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Adoption of improved agricultural practices for wheat crop in babina block of Jhansi district (U.P.)

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Abstract

The present study, entitled "Adoption of Improved Agricultural Practices for Wheat Crops in Babina Block of Jhansi district (U.P.)," was undertaken to assess the awareness, extent of adoption, and constraints in the adoption of improved agricultural practices (IAPs) among wheat farmers. A total of 120 respondents were chosen through multistage purposive-cum-random sampling from different villages of the Babina block. Data were collected using a structured questionnaire and examined using percentage analysis, mean, standard deviation, chi-square test, Garrett ranking, correlation, and regression analysis. The findings acknowledged that the majority of farmers were aware of foundational agronomical practices, such as timely sowing and crop rotation, HYV seeds, but lacked the knowledge to make use of advanced technologies like soil testing and minimum tillage. Further findings suggested a weak positive correlation of large farmers having a high rate of adoption, affirmed by the chi-square and Spearman correlation test. Major constraints included a lack of knowledge, high input costs, and inadequate extension support. Physical barriers like unfavourable rainfall, drought, and high temperature are concerning environmental factors acting as barriers to increased yield. The study suggests improving agricultural extension service delivery by frequent and seasonal field visits to farmers' fields, improving awareness through training, ensuring subsidy support to small and marginal farmers, awareness about government schemes. The findings have practical implications for policymakers, extension workers, and researchers aiming to improve wheat productivity and farmer livelihoods in the region thus evolving the overall income and livelihood of the people.

Keywords: Improved agricultural practices, adoption of improved agricultural practices, agricultural extension services, socio-economic factors, awareness, awareness index, satisfaction index

Introduction

Wheat is undoubtedly the most widely grown, looked-after crop after rice, and a staple crop for most countries worldwide. Also, being an important cereal crop globally and nationwide, it is instrumental to food security for many economies of the world, and mainly for developing and constantly evolving economies like India, and many countries where wheat is the main food for consumption. Wheat provides about 20% of global dietary energy and protein intake (FAO). It is estimated by trusted sources that the crop is serving the primary caloric needs of 35% of the global population around the world. In 2024/25, global wheat production reached a historic 793.2 million metric tons (MMT), driven by technological advancements and expanded cultivation areas, yet tempered by climatic volatility and geopolitical disruptions (FAO, 2023; Reuters, 2025, March 10).

Asia: India emerges as a growth leader, with record production of 115.4 MMT projected for 2024/25, at 6.7% increase over 2021/22 levels-attributed to Minimum Support Price (MSP) incentives and adoption of high-yield seed varieties. (Indian Express, 2025 March 10)

What are improved agricultural practices (IAPs)?

Improved agricultural practices are validated or trustworthy practices, techniques, technologies, and methods of farming that enhance, improve, and increase the crop's fertility, productivity, efficiency, sustainability, and bring environmental resilience.

The introduction of improved agricultural practices is not a new concept.in modern agriculture improved agricultural practices include wide range of practices and tools like zero tillage and minimum tillage, mechanised and timely farm operation, integrated nutrient management, and timely management practices (weed management, pest management, water application, etc.), climate resilient seed

varieties, high-yielding varieties, though overrated, but still prevalent, diversified farming, intercropping, precision farming etc. All these interventions and tools play a significant role in making agriculture modern with the latest addition of precision farming, geographical mapping, global positioning system, and resource mapping, making it more appealing and advanced. The adoption of such technologies and tools will lead to further enhancement in yield, lower input costs, reduced losses, and decreased costs.

Studies in Bundelkhand have shown that farmers adopting zero tillage and improved seed varieties reported a 15-20% increase in wheat yield along with savings in irrigation and labour costs (Choudhary *et al*., 2019) [3]. Hence it becomes of great significance for developing country like India to comprehend the Various Improved Practices Being Adopted by Farmers for Wheat Crop. The present study was conducted to study the adoption of Improved agricultural practices for wheat crop in Babina block of Jhansi District (U.P.).

Methodology

The universe of the study is submerged inside the Bundelkhand region of Jhansi district eastern Uttar Pradesh, known for being drought-affected where wheat cultivation plays a major role in farmers livelihoods (District Agriculture Office, 2023). Study emphasises upon the undeveloped area in terms of poor infrastructure due to its geography and unfruitful less productive soil.

An average of 15 farmers were randomly chosen from each village, resulting in a total sample size of 120 respondents. A multistage purposive-cum-random sampling method was used i.e., the study utilises stratified as well as random sampling methods to categorise the findings. A sample size of 120 farmers practicing wheat cultivation was selected, furthermore, 8 villages from the block were surveyed, and 15 respondents from each village were interviewed through a well-drafted questionnaire. The investigation employed the application of descriptive statistics, chi-square test, Pearson correlation test, Spearman correlation analysis, Garrett ranking, Satisfaction Index, and regression analysis for addressing the objectives in the study. Analytical tools and appropriate questionnaire was prepared for effective analysis and collection of data.

Results and Discussion

The notable aspects of the key discoveries of the investigation are listed below:

1. Socio-economic profile of the farmers

The sample involved overall male participation (100%). 60% of the farmers belonged to the Senior age group (51+). The percentage of farmers with an illiterate and primary education level was 38.3% and 35.8%, respectively, dominating the education category. Overall, more than half (64.5%) of the farmers had marginal (<1 ha) and small (1-2 ha) of land landholdings. The mean landholding of 2.23 hectares has been reported, with min land holding being 0.2 ha and the maximum 7 hectares. The two major sources of information for farmers are fellow farmers, 48%, and private dealers, 51%. Yield was evaluated to be 32.25 quintals/ hectares before IAP adoption. Yield after IAP adoption increased to 38.47 quintals/hectares.

Table 1: Socio-economic profile of respondents

Attribute	Category	Frequency(n)	Percentage(%)
Age Group	18-35 years	20	16.66
	36-50 years	28	23.33
	Above 50 years	72	60
Attribute	**Category**	**frequency**	**Percentage**
Farm Size	Marginal (<1 ha)	**41**	**34.16%**
	Small (1-2ha)	**34**	28.33%
	Medium (1-2 ha)	**23**	19.16%
	Large (>2 ha)	**22**	18.33%
Attribute	**Category**	**Frequency**	**Percentage**
Education Level	Illiterate	46	38.33
	Primary	43	35.83
	Secondary	12	10
	Higher Secondary	11	9.16
	Graduate	2	1.66
	Post-graduate	6	5

2. Awareness & Knowledge of IAPs: It was found that the majority of farmers had a moderate awareness percentage of awareness towards IAPs like HYV, crop rotation, timely sowing, INM, and use of improved varieties, etc.

They were well aware that the use of HYV and improved varieties would increase the yield and income.

Table 2: Awareness parameters of improved agricultural practices.

Statistic	Value (%)
Number of farmers	120
Mean Awareness Index	82.02%
Min Awareness	42.86%
Max Awareness	100%
Std Deviation	12.63

Adoption of Improved Practices: Basic foundational agronomic practices like HYV, timely sowing crop rotation had 100% adoption. Medium to low trend is seen in the adoption of practices like organic manure, IPM, and soil testing. The areas of gap having zero or negligible adoption are minimum tillage water-saving irrigation. A mean awareness percentage of 82.02% was noted.

Table 3: Adoption Rates of Specific IAPs

No	Practice	Adoption (%)	Standard Deviation
1	Uses HYV Seeds	100.00%	0
2	Practices Timely Sowing	100.00%	0
3	Practices INM	100.00%	0
4	Crop Rotation	100.00%	0
5	Seed treatment	84.17%	0.367
6	Practices of Organic Manures	49.17%	0.502
7	Uses Seed cum Ferti Drill	48.33%	0.502
8	Post-Harvest Management	45.00%	0.5
9	Practices IPM	35.00%	0.479
10	Uses Soil Testing	26.67%	0.444
11	Practice Water-Saving Irrigation	0.00%	0
12	Fertigation	0.00%	0
13	Minimum Tillage	0.00%	0

Adoption Level by Farmer Category: Large farmers had a mean adoption of 7.23, which is greater than the mean adoption score of small (6.88) and medium farmers (7.09), indicated by Marginal farmers showed the lowest mean adoption (6.24) may be due to financial and resource

constraints. Chi-square tests showed a slight association between farm size and adoption level ($p < 0.05$).At the Local level, there have been existing adoption gaps despite the new interventions, depicting the scope for strengthened extension approaches(District Agriculture Office, 2023;ICAR-IARI, 2022).

Table 4: Adoption of IAPs by Farm Size

No.	Farmer Category	Sample Size	Mean Adoption	Std Dev	Min	Max
1	Large (>4 ha)	22	7.23	1.38	5	9
2	Medium (2-4 ha)	23	7.09	1.31	4	9
3	Small (1-2 ha)	34	6.88	1.41	4	9
4	Marginal (<1 ha)	41	6.24	1.46	3	9

Socio-economic & Constraint Analysis

Regression analysis and Spearman correlation revealed that attitude had positive correlations with adoption, acting as the deciding factor in the adoption of IAP. Farm size showed a weak positive relationship with adoption. Garrett Ranking identified the key constraints like lack of Knowledge, High cost of input, unfavourable rainfall, and peer influence.

Table 5: Constraints and Socio-Economic Factors Deciding the Rate Of IAPs Adoption In Wheat.

Table 5.1: General Constraints Faced by Farmers

Constraint	Frequency	Rank	Garrett Score	Total Garrett Score
High input cost	39	1	80	3120
Lack of knowledge	32	2	70	2240
Limited extension support	22	3	60	1320
Labour	16	4	50	800
Risk of failure	10	5	40	400

Table 5.2: Physical Barriers In Adoption Of IAPs In Wheat

Physical Barrier	Frequency	Rank	Garrett Score	Total Garrett Score
Unfavourable rainfall	39	1	80	3120
Drought	36	2	70	2520
High temperature	32	3	60	1920
Climate variability	6	4	50	300
Soil fertility issues	3	5	40	120

Table 5.3: Social Barriers In Iaps Adoption For Wheat Crop

Sociological Barrier	Frequency	Rank	Garrett Score	Total Garrett score
Peer influence	75	1	80	6000
Traditional beliefs	45	2	70	3150

Role of Extension Services: The Satisfaction Index was 53.3%, indicating moderate or neutral satisfaction. Furthermore, the satisfaction score of 2.67 reflects moderate to low satisfaction, recommending a lot of work has to be done for further improvement. A minimum of four farmers reported regular visits by extension personnel. Farmers with frequent contact with extension personnel had higher adoption. Pearson correlation test revealed r=0.211, the correlation between extension contact and adoption level.

Table 6: Hypothesis testing through Spearman Correlation

Variables	Spearman ρ	Interpretation
Education ↔ Adoption	-0.11	Weak negative
Farm Size ↔ Adoption	+0.16	Weak positive
Attitude ↔ Adoption	+0.17	Weak positive

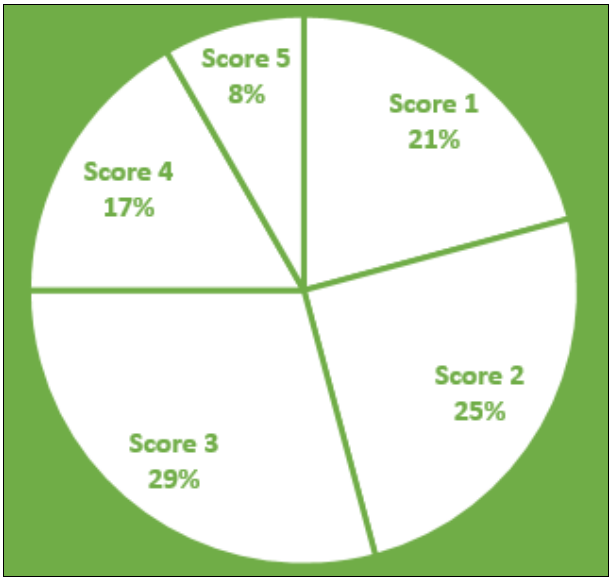

Fig 1: Percentage of farmers score according to satisfaction

Feedback and Suggestions: Farmers recommended the following feedback and suggestions: fertilizer (especially DAP) is expensive, needs subsidy access; there is a need for more extension visits as extension officers don't visit, credit access, localized training, and government scheme awareness. Many Farmers emphasized the need for improving field demonstrations and personalization, keeping in mind their social and economic aspects.

Conclusion

The study concludes that awareness and adoption do exist in a moderately abundant amount. However, awareness and adoption are present partially and incompletely, which hinders the capitalisation of the practices to obtain a marked increase in yield. Soil health and its management practices including soil testing and treating are also not addressed appropriately as only few are practicing such interventions. Hence strengthening soil health management and improving access to technologies can substantially enhance wheat productivity in Babina block of Jhansi and similar regions. Farmers with larger holdings and more positive attitudes are more likely to adopt IAPs. Financial and social, and environmental constraints are the most dominating barriers to widespread adoption. Although extension services are moderately based on the satisfaction index. There is a need for better and frequent personal extension visits, and service delivery is required for improvement. Adoption of Improved Agricultural Practices need demands not only technological accessibility but also supportive policies, institutional support, and farmer-oriented efforts and strategies. (MoAFW, 2024; ICAR-IARI, 2022)." Farmers do have a basic knowledge about tillage and crop rotation practices, as they follow wheat and legume crop rotation but except for this, the adoption is partial and incomplete, after careful observation, many farmers are aware of the benefit of

organic manure application but they due to unavailability in the market locally they aren't able to apply in full proportion. Similarly, unavailability and unaffordability of technological tools, drip, and sprinkler, pose hurdles for development. To guarantee quality and reliability, efforts should be made to mitigate environmental problems and improve extension service delivery.

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