

## International Journal of Agriculture Extension and Social Development

Volume 9; Issue 7; July 2026; Page No. 765-769

Received: 11-05-2026  
Accepted: 15-06-2026

Indexed Journal  
Peer Reviewed Journal

### Growth performance and economic analysis of niger cultivation in Visakhapatnam District, Andhra Pradesh

<sup>1</sup>Sruthi P and <sup>2</sup>Aparna B

<sup>1</sup>Department of Dairy Economics, Statistics and Management, ICAR-National Dairy Research Institute, Karnal, Haryana, India

<sup>2</sup>Department of Agricultural Economics, Agricultural College, Bapatla, Andhra Pradesh, India

DOI: <https://www.doi.org/10.33545/26180723.2026.v9.i7j.3952>

Corresponding Author: Sruthi P

#### Abstract

Niger is an important Rabi oilseed crop cultivated mainly under rainfed conditions across several Indian states, including Andhra Pradesh, Madhya Pradesh, Odisha, Maharashtra, Bihar, Karnataka and West Bengal. This study analyzes trends in the area, production and productivity of niger and examines its cost of cultivation and returns. The study conducted in Visakhapatnam district, Andhra Pradesh with a sample of 80 farmers. Trends in the area, production and productivity of niger in Andhra Pradesh and Visakhapatnam district were examined for the period 2000–01 to 2020–21. The overall state (Andhra Pradesh) and Visakhapatnam district exhibited significant negative growth in niger area and production, at –6.87% and –6.71% for the state, and –7.54% and –7.47% for the district, respectively. The study revealed that the overall cost of cultivating niger was ₹18,428.20 per hectare, with human labour accounting for the largest share (42.87%). The gross returns from niger cultivation were ₹26,240 per hectare, and the rate of return per rupee spent was 0.38. The resource use efficiency analysis showed that seed, urea and machine labour significantly influenced gross returns.

**Keywords:** Minor oilseeds, compound growth rate, Cobb-douglas production function, resource use efficiency

#### Introduction

India is the world's fourth largest oilseeds producer, after the USA, China, and Brazil, accounting for about 5–6% of global production. During 2023–24, India's total edible oil production was estimated at 12.18 million tonnes. The diverse agro-ecological conditions in the country are favorable for growing nine annual oilseed crops, which include seven edible oilseeds (groundnut, rapeseed & mustard, soybean, sunflower, sesame, safflower and niger) and two non-edible oilseeds (castor and linseed). Rajasthan, Madhya Pradesh, Gujarat, and Maharashtra are the major oilseed producing states in the country.

Niger, a rabi oilseed crop, is mainly cultivated under rainfed conditions across several Indian states, including Andhra Pradesh, Madhya Pradesh, Odisha, Maharashtra, Bihar, Karnataka, and West Bengal. India ranks first globally in its production, with approximately 0.7 lakh tonnes (Directorate of Vanaspati, Vegetable Oils and Fats). Although considered a minor oilseed crop, niger is important due to its high-quality oil content (32–40%) and appreciable seed protein content (18–24%).

Niger is a multipurpose crop with diverse uses across its plant parts. The whole plant is used as green manure, while the flowers serve as an important bee plant in apiculture. The seeds are consumed in fried form and used as a condiment. Oil extracted from the seeds is used for cooking, paint and soap manufacture, as illuminant, and in the perfume industry. It is also traditionally applied in the treatment of burns and

scabies. The press cake obtained after oil extraction is used as a valuable livestock feed.

India is able to meet only about 44 per cent of its domestic edible oil demand through internal production. Despite being among the world's largest producers of oilseeds, the country remains heavily dependent on imports to bridge the widening edible oil deficit. Rapid growth in per capita consumption, outpacing domestic production, has led to a sharp rise in edible oil imports, which reached 15.66 million tonnes in 2023–24, accounting for nearly 56 per cent of total domestic demand. To address this gap and achieve self-sufficiency. There was a drastic reduction in the cultivated area of niger from 0.18 lakh ha in 1999-00 to 0.1 lakh ha in 2023-24 in Andhra Pradesh (DES). This long-term decline, together with limited evidence on the economic performance of the crop at the regional level, underscores the need for a systematic assessment of its growth trends and economic viability. Under these perspectives the study aims (i) to analyse the trends in area, production and productivity of niger in Andhra Pradesh, and (ii) to estimate the costs and returns of niger cultivation.

#### Materials and Methods

In Andhra Pradesh, Visakhapatnam district was purposively selected as the study area due to its considerable area under niger cultivation. For the study, two mandals—Munchingiputu and Araku Valley were selected as they have the highest area under niger cultivation. From each mandal,

two villages with a larger area under the crop were chosen. From each village, 10 farmers were selected making a total sample of 40 farmers. The primary data required for the study on production aspects were collected from farmers through personal interviews using a pre-tested schedule. Secondary data on area, production and productivity of niger at the state and district levels were collected from IndiaStat, the Directorate of Economics and Statistics, the Joint Director of Agriculture Office, Visakhapatnam.

### Estimation of compound growth rate

The data on area, production and productivity of niger from 2000-01 to 2020-21 was used for study. The compound growth rate of niger was estimated using the exponential curve.

$$Y = ab^x$$

Where,

Y= Dependent variable in period (Area, Production and Productivity)

a= Intercept

b= Regression coefficient

x= Year which takes values (1, 2 .....n)

It has been estimated as linear equation after taking the log for both sides. The data used for the period was 2000-01 to 2020-21 i.e. 18 years.

Log y= log a + x (log b)

Growth rate (%) = [Antilog (log b)-1]\*100

The compound growth rates were tested for their significance by F test.

### Conventional Analysis

The cost of cultivation analysis is based on primary data collected during 2024-25 and therefore reflects the cost structure prevailing during the study period. Averages and percentages were calculated through conventional analysis. The same pertaining to costs, returns and various measures of farm income were calculated and presented in the study.

### Cost concepts

The cost concepts i.e. cost A<sub>1</sub>, cost A<sub>2</sub>, cost B and cost C were followed in the analysis. These concepts were given below in detail.

#### Cost A<sub>1</sub>

This cost includes values of hired human labour, owned and hired cattle labour, owned and hired tractor services, seeds, fertilizers, farm yard manures, plant protection chemicals, depreciation, repairs, land revenue and interest on working capital.

**Cost A<sub>2</sub>** = Cost A<sub>1</sub> + rent paid for leased in land

**Cost B<sub>1</sub>** = Cost A<sub>2</sub> + Interest on value of owned fixed capital assets (excluding land)

**Cost B<sub>2</sub>** = Cost B<sub>1</sub> + Rental value of owned land and rent paid for leased-in land

**Cost C<sub>1</sub>** = Cost B<sub>1</sub> + Imputed value of family labour

**Cost C<sub>2</sub>** = Cost B<sub>2</sub> + Imputed value of family labour

**Cost C<sub>3</sub>** = Cost C<sub>2</sub> + 10 per cent of cost C<sub>2</sub> as management cost (On account of managerial functions performed by

farmers).

### Farm efficiency measures

Farm business income = Gross income – Cost A<sub>1</sub> (Cost A<sub>2</sub> in case of tenant operated land)

Family labour income = Gross income – Cost B<sub>2</sub>

Net income = Gross income – Cost C<sub>2</sub>

Farm investment income = (Gross income – Cost C<sub>3</sub>) + (Cost B<sub>2</sub> – Cost A<sub>1</sub>)

Returns per rupee of expenditure = Net income / Cost C<sub>3</sub>.

### Resource use efficiency

Cobb-Douglas production function to the farm level data was fitted to examine the resource use efficiency in niger cultivation.

The specification of the equation was as follows,

$$Y = AX_1^{b_1} \times AX_2^{b_2} \times AX_3^{b_3} \times AX_4^{b_4} \times AX_5^{b_5} \times AX_6^{b_6}$$

The Cobb–Douglas production function was transformed into a linear form by applying a logarithmic transformation, which is expressed as:

$$\ln Y = \ln a + b_1 \ln X_1 + b_2 \ln X_2 + b_3 \ln X_3 + b_4 \ln X_4 + b_5 \ln X_5 + b_6 \ln X_6$$

Where,

ln= natural logarithm a= constant

Y= Gross return per hectare from niger cultivation (₹/ha)

X<sub>1</sub>= Total cost of human labour per hectare used in niger cultivation (₹/ha)

X<sub>2</sub>= Total cost of cattle labour per hectare used in niger cultivation (₹/ha)

X<sub>3</sub>= Total cost of machine labour per hectare used in niger cultivation (₹/ha)

X<sub>4</sub>= Total cost of seed per hectare used in niger cultivation (₹/ha)

X<sub>5</sub>= Total cost of urea per hectare used in niger cultivation (₹/ha)

X<sub>6</sub>= Total cost of FYM per hectare used in niger cultivation (₹/ha)

### Results and Discussion

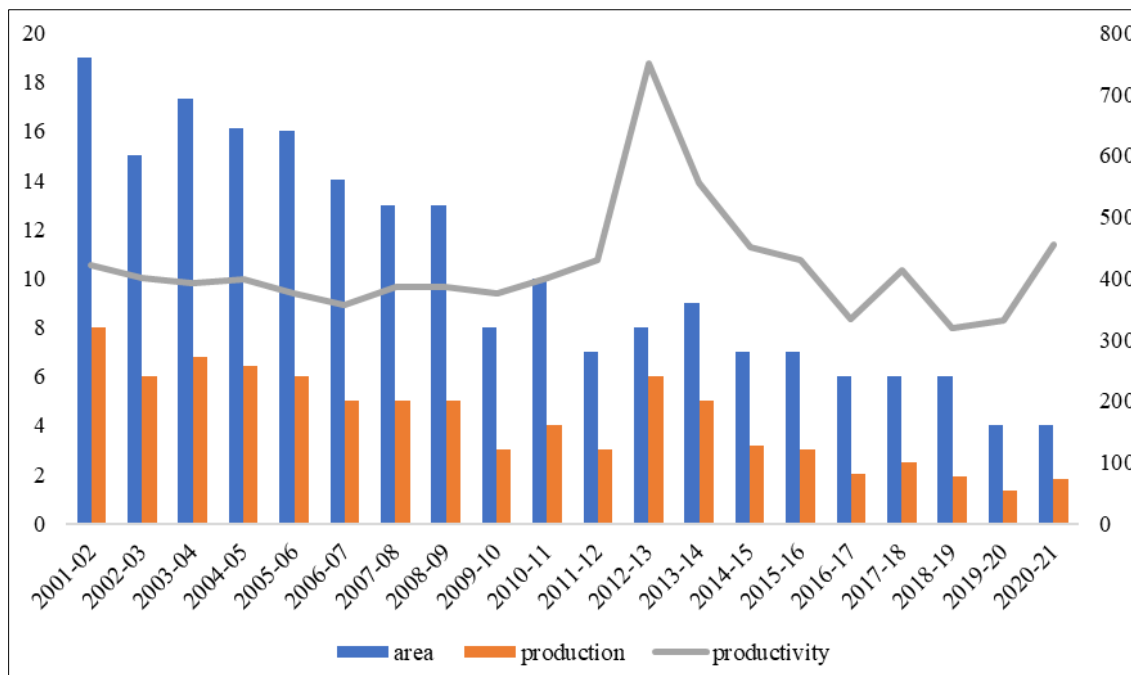
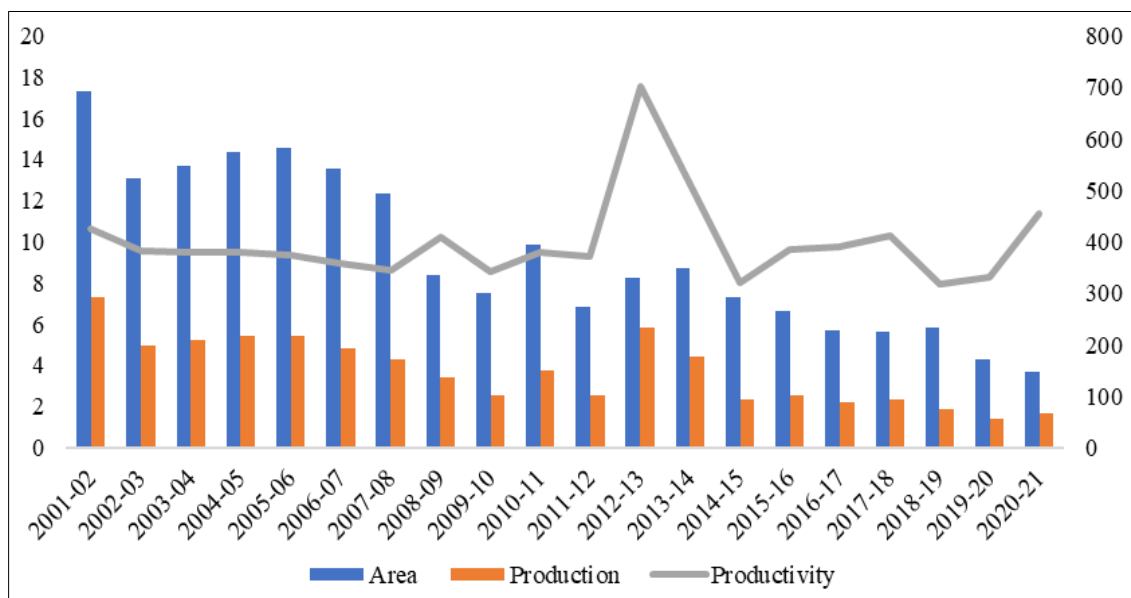
#### Trend in area, production and productivity of niger

The compound growth rate analysis revealed a significant declining trend in area and production of niger both in the study area and at the overall state level during the period 2000–01 to 2020–21. This declining pattern is clearly illustrated in Figures 1 and 2, which depict the trends in area, production and productivity of niger in the study region and state. In the study region, niger area and production declined annually by 6.87 per cent and 6.71 per cent, respectively, both significant at the 1 per cent level. Similarly, at the state level, they recorded significant negative growth rates of 7.54 per cent and 7.47 per cent. In contrast, productivity showed a marginal and statistically non-significant growth in both the study area (0.08 per cent) and the state (0.07 per cent), indicating that yield levels remained largely stagnant over the study period. The results suggest that the decline in production of niger is primarily attributable to a reduction in area rather than changes in productivity.

**Table 1:** Trends in area, production and productivity of niger

| S. No. | Particular   | Compound growth rate (200-01 to 2020-21) |                    |
|--------|--------------|------------------------------------------|--------------------|
|        |              | Study area                               | Overall state      |
| 1.     | Area         | -6.87**                                  | -7.54**            |
| 2.     | Production   | -6.71**                                  | -7.47**            |
| 3.     | Productivity | 0.08 <sup>NS</sup>                       | 0.07 <sup>NS</sup> |

Note: \*\*=5% level of significance, NS = Non significant

**Fig 1:** Trends in area, production and productivity of niger-Andhra Pradesh**Fig 2:** Trends in area, production and productivity of niger-Visakhapatnam

### Variable and fixed costs of niger cultivation

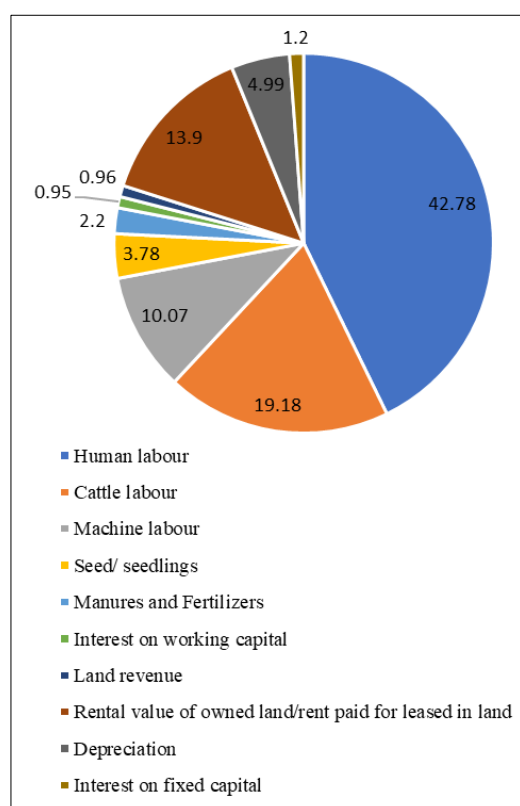
Variable and fixed cost incurred in cultivation of niger have been analyzed and presented in the Table 2.

The cost of cultivation of niger per hectare was ₹18,428.19, of which variable costs accounted for ₹14,548.94. Human, cattle, and machine labour constituted the major share of variable costs (Figure 3) with expenditures of ₹7,883.26,

₹3534.30 and ₹1,855.51 respectively. Seed material and fertilizers were the next major inputs, costing ₹695.82 and ₹405.56 respectively, while interest on working capital amounted to ₹174.49. Fixed costs totaled ₹3,879.26 per hectare, comprising the rental value of owned land (₹2,562.37), depreciation (₹918.92), interest on fixed capital (₹221.25) and land revenue (₹176.72).

**Table 2:** Variable and fixed costs incurred in cost of cultivation of niger (per ha)

| Particulars                                             | Value (₹/ha) |
|---------------------------------------------------------|--------------|
| <b>Variable cost</b>                                    |              |
| Human labour (Man days)                                 | 7883.26      |
| Owned                                                   | 4401.97      |
| Hired                                                   | 3481.29      |
| Cattle labour (Pair days)                               | 3534.30      |
| Owned                                                   | 2297.30      |
| Hired                                                   | 1237.01      |
| Machine labour (hours)                                  | 1855.51      |
| Owned                                                   | -            |
| Hired                                                   | 1855.51      |
| Seed/ seedlings (kg)                                    | 695.82       |
| Manures and Fertilizers (kg)                            | 405.56       |
| Interest on working capital                             | 174.49       |
| Total variable costs                                    | 14,548.94    |
| <b>Fixed cost</b>                                       |              |
| Land revenue                                            | 176.72       |
| Rental value of owned land/rent paid for leased in land | 2562.37      |
| Depreciation                                            | 918.92       |
| Interest on fixed capital                               | 221.25       |
| Total fixed costs                                       | 3,879.26     |
| Total cost                                              | 18,428.20    |

**Fig 3:** Component-wise Distribution of Cost of Cultivation of Niger

### Cost concepts and Measures of farm income

The cost of cultivation of niger was analysed using CACP cost concepts and the associated farm efficiency measures are presented in Table 3. The Cost A<sub>1</sub> and Cost A<sub>2</sub> were identical at ₹11242.61 per hectare, indicating that none of the sample farmers cultivated niger on leased-in land. The estimated Cost B<sub>1</sub> was ₹11463.86 per hectare, representing paid-out costs along with interest on owned fixed capital. When the

rental value of owned land was included, the cost increased to ₹14021.23 under Cost B<sub>2</sub>, indicating the significant contribution of land to the total cost of cultivation. Further inclusion of the imputed value of family labour raised the cost to ₹15865.83 under Cost C<sub>1</sub>, highlighting the labour-intensive nature of niger cultivation and the heavy reliance on family labour. Accounting for both the rental value of land and family labour, the cost under Cost C<sub>2</sub> was estimated at ₹18,428.20 per hectare, which provides a comprehensive estimate of the total economic cost of cultivation. The highest cost, ₹2,0271.02 per hectare under Cost C<sub>3</sub> reflects the addition of managerial remuneration emphasizing the role of farmers' managerial efforts in the production process. The gross income from niger cultivation was ₹26,240 per hectare. After accounting for total costs, the net income representing the surplus of gross income over Cost C<sub>2</sub>, was estimated at ₹7,811.80 per hectare. The farm business income which reflects returns to owned resources such as land, labour and capital amounted to ₹14,997.39 per hectare. The family labour income indicating returns to the farmer's own and family labour was ₹12,213.77 per hectare, while the farm investment income representing returns to fixed capital was estimated at ₹8,752.62 per hectare.

**Table 3:** Cost of cultivation of niger based on cost concepts and Measures of farm income

| S. No.                         | Particulars                         | Niger farm (₹/ha) |
|--------------------------------|-------------------------------------|-------------------|
| <b>Cost Concepts</b>           |                                     |                   |
| 1.                             | Cost A <sub>1</sub> /A <sub>2</sub> | 11242.61          |
| 2.                             | Cost B <sub>1</sub>                 | 11463.86          |
| 3.                             | Cost B <sub>2</sub>                 | 14026.23          |
| 4.                             | Cost C <sub>1</sub>                 | 15865.83          |
| 5.                             | Cost C <sub>2</sub>                 | 18428.20          |
| 6.                             | Cost C <sub>3</sub>                 | 20271.02          |
| <b>Measures of farm income</b> |                                     |                   |
| 1.                             | Yield(Q/ha)                         | 3.60              |
| 2.                             | Gross Income                        | 26,240.00         |
| 3.                             | Net Income                          | 7811.80           |
| 4.                             | Returns per rupee                   | 0.38              |
| 5.                             | Farm business Income                | 14997.39          |
| 6.                             | Family Labour Income                | 12213.77          |
| 7.                             | Farm investment Income              | 8752.62           |

**Table 4:** Estimates of the Cobb-Douglas production function

| Variables      | Elasticity coefficients       |
|----------------|-------------------------------|
| Intercept      | 5.42**<br>(0.02)              |
| Human Labour   | -0.08 <sup>NS</sup><br>(0.14) |
| Cattle labour  | -0.06 <sup>NS</sup><br>(0.12) |
| Machine labour | 0.21*<br>(0.11)               |
| Seed cost      | 0.47***<br>(0.10)             |
| Urea           | 0.22**<br>(0.08)              |
| Manure         | 0.01 <sup>NS</sup><br>(0.00)  |
| R <sup>2</sup> | 0.81                          |
| F value        | 24.44                         |
| d.f            | 39                            |

(Figures in parentheses are errors of respective coefficients)  
\*, \*\* and \*\*\* indicates significance level at 10, 5 and 1 per cent level, respectively. NS= non-significant

### Resource use efficiency in niger cultivation

Resource use efficiency in niger cultivation was estimated using the Cobb–Douglas production function, where the regression coefficients represent the elasticity of production. The results indicated that machine labour, seed, and urea significantly contributed to gross returns from niger cultivation. A one per cent increase in machine labour, seed, and urea from their respective geometric mean levels increased gross returns by 0.21, 0.47 and 0.22 per cent, respectively, *ceteris paribus*. The coefficient of multiple determination ( $R^2$ ) was 0.81, indicating that 81 per cent of the variation in gross returns was explained by the variables included in the model (Table 4).

The marginal value product (MVP) analysis revealed that none of the inputs were utilized at their optimal level (Table 5). Human labour and cattle labour exhibited negative MVP/MFC ratios, indicating excessive utilization and inefficient allocation of these resources. Machine labour, seed, urea, and FYM recorded MVP/MFC ratios less than unity, indicating over-utilization of these inputs. Among the inputs, seed and urea showed relatively higher resource-use efficiency. The findings suggest that appropriate adjustment in input use, particularly labour and key productivity-enhancing inputs, could improve resource-use efficiency and profitability in niger cultivation.

**Table 5:** Resource use efficiency in niger cultivation

| Particulars    | Geometric mean | bi    | r=MVP/MFC |
|----------------|----------------|-------|-----------|
| Human Labour   | 8.64           | -0.08 | -0.09***  |
| Cattle Labour  | 7.84           | -0.06 | -0.08***  |
| Machine Labour | 7.19           | 0.21  | 0.30***   |
| Seed cost      | 6.55           | 0.47  | 0.73***   |
| Urea           | 5.90           | 0.22  | 0.38***   |
| FYM            | 3.13           | 0.01  | 0.03***   |
| output         | 10.17          | -     | -         |

\*MVP/MFC>1: underutilization of resources, \*\*MVP/MFC=1: Optimal use of resources, \*\*\*MVP/MFC<1: Over utilization of resources

### Conclusion

The study examined the growth trends and economic viability of niger cultivation in Andhra Pradesh, with special reference to Visakhapatnam district. The compound growth rate analysis revealed a significant decline in the area and production of niger during the period 2000–01 to 2020–21 at both the study area and state levels, while productivity recorded marginal but statistically non-significant growth, indicating the absence of any meaningful improvement in yield levels. This suggests that the decline in niger production was primarily driven by a contraction in cultivated area rather than changes in productivity.

The cost of cultivation analysis based on CACP cost concepts showed that niger cultivation involved low cash (paid-out) expenditure, as evidenced by identical Cost  $A_1$  and Cost  $A_2$ , reflecting cultivation predominantly on owned land. However, imputed costs, particularly the rental value of owned land, family labour and managerial input, constituted a substantial share of total cultivation cost under higher cost concepts. Despite this, income measures indicated positive net income, farm business income, family labour income and farm investment income, confirming the economic viability of niger cultivation under existing production conditions.

Further, resource use efficiency analysis indicated that seed, urea, and machine labour significantly contributed to gross returns, although all inputs were away from their optimal utilization levels. Excessive use of labour and other inputs highlights the need for efficient resource allocation to enhance profitability in niger cultivation.

Overall, the findings indicate that niger remains a profitable yet declining minor oilseed crop. To arrest the decline in cultivated area and enhance returns, policy interventions should focus on improving farm-gate price realisation, strengthening market access, and reducing income risk for farmers. Enhancing productivity through improved varieties, efficient input management, and better crop management practices, along with the rational use of mechanisation to reduce production constraints, can further improve profitability. Additionally, improved access to quality seed, value addition, and collective marketing can make niger cultivation more attractive, particularly in rainfed and marginal regions, thereby strengthening its role in domestic edible oil production.

### References

1. Anonymous. Agricultural statistics at a glance 2020-21. New Delhi: Directorate of Economics and Statistics; 2017. p. 211-249.
2. Atree N, Koshta AK, Parha MK, Painkra AK, Painkra DS. An economic analysis of production and return of niger crop grown in Jashpur district of Chhattisgarh State. International Journal of Current Microbiology and Applied Sciences. 2020;9(10).
3. Directorate of Economics and Statistics. District handbook of statistics: Visakhapatnam (2000-01 to 2020-21). Amaravati: Government of Andhra Pradesh.
4. IndiaStat. State-wise area, production and productivity of niger (2020-23). <https://www.indiastat.com>
5. Press Information Bureau. National Mission on Edible Oils: Strengthening India's edible oil ecosystem. New Delhi: Government of India; 2025 Dec 8. <https://pib.gov.in>