Plant Archives Vol. 26, Supplement 1, 2026 pp. 349-352 e-ISSN:2581-6063 (online), ISSN:0972-5210

Plant Archives

Journal homepage: http://www.plantarchives.org
DOI Url : https://doi.org/10.51470/PLANTARCHIVES.2026.v26.supplement-1.045

ASSESSMENT OF PRODUCTIVITY AND PROFITABILITY OF IMPROVED MAIZE VARIETIES IN WEST GARO HILLS, MEGHALAYA INDIA

Priyanka Saha[1*], Monica S. Singh[1], Tarun K. Das[1] and B.P. Singh[2]
[1]ICAR Krishi Vigyan Kendra, West Garo Hills, Tura, Meghalaya-794005, India
[2]ICAR Research Complex for North Eastern Hill Regions, Umiam, Meghalaya-793103, India
*Corresponding author E-mail: priyankasaha9933@gmail.com
(Date of Receiving : 23-08-2025; Date of Acceptance : 30-10-2025)

ABSTRACT

Maize is one of the most important cereal crops in Meghalaya, cultivated both as food and fodder. However, productivity under farmers' practice remains low due to reliance on local seeds and traditional practices. The present study was undertaken to evaluate the performance of two improved maize varieties, *Megha Maize-1* and *Megha Maize-2*, against farmers' practice under field conditions. The results indicated that *Megha Maize-1* recorded the highest grain yield (3.15 t/ha), gross return (Rs. 99,086/ha), and net return (Rs. 59,286/ha) with a benefit-cost (B:C) ratio of 2.48. This was followed by *Megha Maize-2* (2.70 t/ha yield; B:C ratio 2.25), while farmers' practice recorded the lowest yield (2.03 t/ha) and net return (Rs. 28,900/ha) with a B:C ratio of 1.74. Superior yield attributes such as seed weight per cob (78 g), number of seeds per cob (303), and harvest index (31%) were recorded in *Megha Maize-1*. The study concludes that adoption of improved maize varieties, particularly *Megha Maize-1*, can substantially enhance maize productivity and profitability in the region.
Keywords **:** Megha maize-1, Megha maize-2, Productivity, Profitability, Growth.

Introduction

In India, maize (*Zea mays* L.) is the third most important cereal crop after wheat and rice. It makes a substantial contribution to industrial raw materials, food, and fodder (Pingali, 2001). Maize is known as the "queen of cereals" throughout the world because of its great genetic yield potential and variety of applications in the production of biofuel, animal feed, and human consumption (Joshi *et al*., 2016). Even with this national notoriety, Meghalaya and other northeastern hill states continue to have maize productivity levels that are significantly lower than the national average. Tribal farmers in Meghalaya mostly grow maize in rainfed upland environments, frequently using traditional crop management techniques and little inputs. Despite being tailored to local conditions, local landraces and farmers' conserved seed are widely used, despite their low yield potential and weak resilience to biotic and abiotic stressors. Additionally, maize productivity is further limited by conventional crop husbandry techniques such inadequate crop management, minimal fertilizer application, and suboptimal plant populations. Over 11.2 million hectares of maize are grown in India, where an astounding 37.7 million metric tonnes of maize were produced in 2023–2024 (Pal and Jat, 2024). Research organizations have released a number of modified maize varieties that are appropriate for the agro-climatic conditions of the northeastern hill region in order to address these issues. These include the region-specific Megha Maize-1 and Megha Maize-2 varieties, which are anticipated to yield more, have better grain quality, and be more resilient to local environmental conditions. Adoption of these enhanced cultivars is still restricted, though, mostly because farmers are unaware of them and have not sufficiently shown how they are more profitable than the conventional method. Therefore, this on farm trial was conducted to check the location specificity of improved variety viz. Megha maize 1 and Megha Maize 2 and to prove that these varieties are superior in terms of productivity, profitability, and yield-attributing characteristics.

Materials and Methods

The following field study was conducted in 2024 at the farmers' field at Haripur, West Garo Hills, Meghalaya, in the plain region of the state. The location of this experimental site is 25° 75' North and 89° 94' East longitude. Most of the rainfall fell between May and October, with only a little amount falling between November and March. During the *rabi* season, the study was carried out on the fields of seven farmers. Farmers' practices (local yellow) (using local seeds and managing crops traditionally), Megha Maize-1, and Megha Maize-2 were the three treatments that were assessed. The farmers used their traditional methods without significant input inputs, while the enhanced varieties were grown using the suggested agronomic techniques. The results were compared with farmers' practices (random seed sprinkling, no fertilizer or manure application, one hand weeding, no plant protection measures, etc.). The recommended agronomic practices for maize included doses of manure (5t/ha), line sowing of maize at 45 cm apart, two hand weeding, and need-based insect-pest and disease management with biopesticides, etc. In accordance with suggested agronomic methods, maize seeds were planted in the fourth week of October with a 45 cm row-to-row and 30 cm plant-to-plant spacing; in contrast, farmers' practice involved randomly distributing three to four seeds with no set spacing. In addition to economic parameters like cultivation cost, gross return, net return, and benefit-cost ratio, data were also recorded on grain yield (t/ha), growth parameters like plant height (cm), crop growth rate, net assimilation rate, and yield attributes like number of seeds per cob, number of rows per cob, seed weight per cob, and harvest index (%). The current market prices for maize grains in the research area were used to perform economic calculations. A randomized block design was used to statistically analyze the data. The F test, as outlined by Gomez and Gomez (1984), was used to determine whether there was a significant difference between the treatments.

Fig. 1 : Demonstration plot of of Megha maize 1 at the farmers field

Results and Discussion

Considerable variance in growth characteristics was found in the performance of many maize varieties (Table 1). Low growth was indicated by the farmers' practice, which had the lowest plant height (130 cm), dry matter output (230 g/m2), crop growth rate (3.44 g/m²/day), and net assimilation rate (2.93). With the tallest plants (195 cm), most dry matter accumulation (684 g/m²), highest CGR (6.89 g/m²/day), and NAR (5.76), Megha Maize-1, on the other hand, performed better than Megha Maize-2, which had 189 cm plant height, 568 g/m² dry matter production, 5.61 g/m²/day CGR, and 4.88 NAR. The farmers' methods were noticeably subpar, yet Megha Maize-1 showed the most vigorous growth, closely followed by Megha Maize-2.

Table 1: Growth parameters of different maize varieties

Technology	Plant height at harvest	Dry matter production (g/m^2)	CGR	NAR
Farmers practice	130	230	3.44	2.93
Megha maize-1	195	684	6.89	5.76
Megha Maize-2	189	568	5.61	4.88
SEm	6.53	18.22	0.20	0.15
CD	19.81	55.27	0.61	0.47

The study found that the three production systems differed significantly in terms of economic returns and productivity. Megha Maize-1 continuously recorded superior values among yield attributes (Figure 2). This variety's average seed weight per cob was 78 g, which was 34% more than Megha Maize-2 (58 g) and over 70% more than farmers' usual practice (46.2 g). Likewise, Megha Maize-1 (303) had a much higher quantity of seeds per cob than Megha Maize-2 (264) and farmers' practices (235). Megha Maize-1 had a slightly higher seed index (23.9 g), which is a measurement of seed weight and size, than Megha Maize-2 (23.5 g) and farmers' practice (22.8 g). There was less fluctuation in the number of rows per cob between treatments, with Megha Maize-1 having 11.8 rows and farmers' practice having 11.2 rows. Grain yield of 2.03 t/ha was recorded by farmers, which is typical of the region's average productivity levels. On the other hand, Megha Maize-1 and Megha Maize-2 yielded 3.15 t/ha and 2.70 t/ha, respectively, which were significantly higher (Figure 3). Megha Maize-1 surpassed farmers' practices by around 55% in terms of yield, while Megha Maize-2 beat farmers' practices by roughly 18%. The enhanced varieties' greater genetic potential and improved yield-attributing characteristics are directly responsible for this productivity increase.The harvest index, however, showed significant variations, with Megha Maize-1 having the greatest value (31%), followed by Megha Maize-2 (29%), and farmers' practices having the lowest harvest index (24%). This suggests that better varieties increase overall efficiency by producing more biomass and allocating a larger percentage of that biomass to grain production.

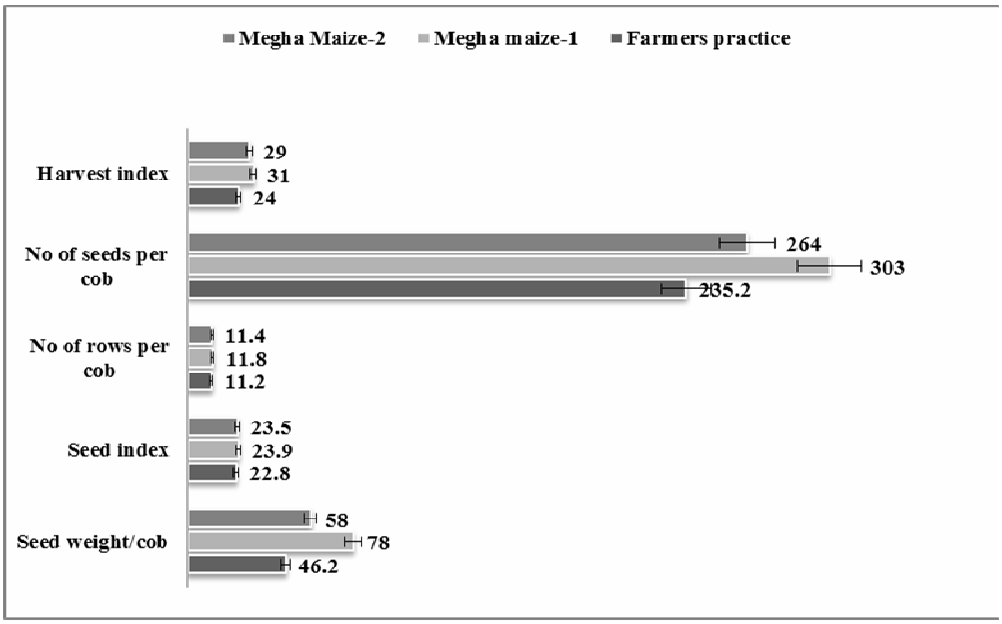

Fig. 2 : Yield attributing characteristics of different maize varieties

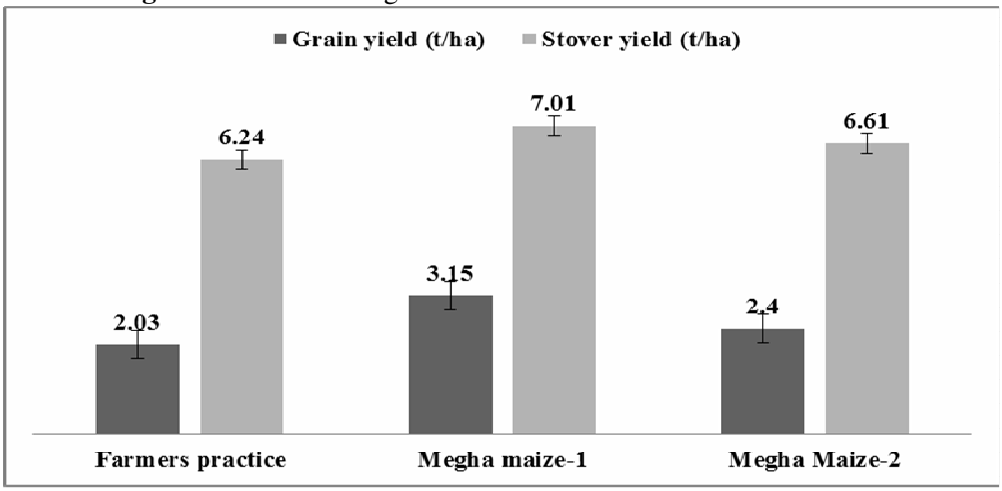

Fig. 3 : Grain and stover yield (t/ha) of different maize varieties

The superiority of enhanced varieties was further supported by economic analysis (Table 2). The cultivation costs for each treatment ranged from Rs. 38,900/ha to Rs. 39,800/ha, which was almost same. However, gross returns varied greatly as a result of increased productivity. Megha Maize-1 and Megha Maize-2 produced gross returns of Rs. 99,086 and Rs. 88,560/ha, respectively, whereas farmers' practices produced a gross return of Rs. 67,800/ha. Thus, Megha Maize-1 had the highest net returns (Rs. 59,286/ha), followed by Megha Maize-2 (Rs. 49,260/ha), and farmers' practice had the lowest (Rs. 28,900/ha). Additionally, Megha Maize-1 had the highest benefit-cost ratio (2.48), followed by Megha Maize-2 (2.25), and farmers' practice (1.74), which is a good measure of profitability. These results unequivocally show that Meghalaya may greatly increase maize yield and profitability by implementing better varieties, especially Megha Maize-1. Superior yield qualities like increased seed weight per cob, increased number of seeds per cob, and enhanced harvest index reflect Megha Maize-1's higher yield performance. This supports past findings that the northeastern hill region can increase farm revenue and close the yield gap by implementing high-yielding cultivars in conjunction with suggested crop management techniques. Ramkrushna *et al.*, (2023) also found the similar results.

Table 2: Economics analysis of different maize varieties

Technology	Cost of cultivation (Rs./ha)	Gross return (Rs./ha)	Net return (Rs./ha)	B:C ratio
Farmers practice	38900	67800	28900	1.74
Megha maize-1	39800	99086	59286	2.48
Megha Maize-2	39300	88560	49260	2.25
SEm±	-	5644	5644	0.08
CD	-	17122	17122	0.24

Conclusion

The study revealed that improved maize varieties significantly outperformed farmers' practice in terms of both productivity and profitability in Meghalaya. Among the tested varieties, *Megha Maize-1* emerged as the most promising, producing 55% higher yield and more than double the net return compared to farmers' practice. The improvement in yield attributes and harvest index further demonstrates its superiority. Therefore, promotion of *Megha Maize-1* through large-scale demonstrations, farmer participatory trials, and assured seed availability can play a vital role in enhancing maize-based livelihood security in the northeastern hill region.

References

Joshi, E., Vyas, A.K., Dass, A. and Dhar, S. (2016). Nutrient omission effect on yield, water productivity and profit-ability of maize (*Zea mays*). *Indian Journal of Agronomy*, **61**(2): 204–209.

Pingali, P.L. (2001). CIMMYT 1999/2000 World maize facts and trends. Meeting world maize needs: Technological opportunities and priorities for the public sector.

Ramkrushna, G. I., Layek, J., Das, A., Verma, B. C., Pande, R., Mohapatra, K. P., & Babu, S. (2023). Sustaining maize (*Zea mays*) productivity through improved agronomic management practices under jhum ecosystems. *The Indian Journal of Agricultural Sciences*, **93**(1), 73-77.

Pal, B., & Jat, S.L. (2024). Enhancing state-wide corn (*Zea mays* L.) productivity by bridging the yield gap between top and average farmers in India.