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Role of extension personal for transfer of information on climate change in agriculture: A case study of Haryana, India

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ABSTRACT

A study was conducted to explore the role of extension personal suggestions to mitigate the effect of climate change in agriculture. Study area was four districts from southern and northern zone of Haryana namely Karnal, Kurukhestra, Rewari and Bhiwani. The results showed that vast majority of respondents suggested about new technology like laser land leveler, zero tillage, seed treatment technique, water conservation technology, micro irrigation technology and poly house. Whereas, suggestions about enhancing the farmer knowledge about different subsidy plan guide about crop insurance, soil/water testing and advice to come in Kissan Mela were maximum to mitigate the impact of climate change. Data further revealed that maximum extension personnel agreed on that they suggest strategies like guidance about crop insurance, to lower down the input cost and for better adaptation to climate change.

Key words: Adaptation, Climate change, Extension management, Mitigation.

INTRODUCTION

Today global climate change is the burning issue all over the world. The determining parameters of climate change are like several extreme events such as drought, changes in pattern of rainfall, high temperature and floods which affect the agriculture production directly or indirectly. The impact of climate change is more on developing country like India due to less climate change resilient technology development and government policy concerning this issue which resulted loss of socio and economical of agricultural community on long run basis. Climate change especially rise in temperature is caused by the accumulation of green house gases namely carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O) and chlorofluorocarbon (IPCC,2001).Which is attributed directly or indirectly to human activities that alter the composition of the global atmosphere and which are in addition to natural variability observed over comparable time periods. The main factors which are responsible for disturbing the climatic concentration are emission of GHG from various sources including agriculture, industrializations and uncontrolled exploitation of natural resources.

According to IPCC, (2001) main reason of climate degradation is green house gases. As a consequence of increase in consumption, vast quantities of gases and effluents are discharged that may change the climate composition of atmosphere and its capacity to regulate its temperature. The rise of temperature is caused by the accumulation of green house gases namely carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O) and chlorofluorocarbon.

Industrialization caused increased concentration of green house gases (GHGs) in atmosphere resulting in warming of global climate system by 0.74°C between 1995 and 2005. An increase in average temperature can decrease the growing season in regions with a cool spring and fall and adversely affect crops in regions where summer heat already limits production. It may also increase the soil evaporation rates, and increase the chance of severe droughts. Higher temperature eventually reduces yields of desirable crops while encouraging weed and pest infestation.

The intergovernmental panel on climate change IPCC, (2007) has projected that temperature increased by end of the century is likely to be in the range 1.8°C to 4.0°C. Changes in precipitation pattern increase the more change or more crop failures likelihood of short-run crop failures and long–run production decline. While food production may benefit from a warmer climate, the increased potential for droughts, floods and heat wave will pose challenges for farmers. Additionally, the enduring changes in climate. Water supply, soil moisture, could make it less feasible to continue crop production.

A further some new technologies also were developed to overcome the effect of climate change i.e. zero tillage, micro irrigation technique, poly house technology to grow the vegetable in adverse climate. Water conservation also helpful to overcome the climate change along with area specific nutrient management, genetic modified (GM) crops, use of solar and wind energy, laser land leveler, update with latest agro-metrological information, use of heat and drought

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resistant crop, seed treatment, raised bed planting system, adoption of ground water recharge technique and adoption of crop simulation model to reduce the effect of climate change. Further some other agronomic practices like adoption of line spacing, crop diversity, crop intensity, adjust time of sowing and farm operation also help to mitigate climate change effects. In order to sustain the agricultural sector that plays pivotal roles in human existence in terms of the provision of food, fiber, fuel and income, strategies of change need to be urgently initiated to cope with the changing climate. Beside it Management decisions both at the field and off site have the potential to contribute to climate change mitigation and adaptation. However challenge arrive promoting and adopting relevant information and technology up to the grass root level.

Agricultural extension personnel has key roles to play in initiating this change. This is because adaptations to climate change impacts require changes in knowledge, attitudes, resilience capacities, and skills of the people and agricultural extension can bring this change. In this regarding ADO/HDO are the key transferor of technology at farm level and work as a catalyst for farmer community. It become important to acquainted their knowledge and attitude towards latest technology and government scheme regarding climate change. Their knowledge on the issue has to go a long in shaping the climate resilient technologies, government policies as well as facility. Keeping these all in view, the present a study on Role of Extension personal in Transfer of Information on Climate Change in Agriculture was undertaken.

MATERIALS AND METHODS

The study was conducted in Haryana state of India. Extension personnel working as A.D.O. (Agriculture Development Officer) and H.D.O. (Horticulture Development Officer) in state agriculture department, Haryana constituted the population for the study. A multi-stage random sampling technique was used to select respondents, thus two agricultural zones (Northern and Southern) were randomly selected. From Northern zone two districts, namely, Karnal and Kurukshetra and from southern zone two districts, namely, Rewari and Bhiwani were selected to study the role of extension personnel to mitigate the effects of climate change in state. From each district, twenty extension personnel were randomly selected. Thus a total of eighty respondents were interviewed for the study. Data for the study were collected through a semi-structured interview schedule that was validated by experts in agricultural extension and climatology. Questionnaire had two sub headings namely (A) Management based upon Technology, (B) Management based on government facilities and two sub heading were constituted total 30 statements. These statements rated on two point continuing rating scale 'Yes' and 'No'. Data were analyzed using simple descriptive statistics (frequency distribution and percentage).

RESULTS AND DISCUSSION

Management based upon technology: It is revealed from the data (Table 1) that 95 percent of the officers suggested 'micro irrigation technology followed by zero tillage technology' 97.50 percent was helpful in mitigating the effect of climate change, while 90 percent of officers suggested to adopt technologies like poly house to grow vegetable in adverse climate. In a report (2017) of Scientists working at International Maize and Wheat Improvement Center (CIMMYT) determined that using zero tillage with residue retention techniques resulted in the lowest global warming potential. The percentage of Greenhouse gases (CO_2-equivalent) released into the atmosphere (on a life cycle

Table1: Extension management based upon technology. (n=80)

Particulars	Frequency	Percentage
Suggest micro irrigation technology to mitigate the effect of climate change.	76	95.00
Zero tillage technology.	78	97.50
Adopting the poly house to grow vegetable production in adverse climate.	72	90.00
Water conservation technology in changed climate	77	96.25
Area specific nutrient management techniques.	67	83.75
Growing genetic modified crop to lower the effect of climate change.	71	88.75
Adopting solar/wind energy to reduce the GHG gases.	63	78.25
Provide agro meteorological data information to farmers.	21	26.25
Screen house in field to grow the seed in adverse climate.	19	23.75
Adopt university agro metrology SMS service.	43	53.75
Laser land leveler technology for smoothly irrigation and water saving in your area.	79	98.75
Heat and drought resistant variety/breed of crop and livestock.	69	86.25
Seed treatment technology to avoid soil based disease in changed climate.	78	97.50
Raised bed planting system in dry region.	37	46.25
Encourage farmers to establish of small weather observatory in villages.	14	17.50
Nutrient management alternatives.	17	21.25
Ground water recharges techniques.	52	65.00
Crop simulation modal to reducing adverse environmental impact.	21	26.25
Kisan call centre for agricultural update in adverse climate.	70	87.50

Table 2: Mitigation based on govt. facility. (n=80)

Particulars	Frequency	Percentage
Crop insurance to mitigate the effect of climate change	61	76.25
Weather based crop insurance	45	56.25
To come in to kisan mela/farm darshan	78	97.50
About seed bank etc	23	28.75
About credit facility in adverse climatic condition	34	42.50
Farmer field school to build different climatic adaptation	79	98.75
Training for farmer to aware about climate change	36	45.00
Organize any tree planting program	28	35.00
To establishment local weather data bank in local to know about previous weather records to avoid adverse climate	12	15.00
About different subsidy plan on seed and agricultural implements to lower the input cost in adverse climate	79	98.75
To test soil/water testing mobile services	78	97.75

analysis basis that includes global warming potential from inputs, operations, emissions and soil organic carbon) was lower by approximately 8 tonnes per hectare per year. About 96.25 per cent of the officers suggested to adopt water conservation technology where as 83.75 per cent of the officers considered that successful adoptions of practices such as area specific nutrient management technique was more useful in mitigating climate change along with it adoption of genetically modified crops were suggested by 88.75 per cent of the officers because GM crop are more resistant to climate change. Data presented in Table 1 further indicated that 78.25 per cent of extension personnel suggested adoption of solar energy utilization techniques was better option due pollution free and renewable source to reduce GHG gases. Further, it was revealed that only 26.25 per cent of the respondents provide agro-metrological data to farmer. This will helps farmer to Estimation of monsoon pattern. A very few 23.75 per cent officers suggested adopting green house in field to grow seed for better germination in adverse conditions because the effect of climate variations is more on germinations. It was showed from the data that 53.75 per cent of respondents were advised to adopt university agro-metrology SMS service to deal with abrupt climate change conditions in advance. Whereas the maximum number 98.75 per cent of the officers suggest adopting the laser land leveler technology was successful for farmers to cope up with adverse climatic conditions because it save water money as well increase production. Moreover, 86.25 per cent of the respondent promoted heat and drought resistant varieties of crop and livestock while 97.50 per cent of the respondents expressed the seed treatment technology for better adaptation to climate change. Data further denoted that only 46.25 per cent of the respondent suggests raised bed planting system while very few 17.50 per cent of the respondent told farmers to establish of small weather observatory in villages. It was perceived that 21.50 per cent of respondent suggested farmers about nutrient management alternatives. Data indicated that 65.00 per cent of the respondents suggest farmers about ground water recharge techniques, while few 26.25 per cent of the respondent told that adopting crop simulation modal was effective in reducing adverse environment impact. Moreover 87.50 per cent of the respondent gives suggestions to farmer about kisan call centre to get latest agricultural update in adverse climate for better adaptation. The data suggested that maximum number of officers recommended conservation agricultural technologies such as zero tillage, water conservation, laser land leveler, area specific nutrient management technology because emissions of green house gases such as CO_2, CH_4 etc. are minimized through adoption of these technologies and these strategies help in more carbon sequestration and thereby mitigating the effect of climate change. Similar findings have been reported by. Khatri-Chhetri *et al* (2017) that most preferred technologies by local farmers were crop insurance, weather-based crop agro-advisories, rainwater harvesting, site-specific integrated nutrient management, contingent crop planning and laser land leveling. Similar findings were reported by (Pandey *et al.* (2012) and Lal *et al.* (2011).

Mitigation based on govt. facility: A perusal of data (Table 2) indicated that 76.25 per cent of the respondents told that they guided about crop insurance whereas suggestion about weather based crop insurance was suggested by the 56.25per cent of the respondents to secure net return to farmers under adverse climatic events. Findings are in conformity with the researches of Nagasree *et al.* (2011) reported that Government of India launched a Weather Based Crop Insurance Scheme (WBCIS), which is a unique weather based insurance product designed to provide insurance protection against losses in crop yield resulting from adverse weather incidences. Thus, Government provides subsidy in premium thus making it affordable. Whereas maximum number of officers 97.50 per cent advised farmers to come in kissan mela/ farm darshan so that they become aware of new farm technologies to lower the adverse effect of climate change. It was further revealed from the data that only 28.75 per cent of the respondents guide farmers about seed bank to maintain genetic variability of seeds that

will make crop more resistance to climate variability while 42.50 per cent of the respondents suggested about credit facility from government financial institute that enable farmers to put in more crop inputs. Findings are in conformity with the researches of Mamta Swain (2014) found that In the context of climate change with increasing agricultural risk, there is a need to redesign insurance products not merely as a risk transfer mechanism but as a potent device to reduce risk and crop loss by inducing desirable proactive and reactive responses in insurance users. About 98.75 per cent of the respondents said that they promote farmer field school for better adaptations. It was further observed from data (Table 2) that only 45 per cent of the officers that they emphasize on organizing training programmes for farmer to enhance their knowledge to improve their decision making ability whereas 35 per cent of them considered that organizing any tree planting programme was better strategy to cope up with present situation. Very less number of the officers 15 per cent told that they suggested establishment of local weather data bank was more promising strategy. Whereas the 98.75 per cent of the officers admire farmers for making best possible use of different subsidy plans and 97.75 per cent recommended farmers to get their soil and water samples to be tested using soil/water testing mobile services and demarked as one of the best tool. But farmers are not giving much importance to soil/ water testing till now due to lack of awareness and government facilities at grass root level.

CONCLUSION AND RECOMMENDATIONS

Climate change is a major threat in present situation and work carried out have describes the key role of transfer of technology though extension personnels. Work was carried out at grass root level and was able to identify the root cause of non-adoption of mitigation strategies. It was clearly evident from study that anthropogenic activities results in alteration of environmental balance at large scale. In present day situation climate change severely affect the agricultural enterprise. Findings are in conformity with the researches of Chandershekar, (2013), who reported that need a paradigm shift from the existing high-input practices to resource conserving technologies for adaptation to and mitigation of climate change. Application of available stock of knowledge and technology for bridging the yield gap, particularly different subsidy plan on seed and agricultural implements to lower the input cost in adverse climate, farmer field school to train the farmer on practical basis about different climate adaptation, weather risk insurance of crop in the eastern region, can have immediate impacts. A long term strategy should also target farmers to get their soil and water samples to be tested using soil/water testing mobile services for adaptation and mitigation of climate change. The key role of extension functioning in agricultural adaptation to climate change was in retraining of extension staff to acquire the new knowledge and skills (capacity) in climate risk management. These will of course reduce the anthropogenic causes and hence the effects/impacts of climate change. Also, there is need for increased research and innovation in agriculture to find out more sustainable ways of adaptation to climate change. Extension personnel suggestions are quite effective in mitigating the adverse effect of climate change if successfully adapted by farmers and help to cope up with the present scenario of climate variability where climate change threatens agricultural production.

In the light of the finding of the study, the following recommendations are made that extension strategies should brace up to the new challenges posed by climate change by retraining its staff, mounting awareness programmes, and disseminating proven measures to boost the adaptive/ resilience capacities of farmers and moreover government participation through translocation of funds in form of subsidy on improved machinery and other scheme like crop insurance and also making it more effective and simple so that farmers can be benefited to minimizing climate change effect for farmer community will act as milestone for adaptation and mitigation strategies that will support extension efforts and deliver new technologies, information and education.

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