

Research Article



Livelihood Strategies of Small-Scale Farmers in Pakistan in the Scenario of Climate Change

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Abstract | The present study was designed to assess the livelihood strategies of small-scale farmers in rain-fed areas of Pakistan. The targeted area of the study was Potohar region of the Punjab Province. Quantitative data were collected from 200 households and analyzed by using SPSS. Results highlighted that the situation of livelihood assets possessed by the respondents was not satisfactory. Majority of the households had limited human, financial, physical, social and natural capitals. In the scenario of climate change, households adopted diverse nature of farm and non-farm related strategies to secure their livelihoods. Findings of chi-square statistics showed highly significant association ($P < 0.05$) between agricultural diversification strategies being adopted by households in the situation of changing climate and income level of households. It was found that social capital was highly influenced and depends upon income level of households as majority (67.0%) of the poor people with low income level had low level of financial capital. The preference or choice of livelihood strategies by different income groups was measured through chi-square test of independence ($\chi^2 = 122.770$) which shows that majority (79.3%) of low income households used to adopt only farming as their major livelihood strategy. The results of multiple regression analysis showed that problem of poverty and hunger (PPH) can easily be estimated from different livelihood assets like education, ability to produce enough food, access to rural advisory (extension) services, access to financial support structures (in the form of social safety nets) and crop diversification strategies.

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Introduction

Small-scale farmers play significant role in agricultural production around the world. But majority of them are suffering from poverty, food insecurity and many other development related challenges and they are considered as marginalized

and socially excluded rural communities (Oxfam, 2014). Research studies indicate that in developing and low income countries, agriculture is dominated by small-scale farmers. They are experienced from low agricultural production which in turn is responsible for widespread food shortage and poverty (Hazell et al., 2007). According to the report of FAO (2015)

and IFAD (2011) subsistence farm producers or small scale farmers constitute more than 2/3rd of the total poor and food insecure people round the globe. Regarding consequences of small agricultural land holdings particularly in developing countries Gautam and Anderson (2016) and Hussain and Thapa (2012) reported that small land holders are more vulnerable towards shortage of food and considered as food insecure people. The percentage of undernourished and food insecure people in South Asia is about 16% which is comparatively higher than the other regions of Asia (FAO, 2015). Similar situation exists in Pakistan which is the 6th most populous country of the world and where more than 60.0% of the population is living in rural areas and associated with farming for their livelihoods. Out of this massive rural majority is facing the problem of poverty (IFAD, 2016).

Similar to other developing countries of South Asian region, small agricultural land holders are very common (Ghafoor et al., 2010). Poverty in rural settings is also very common. Out of the total 23 Mha cultivated area of Pakistan, 25% area is characterized as rainfed (Baig et al., 2013). In these areas farming is mainly depend upon rainfall as source of irrigation. Potohar region of the Punjab is also fall in the category of rainfed areas of Pakistan. These areas are mainly characterized by small agricultural land holdings (Adnan et al., 2009). Agricultural land in this region is fragmented and here farming is associated with many constraints which underpin the low agricultural productivity (Qureshi et al., 2010).

The people living in these areas are more vulnerable to climatic changes and variability in climatic conditions. These factors are strongly associated with low crop productivity in general and specifically widespread rural poverty (Cheema, 2001). Rainfed areas have much potential to cope with food demands of rapidly ever growing population of the country (Baig et al., 2013). In spite of presence of abundant literature on livelihoods in Pakistan as well as in the rest of world, it is not yet clear that which livelihood strategy is better one for a household for sustainable and healthy life (Ng'ang'a, et al., 2011). Households in rural areas of Pakistan earn income for their livelihoods from diverse nature of farming and non-farming activities (Arshad et al., 2010; Israr and Khan, 2010). But the choice of every household about livelihood means or strategies is largely depend upon its livelihood assets as in overall rural development livelihood assets play

vital role (DFID, 2002). The interconnection between five livelihood assets which transform into livelihood strategies is also illustrated in the Figure 1.

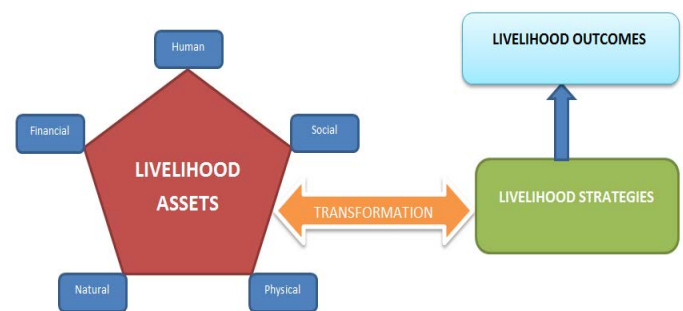


Figure 1: Conceptual Framework; *Adopted from DFID (2002) and modified by authors.*

With this backdrop research studies reporting the role of livelihood strategies in poverty reduction and food security are abundant (see Alemu (2012); Gentle and Maraseni (2012); Soltani et al. (2012) and many others). But the prerequisite is to identify and address the existing pattern of livelihood strategies. This procedure will be helpful in presenting then the holistic approach towards their potential coping strategies to mitigate poverty, food insecurity and adverse impacts of climatic natural hazards. This is very important also due to the fact that Pakistan is very much prone to the natural hazards and disasters associated with rapid climatic changes (Oxfam, 2009). This has been observed that due to the large dependency of country's national economy on agriculture sector, the whole socio-economics of Pakistan is highly vulnerable to climate change, poverty and food shortage (Rasul et al., 2012). With this background the research study was conducted to identify the major livelihood strategies being adopted by the small agricultural land holders in rain-fed areas of the Punjab, Pakistan.

Materials and Methods

Research area

The present study was conducted in Pothwar region of the Punjab province Pakistan as majority of the rainfed areas of Pakistan are located in this region (Adnan et al., 2009). Semi-arid to sub-humid climate was observed in this region. Out of the total 1.8 Million hectare, only 0.77 million hectare area is under cultivation. Majority of the cultivated area (90%) is rain-fed and only 10% cultivated area is under irrigated cultivation. Farm size in the region is smaller than southern and central Punjab. The size

of more than 64% of the farms was less than 5 acres (GoP, 2015).

Sampling procedure

Whole of the agriculture of this region is largely depends upon rainfall. The major districts of the Punjab which are included in this region are Attock, Chackwal, Jehlum and Rawalpindi. Out of these two districts were randomly selected. The list of farmers having upto 5 acres of agricultural land was prepared in consultation with the staff of agricultural extension and revenue department of the respective districts (Attock and Chackwal). From that list 100 households were randomly selected and interviewed. The total sample size for the present study was 200 small land holders.

Statistical analysis

The data were analyzed by using statistical software SPSS. The nature of data collected in the present research was quantitative. With this rational, both descriptive and inferential statistics were used for data analysis and its description. Chi square test was used to find out the statistically significant relationship between different Income Sources (IS) as livelihood strategies which serve as an independent variable and Monthly Income (MI) of households as dependent variable. Both dependent and independent variables were in the form of categorical data. The dependency of social capital (low, medium and high) was also assessed by its relationship with different income levels of respondents using chi square statistics. Moreover, the impact of agricultural diversification on income level of households, chi-square test was applied.

To see about the relationship between several independent variables (predictors) and one dependent (criterion) variable, Multiple Regression Model was used. Independent variables which were being used in this study were; Enough Food Production (EFP), Access to Rural Advisory Services (RAS), Access of Financial Support Structures (FSS), Education (ED), and Crop Diversification (CD). The dependent variable was Problem of Poverty and Hunger (PPH), which is being faced by many of the small scale farmers in the research area. Following equation was formulated for the above mentioned variables:

$$Y=B_0+B_1X_1+B_2X_2+B_3X_3+B_4X_4+B_5X_5+e$$

$$PPH=B_0+B_1EFP_1+B_2RAS_2+B_3FSS_3+B_4ED_4+B_5CD_5+e$$

Results and Discussion

Livelihood assets

Using Sustainable Livelihood (SL) framework, livelihood assets are divided into five types as human, financial, natural, physical and social. The situation of all these assets in the research area is given in below:

Human assets: It includes human health, educational status, knowledge and skill level and capacity to work. It provides basis of overall livelihood of farmers. It also determines the capabilities of individuals to have control over other livelihood assets (DFID, 2000). In this study, four variables/indicators were selected to measure the status of human assets in the research area as education, ability to produce enough food, age (in years) and size of household (in numbers). The data regarding these variables and situation of human assets in the study area are presented in Table 1.

The detail of human assets possessed by the respondents as presented in Table 1 shows that illiteracy is very common as large majority (82.0%) of the respondents didn't receive formal education even up to ten years of schooling. Regarding capacity to produce enough food out of their own resources, a large majority (97.5%) of the households said that they had no capacity to produce enough food due to small agricultural land holds and other productive assets. Only 2.5% of the respondents had enough capacity to produce food for household consumption. The mean age of respondents was 41 years. Household size helps in determining number of dependents in each household. Minimum, maximum and average size of household was assessed and data in this regard is given in Table 1. The average size of household in the research area was 5 members.

Financial assets: Financial assets refer to as financial resources that an individual use in order to achieve livelihood outcomes (Lasse, 2001). In this research three indicators were used to assess the financial assets possessed by the households. These indicators were income sources as livelihood diversification strategies used by household head and other members of household, monthly income of each household and access to financial support structures present in the research area. The exact picture of financial assets possessed by the respondents in the research area is given in Table 2.

Table 1: Human assets possessed by households n=200.

Educational status	Frequency	Percentage
Literate (Having education up to 10 years of schooling ¹ or above)	36	18.0
Illiterate (No schooling or schooling less than 10 years)	164	82.0
Capacity to produce enough food		
Yes	05	2.5
No	195	97.5
Age		
Minimum	30 Years	
Maximum	65 Years	
Mean	41 Years	
Household size	Frequency	Percentage
Small (upto 3 members)	21	10.5
Medium (4-5 Members)	60	30.0
Large (More than 5 members)	119	59.5

Source: Survey data.

Table 2: Financial assets possessed by households n=200.

Income sources	Frequency	Percentage
Farming	89	44.5
Non-farming	83	41.5
Both farming and non-farming	28	14.0
Income level		
Low income (Having monthly income upto 15,000 PKR)	92	46.0
Medium (Having monthly income from 15,001-20,000 PKR)	78	39.0
High (Having monthly income more than 20,000 PKR)	30	15.0
Access to financial support structures		
Yes	11	5.5
No	189	94.5

Source: Survey data.

The data concerning financial assets possessed by the households in the research area as presented in Table 2 shows that majority of the households (44.5%) used to earn income from farming. In farming both crop and livestock production were the main livelihood activities. More or less same percentage (41.5%) of respondents got income from non-farm sources. However, some respondents (14.0%) earn income for livelihoods from both farm and non-farm income sources. In case of non-farming households earn income from labour, job and business. On the basis of monthly income, households were divided into three groups as; low income group (Having monthly income up to 15,000 PKR), medium income group

(Having monthly income from 15,001-20,000 PKR) and high-income group (Having monthly income more than 20,000 PKR). Findings reveals that slightly less than fifty percent (46.0%) of respondents belong to low income group. Only 15.0% of the households had monthly income >20,000PKR and belong to high income group. Regarding access to financial support structures by the households, data shows that large number of households (94.5%) had no access to financial support structures in the form of micro-credit and other informal support structures.

Social assets: It is an important feature of community which influences other assets. According to Lasse (2001), it is form of social networks, norms, coordination, social trust and cooperation between individuals within a society. In this research, three indicators were being used to measure the status of social assets as membership of any non-governmental organization (NGO), access to agri. extension and advisory services, and participation level of households in social/community development related activities. The data in this regard is given in Table 3.

Table 3: Social assets possessed by households n=200.

Membership of NGO	Frequency	Percentage
Yes	2	1.0
No	198	99.0
Access to Agri. Extension and Advisory Services		
Yes	2	3.5
No	198	96.5
Participation level in social activities		
Low	100	50.0
Medium	76	38.0
High	24	12.0

Source: Survey data.

The data regarding social assets possessed by the respondents in the research area as given in Table 3 indicate that only 1.0% of households reported the membership of NGO and very high majority of the respondents (96.5%) had no access to agricultural extension and rural advisory services at their door steps. Intensity of social assets was assessed with the participation level of households in social and community development related activities in the research area. About 50.0% of households reported low level of participation and only 12.0% had high level of participation in the form of social assets.

Physical assets: One of the important assets among

five livelihood assets is physical. It comprises of infrastructure, goods, land holding and activities required to maintain livelihoods (Jonathan, 2000). Four indicators were being used to assess the status of physical assets of households in the research area. These indicators were agricultural diversification, crop diversification, type of house and status of land holding possessed by the respondents. The data in this regard is presented in Table 4.

Table 4: Physical assets possessed by households n=200.

Agricultural diversification	Frequency	Percentage
Yes	28	14.0
No	172	86.0
Crop diversification		
Single crop	164	82.0
Multiple crops	36	18.0
Type of house		
Kacha (with mud)	16	8.0
Packa (cemented)	184	92.0
Land holding status		
Landowner	95	47.5
Tenant	18	9.0
Landless	87	43.5

Source: Survey data.

The data regarding physical assets of households in the research area shows that majority of the respondents (86.0%) didn't adopt agricultural diversification techniques. In crop diversification high majority (82.0%) of households reported that they used to grow single crop on their land. Majority (92.0%) of households used to live in cemented houses. The houses of only few percentage of households were made of mud. Regarding land holding status of households, the results shows that majority (47.5%) of households cultivate their own land. However, some percentage (9.0%) of households were tenants. Remaining percentage of households didn't have their land and they used to earn income from non-farm income sources.

Natural assets: Natural assets are referring to as stock of natural resources. These assets constitute a wide range of goods like atmosphere, biodiversity, land, trees etc. (Goldman, 2000). In this research, two indicators were used to assess the status of natural assets possessed by the households as size of landholding and exposure to climate change. The data in this regard is given in Table 5.

The data regarding natural assets possessed by the

households in the research area indicate that all the households (100.0%) reported the exposure of climate change and its impacts on livelihood assets and strategies. Minimum size of landholding of households who used to do farming was one (01) acre and maximum is 4.5 acres. The average size of land holding as reported by respondents was 1.8 acres, which indicate the presence of small land holders in the research area.

Table 5: Natural assets possessed by households n=200.

Exposure to climate change	Frequency	Percentage
Yes	200	100.0
No	0	0.0
Size of land holding (In acres)		
Minimum	01 Acres	
Maximum	4.5 Acres	
Mean	1.8 Acres	

Source: Survey data.

Association between agricultural diversification strategies and household income

In order to find out the significant relationship/ association between agricultural diversification strategies with income level of households, chi-square test of independence was used. Cross tabulation between these two variables is given in Table 6.

Table 6: Relationship between agricultural diversification and income level of households.

Income level	Agricultural diversification		Total
	Yes	No	
Low	0 (0.0%)	92 (51.7)	92 (46.0)
Medium	9 (41.0)	69 (38.8)	78 (39.0)
High	13 (59.0)	17 (9.5)	30 (15.0)
Total	22 (11.0%)	178 (89.0%)	200

χ^2_{cal} : 43.430***; Highly Significant df: 2; Likelihood Ratio: 41.762; Linear-by-Linear Association: 38.845.

The data presented in Table 6 shows that majority (89.0%) of the households didn't adopt agricultural diversification strategies. Out of these households, slightly more than half (51.7%) had low income level. Out of 11.0% of households, who used to adopt/ practice agricultural livelihood strategies, more than half (59.0%) had high income level.

Selection of livelihood strategies by different income groups

In order to find out which livelihood strategy was being adopted by different income groups, chi-square test was used. And the results in this regard are given in Table 7.

Table 7: Association between livelihood strategies income groups.

Livelihood Strategies	Income Group			Total
	Low	Medium	High	
Farm	73 (79.3)	09 (11.5)	07 (23.3)	89 (44.5)
Non-Farm	14 (15.2)	61 (78.2)	08 (26.7)	83 (41.5)
Both	05 (5.5)	08 (10.3)	15 (50.0)	28 (14.0)
Total	92 (46.0)	78 (39.0)	30 (15.0)	200

χ^2_{cal} : 122.770***; Highly Significant df: 4; Likelihood Ratio: 166.989; Linear-by-Linear Association: 64.134.

The data given in Table 7 shows that majority (79.3%) of people having low income adopt farming as livelihood strategy. The data also indicate that out of the total 14.0% of households who adopt both farming and non-farming activities as livelihood strategies, majority (50.0%) belong to high income.

Regression model description

Multiple Regression Model was used in order to find out the relationship between Problem of Poverty and Hunger (PPH) as dependent variable and five independent variables as Capacity to Produce Enough Food (EFP), Access to Rural Advisory Services (RAS), Access to Financial Support Structures (FSS), Education (ED), and Crop Diversification (CD). Summary of multiple regression analysis is given in Table 8.

The results of multiple regression model as presented in Table 8 shows that problem of poverty and hunger faced by respondents can easily be estimated/predicted from independent variables as ability to produce enough food, access to rural advisory services and financial support structures, education and crop diversification strategies. This showed that it is very much easy to predict the problems of poverty and hunger of households from their different livelihood capitals (human, social, financial and physical). Value of R (0.623) as correlational coefficient, also indicate that problem of poverty and hunger of respondents had highly positive correlation independent variables (ability to produce enough food, access to rural advisory services and financial support structures, education and crop diversification strategies). In addition, ANOVA also showed that all the independent variables were significantly (0.000) estimating the problem of poverty and hunger faced by households in the research area.

Livelihood assets' entitlement

All the livelihood assets are very much important

and play significant role in finding out the livelihood strategies. Among all assets, human asset is the major one as it influences the capability of individuals to have access to other assets (DFID, 1999). Productive age in the targeted study areas was 15 to 64 Years. Involvement of elder age group in agricultural activities is more, no opportunities for youth in agriculture. Youth can be used to accelerate economic growth as best strategy for poverty reduction. Rapid urbanization can also be minimized by providing sustainable income generation activities for rural youth in rural areas. Because of this no incentive and charm is present for youth in agriculture.

High educational level is associated with better job opportunities other than farming. This has been observed that higher education significantly influences the choice of better livelihood strategy by an individual (Xu et al., 2015). In the form of human asset, education play dominant role in identifying more remunerative and profitable livelihood strategies (Nielsen et al., 2013). In the context of Pakistan low educational level is very common especially among rural farming communities (Jalal-Ud-Din, 2011). The basic reason behind this factor is the rural people are generally considered as poor and possess limited financial resources to gain maximum education (Luqman, 2014). This situation leads them to become more vulnerable to poverty and food insecurity. With this background, it is concluded that human capital in the form of education is very much important for sustainable livelihoods.

Small size households are more prone towards poverty than households having large size due to the less number of food/financial dependents in small size households compared to large sized households where number of food/financial dependents is comparatively high. Large household size is more common in developing countries and they are facing the severe problem of poverty and hunger. The average household size in the research area was 05 (member), which was higher than developed countries. It was found that majority of the households (58.0%) who were facing the problem of poverty and hunger had large household size (>5 members). Household size and their vulnerability towards poverty was also discussed by Mwabu and Thorbecke, 2001; Mwabu, 2002 and Oluwatayo, 2009.

Table 8: *Summary of regression analysis.*

Model Summary						
Model	R	R Square	Adjusted R Square		Std. Error of the Estimate	
1	.623 ^a	.388	.372		.11119	
a. Predictors/Independent Variables: (Constant), Produce Enough Food, Access to rural Advisory Services, Access to Financial Support Structures, Education and Crop Diversification						
ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.522	5	0.04	24.614	.000 ^b
	Residual	2.398	194	.012		
	Total	3.920	199			
a. Dependent Variable: Problem of Poverty and Hunger (PPH)						
b. Predictors/Independent Variables: (Constant), Produce Enough Food, Access to rural Advisory Services, Access to Financial Support Structures, Education and Crop Diversification						
Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.036	0.143		14.279	0.000
	Produce Enough Food	-.291	.052	-.325	-5.610	0.000
	Access to Rural Advisory Services	-.198	.044	-.259	-4.489	0.000
	Education	.080	.021	.221	3.868	0.000
	Access to Financial Support Structures	-.112	.035	-.183	-3.181	0.002
	Crop Diversification	.060	.021	.164	2.913	0.004
a. Dependent Variable: Problem of Poverty and Hunger (PPH)						

The probability of facing the problem of poverty and hunger was found to be more in case of large family size and low educational status as all the illiterate people in the research area were facing the problem of poverty and hunger with increased number of family dependents. In connection with these findings Hussain (2004) concluded that the probability of households to be poor increases due to the increase in number of dependents and educational level of head of households as educated households possess more employment and income generation activities than uneducated ones.

Value of chi-square (35.762) shows highly significant relationship ($P < 0.05$) between social capital level of households and their income level. Highly significant difference was found in financial capital of households with low, medium and high level of social capital. Cross tabulation shows that 67.0% of the poor households (having low income level) had low level of social capital. This indicate that income play a significant role in social capital of rural households. Households with high income level were more inclined towards participation in social activities and had high level of social capital compared to households with income.

Low level of social capital is due to the fact that high majority (98.0%) of the households were facing the problems related to poverty, food insecurity and food shortage. Due to low income and high level of poverty people rarely involved in social activities. Their basic problem is to feed the family with minimum financial resources. The relationship between social capital and financial capital (income level) of rural households was also described by Hussain (2004). Low level of social capital was found in the research area as an overwhelming majority of households reported that they didn't have membership of any formal or non-formal NGO and had no access to agricultural extension and advisory services. Lack of access to agricultural extension and rural advisory services by the public sector is one of the major reasons behind widespread rural poverty due to low agricultural production and farm yield. The major purpose of agricultural extension services in rural areas is to enhance the productivity level of farmers on sustainable basis (World, Bank, 2010).

Limited access to financial support structures as an overwhelming majority (94.5%) of the households in the research area had no access to any form of financial

support structures, which serve as Social Safety Nets (SSNs) for rural poor. Due to poor accessibility towards financial support structures by the households in this study, large majority (98.0%) were facing the problem of poverty and hunger. This has been proved by different economists and social scientists that financial support structures serve as significant and important strategy in reducing poverty (Fareed et al., 2014; Durrani, 2011; Gurses, 2009; Mawa, 2008; many others). Improvement in livelihood status of rural households in the Punjab, Pakistan through their accessibility towards microcredit services in the form of financial support structures was also explored and discussed by Luqman et al. (2016).

Agricultural and crop diversification technologies play important role in improving livelihood status of households. But physical assets mostly depend upon other assets like human, financial and natural (Barrett et al., 2005). In the research area, it was found that a large majority of the households didn't adopt agricultural as well as crop diversification techniques. Large majority (82.0%) of the households used to grow single crops due to small land holdings. The value of chi square (112.00) showed highly significant relationship ($P > 0.05$) between size of land holding and application of agricultural diversification strategies by the households. This was observed that households with large size of land holdings tend to adopt agricultural and crop diversification strategies to gain maximum income.

Due to small size of agricultural land holding, majority of the farmers were considered as small-scale and practicing subsistence farming. Existence of subsistence farming at large scale is mainly responsible for existence of poverty, food insecurity and food shortage at rural household level. The same about Pothwar region was also observed and discussed by Qasim (2012). He reported that the size of majority of the farms in the Pothwar region was small as compared to other regions of the province. Net cultivated area of district Chakwal is more than Attock (Government of the Punjab, 2015). Cent percent of the households reported that climate change (increase in daily temperature and changes in rainfall pattern) badly affected their livelihoods as whole of the agriculture in rain fed areas is depend on rainfall. According to the data reported by Government of the Punjab (2015), minimum mean temperature in Pothwar region during the last decade was 16.2 Centigrade

and maximum mean temperature was recorded as 30 Centigrade. High variation was recorded in the annual rainfall during the last ten years in the region. In the scenario of changing climate, households tend to adopt different strategies to mitigate climate change impacts on livelihoods but due to the lack of livelihood assets, the strategies which were being adopted by the households were not so effective.

Agricultural diversification strategies

Agricultural diversification strategies are being undertaken in developing and least developed countries especially by the small-scale farmers to raise farm income and also to mitigate the risks involved in farming. The role of such strategies in improving household's income has been explained by different scientists like Caviglia-Harris and Sills (2005), Kurosaki (2003), Weiss and Briglauer (2002) and Papademetriou and Dent (2001). Results of chi-square show that agricultural diversification strategies strongly influence the income of rural households. Cross tabulation between agricultural diversification and income level of households indicate that low income level was found in those households who didn't practice agricultural diversification strategies. Lack of agricultural diversification strategies in low income households may be due to lack of financial resources at household's level as majority (44.5%) of the respondents depend only on farm economy with limited financial resources and low income level. Highly significant relationship ($P < 0.05$) was found between agricultural diversification strategies being adopted by the households. The low adoption level of agricultural diversification strategies by the households was mainly responsible for low income level of households in the research area. The results of chi-square statistics showed that agricultural diversification strategies play significant role in improving income level of rural households and ultimately improve livelihood status. Low involvement of households in agricultural activities was due to factor that majority of the households possess low level of livelihood assets. Marking of low income households with lack of agricultural diversification strategies was also discussed by Pellegrini and Tasciotti (2012) while studying crop and dietary diversification, and farm Income in Malawi, Pakistan, Nepal and Vietnam.

According to the report of FAO (2003) agricultural diversification strategies could play significant role and serve as catalysts in the socio-economic development

of rural households by providing maximum farm and non-farm income sources. The impact of agricultural diversification of farm income and overall farm productivity in the context of Pakistan was also discussed by Qasim (2012). In developing countries like Pakistan, agricultural diversification strategy is the best strategy to increase farm income, generate employment opportunities and poverty reduction (Joshi et al., 2004). The significant role of agricultural diversification in improving farm income in Pakistan was also discussed by Ali (2001). Low level of diversification in agriculture was found in the research area due to the limited well-developed super markets for efficient marketing of agricultural produce. In these cases, rural people used to cultivate those crops, which they consumed at their household level. Low level of agricultural diversification is responsible for high poverty rate in the research area as large majority of the respondents (97.5%) didn't have capacity to produce sufficient food for household consumption and majority (46.0%) belongs to low income group (monthly income up to 15,000).

Conclusions and Recommendations

It was concluded that majority of the households had limited human, financial, physical, social and natural capitals. In the scenario of climate change, households adopted diverse nature of farm and non-farm related strategies to secure their livelihoods. Findings of chi-square statistics showed highly significant association ($P < 0.05$) between agricultural diversification strategies being adopted by households in the situation of changing climate and income level of households. It was found that social capital was highly influenced and depends upon income level of households as majority (67.0%) of the poor people with low income level had low level of financial capital. The preference or choice of livelihood strategies by different income groups was measured through chi-square test of independence ($\chi^2 = 122.770$) which shows that majority (79.3%) of low income households used to adopt only farming as their major livelihood strategy. Due to which they were considered as more prone to poverty as high majority (98.0%) of households were facing the problem of poverty and hunger (98.0%) at household level. The results of multiple regression analysis showed that problem of poverty and hunger (PPH) can easily be estimated from different livelihood assets in the form of independent variables like education, ability to produce enough food, access to rural advisory (extension) services, access to financial support structures (in the form of social safety nets –SSNs) and crop diversification strategies. Following policy recommendations are hereby formulated:

- State management should revise the poverty

reduction policies and strategies emphasizing adoption of livelihood diversification strategies

- Youth policy must be redefined with special focus on agriculture
- Government should device policies for rural livelihood strategies keeping in view the status of livelihood assets possessed by the households

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Novelty Statement

The research is unique in nature that would be helpful in presenting the holistic approach towards their potential coping strategies to mitigate poverty, food insecurity in relation to climate change.

Author's Contribution

Raheel Saqib: Designed research as principal author and finalized the manuscript.

Muhammad Luqman: Developed research instrument and coordinated overall research.

Iqbal Javed: Data collection and entry

Abdur Rehman: Reviewed the relevant literature and data analysis.

Muhammad Yaseen: Data collection and entry

Saleem Ashraf: Analysis of data and tabulation

Muhammad Zeeshan Majeed: Proofreading of manuscript

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