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GENDER PERSPECTIVE OF CLIMATE CHANGE VULNERABILITIES IN THE AGRARIAN COMMUNITIES OF SEMI-ARID AREAS IN THE PUNJAB, PAKISTAN

Nida Fatima*[1], Babar Shahbaz[2], Muhammad Iftikhar[3] and Naveed Farah[4]

[1]Ph.D. Scholar, [2]Professor/ Director, [3]Associate Professor, Institute of Agri. Extension, Education and Rural Development, [4]Associate Professor, Department of Rural Sociology, University of Agriculture, Faisalabad, Pakistan.

*Corresponding author's email: nidahussain80@gmail.com

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ABSTRACT

Pakistan is one of the most vulnerable countries in the world due to extreme climate change events. However, it is important to know about the perceptions about climate change vulnerabilities in the rural areas from rural communities to overcome the climate changes related challenges. Gender remains an important social factor and the effects of climate change are felt in a different way for women and men therefore, adaptation intervention also need to be gendered. In this perspective, this study was conducted to find out the gender wise perception of climate change as well as vulnerability and adaptive capacity in the context of climate change. A cross-sectional survey of the male and female respondents was conducted from 24 villages of semi-arid areas of the Punjab, Pakistan. Data collection was conducted during 2023 in two semi-arid districts of Punjab Pakistan one from Layyah and other from Bhakkar district. Multistage random sampling technique was used to select a size of 360 households. Both male and female members of the households were interviewed to have a gender perspective. A total of 720 respondents (30 from each selected village: 15 Males and 15 Females) were taken as the study sample. This survey was supplemented with 25 key informant interviews. The data were analyzed descriptive statistical analysis used. For comparison, the independent samples t-test was used to compare the mean scores of both genders for a given variable. The results indicate that the female respondents perceived that in the past 10 years the summer heat waves have increased and rainfall has decreased as compared to their previous years experiences. Due to climate change impacts extreme cold wave have also increased which destroyed standing crops, vegetables and high risk of disease attacks plants and livestock. During drought and dry spell most of the crops were also destroyed due to shortage of water. Due to climate change impacts irregular rain fall also effected the seasonality of the crops and some crops could not be cultivated. Results also show that the sampled households get their food form their own farms to fulfill their basic food needs thus in case when any natural disaster occur they cannot fulfill the demand of food and face shortage of food. "Household got food from their own farmland" got mean values 4.07 and 3.31 for male and female respondents respectively. There was a significant difference between male and female respondents with t-value 7.764. During any natural disaster female member suffer more for collection of water from far areas. "Household with consistent water supply during natural disaster" had values 2.74 and 3.02 for male and female respondents respectively. The tendency for male respondents was rarely to sometimes, while for female respondents it was between sometime to often there was significant difference between male and female respondents with t-value 2.881. The overall results also indicate that most of the household rely on natural resources and they face difficulty during any natural climate change event occur.

KEYWORDS: Climate change; gender; perspective; arid zone; vulnerability indicator; households; perception; Pakistan

INTRODUCTION

The large number of negative impacts related to global climate change are enhancing concerns of the scholars, scientists, government officials as well as the general public (Phuong *et al*., 2023). Climate change-related impacts including prolonged flooding, heat waves, drought, sea level rises, and salinity, temperature and rainfall variations have become evident. Farmers are directly exposed to changing weather patterns (temperature, precipitation, sea-level rises and more frequent extreme events) and indirectly through changes in the quality of water, air and food in addition to changes in ecosystems, agriculture, industry, human settlements and the economy (Saeed *et al*., 2023).

These forms of direct and indirect exposure can lead to food insecurity, famine, insect/pest attack, loss of crop yield, death of animals (Upadhyay, 2024). Climate change risk is also greater for women because they typically lack the necessary resources to adapt to climate change such as land ownership financial resources as well as the relevant skills to adapt to climate change. An empowered woman who can make decisions about planting materials and inputs is more productive in agriculture. Furthermore, cultural barriers can often limit women access to the services which are necessary to adapt to climate change (Mishra and Pede, 2017). Intergovernmental Panel on climate change (IPCC) also indicate that the climate change extreme events such as droughts, floods, heat wave have also threaten the farmers of semi-arid regions which have extremely poor infrastructure which make them more vulnerable to climate change events (Magalhães *et al*., 2021). Rural communities in semi-arid zones experience considerable negative affects by climate change related vulnerabilities and those changes which is also compounded by different other socio-economic factors. Although, vulnerabilities are also influence by the social inequalities inbuilt in class, age, gender, race, and some other power structure, joined with other situational variable also such as where all people live, their mental and physical health, composition of household and size of different available resources to them to cope with all crises (Gahlawat and Lakra, 2020). However, gender remain an most important social and that also influences people life and increase ability to adopt different climate change related impact, this means that affect of climate change are felt in a different way by women and men therefore, adaptation intervention also need to be gendered. Pakistan is amongst the most vulnerable areas which are affected by the climate change extreme events. These climate changes related extreme events are in the form of irregular rain fall patterns, fluctuations in temperature, devastating floods, heat waves etc. (Fahad and Wang, 2018). Most frequent floods and droughts cause social and economic risk among individuals and are continues natural threat to people who are highly exposed to the climate change events particularly farmers. During 2022 Pakistan has been affected by flash floods brought on by the “monster monsoon” and high rains. The floods have affected 116 of the 160 districts of country, or approximately 75 percent of it, according to the most recent statistics, Pakistan has declared a state of emergency. However, the rainfall in the 2022 season was 375.4 mm, which is 187% more than average levels. Around 90% of the land in flood affected areas was either submerged or unfit for cultivation, mainly in Sindh and Balochistan provinces, making it impossible to become the cultivation of wheat and cotton. The agriculture sector is severely affected by the effects of climate change. This climatic disaster has destroyed infrastructure worth $30 billion dollars, including homes, bridges, roads, and cattle (Farah *et al*., 2023; Syed *et al*., 2022). Major climate change related vulnerability is frequently occurrences of drought in Pakistan which impact agriculture dependent livelihoods. Drought with various characteristics can impact in different climatic regions for short and long period which mostly depend upon the climatic condition and socio-economic situation of the area (Sultana *et al*., 2009).Women are also generally not involved in process of decision making both at the household and community base level. There have been very less systematic attempts to understand how gender responsibilities and roles interact with social and economic status, institutional arrangement and environment condition also shape their vulnerability and how their process of experiences different from men. Lack of the gender specific studies or vulnerability in rural context in Pakistan has created a large gap in climate change related literature. ***Problem statement*:** Gender remains a most important social factor which also influences the ability to cope with different climate change related impacts. This indicates that because men and women experience the effects of climate change differently, gender-specific adaptation interventions are also necessary. Rural women in Pakistan are generally not involved in process of decision making both at the household and community base level. Lack of the gender specific studies on vulnerability in rural context in Pakistan has created a gap in climate change related literature. To promote an understanding of the gender aspects of vulnerability to climate change, more strategic effort is required. This study aims to close this gap.Therefore this research was conducted with the following objectives

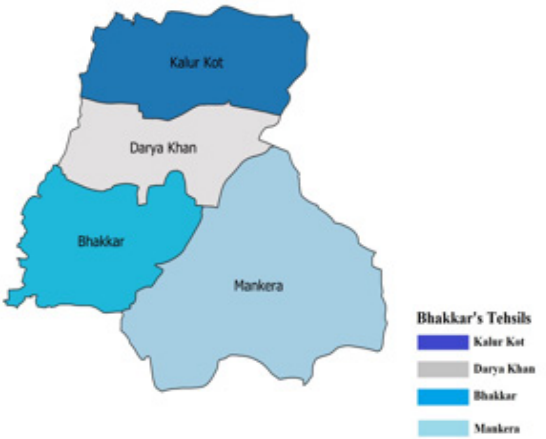
a) To find out gender based perceptions of farmers about climate change

b) To analyze vulnerability, adaptive capacity, sensitivity and exposure of the farming household in the study area through gender lenses (IPCC, 2001 and 2007)

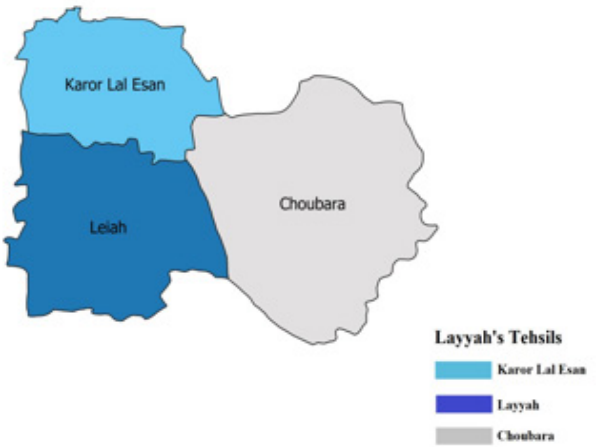
MATERIALS AND METHODS

Climate change risk perceptions plays an important role to identify the extent to which people actually are at risk, this is really important implications for climate change perception that effects on people adopt, modification or accept and reject the adaptive measures (Rühlemann and Jordan, 2021). Climate change related perceptions were assessed by using

Map of Bhakkar



Map of Layyah



the mixed method research approach. Data collection was conducted during 2023 in two semi-arid districts one from Layyah tan and other from Bhakkar district. These semi-arid regions of Punjab Pakistan categorized as a most drought and heat wave prone zone, flood and other climate change vulnerable areas (Farooqi *et al*., 2005). Multistage sampling technique was used to select the village from each union council. Data were collected from two districts and total four tehsil e.g. Layyah, Chobera, Mankara, Bakhar, then from each tehsil, three administrative Union Councils (UCs) were randomly selected, and then two villages from each UC were randomly taken. Thus in total 24 villages were selected. The sample size calculation procedure created by Yamane (1967) was used to determine a suitable sample size with a 95% confidence level and 5% margin of error. This table was used to select a sample of 360 household, evenly distributed among the villages. A total of 720 respondents (30 from each selected village: 15 Males and 15 Females) from the same household were taken as the study sample. In order to collect the qualitative data, key informants' interview and field observations were used by the researcher. Mixed method research is used because to gain more comprehensive research topic understanding by combing both quantitative and qualitative methods. For comparison, the independent samples t-test was used to compare the mean scores of two groups in a given variable, that is, two mean scores of the same variable, whereby one mean represents the average of that characteristic for one group and the other mean represents the average of that specific characteristic in the other group.

RESULTS AND DISCUSSION

One of the specifics objectives of this study was to find out how male and female farmers perceived and felt about climate change. The respondents were asked to tell different aspects of climate change and the results are given and presented in the following sub-section.

Socio-economic characteristics of respondents: Socio-economic characteristics of the respondents are viewed as the key determinants to understand the climate change vulnerabilities which are not distributed evenly with in the population groups, and the ability of coping the consequences of climate change also varies with the population characteristics (Muttarak, 2021). Demographic information can be used to identify demographically differentiated vulnerability that results from differences in physiological susceptibility, hazard exposure, and socio-economic and psychosocial factors influencing risk perceptions and capacity to respond.

***Age and education*:** The analysis of data regarding age and education of respondents has been presented in this section. A cross-sectional study conducted by (Nieuwhof *et al*., 2004) regarding climate change revealed that the strength of motivation increases with age especially between 18 to 24 year. After the age of about 24 years the strength of motivation more or less remains constant. Adzawla *et al*., (2020) found that climate change had the expected negative impact on farmers' livelihoods, and the older the farmer, the greater the perceived impact of climate change. It was also stated that elderly were more vulnerable to climate change than younger farmers, who appear to be more innovative and responsive to climate change.

It can be seen from Table 1 indicates that average age of the male and female respondents was 48 years and 43 years respectively with minimum age of male as 25 years and maximum age is 70 years, while in case of female, minimum age 20 years and maximum age was 60 years. T-test indicates that significant difference (Table 1). T-test revealed significant difference between both genders. It would be pertinent to mention

that both male and female respondents were involved in farming activities. Previous research shows that young farmers were more excited and energetic to enhance crop production, making them more efficient in their adaptation measures. Previous researchers (Denkyirah *et al*., 2016; Ojo and Baiyegunhi, 2020), have confirmed that younger farmer were more willing to take risk and participate in climate change adaption activities related to agriculture. The education was measured in term of total years of schooling completed by the respondents. The results in this regard are given in Table 1. The results regarding education of respondents presented in Table 1 indicate that majority of sampled female respondents were illiterate. The mean value of educational level (years of schooling) of male respondents was 4.18 years and that of female respondents were 3.38years. The range 0 was minimum and 12 maximum for both male and female respondents. There were significant differences between the educational level among male and female respondents with p-value .000**.Thus male respondents had more education (years of schooling) then female respondents. Factors such as, age and education are important for male and female farmers that influence on the farmers agriculture related activities which are helpful for adapting climate change related activities (Lasco *et al*., 2016; Fadina and Barjolle, 2018) Educated farmers are more interested to take risk and to apply new agriculture techniques, moreover education also increases the ability of farmers to get climate change related information and then understand it and come up with new ideas and different coping strategies to overcome these climatic impacts (Deressa *et al*., 2011).

Main source of household income: Intergovernmental Panel on Climate Change (IPCC) describes the adaptive capacity as potential of any system to successfully adjust to climatic extreme and variability one from moderate potential damages second to take benefits of opportunities and to cope with all the consequences of the climate change (IPCC, 2007). Adaptive capacity deals with the adjustments in the available resources and technology as well as behavior (Mthethwa and Wale, 2023). Household income contributes to the adaptive capacity of the households and it is defined as the combined overall income of the all household members over specific age groups, which also include salary, wages, self-employment, pension, investment income, retirement income also included. A household is family units which live together and share their males with each other and it also consist of the men, women and children. Women also participating in income generation activities to maintain household expensive female are the silent contributors in the rural economic (Khan and Rahman, 2016). Income source is a main indicator to measure sensitivity of household to climate change. Agriculture was primary source of income for 155 (43%) household, and it was secondary source for 182 (50%) household, and 22 household were having agriculture as their tertiary source of income. Livestock was a primary source for 150 (41.6%) household it was tertiary source 102 (28.3%) as source of income." Labor/Daily wages" was primary source of income for 177 (49.1%) household, and it was secondary source for 101 (28%) household, and 87 household were having agriculture as their tertiary source of income. "Business" was primary source of income for 140 (38.8%) household, and it was secondary source for 160 (44.4%) household, and 60 household were having agriculture as their tertiary source of income.

The results indicate that most of the household have primary sources of income was the agriculture along with livestock raring activities, but due to negative impacts of the climate change this trend shift towards livestock raring due to low yield and frequently occur of the natural disaster which destroy standing crops. In recent years, this trend shifts towards the business and labor to fulfill their needs at household level.

***Gendered perceptions of climate change*:** During the survey, I asked the respondents to report observed

Table 1: Comparison of respondents according to their age and education (n = 360 male, 360 female)

Demographic characteristics		Mean	Min	Max	S.D.	t-value	P-value
Age (years)	Male	48	25	70	9	7.21	.000**
	Female	43	20	60	11		
Education level (years of schooling)	Male	4.18	0	12	2.371	4.94	.000**
	Female	3.38	0	12	1.965		

** = Highly Significant

Table 2: Distribution of respondents according to main source of household income

Main source of household income	Primary (1)		Secondary (2)		Tertiary (3)	
	F	%	F	%	F	%
Agriculture	155	43.0	182	50.0	22	6.1
Livestock	150	41.6	107	29.7	102	28.3
Labor/daily wages	177	49.1	101	28	87	24.1
Business	140	38.8	160	44.4	60	16.6

(Rank 1= Primary, 2= Secondary, 3= Tertiary)

major changes in climatic indicators during the last ten and twenty years. Their perceptions regarding climate change were recorded. Both male and female respondents were asked the same questions and their responses were compared by using t-test. The results in terms of mean values, S.D, t-value (for the last 10 and 20 years) are presented in table 1 and 2 respectively.

The results regarding change in summer temperature during the last 10 years (Table 1) indicated the mean value for male and female respondents as 2.88 and 3.14 respectively. There was a significant difference in the perceptions of male and female respondents as calculated by the p-value .012*. The male respondents perceived less change in summer temperature as compared to female farmers. This might be due to involvement of females in household activities (cooking, take care of children etc.) and some other domestic responsibilities. The results related to "winter temperature" indicated that had mean values for male and female respondents as 3.85 and 2.78 respectively. The tendency for male respondents was between increased a little and increased a lot, while for female respondents it was between remained same and increased a little Significant difference were found regarding perception of male and female respondents with p-value .000*. "Monsoon rain" with mean values for male and female respondents 2.72 and 2.47 respectively. The tendency for male respondents was between remained same and increased a little while for female respondents was fall between decrease a little and remained same, Significant difference regarding perception of male and female respondents with p-value .023*. Meanwhile, "Disaster" had mean values for male and female respondents 2.65 and 2.30 respectively. The tendency for male respondents was between remained same and increased a little while for female respondents it was between decrease a little and remained same, significant difference is evident regarding perceptions of male and female respondents with p-value .002**. The overall mean value for male and female respondents was 3.04 and 2.74 respectively, indicating male respondents had comparatively more strong perception about climate change events than female respondents.

Perception of climate change is significantly influenced by different factors like education and gender. Likewise, climate change perception varies according to gender and marital status (Nadeem *et al*., 2022). For instance, male farmers are less likely to notice changes in climatic conditions than their female counterparts (Aslam *et al*., 2022).

The results related to the perceptions of male and female respondents regarding climate change during last 20 years are presented in table 2. The results regarding change in summer temperature during the last 20 years (Table 2) indicate that mean value for male and female respondents as 3.00 and 3.08 respectively. There was no significant difference in the perceptions of male and female respondents as indicate by the p-value .462Ns. The results related to "winter temperature" had mean values for male and female respondents as 3.10 and 2.87 respectively. The tendency for male respondents was between remained same and increased a little while for female respondents it was between decreased a little and remained same. Significant differences were found regarding perception of male and female respondents with p-value .004*. "Monsoon rain" had mean values for male and female respondents as 3.13 and 3.15 respectively. There was no significant difference in the perceptions of male and female respondents as indicate by the p-value .713 Ns. "Disasters" had mean values for male and female respondents for" as 3.05

Table 3: Gender based distribution of respondents to their perceptions regarding climate change (During last 10 Year)

Perceptions regarding climate change		Mean	S. D.	t-value	p-value
Summer temperature	Male	2.88	1.65	-2.527	.012*
	Female	3.14	0.93		
Winter temperature	Male	3.85	1.42	10.671	.000**
	Female	2.78	1.27		
Monsoon rain	Male	2.72	1.57	2.278	.023*
	Female	2.47	1.43		
Disaster	Male	2.65	1.61	3.115	.002**
	Female	2.30	1.41		
Erratic rainfall	Male	3.09	1.15	2.000	.046^{NS}
	Female	2.92	1.15		
Drought	Male	3.09	1.15	2.400	.017^{NS}
	Female	2.88	1.20		
Overall mean	Male	3.04	1.42		
	Female	2.74	1.23		

and 3.24 respectively. There was a significant difference in the perception of male and female respondents as indicate by the p-value .012*. “Erratic rainfall” during last 20 years (Table 2) had mean values for male and female respondents as 3.12 and 2.86 respectively. There was a significant difference in the perception of male and female respondents as indicate by the p-value .003**. “Drought” had mean values for male and female respondents as 3.09 and 2.96 respectively. There was no significant difference in the perceptions of male and female respondents as indicate by the p-value .116Ns. The overall mean value for male and female respondents was 3.08 and 3.02 respectively, indicating male respondents had comparatively more strong perception about climate change events than female respondents.

Results indicate that severe winter season destroyed standing crops due to frost burring of vegetable plants and different fungal disease attack on the fruits which make this situation worse for small land hold farmers. During drought and dry, spell most of the crops also destroyed due to shortage of water and this situation become worse in upcoming years. Due to climate change impacts irregular rain fall also affects on the seasons of the crops some crops don’t not cultivated. These climate change events increase our work load to maintain our livelihood resources most of the female during summer and winter season feel some health issues.

During qualitative interview most of the female respondents complained about the extreme climate change events and as these events had destroyed their crop, livestock and made difficult to perform their duties at household level.

At household level most women complained that any time floods occur and they were we are not able to go to work because they we have to spend most of time in collecting fuel wood form field and also take care of children, all these activities increase workload. Due to climate extreme events and seasonal variations affects crop production and decrease crop growth but government did not provide any type of help to farming community.

Woman farmer explained difficulties during and after any disaster. At household level we perform different duties like cooking, livestock management, take care of children, small kitchen garden etc. During summer season kitchen garden are effected by extreme heat event and burning of small vegetables, death of cow, buffalos etc. Agriculture related activities become more difficult during extreme cold and summer temperature like hoeing and fertilizer application and it is also difficult to manage the livestock activities. Government does not provide any type of help to overcome all these losses at household level.

The above qualitative data indicate that female farmers faced more difficulties as compare to the male farmer because they take part most of the activities which is performed on the field and at household level due it increased workload face more climate change impacts. In harsh environment women travel more for collection of water fuel wood and take care of children at home. Animals’ death burning of vegetables leaves during extreme climatic conditions. The overall results indicate that both male and female respondents had observed change in different aspects of climate change our

Table 4: Gender based distribution of respondents to their perceptions regarding climate change (During last 20 Years)

Perceptions regarding climate change		Mean	S. D.	t-value	p-value
Summer temperature	Male	2.04	0.91	-0.736	.462^{NS}
	Female	3.08	1.86		
Winter temperature	Male	2.10	1.10	2.861	.004**
	Female	2.87	1.19		
Monsoon rain	Male	2.13	1.01	-0.367	.713^{NS}
	Female	3.15	1.01		
Disasters	Male	2.05	1.00	-2.532	.012*
	Female	3.24	0.93		
Erratic rainfall	Male	1.12	1.10	2.974	.003**
	Female	2.86	1.20		
Drought	Male	2.09	1.15	1.574	.116^{NS}
	Female	2.96	1.16		
Overall mean	Male	3.08	1.05		
	Female	3.02	1.02		

Table 5: Gender-wise distribution of respondents according to their sensitivity related to food

Sensitivity indicator (Food)		Mean	S. D.	t-value	p-value
Household got food from their own farmland	Male	4.07	1.09	7.764	.000**
	Female	3.89	1.30		
Household face any type of food shortage during last year	Male	3.08	1.48	2.575	.010*
	Female	3.32	1.52		
Household store grain crops	Male	3.52	1.06	2.830	.005**
	Female	3.19	1.94		
Household is unable to trade self grown crops	Male	3.09	1.15	2.000	.046*
	Female	2.92	1.15		

(Scale = 1 = Never, 2 = Rarely, 3 = Sometime, 4 = Often, 5 = Always)

study found similar results as that of pervious research those farmers perceive climate change threat to their wellbeing (Frank *et al*., 2015). However, change in responsibilities, roles of male and female, women were more affected by the climate change effects due to their workload, they have limited opportunities to make money (Alston, 2014). Women travel more to maintain access to climate sensitive resources such as collection of firewood; water fetching, child caring, marketing and collection of ration commodities for their homes (Clarke *et al*., 2012). In addition to these responsibilities, women participate in different agriculture activities for generation of income and livelihood to maintain households against the effect of climate change related variability.

Households' vulnerability: Household vulnerability largely depends upon the sensitivity of the external environment and also its ability to cope with natural climatic hazards (Jalal *et al*., 2021). Most of the studies focus on the rural household vulnerabilities and assets which explain that if any household have more livelihood resources, they can easily cope with the climate change affects. However, household level vulnerability is more likely to be far and more complex than national or regional level vulnerability and there are many studies elaborate that household vulnerability varies with time and location (Zheng *et al*., 2014). IPCC vulnerability framework was used to measure the climate change related vulnerabilities at household level. As depicted in Table 3 the statement "Household got food from their own farmland" got mean values 4.07 and 3.31 for male and female respondents respectively. The tendency for male respondents was often, while for female respondents it was between sometimes to often and there was significant difference between male and female respondents with t-value 7.764. "Household faces any type of food shortage during last year" had mean values 3.08 and 2.79 for male and female respondents respectively. The tendency for male respondents it was sometime to often, while for

female respondents was between rarely to sometimes there was significant difference between male and female respondents with t-value 2.575. "Household store grain crops" with mean values 3.52 and 3.19 for male and female respondents respectively. The tendency for male respondents was often and always, while for female respondents was between sometime to often there was significant difference between male and female respondents with t-value 2.830. However, "Household is unable to trade self grown crops" with mean values 3.09 and 2.92 for male and female respondents respectively, the tendency for male respondents was sometime to often, while for female respondents it was between rarely to sometime there was Significant difference between male and female respondents with t-value 2.000.

Results show that the sampled households get their food form their own farms to fulfill their basic food needs thus in case when any natural disaster occur they cannot fulfill the demand of food and face shortage of food. Farmers also often store grain for next season crops to meet the household expenses because they cannot afford the seed for next season crops. They also trade the crops in every season to meet their other expenses like medical, children education and some other needs. Most of these activities are performed by the male member of the household and females only allowed selling very small amount of crops and milk to local shopkeeper to buy household items only. Finding of some previous studies highlighted that the changing climate change affects on livelihood resources and farming activities of the rural community, with great impact the crops yield most importantly the yield of staple crops might be decreased due to climate change impacts (Bocchiola *et al*., 2019). These climate change affects also create the shortage of food specially those farmers which completely rely on the agriculture production because it reduces the agriculture outputs so that farming shift to non-farming activities (Bastakoti *et al*., 2017).

Water availability and irrigation water facilities at play an important role in crop production and availability of water is highly affected by the drought events (Kong *et al*., 2019). When disasters occur, the drinking water, health and food of farm households are affected therefore, the sensitivity dimension is selected to measure healthy food, and water resources. Four statements were asked to bout the sensitivity (water) from both genders to cope with adverse climate change vulnerabilities of the sampled household on a Likert Scale: 1= Never, 2 = Rarely, 3 = Sometimes, 4 = Often, 5 = Always. The results in this regard are given in table 1.3. As shown in the table 4 "Household utilizing natural water resources" got mean values 3.51 and 2.88 for male and female respondents respectively. The tendency for male respondents was often to always, while for female respondents it was between rarely and sometimes, and there was significant difference between male and female respondents with t-value 6.536. During any natural disaster female member suffer more for collection of water from far areas. "Household with consistent water supply during natural disaster" had values 2.74 and 3.02 for male and female respondents respectively. The tendency for male respondents was rarely to sometimes, while for female respondents it was between sometime to often there was significant difference between male and female respondents with t-value 2.881. "Household store water during dry days" had values 2.85 and 2.78 for male and female respondents respectively. The tendency for both male and female respondents was between rarely so; there was no significant difference between male and female respondents with t-value .804. Drought condition or acute shortage of water availability most of the time people conflicts were reported in community "Household report any conflicts within their local community on water issue" with mean values 3.00 and 2.81 for male and female respondents respectively. The tendency for male respondents was often to always, while for female respondents it was between rarely and sometimes and there was significant difference between male and

Table 6: Gender wise distribution of respondents according to their sensitivity related to water

Sensitivity indicator (water)		Mean	S. D.	t-value	p-value
Household utilizing natural water resources	Male	3.51	1.14	6.536	.000**
	Female	3.88	1.43		
Household with consistent water supply during natural disaster	Male	2.74	1.32	2.881	.004**
	Female	3.02	1.30		
Household store water during dry days	Male	2.85	1.06	.804	.421^{NS}
	Female	2.78	1.06		
Household report any conflicts within their local community on water issue	Male	3.00	1.19	2.252	.025*
	Female	3.81	1.09		

female respondents with t-value 2.252.

The overall results indicate that most of the household rely on natural water resources and they face difficulty during any natural climate change event occur. Most of the time people conflicts are reported on the availability of water. Respondents indicate that acute shortage of water during drought seasons.

A female member of household said "we all community fulfill our needs through natural water resources our crops production also depend upon the natural water resources irrigation expenses we cannot tolerate some time at community level people fight for irrigation water due to limited availability of water we cannot irrigate our crops. During any natural climatic condition we travel more for faceting of water to fulfill our household needs"

Qualitative data indicate that sampled households rely on the natural water resources for irrigation purpose, but during dry spell some crops like wheat required more irrigation so, farmers can't not afford the expenses of the irrigation. However, key informants report that many conflicts rises due to shortage of water. Due to natural disaster female member suffer more because they have to frequently move for the in collection of water to fulfill domestic needs of the household as compared to men. Water level is decreasing day by day which also increase the chances of the drought.

CONCLUSION

Rural communities are well aware about the climate change vulnerabilities because these extreme climate change events like heat wave, cold wave, and rainfall that occurred over past ten to twenty years. climate change vulnerabilities increased day by day overall summer temperature, short winter, prolong drought and extreme flood which destroy crops and livestock, however, the climate change vulnerability negative effects in term of women health, decrease agriculture production. However, climate change has negatively impacted both male and female farmers in the semi-arid rural areas. This variability might also be caused due to weak and deteriorating irrigation infrastructure. In the study area agriculture and livestock were both the major sources of income, however, in the perspective of climate change, livestock farming was becoming more important because when any natural climatic disasters occur most of the farming community rely on the livestock as a major source of earning. Agriculture related livelihoods were increasingly become more vulnerable due to negative climate change impacts. Due to climate change negative impacts females were more vulnerable group before and after occurrence of any natural disaster because of their multiple responsibilities at field and household level other reason their limited mobility due to social norms, values and cultural barriers in the society and most importantly female famers had limited access to financial resources as well as low literacy rate all these factors made female more vulnerable. Women actively participant in the agriculture related activities, especially in Layyh and Bhakkar their vulnerability to climate change is very high. Government and other NGO promote non-farm activities for female at household level. Evidence regarding climate change vulnerabilities in Pakistan such finding can be used to develop government level policies and interventions. The collection of such type of date will allow other social scientists policy maker at government level and researchers to develop and implement appropriate strategies at country level in those areas which is especially vulnerable to climate change extreme events.

Recommendations

Based on the research findings, the following recommendations are considered appropriate and relevant

- Climate change impacts negatively on farming community to so new pathways are required to overcome negative effects so that, seasonal variations, change of planting and harvesting date of crops to overcome these challenges, use early maturing crop varieties to overcome climate change losses.
- Male and female farmers in climate research, early warning systems, and policy design to ensure that adaptation strategies are context specific and equitable
- Limited coping strategies of extension department should be focused on climate change related activities.

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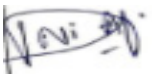
CONTRIBUTION OF AUTHORS

Sr. No.	Author's name	Contribution	Signature
1.	Nida Fatima	Concieved the idea and analysed the data	
2.	Babar Shahbaz	Supervised the research	
3.	Muhammad Iftikhar	Assisted the research work and wrote up the manuscript	
4.	Naveed Farah	Proof read the manuscript