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Training impact analysis of farmers knowledge and adoption behavior on climate smart village

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Abstract
This study aimed to investigate the effects of the training offered by Krishi Vigyan Kendra in Kishanganj on various climate-resilient technologies. A total240 respondents were selected using purposive sampling out of which 120 respondents were trainee farmers and 120 were non trainee respondents farmers. The primary data was collected through a semi-structured interview schedule using face to face data collection method. The result of the study revealed that the trainee farmers were found higher in respect of knowledge and adoption level than the non-trainee respondents on improver climate resilient technologies. The socio-economic characteristics of trainees were found to be positively and significantly correlated with the knowledge and adoption level of the trainee respondents. This indicates that training provided by Krishi Vigyan Kendra on different climate-resilient practices benefited the farmers and boosted their productivity and lead them to adopt climate-resilient technologies. Almost half (49.4%) of the respondents showed a high level of knowledge, while 33.3% had a medium level of knowledge. The remaining 17.5% of respondents fell into the low knowledge category when it came to CRA interventions during their trainee period. It is recommended that KVK organize additional training programs on climate-resilient practices for non-trainee farmers in the villages. This will help ensure that all farmers have access to improved knowledge and can adopt these practices for better results.

Keywords: Adoption, climate, knowledge, technology, training

Introduction
India faces the most difficult problem of transmitting rapidly evolving agricultural technologies in order to sustain increases in farm production and economic viability. Several extension initiatives are being developed to raise awareness, educate, and motivate farmers, farm women, and rural youth to embrace and handle new agricultural technologies in their fields/homes (Samanta *et al*., 2003) [15]. India has multiple extension systems and Krishi Vigyan Kendra is the one of the district-level organization that provides technical support for agriculture and allied sectors (Aprillirin *et al*., 2023) [3]. KVK (Farm science center) is a grass root level innovative project of ICAR for testing and transfer of agricultural and allied technologies to bridge the gap between technology generation at one end and their increased utilization at the other by farming communities (Rachna *et al*., 2013) [14]. KVKs are designed to minimize the delay between research center technological advancements and their implementation in specific farmer fields, resulting in increased production, productivity, and net farm profit. They are connected to Agricultural Universities, NGOs, farmer-producer organizations, credit institutions, leaders, the farming community, and development bureaucrats from different departments. KVKs also function as intermediaries between farmers and the Indian Council of Agricultural Research (ICAR). Farmers require access to innovative technologies, inputs, and information in all agricultural, livestock, forestry, and fisheries segments to reach their full potential. In India, the government has established a network of Krishi Vigyan Kendra (KVKs) across all districts through the Indian Council for Agricultural Research (ICAR). These KVKs are equipped with cutting-edge technologies to provide farmers with essential input support and knowledge. The KVKs' primary goal is to offer need-based training to farmers and farm women in their communities, enabling them to increase their capability through vocational training and farm demonstrations (Acharya and Chatterjee, 2019) [1].

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Training of farmers, farm youth and farm women is critical input for rapid transfer of agricultural technology (Ahmad *et al.*, 2012) [2]. The process of training involves structured opportunities for individuals to acquire relevant knowledge and skills. Initially designed to provide vocational training for rural youth, the KVKs aim to equip them with the necessary skills for self-employment. Through KVK-organized trainings, farmers, farm women, and rural youths in India are able to improve their poor socioeconomic conditions by enhancing farm production, income, and employment opportunities through the use of agricultural innovations developed at research stations (Dubey *et al.* 2008) [6]. It is therefore apprehended that significant improvements might have been made to the farmers after taking training from KVK (Lal and Tondon, 2011) [11].

The Krishi Vigyan Kendra is an instrumental organization in promoting the welfare of farming communities in Bihar, where agriculture is the primary occupation. In recent years, the state's climate has been affected by climate change, which has created uncertainty and posed a threat to the agricultural system, leaving farmers vulnerable. To address this challenge, the state government launched a program called Climate Resilient Agriculture in 2019, which is being implemented through the Krishi Vigyan Kendra in each district. Since then, the KVK in Kishanganj, which is under the administrative control of Bihar Agricultural University in Sabour, has been conducting numerous training programs for farmers to adopt climate-resilient technologies. This training program has accelerated the pace of adoption and knowledge of different climate-resilient technologies among trainees. This paper examines the level of knowledge and extent of adoption of various interventions through the training program under the Climate Resilient Agriculture program.

Methodology
This research objectives to investigate the benefit gained andthe level of knowledge, adoption and behavior changes gained by farmers through training. The study was carried out in five climate-resilient agriculture villages under the supervision of Krishi Vigyan Kendra, Kishangnaj during 2021-22. These villages were chosen and developed as climate model villages under the climate resilient agriculture programe. Purposive sampling was used in the selection of respondents. For the study, there were two types of respondents: sample I consisted of trainee farmers, while sample II consisted of non-trainee farmers. The data was collected through face-to-face interviews using a semi-structured interview schedule between March to April of 2023. Once collected, the data was scored, tabulated, computed, and analyzed to provide necessary interpretations.

Results and Discussion
According to the data presented in Table 1, nearly half of the respondents (49.4%) in the trainee category had a high level of knowledge about CRA interventions through Krishi Vigyan Kendra training. About a third of respondents (33.3%) had a medium level of knowledge, while the remaining 17.5% had a low level of knowledge. In the non-trainee category, however, the majority of respondents (55.8%) had a low level of knowledge, with only 32.5% having a medium level of knowledge and 11.6% having a high level of knowledge. The mean score for trainee farmers was also higher than that of non-trainee farmers, indicating that trainee farmers possess higher knowledge about different climate-resilient technologies. This is likely due to the training programs provided by Krishi Vigyan Kendra under the climate resilient program, which enables trainee farmers to gain more knowledge about CRA interventions. Overall, these observations suggest that trainee farmers have a higher level of knowledge about CRA interventions compared to non-trainee farmers. Similar findings were also reported by Jadhav and Darandal (2014) [7], Badodiya *et al.* (2021) [4], Deshmukh *et al.* (2021) [5].

Table 1: Distribution of respondents according to their knowledge regarding climate resilient technologies

| Category	Trainee farmers (n=120)		Non Trainee farmers (n=120)	
	Frequency	Percentage	Frequency	Percentage
Low	21	17.5	67	55.8
Medium	40	33.3	39	32.5
High	59	49.4	14	11.6
Total	120	100	120	100
Mean index	25.22		21.27	
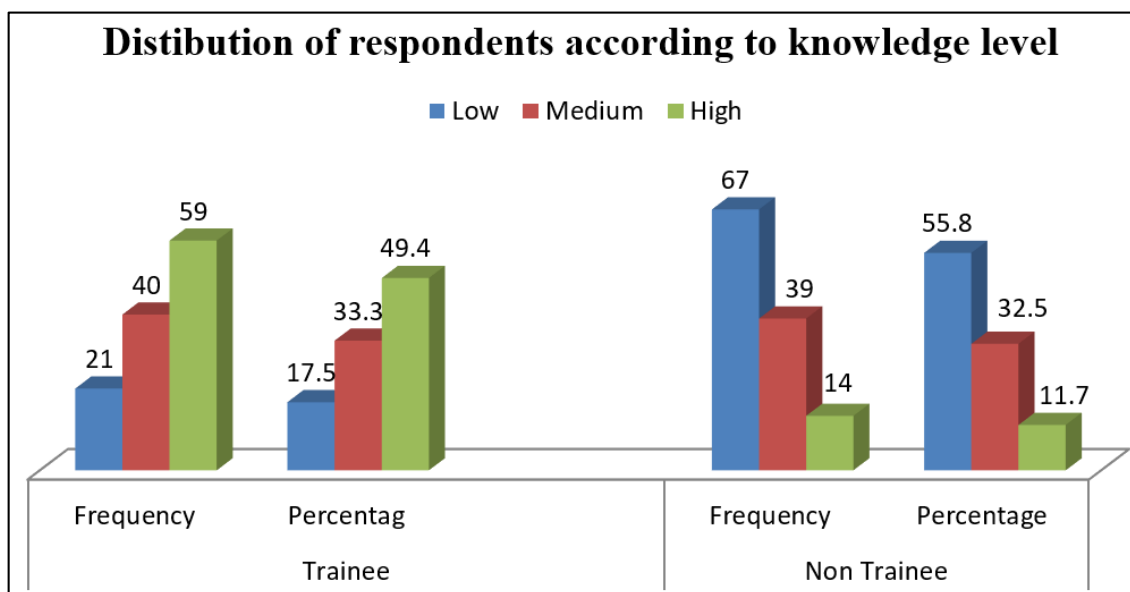
Fig 1: Distribution of respondents according to the knowledge level

Table 2: Distribution of respondents according to their adoption behavior regarding climate-resilient technologies.

Category	Trainee farmers (n=120)		Non Trainee farmers (n=120)	
	Frequency	Percentage	Frequency	Percentage
Low	20	16.6	57	47.5
Medium	38	31.6	40	33.3
High	62	51.6	23	19.6
Total	120	100	120	100
Mean index	17.54		15.8	

Table 2 indicates that about 51.6 percent respondents had high level of adoption followed by 31.6 percent respondents had medium level of knowledge. Rest 16.6 percent respondents had low level of adoption in trainee category regarding CRA interventions through Krishi Vigyan Kendra training. In non trainee category 47.5 percent respondents had low level of adoption followed by 33.3 percent respondents had medium adoption level. 19.6 percent respondents had high level of adoption regarding CRA interventions. Mean index score of trainee farmers was 17.54 percent and mean score of non trainee respondents was 15.8 percent which shows higher adoption of knowledge gained in training programe. The adoption level of trainees was higher than non trainee as the trainees farmers underwent the training programe on different climate resilient technology organized by Krishi Vigyan Kendra. These training programs enable participant's trainees to boost their knowledge and apply that knowledge in real life situation and finally adoption of that knowledge as practice to enhance their productivity. Present findings were in line with the findings of Meena et al. (2020) [13], Kadagi et al. (2020) [9], Jena et al. (2022) [8].
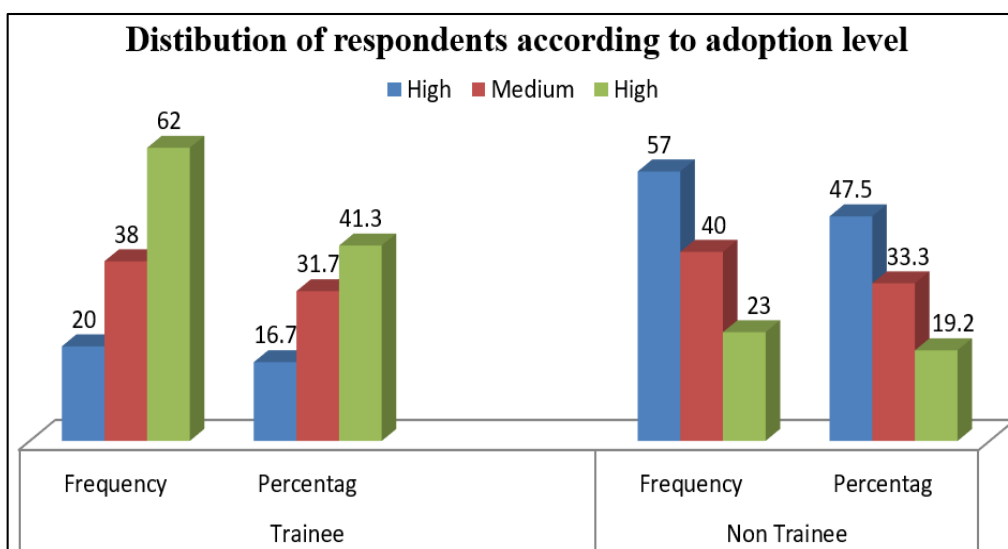
Fig 2: Distribution of respondents according to adoption level

Table 3: Relationship between socio-economic characteristics of trainees and non trainees with knowledge and adoption level of farmers under climate resilient agriculture programe.

Independent variables	Trainee 'r' value	Non-trainee 'r' value
Age	0.061[NS]	0.127[NS]
Education	0.728**	0.621**
Landholding	0.371*	0.339*
Annual income	0.259*	0.241*
Extension contact	0.316**	0.218[NS]
Innovativeness	0.248**	0.128[NS]
Extension participation	0.332**	0.215[NS]
Social participation	0.377**	0.251[NS]

**Significant at 1% level of probability *Significant at 5% level of probability NS not significant

The relationship between the knowledge and adoption level of trainee and non-trainee farmers and their socio-economic characteristics were studied in Table 3. Eight socio-economic characteristics, including age, education, land holding, annual income, extension contact, innovations, extension participation, and social participation, were analyzed to determine the relationship between the dependent and independent variables. For trainee farmers, age did not have a significant relationship with their knowledge and adoption level. However, education, extension contact, innovativeness, extension participation, and social participation were found to be significant at a level of significance of 1%. Findings were line with the finding of Singh et al. (2015) [16], Tiwari et al (2011) [17], Vennila et al (2020) [18] L and holding and annual income were significant at a level of significance of 5%. For non-trainee farmers, age, extension participation, social participation, extension contact, and innovativeness did not have a significant relationship with knowledge and adoption level. Education was found to be significant at a level of significance of 1%, while land holding and annual income were significant at a level of significance of 5%. Deshmukh et al. (2021) [5], Mazumdar (2016) [12], Krishna et al. (2018) [10] reported similar findings.

Conclusion
Krishi Vigyan Kendra (KVK) plays a crucial role in providing information and training to farmers. Studies have shown that farmer trainees have a higher level of knowledge and adoption of climate-resilient technology compared to non-trainee farmers. The knowledge level of both trainees and non-trainees was positively correlated with their adoption of climate-resilient practices. Trainee farmers had a higher mean score than non-trainees, and education was found to be a significant factor in improving knowledge and the impact of training. This indicates that KVK has significantly contributed to improving the awareness and implementation of better climate-resilient practices among trainee farmers. The knowledge imparted by KVK scientists during training and subsequent extension operations has undoubtedly raised the knowledge level of trainee farmers, leading to an increase in the adoption of improved climate-resilient practices.

Therefore, it is recommended that KVK conduct more training programs on climate-resilient practices for all non-trainee farmers in the villages to ensure that all farmers benefit from improved knowledge and adoption.

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