*Indian Journal of Extension Education*
*Vol. 54, No. 2, 2018 (41-47)*

# Information Needs for Climate Change Adaptation among Farmers of Uttrakhand, India

**Anjali Chunera[1] and Amardeep[2]**

**ABSTRACT**

The study attempts to determine the information needs for climate change adaptation and preferenceof farmers aboutcommunication media and methods in the hilly region of Uttarakhand. Using the multistage sampling procedure, a total of 300 men and women farmers were selected through Probability Proportionate to Size method from the villages. Pretested interview schedule was used for collecting the information. The findings show that the major areas of information needs of farmers on adaptation strategies to climate change werewater harvesting schemes,crop management strategies, drought/flood tolerant crop varieties, control of animal diseases, climate change tolerant livestock breeds, quality of feed/fodder, sources for credit, climate-smart agriculture practices and technology andinsurances.It was also found that farm and home visit was the most preferred method to receive information. Extensive efforts along with the application of emerging information communication technologies for the information-oriented farming community are required in order to impart information to farmers related to climate change adaptations.

**Keywords:** Adaptation strategies, agriculture, climate change, information needs, livestock rearing

## INTRODUCTION

Climate change is a global and complex threat that affects the present as well as the future of mankind. It puts millions of livelihoods and ecosystems around the world at risk. It is gradually realized as a forceful threat to agriculture and also to food security. The impacts of climate change are not equally distributed. It differs from region to region. More than any other region, hills and mountains in the northwestern Himalayan (NWH) region are experiencing the consequences of climate change (Anthwal *et al.,* 2006). Uttarakhand state is amongst the most vulnerable states of India to climate-mediated risks. It is due to the fact that a major part of the state population, as well as its economy, is dependent upon climate-sensitive sectors such as agriculture, forests, tourism, animal husbandry and fisheries along with its high physical exposure to climate-related disasters.

The economic upliftment of the entire state depends, to a large extent, on the progress of the agricultural sector. Agriculture sector contributes 15.50 per cent of the Gross State Domestic Product (GSDP) in the year 2009 (Ministry of Agriculture, Directorate of Economics and Statistics, Uttarakhand, 2014). More than 80 per cent of the working population is directly engaged in this important and widespread occupation(www.ceeindia.org, 2018). As agriculture is climate sensitive sector it faces adverse impacts of climate change and climate variability, therefore it is imperative for farmers to deal with them through various adaptation strategies. It is also noticed that the impacts of climate change vary by agroclimatic

[1]Ph.D. Scholar, Department of Agricultural Communication. Govind Ballabh Pant University of Agriculture and Technology, Pantnagar, [2]Associate Professor, Department of Agricultural Communication. Govind Ballabh Pant University of Agriculture and Technology, Pantnagar, Corresponding author's e-mail: anjalichunera@gmail.com

zones, various socio-economic factors and other facets of vulnerability. The capacity to cope up with the impacts of climate change also differs respectively. Adaptation to climate change is different across locations, making it a local process (Blaikie *et al.,* 1994, Agarawal *et al.,* 2008). There is no single appropriate approach for reducing risks across all settings (Rakshit *et al.* 2016). Therefore, in order to enable practical adaptation at the grassroots level, provision of information on climate change to farmers living in climate-sensitive areas is essential.

The hill region of the state is particularly affected more by the climate change as the districts have relatively limited technical manpower to disseminate information in rural and remote areas, less developed in terms of infrastructure, *i.e.,* electricity, roads and irrigation, lack of transport and communication facilities, inadequate financial support to the technology transfer which creates huge technological gap among the rural farming community. The local topography limits the scope for agricultural policies based on modern input-intensive agriculture and also due to remoteness and inaccessibility of hilly areas the transfer of technology is inhibited. For the sustainable development of the Himalayan ecosystem and reducing the vulnerability of resource-poor hill farmers, strong adaptation and mitigation strategy is needed (Mukherjee *et al.,* 2016). Early warning system and speedy communication of contingency technological options are the keys for successful adaptation to climatic risks and vulnerability (Padaria *et al.,* 2017). The farmers need information on these climate change adaptation strategies in order to effectively adapt to the unexpected impacts of climate change. Further due to non-availability of proper information and communication network system, need-based information dissemination centre and improved technological information to the farmers, agriculture becomes less remunerative (Meitei and Devi, 2009). Inaccessibility to timely and quality information makes farmer vulnerable to climate change and furthermore susceptible to receive inaccurate and misleading information. It is essential that information needs are readily met in order to enable the users (farmers) to make appropriate decisions on any related problem (climate change) faced by them (Solomon, 2002). It is also noticed that agricultural extension systems often fail due to inadequate consultation of farmers about their information needs and poor understanding of their information search strategies (Babu *et al.*, 2012). Therefore, to a significant degree, the effectiveness with which farmers adapt to climate change depends on how well their information needs onclimate change issues are met. Information needs assessments gives program designers the ability to develop interventions, designing appropriate policies, programs, and organizational innovationsthat target users with specific information needs. Keeping the above facts in the view, a study was conducted to determine the information needs of farmers regarding climate change adaptation and their preferred communication media and methods for climate change information delivery.

There have been numerous studies to assess the information needs of farmers for climate change adaptation. Churi *et al.* (2012)examined channels for communicating climate and market information and observed that the major information areas needed by farmers were droughts and string winds alert for crop planning, daily weather forecast, seasonal climate forecast, market and agricultural information. Umunakwe *et al.* (2014) assessed information needs for climate change adaptation among rural farmers in Nigeria and found that the farmers identified following information needs: causesof climate change, effects of climate change, vulnerable groups to climate change, appropriate socio-cultural practices inclimate change adaptation, crops adaptable to climate change, sources of information on climatechange, flood/ erosion control practices, afforestation practices, agroforestry practices, carbon trading and adaptation strategies. Okoro *et al*. (2016) in a study on climate change information needs of rural farmers in Enugu state, found that the highly needed areas of information onmitigation and adaptation strategies were: use of improved varieties, occupation diversification, use of weed tolerant varieties and planting of trees, change in timing of farm operation, use of herbicides and use

of pesticides as well as, incorporating residue into the soil.

## METHODOLOGY

The study was carried out in Chamba block of Tehri Garhwal and Bageshwar block of Bageshwar district of Uttarakhand state. Three villages from each block were selected randomly through simple random sampling without replacement. The empirical and descriptive research design was used for conducting the research. A total of 300 men and women farmers were selected through Probability Proportionate to Size method from the villages. Pretested interview schedulewas used for collecting the information.

In the study information needs of farmers with climate change refers to different types of information required by farmers to fulfill their needs or to solve the farming problems they face related to climate change. Respondents were asked to indicate areas they need information on climate change adaptations and their preferences of media and method that they want to be used in communicating the information to them. The major areas of information needs for adaptation were categorized into three categories and the response was rated on the three-point continuum. The preferred communication media and methods were asked to rank in order. The weighted mean score was used to identify the most desired information needs in various areas of climate change and to find out the most preferred communication media and methods by the respondents, Garrett's ranking technique was used.

## RESULTS AND DISCUSSION

### Information needs of the farmer regarding adaptation strategies to climate change

#### *I. Areas of information needs on adaptation strategies to climate change in agriculture:*

Data regarding the distribution of respondents on the basis of information need on adaptation strategies to climate change in agriculture as perceived by respondentshave been presented in table 1. Results

**Table 1: Distribution of respondents on the basis of information on Adaptation strategies to climate change in agriculture (n=300)**

| Areas of information are needed | Most needed (2) | Somewhat Needed (1) | Not needed (0) | Overall | |
|---|---|---|---|---|---|
| | | | | Weighted mean score | Rank |
| Water harvesting schemes | 258 (86) | 42 (14) | 0 (0) | 1.86 | I |
| Crop management strategies | 252 (84) | 29 (9.67) | 19 (6.33) | 1.78 | II |
| Drought/flood tolerant crop varieties | 225 (75) | 53 (17.67) | 22 (7.33) | 1.68 | III |
| Crop diversification, e.g. off-season crops, short season crops, fruit cultivation | 219 (73) | 42 (14) | 39 (13) | 1.60 | IV |
| Indigenous crops those are better adapted to local conditions | 181 (60.33) | 52 (17.33) | 67 (22.33) | 1.38 | V |
| Weed control | 158 (52.67) | 92 (30.67) | 50 (16.67) | 1.36 | VI |
| Planting methods | 160 (53.33) | 84 (28) | 56 (18.67) | 1.35 | VII |
| Integrated Pest and disease management | 142 (47.33) | 57 (19) | 101 (33.67) | 1.14 | VIII |
| Irrigation practices | 106 (35.33) | 121 (40.33) | 73 (24.33) | 1.11 | IX |
| Agro advisory | 145 (48.33) | 33 (11) | 122 (40.67) | 1.08 | X |
| Information on soil nutrient management | 121 (40.33) | 69 (23) | 110 (36.67) | 1.04 | XI |
| Pest and disease resistant crops | 102 (34) | 85 (28.33) | 113 (37.67) | 0.96 | XII |
| Agro forestry practices | 116 (38.67) | 34 (11.33) | 150 (50) | 0.89 | XIII |
| Use of inorganic manure | 73 (24.33) | 49 (16.33) | 178 (59.33) | 0.65 | XIV |
| Use of organic manure | 38 (12.67) | 73 (24.33) | 189 (63) | 0.50 | XV |
| Storage methods | 27 (9) | 89 (29.67) | 184 (61.33) | 0.48 | XVI |

Figures in parentheses denote Percentage

reveal that respondents expressed that they needed information on water harvesting schemes(mean score 1.86) followed by crop management strategies second (mean score 1.78), drought/flood tolerant crop varieties was perceived third (mean score 1.68). The other strategies on which information was desired in order were crop diversification, *e.g.* off-season crops, short season crops, fruit cultivation(mean score 1.60),indigenous crops those are better adapted to local conditions (mean score 1.38), weed control (mean score 1.36), planting methods (mean score 1.35), integrated pest and disease management(mean score 1.14), irrigation practices (mean score 1.11), agro advisory(mean score 1.08), information on soil nutrient management (mean score 1.04), pest and disease resistant crops (mean score 0.96), agroforestry practices (mean score 0.89), use of inorganic manure (mean score 0.65), use of organic manure (mean score 0.50), and storage methods (mean score 0.48).

Thus, it can be concluded that water harvesting schemes were most desired area in which information was needed this might be due to the fact that the region was under high water scarcity which compelled them to depend upon the rainfall and no major steps were taken by farmers to harvest water. Due to the climate change, there is downfall in minimum rainfall recorded which causes them great loss in crop production as well as animal rearing.

### *II. Adaptation strategies to climate change in livestockrearing*

Data regarding thedistribution of respondents on the basis of information need on adaptation strategies to climate change in livestock rearing as perceived by respondentshas been presented in table 2. It is evident from the table that regarding the adaptation strategies to climate change livestock rearing area the majority of the respondents perceived control of animal diseases (mean score 1.78) as most needed information and was ranked first, climate change tolerant livestock breeds was the second perceived area of need (mean score 1.56), while quality of feed/fodder (mean score 1.44) was ranked third in priority and the last was climate tailored sheltering (mean score 1.20).

It can therefore, be concluded that control of animal diseases was perceived as most needed information. Probable reasons might be that they earned income from livestock and thus were concerned about their livestock health and wanted to take precautions for their livestock.

### *III. Other adaptation strategies to climate change*

Data regarding distribution of respondents on the basis of information need on other adaptation strategies to climate change as perceived by respondentshave been presented in table 3.The table exhibits that sources for credit (mean score 1.80) was perceived as most needed information in other adaptation strategies to climate change and was ranked first followed by climate smart agriculture practices and technology (mean score 1.75) as second most needed information, insurances (mean score 1.72) was ranked third. The other information needed areas in order are alternative/complementary livelihood activities (mean score 1.65), market prices (mean score 1.57), capacity building trainings (mean score 1.54),

**Table 2: Distribution of respondents on the basis of information on adaptation strategies to climate change for livestock (n=300)**

| Areas of information are needed | Most needed (2) | Somewhat Needed (1) | Not needed (0) | Overall | |
|---|---|---|---|---|---|
| | | | | Weighted mean score | Rank |
| Control of animal diseases | 241 (80.33) | 52 (17.33) | 7 (2.33) | 1.78 | I |
| Climate change tolerant livestock breeds | 195 (65) | 77 (25.67) | 28 (9.33) | 1.56 | II |
| Quality of feed/fodder | 169 (56.33) | 94 (31.33) | 37 (12.33) | 1.44 | III |
| Climate tailored sheltering | 135 (45) | 89 (29.67) | 76 (25.33) | 1.20 | IV |

Figures in parentheses denote Percentage

**Table 3: Distribution of respondents on the basis of information on otheradaptation strategies to climate change (n=300)**

| Areas of information are needed | Most needed (2) | Somewhat Needed (1) | Not needed (0) | Overall | |
|---|---|---|---|---|---|
| | | | | Weighted mean score | Rank |
| Sources for credit | 251 (83.67) | 38 (12.67) | 11 (3.66) | 1.80 | I |
| Climate smart agriculture practices and technology | 232 (77.33) | 60 (20) | 8 (2.67) | 1.75 | II |
| Insurances | 225 (75) | 66 (22) | 9 (3) | 1.72 | III |
| Alternative/complementary livelihood activities | 228 (76) | 38 (12.67) | 34 (11.33) | 1.65 | IV |
| Market prices | 192 (64) | 87 (29) | 21 (7) | 1.57 | V |
| Capacity building trainings | 203 (67.67) | 56 (18.67) | 41 (13.66) | 1.54 | VI |
| Government programmes and subsidies | 171 (57) | 59 (19.67) | 70 (23.33) | 1.34 | VII |
| Water management | 116 (38.67) | 102 (34) | 82 (27.33) | 1.12 | VIII |
| Success stories of adaptations to climate change | 87 (29) | 54 (18) | 159 (53) | 0.76 | IX |
| Resource conserving technologies | 83 (27.67) | 41 (13.66) | 176 (58.67) | 0.69 | X |

Figures in parentheses denote Percentage

government programs and subsidies (mean score 1.34), water management (mean score 1.12), success stories of adaptations to climate change (mean score 0.76), resource conserving technologies (mean score 0.69).

It can be concluded that sources for credit was reported as most needed information need as other adaptation to climate change.

Data regarding the distribution of respondents on the basis of information needs on other adaptation strategies to climate change as perceived by respondentshave been presented in table 4. The results reveal that majority of the respondents (63.33 %) were found to be in medium category of information need followed by 23 per cent in high category while rest 13.67 per cent belonged to low category of information need on adaptation strategies to climate change.

**Table 4: Distribution of respondents on the basis of information need onadaptation strategies to climate change**

| Category | Frequency (n=300) | % |
|---|---|---|
| Low (Up to 33.98) | 41 | 13.67 |
| Medium (33.98-43.90) | 190 | 63.33 |
| High (More than 43.90 ) | 69 | 23 |
| **Total** | **300** | **100** |

Thus it can be concluded that medium to high level of information need was perceived by respondents on adaptation strategies to climate change. The results of the present investigation are incongruous to the findings of Canto *et al.* (2016) found that key area of information needs under climate change circumstances emphasized by farmers were crop insurance and capacity building on how to apply for such insurances.

## Preferred communication media and methods for climate change information delivery

Data regarding preferred communication media and methods by respondents have been presented in table 5. It is clear from the table, thatfarm and home visit was ranked first by the respondents followed by demonstration method, folk media, group discussions/ meetings, workshop/training, announcement/ advertisement in television, announcement/ advertisement in radio, text messages from phones, posters/ leaflets/ magazines was ranked last. Farm and home visit was more preferred by respondents as they mentioned that by face to face interaction their instant

questions were answered quickly. Demonstration method was also preferred because of the fact that through demonstration new practices were easily explained to the respondents.

The findings of the present study are in line withIdowu (2005), Rawal (2017) who reported that majority of the respondents who stated farm visit as most desired form of method for disseminating information and Barbercheck *et al.* (2009) whoreported that demonstrationas most preferred form for teaching method.

to climate change on which information was needed were sources for credit, climate-smart agriculture practices and technology andinsurances. It was also found that farm and home visit was the most preferred method to receive information about climate change adaptation strategies by the respondents. In order to impart information to farmers related to climate change adaptations, considerable efforts are required along with the application of emerging information communication technologies for information oriented farming community. There is also a need to use media that is

**Table 5: Distribution of respondents on the basis of communication media and methods preference for climate change information delivery (n=300)**

| Communication media and methods | Ranks Scale (x) | I 81 | II 70 | III 62 | IV 56 | V 50 | VI 45 | VII 39 | VIII 31 | IX 20 | Total score | Garrett score | Rank |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Farm and home visit | F | 215 | 85 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 23365 | 77.88 | I |
| | fx | 17415 | 5950 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| Demonstration method | F | 36 | 80 | 119 | 27 | 14 | 7 | 4 | 7 | 6 | 18914 | 63.05 | II |
| | fx | 2916 | 5600 | 7378 | 1512 | 700 | 315 | 156 | 217 | 120 | | | |
| Using folk media | F | 34 | 92 | 37 | 57 | 36 | 22 | 7 | 12 | 3 | 18175 | 60.58 | III |
| | fx | 2754 | 6440 | 2294 | 3192 | 1800 | 990 | 273 | 372 | 60 | | | |
| Group discussions/meetings | F | 9 | 19 | 102 | 89 | 49 | 25 | 7 | 0 | 0 | 17215 | 57.38 | IV |
| | fx | 729 | 1330 | 6324 | 4984 | 2450 | 1125 | 273 | 0 | 0 | | | |
| Organizing workshop/training | F | 5 | 22 | 23 | 68 | 75 | 46 | 35 | 23 | 3 | 15137 | 50.46 | V |
| | fx | 405 | 1540 | 1426 | 3808 | 3750 | 2070 | 1365 | 713 | 60 | | | |
| Announcement/ advertisement | F | 1 | 2 | 8 | 29 | 78 | 83 | 51 | 33 | 15 | 13288 | 44.29 | VI |
| in television | fx | 81 | 140 | 496 | 1624 | 3900 | 3735 | 1989 | 1023 | 300 | | | |
| Announcement/ | F | 0 | 0 | 0 | 22 | 29 | 21 | 53 | 162 | 13 | 10976 | 36.59 | VII |
| advertisement in radio | fx | 0 | 0 | 0 | 1232 | 1450 | 945 | 2067 | 5022 | 260 | | | |
| Text messages from phones | F | 0 | 0 | 5 | 8 | 14 | 35 | 74 | 46 | 118 | 9705 | 32.35 | VIII |
| | fx | 0 | 0 | 310 | 448 | 700 | 1575 | 2886 | 1426 | 2360 | | | |
| Using posters/ leaflets/ magazines | F | 0 | 0 | 6 | 0 | 5 | 61 | 69 | 17 | 142 | 9425 | 31.42 | IX |
| | fx | 0 | 0 | 372 | 0 | 250 | 2745 | 2691 | 527 | 2840 | | | |

Note: x = Scale value, f = number of respondents, fx = score

## CONCLUSION

The major areas of information need as expressed by farmers on adaptation strategies to climate change in agriculture werewater harvesting schemes followed by crop management strategies and drought/flood tolerant crop varieties. Andmajor areas of information needs on adaptation strategies to climate change in livestock were control of animal diseases, climate change tolerant livestock breeds and quality of feed/fodder. Other adaptation strategies accessible to small scale farmers for the dissemination of locally relevant information.

*Paper received on : November 27, 2017*
*Accepted on : December 11, 2017*

## REFERENCES

Agrawal, A., McSweeney, C. and Perrin, N. (2008). Local Institutions and Climate Change Adaptation World Bank, Washington, DC. https://

openknowledge.worldbank.org/handle/10986/11145 accessed on 9th October, 2017.

Anthwal, A., Joshi, V., Sharma, A. and Anthwal, S. (2006). Retreat of Himalayan glaciers – indicator of climate change. *Natural Science*, 4: 53-59.

Babu, S.C., Glendenning, C.J., Asenso-Okyere, K. and Govindarajan, S.K. (2011). Farmers' information needs and search behaviors: Case study in Tamil Nadu, India. Division Discussion Papers, International Food Policy Research Institute, N W, Washington, DC, USA.

Barbercheck, M., Brasier, K., Kiernan, N.E., Sachs, C., Trauger, A., Findeis, J., Stone, A. and Moist, L. (2009). Meeting the extension needs of women farmers: A perspective from Pennsylvania. *Journal of Extension*, 47(3), 82071-2000.

Blaikie, P., Cannon, T., Davis, I. and Wisner, B. (1994). 'At Risk: Natural Hazards, People's Vulnerability and Disasters' Routledge London.

Canto, G. B., Mendez, D. G., Alvarez-Toro, P., Marulanda, L. P., Vargas, C. G. (2016). Local, reliable and timely agro-climatic information: a requirement of Colombian farmers Results from mapping actors and agro-climatic information needs for maize and bean cultivation in pilot sites – Colombia, https://ccafs.cgiar.org/publications/local-reliable-and-timely-agro-climatic-information-requirement-colombian-farmers#.W9I_-9czZdg, accessed on 9th October, 2017.

Churi, A. J., Mlozi1, M. R. S., Tumbo, S. D., Casmir, R. (2012). Understanding Farmers Information Communication Strategies for Managing Climate Risks in Rural Semi-Arid Areas, Tanzania. *International Journal of Information and Communication Technology Research*, 2 (11), 838-845.

Directorate of economics and statistic, ministry of Agriculture, Government of India Agriculture statistics at a glance, 2014.

Idowu, O. (2005). Farmers' perception of agricultural extension agents' characteristics as factor for enhancing adult learning in Mezam division of northwest province of Cameroon. *Australian journal of adult learning*, 42(2), 224-237.

Meitei, L.S. and Devi, T.P. (2009). Farmers information needs in rural Manipur: an assessment. *Annals of Library and Information Studies*, 56, 35-40.

Mukherjee, A., Rakshit, S., Nag, A., Ray, M., Kharbikar, H.L., Shubha, K., Sarkar, S., Paul, S., Roy, S., Maity, A., Meena, V.S. and Roy Burman, R. (2016). Climate Change Risk Perception, Adaptation and Mitigation Strategy: An Extension Outlook in Mountain Himalaya. Springer Science + Business Media, Singapore 2016. J.K. Bisht et al. (eds.), Conservation Agriculture. pp. 257-292

Okoro, J. C., Agwu, A.E., and Anugwa, I.Q. (2016). Climate change information needs of rural farmers in Enugu state. *Journal of Agricultural Extension*, 20 (2), 215-232.

Padaria, R.N., Rakshit, S., Bandyopadhyay, S.K. and Pathak, H. (2017). Climate resilient agriculture for food security: Farmers perspective and community initiatives. *Current Advances in Agricultural Sciences,* 9(2), 123-131.

Rakshit, S., Padaria, R. N. and Bandyopadhyay, S. (2016). Farmers' adaptation strategies, coping behaviour and barriers to effective adaptation to current climatic risks: A Study on Sundarban region. *Indian Journal of Extension Education,* 52 (3&4), 17-20.

Rawal, J. (2017). A study on extension needs of vegetable growers of Kumaon region of Uttarakhand, Unpublished M.Sc. thesis, Department of Agricultural Communication, G.B.P.U.A&T, Pantnagar.

Solomon, P. (2002). Discovering information in context. *Annual review of information science and technology*, 36(1), 229-264.

Umunakwe, P.C., Nnadi, F.N., Chikaire, J. and Nnadi, C.D. (2014). Information Needs for Climate Change Adaptation among Rural Farmers in Owerri West Local Area of Imo State, Nigeria, *Agrotechnol*, 3(1), 1-6.

www.ceeindia.org, (2018). Assessed on 14 October 2017.