Pak. J. Agri. Sci., Vol. 42(1-2), 2005

LIVELIHOOD ASSETS AND LIVELIHOOD STRATEGIES OF SMALL FARMERS IN SALT RANGE: A CASE STUDY OF PIND DADAN KHAN DISTRICT JHELUM, PAKISTAN

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This paper investigates the livelihood assets along with strategies and land management practices used in the salt affected areas near the Khewra Salt Mines. The effect of brackish water on crops, copping strategies, farm and off farm income and off farm work type, other sources of livelihood like pension and remittances were probed in detail with in context of five livelihood capitals. We find that little profitable opportunities exist to increase agricultural production, household incomes and achieve more sustainable land management in the salt range area of P.D. Khan. For sustainable livelihood improvement of crop production, using FYM, effective utilization of rainwater with very little application of brackish ground water for irrigation; improved livestock management; and diversification of livelihoods towards non farm activities are of utmost importance. The comparative advantage of people in the foothills of salt range is not only in intensive wheat production but also more in other alternative activities. As a result, greater emphasis on developing these alternatives in agricultural extension and other development programs may be fruitful.
Key words: Salt range, brackish underground water; livelihood strategies

INTRODUCTION

The study was conducted in the foothills of the salt range nearby Khewra salt mines. The area is affected by heavy salinity and the condition is deteriorating overtime with the use of brackish underground water. The agricultural sector supports the Pakistani economy, and provides food for the 145 million populations, which is growing at a rate of 2.2% per annum. The country has a total area of 79.6 Mha, with 22.0 Mha cultivated (GoP, 1999), and 6.28 Mha affected by salt (Rafiq, 1990). Out of this between 2 and 3 Mha are categorized as wasteland due to high salinity and sodicity (Qureshi *et al*, 1993), but could be brought under cultivation by harnessing available water resources, improved water management, additional surface storage and introduction of better-adapted crops. Water logging and salinity have devastating social and economic effects on farming communities in Pakistan (Ijaz and Davidson, 1998), leading to lower standards of living, migration, health problems, the crumbling of houses, and damage to communications and transport (Hollington *et al* 2001).

The injudicious use of brackish under ground water is one of the major factors responsible for increased salinity leading to low crop production in Pakistan. Additionally, Pakistani economy is heavily dependent on agriculture through the exports of agricultural goods and the dependence of textile sector upon cotton crop. According to an estimate, about 6.0 million hectares of agricultural land in Pakistan is affected by salinity causing an estimated 62% loss in agricultural incomes (Davidson & Ijaz, 1997). Discussion of salinity has also been undertaken at the National and Provincial levels of government with a range of solutions and partial solutions being identified and implemented (IWASRI, 1991). These include changing the management of irrigation flows, investment in the upgrading of irrigation channels, research to determine the specific constraints on water use, and more recently, the use of alternative crops such as Eucalyptus trees and Atriplex saltbush that have been successful in the reduction of salinity in other parts of the world (Davidson & Ijaz, 1997). Very little research and development activities have been implemented in the study area infested with heavy salinity due to the presence of millions of tones of salts in the salt range. Negligible research has been done so far to explore the impact of salinity on the socio-economic conditions of small farmers. This study investigates into the livelihood assets and farmers coping strategies for sustainable livelihood in the presence of high salinity.

METHODOLOGY

The study was conducted in village Kaslian situated in the salt affected area of Tehsil Pind Dadan Khan, District Jhelum. The village is one of the representative sites for integrated research of Barani Village development Project (BVDP) and was selected following a comprehensive site selection criterion for conducting development-oriented research in the target area. At the first step diagnostic analysis was conducted by an informal method of investigation called Participatory Rural Appraisal (PRA) using group interviewing technique. Using this method rural

community was involved in analyzing: (a) production systems (b) problem diagnosis and (c) setting priorities. Construction of list frame of all the households at the sample village was taken as one of the most important activities of survey planning and serves as a prerequisite for a scientific survey. Therefore, for the selection of reliable and informative farmers, farm household profile through a list of sampling frame was prepared in the second step. Sample size was decided on the basis of number of households in the village and cultivated area owned. For the selection of a representative sample the population was divided into four farm size (<2 ha, 2-5 ha, 5-10 ha and >10 ha) categories. A total of 71 respondents (farmers) as given in Table 1, were interviewed by random selection from the selected site during 2002.

Table 1. Sample size by farm size at target site

Farm Size	Farm Households #	Sample #
< 2 ha	304	55
2-5 ha	94	15
5-10 ha	12	5
>10 ha	1	1
Overall	411	76

Data was collected through a well-developed and pretested questionnaire. Mainly cross tabulation frequency and percentage for different variables of interest were computed. Enterprise budgets were prepared and net incomes were calculated.

RESULTS AND DISCUSSION

Livelihood and Livelihood Strategies

As defined by Chambers and Conway, 1992 *livelihood is a* means of living, and the capabilities, assets and activities required for it. "A livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living". A livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base (Carney, 1998). Whereas livelihood strategies are the sum of all the different activities that people are doing in the context of their livelihood (Chambers and Conway, 1992).

As Hans et al (2003) have concluded that livelihood strategies can be a useful and quantifiable concept especially when exploring land and soil conservation measures. Conservation practices and investments need to be appropriate for the production system, agro-ecological conditions, and the livelihood strategy. The livelihood strategy framework has the potential to be an important tool in both the formulation and targeting of policy. To keep the wider picture of livelihood in mind livelihood framework is presented in Fig 1. Livelihoods are shaped by a multitude of different forces and factors that are themselves constantly shifting. People-centred analysis is most likely to begin with simultaneous investigation of people's assets, their objectives, the livelihood outcomes which they are seeking and the Livelihood Strategies, which they adopt to achieve these objectives as given by Department for International Development (DFID 2001).

Relationships between assets and their accessibility are very important for livelihood strategies of the people. Poverty analyses have shown that people's ability to escape from poverty is critically dependent upon their access to assets. Different assets are required to achieve different livelihood outcomes. For example, some people may consider a minimum level of social capital to be essential if they are to achieve a sense of well-being, or in a remote rural area, people may feel they require a certain level of access to natural capital to provide security (DFID 2001). Those with more assets tend to have a greater range of options and an ability to switch between multiple strategies to secure their livelihoods.

Human capital

The livelihood analysis of the human capital was conducted in particular because human capital is required in order to make use of any of the four other types of assets. Human capital represents the skills, knowledge, ability to labor and good health that together enable people to pursue different livelihood strategies and achieve their livelihood objectives.

Household head remains the main driving force behind any livelihood strategy of the household. Characteristics of the household head were asked in particular to understand the farm manager's decision making power to adopt a particular livelihood strategy. Education, experience and age of the head have strong influence on the decision regarding the crops and livestock management and farm investments. Among the sample 34 percent of the household heads were illiterate and the remaining have an average of 6 years schooling. Two third of the households head were working full time at farm while the remaining one third were engaged in off farm activities along with working part time at farm. The off farm work types was also investigated it was found that 38 percent were government employee, 24 percent doing some private business and remaining 38% work as laborer. The survey results revealed that majority of the decision

makers or heads of households were previously drawing their livelihood working as government servants particularly in Army and only 28 percent remained working as laborer in some factory or in near urban towns. None of the respondents had gone abroad. The average family size was 8.3 comprising of 5.1 adults and 3.2 children under the age of 15 years with equal adult male-female ratio. The average child dependency ratio was 61 percent.

The formal education level among female adults was worse than adult males. Majority of adult males (24%) and females (68%) were illiterate.

Almost 37% male labour force was working full time at farm while 36% were working at farm as part time activity whereas 45% were engaged in some off farm work. Adult females were not contributing to the livelihood of the household fully as majority (61%) help in farm activities as part time with only 13% fully involved in farming activities. The opportunities to participate in off farm activities were also limited for women and only 1% of the adult females were reported to be engaged in off farm employment.

Natural Capital

Natural capital is very important for rural communities because they derive all or part of their livelihoods from resource-based activities. For all these it is important to consider access and quality and how both are changing.

Farm size is one of the major determinants of financial status of a farmer, which in turn affect farmers' ability to adopt modern production practices of farming. Operational land holdings play an important role in the family labour employment as well as income. Production per unit area depends on size of the farm (Iqbal, 1989). The operational land holding is an important indicator of family farm resources. Nearly 90 percent of the households of the community under study were mainly dependent on farming. The farm size was categorized into small units and there were 32, 38 and 30 percent farmers having operational holding up to 1.5 hectares, 1.51-3 hectares and more than 3 hectares respectively. Two third of the cultivated area was irrigated through tubewells. Out of the total land of the sample respondents 44 % was not cultivated. The saline/kallar type area was found in the village and was observed to be common in P.D.Khan tehsil and comprises of the area affected by the salt range where only shrub growth is possible in the rainy season. Usually these lands are used for uncontrolled grazing and cutting of fuel wood. The uncultivated lands in the rainfed area are a major source of grazing for the livestock. However, it was observed that grazing was usually uncontrolled therefore development of these lands as more productive ranges would be a challenging task. Due the brackish under ground water farmers used to get mainly one crop in one crop season

Tubewell Water Quality and its Effect on Crops

From the survey it was reported by 54 percent respondents that the water quality of tubewells is highly brackish and the remaining reported somewhat brackish except only one percent respondents who had the sweet underground water. In fact the farmer who reported sweet water had his farm near the River Jehlum that is why water was of good quality there. Seventy nine percent farmers reported about the negative effect of tubewell water quality on the growth of Kharif crops, only 5 percent respondents expressed their views in the favour of positive effect but 17 percent respondents told that water quality was useful enough to prevent the crops from wilting. In case of Rabi crops 90 percent farmers reported positive effect on growth of crops but 10 percent farmers told that water quality is only helpful to prevent the crops from wilting. The results of soil and running tubewell water samples identifies that soil EC increased by 1-2dSm^{-1} after each irrigation along with significant increase in soil SAR. The EC ranges from 2270 to 8000 m mohos/cm.

Table 2. Tube well water quality and effect on crops in Kaslian

	Quality and Effect	Percent response
Quality of Water	Sweet	1
	Somewhat Brackish	45
	Highly Brackish	54
Effect on growth of Kharif Crop	Increase	5
	Decrease	79
	Sustain/Prevent From Wilting	17
Effect on growth of Rabi Crop	Increase	90
	Prevent From Wilting	10

As the quality of water was so bad that it could not be used continuously therefore, as livelihood strategy for sustainable production and reclamation of soil with rain water farmers used to get mainly one crop either in Rabi or Kharif season. Therefore the cropping intensity was very low both at irrigated and rainfed farms. At irrigated condition farmers mainly grow wheat both for food and feed during Rabi and keep it fallow during Kharif. The rainfed area was mainly used during Kharif for sorghum and millet as fodder crops and kept fallow during Rabi. The cropping intensity is given in Table 3.

Table 3. Cropping intensity on sample farms

Cropping intensity		Kaslian
Irrigated area	Rabi	94
	Kharif	9
Rainfed area	Rabi	14
	Kharif	85

Low cropping intensity depicts that farmers kept most of the land fallow in one cropping season. The farmers decision to keep land fallow, future intention, reason to keep land fallow and alternative options for soil/moisture conservation were explored during the survey and results show that it was farmers' own decision either as individual or as a community to keep land fallow and not a forced decision. However only 2% farmers reported that they have to keep land fallow due to uncontrolled grazing during summer. Most of farmers like to utilize their land resources intensively but the brackish water was the main reason hindering this. The low moisture was another major reason, as tube well water could not be applied intensively. Farmers found no other alternative other than to keep land fallow for soil and moisture conservation.

Table 4. Land fallowing decisions by farmers

Fallowing decision	Kaslian
Own decision	87
Communal Decision	11
Forced decision	2
Like intensive cultivation	87
Reasons for fallowing	
Family labor shortage	1
Low moisture	14
Grazing	3
Brackish water	58
More than one	23
Fallowing as the only option to conserve soil moisture/fertility	93

Crop Germination after Tube Well and Rain Watter (Pre-Irrigation)

Farmers response on crop germination from pre irrigation by tube well and rain was also asked. The crop germination after rain was highest as 94 percent farmers reported maximum (100%) germination when crop was sown at rain moisture (watter) while nearly half of the farmers reported 60-75 percent germination at tube well moisture (watter).

Table 5. Crop germination on tube well and rain watter

Source of irrigation	Germination		
	50 %	60-75 %	100 %
Rouni by tube well water	11 (16)	32 (46)	26 (38)
Wattar from rain water	2 (3)	2 (3)	65 (94)

Figures given in the parenthesis are the percentages.

Social Capital

The social capital of any society is very important as mutual trusts and connectedness helps to cope with shocks in any vulnerability context particularly for the poor such as at the time of death, provide informal safety nets and group actions such as shared labour at the time of sowing and harvesting seasons. Mughal, Syed, Awan and Tajak are the major casts of the village. The village has nearly 500 years old history. Community is not very well organized at macro level whereas at micro level different racial groups are present. However, they have the potential to join hands for commonly beneficial development schemes. Due to the decline of social capital and lack of group action at macro level the livelihood strategy to utilize rainwater through bund system for reclamation of soils was abolished and no proper strategy to control grazing could be adopted. The organizational weaknesses of the village community surfaced when they were asked to prioritize their agricultural development needs. There is strong need to develop mutual trusts and organization of the community to develop proper strategy to develop and utilize the available resources for sustainable livelihood.

Physical Capital

Physical capital plays a vital role for the development of the society, as it comprises the basic infrastructure and producer goods needed to support livelihoods. Many participatory poverty assessments have found that a lack of particular types of infrastructure is considered to be a core dimension of poverty. Without adequate access to services such as water and energy, human health deteriorates and long periods are spent in non-productive activities such as the collection of water and fuel wood (DFID 2001). Due to brackish underground water the sweat water was supplied through water supply scheme but the quantity was not enough to fulfill the needs of the population of the area. Livestock had to drink to highly brackish water during the summer due to which livestock productivity was low. Farmers have access to market through link roads and public transport available. The supply of electricity was satisfactory in the area. PTCL telephone along with mobile service was available in

the area. The input like fertilizers were available at town level while grain market was at tehsil level. Primary school for girls and primary to middle for boys was available at village level.

Financial Capital

The availability of cash or equivalent that enables people to adopt different livelihood strategies may be defined as financial capital. Most of the available stock and savings were not put as cash but were kept mainly as livestock, which were considered as the ready liquid asset to be used as livelihood strategy to reduce vulnerability.

Table 6. Animal per farm of the sample respondents

Type of Animal	Mean	S.D
Milking buffalo	0.8	0.8
Dry buffalo	0.4	0.7
Buff. Young stock>1 year	0.4	1.0
Buff. Young stock <1year	0.6	0.7
Adult donkeys	0.6	0.5
Milking cows	0.2	0.6
Dry cows	0.6	1.2
Bullocks	0.0	0.2
Cow young stalk>1year	0.3	0.8
Cow young stock <1year	0.3	0.7
Poultry birds	0.7	2.8
Adult goats male	0.3	0.5
Adult female goats	1.1	1.8
Young goats < 6 months	0.5	2.0

After livestock jewelry was used if credit from some informal or formal sources was not available. Small farmers were mainly dependent on the relatives for credit although ADBP and NRSP were providing loans to small farmers.

In spite of relatively high male participation in off-farm work the off-farm income was only Rs. 2565 per person per month. Pension was another source of income and there were 37 % household having on an average one person getting pension (Rs. 1082) each month. Only 1 of the adult male was working abroad and was fetching nearly Rs. 35000 per month as the remittances. The average overall off farm income of sample households is Rs. 3678 per household from all sources. The net income from crops including land rent came out to be Rs. 13864/annum (Rs. 1155/month) per farm in the study area. The net returns per animal units of milking cow, buffalo and sheep/goat came out to be Rs. 2186 after deducting total cost including cash cost, imputed of the farm products and labour cost of the family. The net income from livestock per household was Rs. 4547 per annum and the main share in livestock income was of milking buffaloes (Rs. 2623).

Conclusion

The diverse range of livelihood strategies according to the available livelihood assets are examined as pursued by smallholders in the study. Soil salinity has emerged as basic problem, which is reducing the agricultural productivity on the one hand and putting far-reaching impacts on the livelihood strategies of resource poor farmers. On the other hand due to high salinity the income from livestock as well as crops is very low. The off farm employment opportunities are also not enough to match the demand of the community. Due to low crop and livestock productivity the household are mainly dependent on the off farm income, which is also very low. Intensity of salinity becomes very large when there are little rains in summer, which has made it very difficult for the farmers to combat with the situation, and no alternative livelihood strategy is available in the short run. The temporary solutions of tube well irrigation being adopted by the farmers seem to have adverse affects in the long run for sustainable livelihood. The intensive use of tube well irrigation even in Rabi season will deteriorate the soil and ultimately the crop productivity resulting in low crops and livestock production. Integrated efforts from government, NGO's and the farmers are immediately required to diversify the livelihood strategies through creating new income opportunities in the form of small enterprises along with the judicious use of land and water resources for sustainable production.

Acknowledgement

The work done by the scientists of Soil Salinity Research Institute, Pindi Bhattian, for conducting soil and water analysis and providing results is duly acknowledged. The contribution of multidisciplinary team engaged in the PRA is also appreciated.

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