Biological Forum – An International Journal **14(2): 355-358(2022)**

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Prioritization of Measures useful for Climate Smart Agricultural Practices by the Farmers of Chhattisgarh Plains, India

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(Received 27 January 2022, Accepted 05 April, 2022)
(Published by Research Trend, Website: www.researchtrend.net)

ABSTRACT: Climate change is widely recognized as one of the most challenging threats to agricultural productivity and people's livelihoods. To address the effects of climate change on agriculture is an extremely difficult task. Farmers are the mostly affected, as they must constantly adapt to climate change. There are a number of factors that influence the extent to which farmers in a particular location adapt climate smart agricultural practice. To find farmers' preferences for climate smart agricultural practices, study were conducted on the plains of Chhattisgarh, according to their socio-economic characteristics and rainfall zones, for this study 240 respondents were selected randomly from selected three districts (Raipur, Dhamtari, and Mahasamund). To identify adaptation needs and farmers' priorities for climate smart agricultural practices. Group discussions and structured questionnaire surveys were conducted. Local farmers preferred the following practices which were duration of variety, sowing method, soil conservation, irrigation management, integrated farming, etc.

Keywords: Climate smart agriculture, preference, climate change.

INTRODUCTION

Farmers are dealing with climate-related shocks in agricultural productivity, which has brought the need for agricultural resilience to the center of agricultural policies around the world. Policymakers and development practitioners are increasingly interested in encouraging as many farmers as possible, mostly small-scale farmers, to adapt sustainable farming practices that will strengthen agriculture and food systems.

Climate change is, to a large extent, the result of the increase in greenhouse gases (GHG) caused by human activity. Bush burning and deforestation are examples of agricultural operations that contribute to GHG emissions. Climate change has an impact on natural and social systems all across the world. Pachauri and Reisinger (2007) expressed that the world's atmosphere has consistently changed in light of changes in the cryosphere, hydrosphere, biosphere and other environmental and communicating factors. It was broadly acknowledged that human exercises are presently progressively influencing changes in the worldwide atmosphere. However, studies have indicated that underdeveloped countries, particularly India, are more sensitive to climate change's effects. The majority of small-scale farming in India is rain-fed, making it extremely vulnerable to climate change and fluctuation.

Many strategies for minimizing the effects of climate change on agricultural production have been proposed. The food and agriculture organization (FAO) is actively striving to assist nations in addressing the problem of managing agriculture to alleviate hunger and poverty. In 2009, the FAO introduced the idea of climate smart agriculture (CSA) to highlight the connections between ensuring food security and combatting climate change through agricultural development, as well as the potential for enormous synergies. In general, the CSA options integrate traditional and innovative practices, technologies and services that are relevant for a particular location to adopt climate change and variability (CIAT, 2014). Climate-smart agriculture (CSA) methods that combine the benefits of increased agricultural production over time, the adaptation and development of resilient agricultural and food security systems, and the reduction of GHG emissions from agricultural activities have shown to be very promising. Neufeldt *et al*. (2013) stated that all agricultural practices that improve resource-use efficiency or productivity, reduce a community's exposure or vulnerability to climate change, reduce GHG emissions, and increase carbon sequestration are climate smart agriculture practices (CSAP). Adoption of improved management practices, for example, stabilizes and increases farm production even under adverse production conditions, as does the use of stress-tolerant and high-yielding seed varieties/breeds. Rohila *et al.* (2018) reveal that climate change is reducing agricultural productivity, production stability, and incomes in some way, as well as affecting areas with high levels of food insecurity. Developing climate smart agriculture is thus critical to meeting future food security and climate change goals. The task of informing policymakers has shifted to researchers. Policymakers must be aware of the elements that can impact farmers' adoption of these practices in order to enact well-informed and practical initiatives that will help farmers embrace these practices successfully.

Several types of research have been conducted to determine the elements that influence farmers' adaptation of CSA techniques. According to Nyasimi *et al.* (2017), farmers, financial institutions and agro-consulting service providers should be forced to learn and share CSA practices, climate, and agro-consulting information. Farmers adaptive capacity will undoubtedly improve as a result of this, as will their knowledge and attitudes toward climate-smart agriculture. Aryal *et al.* (2018) investigated the elements that influence farmers' adoption of CSA methods in India's Indo-Gangetic plains. Farmers' characteristics including gender, education, social and economic capital, as well as farmers' experience with climatic hazards and availability to extension services and training, were found to be important drivers of CSA adoption. CSA focuses on creating climate-resilient food production systems that lead to food and financial security in the face of ongoing climate change and variability (Vermeulen *et al.*, 2012; Lipper *et al.*, 2014). The term "CSA" refers to a collection of farming practices that farmers use in various combinations. Managa and Mhlongo (2016) said that climate smart agriculture provides an evidence-based and location-specific framework that reduces complexity and defines precise implementation pathways, which is urgently needed. The CSA is a strategy that offers much-needed potential. Deressa *et al*. (2009) stated that farmers' agro-ecological conditions, such as climate and soil, are likely to influence their climate change adaptability. Farmers in drier and hotter climates are more likely to respond to climate change than farmers in colder and wetter climates, according to evidence. Despite the uncertainty about future consequences and implications of climate change, Roberts *et al.* (2009) argue that efforts must be taken to lessen the susceptibility of natural and socioeconomic systems to climate change (which increases resilience).However, there is limited evidence about CSA acceptance, especially when it comes to small-scale farming.

Farmers gain more when they use numerous techniques, because some of the strategies are complementary to one another, allowing them to take advantage of applicable synergies. As a result, implementing a variety of CSA practices aids in the development of a long-term agricultural system that is resistant to shocks caused by climate change and other variables that pose a threat to agricultural productivity (Teklewold *et al*., 2013). Goklany (2007) said that because of the limited resources of the governments in developing countries, farmers face challenges in identifying and prioritizing key adaptation strategies that can speed up sustainable development at the local level. When developing farm-level climate smart agricultural practices implementation plans, it is critical to utilize adaptation strategies that have been thoroughly examined and prioritized by local farmers in respect to prominent climatic threats in that locality (Khatri-Chhetri *et al.*, (2017). Despite the importance of prioritization of climate smart agricultural technologies at farm level, existing climate change adaptation programmes lack such information for better adaptation planning. Evidences on farmers' prioritization can support key stakeholders make informed decisions that are in line with government policies and institutional arrangements. Also find that the 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.

The purpose of this study is to know about farmers' preferences for climate-smart agricultural practices in order to provide local climate change adaptation planning and information. The agricultural practices adapted by the farmers, which have been identified to fit into the profile of climate smart agricultural practices, were considered in the study to investigate the preference level of adaptation of climate smart agricultural practices among the sampled farmers.

METHODOLOGY

The present investigation was carried out in three randomly selected districts out of the total 15 districts of Chhattisgarh Plains namely Raipur, Dhamtari and Mahasamund. 12 villages were selected randomly for the selection of respondents, 4 villages from each district. From each selected village, 20 farmers were selected randomly, in this way, a total of 240 farmers (Total $12 \times 20 = 240$) were considered as respondents for the study. These selections were done by using a simple random sampling method for the purpose of the study.

Farmers in the study area were surveyed and interviewed using a systematic questionnaire and interview schedule to acquire data from primary sources.

Descriptive and inferential statistical tools were used to analyze data. It was analyzed using frequency and percentage, total weighted score and ranking based on the prioritization index.

RESULT AND DISCUSSION

Prioritization is the process of arranging items or activities in descending order of relative importance. It given the stated goal and vision, what matters most to the respondents now and in the future.

Table 1 revealed that most of the respondents prioritize duration of varieties which occupied rank 1st with the highest prioritization index 83.33 per cent followed by integrated farming system occupied 2nd rank with the prioritization index 80.75 per cent and integrated pest management occupied 3rd rank with a prioritization index 79.50 per cent.

Moreover, irrigation management ranked 4th with a prioritization index 78.41 per cent, sowing method ranked 5th with a prioritization index 71.16 per cent, and multiple resistance to major insect/disease ranked 6th with a prioritization index 69.83 per cent. The cropping system ranked 7th with a prioritization index 68.16 per cent, crop diversification ranked 8th with a prioritization index 65.91 per cent and post-harvest management ranked 9th with a prioritization index 57.33 per cent.

It was also shown that respondents place a lower priority on crop rotation, organic agriculture and soil conservation which ranked 10th, 11th and 12thwith a prioritization index 56.50 per cent and 54.08 per cent and 47.25 respectively. Even though there are anticipated benefits and it can also help to mitigate the negative consequences of climate change. Similar findings were reported by Khatri-Chhetri *et al.,* (2017) ; Weldegebrial *et al.*, (2019).

Table 1: Distribution of respondents according to prioritization of measures useful for climate smart agricultural practices.

Sr. No.	Statement	HU		U		UD		LU		NU		Priori-tization index	Rank
		F	%	F	%	F	%	F	%	F	%		
1.	Duration of varieties	91	37.9	134	55.8	0	0	6	2.5	9	3.8	83.33	I
2.	Sowing method	3	1.3	158	65.8	52	21.7	24	10.0	3	1.3	71.16	V
3.	Multiple resistance to major insect/Disease	46	19.2	72	30.0	79	32.9	40	16.7	3	1.3	69.83	VI
4.	Cropping system	18	7.5	142	59.2	12	5.0	56	23.3	12	5.0	68.16	VII
5.	Crop diversification	19	7.9	118	49.2	21	8.8	79	32.9	3	1.3	65.91	VIII
6.	Crop rotation	64	26.7	3	1.3	3	1.3	167	69.6	3	1.3	56.50	X
7.	Integrated farming system	44	18.3	167	69.6	23	9.6	6	2.5	0	0	80.75	II
8.	Irrigation management	2	.8	223	92.9	9	3.8	6	2.5	0	0	78.41	IV
9.	Soil conservation	19	7.9	15	6.3	3	1.3	200	83.3	3	1.3	47.25	XII
10.	Integrated Pest Management	34	14.2	183	76.3	6	2.5	17	7.1	0	0	79.50	III
11.	Organic agriculture	37	15.4	40	16.7	6	2.5	129	53.8	28	11.7	54.08	XI
12.	Post harvest management	42	17.5	50	20.8	3	1.3	124	51.7	21	8.8	57.33	IX

HU= highly useful, U= useful, UD= undecided, LU= less useful, NU= not useful, F = Frequency

Here, after ranking the selected practices according to their preference described farmers' overall preferences for climate smart agricultural practices based on their climatic condition and perceived risk. The majority (69.16%) of the farmers belonged to medium level of prioritization and 19.17 per cent were low prioritization level of climate smart agricultural practices. While very few 11.67 per cent of the farmers belonged to high prioritization level. It may be because of a lack of knowledge about climate smart agricultural practices, risk bearing ability and financial problems.

Table 2: Distribution of respondents according to prioritization levels of measures useful for climate smart agricultural practices.

Sr. No.	Category	Frequency	Percentage
1.	Low (Up to 34)	46	19.17
2.	Medium (35 – 46)	166	69.16
3.	High (Above 47)	28	11.67

Mean 40.68 SD 6.41

CONCLUSION

This study reveals that farmers' preferences for climate smart agricultural practices significantly differ based on the potential benefits and costs of technologies as informed to them. The study suggests that farmers may not be willing to invest in many climate smart agricultural practices even if there are foreseen benefits. Therefore, adaptation policies need to emphasize the crucial role of providing information about available climate smart agricultural practices and creating financial resources to enable farmers to adapt various climate smart agricultural practices that are relevant to their location.

Farmers' priorities for climate smart agricultural practices are linked to prevailing climatic conditions in a given place, socio-economic characteristics, and willingness to pay for accessible practices, according to this study.

Depending on climate conditions and perceived hazards, farmers' preferences for climate smart agricultural practices may fluctuate. As we all know, the implementation of climate smart agricultural practices is largely determined by the prioritization of farmers. As a result, the findings of this study can be used to develop clear guidelines for existing and new climate change adaptation policies in agricultural and related industries.

FUTURE SCOPE

The similar study should also be conducted in other agro climatic zone of Chhattisgarh state to know their prioritization of measures useful for climate smart agricultural practices in different agro climatic conditions.

Acknowledgement. I would like to thank the Department of Agricultural Extension, COA, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, for providing me with all of the resources I needed to complete my research.

Conflict of Interest. None.

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How to cite this article: Karishma Baidya, M.A. Khan, and M.L Sharma (2022). Prioritization of Measures useful for Climate Smart Agricultural Practices by the Farmers of Chhattisgarh Plains, India. *Biological Forum – An International Journal, 14*(2): 355-358.