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Knowledge level of farmers *vis-à-vis* improved sugarcane production technology in Lakhimpur Kheri district, Uttar Pradesh

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Abstract

India, being the second-largest producer, considers sugarcane vital not only for sugar production but also for its role in generating bio-products and supporting agro-based industries. Despite its significance, the sector faces challenges, including limited farmer awareness of improved production technologies. This study was conducted during 2022-23 in Lakhimpur Kheri district of Uttar Pradesh—one of the major sugarcane-producing regions in the state—with the objective of assessing the knowledge level of farmers regarding improved sugarcane production technologies and identifying factors influencing this knowledge. A total of 120 farmers from Bankeyganj and Kumbhigola blocks were selected through proportionate random sampling. Data were collected using a pre-structured interview schedule and analyzed using suitable statistical tools. The findings revealed that the majority of farmers possessed a medium level of knowledge, with the highest awareness in practices such as ratooning, sowing time, and water management. Correlation analysis showed that variables such as education, land holding, type of family, risk orientation, economic motivation, and scientific orientation had a highly significant and positive relationship with knowledge levels. In contrast, caste, annual income, family size, social participation, and age were negatively correlated, with the latter two showing high significance. Marital status, material possessions, and extension contact were found to be non-significant but positively correlated. These insights highlight the critical socio-economic and psychological factors that influence the dissemination and adoption of improved sugarcane cultivation practices and suggest the need for targeted extension efforts to bridge knowledge gaps among farmers.

Keywords: Improved sugarcane technology, knowledge level, sugarcane

Introduction

Sugarcane (*Saccharum officinarum* L.) is a key commercial crop in India, serving as the primary raw material for sugar, jaggery, ethanol, and other agro-based industries (Gurjar *et al*., 2017; Buller *et al*., 2021). India is the second-largest producer of sugarcane globally, cultivating it on approximately 5.22 million hectares with a production of 463.97 million tonnes and an average yield of 88.82 tonnes per hectare during 2022–23 (DAC&FW, 2023). Uttar Pradesh leads in sugarcane area and production, accounting for around 43% of the national output. Among the districts, Lakhimpur Kheri is a major sugarcane belt with favorable agro-climatic conditions and a dense concentration of sugar mills, making it an ideal location to evaluate the dissemination and adoption of improved technologies. Improved sugarcane production technologies (ISPTs)—including high-yielding varieties, mechanized planting, drip irrigation, integrated nutrient and pest manage-

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ment, and ratoon management—have significant potential to enhance productivity and profitability. However, the mere availability of these technologies does not ensure their adoption. The level of knowledge possessed by farmers plays a crucial role in bridging the gap between research and field-level implementation (Bhowmick *et al*., 2021). Variability in knowledge levels affects how effectively farmers implement recommended practices, which ultimately impacts yield, cost-efficiency, and sustainability. A study by Bhowmick *et al*. (2021) in West Bengal found that only 41.7% of farmers had a high level of knowledge regarding improved sugarcane cultivation practices, with critical gaps in ratoon management, pest control, and seed treatment (Suresh and Shivamurthy, 2017; Rathod *et al*., 2018). The study emphasized the role of targeted extension interventions and local demonstrations in bridging the knowledge gap. In Uttar Pradesh, Singh and Sharma (2022) evaluated farmer awareness in sugarcane-growing districts and reported that while over 70% of respondents were aware of new varieties (e.g., Co 0238), less than 30% implemented precision nutrient or water management. The study found that education, landholding size, and contact with extension agents had a significant positive correlation with knowledge level ($p < 0.01$). Rathi *et al*. (2020) reported that in western Uttar Pradesh, many farmers still rely on traditional methods of planting and lack awareness of scientific ratoon management, which reduces crop longevity and profitability. Only 26% of farmers followed proper spacing and intercropping methods, despite these being promoted by state agricultural departments. Further, Kumar *et al*. (2023) highlighted that exposure to mass media and digital advisories (such as mobile-based agri apps) significantly influenced knowledge acquisition among sugarcane farmers in north India. Their study recommends leveraging ICT-based tools for region-specific awareness campaigns. In Lakhimpur Kheri specifically, although the region hosts multiple sugar mills and benefits from a strong cooperative infrastructure, preliminary reports suggest that technology adoption remains fragmented due to variation in farmer literacy, limited training programs, and weak linkages between research institutions and grassroots extension (Department of Agriculture, U.P., 2023). Although multiple sugarcane technologies have been developed and recommended, adoption in many regions, including Lakhimpur Kheri, remains inconsistent. Prior studies have primarily focused on agronomic performance, input use, and yield gaps but have not sufficiently addressed the knowledge dimension of farmers in localized contexts. There is limited empirical evidence evaluating the knowledge level of farmers vis-à-vis specific components of ISPTs, especially in high-production zones like Lakhimpur Kheri. Moreover, few studies have correlated socio-economic variables such as education, landholding, access to extension services, and media exposure with knowledge levels, which is critical for tailoring location-specific extension strategies (Carvalho *et al*., 2017; Singh *et al*., 2019; Meena *et al*., 2020; Atinkut *et al*., 2020). We hypothesize that there is no significant relationship between farmers' socio-economic characteristics and their knowledge level regarding improved sugarcane production technologies. There is a significant relationship between farmers' socio-economic characteristics and their knowledge level regarding improved sugarcane production technologies. With this in mind, the study was undertaken with the objective to understand the knowledge level of farmers with respect to improved sugarcane production technology in Lakhimpur Kheri District, Uttar Pradesh and to find out the factors that has an effect on the knowledge level of the farmers.

Materials and Methods

The present study was conducted in Lakhimpur Kheri district of Uttar Pradesh, latitude 28.1651^0 and longitude 80.6327^0. The district lies in the northern most part of the state in Lucknow division and is situated in the Sub Himalayan belt bordering the territory of Nepal. Lakhimpur is one of the major sugarcane cultivation District in the state of Uttar Pradesh. The district has total fifteen blocks, namely out of which, Bankeyganj and Kumbhigola block were selected purposely for the study because of the highest sugarcane production in these blocks. For the selection of respondents, a comprehensive list of sugarcane cultivators was prepare from each iden-

tified village from both the block with the help of villages patwari and agriculture officers of respective village, sugarcane cultivators were selected proportionally from each village identified block. A total of 120 farmers were included in the sample for the study. A pre-structured interview schedule was used for primary data collection. Suitable statistical methods used for analysis of the data.

Results and Discussion

Socio-economic characteristics of the respondents

The findings in Table 1 reveals that the mean age of respondents ranged from 46.45 year with 61.6 per cent belonging to middle age group and with majority of the respondents (49.1%) falling to other backward caste category. Further, the findings reveals that the majority of the respondents (85%) were literate and (15 %) illiterate. Hence, it may be said that the educational standard of the respondents was considerably good in comparison to average literacy rate of the state and country as such. The maximum number of the respondents was found in the annual income range of . 60001 to 300000 with an average of . 214583/-. The maximum number of respondents (94.1%) were married followed by (5.83%) were unmarried. The average size of land holding was found to be 1.85 hectare. Therefore, it may be said that the small and marginal farmers were mostly there in the study area. It might be due to fragmentation of the family. Nuclear family system is dominant in the area of study. The similar finding was also reported by Jaiswal *et al*. (2014); Saini *et al.* (2017). Most respondents (57.5%) belonged to small category of those had below 4 members in their families. A cursory glance over the findings further indicates that out of 120 respondents, 46.67 per cent have no participation in any organization, followed by (29.1%) respondents has participation in one organization, while (15.8%) and (08.3%) respondents has participation in two organization and participation in more than two organizations, respectively. It is apparent from the findings that the maximum number of respondents (56.6%) was found having medium level of risk orientation while (24.1 per cent) and (19.1%) respondents were found in the categories of low and high level of risk orientation, respectively. The average mean of scores of risk orientation observed to be 19.35 with range of minimum 6 and maximum 30. Hence, it can be stated that the most of the respondents have average interest to bear the risk relating to improved farming. Data also says that most of the respondents were found possessing medium level of orientation towards scientific knowledge. Similar results also reported by Sebele-Mpofu *et al*. (2019); Jeya and Vasanthakumar (2020).

Almost 57.7 per cent of the farmers was found having medium level of economic motivation. The findings in Table 1 further reveals that most of the respondents have their own diesel engine/ pumping set with Mean Per Score (MPS- More than one items had reported by respondents, hence the total MPS of all items would be more than 100) 71.6 ranked I, followed by tractor with MPS 32.5 ranked II, the electric motor with MPS 11.6 ranked III, the bullock with MPS 05.00 ranked IV, and power tiller with MPS 04.16 ranked V, respectively. With respect to the possession of farm implements among respondents the findings reveals that most of the respondents reported having, spade with MPS 96.3 ranked I. Similarly with respect to transport material majority were found having cycle with MPS 77.50 ranked I and lastly the majority of respondents possessed mobile phone with MPS 81.66 ranked I. Information sources were categorized into three categories namely formal sources, informal sources, and mass media, exposure to find out the extent of contact of respondents. So, for as contact with formal sources was concerned, Kishan Sahayak ranked 1st, as for contact with informal sources was concerned, got rank, Local leaders ranked 1st and among the mass media exposure T.V ranked 1st.

Knowledge level of respondents regarding improved sugarcane production technology

The findings in Table 2 reveals majority of the respondents had medium knowledge level followed by low Knowledge level (30.0%) and high knowledge level (17.5%) respectively.

Further the Table 3 reveals that among all 16 agricultural practices of sugarcane production, ratooning with MPS 96.2 ranked I, followed by

Table 1. Socio-economic characteristics of the respondents

Characteristics	Category	Frequency	Percentage
Age	Young (up to 34)	25	20.8
	Middle (35 to 58)	74	61.6
	Old (above 59)	21	17.5
Caste	Scheduled Tribe	09	07.5
	Scheduled caste	33	27.5
	Other backward caste	59	49.1
	General caste	19	15.8
Education	Illiterate (cannot read and write)	18	15.0
	Literate	102	85.0
	Can read and write	16	13.3
	Primary	15	12.5
	Middle	19	15.8
	High School	20	16.6
	Intermediate	21	17.5
	Graduate/Post Graduate	11	09.1
Annual income ()	Small(up to 60000)	41	34.1
	Medium(60001 to300000)	65	54.1
	High(300001 and above)	14	11.6
Marital status	Married	113	94.1
	Unmarried	07	05.8
Land holding	Marginal(below1)	57	47.5
	Small(1.01to 2.00)	36	30.0
	Medium(2.01to3.00)	15	12.5
	Large(above3.01ha.)	12	10.0
Family type	Nuclear family	68	56.6
	Joint family	52	43.3
Family size	Small(below4)	69	57.5
	Medium(5 to9)	26	21.6
	Large(above10)	25	20.8
Social participation	No participation	56	46.6
	Participation in one organization	35	29.1
	Participation in two organization	19	15.8
	Participation in more than two organization	10	08.3
Risk orientation	Low (below10)	23	19.1
	Medium (11 to27)	68	56.6
	High (above 28)	29	24.1
Scientific orientation	Low (below9)	21	17.5
	Medium (10 to23)	73	60.8
	High (above 24)	26	21.6
Economic motivation	Low (below9)	23	19.1
	Medium (10 to23)	69	57.5
	High (above 24)	28	23.3
Material possession	(A) Farm power	Mean Per Score (MPS)	Rank
	Tractor	32.5	II
	Power tiller	4.16	V
	Diesel engine/ Pumping set	71.6	I
	Electric motor	11.6	III
	Bullock	05.0	IV
	(B) Farm implements	MPS	Rank
	Disc Plough	05.0	XIV
	Cultivator	32.5	VIII
	Disc Plough	35.0	VII
	Seed drill	09.1	XII
	Rotavator	30.8	IX
	Chaff Cutter	86.6	IV

Table 1. ***Continue ...***

Characteristics	Category	Frequency	Percentage
	Thresher	23.3	X
	Cane crusher	07.5	XIII
	Leveler	20.0	XI
	Sprayer	52.5	V
	Spade	96.3	I
	Khurpi	95.2	II
	Sickle	94 .6	III
	Pata	37.5	VI
	(C) Medium of Transportation	MPS	Rank
	Car	10.8	IV
	Tractor Trolley	32.5	III
	Pickup	05.0	V
	Bullock cart	03.3	VI
	Bike	66.6	II
	Cycle	77.5	I
	(D) Communication media possession	MPS	Rank
	Radio	17.5	VI
	T.V.	68.3	III
	Mobile phone	81.6	I
	D.T.H.	75.0	II
	Newspaper	67.5	IV
	Agri. Book	09.1	VII
	Computer	21.6	V
Extension contact	(A) Formal Sources	MPS	Rank
	B.D.O.	49.5	V
	A.D.O.	45.8	IX
	V.D.O.	52.5	VIII
	Kishan Sahayak	66.6	I
	Gram Pradhan	64.1	II
	Co-operatives	55.8	VI
	Agril. College/University	42.5	XI
	Mandi Samiti	56.6	IV
	Fertilizer/Seed Stores	62.5	III
	Agril. Scientists	39.1	XII
	KVK	44.1	X
	Others	54.1	VII
	(B) Informal Sources	MPS	Rank
	Family Members	65.0	III
	Neighbours	50.0	V
	Friends	67.5	II
	Relatives	51.6	IV
	Local Leaders	73.3	I
	(C) Mass Media Exposure		
	Radio	69.1	IV
	T.V.	74.1	I
	Newspaper	72.5	II
	News bulletins	60.8	VII
	Farm magazines	58.3	VIII
	Circular letters	56.6	IX
	Agri. books	62.5	VI
	Posters	70.8	III
	Farmers fair	55.0	X
	Demonstration	45.0	XII
	Folders	46.6	XI
	Others	65.0	V

Table 2. Distribution of farmers on the basis of knowledge level about recommended sugarcane production technology

Sl. No.	Knowledge level	Frequency	Percenatge
1	Low (below 16)	36	30.0
2	Medium (17 to 19)	63	52.5
3	High (above 20)	21	17.5

season and time of sowing sugarcane with MPS 96.2 ranked II, water management with MPS 89.3 ranked III, harvesting with MPS 88.4 ranked IV, wrapping and earthling with 86.1 ranked V, field preparation with MPS 85.0 ranked VI, fertilizer application with MPS 75.8 ranked VII, varieties of sugarcane crop with MPS 74.9 ranked VIII, weed management with MPS 70.4 ranked IX, yield with MPS 67.3 ranked X, seed rate/hectare with MPS 55.7 ranked XI, plant protection with MPS 55.2 ranked XII, method of sowing with MPS 50.7 ranked XIII, Climate with MPS 47.4 ranked XIV, inter cropping in sugarcane with MPS 34.0 ranked XV and seed treatments with MPS 24.8 ranked XVI, respectively. It can be calculated that the extent of knowledge about sugarcane production technology.

Relationship of independent variable with knowledge level of respondents

The relationship of independent variables with knowledge level of farmers about sugarcane production technology was tested with the help of correlation. The result has been presented in the Table 4. The findings reveals that out of 14, namely 05 variables like education, land holding, type of family, risk orientation, economic motivation and scientific orientation positively high significant and positive relationship with the extent of the knowledge level of the respondents. Whereas, caste, annual income and size of family negative significant relationship with the extent of knowledge level of the respondents. Social participation and age are two variables high significant and negative correlation with knowledge. Marital status, material possessions and extension

Table 4. Relationship of independent variable with knowledge level of respondents

Independent variable	Correlation Coefficient value
Age	-0.6849**
Caste	-0.2065*
Education	0.5638**
Annual income	0.2109*
Marital status	0.1046
Land holding(ha)	0.4028**
Type of family	0.3203**
Size of family	0.2723*
Social participation	-0.6454**
Risk orientation	0.6465**
Economic motivation	0.6439**
Scientific orientation	0.6605**
Material possessions	0.1307
Extension contact	0.0381

**Highly significant at 0.01 % level of probability
* Significant at 0.05 % level of probability

Table 3. Knowledge level of respondents regarding improved sugarcane production technology

Cultivation Practices	Mean Per Score	Rank
Field preparation	85.0	VI
Season and Time of sowing sugarcane	96.2	II
Climate	47.4	XIV
Varieties of sugarcane crop	74.9	VIII
Seed rate/hectare	55.7	XI
Seed treatments	24.8	XVI
Method of sowing	50.7	XIII
Fertilizer application	75.8	VII
Intercropping in sugarcane	34.0	XV
Water management	89.3	III
Wrapping and Earthling	86.1	V
Plant protection	55.2	XII
Weed management	70.4	IX
Ratooning	96.2	I
Harvesting	88.4	IV
Yield	67.3	X

are non- significant and the correlation is positive with knowledge (Rao, 2016; Gaikwad and Jadhav, 2017).

Conclusion

A study in Uttar Pradesh's Lakhimpur Kheri district found that sugarcane is a crucial commercial crop with economic importance, but farmers face challenges in adopting improved production technologies. Most farmers have a medium level of knowledge about sugarcane cultivation practices, with the highest awareness in ratooning, sowing time, and water management. Factors such as education, landholding, family type, risk orientation, economic motivation, and scientific orientation positively influence farmers' knowledge levels. Conversely, factors like caste, annual income, family size, social participation, and age show a negative correlation with knowledge. The study suggests that enhancing education, promoting scientific orientation, and increasing risk-taking capacity can positively influence farmers' awareness and adoption of advanced sugarcane production technologies.

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