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A Study on the Awareness of Hill Women Farmers to Climate Change and its Impact on Agriculture

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ABSTRACT: Climate is the average weather condition for a particular location over a long period of time, ranging from months to thousands or millions of years. From over decades, centuries or longer there has been occurring a drastic change in climate which is being referred to as climate change. Since climate is one of the most important determinants in agricultural production so its change is affecting the feed and fodder requirements of the growing population. In India majority of the agricultural operations are being conducted by women and they are thus considered to be the main actors in crop production and its sustainability. Therefore, with this view point present study was conducted on 100 farm women of Himachal Pradesh to understand the level of awareness of women on climate change and its adverse effects and their ways of coping with it along with making them aware about various climate resilient agricultural strategies. The results indicate that majority of the respondents were fully aware about only the indicators visible to them about climate change. Regarding level of awareness related to causes of climate change it was found that more than half of the respondents were somewhat aware.

Keywords: Climate Change, Sustainable Development goals, Rural Women, Climate Action, Zero Hunger and Integrated Farming System.

INTRODUCTION

Climate change means shifting average weather conditions, including measures such as temperature, humidity, rainfall, cloudiness, wind patterns and changes in the frequency or severity of these conditions. Climate change is the issue of major concern and has gained momentum in today's scenario. All the visionary planners are taking a serious note regarding this and making all their efforts while policy formation to keep this issue on priority. That's why mitigating it through Climate Actions has been kept as 13th Sustainable Development Goal of 2030. Climate change occurs due to various natural reasons like volcanic eruptions, fluctuations in solar radiations, small changes in the orbit, tectonic shifts etc. and also due to anthropogenic reasons. It was believed by the scientists that the influence of natural causes of climate change is too slow to explain the causes of rapid warming over the decades. Combustion of fossil fuels for transport, heating, cement production, deforestation, etc leads to increased CO_2. Various agricultural activities, waste disposal etc, will increase methane generation in the atmosphere. Natural processes in the soil and nitrogen fertilization application leads to Nitrogen oxides (N_2O) emissions in the atmosphere (Slave and Man 2012). Green house gas emissions due to human activities may be related to agricultural or non agricultural sectors are the major contributors behind climate change. Agricultural sector itself contributes 24 percent of the total anthropogenic factors responsible for Green House Gas emissions directly through production linked On-farm emissions and indirectly through land use change as a result of agricultural expansion (IPCC, AR5 to be released). Czyżewski and Kryszak (2018) reported that agricultural practices contribute about 25–30% of GHG emissions. Thus, there's a big dilemma that agriculture is both the victim as well as the contributor towards climate change.

Agriculture depends totally on weather and climatic conditions. Change in climate will affect the groundwater recharge, soil moisture and frequency of drought or flood, and groundwater level in different areas (Allen *et al*., 2004). This sector is itself facing a great negative consequences emerged out of climate change like increased infestation causing varied plant diseases, droughts or floods or variations in seasonal lengths resulting in changing of cropping season and crop failures or delay in fruiting and flowering of crops, etc. Climate change leads to variation in the incidence and distribution of pests and pathogens causing decrease in agricultural production due to variation in the patterns of pests and diseases with climate change

(Fan Zhai and Juzhong Zhuang 2012). A report of the (IMF, 2017) founds that for rising market economies a 10 degree celsius rise in temperature would decrease agricultural production by 1.7%, and a 100 millimeters decrease in rain would reduce growth by 0.35%. This decreased agricultural productivity poses a great threat towards meeting out the basic needs of human survival.

In the state of Himachal Pradesh women are the main actors and producers of the food for their families. In lieu of climate change, the time she is going to spend in field gets affected as they have to manage all household resources for their family which may range from arranging of water for drinking, cooking and cleaning to collecting fuel wood for cooking food. Since they perform major agricultural activities hence it is important to study that how much these women are aware about climate change along with finding out its impact these are viewing in the crops grown by them and how they are coming up with the solutions to mitigate and adapt to the changing climate. This will help to overcome the threats of feeding a huge population. Thus, this study has been planned with the following objectives

1. To study farm women's level of awareness regarding climate change and its causes
2. To study the adverse effect of climate change perceived by the farm women
3. To study the farm women's awareness regarding adaptation strategies followed *w.r.t.* climate change.
4. To generate awareness among farm women to follow climate resilient agricultural strategies.

METHODOLOGY

The study was conducted in Kangra district of Himachal Pradesh which lies in the Northern Himalayan region of India. Data were collected from 100 farmwomen using random sampling technique from four villages of Panchrukhi block of Kangra district of Himachal Pradesh. The data was collected using pre structured interview schedule. Focus group discussion method was used too to dig up the detailed information related to climate change. Level of awareness was measured on three points continuums *i.e.* fully aware, somewhat aware and not aware. The data thus collected was analyzed using frequency and percentages

RESULTS AND DISCUSSION

Table 1 depicts that 59 percent of the farm women were of middle age group. There were no women who was illiterate. Almost all the women were married. Majority (85%) of the farm women reported that their main occupation was farming and 73 percent revealed that they do not have any subsidiary occupation. It was found that 46 percent of the farm women exhibit joint family structure and 61 percent reported that they had medium family size.

Table 1: Distribution of the respondents according to their General background information N = 100.

Sr. No.	Characteristics/Attributes	Category	Percentage
1	Age	Young (18-35yrs.)	34
		Middle (36-50 yrs.)	59
		Upper middle (50 yrs. and above)	7
2	Caste	Gen	40
		OBC	29
		ST	13
		SC	18
3.	Education	Illiterate	0
		Can read and write	9
		Primary	9
		Middle	16
		Up to class x	20
		HSLC passed	3
		Higher secondary passed	26
		Graduate	12
		Post Graduate	5
4.	Marital status	Married	97
		Widow	3
5.	Occupation		
	i) Main occupation	Farming	85
		Service	9
		Business	6
	ii) Subsidiary occupation	Farming	15
		Daily wage earner	12
		No subsidiary occupation	73
6.	Type of family	Nuclear	41
		Joint	46
		Extended	13
7.	Size of family	Small	24
		Medium	61
		Large	15

Table 2: Distribution of respondents according to the level of awareness on indicators on climate change (N = 100).

Indicators /Phenomenon	Level of awareness		
	Fully aware	Somewhat aware	Not aware
Increase in melting of glacier	12%	50%	38%
Increase in temperature	80%	20%	0
Changes in water level	-	30%	70%
Irregular and erratic rainfall	82%	18%	-
Change in length of seasons	73%	27%	-
Change in intensity and frequency of storm	65%	35%	4%
Decline of soil productivity	16%	-	84%
Occurrence of extreme event — Cold waves — Hot waves — Heavy fog — Frequent flood	 11% 75% 65% 65%	 56% 25% 35% 22%	 33% - - 13%

Extent of awareness of farm women regarding climate change is covered in Table 2. The table exhibits the distribution of respondents according to the level of awareness on indicators on climate change. It was found that majority of the respondents were fully aware about the irregular and erratic rainfall (82%) and increasing temperatures (80%) due to climate change. It was also reported by 73 percent of the respondents that they had observed great changes in the length of cropping seasons as against past which indicates that they are fully aware about this incidence of climate change. Majority of the farm women were fully aware that climate change is also responsible for hot waves (75%), heavy fog (65%) and frequent floods (65%). However very few farm women were fully aware about the decline of soil productivity (16%), increase in melting of glaciers (12%) and occurrence of extreme cold waves. The findings thus show that the farm women were fully aware about only those indicators which are directly visible or felt to them.

Bansal *et al*. (2022) studied the awareness and knowledge of 100 farm women of Mavli block of Udaipur District and found that 74 per cent respondents were fully aware of occurrence of utmost event like wave, 50-55 per cent of them also knew about irregular and erratic rainfall, change long of season i.e. short winter and long summer days. Nearly one third respondents had somewhat awareness about frequent flood, increase in melting of glacier, decline of soil productivity, changes in water level heavy fog. There have been only 8-34 per cent respondents who didn't have any idea about all the indications.

Table 3: Distribution of respondents according to the level of awareness of causes of climate change N=100.

Statement	Level of awareness		
	Fully aware (%)	Somewhat (%)	Not aware (%)
Deforestation	33.0	67.0	0.0
Increase in number of vehicles	40.0	60.0	0.0
Overpopulation	37.0	52.0	11.0
Industries and factories	37.0	42.0	21.0
Use of pesticides	37.0	63.0	0.0
Burning of fossils and farm waste	31.0	50.0	19.0
Use of electrical appliances	21.0	43.0	36.0
Pollution	31.0	69.0	0.0
Global warming	31.0	39.0	30.0
Natural disaster	29.0	44.0	27.0
Rapid urbanization	36.0	41.0	23.0

Distribution of respondents according to the level of awareness of causes of climate change can be seen in Table 3. Data revealed that approximately half or more than half of the respondents were somewhat aware about the causes of climate change *viz.* pollution(69%), deforestation (67.0 %), use of pesticides (63%) increase in number of vehicles (60.00%), overpopulation (52.00%) and burning of fossils and farm waste (50%). This shows that farm women had partial awareness about the causes of climate change and hence there is need to create awareness and motivate them to mitigate these causes like not to cut forest, tree plantation, limit the use of pesticide, reduce/ avoid burning of fossils and farm waste in order to avoid further aggregation of climate change.

In a study by Tewari *et al.* (2019) on 100 farm women of Uttarakhand regarding causes of climate change it was found that more than half of the farm women were partially aware of rapid urbanization (71.00%), pollution (70.00%), use of pesticides (63.00%) and increased number of vehicles (56.00%) as the causative factors behind climate change.

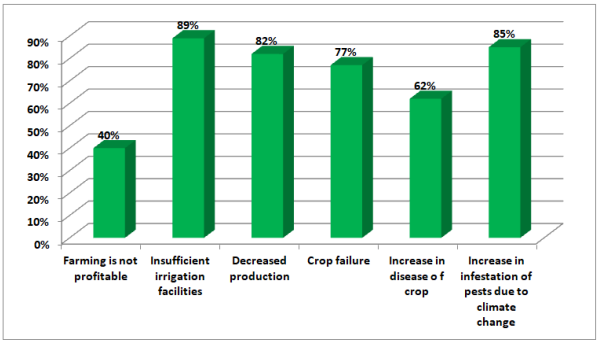

Fig. 1. Distribution of respondents according to the perception of adverse effects of climate change on agriculture.

Majority of the farm women perceived that climate change has adverse effects on agriculture *i.e.,* insufficient irrigation facilities (89%), increased infestation of pests (85%), decreased production due to climate change (82%), crop failure (77%) and increase in disease incidences (62%). It was also found from the data that 40 percent of the women reported that they think farming is no more a profitable venture (Fig. 1). Crop failure, migration and flooding were also the three major effects of climate change as reported by Raghuvanshi *et al.* (2017) in a Study of Farmers' Awareness about Climate Change and Adaptation Practices in India.

Table 4: Distribution of respondents according to the awareness on agricultural adaptation practices for climate change.

Statement	Percentage
Diversification of crop type	39
Diversification of crop varieties	36
Change in planting calendar	74
Change in use of chemical fertilizers	33
Changing the traditional irrigation methods	34
Switching from mono cropping to Integrated Farming system	75
Adoption of crop rotation	34

Table 4 depicts that somewhat change has been observed w.r.t following agricultural practices in relation to climate change. Majority of the farm women (75%) has switched from monocropping to Integrated Farming system and has changed the planting calendar (74%). However, it was found that approximately only one-third of the respondents had brought changes in their agricultural practices which included diversification of crop types, and crop varieties, change in use of chemical fertilizers, change in traditional irrigation methods and crop rotation methods. Thus, it was inferred from the farm practices followed by farm women in relation to climate change that there is lack of awareness of climate friendly practices and efforts need to be done in this regard. Selvaraju *et al.* (2006) reported that the main adaptation strategies practiced by small-scale farmers were in the form of modification of agronomic practices and in the choice of crop varieties that tolerate the new regime

Extension strategies to generate awareness regarding climate resilient agricultural practices:

Regarding following of agricultural practices to adapt to changing climate it has been viewed that gap in technology, its dissemination, lack of resources with farmers, lack of agricultural inputs etc. are some of the factors that hinder farmers practicing agriculture as per today's need of climate change. Legesse *et al.* (2013) conducted a study on farmers' perceptions and adaptation to climate change in Ethiopia and analyzed that farmers are facing various barriers that can make the adaptation strategies ineffective at the local level. There was limited financial capital (43.8%), limited credit availability (16.9%) and limited skills to engage in new income sources (22.5%). Lack of high yielding and drought resistant crop varieties (15%) were also mentioned as serious barriers to effective adaptation. Therefore, looking to these lacunas in extension strategies, an effort has been made in the present study to generate awareness regarding climate resilient agricultural practices with a view to achieve three main objectives

— Increased Productivity
— Enhanced resilience
— Reduced emissions

FAO (2013) focusses on Climate-Smart Agriculture (CSA) that integrates the three dimensions of sustainable development (economic, social, and environmental) by jointly addressing food security and climate challenges through the development of technical, policy, and investment conditions to achieve sustainable food security in agricultural development.

To meet out these objectives various intervention programmes regarding awareness generation and imparting knowledge were conducted on the following topics:

1. Climate change and its causes
2. Adoption of chemical free farming
3. Moving ahead to Integrated Farming system
4. Application of water conservative methods of irrigation
5. Diversification of crop types
6. Adoption of Climate sensitive agricultural crop varieties.

CONCLUSIONS

The present study reveals that the farm women were fully aware about only those indicators which are directly visible or felt to them**.** Regarding awareness about the causes of climate change the analyzed data showed that farm women had partial awareness about the causes of climate change like deforestation, use of pesticides, overpopulation and pollution and hence there was a need to create awareness and motivate them to mitigate these causes like not to cut forest, tree plantation, limit the use of pesticide, reduce/ avoid burning of fossils and farm waste in order to avoid further aggregation of climate change. Women reported that climate change has affected time irrigation, increased infestation of pests and thereby affecting agricultural production. Looking to climate change there is a dire need to put emphasis on extension interventions among people so that they become aware

about it and make transition in their agriculture under expert guidance to sustain agriculture.

FUTURE SCOPE

There is the scope to widen the horizon of the study by covering more districts of the state. The present study is confined to assess the level of awareness of women farmers to climate change in crop sector only. Other allied sectors may also be covered for studying the impact of climate cahnge. Attempts may also be made to study the use of various mass media channels by farm women related to adoption of adaptation strategies followed by them w.r.t changing climate for agricultural sustainability as these medias play a great role in awareness generation among people.

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