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A REVIEW

Climate adaptive agricultural extension approaches for putting research into use

Dhanusha Balakrishnan*, Vani Chandran[1], B. Seema **and** Preethu K. Paul[2]
Department of Agricultural Extension, College of Agriculture (KAU),Vellayani (Kerala) India
(Email: balakrishnandhanusha@gmail.com)

Abstract : The reality of climate change is harsh and it's a bitter truth for most of our farmers. In the present situation, climate change is one of the most important challenges to food security. Pertinent actions are, therefore, needed to address these challenges to enable the agricultural sector to significantly contribute to the attainment of agriculture development. Climate adaptive agricultural approach is an approach for developing agricultural strategies to secure sustainable food security under climate change. Through CAA the quality and quantity of agricultural production can be increased and production costs can be decreased. For example, with climatologically data it is also possible to recognize bad weather conditions and to be more prepared to minimize the damage. Many projects have recently adopted with the idea of climate smart agriculture for mitigating the challenges of climate change. With the help of suitable extension approaches we can effectively disseminate various climate smart agricultural practices to farming community.

Key Words : Adaptation, Climate adaptive agriculture, Extension approaches, Strategies

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*** Author for correspondence :**
[1]Dairy Extension Division, National Dairy Research Institute, Karnal (Haryana) India (Email: vaniagri93@gmail.com)
[2]ICAR-Krishi Vigyan Kendra, Santhanpara, Idukki (Kerala) India

climatic situations and it should also reduce greenhouse emissions from agriculture. For disseminating such practices to the farming community, the role of extension approaches is very important. Through various extension tools we can update farmer's knowledge and skills regarding various adaptation strategies and can make them capable to meet the challenges. So the selection of best extension methods for disseminating these practices to farmers is very essential for the successful accomplishment of the objectives.

Climate adaptive agriculture (CAA):

Adaptation is an adjustments made in natural or human systems in accordance with the actual or anticipated climate stimuli or its effects, that abates harm or helps to utilize beneficial opportunities. In order to overcome the impact of changing climate in agriculture, our system must become adaptive. According to FAO (2017), CAA is the process of reorientation of the farming systems so that adequate development can be promoted and food security is guaranteed in the changing climatic situation. CAA turns out to be essential for adapting to the hard facts of climate change globally, by strengthening our agricultural systems, to feed the planet healthily. Under CAA generally two kinds of adaptations or responses are seen; Autonomous adaptation and planned adaptation. Autonomous adaptation is the reaction of a farmer to changing climatic conditions. Major examples include changing the sowing or harvesting dates as per the changes in precipitation pattern (Esterling, 1996). Whereas planned adaptation it is the conscious policy options or response strategies, adopted by the farmer and are intended to alter the adaptive capabilities of the farming system.

All over the world climate adaptive agricultural practices are adopted at the farmer level as well as implemented by the policy makers. By adopting these farm management practices like cultivating resistant crops, changing the cropping patterns and use of some innovative ideas in the field according to climate change, crop diversification, adoption of soil, land and water management practices, providing climate information and use of latest technologies, we can reduce the impact of climate change.

Climate adaptive agricultural extension approaches:

Successful identification and dissemination of information regarding climate change adaptation obtained from the farmers' fields and research areas demands the interference of extension approaches. The various tools or extension approaches that can be used for dissemination of climate adaptive agricultural practices are.

Climate trainings:

We can organize trainings on a variety of subjects, among that climatology is an important area. In this context, the extension agents must have an idea about regional climatic conditions as well as be able to grasp and interpret these messages scientifically. The extension agents trained at that level, can provide climate services to famers in their fields (Sala *et al.,* 2016). For example, a training programme on empowering farmers to climate change adaptation, was conducted at ICAR, Tripura. Thirty farmers who are resource poor and vulnerable to climate change were given trainings under the aegis of NICRA. They were made aware of the need for changing the farming practices according to the changing climate. They were given demonstrations on climate resilient fish production practices and conservation agriculture (ICAR, 2019).

Climate farmers field schools (*CFFS*):

CFFS, a non-formal, participatory extension method, centered on experiential learning, which focuses on the needs of the participants (FAO,2016). CFFS helps to create a hazard free atmosphere for the farmers to interact, analyze and explore about latest farming methods, in addition, it also provides opportunities to improve themselves through practical exercises. According to Settle *et al.* (2014), it enables farmers to strengthen the decision making abilities, both individually and collectively, in addition it helps to gain more hands on experience. This concept has introduced in the area of adaptation to climate change also, for example, FAO conducted FFS on integrated plant and pest management (IPPM), which brought better HY, modified varieties, cultivation methods etc. for the changing climatic conditions (Raghuvanshi *et al*., 2018).

ICT supported network:

In terms of creating awareness on climate change, it has a prominent position among other approaches, as a tool to interact and educate farmers about various measures of adaptation. Though the accessibility and

acceptance of this tool varies from place to place. The rate is different within developing and developed nations, rural and urban areas, even among the rural areas itself. (Raghuvanshi *et al*., 2018). Usage of mobile phones, videos and radios were used to tackle the issues related to changing climate through updating their knowledge regarding the existence of various preventive or adaptive measures.

Climate smart villages (*CSV*):

CSVs are mostly models or developed villages, which develops location specific plans for ensuring sustainable production, foster to use various mitigation strategies, thus, helps to reduce the impact of changing climate conditions. The 4 basic elements of CSV are; 1. village development plans, 2. climate information services, 3. climate-smart technology 4. local knowledge and institutions. The selection of area for implementing this approach, depends mainly on climatological threats in that area, level of interest among growers as well as local authorities to participate in the programme. (Raghuvanshi *et al*., 2018). There is no one-size-fits-all approach or a fixed package of interventions. The emphasis is on tailoring an interventions portfolio that complements each other and adapts to the local conditions.

Jaldoot:

He is an individual from the same locality who knows the rural people, their cropping patterns and weather updates of that area. He works as an extension agent in that locality, having experience in each and every practices associated with water. Jaldoot has supported the clients in various practices like water budgeting operations and constructing water reservoirs. This is very useful to the growers for scheduling the agricultural activities based on availability of water. The main aim is to capacitate the farmers in dealing with the changing climatic conditions (Raghuvanshi *et al*., 2018).

Informative crop calendar:

It is a type of calendar where information regarding the cultivation of crops is given to the farmer. The information provided in this informative crop calendar is the basis for organizing various agricultural activities like planning, use of plant protective methods, irrigation etc. This is region specific and focused on the particular cropping pattern in the given region. In Akola/ Sangamner block in Ahmednagar, an ICC was developed for the major plants in that area, as part of CCA project with the aid of CRIDA (Central Research Institute for Dryland Agriculture). This provides, climate based agro advisory services for some particular plants such as finger millet, rice and groundnut (Raghuvanshi *et al*., 2018).

Strategies for increasing the effectiveness of climate adaptive agricultural extension approaches for putting research into use:

The following policy changes can be brought about (Cecilia, 2012):

– There should be an assessment for the whole system, which clearly looks at structural, functional as well as policy reforms needed for the system.

– Encouragement of research work by including farmers, those interested in fostering changes, in addition scientifically support them for using various adaptation techniques.

– Broadening the key role from diffusion of technologies to ensure the development of communities by facilitating capacity building, network development, co-ordinating human resources as well as funding to perform those functions.

– Shift in the approach of adaptation strategies across all levels within the agriculture system, as a collection of innovations relevant to policies, institutional as well as technological terms.

Conclusion:

Agricultural activities are very sensitive to climate and weather conditions. An agricultural decision-maker can either be at the mercy of these natural factors or try to benefit from them. The only way to profit from natural factors is to take them into account and learn to know them as well as possible. Here extension approaches play an important role to disseminate various climate adaptive agricultural practices to the farming community. So a shift in the approach of adaptation strategies across all levels within the agriculture system is very essential to improve the effectiveness of these extension approaches at the field level.

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