Recommended practices adoption and constraints among farmers in Guntur district, Andhra Pradesh

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 Received: 01.11.2024/Accepted: 13.01.2025

ABSTRACT

The study explores the adoption of the recommended package of practices for jowar {*Sorghum bicolor* (L) Moench} cultivation among farmers in Guntur district, Andhra Pradesh. Through a multistage sampling approach, 100 farmers across five Mandals, known for significant jowar cultivation, were selected. Data were collected through interviews followed by statistical analysis to assess recommended package of practices adoption rates, reasons for non-adoption and key challenges in jowar production. Results indicated high compliance with practices for soil type, variety selection, sowing methods and post-harvest practices, but lower adoption for seed treatment, fertilizer management and pest control. Key barriers included labour shortage, high input costs and misconceptions about fertilizer use; while pest infestation and rising irrigation expenses were noted as major constraints. Findings suggested the need for tailored interventions, including subsidies, trainings and simplified recommendations to support sustainable jowar cultivation. This study provides actionable insights for enhancing policy and extension services to improve productivity and resilience in jowar farming systems.

Keywords: Jowar; recommended package of practices; adoption; non-adoption; constraints

INTRODUCTION

Jowar {*Sorghum bicolor* (L) Moench}, commonly known as sorghum, is a crucial staple food in India's semi-arid regions. Ranking as the country's fifth most important cereal crop after wheat, rice, maize and barley, sorghum is integral to food security, livestock fodder and industrial uses. Its resilience to drought and adaptability to various soil types, makes it a preferred crop for small and marginal farmers across India. In 2020-21, India produced 4.81 million tonnes of sorghum across 4.38 million hectares with a yield of 1,099 kg per ha. In 2020-21, Andhra Pradesh produced 0.41 million tonnes jowar from an area of 0.12 million hectares, with an average yield of 3,428 kg per ha, contributing 8.55 per cent to the national total (Anon 2023). In Andhra Pradesh, sorghum production is highest in Guntur district with 2.4 lakh tonnes in 0.4 lakh hectares followed by Kurnool and Kadapa. The productivity of sorghum is highest in the Guntur district (grown as an ID crop) with 5,962 kg per ha followed by Kurnool and Nellore. Kurnool and Kadapa follow in production, while Kurnool and Nellore also demonstrate strong productivity. The shift toward hybrids and improved irrigation methods has bolstered Andhra Pradesh's output, even as acreage has declined over the last decade (Anon 2021).

Jowar cultivation has been on the decline, with farmers increasingly shifting towards more profitable crops. The reduced human consumption of sorghum, influenced by the availability of finer cereals through the public distribution system, has further contributed to this trend. Cultivated primarily under rain-fed conditions, sorghum yields are subject to significant fluctuation based on monsoon performance. Despite its resilience and importance in semi-arid regions, sorghum production faces multiple challenges that limit its yield potential. To address these challenges and optimize productivity, Acharya NG Ranga Agricultural University has developed package of practices for jowar cultivation whcih encompasses essential guidelines covering variety selection, sowing techniques, nutrient and water management, pest and

disease control and post-harvest practices, each designed to improve both the yield and quality of sorghum. However, adoption of these practices remains inconsistent. Farmers often face socio-economic, infrastructural and knowledge-related barriers that hinder full implementation of the recommended package of practices. Understanding the rate of adoption, perceived benefits, reasons for non-adoption and specific challenges encountered by farmers is essential for designing effective agricultural interventions.

The present study examines the adoption levels of the recommended package of practices among sorghum farmers and reasons for non-adoption of package, identifies the constraints impacting uptake and offers insights for policy and programmatic improvements to enhance sustainable jowar production. Key areas for potential intervention are discussed, with an emphasis on aligning support mechanisms with farmers' needs and local conditions.

METHODOLOGY

The study was carried out by the Regional Agricultural Research Station, Lam, Guntur, Andhra Pradesh during 2023-2024, using a structured multistage sampling approach to select participants. Focusing on five Mandals namely Chebrole, Ponnuru, Kollipera, Duggirala and Tenali, known for their substantial jowar cultivation areas, two villages from each Mandal were selected with the highest cultivation area. Ten farmers from each village were randomly selected, making a sample size of 100. Data collection involved personal interviews, which were systematically organized and rigorously analysed to reach actionable conclusions.

A range of statistical tools, including frequency distributions and percentages, was applied for analysing the data. The extent of adoption of ANGRAU's jowar recommended package of practices was assessed, covering essential practices such as soil suitability, recommended varieties, sowing methods and timing, seed rate, spacing, seed treatment, weed and water management, fertilizer application, pest and disease control and harvesting and post-harvest techniques. In cases, where farmers deviated from the recommended practices, they were asked to explain their reasons for non-adoption and these reasons were categorized and evaluated based on frequency and percentage.

Additionally, an open-ended questionnaire was posed to uncover key challenges in jowar cultivation. Farmers' responses were grouped into categories and the frequency and percentage of each constraint were calculated to highlight prevalent issues. The results offered an in-depth understanding of both the adoption of recommended practices and the significant challenges faced by jowar farmers, shedding light on potential areas for targeted interventions and policy development to enhance jowar cultivation in the region.

RESULTS and DISCUSSION

Extent of adoption of recommended package of practices of jowar by the farmers

The results on the adoption of ANGRAU's recommended package of practices by jowar farmers in Guntur district are presented in Table 1. All the respondents adhered fully to recommendations on soil type, variety selection, sowing method and harvesting and post-harvest practices, indicating high awareness among them. A large majority of farmers also followed guidelines for optimal sowing time (89.00%), disease management (86.00%), weed management (76.00%), water management (73.00%) and plant spacing (62.00%). However, several critical practices showed lower adoption rates. Seed treatment practices were entirely not adopted (100.00%), while a substantial portion of farmers struggled with fertilizer management (81.00%), recommended seed rate (78.00%) and pest management measures (68.00%).

The findings highlighted both strong areas of compliance and notable gaps inadoption of ANGRAU's recommended package of practices among jowar farmers in Guntur district. Full adherence to recommended practices for soil type, variety selection, sowing method and harvesting/post-harvest processes suggested a high level of awareness and likely accessibility to knowledge and resources in these domains. This comprehensive adoption may reflect the relative simplicity or familiarity of these practices within traditional farming methods as well as the efficacy of extension programmes that address these fundamental aspects of jowar cultivation. High adoption rates in areas such as optimal sowing time, disease management, weed control, water management and plant spacing also suggest that farmers were generally receptive to practices that offered clear benefits to crop health and yield, provided they were manageable within their current resource base. However, the lack of adoption in critical areas like seed treatment, fertilizer management, recommended seed rate and pest control measures presented areas of concern. Moreover, low

Table 1. Adoption of recommended jowar production technology by the farmers in Guntur district, Andhra Pradesh

Recommended practice	Respondents (n = 100)			
	Adopted		Not adopted	
	Frequency	%	Frequency	%
Soil type	100	100.00	0	0.00
Varieties	100	100.00	0	0.00
Sowing method	100	100.00	0	0.00
Sowing time	89	89.00	11	11.00
Seed rate	22	22.00	78	78.00
Spacing	62	62.00	38	38.00
Seed treatment	0	0.00	100	100.00
Weed management	76	76.00	24	24.00
Water management	73	73.00	27	27.00
Fertilizer management	19	19.00	81	81.00
Pest management	32	32.00	68	68.00
Disease management	86	86.00	14	14.00
Harvesting and post-harvest practices	100	100.00	0	0.00

Multiple responses

adoption rates for recommended seed rate and pest control measures suggested that, despite their importance, these practices might be seen as either too costly, labour-intensive or complex for small farmers to implement effectively. This underscores the need for more tailored support, including subsidies, trainings or simplified recommendations that fit local conditions and farmer capabilities, for improved productivity and sustainability in jowar cultivation in the region.

In a study conducted in Haryana on adoption level of modern sorghum production technology, Kumar et al (2019) reported that majority of respondents had partial level of adoption in recommended seed rate, time of planting, manure and fertilizers, intercultural operations, irrigation and disease and their control. The highest level of adoption (78.30%) was found for time of planting and lowest level of adoption was found for planting distance (47%). Authors suggested that for full adoption of sorghum production technologies viz adoption of multi-cut varieties, recommended doses of manures and fertilizers, number of irrigations, integrated pest and disease management practices etc, regularly organizing the trainings regarding fodder production were very useful. To enhance the adoption rate, there were some strategies to be followed like need to highlight the sorghum production to bridge the gap in demand and availability of fodder in the area. Regular farmer trainings and farmer-scientist interaction meets should be organized related to fodder production and livestock management. Agriculture development officers must be given trainings regarding fodder production technology and seed production technology of sorghum crop.

Reasons for non-adoption of ANGRAU recommended jowar production technology

The data in Table 2 show that labour shortage emerged as a significant barrier (71.00%) to adopt the recommended seed rate. This higher seed rate also led to major deviation in maintaining the optimal spacing between plants, with 64.00 per cent of the farmers being unable to achieve the recommended distance. Additionally, none of the farmers practiced seed treatment, largely due to a common assumption that they were using only pre-treated seeds. In terms of fertilizer management, notable deviation was observed. Many farmers held the misconception that higher fertilizer use would result in higher yields (78.00%). The rising cost of potash fertilizer further led 64.00 per cent farmers to substitute with more affordable complex fertilizers. Tenant farmers, who represented 59.00 per cent of the sample, also showed a tendency to rely on chemical fertilizers rather than following the recommended integrated nutrient management practices. The high cost and limited availability of farmyard manure (FYM), due in part to a declining livestock population, further compelled 52.00 per cent of farmers to resort to chemical fertilizers over the

Table 2. Reasons for non-adoption of ANGRAU recommended jowar production technology by the farmers

Recommended technology	Reason for non-adoption	Respondents (n = 100)	
		Frequency	%
Seed rate	Labour problem	71	71.00
Spacing	High seed rate	64	64.00
Seed treatment	With an assumption using only treated seed	100	100.00
Fertilizers management	More fertilizers more yields	78	78.00
	Increased K fertilizer price	64	64.00
	Majority of the respondents being tenants	59	59.00
	Not using FYM being it costly and unavailable	52	52.00
Pest management	Not using granules	72	72.00
	Spraying combination of chemicals	66	66.00
	More number of sprays	53	53.00

Multiple responses

recommended balanced nutrient approach. For pest management, several significant deviations were recorded. A majority of the farmers (72.00%) refrained from using granules, often due to a lack of confidence in this practice. Additionally, 66.00 per cent of the farmers reported that using chemical mixtures was not specified in the recommendations and they followed the advice of local input dealers. Furthermore, 53.00 per cent of the farmers increased the number of pesticide sprays, highlighting a growing concern over pest control practices.

These findings underscore specific areas where targeted interventions and educational support could help farmers address misconceptions and adopt more sustainable practices in jowar cultivation.

Farmers highlighted several key challenges in jowar cultivation (Table 3). The most significant issues were prevalence of stem borer infestation (74.00%), non-availability of broad-spectrum post-emergence herbicides (69.00%) and the incidence of fall armyworm (65.00%). Additionally, increased irrigation costs (60.00%), rising cultivation expenses (59.00%) and price fluctuation in the market (56.00%) emerged as major constraints. Less than half of the respondents reported concerns, such as increased labour cost (46.00%), sucking pest infestation (41.00%) and lower minimum support price (38.00%). Specific operational difficulties like spraying challenges for stem borer control (35.00%), poor pesticide quality (21.00%) and grain mould disease were also cited as factors hindering jowar production. All these challenges impacted the efficiency and profitability of jowar farming.

In a study conducted by Ondiko and Recha (2022) it was indicated that the global sorghum production constraints included drought, water and heat stress, low quality and acidic soils, use of low quality sorghum varieties, weeds, pests and diseases and poor farming practices.

Singh et al (2021) highlighted the main constraints faced by the farmers in adoption of the recommended package of practices of sorghum in Gurugram district, Haryana. Among input constraints, high prices of agro-chemicals was the main constraint faced by the respondents followed by non-availability of inputs at proper time, lack of finance for purchase of inputs, high labour and non-availability of the quality seed was the least serious constraint. Among marketing constraints, lack of transport facilities and disposal of produce were the main constraints followed by lack of guidance for proper time and place of marketing and no support price of produce was the least or not so serious constraint related to marketing.

These challenges underscore the complexity of jowar farming and point towards areas for targeted interventions. The need for accessible and high-quality pest control options and efficient herbicides is apparent, as are economic support to mitigate rising costs and price volatility. Enhanced extension services focusing on efficient irrigation practices, pest and disease management and support for quality inputs could alleviate some of these burdens. Policies to stabilize market prices or increase in minimum support price could offer farmers a more secure financial environment to sustain and enhance jowar production.

Table 3. Constraints encountered by the farmers in jowar production

Constraint	Respondents (n = 100)	
	Frequency	%
Stem borer infestation	74	74.00
Non-availability of broad spectrum herbicides as post-emergence	69	69.00
Fall army worm infestation	65	65.00
Increased irrigation charges	60	60.00
Increased cost of cultivation	59	59.00
Price fluctuation	56	56.00
Increased labour cost	46	46.00
Sucking pests (aphids) attack	41	41.00
Lower minimum support price	38	38.00
Spraying problem for stem borer	35	35.00
Poor quality of pesticides	21	21.00
Grain mould disease occurrence	20	20.00

Multiple responses

CONCLUSION

The study revealed a mixed level of adoption of the recommended package of practices for jowar cultivation among farmers in Guntur district, Andhra Pradesh. While farmers showed high adherence to practices related to soil type, variety selection, sowing method and post-harvest techniques, there was a notable gap in the adoption of critical practices such as seed treatment, fertilizer management, recommended seed rate and pest control. The high adoption of basic practices suggested that extension programmes had successfully imparted fundamental knowledge, especially for practices that aligned with traditional farming methods or were perceived as less resource-intensive. However, the study also identified several barriers to full recommended package of practices adoption. Key issues such as labour shortage, high cost of fertilizers, limited access to farmyard manure and misconception around fertilizer application limited farmers' ability to follow recommended practices comprehensively. Tenant farmers, in particular, showed a reliance on chemical fertilizers due to constraints in accessing integrated nutrient management practices, emphasizing the need for targeted support and education. Additionally, pest control measures were frequently modified by the farmers based on local input dealers' advice, reflecting a gap in awareness and trust in scientifically recommended methods.

Several challenges were also highlighted as impediments to efficient jowar production, including the prevalence of pests like stem borer and fall armyworm, high irrigation cost and fluctuating market prices. These factors significantly impacted the sustainability and profitability of jowar cultivation, underscoring the importance of enhanced pest control measures, access to quality inputs and stable economic supports.

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