Pak. J. Agri. Sci., Vol. 50(4), 751-758; 2013
ISSN (Print) 0552-9034, ISSN (Online) 2076-0906
http://www.pakjas.com.pk

IMPACTS OF FLOOD ON LIVELIHOODS AND FOOD SECURITY OF RURAL COMMUNITIES: A CASE STUDY OF SOUTHERN PUNJAB, PAKISTAN

Saleem Ashraf[1,*], Muhammad Iftikhar[1], Babar Shahbaz[1], Ghazanfar Ali Khan[1] and Muhammad Luqman[2]

[1]Institute of Agricultural Extension and Rural Development, University of Agriculture Faisalabad, Pakistan
[2]University College of Agriculture, University of Sargodha, Pakistan
[*]Corresponding author's e-mail: saleem1828@gmail.com

Pakistan faced a tragic and massive flood in mid of 2010. The occurred disaster was of unprecedented level affecting more than 20.1 million population in entire country. The Punjab province was major hit by the flood. In this regard, present study was conducted in Southern Punjab to explore the impacts of flood on livelihoods and food security of rural communities. District Muzaffargarh was the major flood affected area of Punjab and was selected as study area. Total 120 flood affected people were interviewed for the sake of data collection. Data were collected through interview schedule and later on were analyzed with the help of computer software SPSS (Statistical Package for Social Sciences). The findings revealed that agriculture was the major income source of the area and flood affected the natural capitals (land, irrigation, orchards and livestock) pushing the income generating sources into darkness. These situations made the people food deficit and food insecure as they had to use contaminated commodities especially water. Generally that disaster pushed the farmers' prosperity to several years back. Integration of public and private sector along with NGO'S and national and international funding agencies can help to gain their resilience. Furthermore, establishment of early warning system and capacity building of flood victims will be helpful to cope with disasters. These actions should be established in the flood prone areas of entire country.

Keywords: Flood, livelihoods, food security, Punjab, Pakistan

INTRODUCTION

A livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living (ILO, 2006; DFID, 1999). Livelihood is represented as a whole of dynamic interactions between actors and five vital capitals i.e. human, natural, physical, financial, and social capital. These capitals constitute livelihood building blocks (Carney, 1998).

The common view about rural economy among Pakistani policymakers is that it is confined exclusively to agricultural sector. However, there is a growing evidence that rural sector is much more than just farming (Manig, 1991; Csaki *et al.*, 2000). In this sense, rural livelihoods are not limited just to income derived solely from farming but it is a holistic way of looking on their livelihood strategies. Regarding strategies Scoones (1998) and Ellis (2000) considered agricultural intensification, livelihood diversification, and migration as the three core livelihood strategies. In addition, multiple employments are also a potential livelihood strategy on part of the rural people when the farm does not provide an adequate amount of income to the peasant families (Dharmawan, 1994; Upton, 1996). For instance in Pakistan, rural households commonly depend on farm sources (agriculture) for major portion of their (Lodhi *et al.*, 2006). As the asset of poor people is only their labor power, so they supply their labor for wage in the rural labor (Mduma and Wobst, 2005).

Persistent monsoonal rainfall in 2010 caused tragic flood in Pakistan, which was massive, disastrous, and unprecedented. Resultantly, livelihood of the people was affected at all as flood damaged every earning mean including the major crops cotton, sugarcane, rice, vegetable of the people (Jamal, 2011). In this disaster more than 1700 persons lost their lives, over 20% of the land area was affected and caused a loss of billions of dollars through damage to livelihood including housing, agriculture and livestock, health, infrastructure and family assets but the most immediate impact of erratic flood on rural livelihoods was on crop production. Prior to the recent flooding, poverty and hunger in Pakistan were already widespread and were widespread in rural areas. Nearly two-thirds of the total population and 80% of the country's poor (about 35 million people) live in rural parts of the country (FAO, 2011) which is heavily dependent on agriculture.

The flood caused significant losses to agriculture (e.g. seed stocks, irrigation, livestock, farmland), and resulted increase in poverty and misery of affected small farmers who were residing on cops production (Govt. of Pakistan, 2011). Punjab contributes major role in agricultural share in GDP

and Muzaffargarh is blessed with fertile agriculture Land in its south. Vast majority of the population resides on crops farming. Cotton, Wheat, Sugar Cane, Vegetables and Fruits are grown here and the major crops damaged by devastating floods were cotton, mango orchards, sugarcane and rice (Dawn, 2011). In this perspective the presented research was conducted in flood prone areas of Southern Punjab to assess the impacts of flood on the livelihood of rural communities.

Conceptual framework

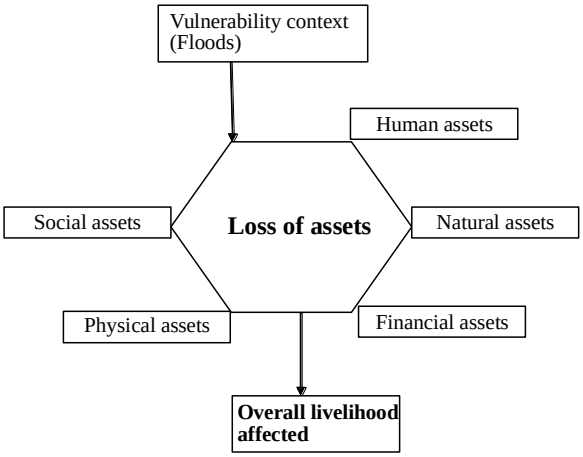
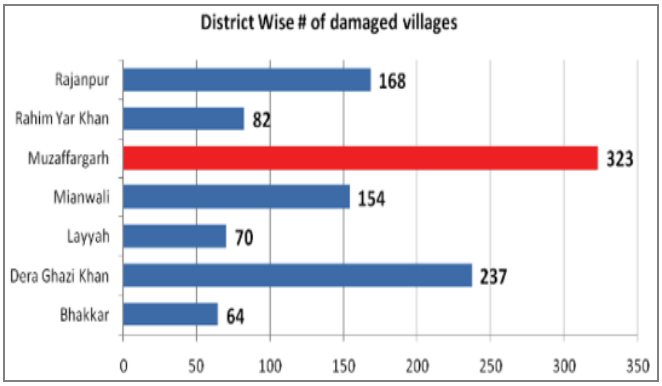


Figure 1. Sustainable livelihood framework

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 (DFID, 2000). It was also proved by the many researchers such as Ashley and Carney (2002) sustainable livelihoods thinking has also been criticized for underplaying the importance of one or more critical factors including vulnerability, gender and market. UK Department for International Development (DFID) adopts this definition to apply it for livelihood analysis. In its simplest form (see Fig. 1), the framework views people as operating in the context of vulnerability. Within this context, they have access to certain assets or poverty reducing factors. These derive their meaning and values from the prevailing social, institutional and organizational environment (Shahbaz, 2009). Lack of access to certain livelihood assets would increase vulnerability, defenselessness and insecurity. It ultimately increases the external dimension of risks, shocks, and stress such as negative income shocks, diseases, and natural hazards (UNISDR, 2004) to which an individual or household is subjected.

MATERIALS AND METHODS

***Study area*:** Flood prevailed in the entire country including Punjab province (World Food Programme, 2010), the major economy builder of Pakistan. Within the Punjab several districts were affected by the flood and among all the affected villages district Muzaffargarh was the most adversely affected by the flood (Fig. 2). The said district comprises 4 tehsils (Ali Pur, Kot Adu, Jatoi and Muzaffargarh) and within the entire district 323 villages were affected by the flood, the most than any other district (Govt. of Punjab, 2011). Muzaffargarh is also assumed as the poor district in southern Punjab where literacy rate is not so good and majority of the residents is agriculture dependent. In this perspective, Muzaffargarh was selected as study area.



Source: Government of Punjab, 2011 www.floodrelief.punjab.gov.pk

***Population*:** The study focused on impacts of flood on the livelihoods of rural communities thus, all the rural communities affected by flood were the population of study. Study was confined to entire district and within the whole district 10 flood affected villages were selected purposively from total 323 focusing on the damage extent caused by the flood. Moreover, 12 flood affected rural people were selected purposively thereby, making a total sample size of 120 flood affected respondents.

***Research instrument*:** For the sake of data collection research instrument "Interview Schedule" was developed having all the parameters regarding livelihood.

***Interviewing of respondents*:** Respondents were personally interviewed and attempt was made to interview the persons who were worst affected by the flood. In this context, researcher travelled to the tent houses where the people were refuges after migration from their homes because of flood stream. The medium of interview was "saraiki" (local language) for the collection of accurate data. Moreover, three point scale *[1=low, 2=medium, 3=high]* was used for the responses.

***Data analysis*:** Data were analyzed using computer software SPSS (Statistical Package for Social Sciences). Descriptive statistics was applied to extract the frequencies, percentages, mean and standard deviation. Chi- Square analysis was used

for the relationship between demographic characteristics and the livelihood assets to explore vulnerability. Mean was calculated on the basis of responses attained on three point liker scale. The mean value ranging from 2.00-3.00 was assumed as damage to high extent while range of mean between 0.00-1.00 was assumed as low damage extent followed by 1.00-2.00 range revealed that damage caused by flood is of medium extent.

RESULTS AND DISCUSSION

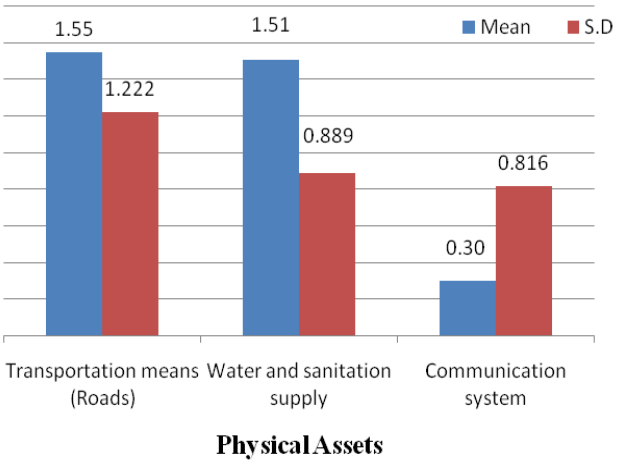
Table 1. Demographic characteristic of the respondents (n=120)

Age (Years)	**Frequency**	**Percentage**
Young (<35)	39	32.5
Middle (35-50)	52	43.3
Old (> 50)	29	24.2
Educational level		
Illitrate	32	26.7
Up to primary	38	31.7
Primary to middle	36	30.0
Middle to matric	8	6.7
Above matric	6	5.0
Size of land holding (acre)		
< 5	84	70.0
5-10	28	23.3
> 10	8	6.7
Tenancy status		
Owner	76	63.3
Owner cum tenant	8	6.7
Tenant	36	30.0
Source of income		
Crop farming	23	19.2
Non Farming	8	6.7
Crop farming+livstock	89	74.2

Source: Field survey 2012

Data given in Table 1 revealed that middle aged category was prominent followed by young aged category. Literacy level of the study area was not much impressive as one fourth of the respondents were illiterate while just 5% respondents were having education above matriculation. This indicates that education is still limited in the study area. A condition of holding of agricultural property is stated as tenancy. Almost one third of the respondents were owner of their land where they were cultivating various crops to earn capital for better livelihood. Majority of the respondents was falling in small farmer category. Moreover, crop farming and livestock rearing were the major source of income of the people residing in study area.

***Overall flood impact on livelihood assets*:** The significance of assets in the likelihoods of an individual is well established by many national and international development practitioners and agencies like Ashley and Carney (2002), Shahbaz (2009), DFID (2000) and many others. The people who suffered flood destruction were the only sources to reveal the real extent of damage caused by flood. So the respondents were asked about the faced consequences of flood on their livelihood.

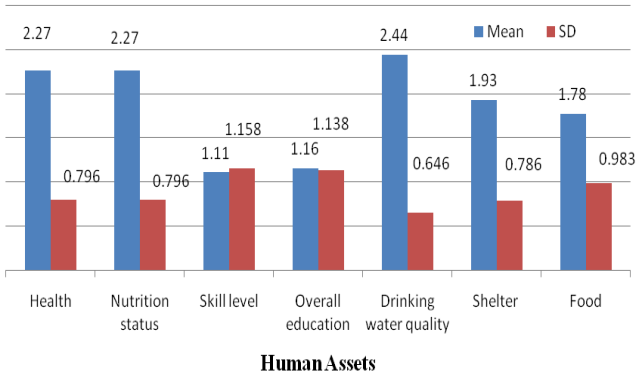


Source: Field Survey 2012 *[scale: 1=low, 2=medium, 3=high]*

Figure 3. Distribution of respondents according to the damage to physical assets

Physical assets: Infrastructure of any area is always considered important for the stability of the living people but because of flood the overall infrastructure was totally scattered in study area. Transportation mean got the maximum mean value ($\bar{x}$=1.55) representing damage of medium extent followed by water and sanitation supply ($\bar{x}$=1.51) showing medium extent damage as well. Rural transport services are provided by both public and private companies and individuals. Companies and individual provide intermediate means of transportation (including small tractors**)** (Starkey *et al.* 2002) and for the many respondents these services were income generating source being employed as driver or conductor. Flood water stream made this employment difficult through damaging roads; moreover, the accumulation of water in entire area hindered the migration of people. Study area is significantly rural area having majority of "*kachay roads"* within the villages which were completely washed out for couple of months especially in remote areas. Hand pumps and electric motors were the major water sources for domestic purposes but flood water that was polluted already made the ground water contaminated which became seriously dangerous for the health. Now a days' world has become a global village and communication services are integral part of life, moreover, everyone has the communication medium carrying along with just like cell phone. Flood devastations also disturbed the telecommunication system for few days because of electricity failure.

***Human assets*:** Services such as education, medical care, food, and housing, are considered necessary for sustainable life, not merely consumption choices (Serra, 2000). In simple words these services help in reducing rural poverty (Adisa, 2012). The mean values represented in Figure 4 depict that human capitals of the respondents were worst damaged.



Source: Field survey 2012 *[scale: 1=low, 2=medium, 3=high]*

Figure 4. Distribution of respondents according to the damage to human assets

Water is life and quality of drinking water became deteriorated because of polluted sediments causing bad odor. This condition of water was seriously dangerous for the health (Ahmad *et al*., 2013). Migration of people made them food deficit and then the contaminated water increases nutritional and health problems. Nutritional and health problems appeared as most adverse impacts of flood by attaining mean value of 2.27.

Skill level, overall education, shelter and food were also damaged because of flood stream as they were unable to do any work because of flood severity complications. Excessive quantity of water and destruction of homes made respondents forced to migrate towards safe places. Even victims were living on the road sides which remained safe from water. Deficiencies of basic elements just like clean water, warm clothes and stable food promoted food insecurity and malnutrition among victims. It was not possible for them to keep everything safe including their lives, family members, edibles shelters during this devastation. These all issue turned into the acute diseases such as malaria, diarrhea and skin diseases. Especially in children who were less resistant to the polluted environment became major victim of these diseases. Flood can increase the spread of water-borne diseases likewise standing water caused by flooding can serve as breeding grounds for mosquitoes, increasing the potential for vector-borne diseases (WHO, 2010). Abbas *et al*. (2011) tested 125 water samples selected from Muzaffargarh and revealed that 90% of the total analyzed samples were found microbiologically contaminated and unfit; 93% samples were found with unpleasant taste; 40% samples were found having turbidity beyond the permissible limits, while 46% samples were found with high value of Total Dissolved Solids (TDS). Moreover 21% of the total analyzed samples were having arsenic so this contaminated drinking water was also the disease causing factor. Water contamination revealed potential cases of typhoid fever, Hepatitis A and E, Leptospirosis, Dengue fever, Measles and Polio, and increasing malnutrition among children and pregnant women were also found (WHO, 2010). According the Kaiser Family Foundation (2010) approximately 3.5 million flood survivors were having access to contaminated water.

The contaminated water caused severe diarrhea which was one of the most common illness and a major cause of death amongst the flood victims of Bangladesh in 1988 (Siddique *et al.*, 1991). In majority of the developed country communities avoid to use contaminated water as it is responsible for many diseases caused by bacteria (Aurangzeb *et al*., 2007, Rosemann, 2005; Gerencher, 2005) while in the study area most of the respondents were compelled of situation to utilize this contaminated water for cooking and drinking purpose due to non-availability of clean water.

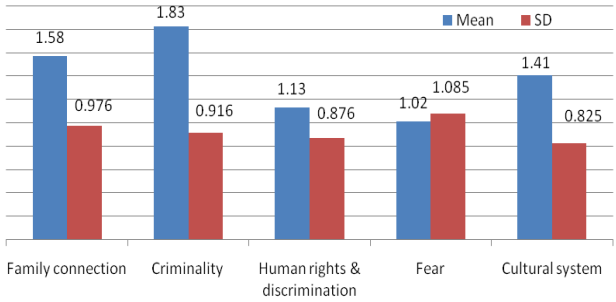
Source: Field survey 2012 *[scale: 1=low, 2=medium, 3=high]*

Figure 5. Distribution of respondents according to the damage to financial capitals

Financial assets: For the sustainable livelihood income is desperately needed to purchase the basic needs. Farming was the major income source as the study area is significantly rural area. Moreover, study area is famous for the cotton and mango cultivation. Livestock farming was another complementary income generating source along with crop farming. When flood prevailed in mid July it was cotton season and maximum part of cultivation was washed off. According the representation of Fig. 5 farming got the highest mean value ($\bar{x}$=2.48) representing the high extent of damage. Non farming income sources of victims were also affected by flood water stream but to lower extent as they

were doing private business, just like general stores and shops. Employment also showed the medium extent damage. There was not a single loan or credit scheme for the flood victims in entire region so it got nil mean value.

Social assets: It is assumed that people living in rural areas are united and used to live together by helping each other, and family interactions are considered important as well. Flood stream appeared a cause of lost of family connection through destruction and blockage of physical capitals (transportation means, communication system).



Source: Field survey 2012 *[scale: 1=low, 2=medium, 3=high]*

Figure 6. Distribution of respondents according to the damage to social assets

Family connection got mean value of 1.58. Living on roadside in camps with insecure and insufficient food is full of threats and criminality ($\bar{x}$=1.83) was prominent threat among various threats. It was not possible during migration to the safe places to bring the whole commodities and precious things along so criminality became the main issue as the left over commodities were misplaced. Cultural values are source of rural communities' unity but this unity was also disturbed because of lack of transportation means and infrastructure. Hussein and Nelson (1998) reported that people especially women remained unsuccessful to diversify their opportunities because of cultural constraints.

Natural assets: To own a piece of land is considered honour and prestige in the rural areas. Tenancy status of these farmers varied to owner, owner cum tenanats and tenants but all have the same ultimate objective of farming to for better livelihoods. Land of the research area faced effects from flood because of polluted sediments. During informal discussion victims reported, soil fertility and water holding capacity has increased because the flood water was mixture of different components of various soils as water travelled from miles. Flood may have invarialbel effcets on the water holding capacity actually, soil moisture was increased and water was stored in soil. Soil erosion got the maximum mean value of 2.11. Flood water flow was massive which caused soil erosion as water took the fertile portion along with him but in this process flood recharged the ground water which made soil more fertile and provided nutrients in which it was deficient (Malik, 2011). Soil faced very high erosion due to which fertlity was in danger. But due to mixture of different sediments present in the water helped in improving the productivity. Respondents argued this fixation of soils helpful in boosting the overall productivity of soil and crop. Ahmed (2011) revealed in this regard, that about 15 cm thick layer of fine mud and silt was deposited on the soil surface, which affected the soil fertility status of the affected areas soil. However, flood water helped in process of soil formation and a acted as source of enhancing soil productivity due to deposition of fresh alluvium, which is free of excessive soluble salts and rich in minerals, especially potassium (K). As mentioned earlier that crop farming and livestock rearing was the major source of income and it was affected by flood. Among various fruit orchards mango got the maximum mean value of 1.31. At the spot mango orchards because of health and vigorous growth of tree were looking sound but after couple of days of flood plants sudden started die back because plant didn't tolerated water logging created by the water under their roots for the 4-5 months.

Table 2. Distribution of respondents according to the damage to natural assets

Natural Assets	Mean	SD
Soil moisture retaining capacity	1.30	0.875
Soil water holding capacity	1.65	0.729
Soil erosion	2.11	0.719
Overall productivity	0.93	0.941
Orchards		
Mango	1.317	0.860
Citrus	0.292	0.627
Fruit quality	0.317	0.799
Crops		
Cotton	2.64	0.482
Sugarcane	0.30	0.717
Rice	0.57	0.775
Disease attack	0.67	1.007
Yield of crops	1.03	1.045
Input prices	2.45	0.578
Livestock		
Milk production	1.69	0.848
Animal diseases	0.93	0.886
Animal deaths	1.13	0.879
Fodder shortage	1.78	0.667
Irrigation water source		
Tube well	1.19	0.892
Canal water	0.67	0.882
Irrigation system	2.33	0.637
Irrigation water fitness for soils	0.92	0.751

Source: Field survey 2012 *[scale: 1=low, 2=medium, 3=high]*

Among crops cotton got the highest mean value 2.64. When flood arrived it was cotton season and major part of total cultivated cotton crop drowned in water. This was the major and unprecedented loss to the livelihoods of cotton growers. During discussion Executive District Officer (Agriculture Department Muzaffargarh) reported that flood completely washed about 21000 acres (47%) of cotton crop out of the cultivated 455000 acres, 96000 acres (65%) of sugarcane out of the cultivated 147000 acres, about 37000 acres (62%) of rice paddies out of cultivated 60,000 acres and 2531 acres (34%) of vegetables out of 7000 acres.

Livestock played a significant role in sustainable livelihoods of the local communities and it is a source of energy for the local community of the study area as dung of these animals is converted to dung cakes and burnt for cooking and heating purposes. The heavy damage to livestock from floods was not only loss of livelihood but also a source of energy of these rural residents. The heads of small and large livestock were died, and almost 600,000 more were expire due to lack of emergency feed and veterinary support. In addition, poultry losses faced were also in the millions, as the entire poultry stocks wiped out in some areas. Many animals died because people were forced to leave them behind when they were rescued by the Pakistani military and other rescue services (FAO, 2011). The direct and indirect damages to livestock in Muzaffargarh district were heavier than the any other district of the Punjab and millions of surviving animals are now facing severe feed shortages ($\bar{x}$=1.78) (FAO, 2011). In addition to mortality and losses of livestock, the other problems erupted from the flood for livestock were loss of shelters and fodder and emergence of infectious diseases in livestock (Khan *et al*., 2011). Reduction in milk production ($\bar{x}$=1.69) was also the heavier loss because of feed shortage.

Irrigation sources were the major affected from flood which ultimately affected the crops as agriculture is by far the largest consumer of water (Haddad *et al*., 2011). Irrigation system (such as canals, water channels) was completely destroyed so it got maximum mean value of 2.33. After evaporation of water farmers exerted extra efforts and cost to recover the irrigation system. Major impact of soil completely covered with water was a rapid depletion of oxygen required for plant growth and development therefore because of contamination water became unfit for the irrigated soil.

Vulnerability: The vulnerability concerns refer to: i) shocks, ii) adverse trends and iii) unfavorable seasonal patterns that can affect the livelihood of rural communities. All these factors can have significant impact on livelihoods assets and households as well and resultantly on their capabilities to generate incomes (Kabir, 2012). It is therefore necessary to probe strategies by which vulnerability can be reduced including construction of greater flexibility and improving overall livelihood security. Disastrous flood promoted the vulnerability among the rural communities of the research area. Similar observations regarding vulnerability of livelihood assets and floods were also described by O'Riordan, (2002).

***Shocks*:** Shocks in the form of flood or drought/ natural disaster in farming communities can destroy livelihood assets. Other natural disaster (heavy rains and cyclones) can also have significant impacts on natural resources or environmental sustainability on which farmers livelihood greatly relies. Illness of farmers, destruction of cultural system, diseases in livestock and deterioration of crops grown and poor production of crops are all shocks and make livelihoods hazardous. Small rural farmers who remained totally dependent on farming are especially vulnerable as shocks can compel them to clear up the assets (Kabir, 2012). Same consequences were left out by flood faced by almost entire country Pakistan.

***Trends*:** Rural livelihoods can be made more or less vulnerable depending on long-term trends. Over population, environmental changes, political unrest, social conflict may intensify the problem of inadequate incomes. Over populations within rural farming communities can contribute to a reduction in their access to natural resources or assets.

***Seasonality*:** Various types of seasonal stress materialize in small farmers and small scale agricultural systems. In Rural area small land holding communities with primarily natural resource-based livelihoods are subject to seasonal cycles of stress. Seasonal employment opportunities such as trading, harvesting and marketing, and day laboring all affect livelihoods of poor people.

Chi-Square analysis was applied to identify the relationship between socio economic factors and the livelihood assets to reveal the vulnerability. Age showed significant relationship with human capitals and highly significant relationship with financial capitals. It is obvious that farmers who are of old

Table 3. Chi Square analysis of socio economic factors with livelihood assets

	Physical		Human		Financial		Social		Natural	
	χ^2	Sig.	χ^2	Sig.	χ^2	Sig.	χ^2	Sig.	χ^2	Sig.
X1	11.87	0.18	14.20	0.06*	12.91	0.02**	2.16	0.70	4.75	0.36
X2	15.73	0.04**	5.45	0.70	6.78	0.56	15.13	0.05*	14.45	0.07*
X3	14.44	0.00**	2.96	0.56	7.09	0.13	2.68	0.61	10.05	0.03**
X4	5.35	0.252	7.10	0.131	1.70	0.79	10.84	0.02**	2.89	0.57
X5	2.91	0.23	3.86	0.14	5.54	0.06	1.02	0.59	5.57	0.86

**Significant at 0.05 ** Significant at 0.01*

age cannot utilize their human skills effectively, moreover, they also not have tendency to perform income generating functions, in this regard persons falling in old age were more vulnerable to the flood severity.

Education of respondents indicated highly significant relationship with physical capitals and significant relationship with social and natural capitals respectively. Persons having enough educational level remain able to utilize the capitals effectively either they are social, physical or natural capitals. Unfortunately the literacy rate of stud area was below the mark making the respondents more vulnerable to the flood devastations. It has been mentioned above that in rural area town a piece of land is prestige and when land owned increased in size it gives immense honor to this person. This maximum land ownership also makes him capable of judiciary of the rural area. Significant relationship of tenancy status with social capitals confirms this situation and also describes that farmers owning lesser lands were more vulnerable to the flood because of lacking potential to cope the disaster.

Income source was not found with any significant association because farming was the major income generating source that was dominantly washed off in that disaster.

***Conclusion*:** The present study reveals that flood destroyed the livelihoods assets of rural communities and also promoting the poverty and food insecurity in flood prone area. Financial assets and natural assets which were the necessary and significant assets for sustainable livelihoods were almost washed off. It can be said that the livelihood of these flood victims has been shifted to several years back of their progress and now they have to work hard and hard for their resilience. It's also obvious that by their only efforts they will never come to resilience. In this view, role of public and private sector along with foreign investors is required for long term actions. On the basis of findings following recommendations are made

- Rehabilitation of damaged infrastructure especially orchards along with the provision of farm inputs
- Maximum support is needed to agro-based enterprises and value chain development for maximum return
- Irrigation infrastructure was badly damaged in disaster so, cleaning, de silting and lining of damaged irrigation channels and water courses is needed.
- Reconstruction and rehabilitation of farm to market roads as existing roads are damaged or of sub standard
- Early warning system should be implemented for the mitigation of disasters in future as the area is not in the position to bear the devastation of disaster again in future
- Capacity building of all the farming communities in the area is necessary; in this regard the role of agriculture extension should be diversified to reduce the impacts of problems especially food security.
- Moreover, it is also suggested that these recommendations should not only be limited to the Muzaffargarh District but efforts should be made in each flood prone area of entire country as Pakistan is low income country and struggling in several issues. The occurrences of that type of disaster again in near future can double the struggles.

REFERENCES

Abbas, A., S.I. Ali, M.A. Noman and S. Haiser. 2011. Needs Assessment Report: Flood in District Muzaffargarh. 28-Dec. 28, 2010 to Jan. 28, 2011. HOPE'87 (Hundreds of Original Projects for Employment in Pakistan). Available online with updates at www.hope87.org

Adisa, R.S. 2012. Rural development in the 21st century as a global necessity. In: Rural Development-contemporary issues and practices. Tech publishers, Rijeka, Croatia.

Ahmad, S.A., A. Gulzar, H. Ur Rehman, Z. A. Soomro, M. Hussain, M. Ur Rehman and M. A. Qadir. 2013. Study of Arsenic in drinking water of distric Kasur Pakistan. World Applied Sci. J. 24:634-640.

Ahmad, Z. 2011. Impact of alluvial deposits on soil fertility during the floods of 2010 in Punjab, Pakistan. International Potash Institute, e-ifc No. 26.

Ashley, C. 2002. Applying livelihood approaches to natural resource management initiatives, experiences in Namibia and Kenya. Overseas Development Institute, London, UK.

Aurangzeb, M., I.M. Zai, and M.T. Jan. 2007. An assessment of potable water and sanitation facilities provide in rural areas of district Peshawar NWFP-Pakistan. Sarhad J. Agric. 23:207-216.

Bhatti, R. 2011. Impacts of flood on soil & crops. Keep Earth & Environment Pure for Future , Newsletter 4.

Carney, D. 1998. Sustainable Livelihoods. What difference can we make? Papers presented at the Department for International Development's Natural Resources Advisors Conference, July1998, DFID, London.

Csaki, C. and L. Tuck. 2000. Rural Development Strategy: Eastern Europe and Central Asia. World Bank Tech. Report No. 484. World Bank, Washington DC, USA.

DAWN, 2011. Muzaffargarh: Small farmers, huge losses. Available online with updates at http://www.dawn.com/2011/01/09/muzaffargarh-small-farmers-huge-losses.html

DFID. 2000. Sustainable livelihoods guidance sheets. Dept. of International Development, London, UK.

DFID. 1999. Sustainable livelihoods guidance sheets. Available online with updates at http://www.ennonline.

net/pool/files/ife/dfid-sustainable-livelihoods-guidance-sheet-section1.pdf

Dharm, A.H. 1994. Farm income and financing in rural Indonesia: a case study from West Kalimantan. Alano Verlag, Aachen, Germany.

Ellis, F. 2000. Rural livelihoods and diversity in developing countries. Oxford University. Press, UK.

FAO. 2011. Millions of livestock dead or in danger in Pakistan. Available online with updates at http://www.fao.org/news/story/en/item/ 44803/ icode

Gerencher, K. 2005. Flood waters found contaminated. Available online with updates at http://www. marketwatch.com/News/Story/Story.aspx?guid=%7B88 A73C50-603B-474D-AED1-9A57341A0F0E%7D& siteid=google

Haddad, N., M. Duwayri, T. Oweis, Z. Bishaw , B. Rischkowsky, A.A. Hassan and S. Grando. 2011. The potential of small-scale rainfed agriculture to strengthen food security in Arab countries. Food Sec. (Supl. 1): S163-S173.

Hussein, K. and J. Nelson. 1998. Sustainable livelihoods and livelihood diversification. Institute of Development Studies Working Paper 69. University of Sussex, Brighton, UK.

International Labour Organization (ILO). 2006. The Reader: Implementing sustainable private sector development: Striving for tangible results for the poor. Int. Training Centre of ILO. 66 p. Available online at www.bdsknowledge.org/dyn/ bds/docs/497/PSDReader 2006. pdf

Jamal, A. 2011. Crops destruction through flood in Punjab, Pakistan .World Food Programme.

Kaiser Family Foundation. 2010. At least 3.5M Pakistanis have no access to clean water, raising risk for waterborne diseases," August 26, 2010. Available online at http://globalhealth.kff.org/Daily-Reports/ 2010/August/26/GH-082610-Pakistan.aspx

Khan, M.A., A. Said, Z. Ali, H. Khan, N. Ahmad and R. Garstang. 2011. Rapid assessment of flood impact on the environment in selected affected areas of Pakistan. Pakistan Wetlands Programme and UNDP Pakistan. 35p.

Kabir, M.S., X. Hou, R. Akther, J. Wang and L. Wang. 2012. Impact of small entrepreneurship on sustainable livelihood assets of rural poor women in Bangladesh. Int. J. Econ. Finance. 4:265-280

Lodhi, T.E., M. Luqman, and G.A. Khan. 2006. Perceived effectiveness of public sector extension under decentralized agricultural extension system in the Punjab, Pakistan. J. Agric. Soc. Sci. 2:195-200.

Malik, I.M. 2011. Post flood ecological impact on lower Indus Basin. Keep Earth & Environment Pure for Future, Shah Latif Uni. Newsletter 4:5.

Manig, W. 1991. Stability and changes in rural institutions in north pakistan. Socioeconomic studies on Rural Development, 85, Alano Verlag, Aachen Germany.

Mduma, J.K. and P. Wobst. 2005. Determinants of rural labor market participation in Tanzania. Afric. Stud. Quart. 8.

Rosemann, N. 2005. Drinking Water Crises in Pakistan and the Issue of Bottled Water: The Case of Nestle's Pure Life. Action aid Pakistan.

Scoones, I. 1998. Sustainable rural livelihoods: A framework for analysis. IDS Working Paper No. 72, Brighton, UK.

Serra, P. 2000. Subsidies in Chilean public utilities. Washington, DC, World Bank.

Siddique, A.K. 1991. 1988 Floods in Bangladesh: Pattern of illness and causes of death. J. Diarrh. Dis. Res. 9:310-4.

Starkey, P., S. Ellis, J. Hine, and A. Ternell. 2002. Improving rural mobility: options for developing motorized and non-motorized transport in rural areas. Washington, DC, World Bank Tech. Paper TWU-48.

Shahbaz, B. 2009. Dilemmas in participatory forest management in Northwest Pakistan: a livelihood perspective. Dept. of Geography, Univ. of Zurich, Zurich, Switzerland.

UNISDR (United Nations International Strategy for Disaster Reduction). 2002. Disaster risk and sustainable development: understanding the links between development, environment and natural hazards leading to disasters. Background document for the World Summit on Sustainable Development (WSSD) No 5, revised version April 2, 2002. Available online with updates at http://www.unisdr.org

Upton, M. 1996. The economics of tropical farming systems. Cambridge Univ. Press, UK.

WHO. 2010. Communicable disease risk among populations affected by flooding in Pakistan. Available online with updates at http://www.who.int/diseasecontrol_ emergencies/publications/Pakistan_floods2010_08_04.p df