P-ISSN: 2618-0723
E-ISSN: 2618-0731

NAAS Rating (2025): 5.04
www.extensionjournal.com

International Journal of Agriculture Extension and Social Development

Volume 8; Issue 8; August 2025; Page No. 114-118

Received: 13-06-2025
Accepted: 15-07-2025

Indexed Journal
Peer Reviewed Journal

Adoption of maize production and marketing technologies in Mandalgarh block of Bhilwara District, Rajasthan

Chandra Prakash Dhakar and VK Sharma

Department of Agriculture Extension, R.B.S. College, Bichpuri, Agra, Uttar Pradesh, India

DOI: https://www.doi.org/10.33545/26180723.2025.v8.i8b.2252

Corresponding Author: Chandra Prakash Dhakar

Abstract

The present study was undertaken to evaluate the knowledge level, adoption behavior, and marketing awareness of maize growers regarding improved production technologies in the Mandalgarh block of Bhilwara district, Rajasthan. A total of 90 respondents were selected through a multistage sampling technique. The study focused on 14 critical aspects of maize cultivation including field preparation, seed treatment, improved varieties, sowing time, spacing, nutrient and water management, weed control, pest and disease management, harvesting, storage, and marketing strategies. The results revealed that the overall knowledge level of respondents regarding maize production technology was 74.45%, indicating a moderately high awareness. Farmers showed the highest familiarity with nutrient management (90%), sowing time (88.89%), and field preparation (85.56%), reflecting effective dissemination of foundational agronomic practices. However, knowledge regarding pest and disease control remained comparatively low at 60% and 58.33%, respectively, suggesting the need for targeted training in these domains. Adoption analysis across 13 improved production practices revealed an average adoption level of 75.21% with a standard deviation of 8.92, highlighting moderate variation among farmers. Practices such as field preparation (92.22%), sowing time (90%), and irrigation (87.78%) were widely adopted, while adoption of seed treatment (62.22%), improved varieties (64.44%), and plant protection (67.78%) remained limited. Regarding marketing awareness, 80% of respondents were aware of current maize prices, 73.33% had knowledge of market trends, and 66.67% could identify their local markets. These findings underscore the importance of strengthening extension services, particularly in the areas of plant protection and post-harvest management, and improving market linkages to enhance maize productivity and farmer income. Focused interventions addressing these gaps could lead to more informed decision-making and sustainable agricultural development.

Keywords: Maize production, technology adoption, marketing awareness

1. Introduction

Maize (*Zea mays* L.), often addressed as the "Queen of Cereals," is one of the most important and versatile cereal crops globally. It plays a pivotal role not only in food and nutritional security but also in supporting rural livelihoods and industrial development. In India, maize ranks third in area and production after rice and wheat, covering approximately 9.2 million hectares and yielding around 35.67 million tonnes during the 2023-24 cropping season (DES, 2024). Its demand has been rising rapidly due to its diversified use in poultry feed, starch manufacturing, and more recently, as a key raw material for ethanol production. As a result, maize has emerged as a strategic crop both for food systems and industrial supply chains.

The Government of India has actively promoted maize development through initiatives such as the National Food Security Mission (NFSM) and the Rashtriya Krishi Vikas Yojana (RKVY), aiming to enhance both domestic availability and farmer incomes (IIMR, 2023). A particularly transformative policy direction is the national push towards ethanol blending in petrol, targeting 20% blending by 2030. According to NITI Aayog (2021), maize will be a vital alternative to sugarcane in this context due to its lower water requirement and adaptability, especially in regions where sugarcane is becoming unsustainable. With its ability to thrive under varied agro-climatic conditions, short crop duration, and resilience to water stress, maize is particularly well-suited for rainfed and semi-arid regions of India.

In the agricultural year 2023-24, maize in India was cultivated on approximately 10.89 million hectares (108.87 lakh hectares), with a national production of 35.67 million tonnes and an average productivity near 3,000 kg/hectare, according to official advance estimates (Anonymous, 2023) [4]. Rajasthan, which is among the top maize-producing states, had 847,001 hectares under maize, yielding 1,808,444 tonnes at an average productivity of 2,135 kg/hectare, noticeably below the national average due to factors such as rainfed cultivation and limited irrigation (Anonymous, 2024a & Anonymous, 2024b) [2, 3].

From a nutritional standpoint, maize is a valuable energy-rich food. A 100-gram portion of raw maize kernels provides approximately 86 kilocalories, 18.7 g of carbohydrates, 3.27 g of protein, and 1.35 g of fat. The carbohydrate content, largely composed of starch (28-80% of dry weight), is a key energy source, particularly in rural diets. While maize protein, primarily zein, is limited in lysine and tryptophan, the promotion of Quality Protein

Maize (QPM) addresses this nutritional deficiency. Maize also contains heart-healthy polyunsaturated fats, especially linoleic acid, and provides about 2.7 g of dietary fiber, which aids digestion and reduces the risk of metabolic disorders (Kumar *et al*., 2014) [17].

Despite its increasing significance, several production and marketing challenges persist. Low levels of awareness and adoption of recommended technologies, poor access to extension services, weak market infrastructure, and limited price realization continue to hinder the profitability of maize cultivation (Fisher *et al*., 2015, Yadav *et al*., 2016) [8, 26]. Socio-economic factors such as landholding size, education, credit access, and market exposure significantly influence the knowledge and behavior of farmers regarding production and post-harvest practices. While innovations such as improved hybrids, mechanization, and integrated nutrient and pest management can substantially enhance productivity, their adoption remains limited, especially in rainfed and tribal-dominated regions (Asfaw *et al*., 2012, Thombre *et al*., 2020) [5, 25].

Marketing-related constraints such as lack of storage facilities, poor transportation networks, and limited access to price information frequently force smallholders to sell their produce below the Minimum Support Price (MSP). This not only impacts income but also reduces incentives for adopting improved production practices (Goyal, 2010) [10]. Therefore, understanding the socio-economic profile of farmers and their adoption behavior is crucial for developing effective extension strategies (Kumar *et al*., 2024) [16].

From an agricultural extension perspective, region-specific insights are necessary to inform decentralized, participatory approaches to technology dissemination and policy planning. In the context of the Mandalgarh block of Bhilwara district where maize cultivation is expanding identifying gaps in knowledge, access, and adoption is essential for designing need-based interventions. Furthermore, the promotion of nutritionally enhanced maize varieties like QPM and value-added products such as baby corn and sweet corn can create new income avenues and support rural entrepreneurship.

Given this background, the present study was conducted with the primary objectives of evaluating their knowledge and adoption of maize production and marketing technologies in Mandalgarh block of Bhilwara district, Rajasthan. The findings aim to provide empirical insights for strengthening extension systems, facilitating technology transfer, and improving the competitiveness and sustainability of maize-based farming systems in the region.

2. Materials and Methods

2.1 Study Area

The present study was conducted in the Mandalgarh block of Bhilwara district, located in the south-eastern part of Rajasthan, India. The region falls under the semi-arid zone with predominantly rainfed agriculture. Maize is a principal Kharif crop in the area, cultivated under varied agro-ecological conditions. The Mandalgarh block was purposively selected due to its substantial maize-growing population, presence of tribal communities, and relevance for maize-based livelihood systems.

2.2 Sampling Technique

In the present study, a multi-stage random sampling technique was employed to ensure comprehensive representation of the maize producers and marketers in the study area. The sampling was conducted in four stages: selection of blocks, villages, and respondents, applying a combination of purposive and proportionate random sampling methods to meet the research objectives.

2.3 Selection of Block

Out of the 14 administrative blocks of Bhilwara district in Rajasthan *viz*., Asind, Badnor, Banera, Hurda, Jahazpur, Kareda, Kotri, Mandal, Raipur, Sahara, Shahpura, Suwana, Mandalgarh, and Bijoliya. The blocks Mandalgarh and Bijoliya were purposively selected. These two blocks report the highest maize-producing farmers in the district, making them ideal for studying maize production and marketing systems. This purposive selection aligns with the principle of targeting areas with significant maize-related activities to maximize the relevance and depth of data collected.

2.4 Selection of Villages

Within Mandalgarh block, five villages Dolpura, Badanpura, Pipalda, Manpura, and Mahuwa were purposively selected. These villages were chosen based on multiple criteria: a sizeable area under maize cultivation, active farmer participation in marketing activities, accessibility for researchers, and a diverse socio-economic composition. The region's suitable agro-climatic conditions**,** particularly for *kharif* maize, and the presence of various caste and landholding groups (including SC, ST, OBC, and general categories) provided a rich context for data collection.

2.5 Selection of Respondents

From the selected five villages, a total of 90 maize-growing farmers were selected as respondents using the proportionate random sampling technique. The number of respondents per village was proportional to the number of maize farmers in each village, ensuring equitable representation. Assistance from local patwaris, agricultural officers, and village leaders was sought to identify eligible respondents, specifically those actively involved in both maize cultivation and its marketing. The final sample included small, marginal, and medium farmers, allowing for a holistic analysis of production and marketing practices across different farm sizes and socio-economic conditions.

2.6 Tools and Techniques of Data Collection

Primary data were collected using a well-structured and pre-tested interview schedule through personal interviews. Respondents included heads of maize-growing households who actively participate in farming and decision-making. The schedule included detailed questions on knowledge and adoption of recommended maize production and marketing practices. Standardized psychological scales were used where necessary. Prior to final use, the schedule was pre-tested in a non-sample area and revised accordingly.

2.7 Methods of Data Collection

Face-to-face interviews were conducted at respondents'

homes or fields during their leisure hours to ensure accuracy and cooperation. Data collection focused on independent variables such as education, landholding, income, social participation, extension contact, and risk orientation, as well as dependent variables like knowledge and adoption of maize technologies. Constraints faced by respondents were also recorded.

S. No	Dependent Variables	
1.	Knowledge	Procedure followed by Anastasi (1961) [1]
2.	Adoption	Procedure followed by Sengupta (1967) [21]
3.	Marketing	Structure schedule were developed

The dependent variables studies were knowledge and adoption of maize production technology among the maize growers.

2.7.1 Knowledge

The level of knowledge of maize growers about production technology of maize was measured by scoring technique. Total 34 practices were selected for measuring knowledge level. Score one was assigned for knowing the practices completely and score zero was assigned for total lack of knowledge about the practice. Accordingly, total score of every maize grower was worked out.

The Knowledge Index of each respondent was calculated on the basis of total score obtained by them with the following formula.

Knowledge Index (K.I.) = Score obtained / Maximum possible score × 100

The total score scored by each respondents was worked out with help of mean + S.D. as given below.

Sr. No.	Knowledge level of respondents	Score
1.	Low knowledge level	Upto 22
2.	Moderate knowledge level	23 to 30
3.	High knowledge level	31 and above

2.7.2 Adoption

For studying adoption of improved cultivation practices of maize by maize growers, the level of adoption i.e. full adoption, partial adoption and non-adoption, the scoring as two score were assigned for full adoption, one score for partial and zero score for non-adoption.

The package of practices namely under the main head titles as preparatory tillage, seed (selection and seed treatment), sowing, protective irrigation, weed management, manures and fertilizers, inter cultivation, plant protection, intercrop, and harvesting were considered. In all 20 subheads were put before respondents under above 10 recommended major practices.

The adoption of maize growers in respect of recommended improved cultivation practices of maize was studied by computing adoption score. Two score were assigned for full adoption one score for partial adoption and zero score for non-adoption. The maximum and minimum score one could be obtained were 44 and 22, respectively.

Total score of every maize grower was worked out and the adoption was measured with the help of Adoption Index by using following formula.

Adoption Index (A. I.) = Score obtained / Maximum possible score × 100

The total score of all maize growers was worked out and the respondents were grouped in three categories by using mean + S.D. as follows

Sr. No.	Category	Score
1.	Low adoption level	Upto 20
2.	Medium adoption level	21 to 30
3.	High adoption level	31 and above

2.7.3 Marketing

Marketing refers to activities a company undertakes to promote the buying or selling of a product, service, or goods. It is one of the primary components of business management and commerce.

Sr. No.	Category	Score
1.	Knowledge of Market trends	0
2.	Market rate of Maize	1
3.	Name of Maize market in area	2

2.8 Statistical Analysis

The data collected from the respondents were processed by giving score and tabulated in primary and secondary tables, percentage were calculated wherever needed and established parameters like mean and standard deviation were used.

3. Results and Discussion

The study examined the knowledge level of respondents regarding maize production technology across 14 key components. The overall knowledge percentage was found to be 74.45%, indicating a moderate to high level of understanding among the 90 respondents. The highest knowledge was observed in the area of manures and fertilizer application (90.00%), showing that respondents were highly aware of nutrient management practices. This was followed by knowledge on time of sowing (88.89%) and field preparation (85.56%), reflecting good understanding of agronomic practices that influence crop establishment and yield (Table 1).

Farmers also showed relatively strong knowledge of high yielding varieties (82.78%) and irrigation management (81.67%), suggesting they are informed about modern inputs and appropriate water use, possibly due to practical experience and local guidance. Moderate levels of knowledge were recorded in areas like method of sowing (78.89%), crop rotation (75.00%), seed treatment (71.11%), and harvest and post-harvest practices (68.33%). Awareness was also fair in intercropping and weed management (66.67%), seed rate (64.44%), and sowing distance (62.22%), indicating some understanding but also room for further improvement.

The lowest levels of knowledge were reported in insect and pest control (60.00%) and disease control (58.33%), highlighting a critical gap in plant protection awareness. This may reflect a lack of access to timely technical information or extension services related to pest and disease management. Overall, the findings suggest that while

farmers are generally well-versed in field operations and input usage, targeted extension efforts are needed to improve knowledge in pest and disease control, post-harvest practices, and certain agronomic techniques. Focused training, demonstrations, and effective communication strategies can help bridge these gaps and enhance overall productivity. Previous researcher's *viz*., Chinnappa *et al*. (2017) [7], Gauraha and Thakur *et al*. (2020) [9], Sharma and kumar (2017) [22], Singh and Kumar (2017) [23], Pandey and meena 2019 [19] also reported similar findings.

Table 1: Distribution of respondents on the basis of their Knowledge level:

Sr. No.	Categories	Respondents	
		%	Rank
1.	Field preparation	85.56	III
2.	High yielding varieties	78.89	VI
3.	Crop rotation	72.22	VIII
4.	Seed rate	80.00	V
5.	Seed treatment	67.78	X
6.	Time of sowing	88.89	II
7.	Method of sowing	70.00	IX
8.	Sowing distance	62.22	XII
9.	Manures & fertilizer application	90.00	I
10.	Irrigation management	75.56	VII
11.	Intercropping & weed management	65.56	XI
12.	Insect/ Pest control	60.00	XIII
13.	Disease control	58.33	XIV
14.	Harvest & Post-harvest	83.33	IV
	Overall knowledge per cent	74.45	

n=90,%= Per cent, Mean = 12.61, S.D.=2.58, Min.=2, Max=14

The adoption level of respondents regarding maize production technology was assessed across 13 key practices. Results indicated that adoption varied across different components, with some technologies being widely accepted while others lagged behind. The highest adoption was observed in field preparation, irrigation management, and time of sowing, suggesting these are well-integrated practices among farmers. Conversely, relatively lower adoption was seen in plant protection measures, seed treatment, and intercropping & weed management, indicating potential gaps in knowledge or resource access.

The average adoption level among the respondents was 75.21%, reflecting a moderately high overall adoption rate of maize production practices. The standard deviation of 8.92 indicates a moderate variability in adoption across different respondents and practices. This suggests that while many farmers are adopting modern maize technologies, there remains a segment with lower levels of adoption that may benefit from targeted extension and training efforts (Table 2). Previous researcher's *viz*., Shrikant *et al*. (2017), Chinnappa *et al*. (2017) [7], Gauraha and Thakur *et al*. (2020) [9], Sharma and kumar (2017) [22], Singh and Kumar (2017) [23], Pandey and meena 2019 [19] also reported similar findings.

Table 2: Distribution of respondents on the basis of their Adoption level:

Sr. No.	Categories	Respondents	
		Per cent (%)	Score
1	Field preparation	86.67	II
2	High yielding varieties	82.22	IV
3	Crop rotation & mixed farming	75.56	VIII
4	Spacing in plant to plant	68.89	X
5	Time of sowing	88.89	I
6	Method of sowing	77.78	VII
7	Seed rate	71.11	IX
8	Seed treatment	64.44	XI
9	Application of fertilizer & Manures	84.44	III
10	Irrigation management	80.00	V
11	Intercropping & weed management	66.67	XII
12	Plant protection measures	57.78	XIII
13	Harvest & Post-harvest	73.33	VI

On the basis of their marketing of respondents were classified into three categories i.e. knowledge of market trends, market rate of maize and name of the maize market in area**.** Out of 90 respondents, 73.33% had knowledge of market trends, suggesting that a significant number of farmers stay informed about pricing patterns and market behavior. 80% of the respondents were aware of the current market rate of maize, reflecting a high level of attention to price-related information. However, only 66.67% could name the maize market in their area, indicating that while price awareness is high, specific knowledge about marketing locations is slightly lower. Overall, farmers demonstrated good awareness regarding maize marketing, though further efforts in market linkage and awareness programs could improve their access to structured markets and reduce exploitation by middlemen and weakens the farmer's bargaining power (Table 3).

Several studies have underscored the critical role of market information and infrastructure in enhancing the market participation and income of Indian farmers. Birthal and Joshi (2007) [6] emphasized the gaps in market knowledge and infrastructure at the grassroots level, highlighting how limited access to market information weakens farmers' bargaining power. Gulati and Narayanan (2003) [11] discussed the inefficiencies caused by poor awareness of market locations and prevailing prices, which, compounded by the role of middlemen, often leads to reduced farmer income.

Similarly, Kumar and Mittal (2011) [15] analyzed the low level of awareness among farmers regarding price trends and markets, advocating for improved market information systems to empower them. Reddy and Reddy (2004) [20] found that lack of precise knowledge about marketing centers and prices limits farmers' participation and ability to realize fair prices. Nair and Namboodiri (2015) [18], studying the maize market in Kerala, noted that while general price awareness exists, specific knowledge about market locations is often inadequate, indicating the need for targeted awareness programs and stronger market linkages.

Table 3: Distribution of respondents on the basis of their marketing

Sr. No.	Categories	f	%
1.	Knowledge of Market trends	66	73.33
2.	Market rate of Maize	72	80.00
3.	Name of Maize marke in area	60	66.67
	Total	90	100.00

n=90, f= frequency, %= Per cent

4. Conclusion

The study concludes that while maize growers in Mandalgarh block, Bhilwara district exhibit moderately high knowledge and adoption levels regarding improved production practices, critical gaps remain in areas such as seed treatment, use of improved varieties, and plant protection measures. Additionally, marketing awareness, though present, requires further strengthening to ensure better price realization and reduced exploitation. Focused extension efforts, capacity-building programs, and farmer-centric training on scientific crop management and market dynamics are essential to bridge these gaps. Empowering farmers with both technical know-how and market intelligence will enhance productivity, profitability, and overall sustainability of maize cultivation in the region.

5. References

1. Anastasi A. Psychological tests: Uses and abuses. Teachers College Record. 1961 Feb;62(5):1-5.
2. Anonymous. Agricultural Statistics - Government of Rajasthan. Area in hectares P: Production in Tonnes Y: Yield in Kgs. Jaipur: Directorate of Economics and Statistics, Government of Rajasthan; 2024. https://rajas.rajasthan.gov.in/PDF/5312024110403AMSecond.pdf.
3. Anonymous. Final Estimates of Production of Major Agricultural Crops for 2023-24. New Delhi: Ministry of Agriculture and Farmers Welfare, Government of India; 2024. https://www.pib.gov.in/PressReleasePage.aspx?PRID=2058534.
4. Anonymous. Maize Outlook Report - June to May 2023-24. Guntur: Acharya N. G. Ranga Agricultural University (ANGRAU); 2023. https://angrau.ac.in/downloads/AMIC/OutlookReports/2023_24/Maize%20outlook-June-july-2023-24.pdf.
5. Asfaw S, Shiferaw B, Simtowe F, Lipper L. Impact of modern agricultural technologies on smallholder welfare: Evidence from Tanzania and Ethiopia. Food Policy. 2012 Jun 1;37(3):283-95.
6. Birthal PS, Joshi PK. Market participation by Indian farmers: A disaggregate analysis at the worest level. Agric Econ. 2007;37(2-3):285-95.
7. Chinnappa B, Mule RS, Jadhav SJ. Extent of knowledge and adoption level of improved maize cultivation practices by farmers in Bidar district (Karnataka), India. Int J Curr Microbiol Appl Sci. 2017;6(10):3127-33.
8. Fisher M, Abate T, Lunduka RW, Asnake W, Alemayehu Y, Madulu RB. Drought tolerant maize for farmer adaptation to drought in sub-Saharan Africa: Determinants of adoption in eastern and southern Africa. Clim Change. 2015 Nov;133(2):283-99.
9. Gauraha AK, Thakur SK. Knowledge level and adoption of improved maize production technology in Bilaspur district of Chhattisgarh, India. Int J Chem Stud. 2020;8(3):2720-3.
10. Goyal A. Information, direct access to farmers, and rural market performance in central India. Am Econ J Appl Econ. 2010 Jul 1;2(3):22-45.
11. Gulati A, Narayanan S. The subsidy syndrome in Indian agriculture. Oxford University Press; 2003.
12. Hanumanaikar RH. A study on knowledge adoption and marketing behaviour of sunflower growers in Dharwad district. [Dharwad]: University of Agricultural Sciences; 1995.
13. Himantharaju. A study on extent of extension guidance received by the fanners in adoption of selected practices of summer paddy cultivation in Mandya District, Kamataka state. [Bangalore]: University of Agricultural Sciences; 1984.
14. Karthikeyan C, Chandraakandan JK, Parvathi S. Factors influencing adoption behaviour of sugarcane growers. J Ext Educ. 1995;7(4&1):1331-4.
15. Kumar D, Mittal SK. Market information system for Indian agriculture: An analysis. Agric Econ Res Rev. 2011;24(2):257-65.
16. Kumar M, Pannu RS, Malik DP, Mahapatra A. Production and marketing constraints faced by spring maize growers in Haryana. Econ Aff. 2024 Sep 1;69(3):1215-20.
17. Kumar R, Srinivas K, Boiroju, Gedam PC. Production performance of maize in India: Approaching an inflection point. Int J Agric Stat Sci. 2014;10(1):241-8.
18. Nair TM, Namboodiri NK. Market information and price behavior: The case of maize in Kerala. Indian J Agric Econ. 2015;70(3):321-32.
19. Pandey DK, Meena GL. Farmers' knowledge gap in maize production technology in Rajasthan, India. Indian Res J Ext Educ. 2019;19(2-3):86-9.
20. Reddy VN, Reddy SV. Market access and marketing efficiency of small farmers in India. Indian J Agric Mark. 2004;18(1):59-68.
21. Sengupta JK. Econometric models of risk programming. Indian Econ J. 1967 Jun;15(4):423-41.
22. Sharma B, Kumar R. Knowledge and adoption of recommended maize production practices among the farmers in hills of Himachal Pradesh, India. Int J Farm Sci. 2017;7(3):125-31.
23. Singh K, Kumar S. Assessment of knowledge level of maize growers about improved production technologies in Uttar Pradesh, India. Indian J Agric Sci. 2017;87(1):79-84.
24. Srikanth B, Kausadikar HH, Jondhale RN, Gandhi N. Economic Analysis of Maize Production and Marketing in Khammam District, Telangana. Asian J Agric Ext Econ Sociol. 2017;20(4):1-13.
25. Thombre RF, Deshmukh KV, More SS, Chavan RV. Constraint and Suggestion Analysis in Production and Marketing of Maize in Marathwada Region of Maharashtra using Garrett's Ranking Technique. Int J Curr Microbiol Appl Sci. 2020;9(3):2319-7706.
26. Yadav OP, Prasanna BM, Yadava P, Jat S, Kumar D, Dhillon BS, *et al*. Doubling maize (*Zea mays*) production of India by 2005-06 Challenges and opportunities. Indian J Agric Sci. 2016;86(4):427-34.