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Title

ECONOMETRIC ANALYSIS OF INCOME OF NOMADS IN

IRRIGATED AREAS OF CHOLISTAN DESERT

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ABSTRACT:

Economy of any rural areas depends on different types of economic indicators. The economic indicators which affect the income of nomads in Cholistan Desert are described in this paper. Economy of the nomads of Cholistan desert can be divided in to two parts, i) economy of the nomads when they stay in the desert and ii) economy of the nomads when they are at irrigated areas. Nomads earns more income in irrigated areas as 71% earn their income in the range of Rs. 1,00,100/- to 2,00,00/-. The present study revealed about the factors which influence the income of nomads in irrigated areas of Cholistan Desert. The study was econometric and income is estimated by using Binary Logistic Regression Model on 200 sample data taken from ten different villages of Cholistan Desert.

INTRODUCTION:

More than 45% people in Pakistan generate income from agriculture sector and the cultivable wasteland in Cholistan (Bahawalpur and Rahimyarkhan,) is 6.6 million acres with 1.2 million inhabitants. Since 1978, only 350000 acres were allotted to its 30000 applicants while 5784 applications are still pending. All the people who were allotted the lands are now in better economic conditions as compared to the majority of the poor landless 'Rohailas' (Cholistan). The allotment of the land is banned regardless of the promises and commitments made by the successive governments to allot the land to the landless 'Rohailas'. It seems that the government wants to bring these 'Rohailas' and people in other parts of the country to the same fate as of tenants in 'Pirowa'l and 'Okara' (Roshan, 2006).

The economy of nomads of Cholistan Desert entirely depends on fragile and meager natural resources associated with inconsistent rain pattern. Job opportunities are confined to labour in agricultural fields or other minor activities due to lack of education or skilled training. In Cholistan desert most of the nomads live below poverty line in the absence of basic human needs like clean drinking water or sufficient food, health and education for their children. Livestock breeding, improvement of performance or range management is not practiced scientifically (Sharif, 2003).

The total human population of Cholistan desert is around 120,000. The economy of the region is predominantly pastoral. People have practiced a nomadic life style for centuries. Large herds of camels, cattle's, sheep, and goats are owned by the nomads. The area is not served by modern communication system and can be traversed by either camels or jeeps. Local people use camels as a mode of transportation. Habitations are small and extremely scattered (Ahmad, 2002).

The nomads and their herds return back to the desert around July or August with the news of first monsoon showers. Distance traveled during this migration varies 10 to 100 Km. While in the desert natural vegetation is the main source of feed for grazing livestock. Tobas serves as drinking water both for nomads and their livestock. Tobas are made in clayey that locally called dahars in catchments area to avoid heavy water percolation. Tobas belonging to the same clan are generally located to each (often 1 Km radius). At the start of the rainy season, livestock graze with in one or 2 km radius of each Toba. This distance increase about 15 km as the season progress. During October and November, when water resources become almost totally depleted, each clan moves its herds to semi-permanent centers equipped with a serious of traditional (hand-dug and unlined) wells and kunds (usually lined) (FAO 1993).

The nomads manage their mixed livestock in such a way that milking cows are moved near by the urban centers where milk is sold readily while other animals like camels, goats, sheep and bullocks are kept in the desert for grazing. Nomads attach high values to their herds. Livestock are the main source of their survival and a number of cultural norms are frequently used meat, milk and gifts. Communal ceremonies like weddings, funerals, and tribal celebrations include slaughtering and exchange of animals. A person's status in the desert nomadic life style is chiefly represented by the size of the herds he owns. (Arshad, et al. 1999).

OBJECTIVES:

Keeping in view the environmental changes in the Cholistan, it is important to study the income of desert dwellers. Such a study could help in formulating the poverty reduction and up lift of Cholistan desert nomads in changed environment. Such a study could also be benefited for NGO's especially which are working for poverty alleviation and socio-economic up lift in

Cholistan and build on the existing resources for community development through improvement in infrastructure, job creation and human resource development. However, the main objectives of this study are

1. Evaluate income of nomads of Cholistan Desert to find out economic status in irrigated areas of Cholistan Desert.

2. To find out different sources of income of nomads of Cholistan desert.

3. Find out the major variables effects the income of nomads in irrigated areas of Cholistan Desert.

LITERATURE REVIEW:

Khan et al. (1996) examined the factors behind low crop yield in Cholistan. Both the quantitative and qualitative analysis showed how the low levels of agricultural productivity in this area may be linked to material and climatic factors. The quantitative analysis was mainly focused on physical factors. The qualitative analysis, however, emphasises that relative inefficiency of agricultural activity in Cholistan reflected the influence of physical, economic, social and, most importantly, climatic factors.

Ajmal et al. (2001) described the problems and sustainable development of cholistan desert communities through various resources and sampled the available recourses such as vegetation resources, livestock resources, soil resources and water resources.

Sharif (2003) explained that extent, nature, structure and determinants of rural poverty was a pre condition for effective public action to alleviate poverty in rural areas of Pakistan. The major concern of this study was to explore the determinants of poverty in Pakistan with a case study of Cholistan in Bahawalpur district. In this study an attempt was made to analyze the economic, social and demographic characteristics of households in poverty and a detailed poverty profile based on the household survey data of a cluster sample of Cholistan. In addition, the author performed an econometric analysis in terms of income and logistic regression models looking at the determinants of rural poverty for empirical analysis.
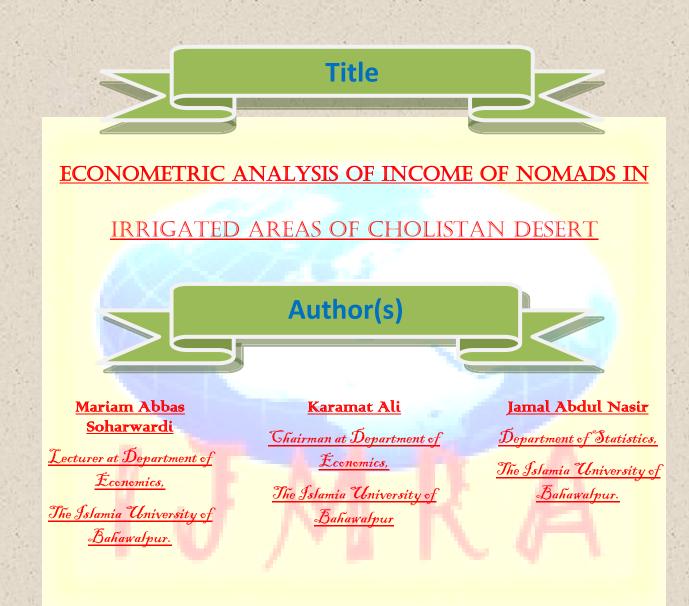
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Ahmad (2006) described the agro pastoral systems in cholistan and repeated that the cholistan desert has extreme summer temperatures (50oC plus) and prolonged droughts rearing is the only age-old profession of the nomad pastoralists of this desert. Pastoral system is characterized by mass migrations of animals and people throughout the year in search of water and forage. The onset of monsoon and the distribution of rainfall mainly dictate the pattern of movement of nomadic herders. Livestock are the main source of their survival and a number of cultural norms are linked with the animals. The major constrains to the nomadic system are very poor quality of drinking water and inadequate feed, both of which are acute during summer.

ECONOMIC INDICATORS OF NOMADS OF CHOLISTAN DESERT:

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

- Sex (x1): Male-female ratio is taken there as independent variable, means who are the head of household.

- Age (x2): Age means number of years after born. Age of head of household is taken as independent variable.

- Total Cultivated Land (x3): 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.

- Total Number of Livestock (x4): Total number of livestock means livestock holds by respondent in irrigated areas of Cholistan Desert. It is taken as independent variable.

- Health Status (x5): Health status means health of respondent, it is measured as respondent have any disease or not. It is taken as independent variable.

- Education Status (x6): Education status means education of respondent and it is measured as respondent can read and write or not. It is taken as independent variable.

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- Income in Irrigated Areas (y): 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.

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 2007. 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 Ө or the value 0 with probability of failure 1-Ө. Consider a collection of k independent indicators, thus the general form of the Logistic regression is

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

(1)

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

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$$\text{Log it } \left[\theta\ X\ \right] = \text{Log}\left[\theta(x)\,/(1-\theta(x))\right] \quad =\alpha+\beta_1 x_1 +_{\beta 2 X 2}+\ldots\ldots\ldots+\beta_k x_k \qquad (2)$$

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.

STRATEGIES IN MODEL SELECTION:

As we have number of explanatory variables that should include all the important (influential) factors, but the actual subset of predictor variables that should be used in the model need to be determined. When the number of variables increases, the selection process becomes harder. Fitting all possible models is impractical when the number of dimensions exceeds three, and it helps to have guidelines.

Stepwise selection of variables has been widely used in linear regression. Most major software packages have either a separate program or an option to perform this type of analysis. At one time, stepwise regression was an extremely popular method for model building. Methodology for performing stepwise logistic regression has been available for much less time [Hoshmer, wang, Lin, and Lemeshow (1978)]. Among major software packages only BDMP offers a program for stepwise logistic regression. We feel that the procedure provides a useful and effective data analysis tool.

Any stepwise procedure for selection or deletion of variables from a model is based on a statistical algorithm which checks for the "importance" of variables, and either includes or excludes them on the basis of fixed decision rule. The "importance" of a variable is defined in terms of a measure of the statistical significance of the coefficient for the variable.

RESULTS AND DISCUSSION:

The results showed that there are three major sources of income in irrigated areas of Cholistan desert i.e. crops, livestock and embroidery. Other sources included jobs in different sectors, like teaching in schools or in government institutes, labor with the farmer or in some

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factories etc. Sources of income along with income generated from these sources by nomads of Cholistan desert in irrigated areas are incorporated in table 1.

Table 1:

Sources and annual income (Rs.) of nomads in irrigated areas of Cholistan desert

Sr. No.	Sources of Income(Rs.)	Average Income(Rs.)	Maximum Income(Rs.)	Minimum Income(Rs.)
1	Crops	78113.6	685000	200
2	Livestock	81805.7	888000	1000
3	Embroidery	7895.01	150000	0
4	Other Sources	11739.5	100000	0

Source: Survey

Maximum average annual income is earned from livestock, crops and other sources and minimum average annual income is generated by embroidery. So far as range of average annual income is concerned, the income from livestock ranged from Rs.1000/- to Rs.8,88,000/-, from crops range of income was Rs.200/- to 6,85,000, from embroidery the annual average income was Rs.0.00 to Rs.1,50,000/- and from other sources the average annual income ranged from Rs.0.00 to Rs.1,00,000/- .

Livestock in irrigated areas include cattle, buffaloes, sheep, goats and camels. Populations of livestock in irrigated areas are described in table 2. Maximum numbers of animals (500) were recorded by sheep and goats and minimum (40) by camels, whereas population of animals recorded by cattle was 150 and buffaloes 170.

Table 2:

Number of Livestock in Irrigated areas

Sr. No.	Livestock	Maximum	Minimum	Average
1	Cattle	150	0	6
2	Buffalos	170	0	6
3	Sheep	500	0	17
4	Goats	500	0	34
5	Camels	40	0	1

Source: Survey

Nomads of Cholistan desert generate income from different products of livestock like milk, wool, goat hairs, and meat. During the drought period (environmental stress) the nomads of Cholistan desert sell almost half of their livestock for the safety of their income.

Second major source of income in irrigated areas is by crop production. Table 3 showed that major crop cultivated in irrigated area is wheat and 35% people of the area are directly involved in the production of wheat and remaining is indirectly involved. Other crops grown in the area are cotton, sugarcane and mustard. These crops are grown in different groups and 43% people of the area select different groups of crops for their income.

Table 3:

Majors crops cultivated in irrigated areas of Cholistan Desert.

Sr. No.	Group of Crops	Frequency	Percentage
1	Wheat	69	**34.5**
2	Mustard	5	2.5
3	Mustard, Sugarcane	7	3.5

4	Wheat, mustard, cotton, sugarcane	86	**43**
5	Wheat, mustard, cotton	10	11
6	Wheat, Sugarcane	4	2
7	Wheat, Cotton, Sugarcane	18	9
	Total	200	100

Source: Survey

ECONOMETRIC ANALYSIS OF INCOME:

Logistic Regression Model (Backward Stepwise Regression Method)

Model	Variables	Co-efficient	S.E	p-value	OR
Income in Irrigated Areas	Total cultivated land	0.069	0.034	0.042	1.072 (1.002--1.146)
	Health Status	-1.169	0.392	0.003	0.311 (0.144--0.669)
	Education Status	1.159	0.32	0	3.187 (1.703--5.964)
	Constant	-790	4.29	0.038	0.454

OR: Odd Ratio, S.E: Standard Error, C.I: Class Interval, P-value: Level of Significance

In irrigated areas income of respondent is highly affected by three variables as shown in model, total cultivated area, health and education status of respondent remaining variables was excluded from the model by using stepwise regression method. Respondent have more cultivated area, earn more income. Similarly health and education shows positive affect on the income of respondent. Income of educated people in irrigated areas is 3.0 times more than uneducated people. Sex and age are used as independent variable in model, showing minimum effects on the income of respondent in irrigated areas. Major indicators highly effect the income of respondent in irrigated areas are total cultivated land, more area cultivated by respondent showed more income, similarly respondent with better health and education showed high level of income.

CONCLUDING REMARKS:

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. 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 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.

Cholistan desert is one of the most under-developed and highly degraded region of the country. The people lack even basic amenities of life. Their socio-economic profile is nomadic pastoral and livestock production is the major economic activity. Scarcity of water and lack of adequate infrastructure are among the major constraints for the development of this arid tract. Lack of roads and communication has hampered the development of this area by making its accessibility very difficult for the people and officials.

Sample population showed that male is dominant as a head of household in Cholistan desert. Male-female ratio as a head of household play an important role to earn income in desert areas as males play effective role to graze their livestock as compared to females.

Age of the household head ranged between 31 to 45 years is common in this Cholistan desert. Respondent with this age group showed better health and health plays a very important role to earn more income.

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/-.

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.

RECOMMENDATIONS:

Special attention should be given towards education because education will help in providing awareness among the people. Schools should be opened in each village and all facilities should be provided to attract students towards education which ultimately boost up the income of nomads of cholistan desert.

Vegetation resources available in Cholistan desert are insufficient and it is recommended that these resources should be enhanced for the healthy livestock of desert dwellers. Ultimately, it will help in increasing the income of the Cholastani people.

Expansion of national health, education, population and nutrition programs that include services to the population of Cholistan desert and a focus on primary services.

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