The Andhra Agric. J 71 (2): 240-245, 2024
doi :10.61657/aaj.2024.123

Exploring technology adoption and production constraints in maize cultivation in Guntur district of Andhra Pradesh

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ABSTRACT

This study was conducted by the Extension Department of Regional Agricultural Research Station, Lam, Guntur, during 2023-2024, aimed to assess the adoption of recommended maize production technologies and identify key challenges faced by farmers. Using a multistage sampling design, 100 maize farmers from five mandals with the highest maize cultivation areas were selected. Data were collected through personal interviews and analysed by using frequency distributions and percentages. The study assessed the extent of adoption of various recommended practices, including soil types, sowing methods, seed treatment, weed management, water management, fertilizer management, pest and disease management, and harvesting. The results revealed that farmers fully adhered to recommended practices for recommended soils, sowing methods, spacing, water management, and harvesting. High adoption rates were also observed for sowing time (89%) and disease management (81%). However, significant non-adherence was noted in fertilizer management (88%), pest control (67%), and weed management (67%), where most farmers deviated from the recommended practices. Key reasons for non-adoption included misconceptions about fertilizer requirements, inadequate awareness of proper seed treatment, reliance on stubble burning for weed control, and the high cost of potassium fertilizers. Additionally, insufficient labour and knowledge of pest management techniques contributed to deviations from recommended practices. Major constraints faced by farmers included the incidence of pink stem borer (83%) and Fall Armyworm (71%), rising input costs, and price fluctuations. These findings highlight the need for targeted interventions to promote better awareness, adoption of integrated nutrient and pest management practices, and policy support to stabilize input costs and crop prices. Addressing these issues could improve the sustainability and profitability of maize cultivation in the region.

KeyWords: *Maize adoption, Production constraints and Reasons for non adoption.*

Maize (*Zea mays* L.) is one of the world's most important cereal crops, leading global cereal production. Known for its remarkable yield potential, maize is often referred to as the "queen of cereals" due to its unmatched productivity. No other cereal crop on earth can match its immense potential, making it a crucial agricultural staple food crop. Maize is highly versatile, with several varieties including yellow and white grain maize, sweet corn, baby corn, popcorn, waxy corn, high amylase corn, high oil corn, and quality protein maize. With its exceptional versatility it is grown in more than 166 countries across the globe, including tropical, subtropical and temperate regions, from sea level to 3000 m above mean sea level. It is cultivated in nearly 205 m ha with a production of 1210 m tonnes and productivity of 5878 kg/ha all over the world, having wider diversity of soil, climate, biodiversity and management practices (FAOSTAT 2021). Beyond its role as a staple food in many countries, maize serves as a key ingredient in animal feed and has extensive industrial applications, contributing to its global significance. Maize is 3rd major crop in India after rice and wheat (Cox, E., 1956 and Reddy *et al*., 2013). India produced 33.62 million tonnes in an area of 10.04 million hectares in 2021-22, whereas in kharif 2022-23, maize production was 23.10 million tonnes in an area of 9.68 million hectares (agricoop.nic). In Andhra Pradesh, maize was cultivated in an area of 3.01 lakh ha with a production and productivity of 17.84 lakh tonnes and 5918 kg/ha, respectively, contributing 5.66 per cent to total country's production (des.ap.gov.in, 2020-21). In

terms of maize production, the major districts were Guntur (5.03 lakh tonnes), West Godavari (4.40 lakh tonnes), Srikakulam (2.61 lakh tonnes), Vizianagaram (2.45 lakh tonnes) and Kurnool (2.37 lakh tonnes) (apagrisnet).In Guntur district maize has cultivated in 48,000 ha area with the highest maize yield in 2019-20.

Improving agricultural production and productivity through the use of new agricultural technologies is a critical approach to improve the majority's livelihoods and increasing food security (Kaliba *et al.,* 2018). Because of maize's importance in the country's agricultural economy and household food security, modern technology must be used to increase its production and productivity. However, due to many obstacles that are either internal or external to the farmers' circumstances, smallholder farmers' understanding and application of agricultural technologies in general, and improved maize varieties in particular, are limited (Jaleta *et al.,* 2013). Farmer adoption of different intensification technologies in maize is linked to increased crop yield, profitability, or both, resulting in increased household income and consumption (Abdulai, 2016; Chepchirchir *et al*., 2017 and Makate *et al*., 2017). Considering Maize cultivation importance in Guntur district a study was conducted by the extension department of Regional Agricultural Research Station, Lam during the year 2023-24 with the following objectives

1. To analyze adoption pattern of maize recommended production technology by the farmers of Guntur district.
2. To understand the reasons for non-adoption of recommended production technology by the maize farmers
3. To elicit constraints experienced by the farmers in maize production

MATERIAL AND METHODS

The present study was conducted during 2023-2024 by the Extension Department of the Regional Agricultural Research Station, Lam, Guntur, employed a multistage sampling design to select participants. Five mandals—Duggirala, Tenali, Ponnuru, Kollipera, and Chebrole—known for having the largest maize cultivation areas and were purposively selected for the study. From each mandal, two villages with the highest maize cultivation areas were chosen, and 10 farmers from each village were randomly selected, resulting in a total sample size of 100 maize farmers. Data were collected through personal interviews, organized, and analysed to determine the results and draw conclusions.

The analysis employed various statistical tools such as frequency distributions and percentage. The extent of adoption of recommended maize cultivation practices was assessed using the Maize production technology recommended by ANGRAU. This included evaluating adoption across several categories: recommended soil types, sowing methods, sowing time, seed rates, spacing, seed treatment, weed management, water management, fertilizer management, pest management, disease management, and harvesting practices. In cases where significant deviations from the recommended practices were observed, respondents were asked to explain their reasons for non-adoption. These reasons were then categorized and analysed using frequencies and percentages.

To further identify major constraints in maize cultivation, an open-ended question was posed to the farmers. Their responses were grouped into categories, and the frequency and percentage of each constraint were calculated to highlight the most pressing issues. The results provide insights into both the adoption of recommended practices and the challenges faced by maize farmers, offering a comprehensive understanding of the current state of maize cultivation in the region.

RESULTS AND DISCUSSION

Adoption pattern of recommended Maize production technology by the farmers

From Table 1, it can be inferred that all maize farmers were fully adopting the recommended soils, sowing methods, spacing, water management, and harvesting. A significant proportion were also following recommendations for sowing time (89.00%), disease management (81.00%), and seed rate (76.00%). However, a large majority were not adhering to recommended practices in fertilizer management (88.00%), pest management (67.00%), and weed management (67.00%). This indicates that while farmers are diligent in some aspects of maize cultivation, there are critical areas like fertilizer, pest, and weed management where efforts are needed for better adherence to recommended agricultural practices.

Table 1. Adoption of recommended maize production technology by the farmers in Guntur district

S.No	Recommended practices	Adopted		Not adopted	
		Fre.	%	Fre.	%
1	Recommended Soils	100	100	0	0
2	Sowing method	100	100	0	0
3	Sowing time	89	89	11	11
4	Seed rate	76	76	24	24
5	Spacing	100	100	0	0
6	Seed treatment	0	0	100	100
7	Weed management	36	36	64	64
8	Water management	100	100	0	0
9	Fertilizers management	12	12	88	88
10	Pest management	33	33	67	67
11	Disease management	81	81	19	19
12	Harvesting	100	100	0	0

Table 2. Reasons for non-adoption of ANGRAU recommended Maize production technology

S.No	Technology recommendations		Freq.	%
1	Seed treatment	With an assumption using only treated seed	75	75
		Insufficient time	28	28
2	Weed management	Burning paddy stubbles	75	75
		Pre emergence herbicide is not needed	68	68
		Pre emergence herbicide is not effective	48	48
		Availability of effective post emergence herbicides	46	46
3	Fertilizers management	Maize is fertilizer intensive crop	83	83
		Increased K fertilizer price	74	74
		Majority of them are tenants.	61	61
		Low soil fertility	51	51
		Not using FYM as it is costly and unavailable	32	32
4	Pest management	Not using granules.	86	86
		Spraying combination of chemicals.	68	68
		More number of sprays	51	51
		Lack of knowledge of proper spraying	39	39
		Labour problem	35	35

Onuwa *et al.(* 2023), in their study on "Socio-economic determinants of adoption of maize production technologies among smallholders" that majority of the maize farmers adopted sowing date (75.00%), planting method (71.00%), seed rate (61.00%) and weed management (60.00%) but they have not adopted disease control (78.00%), water management (66.00%), pest management (58.00%) and fertilizer management (52.00%). Vikas Chowhan *et al.*(2021) in their study on "A study on extent of adoption of recommended production technologies by maize growers in Koppal district of Karnataka" reported that a majority of the maize farmers adopted land preparation, sowing time and harvesting, but not adopted seed treatment, chemical weed management and fertilizer management. Ugwumba and Okechukwu (2014) reported similar findings with respect to adoption of recommended maize fertilizer (45.00%), use of agro-chemicals (40.00%) and use of organic manure (20.00%). Kalyan Singh and Sengarand (2012) reported that maximum number of the respondents had low level of adoption regarding insect control (70.83%), followed by disease control (69.16%), storage facility (68.33%), weed control (60.83%), seed treatment (60.00%). These findings were in accordance with that of Netam *et al.*(2018) with respect to seed treatment, fertilizer application, weed management and plant protection.

Reasons for non-adoption of ANGRAU recommended Maize production technology

Table 2 reveals several key factors contributing to the non-adoption of recommended practices in maize cultivation. One of the main reasons for the non-adoption of seed treatment was the assumption that only treated seeds were used by them, reported by 75% of farmers. Additionally, 28% of farmers cited insufficient time during sowing as a barrier. This highlights the need for greater awareness among farmers regarding the importance of seed treatment. Vikas Chowhan *et al.*(2021) expressed lack of awareness about seed treatment and lack of knowledge about the quantity of chemical used for treatment are the reason for partial adoption of seed treatment practice.

In terms of weed management, over three-quarters of farmers (76.00%) were burning leftover paddy stubbles of *Kharif* season despite recommendations against this practice. This behavior is attributed to a lack of understanding about the harmful environmental impacts of stubble burning. Furthermore, 68.00% of farmers did not adopt pre-emergence herbicides, believing they were unnecessary due to stubble burning. Among those who did not use herbicides, 48.00% found them ineffective.

A significant deviation was also observed in fertilizer management. A large majority (83.00%) of farmers applied more fertilizer than recommended, under the assumption that maize is a fertilizer-intensive crop and that increased inputs would lead to higher yields. Additionally, 74.00% of farmers opted for complex fertilizers over the recommended potassium fertilizers due to the rising costs of potassium. Integrated Nutrient Management (INM) practices were also not widely adopted by 61.00%, primarily because majority of farmers were tenants and less likely to invest in long-term soil health. Other reasons for non-adoption included low soil fertility (51.00%) and the high cost of farmyard manure (FYM) (32.00%). Lack of knowledge and lack of conviction about the recommended nutrient application may be the reasons for partial adoption (Vikas Chowhan *et al.,* 2021)

Pest management also showed considerable non-compliance with recommendations. A majority (86.00%) did not use the recommended granules due to perceived ineffectiveness, while 68.00% resorted to using combinations of chemicals, and 51.00% engaged in excessive spraying. Furthermore, lack of knowledge on proper spraying techniques (39.00%) and labor shortages (35.00%) were additional factors contributing to the deviations from recommended pest management practices. This analysis underscores the importance of targeted awareness campaigns and training for farmers to improve adoption rates of recommended practices in maize cultivation.

Constraints perceived by the farmers in Maize cultivation

Table 3 highlights several major constraints faced by farmers in maize cultivation. The most significant issue reported was the severe incidence of pink stem borer, affecting 83.00% of farmers, followed by the widespread presence of Fall Armyworm (71.00%). Other prominent challenges include the rising cost of cultivation (69.00%), lower Minimum Support Price (MSP) (67.00%), price fluctuations (56.00%), and the incidence of sucking pests (51.00%). Similar constraints were reported by Umar *et al.*(2022) and Onuwa *et al.*(2023). High cost of

Table 3. Constraints expressed by farmers in Maize cultivation

S.No	Constraints	Frequency	%
1	Pink stem borer	83	83
2	Fall Army Worm	71	71
3	Increased cost of cultivation	69	69
4	Lower MSP	67	67
5	Price fluctuations	56	56
6	Sucking pests (Aphids)	51	51
7	Spraying problem for stem borer	48	48
8	Sheath blight	45	45
9	High cost of seed	40	40
10	Increased irrigation charges	39	39
11	Increased labour cost	36	36

inputs and not getting proper value for the produce were some of the constraints in maize production reported by Mubeen Mansuree *et al.*(2024).

In addition, less than half of the farmers identified other concerns, such as difficulties in spraying to control the stem borer (48%), sheath blight incidence (45.00%), high seed costs (40.00%), increased irrigation charges (39.00%), and rising labour costs. These constraints indicate that maize farmers are grappling with both pest related challenges and escalating production costs, which directly impact their overall profitability and productivity. Addressing these issues through improved pest management strategies, affordable input supplies, and better price stability mechanisms could significantly enhance maize cultivation outcomes for farmers.

CONCLUSION

The study highlights that while maize farmers in Guntur are committed to adopting key aspects of recommended maize production technologies, including soil types, sowing methods, and water management, there are significant gaps in the adoption of critical practices such as fertilizer management, pest control, and weed management. Farmers' non-adherence to these practices is influenced by factors such as misconceptions about fertilizer usage, the perceived ineffectiveness of recommended pest control methods, and a lack of knowledge regarding the harmful effects of stubble burning on weed control. Despite their awareness of basic agricultural practices, farmers struggle with adopting integrated management techniques due to the high cost of inputs, labour shortages, and inconsistent knowledge of advanced pest management and nutrient applications. These gaps point to the need for focused training programs, increased awareness campaigns, and financial support mechanisms that can address these constraints. The constraints faced by the farmers—particularly the prevalence of pests such as the pink stem borer and Fall Armyworm, rising production costs, and market price fluctuations—further complicate the cultivation process. Addressing these issues through better pest control strategies, more affordable inputs, and stable pricing mechanisms will be essential in ensuring sustainable and profitable maize production in the region.

Efforts to increase the adoption of recommended technologies should focus on educating farmers about the long term benefits of soil health, integrated pest management, and proper nutrient application, which will improve yield quality and profitability. Enhanced extension services, policy support, and the provision of accessible resources will be crucial in bridging the gap between current farming practices and recommended agricultural technologies.

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Received on 24.03.2024 and Accepted on 08.05.2024