

Climate Change And Its Implications For Food And Nutritional Security In Punjab: A Case Study Of Tehsil 18 Hazari

Muhammad Sayam¹, Hafiza Imrana Javed²

¹Department of Rural Sociology, University of Agriculture, Faisalabad, Pakistan

²Department of Rural Sociology, University of Agriculture, Faisalabad, Pakistan
Department of Social Sciences, University of Sargodha, Lyallpur Campus, Faisalabad, Pakistan

Abstract

The economy of Pakistan is based on agriculture. The global mean temperatures have been increasing since about 1850. The main causes are the burning of fossil fuels (coal, oil and gas) and the spread of intensive agriculture to meet increasing food demand. Climate change were affected directly or indirectly to human activity and also affect four dimensions of food security which is food availability, accessibility, utilization and food systems stability. The impact of climate change on human health, livelihood assets, food production and distribution channels, as well as changing purchasing power and market flows. Its impacts were both short term, resulting from more frequent and more intense extreme weather events, and long term, caused by changing temperatures and precipitation patterns. People who are already vulnerable and food insecure are likely to be the first affected. Agriculture-based livelihood systems that are already vulnerable to food insecurity face immediate risk of increased crop failure, new patterns of pests and diseases, lack of appropriate seeds and planting material, and loss of livestock. This may also lead to shifting vulnerabilities in both developing and developed countries. Agriculture, forestry and fisheries will not only be affected by climate change, but also contribute to it through emitting greenhouse gases. "Food security exists when all people at all times have physical or economic access to sufficient safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life". The main objectives of the present study is to explore the impact of climate change on food and nutrition security in the district Jhang and address the challenges and identify recommendations for actions. Present study was conducted in Tehsil 18-Hazari, district Jhang. Multi-stage sampling technique was applied for data collection. At the first stage two rural UCs (Out of 9) were selected through simple random sampling technique. At the 2nd stage two villages (from each UC) were selected randomly. At 3rd stage 240 respondents (60 from each village) were selected through simple random sampling technique. Questionnaires were develop according to the objective of this study. By using the appropriate statistical techniques data were analyzed.

Keywords: Climate Change, Food insecurity, agriculture, vulnerable

Introduction

“The weather conditions prevailing in an area in general or over a long period are known as climate.” Climate can affect many aspects of people in anywhere such as, plants, crops, livestock, agriculture production, accessibility and utilize of water, and health and wellbeing hazards.

Climate change (CC) is significant and long-term change in the weather patterns over periods from decades or millions years.” Variations in the weather, temperature, storm patterns and rain, mainly the hotness of the earth's atmosphere is caused by the raise of GHG's & CO₂. Climate Change has also affected a more requirement of water, energy, food, or living places. Climate change brings severe challenge to environmental, political, economic, and social development in developing countries, such as Pakistan.

Pakistan faced at least 10 percent reduction in the domestic production of wheat and 20 percent reduction in mangoes in Sindh and in future it may be up to 40 percent reduction owing to heat wave. Water scarcity and other climate changes related issues are also expected to hit us hard if we do not take necessary measures in time. The changing weather patterns can be disastrous to Pakistan agriculture produce. The biggest reason for this is the harmful gases produce by the developed countries of the world. All the crops i.e. sunflower, sugarcane, mango, and wheat have suffered at the hands of the rising temperature. When the temperatures rose in March and April, it was accompanied by dust and wind with storms causing the fruit to fall from the trees prematurely. This caused adverse effects on mango crops. Similarly, wheat per yield decrease every year. Wheat Under these climate scenarios the cereal production 4 to 10% decline by the end of this century in South Asian countries (Alam et al., 2007). In the variation of the climate changes production of maize, wheat, and rice significantly and also depends on the regional differences (Rozenweig et al., 2001 & Parry et al., 1999). Women play a vital role in the production of agriculture's and food. They are engaged in the production of food crops and the tenure of animals and often control the marketing and trade of the produce (World Bank, 2017). Pakistan cultivates the staple food crop that is wheat; most of the former cultivate the wheat in Punjab. The wheat has sown in winter and cultivated in summer season. The cold weather affected the productivity of the wheat. Extreme weather events such as rainfall also effect the production of wheat and prolong the time of harvest; ultimately these climatic events may cause the food insecurity in Pakistan (Janjua et al., 2010). Climate variation adversely affected the Pakistan past few decades especially in agriculture production, so these factors directly affected the supplies of food, production of food and this will be insecure the food and nutrition (GFSI, 2012). Variability in temperature and precipitation during cultivation of wheat play an important role for maximum production (Mitra & Bhatia, 2008; Semenov, 2009). In Pakistan last few decades many research indicated that the productivity of wheat has declined due to the harsh of climate changes (FAO, 2019 and GOP, 2019).

Food and nutrition security definition its pillars and also draw the conceptual frame work because we deeply assessment and understand the impact of climate change i.e. weather, heat, temperature, humidity, flood, drought, rain and GHS on food & nutrition security in Pakistan.

Climate Change Food and Nutrition Security Significantly Climate affected the food & nutrition of all population; particularly the women and the children are more affected the climate. Variability in weather patterns all the farmers facing more hazards in producing food. Climate affects the short term and long term, In short term population growth, mortality due to weather events, food insecurity, poverty and morbidity. In long term natural resources i.e. water, availability & and access of food. In 2050 expected 24 million women and children are malnourished (FAO, 2019). Definitions According to World Food Summit (WFS) food security is: "Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life" (WFS, 1996; WHO, 2016). Food and nutrition security is consisting of four major elements. Availability, adequate good quality food, distributed through household production or imports with the center of attention on national and regional altitudes. The quality and quantity of food that a household can obtain given its resources will depend on domestic food prices, which are usually determined by food availability and aggregate food demand. Dietary preferences can be influenced by factors such as culture, religion and social status (Atkin, 2013).

Access, the sufficient resource for receiving hands on suitable foods to achieve a nutritious diet to individuals or households. Income is more associated with access of food. Food access is to a large extent determined by household resources and food prices. All household has an inadequate of resources at its disposal, including assets, human capital, labor, and natural resources. Utilization Proper utilization of food based on knowledge, feeding practices, water access, hygiene and health care practices. Utilization of food refers to an individual's food intake & her/his capability to absorb nutrients contain in the food that is eaten (UN World Food Program, 2007).

Stability, affected the both availability of food & food access, both elements highlights the significance of having the availability of food & ability to food access all times in the future. An individual or household has hazard to food access as a significance of unexpected shocks, also other shocks, e.g. social, political, economic, e.g. leads to food insecurity (FAO, 2006; WFP, 2009; WHO,2009).

PDMA, Punjab 12 Sep, 2014 the 372 people were injured, while 200 deaths had been reported in the province. More than two thousand houses fully damaged and 30 thousand houses had been partially damage. About 2694 villages & 2 lac people were affected, 1129500 acres of agriculture destroyed and 1050 livestock decomposed. The flood damage district with 20500 houses partially and fully damaged. The flood exaggerated all the 9 UCs of the 18 Hazari. The flood damages their houses, all crops, livestock, poultry and all their income resources (Rapid Needs Assessment Report, 2014).

Nutritional status and Food security will affect people's capacity to adapt their lives and livelihoods. Three billion populations will practice water insufficiency and 200 to 600 million, starvation by 2080 (IPCC 2007; 2014).

This study focuses on production in the existence of climate scenario in Pakistan. Punjab produces the 80 percent total wheat and main province of Pakistan (GOP, 2010)

Food production in Pakistan has decreased, from 53% in 1949-50 to 21.8 % in 2008-09, and that of industry has increased to 17%, agriculture is still the predominant sector of

national economy. It provides food and fiber to the growing population of the country, hence is an important contributor to food-security and it presently employs 44.7 % of Pakistan's labor force (GoP, 2009).

It has been increasingly realized that climate change is the single important factor that is likely to exert pressing effect on productive resources and, ultimately, on agricultural productivity in a number of ways.

The following aims of the study were delineated:

- 1 To assess how climate change is currently affecting food and nutrition security.
- 2 To explore the linkages between socio-economic characteristics and nutritional and food security assessment of households of the respondents.
- 3 To develop specific recommendations for improving food security and nutritional status of the respondents.

Review of Literature

Peng et al. (2004) concluded that 1°C increase in hotness in the increasing stage would lead to 10 % decrease productivity of rice, wheat by extreme weather events. So present study was also shows that temperature decreases the productivity of major food crops.

Xiao et al. (2008) indicated that due to activist change in temperature and rainfall was optimistic impact on wheat and rice production.

FAO (2008) reported that climate directly affected the all four dimensions of food & nutrition not only this also affected food system, production, distribution, livelihood capitals buying ability and market flow.

FAO (2008) reported that climate change there may be many types of stresses includes on livelihoods, i.e. livestock products, less food and crops production, In most of the area which are affecting from decline food access & income from agriculture production. On the other hand, the fluctuation in prices is also a major issue for affording and access to food, so as results less food being produced and limited amount of money is available to buy the expensive food.

Crahay et al. (2010) studied climate has directly import on food system and all agricultural production so, as a resulting it raises the prevalence of malnutrition. However, nutrition insecurity and as well as the food availability and access of the food for the people is very necessary and depending on the type of livelihood.

Rasul (2010) stated that climate change and Food Security in Pakistan melting glaciers, high precipitation and irrigation water for food production. The various issues are facing i.e. high population growth, food insecurity water and energy crisis, unemployment, climate change, education and health.

Mustafa (2011) reported that Pakistan most effected country effected by climate due to high temperature, faces flood every monsoon prolong cold and hotness resulting in food, water crisis. The 21 % GDP of Pakistan rely on agricultural and due to less productivity effected to socio-economic of livelihood.

Naheed and Rasul (2011) reported that the factors i.e. temperature, day length, and evaporation, which are significant impact on the food production and agriculture productivity.

IFAD (2012) reported that extreme weather events high temperature causes the 40-45 percent agriculture land are despoiled over the world. Increasing the demand and supply of

food products the inflation rate is increased, 50 to 80 % incomes of poor people have spent on their food.

Oxfam (2012) stated that Climate change is projected to weather variation. Rainfall, stress, heat, temperature, and extreme events such as drought, flooding, late spring or early fall freezes and severe thunderstorms can critically influence in production.

Walthall et al. (2012) stated that in our life span the prices of the food crops increase up to 135 percent due to variation of climate. Increases in the amount of precipitation coming in very heavy rainfall events and storms will have a number of effects on agriculture and food security.

GoP-ESP (2013) reported that during year 2010-11 and then 2011-12 throughout floods people faces the high inflation rate in all food items, the major and minor crops in Punjab. The consumer price index was peak during flood it increases about 11.3 percent in April 2012.

NCADAC (2013) articulated that the heavy downpours can flood fields and damage crops. Crops are especially vulnerable immediately following spring planting. Rainfall intensity can increase runoff. When the rain runs off of fields, less water infiltrates through the soil to provide water to remaining crops

Qureshi et al. (2013) described that in Australia contribution to trade in wheat, meat, rice & dairy products shows negative impact under the climate change scenario.

The World Economic Forum's Global Risks Report (2013) analyzed that water calamity fall in the top five risk in worldwide .The UN stated that year 2013 as the Water co-operation.

Wheeler & Von Braun (2013) stated that under climate change scenario the variation in food supply can have bad effects on sustainability of food systems in the world. The malnourished and vulnerable region climate can have destructive effect.

WHO (2013) conclude that food security as "when all people at all times have access to adequate, secure, healthy food to keep a healthy and energetic life." Access to food that people meets their nutritional needs economic and physical.

Baldos & Hertel (2014) indicated that extreme climate events will pressure food security due to emission and its food security crash on crop yield. But the agricultural productivity increase due to other aspect.

Sayam (2015) reported that in the livelihoods of poor communities shock trends and seasonality play a vital role. These things are also showing the climate change e.g. rapid change in temperature, lack of rain, drought and changes in season that has been reported in Pakistan

Sayam (2015) reported that there is a relationship between climate and health related practices. Climate directly affected food & nutrition and also water & heat related diseases. Under the umbrella of climate, food becomes less nutrition's, food prices increasing and that is a result of affecting infant, maternal & young child malnutrition.

Material and Methods

Present study was conducted in district Jhang located in Punjab province of Pakistan. District Jhang is divided into four tehsils, Jhang, Ahmed pur Sial, Shorkot and 18 hazari. The study

was conducted in rural areas of District Jhang Tehsil 18 Hazari. The universe is commonly defined as the totality of everything that exists (WBI, 2010). In present study, 240 respondents were selected through multistage sampling technique. From four Tehsils, one Tehsil was selected through randomly. In simple random sampling technique, every unit has been given equal chance for being selection. At the 2nd stage, from 9 rural union councils, two union councils were selected randomly. One union council is Union Council 66 i.e. Rasheed Pur and other is union council 65 i.e Athraazri Hazari. Four villages were selected randomly from these two union councils. Two from Union Council UC#66 (Benda Rasheed Pur, Jubbana) and two villages were selected from Union Council 18 Hazari (Kot Aryania, 5 Marla Scheme). In the last stage, 60 respondents from each village were selected through convenient sampling.

Results and Discussion

Analysis and interpretation of data are the most significant steps in scientific research. Without these steps generalization and prediction cannot be accomplished which is the target of scientific research. Table 1 reveals that most of the respondents' i.e. 74.2 percent were male and little more one fifth i.e. 25.8 percent remaining respondents were female.

Table 1: Distribution of respondents according to their gender

Sex	Frequency	Percent
Female	62	25.8
Male	178	74.2
Total	240	100

Table 2 reveals that most of respondents i.e. 81.7 percent were married, while 18.3 percent of the respondents were unmarried and not a single percent of the respondents were separated and divorced.

Table 2: Distribution of the respondents according to their marital status.

Marital Status	Frequency	Percent
Married	196	81.7
Unmarried	44	18.3
Divorced	0	0
Separated	0	0
Total	240	100.0

Near about one-fourth of the respondents i.e. 24.6 percent were illiterate and more of one -fifth the respondents i.e. 26.7 percent were matriculated. Only 12.1 percent of the respondents were intermediate and just 8 percent of the respondents had graduation or above level of education.

Table 3: Distribution of the respondents according to their educational status

Education Status	Frequency	Percent
Illiterate	59	24.6
Primary	54	22.5

Middle	32	13.3
Matric	64	26.7
Intermediate	29	12.1
Graduation or Above	2	.8
Total	240	100.0

Table 4 reveals that 47.1 percent respondents were agriculturist. The research indicates that 13.8 percent respondents were doing their own business and 8.8 were government employees.

Table 4: Distribution of the respondents according to their occupation

Occupation	Frequency	Percent
Agriculture	113	47.1
Business	33	13.8
Govt. employee	21	8.8
Pvt. Job	12	5.0
Labor	11	4.6
House Wife	50	20.8
Total	240	100.0

According to table 5, half of the respondents 52.9 percent were heard about climate change. 60 percent respondents were knowledge to some extent regarding climate change.

Table 5: Distribution of the respondents according to have heard about climate change

Have you heard of "climate change"	Frequency	Percent
Yes	127	52.9
No	73	30.4
Do not Know	40	16.7
Total	240	100.0

Table 6 reveals that only 7.5 percent of the respondents have air pollution had a climate issue while, most of the respondents i.e. 69.6 percent said that flood was the main issue of climate issue and remaining little less than one-fourth respondents i.e. 22.9 percent have said that climatic changes is the issue of climate change.

Table 6: Distribution of the respondents according to the knowledge about climate issues

climate issues	Frequency	Percent
Air pollution	18	7.5
Flooding	167	69.6
Climate change	55	22.9
Total	240	100.0

Table 7 explains that association between education of the respondents and their knowledge about the impact of climate change. The value of the Chi-square shows a significant association

between respondent's age & their knowledge about the impact of climate change. The value of Gamma shows that a strong positive relationship between variables. It means highly qualified respondents had more knowledge about the impact of climate change as compared to illiterate and low educated. So the hypothesis "Higher the education of the respondents, higher will be the knowledge about the impact of climate change" is accepted.

Table 7: Association between education of the respondents and their knowledge about the impact of climate change

Education of Respondents & Impact of Climate Changes Cross Tabulation			Impact of climate changes			Total
			Low	Medium	High	
Illiterate	Count	28	15	16	59	
	% of Respondents	47.5%	25.4%	27.1%	100.0%	
Primary	Count	7	26	21	54	
	% of Respondents	13.0%	48.1%	38.9%	100.0%	
Middle	Count	5	27	0	32	
	% of Respondents	15.6%	84.4%	0.0%	100.0%	
Matriculation	Count	0	36	28	64	
	% of Respondents	0.0%	56.3%	43.8%	100.0%	
Intermediate	Count	0	27	2	29	
	% of Respondents	0.0%	93.1%	6.9%	100.0%	
Graduation or Above	Count	0	2	0	2	
	% of Respondents	0.0%	100.0%	0.0%	100.0%	
Total	Count	40	133	67	240	
	% of Respondents	16.7%	55.4%	27.9%	100.0%	

Chi-square = 95.12 d. f. = 10 Significance = .05* Gamma = .236 *

Table 8 presents the association between climate change affected the food and nutrition. The value of the Chi-square shows a significant association between climates changes impact on food and nutrition. The value of Gamma shows that a strong positive relationship between the variables. It means highly climate had the more impact the food and nutrition. So the hypothesis "Higher the climate change, higher will be the food and nutrition" is accepted. Total crops area in Jhang 747221 Acres and 5.14 % of the total cropped area is affected in the flood of July, 2013.

Present study shows that climate highly affected the agriculture sector i.e. 47.7 percent while the livestock affected by climate as a medium 77.7 percent. The main interesting results that household are specially women & children in rural areas are most affected by climate change. These are always remaining more vulnerable and under nutrition due to the effect of climate change.

Table 8: Association between climate change of the respondents and impact their food and nutrition

Food and Nutrition & Impact of Climate Changes Cross Tabulation			Impact of Climate Changes			Total
			Low	Medium	High	
	Agriculture	Count	11	12	21	44
		%	25.0%	27.3%	47.7%	100.0%
	Livestock	Count	29	100	0	129
		%	22.5%	77.5%	0.0%	100.0%
	Household	Count	0	21	46	67
		%	0.0%	31.3%	68.7%	100.0%
Total		Count	40	133	67	240
		%	16.7%	55.4%	27.9%	100.0%

Chi-square = 122.31 d. f. = 4 Significance = .27^{NS} Gamma = .437

Conclusion

According to climate risk index from 1992-2011 Pakistan has 8th position. Pakistan is most affected country by the effects of climate change. Climate existence, and food and nutrition are always together as life is concerned on globe. Climate changes are highly association between climate changes & food and nutrition security. The 11th position of Pakistan as a country at 'great risk' on the Food Security Risk Index. Topic of climate is the most important and debatable issue of this decade. Pakistan faced at least 10 percent reduction in the domestic production of wheat and 20 percent reduction in mangoes in Sindh and in future it may be up to 40 percent reduction owing to heat wave. Water scarcity and other climate changes related issues are also expected to hit us hard if we do not take necessary measures in time. The changing weather patterns can be disastrous to Pakistan agriculture produce. The biggest reason for this is the harmful gases produce by the developed countries of the world. All the crops i.e. sunflower, sugarcane, mangos, and wheat have suffered at the hands of the rising temperature. We are suffering from the climate changes however, we are also responsible for this because cutting down the trees, deforestation, expanding our cities due to population bomb. Govt have not environmental checks regarding the plantation and green areas. Another main reason that is cities are expanded and huge buildings all across the cities which is absorb heat during the day and release it at night. Hence, 24 hours day and night warm so that heat wave causing destruction in the cities. Furthermore high industrialization societies, traffic congestion produce the carbon dioxide produced also increased. Smoke release by mills, factories, and cool burn also kept on entering the environment so raise in temperature resultant global warming. Pakistan contributed to harmful gases is much lower than other industrial countries like China, India, USA, and Europe. When global warming happens, winter and summer pattern change abruptly. Earlier we used to experience all the eight seasons however, now the autumn and spring season has almost vanished. The temperature recorded increasing every year and heat wave comes at the end of May or June but now experiencing in April or in May. This

results in negatives impact on our ecosystem and water reserves are almost near to extinction. Thus there are documented climate change has adverse effects on human. Change in climate is exerting pressure on the resources, directly and indirectly effect of these factors. Pakistan is a developing country and one fifth i.e. 21 percent of their economy based on agriculture. Climate directly affected the agriculture, food, and livestock of all rural household. However, according to this report, in Pakistan climate change has given rise to increase in temperature, flood, weather pattern change, less productivity, Current Status and Vulnerability, Household food insecurity, Shocks, trends, seasonality water crisis and increase the health risk. Pakistan has various climatic implications for food and nutrition security. Firstly unavailability of water, secondly prolong summer season the high temperature, thirdly melting of glaciers and precipitation result flood, and finally high population growth causes the damage the crops , low productivity all types of capitals of livelihood. The inflation rate high due to gap between demand, storage and adequate food supply. Under these climate scenarios the cereal production 4 to 10% decline by the end of this century in South Asian countries. In the variation of the climate changes production of maize, wheat, and rice significantly and also depends on the regional differences. Women play a vital role in the production of agriculture's and food. They are engaged in the production of food crops and the tenure of animals and often control the marketing and trade of the produce. Pakistan cultivates the staple food crop that is wheat; most of the former cultivate the wheat in Punjab. The wheat has sown in winter and cultivated in summer season. The cold temperature affected the productivity of the wheat. Extreme weather events such as rainfall also effect the production of wheat and prolong the time of harvest; ultimately these climatic events may cause the food insecurity in Pakistan. Climate variation adversely affected the Pakistan past few decades 90 especially in agriculture production, so these factors directly affected the supplies of food, production of food and this will be insecure the food and nutrition.

Recommendations

Firstly, the speed with which the climate is changing, we are not matching its pace in taking corrective measures. Our speed is much slower that the climate s speed. Secondly, the Govt. and International stakeholders could support, joint public private partnership the following step should be taken. Scaling up existing and additional nutrition interventions that successfully address the increasing impacts of and threats from climate change. Coordinated efforts are needed to tackle the issues of climate change at grass-root levels. Provide support for research to build further evidence on the impact of climate on food and nutrition security. Assist the country in developing capacity within the primary health care sector to adapt to □ Climate challenges and strengthening the capacity to prevent and manage no communicable diseases. Provide sufficient and additional resources to support climate change adaptation. Support integrated food and nutrition programs which link nutrition awareness amongst health staff and mothers. Make some policy to handle the manmade climate and promoted raise HH ability to cope with strategies with impact of climate change on food and nutrition security to adopt to climate change, increase the budget from 0.5 to 3% on climate changes. Associations to particular practices such that food security, mitigation and adaptation.

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