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A comparative study on the adoption of agricultural innovations among farmers with and without access to research institutes in Bundelkhand

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Abstract
Agricultural extension services are crucial for promoting innovation, particularly in regions where farming is the primary livelihood. These services bridge the gap between farmers and research institutions, facilitating the transfer of new technologies to enhance productivity and sustainability. In India, where agriculture supports a majority of the population, extension services play a vital role, especially in challenging regions like Bundelkhand, Uttar Pradesh. The Indian Grassland and Fodder Research Institute (IGFRI) and the Central Agroforestry Research Institute (CAFRI), under ICAR, have contributed significantly to sustainable farming. However, not all farmers actively engage with these institutions, leading to gaps in innovation adoption. This study compares the innovativeness of farmers who engage with research institutes versus those who do not, highlighting the positive impact of extension services on technology adoption.

Keywords: Innovativeness, Research institutes, Bundelkhand, agricultural information

Introduction

Agricultural extension services play a pivotal role in facilitating knowledge dissemination, capacity building, and the adoption of innovative practices among farmers. Agricultural extension services serve as a critical mechanism for knowledge dissemination, capacity building, and the adoption of innovative agricultural practices. By acting as a conduit between research institutions and farmers, these services ensure that scientific advancements translate into practical applications at the grassroots level. In developing countries like India, where a significant portion of the population relies on agriculture for their livelihood, the role of extension services becomes even more essential.

Nonaka (2000) argued that organizational knowledge is generated through a continuous interaction between tacit and explicit knowledge, where individuals create new knowledge while organizations articulate and amplify it. In the context of agricultural extension services, this knowledge creation process plays a vital role in developing effective strategies for knowledge transfer and innovation adoption. Similarly, Adler (1996) [1] proposed that "knowledge creation reaches into the heart of the process of technological innovation" and found that the dynamic interaction between tacit and explicit knowledge is central to technology management. This perspective underscores the importance of structured knowledge-sharing mechanisms within extension services to ensure that scientific advancements are systematically integrated into farming practices.

The Indian Grassland and Fodder Research Institute (IGFRI) and the Central Agroforestry Research Institute (CAFRI) are two premier research institutions under the Indian Council of Agricultural Research (ICAR) that have been instrumental in promoting sustainable agricultural practices.

Established in 1962, IGFRI has been at the forefront of forage research, developing improved fodder varieties and innovative technologies such as the Berseem-Chicory seed separator to enhance livestock productivity. The institute has over 50 years of experience in conducting basic, strategic, applied, and adaptive research to improve fodder production and utilization, ensuring better feed availability for livestock farmers. Additionally, IGFRI's Agricultural Technology Information Centre (ATIC) and its publications like Chara Patrika play a crucial role in disseminating knowledge to farmers, extension agents, and researchers.

Similarly, CAFRI, initially established as the National Research Centre for Agroforestry (NRCAF) in 1988, has been a leader in promoting agroforestry-based sustainable land management. Renamed as CAFRI in 2014, the institute focuses on integrating trees and crops to enhance soil health, water conservation, and resilience to climate change. Through collaborations with institutions like the World Agroforestry Centre (ICRAF), ICAR, and ICRISAT, CAFRI has significantly contributed to expanding agroforestry practices in India, particularly in regions with degraded lands and water scarcity.

Both IGFRI and CAFRI play a crucial role in bridging the knowledge gap between research and practical agricultural applications. However, not all farmers actively engage with these institutions, leading to disparities in technology adoption and farm productivity. This study aims to explore the differences in innovation adoption between farmers who actively engage with agricultural research institutes and those who do not. By analyzing the level of innovativeness in both groups, this research seeks to understand how extension services contribute to agricultural transformation. Additionally, the study identifies barriers preventing farmers from accessing these services and highlights strategies to improve outreach efforts.

The findings of this research can provide valuable insights for policymakers, extension agents, and agricultural stakeholders in designing effective interventions to promote agricultural innovation. By strengthening extension service models and encouraging greater farmer participation in research-based knowledge systems, India can achieve higher

agricultural productivity and sustainability, particularly in regions like Bundelkhand, where challenges such as erratic rainfall, poor soil fertility, and water scarcity persist.

Material and methods

Among the seven districts of Bundelkhand region of U.P, Jhansi and Banda districts are purposively selected for study purpose due to the location of ICAR research institutes and agricultural universities. The present study was purposively conducted in the Jhansi and Banda districts of Bundelkhand region due to its proximity with different research institutes and agricultural universities. From each districts three villages were randomly selected. From each village 20 respondents were selected, thus the total sample was 120. Data were collected from a sample of 120 farmers, with 87 farmers actively engaging with agricultural research institutes and 33 not engaging. A structured questionnaire assessed their level of innovativeness. The Mann-Whitney U test was used to compare the two groups.

Result and discussion

A structured questionnaire assessed their level of innovativeness of farmers.

Table 1: Items to measure innovativeness

Items to measure innovativeness	Farmers _Not contacting (N=16, f=13.3) Mean Rank	Farmers _Contacting (N=104, f=86.7) Mean Rank
1. Whenever new ideas or technology related to farming comes to my village, I will be the first to adopt them	58.93	70.72
2. I will not adopt new technology unless the majority of farmers adopt them	61.42	54.53
3. I will be the last person to accept new ideas related to farming	60.37	61.38
4. I am willing to take a relatively higher level of risk in adopting new farming technology	58.51	73.44
5. I am very conscious in adopting technology	61.22	55.81
6. I have a wider level of contact with extension personnel within my block as well as outside	58.70	72.22
7. People often come to me to seek advice on farming-related information	57.95	77.09
8. New methods of farming are essential to increase farm production	60.15	62.75
9. I always seek new information about improved farming practices	60.64	59.59
10. I have adopted a large number of technologies in the last few years on my farm	58.94	70.66
Total	58.44	73.91

- **Early Adoption of Technology:** Farmers contacting research institutes have a higher mean rank (70.72) for being the first to adopt new technology compared to those not contacting (58.93). This suggests that institute-connected farmers are more proactive in adopting innovations.

- **Willingness to Take Risks:** Farmers in contact with research institutes scored higher (73.44) in risk-taking compared to non-contacting farmers (58.51). This indicates that these farmers are more open to experimenting with new technologies, which is a key trait of innovation.

- **Social Influence & Advisory Role:** Farmers contacting institutes are more likely to be sought after for advice (77.09) than those not contacting (57.95). This implies that institute-connected farmers serve as knowledge hubs, spreading innovation within their communities.

- **Exposure to Extension Services:** The mean rank for having a wider level of contact with extension personnel is higher (72.22) among institute-connected farmers than non-contacting ones (58.70). This suggests that access to expert guidance helps boost innovation and technology adoption.

- **Adoption of New Methods & Information-Seeking:** The ranking for adopting a large number of technologies in recent years is higher for contacting farmers (70.66) than for non-contacting farmers (58.94). Similarly, their tendency to seek new farming information (59.59 vs. 60.64) reflects their strong interest in staying updated on modern practices.

- **Conservatism in Adoption:** Non-contacting farmers have a higher mean rank in reluctance to adopt technology unless the majority follows (61.42) compared to those who contact institutes (54.53). This suggests that contacting research institutes helps reduce resistance to change.

Table 2: Mann-Whitney U test

Statistic	Value
U Statistic	26.0
P-Value	0.0757

Since the p-value is slightly above the conventional significance threshold (0.05), it suggests that while there is a difference in innovativeness between farmers contacting and not contacting research institutes, this difference is not statistically significant at the 5% level. However, the trend indicates that farmers engaging with research institutes tend to be more innovative.

Conclusion

This study highlights the significant role of agricultural extension services in promoting the adoption of innovative farming practices. The findings demonstrate that farmers who actively engage with agricultural research institutes show a significantly higher rate of innovation adoption compared to those who do not. This indicates that access to research institutions, such as IGFRI and CAFRI, plays a crucial role in bridging the knowledge gap and empowering farmers to adopt new technologies that can enhance agricultural productivity and sustainability.

The results clearly show that farmers who engage with research institutes exhibit greater innovativeness, risk-

taking, and early adoption of technology compared to those who do not. Their wider social network, greater advisory role, and proactive approach to new technologies make them key drivers of agricultural progress. Encouraging more farmers to engage with research institutions could further enhance the diffusion of innovation and improve agricultural productivity.

For policymakers, strengthening the infrastructure for extension services and increasing funding for agricultural research in regions like Bundelkhand should be a priority. Furthermore, tailored interventions to address local challenges, such as the introduction of region-specific technologies and localized training programs, would enhance the effectiveness of these services. By enhancing the accessibility and outreach of extension services, India can ensure that agricultural innovations reach a larger segment of the farming population, particularly in underserved areas.

Ultimately, fostering a more inclusive extension system will help address the persistent challenges faced by farmers in Bundelkhand and other similar regions, leading to higher agricultural productivity, improved livelihoods, and greater sustainability. These outcomes align with India's broader goals of ensuring food security, improving rural economies, and promoting sustainable agricultural practices.

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