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Technology Gap in Adopting Recommended Cultural Practices of Cotton

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ABSTRACT

Agriculture is pivotal for industrial progress, with cotton emerging as a critical component of the agricultural economy, particularly in India. This study evaluates the technological gaps in cotton cultivation among farmers in Punjab, a significant cotton-producing region. Cotton, referred to as "white gold," plays a crucial role in India's economy, contributing to GDP, industrial production, and export earnings while employing millions. Despite advancements in agricultural practices, a notable disparity exists between recommended and actual practices among farmers. The research was conducted in seven cotton-growing districts in Punjab, involving 350 farmers. Data were collected using an interview schedule focused on nine key cotton cultivation practices. The analysis revealed significant technological gaps, with the largest discrepancies observed in pest identification (60.38%) and pest control measures (51.0%). Other notable gaps were in irrigation practices, seed selection, and disease management. The study underscores the need for enhanced farmer education and the implementation of recommended practices to bridge these gaps and optimize cotton production. The primary challenge encountered was the limited awareness among farmers about scientific agricultural practices. The study contributes by identifying these gaps and offering targeted solutions to bridge them.

Keywords: *Technology gap, Cultural practices, Cotton, Farmers, Adoption barriers, Pest management, Irrigation, Punjab agriculture*

INTRODUCTION

Agriculture is the backbone of the progress of industrialization. Cotton plays an important role in the agricultural economy of the country (Maqsood *et al* 2022). Cotton, one of the most important commercial and fiber crops of global significance is called as the king of fiber, it is a multipurpose crop grown under various agro-climatic conditions (Reddy *et al* 2020). Cotton is one of the most important cash crops grown by farmers in India and is cultivated on nearly 12 million ha. In Punjab, cotton is the second most important crop after rice in the monsoon season (Dhillon and Pathak 2020). According to the India Brand Equity Foundation report on the cotton industry and export (2021), the Indian textile industry contributes around five percent to the country's Gross Domestic Product (GDP), 14 percent to industrial production, and 11 percent to total export earnings. It is also the second largest employer in the country after agriculture, providing employment to over 51 million people directly and 68 million people indirectly including unskilled workers. Because of this social and economic significance, it is famously renounced as “white gold” (Shwetha *et al* 2022).

India has the highest cotton production and area, with 6.05 million metric tons and 12.96 million hectares accounting for 26 percent and 41 percent of global cotton production and area respectively (Shwetha *et al* 2022).

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Cotton is the major crop, particularly of the western-southern region of the state. It is grown in the area of more than 5 lakh hectares. Punjab state produces about 15 percent of the country and 2 percent cotton of the total production of the world. New technologies in the form of a package of practices suited to the local conditions were evolved and recommended to the cotton growers for adoption to increase their production. In spite of the numerous and concerted efforts of agricultural scientists, a wide gap exists between the recommended technologies and the adoption of these technologies in the field by the farmers. Thus, to study the technological gap in the production recommendation of cotton was undertaken with the following specific objectives:

1. To know the extent of knowledge of the farmers about the recommended package of practices of cotton.
2. To find out the technological gap of farmers about cotton cultivation.

MATERIAL AND METHODS

The study was carried out across seven cotton-growing districts in the Punjab state of India: Mansa, Bathinda, Ferozepur, Sangrur, Faridkot, Muktsar, and Moga. From each district, five villages were selected randomly. From each village, ten farmers were selected randomly, thus a sample of 350 cotton growers was drawn for the study. Data were collected using an interview schedule designed to assess various aspects of the cotton cultivation practices of farmers. This schedule included nine main practices with a total of 34 specific items or questions. Each item or question carried 1 mark for the right answer and 0 mark for the wrong answer. After the data collection, the data were analyzed and the mean score was calculated.

The technological gaps were worked out. This analysis enabled the identification of technological gaps in cotton farming practices. By calculating the percentage gaps between the ideal and actual practices, the ranks were assigned to each practice, highlighting areas where improvements are needed.

FINDINGS AND DISCUSSION

The study reveals significant technology gaps across various practices in cotton cultivation. These gaps are calculated as the difference between the maximum attainable score and the mean score obtained, presented both in absolute terms and as percentages. The practices are then ranked based on the magnitude of the gap.

1. Identification of Insect/pest (Rank I): This practice shows the largest technology gap of 60.38%, with a difference of 4.83 points between the maximum score (8) and the mean score (3.17). This substantial gap suggests that farmers are struggling most with identifying insects and pests accurately, which could lead to ineffective pest management strategies.

2. Insect pest control (Rank II): With a gap of 51%, this practice closely follows pest identification in terms of adoption challenges. The mean score of 1.96 out of 4 indicates that farmers are implementing less than half of the recommended pest control measures.

3. Irrigation (Rank III): The irrigation practices show a gap of 50.5%, suggesting that optimal water management techniques are not being fully adopted. This could have significant implications for water use efficiency and crop yield.

4. Selection of seed (Rank IV): A 46.75% gap in seed selection practices indicates that farmers may not be utilizing the most suitable or high-quality seeds for their specific conditions.

5. Distance row-row and plant-plant (Rank V): With a 45.75% gap, proper spacing techniques are not being fully implemented, which could affect plant density and resource utilization.

6. Control of diseases (Rank VI): The 45.25% gap in disease control practices suggests room for improvement in implementing recommended disease management strategies.

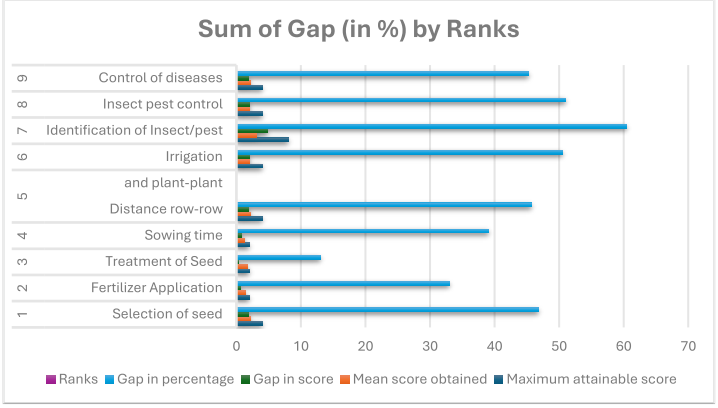
7. Sowing time (Rank VII): A 39% gap in adherence to optimal sowing times could impact crop establishment and subsequent growth stages.

8. Fertilizer Application (Rank VIII): The 33% gap in fertilizer application practices indicates that farmers are not fully following recommended fertilization regimes, potentially affecting nutrient management and yield.

9. Treatment of Seed (Rank IX): While showing the smallest gap at 13%, there is still room for improvement in seed treatment practices to enhance germination and early plant health.

Table 1: Technological Gap of Farmers in Cotton Cultivation

Sr. no.	Practices of Cotton Cultivation	Maximum attainable score	Mean score obtained	Gap in score	Gap in percentage	Ranks
1.	Selection of seed	4	2.13	1.87	46.75	IV
2.	Fertilizer Application	2	1.44	.66	33.0	VIII
3.	Treatment of Seed	2	1.74	.26	13.0	IX
4.	Sowing time	2	1.22	.78	39.0	VII
5.	Distance row-row and plant-plant	4	2.17	1.83	45.75	V
6.	Irrigation	4	1.98	2.02	50.5	III
7.	Identification of Insect/pest	8	3.17	4.83	60.38	I
8.	Insect pest control	4	1.96	2.04	51.0	II
9.	Control of diseases	4	2.19	1.81	45.25	VI



Implications

- **Yield and Quality:** The significant gaps, particularly in pest management and irrigation, are likely to have substantial impacts on cotton yield and quality.
- **Economic Impact:** Suboptimal practices, especially in key areas like pest control and seed selection, may lead to increased production costs and reduced income for farmers.
- **Sustainability:** Gaps in practices like irrigation and fertilizer application could have environmental implications, affecting water use efficiency and soil health.
- **Knowledge Transfer:** The varying degrees of gaps across practices suggest inconsistencies in the effectiveness of knowledge transfer and adoption of new technologies among cotton farmers.

The following recommendations can be made on the basis of the findings obtained:

- Prioritize training programs focusing on insect/pest identification and control, given the large gaps in these areas.
- Develop more effective irrigation management training and technologies to address the significant gap in water management practices.
- Enhance extension services to improve the adoption of best practices in seed selection and spacing.
- Investigate the reasons behind the relatively better adoption of seed treatment practices and apply these learnings to other areas.

- Design targeted interventions for each practice, considering the specific challenges and current adoption levels indicated by the gap analysis.

FUTURE SCOPE

Future research can delve deeper into understanding the behavioral dynamics of farmers that influence the adoption or rejection of recommended cotton cultivation practices. Psychological, cultural, and socio-economic factors often shape decision-making processes at the grassroots level, and investigating these variables could provide a more nuanced perspective on adoption gaps. Additionally, region-specific barriers—such as variability in climatic conditions, landholding patterns, irrigation access, and educational backgrounds—should be systematically explored to design localized intervention strategies.

Moreover, future studies should assess the effectiveness of different agricultural extension models, including ICT-based platforms, community-led farmer field schools, and private-public partnership models, in bridging the technology transfer gap. Evaluating the scalability, cost-effectiveness, and adoption impact of these models will help in identifying the most efficient mechanisms for knowledge dissemination.

Longitudinal studies tracking changes in adoption behavior over time, especially in response to policy shifts or training programs, could provide valuable evidence for refining future extension frameworks. Comparative analyses across different cotton-producing states or countries may also yield transferable insights and innovative solutions. Ultimately, an interdisciplinary approach integrating agronomy, behavioral science, and rural development is essential to foster sustainable and inclusive agricultural growth.

CONCLUSION

The study revealed that a wider technology gap exists in the production recommendation for cotton cultivation in the cotton growers of Punjab. The largest gaps were observed in pest identification and control measures, with the technological gaps reaching 60.38 percent and 51.0 percent, respectively. The findings underscore the urgent need for targeted interventions to bridge these gaps. Enhanced educational initiatives and extension services are crucial to increase farmers' awareness and adoption of recommended practices. Additionally, greater access to resources and support for technology transfer could help mitigate these gaps and boost overall cotton productivity. Addressing these technological deficiencies not only promises to improve the efficiency and sustainability of cotton cultivation but also holds the potential to strengthen India's position in the global cotton market and enhance the livelihoods of countless farmers. Therefore, concerted efforts from policymakers, agricultural scientists, and industry stakeholders are necessary to implement effective solutions and foster advancements in cotton farming practices.

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REFERENCES

1. Maqsood S, Ahmad M, Khan IH, Javaid A. (2022). Evaluation of transgenic cotton cultivars containing cry toxins from Bacillus Thuringiensis against thrips. *Plant Protection*, 6: 161-165.

2. Reddy PS, Kumari RV, Baba MM, Chary DS. (2020). Economic analysis of Bt cotton cultivation in Warangal District of Telangana State. *Multilogic in Science*, 10: 1122-1127.

3. Dhillon BS, Pathak D. (2020). An analysis of cotton cultivation in Punjab and role of Bt Cotton. *Agric Res J*, 57: 965-967.

4. India Brand Equity Foundation. (2021). Cotton industry and export. Retrieved from https://www.ibef.org/exports/cotton-industry-india.aspx on 13 June 2024.

5. Shwetha MN, Devi IS, Thatigutla L, Suhasini K, Meena A. (2022). Growth in area, production and productivity of cotton crop in India: A state wise analysis. *International Journal of Environment and Climate Change*, 12: 51-57.

6. Swanson BE, Bentz RP, Sofranko AJ (Eds.). (1997). *Improving Agricultural Extension: A Reference Manual.* Food and Agriculture Organization (FAO).