

IMPACT OF CLIMATE CHANGE ON RURAL LIVELIHOODS- A CASE OF HAZARA REGION OF PAKISTAN

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ABSTRACT

The study was conducted at the Institute of Agricultural Extension and Rural Development, University of Agriculture, Faisalabad, Pakistan during the year 2014. For this study Hazara region of Khyber Pakhtumkhwa was selected. In mountainous rural areas of Pakistan, livelihoods are highly dependent on natural resources which in turn depend upon climatic conditions. Agriculture is a main source of rural livelihoods, but due to climate change the livelihoods of rural dwellers become more vulnerable due to the adverse effects of climate change on agriculture. Hazara region comprises six districts (Haripur, Abbotabd, Mansehra, Kohistan, Bttagram and Tor Ghur) and is full with natural resources. District Mansehra was purposively selected as the study area. Cross-sectional survey research design was used in this study. One hundred and twenty respondents were selected randomly from rural areas three tehsiles of district Mansehra. The results indicated that majority of respondents (48.3%) were illiterate. Both farming and non-farming was the main source of income for majority (45.0%) of the respondents. It was also found that all respondents were of the view that there exists a rise in temperature which is a major cause of global warming. Regarding the impacts of climate change on livelihoods of rural people it was found that “increase intensity of natural disaster”, was at the top with highest mean value ($M=4.42$). Among different variables of rural livelihoods “increase in human mortality rate” was found at the lowest level with lowest mean value ($M= 3.40$). From the results it was concluded that climate change has adverse impacts on the livelihoods of rural communities in the region and different state departments (agri. extension and forestry) should launch awareness campaigns regarding adoption of different adaptation strategies of climate change so that small farmers can easily secure their livelihoods.

KEYWORDS: Climate change; rural livelihoods; Hazara region; Pakistan.

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INTRODUCTION

Climate change is the change in weather in a statistical manner over periods of time (20). This change in weather may be due to natural variability or as a result of human activities (5). In developing and low income countries a vast majority of people used to live in rural areas and climate changes have significant affect on the livelihood of the people residing in these areas (3). Livelihoods of rural communities largely depend upon agriculture which is badly affected due to adverse changes in climatic conditions in the form of rising temperature and intensity of precipitation both in the form of rainfall and snow. This situation threatens the food security situation in these countries (35). In South Asian countries sustaining rural livelihoods in the realm of climate change has become the major challenge for development practitioners due to the reduction in production of major cereal crops (38).

Increase in global temperature, which is main indicator of climate change, the average production of major cereal crops as well as fruits and vegetables, on which whole of the livelihoods of rural people depends is reducing rapidly. In these circumstances it has become very difficult to meet the food requirements of ever growing population of the global world (26). The increase in temperature invites many insects/pests and diseases to attack the crops, due to which production of these crops automatically is reduced, which ultimately enhances the food insecurity situation in rural areas. Other than the rise in temperature, heavy rainfall shows the harshness in the climatic conditions and has negative impacts on livelihoods of people who reside in rural areas and directly or indirectly depend on agriculture sector for their daily livelihoods (31). The low production of fodder due to the climatic changes also has many negative impacts on the production of livestock (13) which serves as financial and physical capital. It plays an eminent role in sustaining livelihoods of farming community (21).

Like other countries of South Asian region, the livelihoods of rural people in Pakistan totally depend upon agriculture through direct or indirect ways. It is already facing a lot of problems regarding sustainability of livelihoods like sluggish yield of crops, water logging and salinity, soil erosion, natural hazards, day by day reduction in size of farm land holding, price situation of farm inputs, etc. In addition to these intimidating challenges climate change also add pressure on livelihood options of rural people and making impacts on the lives of specifically poor community (14). The livelihoods of poor people who reside in rural areas (12) are disrupted by the risks and vulnerabilities due to the change in climate (8).

The increase in average temperature becomes the foundation of unusual weather conditions which lead to heavy floods and ultimately becomes an important factor behind the loss physical, natural, financial and human assets of rural population (1). Due to climate change the dejection of glaciers in the Himalaya region has increased intensity of the occurrence of events like floods, droughts and many other climatic extremes (24). This situation is more severe in hilly and mountainous areas like Hazara region of Khyber Pakhtunkhwa (KPK) province where majority of the area is under forest cover and due to small landholdings, livelihoods of the people are more vulnerable than plain areas (25).

Keeping in view this notion, the present study was planned to assess the impacts of climate change on the livelihoods of rural people with special reference to Hazara region of Pakistan.

MATERIALS AND METHODS

This study was conducted at the Institute of Agricultural Extension and Rural Development, University of Agriculture, Faisalabad, Pakistan during the year 2014. Hazara region of Khyber Pakhtunkhwa (KPK) Province was selected. The region comprises six districts namely Haripur, Abbotabd, Mansehra, Kohistan, Bttagram and Tor Ghur. The area is full of natural resources having maximum forest cover in the country (39). However, the livelihoods realities in the region especially on high mountains are very hard and rural people are facing a plenty of problems regarding their livelihoods options. Due to small size of farm land holding, rural people also adopt non-agriculture profession alongwith agriculture to maintain their livelihoods (36). Multistage sampling technique was adopted. In 1st step out of total six districts, Mansehra district was selected purposively as the district is the largest one on the basis of population (9). The whole district consists of three tehsiles; Mansehra, Ohgi and Balakot. Out of these three tehsiles, Oghi and Balakot are totally considered as rural tehsiles (4). As the main focus of our research was on the livelihoods of rural people, due to which these two tehsiles (Oghi and Balakot) were selected purposively as the targeted areas in the 2nd step of sampling. In 3rd step 60 respondents were randomly selected from each of the two above mentioned tehsiles making a total number of 120 respondents. Both qualitative and quantitative methods were used to collect relevant data from the research area. Quantitative data were collected through structured interview schedule while qualitative data were collected through indepth personal interviews from key informants and Focus Group Discussion. The data were tabulated and analyzed by using computer operated software

SPSS. A five point likert type scale was used to collect data regarding impacts of climate change on the livelihoods of rural community.

RESULTS AND DISCUSSION

Educational status

Educational status of an individual plays an important role in bringing change in the behaviour (19). It is necessary for an individual's capacity building and among rural dwellers education enhance their farm output due to the adoption of latest crop management practices (28). In view of the importance of educational status of rural people the data regarding literacy level of respondents in the study area were collected and tabulated in Table1.

Table 1. Distribution of the respondents according to their educational status

Education	Frequency	Percent (%)
Illiterate	58	48.3
Up to primary	34	28.3
Middle	20	16.7
Matric	06	5.0
Above Matric	02	1.7
Total	120	100

The data showed that nearly half (48.3%) of the respondents were illiterate. And slightly more than fifty percent (51.7%) of respondents were found literate. Among those literate respondents only 1.7 percent of them had education above matriculation (10 years of schooling). The literacy rate of rural areas of Khyber Pukhtunkhwa, Pakistan is lower than other two provinces i.e. Punjab and Sindh but little higher than Baluchistan (6).

Livelihood income sources

Income sources play a key role in livelihood strategies especially in rural areas where poverty and food insecurity are the two main issues. A variety of income sources were being used by the farmers in study area due to the existence of diversification in livelihood strategies in order to improve their living standards (16). The data regarding different income sources being used in the area were tabulated in Table 2.

The data presented in Table 2 showed that majority (45.0%) of households adopt and rely on farming and non-farming profession as their main sources of income. During qualitative discussion it was found that among farming

Table 2. Distribution of the respondents according to their livelihood income sources

Source of income	Frequency	Percent (%)
Farming	40	33.3
Non farming	26	21.7
Both	54	45.0
Total	120	100.0

source of income, respondents earn money to secure their livelihoods from product of crops and rearing on animals. But on the other hand among non-farming source of income, respondents adopt skilled and unskilled labour as main profession in order to earn for securing livelihoods. In this connection one of the respondents during focus group discussion responded that:

“only agriculture is not sufficient to meet our daily food and living requirements”

The above remarks of the respondent clearly indicate and confirm the results of quantitative data that in the present age of economic crises and economic instability in the country people of the area bound to adopt multiple sources of income. Although Pakistan is agriculture based country, whose economy is heavily relied on agriculture, but due to the adverse climate changes, the livelihoods of rural community in the whole country in general and specifically in hilly areas depend on both farm and non-farm sources of income (32). For better agricultural productivity non-farm income sources also play key role as discussed by Ruben and Berg (30). Diversification of livelihood strategies in the form of income sources in highlands of Pakistan (northern areas) was also described by Tareen *et al.* (37).

Indictors of climate change

There are many indicators and agents of climate change in the world. Out of these indicators; rise in temperature and changes in precipitation/rainfall pattern are the most important ones. In hilly areas of Pakistan especially high hills (North-West Region) rise in temperature resulted in melting of glaciers and patterns of rainfall are disrupted due to the changes in climate (2). In the present research, data regarding different indicators of climate change i.e. rise in temperature, change in rainfall pattern and change in intensity of rainfall in the study area were collected and presented in Table 3.

The data showed that 100 percent of the respondents viewed that rise in temperature in the area is mainly responsible for climate change in the region. Also this rise in temperature is responsible for rapid melting of glaciers, which are expected to increase floods in the Indus River and its

Table 3. Distribution of respondents according to perception about different variables as agents to climate change

n = 120		
Rise in temperature	Frequency	Percent (%)
Yes	120	100
No	0	0
Change in rainfall pattern	Frequency	Percent (%)
Yes	100	83.3
No	20	16.7
Change in intensity of rainfall	Frequency	Percent (%)
Increase	64	53.3
Decrease	16	13.3
Moderate	40	33.3

tributaries. If this situation continues, in future the water flow in the Indus River would decrease as the Glaciers recede (7). This decreased water flow in the canal system of Pakistan will badly affect the security situation in the country as agriculture is supposed to be the main source of livelihoods for majority of the population both in plain and mountainous areas as country's agriculture depends on that single river (18). Increase in temperature also responsible for reduction in crops yield which is a serious threat to agricultural production (17). With special reference to South Asian countries the high hills which are responsible for provision of water for agricultural and non-agricultural purposes, are seriously facing devastating challenge of climate change (27).

Regarding change in rainfall pattern overwhelming majority (83.3%) of the respondents was of the view that in the area there is change in pattern of rainfall during the last five years. In changing pattern of rainfall slightly more than half (53.3%) of the respondents were of the view that during the last five years there is increased intensity of rainfall in the area. In view of these findings. Salman (33) reported that in Northern areas of Pakistan change in natural precipitation both in the form of rainfall and snow is clear indicator of climate change. It has proved through research that increased intensity of rainfall has negative impacts on rural livelihoods (31). However, 13.3 percent of the respondents reported that there is decreased intensity of rainfall in the area. This decrease in rainfall is affecting the grass and forests in the area as reported earlier (33).

Means by which climate change affects rural livelihoods

In hilly areas of Pakistan generally and specifically in Hazara region rural livelihood options not only depend upon agriculture, but also people of these

areas depend upon non-farm income sources for their livelihoods (29). In South Asia including Pakistan, climate change adversely affects the livelihoods of rural community directly or indirectly and has become a threat to natural resources, human security and development (34). For feeding billions of people in Asia-Pacific region climate change is a major challenge for food security and rural livelihoods (14). Data regarding different livelihood variables on which climate change affects through one of other way were collected and tabulated in Table 4.

Table 4. Distribution of respondents according to their perception about impact of climate change on rural livelihoods

Means by which climate change affects rural livelihoods	Mean	SD
Occurrence of increase intensity of natural disasters	4.42	1.030
Water shortage	4.37	0.712
Increase in food prices	4.30	0.830
Increase environmental pollution	4.25	0.856
Disturb health of livestock	4.22	0.976
Decrease in fruit or vegetable production	4.15	0.936
Increase attack of insect/pest	4.15	1.022
Change in rainfall pattern	4.10	0.951
Migration	4.03	0.780
Deforestation	4.00	1.249
Decrease in crop yield	3.88	0.555
Increase exposure to attack of diseases	3.67	1.003
Increase in human mortality rate	3.40	1.498

Scale: 5 = S. Agree, 4 = Agree, 3 = Undecided, 2 = Disagree, 1 = S. Disagree

The data showed that according to the perception of rural community “*occurrence of increase intensity of natural disasters*” due to climate change were at the top having maximum Mean value (M = 4.42/5.00). These findings showed that extreme weather conditions in the form of droughts, floods, cyclones, hailstorms, etc. had bad impacts on the livelihoods of people residing in rural areas. Similar observations and results were also reported previously (14) that Asia Pacific region has the highest population of poor people in these people are intimately exposed to climate hazards due to the adverse change in climatic conditions. Due to these climatic extremes, these people become more vulnerable to poverty (8). Due to these reasons the poverty in Khyber Pukhtunkhwa is higher than Punjab and Sindh provinces (11).

It was also found that in research area climate change was also responsible for “*shortage of water*” with mean value (M = 4.37/5.00) and ranked 2nd position among different variables of rural livelihoods. As in rural areas

majority of households depends upon agriculture, which in turn depends upon availability of water for farm purposes. In this situation if there is shortage of water due to change in climatic conditions, the livelihoods of people residing in these area would automatically be affected. In developing and low income countries especially in those countries where agriculture is the main source of livelihoods of rural people or the economy of whole the country is totally dependent of agriculture, climate change in the form of high temperature, and change in pattern of rainfall reduces yield of crops and ultimately become a serious threat to food security (15, 22, 23).

Among other livelihood variables which are being affected due to adverse changes in the climate, "*increase in human mortality rate*" was found at the bottom with lowest mean value (M = 3.40/5.00). The increase human mortality rate resulted in loss of human capital. Research studies have proved that due to climate change the occurrence of natural calamities especially floods has increased due to which huge loss in the form of human life (10).

CONCLUSIONS AND RECOMMENDATIONS

It was concluded that majority of respondents were illiterate and earn money for livelihoods both from farm and non-farm sources. It was found that all respondents were of the view that there is increase in environmental temperature and also majority (83.3%) of respondents responded that changes were also observed in rainfall pattern. A little more than half (53.3%) of the respondents observed increase intensity of rainfall as the indicator of climate change. It was also concluded that among different variables of rural livelihoods on which climate change affects, occurrence of increase intensity of natural disasters was perceived as at the top with highest mean value (M= 4.42). On the other hand increase in human mortality rate was perceived to be placed at the bottom with minimum mean value (M= 3.40). Keeping in view these results following recommendations are formulated:

1. Concrete measures should be adopted in order to increase the literacy level of rural people so that they can easily adopt cropping strategies against climate change.
2. Emphasis should also be given on non-farm sources on income instead of only on farm (agricultural) income.

3. Joint awareness campaigns regarding adoption of different strategies of climate change should be launched in rural areas to increase the awareness level of communities so that small farmers can easily secure their livelihoods.

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