who have large number of livestock endure 1.0 times more expenditures than those who have less number of livestock in desert areas.

Concluding Remarks

- The results of present study indicated that majority of household in the surveyed area of Cholistan desert are saraiki speaking. There is the traditional extended family and clan system in areas. The area is lacking basic facilities such as no electricity, no basic rural health centers, no safe drinking water and no schools for boys and girls.

- As Cholistan is considered as rural areas of Pakistan and similarly family size of household is also big as half of houses of sample population showed that household members were in the range between 6—10. As more members in a family higher their expenditures.
- Seventy one percents nomads staying at cultivated lands, earn their income from cultivating crops along with livestock keeping which ranged between Rs. 1,00,100/- to 2,00,000/- and their expenditures are in the range of Rs20,100/- to 35,000/-.
- During the stay of nomads in desert areas income is low as compared to irrigated areas where it ranged between Rs.1000/- to 50,000/-. Instead of this low rate of income nomads move towards desert due to their tradition, for better health of their livestock and for free grazing in desert.
- Number and specification of livestock are different in both irrigated and desert areas. In irrigated areas buffaloes and goats are common and in desert areas camels and sheep are commonly holding by mostly people. In desert areas number of livestock is greater and there is no crop production. In desert area, number of camels is greater as compared to irrigated areas where population of buffaloes is high.
- Crop production being the second major source of income of nomadic pastoralist after allotment of lands by government. Pastoral nomadism is not only an environmental sustainable way of managing Cholistan desert dry lands but it could support national dairy and meat consumption requirements.
- Movement of people from desert areas towards irrigated areas and from irrigated areas towards desert areas take place two reasons.
 - i. To earn more income
 - ii. To save their own life and life of their livestock
- People earn more income in irrigated areas as compared to desert areas of Cholistan. People endure more expenditure in irrigated areas as compared to desert areas of Cholistan desert.

Recommendations

- It is recommended that different schemes should be initiated to improve the water supplies, to reduce water losses, to make more efficient use of available water and to develop new water resources. Especially availability of water should be ensured to those villages where water is not enough for the cultivation of crops. With the availability of water supply and improvement of available water resources the income of the desert dwellers could be enhanced which ultimately will help in better household strategies.
- Construction of water reservoirs in those villages where drinking water is not available and people bring their drinking water from far flung areas. In 95DNB local people are forced to drink unhygienic water and their health is at risk.

- The grazing pressure should be reduced in the desert area, particularly during the growing seasons. The reduction in animal's number might be helpful in this regard, which seems not possible because there is a trend between the nomads of the area to enhance animal's population.
- Existing health center and dispensaries for human population and livestock should be improved by providing medicines, equipments and other facilities.

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