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Empirical analysis of knowledge and adoption spectrum of recommended wheat (*Triticum aestivum* L.) agronomic practices among farming community

Avneesh Kumar[1]*, N.R. Meena[1], R.K. Doharey[1], Ranjeet Kumar[1], Sandeep[1], A.P. Verma[2] and Amit Kumar[3]

Acharya Narendra Deva University of Agriculture & Technology, Kumarganj, Ayodhya, 224 229, Uttar Pradesh
Corresponding Author's Email: aakumar871994@gmail.com

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Abstract

Wheat is an important source of nutrition in our staple diet. Although farmers in northern India are growing wheat for a long time many farmers are lacking good knowledge of wheat and its new varieties production practices. The study was conducted during 2022-23 to know the extent of knowledge and adoption of recommended wheat production practices among wheat cultivating farmers of the Lakhimpur Kheri district of Uttar Pradesh. The result revealed that more than half (53.3%) of the wheat growers had medium level of knowledge followed by 26.6 and 20.0 percent had low and high level of knowledge respectively. Majority of the respondents (55.8%) had medium level of adoption followed by 32.5 percent low and 11.6 percent had high level of adoption respectively. Correlation analysis revealed that out of sixteen variables i.e., age, caste, education, material possession, risk orientation, scientific motivation, extension contact, was found highly significant and positively correlated with knowledge level.

Keywords: Adoption, farmers, gap analysis, knowledge, wheat agronomic practices

Introduction

Wheat (*Triticum aestivum* L.) holds a critical position as a global cereal crop, serving as a fundamental food source for approximately two billion individuals, which accounts for nearly 36% of the global population. It surpasses all other cereal crops—including rice and maize—in terms of cultivated area and total production, solidifying its status as the world's leading cereal grain. Wheat serves as a primary source of carbohydrates in many nations and also provides essential micronutrients including vitamins, minerals, and lipids. When supplemented with animal or leguminous protein, wheat-based diets become highly nutritious. Wheat ranks as the second most widely produced crop globally after maize, covering 219 million hectares with a total production of 760 million metric tonnes and an average productivity of 3390 kg per hectare. In India, wheat is cultivated on 29.8 million hectares, yielding approximately 109 million tonnes at a productivity rate of 3424 kg per hectare (Anonymous, 2003). The major wheat-producing states in terms of area and output include Uttar Pradesh, Punjab, Haryana, Madhya Pradesh, Rajasthan, Bihar and Maharashtra. Uttar Pradesh leads with the largest area under wheat cultivation (9.21 million hectares) and the highest production (24.51 million tonnes), though its productivity (2.7 tonnes per hectare) remains lower than that of Punjab and

[1]Acharya Narendra Deva University of Agriculture & Technology, Kumarganj, Ayodhya, 224 229, Uttar Pradesh; [2]Department of Agricultural Extension, College of Agriculture, Banda University of Agriculture and Technology, Banda-210001, Uttar Pradesh; [3]ICAR Research Complex for NEH Region, Sikkim Centre, Tadong, Gangtok, Sikkim 737102

Haryana (Anonymous 2020). As of the 2024–25 crop year, Uttar Pradesh (UP) continues to be India's leading wheat-producing state. According to the Ministry of Agriculture's estimates, UP produced approximately 35.34 million tonnes of wheat during the 2023–24 season, maintaining its top position nationally. The state contributed around 30% of India's total wheat production for the 2024 *Rabi* season. The area under wheat cultivation in UP was about 9.53 million hectares in 2023–24. While specific yield figures for 2024 are not yet available, previous data indicates that UP's wheat yield was approximately 3,804 kg/ha, which is above the national average (Anonymous 2023). Given its strategic importance in national food security, there is a pressing need to analyze wheat cultivation from multiple perspectives to generate actionable insights that can enhance agricultural research, productivity, and sectoral efficiency. India's agricultural framework is primarily composed of three interconnected domains: research, education, and extension, as outlined in the ICAR Handbook of Agriculture. Among these, extension services play a pivotal role in narrowing the gap between scientific research and on-farm application, a linkage notably demonstrated by the achievements of the Green Revolution in the late 1960s. The extension system in India is extensive, encompassing a network of trained personnel operating at national, state, district, sub-divisional, block, and village levels. Numerous governmental and institutional initiatives aim to enhance farmers' knowledge and facilitate the adoption of modern agricultural technologies. However, a significant disparity persists between the innovations developed by research institutions and their implementation on farmers' fields—particularly in wheat cultivation. This technological gap can be attributed to several limiting factors, such as inadequate mechanization, limited access to high-quality seeds, insufficient irrigation infrastructure, and the absence of efficient market linkages (Shitu *et al*., 2018) andassessment of knowledge and adoption of practices is felt to be essential in this context (Patel *et al.* 2020). In light of these challenges, the present study was undertaken to assess the level of knowledge and the extent of adoption of recommended wheat production technologies among farmers in the Lakhimpur district of Uttar Pradesh. The study aims to generate insights that can inform targeted interventions and contribute to improving wheat productivity through enhanced technology transfer.

Materials and Methods

The exploratory research design was followed in this study. This study was carried out in Mohammdi and Mitauli block of Lakhimpur Kheri districts of Uttar Pradesh State during 2023-24 to know the extent of knowledge and adoption of recommended wheat production practices by wheat growers. A total of 12 villages were selected with the help of a stratified random sampling method from 2 blocks on account of the maximum area covered under wheat crop. A total of 120 wheat growers were selected with simple random sampling from each selected village under the study. The primary data was collected through a pre- tested structured interview schedule which was prepared on the basis of objectives of the study. For determining knowledge level a questionnaire was prepared as per recommended package of practices of wheat crop. The responses were recorded on a three-point continuum as complete, partial and no knowledge and were given 3, 2 and 1 score, respectively. The knowledge level possessed by individual respondents was measured by categorizing in into three categories i.e. low, medium and high level of knowledge. For appraising the extent of adoption the responses were recorded by categorizing in into three categories i.e. low adoption, medium and high level of adoption. Appropriate statistical tools were used to draw the meaningful analysis and interpretation.

Results and Discussion

Socio-demographic profile of the Respondents

The results (Table 1) revealed that less than half of respondents (45.0%) belonged to middle age group (39 to 70), 84.1 percent were literate, 36.6 percent had intermediate qualification, majority of the respondents (44.1%) belonged to other backward caste, maximum number of respondents (90.0%) were married, 60.8 percent of respondents were having less than 1 hectare of land,

belonged to small and medium categories were 23.3 percent and 10.0 percent, 73.3 percent respondents belongs to nuclear families, majority of respondents (53.3%) belonged to small family size category, maximum number of the respondents (43.3%) were belonged to the annual income of Rs. 68001 to 395999 (medium), while, 35.8 percent respondents have has participation in one organization, maximum number of respondents (53.3%) was found having medium level of economic motivation, 49.1 percent were found having medium level of scientific orientation, 51.6 percent was found having medium level of risk orientation. The average mean of scores of risk orientation observed to be 23.2 with range of minimum 16 and maximum 30. The findings of the study are in line with the study of Jose *et al*. (2019); Upadhyay *et al*. (2021) who reported that that less than half of the respondents belong to middle age category (48.0%), belong to other backward caste category (50.0%) and majority had nuclear family (67.0%).

Table 1. Distribution of respondents on the basis of socio-demographic profile (n=120)

SI. No.	Variables	Category	f	%
1.	Age	Young age (below 38)	15	12.5
		Middle age (39 to 68)	64	53.3
		Old age (above 69)	41	34.1
2.	Education	Illiterate	19	15.8
		Literate	101	84.1
		Can read and write only	08	06.6
		Primary school	10	08.3
		Middle school	11	09.1
		High school	18	15.0
		Intermediate	44	36.6
		Graduate & post graduate	29	24.1
3.	Caste	General caste	25	20.8
		Other backward caste	53	44.1
		Scheduled caste	42	35.0
4.	Marital status	Married	108	90.0
		Unmarried	12	10.0
5.	Land holding	Marginal farmers (below 1)	73	60.8
		Small farmers (1.01 to 2.00)	28	23.3
		Medium farmers (2.01 to 3.00)	12	10.0
		Large farmers (above 3.01 ha.)	07	05.8
6.	Family type	Nuclear family	88	73.3
		Joint family	32	26.6
7.	Size of family	Small (below 4)	64	53.3
		Medium (5 to 9)	37	30.8
		Large (above 10)	19	15.8
8.	Annual income	Small (below 68000)	43	35.8
		Medium (68001 to 395999)	52	43.3
		High (above 396000)	25	20.8
9.	Social participation	No participation	32	26.6
		Participation in one organization	43	35.8
		Participation in two organization	29	24.1
		Participation in > two organization	16	13.3
10.	Economic motivation	Low (below 14)	23	19.6
		Medium (15 to 18)	64	53.3
		High (above 19)	33	27.0
11.	Scientific orientation	Low (below 15)	36	30.0
		Medium (16 to 17)	59	49.1
		High (above 19)	25	20.8
12.	Risk orientation	Low (below 19)	39	32.5
		Medium (20 to 26)	62	51.6
		High (above 27)	19	15.8

Knowledge of respondents on improved practices of wheat cultivation

Knowledge plays an important role in decision making process at the individual level. It is the precursor to the adoption of any innovation. It might be difficult to presume the level of adoption of technology unless it is first known to the person who is going to adopt it. Ascertaining the level of knowledge and adoption among farmers was done to know their perception about the sustainability of wheat crop. Knowledge and adoption were perceived as the level up to which different practices were known and adopted by the sampled farmers. Further, practice-wise knowledge and adoption were also calculated to see the extent of knowledge and adoption. Results from Table 1 has reflected the knowledge level of different categories of wheat growers regarding different wheat cultivation practices. It is evident from table 2 that more than half (53.33 %) of the wheat growers had medium level of knowledge followed by 26.67 and 20.00 percent had low and high level of knowledge respectively. The findings of the study are in line with the study of Jat *et al.* (2022).

Table 2. Distribution of respondents according to their knowledge level (n=120)

Sl. No.	Categories	f	%
1.	Low level (below 14)	32	26.6
2.	Medium level (15 to 28)	64	53.3
3.	High level (above 29)	24	20.0
	Total	120	100.0

Knowledge level of farmers regarding improved wheat practices

The results revealed that (Table 3) that among all eleven agricultural practices of crop production, knowledge level was observed in sowing time with MPS 95.3 ranked I, followed by irrigation management with MPS 93.0 ranked II, the harvesting with MPS 80.6 ranked III, field preparation with MPS 76.0 ranked IV, weed management with MPS 74.00 ranked V, high yielding varieties with MPS 72.00 ranked VI, plant protection measure with MPS 70.0 ranked VII, fertilizer application with MPS 68.6 ranked VIII, spacing with MPS 68.0 ranked IX, inter cropping with MPS 61.3 ranked X, and plant growth regulator with MPS 50.6 ranked XI respectively.

Table 3. Knowledge level of farmers regarding improved wheat practices (n=120)

Sl. No.	Cultivation Practices	MPS	Rank
1.	Field preparation	76.0	IV
2.	High yielding varieties	72.0	VI
3.	Sowing time	95.3	I
4.	Spacing	68.0	IX
5.	Fertilizer application	68.6	VIII
6.	Irrigation management	93.0	II
7.	Plant growth regulator	50.6	XI
8.	Inter cropping	61.3	X
9.	Weed management	74.0	V
10.	Plant protection measure	70.0	VII
11.	Harvesting	80.6	III

*Mean Per Squire

Correlation analysis of different variables and knowledge level of farmers regarding improved wheat production technology

The findings shows that (Table 4) out of sixteen variables i.e., age, caste, education, material possession, risk orientation, scientific motivation, extension contact, was found highly significant and positively correlated with knowledge level. Variables like annual income, marital status, land holding, type of family, size of family and social participation were found not significant but posi-

Table 4. Correlation coefficient between different variables and knowledge level of farmers regarding improved wheat production technology (n=120)

Sl. No.	Variables	Correlation coefficient
1.	Age	0.632**
2.	Caste	0.455**
3.	Education	0.756**
4.	Annual income	0.147
5.	Marital status	0.148
6.	Land holding	0.115
7.	Type of family	0.156
8.	Size of family	0.106
9.	Material possession	0.415**
10.	Social participation	0.099
11.	Risk orientation	0.676**
12.	Economic motivation	-0.020
13.	Scientific orientation	0.421**
14.	Extension contact	0.661**

*Significant at 0.05% level 0.176; ** Significant at 0.01% level

tively correlated with knowledge level. Only one variable economic motivation was found not significant and negatively correlated with knowledge level. It means that if the value of these variable increases, the knowledge level of cultivation practices was also increases. The findings of study are in conformity with the study of Panchbhai *et al*. (2017) who revealed that socio-demographic profile of respondents had positive and highly significant relationship with knowledge of respondents.

Extent of adoption of wheat cultivation practices among the farmers

The finding revealed that (Table 5) majority of the respondents (55.8%) had medium level of adoption followed by 32.5 percent low and 11.6 percent had high level of adoption respectively.

Adoption level of wheat cultivation practices

The result revealed that (Table 6) that among all eleven agricultural practices of crop production, maximum adoption level was found in spacing with MPS 79.3 ranked I, followed by harvesting with MPS 78.4 ranked II, irrigation management with MPS 77.3 ranked III, Plant protection measures with MPS 73.3 ranked IV, field preparation with MPS 71.4 ranked V, fertilizer application with MPS 71.3 ranked VI, sowing with MPS 69.3 ranked VII, high yielding verities with MPS 64.0 ranked VIII, weed management with MPS 61.3 ranked IX, plant growth regulators with MPS 58.6 ranked X and inter cropping with MPS 53.3 ranked XI respectively. The findings of the study conducted by Gupta *et al.* (2021) are in line with the present study.

Table 7. Correlation coefficient between different variables and adoption level of wheat cultivation practices (n=120)

S. No.	Variables	Correlation coefficient
1.	Age	-0.625**
2.	Caste	0.472**
3.	Education	0.667**
4.	Annual income	0.158
5.	Marital status	0.163
6.	Land holding	0.123
7.	Type of family	0.167
8.	Size of family	0.113
9.	Material possession	0.447**
10.	Social participation	0.115
11.	Risk orientation	0.759**
12.	Economic motivation	0.004
13.	Scientific orientation	0.450**
14.	Extension contact	0.763**

*Significant at 0.05% probability level; ** Significant at 0.01% level

Table 5. Distribution of wheat growers according to their adoption (n=120)

Sl. No.	Categories	f	%
1.	Low level of adoption (below 17)	39	32.5
2.	Medium level of adoption (18 to 34)	67	55.8
3.	High level of adoption (35 and above)	14	11.6
	Total	120	100.0

Table 6. Adoption level of wheat cultivation practices (n= 120)

S. No.	Cultivation Practices	MPS	Rank
1.	Field preparation	71.4	V
2.	High yielding verities	64.0	VIII
3.	Sowing	69.3	VII
4.	Spacing	79.3	I
5.	Fertilizer application	71.3	VI
6.	Plant growth regulators	58.6	X
7.	Irrigation management	77.3	III
8.	Inter cropping	53.3	XI
9.	Weed management	61.3	IX
10.	Plant protection measures	73.3	IV
11.	Harvesting	78.4	II

MPS = Mean per cent score

Correlation coefficient analysis of different variables and adoption level of wheat cultivation practices

The table 7 focuses that out of sixteen variables i.e., caste, education, material possession, risk orientation, scientific orientation, extension contact, was found highly significant and positively correlated with adoption level. Variables like annual income, marital status, land holding, type of family, size of family, social participation, and economic motivation were not significant but positively correlated with adoption level. Only one variable age is highly significant but negatively correlated with adoption level. It meant that if the values of these variables increase, the adoption level of cultivation practices also increases.

Conclusion

The findings of the study indicate that a significant proportion of wheat cultivators possessed a moderate level of knowledge pertaining to the recommended technological practices in wheat production. Similarly, the adoption rate of these technological interventions among the majority of farmers was also observed to be at a medium level. These results underscore the critical need for agricultural extension agencies to actively engage in disseminating information and enhancing awareness among farmers through capacity-building initiatives such as training programs, group discussions, and field demonstrations. Given the strategic importance of wheat as a staple food crop, it is imperative to establish a resilient and sustainable agricultural system. This requires the optimal and judicious utilization of natural and technological resources to ensure long-term food security for future generations.

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