**Maize production in Telangana, India: what’s holding back productivity?**

**Abstract**

Agriculture is an important sector of the Indian economy, which helps in ensuring food security, lowering poverty, and sustaining economic growth. The agriculture sector plays an important role in the economy of Telangana state economy, with around 60% of the population relying on agriculture and allied activities as their primary source of income and livelihood. This study aims to identify the production constraints faced by farmers in maize cultivation in Kamareddy and Warangal districts of Telangana state during 2024. A sample of 120 farmers was selected by using a multistage random sampling method. The Garret ranking results revealed that the fall army worm infestation was the prominent constraint in with a mean score of 70.97, followed by high cost of seed, and crop damage by wild boars in overall and both districts. Loss of produce due to mechanical harvesting, and watch and ward to protect the crop from birds were ranked fourth and fifth in the Warangal district and overall, whereas in the Kamareddy district, watch and ward to protect the crop from birds was ranked fourth. High cost of agrochemicals, lack of technical knowledge on pesticide spraying, and non-availability of farm yard manure have been found to be the limitations in maize cultivation in the study area. Educational status of the farmer is one of the very important socio-economic criteria because it decides relative exposure of the farmer to crop management practices and helps the farmer in power of decision-making. The overall majority of the respondents (37.50%) were small land holders. It was observed that most of the sample respondents were semi- medium (31.67%), followed by small (26.67%), medium farmers (25.00%) in Kamareddy district. Majority of the farmers were small holder (41.67%), followed by semi-medium (38.33%), marginal (11.67%), respectively. The study recommends strengthening extension services to promote Integrated Pest Management adoption for fall armyworm control and emphasizes the need for research and development to improve harvesting equipment compatibility with maize to reduce post-harvest losses.

**Key words:** Constraints, garret ranking, maize, post-harvest losses

**Introduction**

Maize (*Zea mays*) is one of the world’s most vital food crops, grown over an area of 208. 23 Mha, covering more than 160 nations with a total production of 1241 Mt globally (FAO, 2023). It is the most versatile crop, grown in tropical, subtropical, and temperate regions, and it is also cultivated in all three seasons- Kharif (rainy), Rabi (winter), and Zaid (Summer) (Kumar *et al.,* 2025; Kumar *et al.,* 2013). It is a vertile crop cultivated for multiple purposes, including grain, feed, fodder, green cobs, starch, and various industrial products industrial products. It is also known as the “*queen of cereals*” because of its highest genetic yield potential among the cereals (Parkash and Peshin, 2020). The crop's significance extends beyond human consumption; it plays a critical role in global agriculture, contributing to the livelihoods of millions of farmers and supporting economies worldwide (Asfaw *et al.,* 2024). The global maize cultivation faces several challenges, including climate change, pests, and disease, impacting the yield and quality (Grote *et al.,* 2021). The modern agriculture in the rural agricultural sector witnessed heavy shortage of agricultural labour coupled with hike in labour wages. The inputs energy was been a key input of agriculture and is positively correlated with crop production and is required in almost every operations as seed, sowing, fertilizer, pumping of water, weed control, pesticides, fuel – diesel, tractor, human labour, harvesting and their processiong etc (Manjulatha et al., 2021; Sachan et al., 2023).

Agriculture is an important sector of the Indian economy, which helps in ensuring food security, lowering poverty, and sustaining economic growth. It provides income to more than 50 % of rural households. Maize is the third most important cereal crop in India, accounting for around 10 % of the total food grain production in the country. Maize is grown throughout the year in India; it is predominantly a Kharif crop, with 85 % of the area under cultivation in the season. It is cultivated in an area of approximately 11.24 M ha, with the production of 37.67 Mt and a productivity of 3351 Kg/ha. Karnataka state ranks the 1st in terms of area and production, followed by Madhya Pradesh, Maharashtra, and Rajasthan. Among maize-producing states, Telangana ranks 7th in terms of area, it is cultivated in an area of 0.52 Mha, with the production of 2.86 Mt and a productivity of 5557 kg/ha (Anonymous, 2023).

The agriculture sector plays an important role in the economy of Telangana state economy, with around 60% of the population relying on agriculture and allied activities as their primary source of income and livelihood (Bandumula *et al.,* 2022). The maize is one of the major crops grown in Telangana state. It is cultivated in an area of 0.21 Mha during the *Kharif* season and in an area of 0.27 Mha in the *Rabi* season. Therefore, the maize is mostly cultivated in the *rabi* season in the state (Anonymous, 2022). It is largely utilised for three purposes, *i.e.,* as a human staple meal, livestock feed, and industrial raw material in the state (Devi and Suhasini, 2016). The area under maize cultivation expanded from 0.41 Mha in 2022 to 0.52 Mha in 2023 (Anonymous, 2023). However, as the area and production increase, the maize production faces challenges like an increase in the attack of pests and disease, and an increase in the production cost, which reduces the quality and yield (Maheshnath *et al.,* 2024). In this context, the study was conducted to identify production constraints faced by farmers in maize cultivation in the Kamareddy and Warangal districts of Telangana state.

**Materials and Methods**

**Study area**

The study was conducted in the Kamareddy and Warangal districts of Telangana state during the 2024-25 for *Rabi* season. These districts were selected purposively based on the highest area under maize cultivation. The Multistage random sampling method was employed for the selection of the maize farmers. Initially, two mandals, namely: Gandhari, Tadwai, from Kamareddy district, Sangem, Gesugonda mandals from Warangal district. and two villages from each mandal were selected, and 15 farmers were selected randomly from each village, thus, the total sample size of 120 maize farmers. The primary data was collected on socio- socio-economic profile of the sample households, production constraints faced by farmers in maize cultivation through a personal interview method by using a pre-tested schedule.

**Tools and techniques**

**The Garret ranking technique**

The Garrett ranking technique was used to rank the constraints faced by the farmers in the study area. Respondents were asked to rank the listed constraints, and the rank meant most important and the last rank meant least important. Then, the rank assigned to each constraint by each farmer was converted into a per cent position using the following formula.

Percent position =

Where Rij stands for the rank given for the ith constraint (i=1,2,3……..n) by the jth individual (j=1, 2,…..50) and Nj stands for the number of constraints ranked by the jth individual.

**Results and discussion**

**Socio- economic profile of the sample households**

Overall, the majority of maize growers were in the age group of 30-40 (Table 1). Karishma M.D and Ram Chandra, (2021) reported that the majority of the farmers were in the age group of 30-40 age. Majority of the farmers in Kamareddy district had the age group of 40-50, few farmers were in the age group of <30. Whereas in Warangal district farmers had the age of 50-60, few were in the age group of <30.

**Table 1. Age of the sample respondents**

|  |  |  |  |
| --- | --- | --- | --- |
| **Age group (Years)** | **Kamareddy** | **Warangal** | **Overall** |
| <30 | 07 (11.67) | 6 (10.00) | 20 (16.67) |
| 30-40 | 15 (25.00) | 09 (15.00) | 36 (30.00) |
| 40-50 | 19 (31.67) | 19 (31.67) | 23 (19.17) |
| 50-60 | 13 (21.67) | 22 (36.67) | 17 (14.17) |
| >60 | 06 (08.33) | 04 (6.67) | 24 (20.00) |
| Total | 60 (100) | 60 (100) | 120 (100) |

**Table 2. Literacy level of the sample farmers**

|  |  |  |  |
| --- | --- | --- | --- |
| **Education** | **Kamareddy** | **Warangal** | **Overall** |
| Illiterate | 8 (13.33) | 02 (3.33) | 20 (16.66) |
| Primary | 20 (33.33) | 42 (70.00) | 43 (35.83) |
| Secondary | 20 (33.33) | 13 (21.67) | 52 (43.33) |
| Intermediate | 06 (10.00) | 02 (3.33) | 05 (04.16) |
| Degree & above | 06 (10.00) | 01 (1.67) | 00 (00.00) |
| Total | 60 (100) | 60 (100) | 120 (100) |

Educational status of the farmer is one of the very important socio-economic criteria because it decides relative exposure of the farmer to crop management practices and helps the farmer in power of decision-making. Overall, the majority of the farmers had the secondary level (43.33%) and primary level (35.83%) of education (Table 2). The majority of the farmers (66.66%) had primary and secondary levels of education, 20% of the farmers had intermediate, degree and above in Kamareddy district. Whereas in Warangal district, 70.00% of the farmers had primary level of education, followed by secondary level of education, illiterate, and intermediate.

**Table 3. Family size of sample respondents**

|  |  |  |  |
| --- | --- | --- | --- |
| **Family size** | **Kamareddy** | **Warangal** | **Overall** |
| Small (1-4) | 26 (43.33) | 39 (65.00) | 84 (70.00) |
| Medium (5-7) | 20 (33.33) | 18 (30.00) | 30 (25.00) |
| Large (>7) | 14 (23.33) | 3 (5.00) | 06 (05.00) |
| Total | 60 (100) | 60 (100) | 120 (100) |

The family size of a household is crucial to analysis as it provides information about the availability of family labour for various operations. The sample farmers were grouped based on the family size as small (1-4 members), medium (5-7 members) and large-sized families (>7 family members). The majority of the respondents lived the small families in both districts as well as in overall (Table 3).

**Table 4. Categorization of farmers based on land holding size**

|  |  |  |  |
| --- | --- | --- | --- |
| **Category** | **Kamareddy** | **Warangal** | **Overall** |
| Marginal (<1 ha) | 8 (13.33) | 7 (11.67) | 18 (15.00) |
| Small (1-2 ha) | 16 (26.27) | 25 (41.67) | 45 (37.50) |
| Semi medium (2-4 ha) | 19 (31.67) | 23 (38.33) | 37 (30.83) |
| Medium (4-10 ha) | 15 (25.00) | 05 (8.33) | 20 (16.66) |
| Large (>10 ha) | 02 (3.33) | 0 (0.00) | 00 (00.00) |
| **Total** | **60 (100)** | **60 (100)** | **120 (100)** |

Categorisation of farmer respondents into marginal, small, semi-medium, medium and large farmers based on the land holding is evinced in Table 4. Overall, the majority of the respondents (37.50%) were small landholders. Gadigeppa Muramatti (2023) observed that most the respondents were smallholders in maize cultivation in Odisha. It was observed that most of the sample respondents were semi- medium (31.67%), followed by small (26.67%), medium farmers (25.00%) in Kamareddy district. The majority of the farmers were smallholders (41.67%), followed by semi-medium (38.33%), marginal (11.67%), respectively. There were no farmers belonging to large category in Warangal district.

**Production constraints faced by maize farmers**

The production constraints faced by maize growers were ranked, and the Garrett scores are mentioned in Table 1. Among the production constraints, the major constraint faced by maize growers was a severe incidence of the pest, fall armyworm, in both districts and overall. Inbathamizhan *et al.* (2023) reported that the fall armyworm infestation was a major constraint in maize cultivation in Uttar Pradesh**.**

**Table 5. Production constraints faced by sample farmers in maize cultivation**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Constraints** | **Kamareddy** | |  | **Warangal** | |  | **Overall** | |
| **Mean score** | **Rank** |  | **Mean score** | **Rank** |  | **Mean score** | **Rank** |
| Severe incidence of the pest/ fall army worm | 70.97 | 1 |  | 70.62 | 1 |  | 70.97 | 1 |
| High cost of seed | 62.85 | 2 |  | 61.15 | 2 |  | 62.85 | 2 |
| Crop damage by wild boars | 60.65 | 3 |  | 60.52 | 3 |  | 60.65 | 3 |
| Loss of produce due to mechanical harvesting | 51.68 | 5 |  | 56.82 | 4 |  | 51.98 | 4 |
| Watch and ward to protect the crop from birds | 51.98 | 4 |  | 49.97 | 5 |  | 51.88 | 5 |
| High cost of agrochemicals | 44.28 | 6 |  | 42.80 | 6 |  | 44.28 | 6 |
| Lack of technical knowledge on pesticide spraying | 39.47 | 7 |  | 41.63 | 7 |  | 39.47 | 7 |
| Non- availability of farm yard manure | 37.08 | 8 |  | 38.87 | 8 |  | 37.08 | 8 |

Overall, the higher cost of the seed was ranked second, with a mean score of 62.85, and in both districts, which was mainly due to the hybrid seed sold by private firms. Similar results have been reported by (Kumar *et al.,* 2024; Maheshnath *et al.,* 2024 and Kumar *et al.,* 2012). Crop damage by wild boars was ranked third with a mean score of 60.65 in overall and in both districts, during the seed formation stage and the maturity stage, crop was damaged by wild boars.

It can be observed from Table 1 that the non-availability of farmyard manure was ranked fourth overall and in the Warangal district. Whereas in the Kamareddy district, it was ranked fifth, in contrast, watch and ward to protect the crop from birds was another important constraint, particularly during the milky and dough stages of cob development, which was ranked fourth in Kamareddy district and fifth overall, and a similar pattern of ranking was observed in Warangal district. Mandeep (2024) stated that crop damage by birds was an important constraint faced by farmers in maize cultivation in Haryana. High cost of agrochemicals, lack of technical knowledge on pesticide spraying, and loss of produce due to the harvesting machine were ranked sixth, seventh, and eighth, respectively.

**Conclusion**

From the study, it can be concluded that Severe incidence of the pest in general, and particularly the fall army worm, high cost of seed and crop damage by wild boars were major constraints in overall and in both districts. Overall, the loss of produce due to mechanical harvesting constraints was ranked fourth, while it was ranked fifth in the Kamareddy district and fourth in the Warangal district. The study suggested that strengthening extension services is needed to generate awareness on Integrated Pest Management (IPM) for the control of the fall armyworm pest. Farmers should be incentivised for wired fencing in the community to protect the crop from wild animals under various development programs/schemes. Research and development are required to improve the compatibility of harvesting equipment with maize crops, which would enhance harvesting efficiency and reduce both quantitative and qualitative post-harvest losses.

Disclaimer (Artificial intelligence)

Option 1:

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

Option 2:

Author(s) hereby declare that generative AI technologies such as Large Language Models, etc. have been used during the writing or editing of manuscripts. This explanation will include the name, version, model, and source of the generative AI technology and as well as all input prompts provided to the generative AI technology

Details of the AI usage are given below:

1.

2.

3.

**Reference**

Anonymous, 2022. GOT (Government of Telangana). Telangana State Statistical Abstract (ATLAS). 2022. Telangana State Development Planning Society, Directorate of Economics and Statistics. Hyderabad. <https://tgdps.telangana.gov.in/Atlas.pdf>Accessed August 2022.

Anonymous, 2023. GOI (Government of India). Agricultural statistics at a glance. 2023. In: Government of India, Ministry of Agriculture, Cooperation and Farmers Welfare, Directorate of Economics and Statistics. New Delhi. <https://agricoop.nic.in/en/annual-report> . Accessed 15 April, 2024).

Asfaw, D.M., Asnakew, Y.W., Sendkie, F.B., Abdulkadr, A.A., Mekonnen, B.A., Tiruneh, H.D. and Ebad, A.M., 2024. Analysis of constraints and opportunities in maize production and marketing in Ethiopia. Heliyon, 10(20).

Bandumula, N., Rathod, S., Ondrasek, G., Pillai, M.P. and Sundaram, R.M., 2022. An economic evaluation of improved rice production technology in Telangana state, India. Agriculture 12(9), 1387

Devi, I.S. and Suhasini, K. (2016). Economics and constraint analysis of non-traditional maize farmers in Mahbubnagar district under tank irrigation of Andhra Pradesh. *International Research Journal of Agricultural Economics and Statistics.* 7(1): 86-90

FAO. (2023). Production-Crops. Data. Food and Agriculture Organization of the United Nations. Retrieved from: <http://www.fao.org/faostat/en/#data/QC>

Gadigeppa Muramatti (2023). An economic analysis of production and marketing of maize in Karnataka state. Odisha University of Agriculture and Technology. Bhubaneswar, Odisha.

Grote, U., Fasse, A., Nguyen, T.T. and Erenstein, O., 2021. Food security and the dynamics of wheat and maize value chains in Africa and Asia. Frontiers in Sustainable Food Systems, 4, 617009.

Inbathamaizhan M and Sanjkumar, 2023. An Economic Analysis of Production of Rainfed and Irrigated Maize in Ariyalur District of Tamil Nadu in India. International Journal of Environment and Climate Change. 13(8):1572-1578.

Kumar, M., Pannu, R.S. and Malik, D.P., 2025. An Economic Appraisal and Resource Use Efficiency of Spring Maize Cultivation in Haryana. *Indian Journal of Agricultural Research*, 59(5).

Kumar, R., K. Srinivas and N. Sivaramane (2013), Assessment of the maize situation, outlook and investment opportunities in India. Country Report – Regional Assessment Asia (MAIZE-CRP), National Academy of Agricultural Research Management, Hyderabad, India.

Kumar, R.S., Kumar, B, Kaul, J., Karjagi, C.G., Jat, S.L., Parihar, C.M. and Kumar, A., 2012. Maize research in India-historical perspective and future challenges. Maize J, 1(1): 1-6.

Maheshnath, M., Kumari, R.V., Suhasini, K., Reddy, D.S. and Meena, A., 2024. Constraint Analysis of Maize Production in Telangana State Using Garrett’s Ranking Technique. *International Journal of Plant & Soil Science*, 36(8): 455-459.

Karishma M.D. and Ram Chandra, 2021. An economic analysis on production of Maize in Rangareddy district, Telangana. International Journal of Current Research, 13 (10), 19247-19253.

Mandeep K, M., Pannu, R.S., Malik, D.P. and Mahapatra, A., 2024. Production and marketing constraints faced by spring maize growers in Haryana. *Economic Affairs*, 69(3): 1215-1220**.**

Parkash, S. and Peshin, R. 2020. Growers’ Knowledge of Improved Maize Production Technologies in Jammu Region of J&K. *Indian Journal of Extension Education*, 56(3): 41-47

Manjulatha, G., Sowjanya, B., & Rajanikanth, E. (2021). Comparative economics of maize cultivation under conventional and mechanization. International Journal of Environment and Climate Change, 11(12), 113-118.

Sachan , Dhruvendra Singh, K. Jaisimha Reddy, Sulochna, Yonika Saini, Avinash Kumar Rai, Omkar Singh, and Thejavath Laxman. 2023. “Assessing Grain Yield and Achieving Enhanced Quality in Maize by Next Generation Fertilizer: A Review”. International Journal of Environment and Climate Change 13 (8):626-37. https://doi.org/10.9734/ijecc/2023/v13i81991.