

## RESEARCH NOTE

## Measuring Farmers' Awareness and Knowledge Level about Climate Change and Formulating Future Extension Strategies

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### ABSTRACT

*Climate change is being considered as a serious threat to the livelihood of Indian farmers. The increase in temperature, erratic rainfall, increased sea level, decreased snowfall etc. are affecting the production and productivity of different crop across the country. However, the farmers are very poorly informed about recent changes in climate and its impacts on agriculture. Successful adaptation depends on the scientific knowledge level of farmers and formulation of suitable extension strategies. The present study was conducted in Shimla and Kullu district of Himachal Pradesh to measure the knowledge and awareness level of farmers about climate change. Total 100 farmers were interviewed and information from different experts was collected for formulation of future extension strategies. The study revealed that only 22 per cent respondents knew about climate change in the area, while 43 per cent respondents had knowledge about the diverse human induced causes of climate change. The study reveals the low knowledge and awareness level of the sample which suggest need of intensive extension education programme for their capacity building and information empowerment.*

**Key words :** Climate change; Livelihood; Extension strategies;

Climate change has been recognized globally as an ever increasing threat to our planet that is becoming impossible to ignore. Climate change refers to any changes in climate over time, either due to natural variability or as a result of human activity (IPCC 2007). Generally climate change refers to a statistically significant variation in either the mean state of climate persisting for an extended period, usually decades, or in its variability.

The most obvious manifestation of climate change is the rising of average worldwide temperature, popularly termed as global warming. The best estimate for the increase above pre-industrial levels in the 1990-2000 periods is 0.6°C, reflecting the best estimate for warming over the 20th century (Folland et al., 2001). Other major visible impacts of climate change are melting down of glacier, rising of sea level, changes in precipitation pattern, change in snowfall pattern, change in frequency and intensity of storm, increase in plant diseases, and a number of potential challenges for public health. Though climate change is a global phenomenon, its impacts are regional making some regions more vulnerable than the others. According to IPCC report,

the Himalayan ecosystem is one of the highly vulnerable zone after Coastal ecosystem towards climate change in India. Apple production in Himachal Pradesh has decreased between 1982 and 2005 as the increase in maximum temperature has led to a reduction in total chilling hours in the region. The line of production is shifting upwards with increasing temperature. There are also changes in the time and intensity of snowfall in the Himalayan ecosystem affecting the production and productivity of temperate fruits and vegetables. It is of pressing need that farmers should have sufficient knowledge and awareness level about climate change for sustainable agricultural development.

Climate change is a very complex issue and not only lay people but also the well educated people have difficulties in understating the different concept of climate change. Most of the farmers did not have a clear cut understanding on causes of climate change and what could be its consequence in future. In fact, some farmers were even skeptical that climate change was real. Others were doubtful that whether it would affect agriculture. So, understanding the climate change dynamics is very important from adaptation point of

view. If one did not understand what to adapt to, the selection of most appropriate and timely adaptive strategies becomes problematic, if not possible.

Effective adaptation can only be achieved if farmers had sufficient awareness and knowledge on climate change issues. But very few studies have been conducted so far in this direction. The most extensive measurement of knowledge was made by *Sundblad et al., 2007* in Sweden but the measurement was extremely difficult as they assessed very precise climate change knowledge. However, *Krosnick et al., 2006* and *Ashworth et al., 2011* measured self assessed knowledge. Still there is a lack of a standardized knowledge test which can measure the knowledge of lay people about climate change across the place. With this background, the present paper aimed to develop a knowledge test to measure the knowledge level of farmers about climate change.

## METHODOLOGY

With this background the present study was conducted in Himachal Pradesh of Himalayan ecosystem of India. Two districts- Shimla and Kullu were purposively selected from Himachal Pradesh. Theog and Nagar block representing apple belt from Shimla and Kullu were purposively selected to assess the awareness and knowledge level of apple growers. Again two villages- Sandhu and Koti from Theog block were selected purposively. Another two villages- Katrain and Kamsari were selected from Nagar block purposively. Twenty five farmers from each village were selected randomly. Thus, total 100 farmers were interviewed in the present study. Beside farmers, experts from Central Potato Research Institute, Shimla; IARI regional station Katrain; and KVK Subject matter specialists (Kullu) were also interviewed to enrich our primary observations.

## RESULTS AND DISCUSSION

*Knowledge level of the respondents:* From the Table 1 it is evident that only 22 per cent respondents knew about climate change in the area, while 43 per cent respondents had knowledge about the diverse human induced causes of climate change. Majority of the respondents (85%) answered correctly to question, 'which of the following gas is more responsible for climate change'. However, only 45 per cent respondents knew that paddy cultivation also led to emission of

**Table 1. Knowledge score of the respondents (N=100)**

Items	%	MS
Do you know about climate change? If yes, then kindly explain it.	22	0.22
Which of the following is the human induced cause of climate change?	43	0.43
Which of the following gas is more responsible for climate change?	85	0.85
Do you know that cultivation of paddy leads to emission of gasses responsible for global warming?	45	0.45
Which of the following gas i.e. responsible for climate change emitted due to application of chemical fertilizers in the field?	26	0.26
Do you know that cattle are also responsible for emitting GHGs?	31	0.31
Have you heard about different climate resilient technologies like zero tillage, mulching, SRI etc?	43	0.43
Do you know that maturity period of major crops is reducing due to climate change?	85	0.85
Are you informed that practices like burning of crop residues in field is also contributing toward climate change?	54	0.54
Are the gasses used in freeze and refrigerator responsible for climate change?	32	0.32
Which of the following will be the effect of global warming on sea level?	82	0.82
What will happen to the rate of melting of snow glacier under changing climatic situation in Himalayan ecosystem?	86	0.86
What will be the major impact of climate change in arid ecosystem of India due to global warming?	67	0.67
Which of the following will happen if there is an increase in atmospheric CO <sub>2</sub> concentration?	75	0.75

GHGs. A little more than one fourth of the respondents (26%) had knowledge that chemical fertilizer application had role in climate change. Only 31 per cent respondents knew that cattle also played a role in climate change, though livestock was the major source of livelihood for majority of the respondents. The knowledge about different climate resilient practices was possessed by 43 per cent of the respondents. However, 86 per cent respondents had knowledge about the melting of glacier in the Himalayan ecosystem and 85 per cent knew about reduction of the maturity period of major crops like apple. On the other hand, only 32 per cent respondents had knowledge that gasses used in freeze and refrigerator played a major role in climate change. All these findings suggest that knowledge among the respondents was mainly experience based. The score was more for the items which they experienced and knowledge on cause-

effect statements were more than that of factual knowledge about climate change. So, it is of immediate importance to introduce climate change education among the farmers through extension functionaries of different organizations at different level.

*Distribution of respondents according to knowledge level:* Respondents were classified into five categories according to their knowledge level using cumulative cube root frequency method. Only 9 per cent respondents had very high level of knowledge about climate change, while 32 per cent respondents had medium level of knowledge. However, a large number of respondents (38%) cumulatively fell under low knowledge category. The findings drew the attention of the policy makers on immediate introduction of climate change literacy through different social institutions.

**Table 2. Distribution of respondents according to their knowledge level (N=100)**

Category	No.	%
Very Low (<6.15)	19	19
Low (6.15-8.15)	19	19
Medium (8.15-10.15)	32	32
High (10.15-12.15)	21	21
Very High (>12.15)	09	09

Mean=8.49, Range=10

*Awareness level:* The level of awareness was operationalized as the degree to which the farmers had information related to climate change and potential consequences. Several past studies reported that low level of awareness retarded the adaptation potential of the community and make them more vulnerable towards climate change. Thirty six per cent respondents reported that they had heard about climate change and only 31 per cent respondents had heard about global warming. The major causes of climate change were increase in pollution, deforestation, industrialization, rapid building construction, increased use of chemical fertilizers in agriculture, and increased uses of vehicle. The findings revealed respondents' realization that human activities disturbed the ecological balance and consequently, there was climate change. Such understanding provides opportunity to organize dialogue for action towards ecological redressal and willingness for benign action to minimize and mitigate the bad consequences of climate change.

From the Table 3 it can be deduced that a majority of the respondents (mean value=2.09) were aware of

about increased melting down of glacier under changing climatic condition. Seventy eight per cent respondents affirmed that temperature had increased in the valley during last few years. It can be inferred that all the farmers were either fully or somewhat aware about reduction in snowfall. However, 57 per cent respondents were unaware of any changes in water level, while 49 per cent respondents were fully aware of the recent phenomenon of irregular and erratic rainfall and another 42 per cent reported their full awareness about change in length of season in the area. The awareness of the respondents were very low about changes in storm and cyclone pattern ( $\chi^2=1.19$ ), increase in sea water level and phenomenon of heavy flood ( $\chi^2=1.12$ ). Sarkar and Padaria, 2010 also reported that only 38 per cent respondents heard about climate change. It was generally observed that the awareness level was more on the observed impact of climate change. The nature and the level of awareness of the respondents about the major impacts felt in their ecosystem could be useful in developing intervention strategy.

*Distribution of respondents according to the awareness level:* It can be observed from the figure-5.3.1 that the majority of the respondents (27%) had medium level of awareness about climate change. Equal percentages of respondents (19%) showed high and low levels of awareness followed by very high (18%) and very low awareness levels.

What emanates from the study is that a large section of community still was not well aware of the phenomena related to climate change. Therefore, to push forward environmental conservation and adaptation measures it is imperative to promote awareness about climate change and its causes and effects.

What emanates from the study is that the respondents at large were not well aware of the phenomena related to climate change. Therefore, to push forward environmental conservation and adaptation measures it is imperative to formulate suitable extension strategies for better adaptation.

*Future extension strategies:* Extension traditionally has played a pivotal role in providing information and promoting new technologies or new ways of managing crops and farms. But with changing climatic conditions, the role of extension also needs to be redefined. Hence, suggestions from different experts and farmers were collected to reframe the suitable extension strategies

**Table 3. Awareness level of respondents (N=100)**

Phenomenon	Fully (%)	Somewhat (%)	Not (%)	Mean	SD
Increased melting down of glacier	36	37	27	2.09	0.79
Increase in temperature	78	18	4	2.74	0.52
Reduction in snowfall	89	11	0	2.89	0.31
Changes in water level	18	25	57	1.61	0.78
Phenomena of irregular and erratic rainfall	49	39	12	2.37	0.69
Change in length of season – short winter and long summer etc.	42	31	27	2.15	0.82
Changes in intensity and frequency of storm, cyclone etc.	0	19	81	1.19	0.39
Occurrence of extreme events ie. cold wave, heat wave and heavy fog etc.	27	44	29	1.98	0.75
Increase in sea water level	10	28	62	1.48	0.67
Phenomenon of heavy flood	0	12	88	1.12	0.33

for adaptation towards climate change. The following extension strategies could be taken to build the resilience of the community in the study area:

- i. *Developing new messages and contents on adaptation practices and their dissemination among the farmers:* Farmers are more interested to solve the immediate problems like seed availability, disease resistance variety, market price, etc. The study shows that they are not interested in long term issues like climate change. So extension agents have to prepare new messages in such a way that they address their immediate concerns directly and climate change issues indirectly.
- ii. *Raising their awareness level using both traditional media and Modern ICT tools:* Awareness level about climate change is very low at the grassroots level. As a result, they are least concerned about climate change which is affecting their adaptive capacity. So, there is a need to raise their awareness level through intensive campaigning, and using modern ICT tools specially mobile and radio as these two were very popular media in the study area.
- iii. *Raising the knowledge level about climate change and its cause & effect relationship with their livelihood:* Farmers generally do not adopt any technology unless they are convinced about the science and advantage behind that technology. Therefore, extension agents should provide scientifically accurate information about the cause and effect relationship of climate change on their livelihood.
- iv. *Transfer of climate resilient technology at local level:* Extension agents can introduce locally appropriate technologies and management

techniques that could enable farmers to adapt to climate change, for example, developing and disseminating local cultivars of drought-resistant crop varieties with information about the crops' advantages and disadvantages. Extension staff could also share their knowledge with farmers on cropping and management systems that are resilient to changing climate conditions such as agroforestry, intercropping, sequential cropping, and no-till agriculture.

- v. *On-farm testing of different climate resilient practices and its validation:* Different climate resilient practices can be tested at farm level and promoted at large scale for adaptation to climate change. KVKs could play a big role in on farm testing of different regional climate resilient practices.
- xi. *Using ICT to provide real time information like community radio, mobile based advisory service:* Climatic information may be provided using ICT s like community radio, Mobile base SMS service, internet etc.
- xii. *Capacity building:* Extension agents could play an important role by provide training on new crop management practices like crop diversification, DSR, SRI, protected cultivation, entrepreneurship etc. to adapt to climate change.
- xiii. *Enterprise diversification:* Extension agent could guide the farmers in enterprise diversification towards higher value crops, value adding (processing), off-farm employment, and marketing infrastructure
- xiv. *Climate education:* Extension agent could promote social learning among the farming communities so that they learn the issues about climate change from other farmers or from

- communities. It will reduce their dependency on formal educational system.
- xv. *Climate forecasting*: Extension agents could use local level institutions and informal group of community to diffuse weather forecasting information in critical periods to adapt to climatic hazards.
- xvi. *Creation of community level social institution to monitor and implement the different adaptation strategies*: Extension agents could help the community in forming local level social institutions like climate risk management committee, custom hiring centres, fodder banks, seed banks etc. to adapt to climate change.
- xvii. *Sensitization campaign for judicious use of natural/community resources*: Both the ecosystem were facing the problem of limited natural resources like water, fertile land etc. So, extension agent should start sensitization campaign for their sustainable use.
- xviii. *Developing social vulnerability index and climate impact models*: An integrated vulnerability index including more number of variable and model on impact of climate change on livelihood should be prepared by extension agency for better preparedness and adaptation.
- xix. *Developing the capacity for extension professionals in disaster risk management*: At present the extension agents in both the study area lacked in capacity to manage any climatic disaster. So, it is of high priority to build their capacity at first to manage the risk related to climatic disaster.
- xx. *Promotion of farmers' best climate resilient practices through field trials and networking*: Extension agents could document the farmers' best practices for adapting to climate change and then promote them in appropriate time through field trials and networking.
- xxi. *Developing a local contingency plans*: Extension agency could play an important role by taking imitative to prepare a local contingency plan to cover new and evolving risk scenario due to climate change.

## CONCLUSION

The study proved moderate level of information and knowledge base of farming community in the study area. Only 22 per cent respondents knew about climate change in the area, while 43 per cent respondents had knowledge about the diverse human induced causes of climate change. The findings suggest that knowledge among the respondents was mainly experience based. The score was more for the items which they experienced and knowledge on cause-effect statements were more than that of factual knowledge about climate change. So, it is of immediate importance to introduce climate change education among the farmers through extension functionaries of different organizations at different level. The formulated extension strategies need to be incorporated as the guideline in future climate resilient extension strategies for sustainable agricultural development.

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