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Problems and Perception of Farmers Regarding Climate Change in Solan District of H.P.

DD Sharma[1], Supriya Srivastava[2]
[1]*Professor (Agricultural Extension and Communication), Shoolini University of Biotechnology and Management Sciences, Solan, H.P- 173229.*
[2*]*Assistant Professor, Faculty of Management Sciences, Shoolini University of Biotechnology and Management Sciences, Solan, H.P- 173229.*

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Abstract: The study conducted on a random sample of 120 respondents selected from Solan district of Himachal Pradesh revealed that a majority of the respondents had unfavorableperception on climate changei.e. they were agreed that climate change had adversely affected agricultural production, ground water table, cropping pattern and their livelihood as a whole. Low productivity due to small and fragmented land holding, poor soil fertility, lack of technologies to overcome risks and uncertainties, lack of functional irrigation facilities, increased attack of insect-pest and diseases due to climate change etc. were some of the main constrains faced by the respondents, Hence, the study implies that sincere efforts should be made by the government to plan and implement adaptation strategies among the farming community with the involvement of local people besides motivating them to use renewable sources of energy like solar energy wind energy etc. In addition to this, more campaigns for the afforestation should be initiated at the grass root level to create awareness among the people towards the green and clean environment and a suitable mechanism should be devised by blending traditional and modern knowledge/ technologies on climate change.

Key Words: Climate change, Perception, Cropping Pattern, Productivity, Ground Water Table, Traditional Knowledge, etc.

Climate change refers to changes in the global weather conditions on a longer period of time. According to Chakraborty et al (2000), climate change affects agriculture in two ways i.e, directly and indirectly. The rural community in the developing countries are expected to be affected more due to their extensive dependence on climate-sensitive livelihood options. The erratic nature of weather events and lack of predictability were found to pose serious problem for the adaptation processes by the rural poor (Kumar and Pathak, 2020). The adaptation strategy to a larger extent depends upon the farmers'perception towards climate change. It has been observed that most of the farmers are ignorant about the effects of climate change, their risk and the uncertainties involved to mitigate the effects of climate change. Keeping this in view, the present study entitled 'Farmers' Perception on Climate Change in Solan District of Himachal Pradesh' was undertaken with the following specific objectives:

1. To determine the respondents 'perception about climate change.
2. To identify the main problems/difficulties faced by the respondents due to climate change.
3. To provide suggestive measures for mitigating the effects of climate change.

I. Material and Methods:

The study was conducted in Solan district of Himachal Pradesh. Out of the total five development blocks, three blocks viz., Kandaghat, Dharampur and Solan were randomly selected. From each selected block, two villages and from each selected village 20 respondents were randomly selected. In this way, a total sample of 120 respondents was taken for the purpose of the present study.

For the purpose of the present study, perception was operationalized as the farmers' awareness and their opinion on climate change based on their previous knowledge/predisposition. It was measured by utilizing the scale developed by Raghuvanshi (2018) with suitable modifications. The data were collected with the help of well-structured and pre-tested interview schedule by personally interviewing the respondents.

Main Findings:

The main findings of the study have been discussed under the following heads and sub-heads:

Respondents 'demographicprofile:

The socio- personal characteristics of the respondents are presented in Table-1.

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Table-1Respondents'profile(n=120)

S. No.	Socio-personaltraits	Frequency	Percentage
(i)	**Age(years)**		
	Young(35-45)	34	28.33
	Middle(45-55)	53	44.17
	Old (55-65)	33	27.50
(ii)	**Sex**		
	Male	62	51.67
	Female	58	48.33
(iii)	**Educationalqualification**		
	Illiterate	11	09.15
	Primary	32	26.66
	Middle/Matric	56	46.66
	HighSchool/Higher Secondary	11	09.16
	Graduates	10	08.37
(iv)	**Typeoffamily**		
	Nuclear	112	93.33
	Joint	08	06.67
(v)	**Occupation**		
	Agriculture	103	85.84
	Governmentjob	13	10.83
	Ownbusiness	04	03.33

It is clear from the data that a significant majority of the respondents had nuclear familysystem (93.33%) with main occupation as agriculture (85.84%). More than 50 percent of the respondents were male (51.67%), matric/high secondary passed (56%) and belonged to Young to middle-aged categories (72.50%). Hence, it can be concluded that a majorityof the respondents were male, matric to High Secondary passed, had nuclear family system and their main occupation was agriculture.

Respondents' perception on scientific orientation:

The scientific orientation of respondents was determinedand the response is given in Table 2

Table2Respondents'opinionon ScientificOrientation

S. No.	Statements	Perceptual Response						
		SA	A	UD	DA	SDA	Total score	Mean score
(i)	Newmethodsoffarminggive better results to a farmer than theold methods.	15 (12.50%)	105 (87.5%)	-	-	-	495	4.12
(ii)	Evenafarmerwithlotsof experience should use newmethodsoffarming.	01 (83.33%)	119 (99.16%)	-	-	-	481	4.00

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(iii)	Though it takes time for a farmer to learn new method in farmingit is worth the efforts.	01 (83.33%)	119 (99.16%)	-	-	-	481	4.00
(iv)	Agoodfarmerexperiments withnew idea in farming.	02 (1.66%)	118 (98.33%)	-	-	-	482	4.01
(v)	Traditional methods of farminghave to be changed in order to raise the level ofliving of afarmer.	05 (4.16%)	115 (95.83%)	-	-	-	470	3.91
(vi)	The way a farmer'sforefather/elders farmed is stillthe bestwayoffarming today.	-	-	-	115 (95.83%)	05 (4.16%)	485	4.04
OverallMeanScientificOrientationScore= 4.01								

It has been revealed from the data that all the respondents were 'Agreed to Strongly agreed' on the statements like New methods of farming give better results to a farmers than theoldmethods, even a farmer with lots of experience should use new methods of farming, thoughit takes time for a farmer to learn new method in farming it is worth the efforts, aGood farmer experiments with new idea in farming, Traditional methods of farming have tobe changed in order to raise the level of a farmers. However, all the respondents were disagreed on the statement that the way their fore-fathers used to cultivate/farmed was stillthe best way of farming today.

Respondents'overall levelofperceivedScientificOrientation: -

The respondents classified into three categories based on mean score and standard deviation and the data have been shown in Table 3.

Table3Overalllevelof Scientific Orientation

S. No.	Category	Frequency	Percentage
1	**HighScientificOrientation**(>24.91score)	26	21.60
2	**MediumScientificOrientation**(23.49-24.91score)	84	70.10
3	**LowScientificOrientation**(<23.49score)	10	8.30

It has been observed from the Table that 70 percent of the respondents had medium level of Scientific Orientation. Those who had high scientific orientation were about 22 percent whereas the remaining were found to have low scientific orientation.

Respondents'Perception onClimateChange:

The respondents' perception was taken on a-5 point continuum scale viz; Strongly agree , Agree, Undecided, Disagree, Strongly Disagree with respective scoring of 5,4,3,2 and 1 to the positive statement andthe findings are presented in Table 4

Table-4 Perception on climate change

S.No.	Statements	Response						
		SA	A	UD	DA	SDA	Total score	Mean score
(i)	Agriculturesectorhasbecome more vulnerable due to climate change.	103 (85.83%)	17 (14.16%)	-	-	-	583	4.85
(ii)	Climatechangeisnotaserious	-	-	-	-	120	600	5.00

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	problemthesedays.					(100%)		
(iii)	Temperatureisincreasing everyyearduetoclimate change.	13 (10.83%)	107 (89.16%)	-	-	-	493	4.10
(iv)	Humanintervention/activities hasnoroleinclimatechange.	-	-	-	102 (85 %)	18 (15.00%)	498	4.15
(v)	The frequency and extent of dry spellsh a v e adverselyaffected agriculture production.	04 (3.33%)	116 (96.66%)	-	-	-	484	4.03
(vi)	Climatechangehascaused uncertaintyofrainfall.	08 (6.66%)	112 (93.33%)	-	-	-	488	4.06
(vii)	Thereisnoeffectofclimate changeonproductionofcrops.	-	-	-	113 (94.16%)		487	4.05
(viii)	Thereisnochangeincropping patternduetoclimate change.	-	-	-	109 (90.83)		491	4.09
(ix)	Thereisnoeffectofclimate change on water table.	-	-	-	110 (91.6%)		490	4.08
(x)	Climate change is one of the prominent factors for causing deforestation.	08 (6.66%)	112 (93.33%)	-	-		488	4.06
(xi)	Forestfireistheoutcomeof climate change.	12 (10.00)	108 (90.00%)	-	-		492	4.10
(xii)	Climate change has adversely affectedthelivelihoodof farmers.	-	120 (100%)	-	-		480	4.00
(xiii)	Farmers remain	-	116 (96.66%)	-	04 (3.33%)		472	3.93
Weighted mean perception score = 4.19								

All the respondents were agreed that Agriculturesectorhasbecome more vulnerable due to climatechange, Temperatureisincreasing everyyearduetoclimate change, The frequency and extent of dry spellshasa dverselyaffected agricultureproduction, Climatechangehascauseduncertaintyofrainfall, Climate change is one of the prominent factors for causing deforestation. Forestfireistheoutcomeof climate change.

However, the respondents were disagreed on the statements namely, Climatechangeisnotaseriousproblemthesedays.Climatechangeisnotaseriousproblemthesedays. Thereisnochangeincropping patternduetoclimate change.

The weighted mean perception score of 4.19 clearly indicated that the respondents agreed that the climate change had adverselyaffected agricultural production, cropping pattern and their livelihood.

Respondents'overallPerceptiononClimateChange : -

On the basis on Mean scoreand Standard Deviation, the respondents were classified in to three categories mentioned in Table 5.

Table5Overall Perceptionon Climate Change

S. No.	Perception	Frequency	Percentage
1	**Favorable**(>53.86score)	17	14.16
2	**Neutral**(51.5-53.86score)	09	7.51
3	**Unfavorable**(<51.50score)	94	78.33

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It is evident from the Table that more than three-fourths of the respondents (78%) had unfavorable perception on climate change. In other words, they were Agreed that because of climate change the chances of forest fire had increased, it has caused uncertainty of rainfall, adversely affected production of crop, water table and livelihood of farmers. However, those who had favorable perception on climate change were found to be about 15 percent. Thesefindingwerein consonancewith thoseof **Ansari *et al.* (2018)**who observed that many farmers had negative perception about climate change may be due to inadequate knowledgeof adaptation, mitigation and resilience strategies. The authors further found rise in temperature, decrease in the ground water table, erratic and sporadic rainfall and increase in theduration of heat stress due to high temperature.

Main Constraints/Problemsfacedbythefarmersduetoclimatechange: -

The respondents were asked which main problems they had faced due to climate change, their response on 3-point continuum i.e. Most serious, Serious and Not so serious with respective scoring of 3, 2 and 1was obtained and presented in Table 6.

Table6 Main Constraints/Problemsfacedbythefarmers

S. No.	Problems	Response				
		Most serious	Serious	Not serious so	Total score	Mean score
(i)	Low productivity due to small and fragmented land holdingcoupled with climatechange.	102 (85.00%)	18 (15.00%)	-	342	2.85
(ii)	Unprecedented weatherconditions like rainfall, hail storms etc. particularly at the criticalstages of crops growth.	104 (86.66%)	09 (7.50%)	07 (5.83%)	337	2.80
(iii)	Lackoffinance/cashin hand.	-	17 (14.16%)	103 (85.83%)	257	2.14
(iv)	Non-availabilityofcritical inputs	-	17 (14.16%)	103 (85.83%)	257	2.14
(v)	Highercostofinputs.	-	03 (2.50%)	117 (97.5%)	123	1.02
(vi)	Poorsoilfertility.	03 (2.50%)	117 (97.5%)	-	243	2.02
(vii)	Lackoftechnologiestoovercomerisksanduncertainties.	-	115 (95.83%)	05 (4.16%)	235	1.95
(viii)	Lackoffunctionalirrigationfacilities.	04 (3.33%)	116 (96.66%)	-	244	2.03
(ix)	Increasednumber of droughtcases.	15 (12.5%)	105 (87.5%)	-	255	2.12
(x)	Storms and heat waves havebecome common due to climatechange.	-	18 (15.00%)	102 (85.00%)	138	1.15
(xi)	Climatechangehasaffectedthequalityof Crops,particularlytomato.	114 (95.00%)	06 (5.00%)	-	354	2.95
(xii)	Increased attack of insect-pest and diseasesoncropsparticularlyagriculturalcropsduetoclimatechange.	116 (96.66%)	04 (3.33%)	-	356	2.96

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(xiii)	Croppingcycleparticularlyinhorticulturecrops haschanged due to climate change.	100 (83.33%)	20 (16.66%)	-	340	2.83
(xiv)	Scarcityoffoodavailabilitydueto climate change.	-	120 (100%)	-	240	2.00
(xv)	Thespeciesofinsect-pestshaveincreaseddueto climatechange.	08 (6.66%)	106 (88.33%)	6 (5.00%)	236	1.96
Meanconstraintsseriousness score=2.19						

A cursory look at the data clearly indicated that 'Low productivity due to small and fragmented land holding coupled with climate change 'Unprecedented weather conditionslikerainfall, hail storms etc. particularly at the critical stage of crops growth etc.' Lack of functionalirrigation facilities' Increased due to drought cases' 'Climate change has affected the qualityof crops''Increased attack of insect-pest and diseases on crops particularly horticulture crops due to climatechange' 'Cropping cycle particularly in horticulture to crops has changed due to climate change' 'Scarce of food availability due to climate change and the species of insects-pests has increased due to climate change were perceived as the serious problems faced by them. However, a large majority of the respondents did not perceive the problems like 'Lack of finance/ash in hand' 'High cost of inputs and Storms and heat waves have becomecommon due to climate change problems were rated as Not so serious. The overall mean constraint seriousness scoreof2.14 clearlyindicatedthat almost all the problems or constraints faced by the respondents were Serious in nature. Shareya et al (2024) quoted the study conducted by (ICAR) that the climate change had shortened the reproductive phase in wheat and rice crops at Palm valley of Himachal Pradesh. It was furthered revealed from the study that increase in temperature above 1degree centigrade in the Himalayan region adversely affected the yield of the apple.

Similar findings were also reported by Ozor (2010) and Nzeadibe*et al*. (2011) who reported that lack of improved agricultural technologies, lack of weather forecasting technologies, lack of functional irrigation scheme, high cost of fertilizer, inadequate finance tocopewith the changing climate, low adaptive capacity, unsustainable agricultural practices, lackof information, low level of awareness, irregularities of extension services, lack of access to improved crop varieties and poor government attention to climate problems were some of the major constraints faced by the farmers due to climate change.Farauta*et al*. (2011) also observed that frequent occurrence of climate change has causeduncertaintiesintheonsetoffarmingseasons,crop lossrevenueloss,forestresource loss,poor crop yield, increased weed infestation, increase pest attack and delayed planting time.

Respondents' Suggestions for Mitigating/ Minimizing the effects of climate change:-

An inventory of the suggestions was prepared in consultation with the experts, membersof the advisory committee and pertinent literature. The response on 3- point continuum i.e. Most relevant, Relevant and Notso relevant with respective scoreof 3, 2 and1was taken and the data have been presented in Table 7.

Table7:Suggestionsformitigatingtheeffectsofclimate change

S.No.	Suggestions	Response				
		Most relevant	Relevant	Not so relevant	Total score	Mean score
(i)	Sincereeffortsshouldbemade bythe governmentto plan andimplementadaptation strategiesamongthefarming communitywith theinvolvement oflocal people.	99 (82.5%)	21 (17.5%)	-	339	2.82
(ii)	Allthestakeholdersshouldbe motivatedtoreorientthem for adaptationefforts/strategies	-	58 (48.33%)	62 (51.66%)	178	1.48

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(iii)	Concertedeffortsneedtobe made by thepublicandprivate agencies to create awareness amongthefarmingcommunityfor containing Green House Emission.	02 (1.66%)	118 (98.33%)	-	242	2.01
(iv)	More emphasisshouldbegiven by the government agenciesfor the use ofrenewableenergylike solarenergy,windenergyetc.	89 (74.16%)	31 (25.83%)	-	329	2.47
(v)	More campaigns for afforestation shouldbeinitiatedatthegrassroot level to create awareness among thepeopletowardsthegreenand cleanenvironment.	111 (92.5%)	09 (7.50%)	-	351	2.92
(vi)	Cost-effectiveandenergy-efficient tools/strategiesshould be devised for ecological sustainability.	32 (26.66%)	88 (73.33%)	-	272	2.26
(vii)	Awell-designed knowledge network with well-structured framework for sharing and exchangingclimatedatamustbeestabl ished at least at the block level.	29 (24.16%)	91 (75.83%)	-	269	2.24
(viii)	Efforts should be made to devise strategies on development of location-specific and cost-effectivesuitabletechnologyforadaptationa ndmitigationof climatechange.	02 (1.66%)	118 (98.33%)	-	242	2.01
(ix)	A suitable mechanism should be devised by blending traditionalandmodernknowledge/tradition al technologiesonclimatechange.	116 (96.66%)	04 (3.33%)	-	356	2.96

It has been noticed from the data that the suggestions namely 'Sincere efforts should be made by the government to plan and implement adaptation strategies among the farming community with the involvement of local people' Concerted efforts need to be made by the public and private agencies to create awareness amongthe farmingcommunityfor containing Green House Emission' 'More emphasis should be given by the government agencies for the use of renewable energy like Solar energy, Wind energy etc.' 'More campaigns for afforestationshould be initiated at the grass root level to create awareness among the people towards the green and clean environment' 'Cost-effective and energy-efficienttools/strategies should be devised for ecological sustainability' 'A well designed knowledge network with well-structuredframework for sharing and exchanging climate data must be established at least at the block level' ' Efforts should be made to conduct strategies on development of location-specific and cost-effective suitable technology for adaptation and mitigationofclimatechange''Asuitablemechanismsh ouldbedevisedbyblendingtraditional and modern knowledge on climate change were found to be Relevant to Most relevant suggestions by all the respondents. However, about 52 percent of the respondents had perceived that suggestion. All the stakeholders should be re-oriented to review their adaptationeffortswasnotmuchrelevant.TheoverallMe anSuggestionRelevancyScoreof clearly indicated that almost all the suggestions were perceived as Relevant by the respondents.

These findings were found to be similar with those of Shah and Ansari (2020) who advocated that government needs to facilitatethe farmingcommunitybyformulatingrelevant policies and through developing necessary storage infrastructure and transportation facilities backed up by price regulatory mechanism which would

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certainly maximize the farmers' profit.The authors further suggested that agricultural scientists should develop the high yielding and disease resistant variance of vegetables crops. Similar findings were also reported byBarakoti and Ansari (2019), who also observed that the extension system can make a significant contribution by identifying the climate change information needs of the targeted clients, so that climate smart policies and programs related to horticulture crops could be formulated on the basis of climate change information needs. Vedwan and Rhoades (2001) suggested that the local knowledge/ traditional technologies should be incorporated into any strategiesmeantto mitigatetheimpactofclimatechangeandanyframework forunderstanding decision-making must be based on more inclusivecriteria than just economic maximization.

II. Conclusion

The study concluded that the majority of the respondents had no favorable perception on climate change. Low productivity due to small and fragmented land holding, poor soil fertility, lack of technologies to overcome risks and uncertainties, lack of functional irrigation facilities, increased attack of insect-pest and diseases due to climate change etc. were the main constrains faced by the respondents, Hence, the study implies that sincere efforts should be made by the government to plan and implement adaptation strategies among the farming community with the involvement of local people besides motivating them to use renewable sources of energy like solar energy wind energy etc.

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