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Cost and returns of turmeric (*Curcuma longa* L.) growers in Nanded district of Maharashtra

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Abstract

Turmeric (*Curcuma longa* L.) is an important commercial spice crop that provides significant income and employment opportunities to farming households. However, the profitability of turmeric cultivation is strongly influenced by the high cost of inputs, labour requirements, production technology, yield and market prices. The present study was undertaken to estimate the cost of cultivation and returns from turmeric production in Nanded district of Maharashtra. A multistage sampling procedure was followed, and 90 turmeric growers were selected from three purposively selected talukas and nine villages of the district. The cost and returns of turmeric cultivation were estimated using the cost concepts recommended by the Commission for Agricultural Costs and Prices (CACP).

The results revealed that turmeric cultivation required substantial use of hired labour, machinery and seed rhizomes. The total cost of cultivation (Cost C₃) was estimated at ₹398,539.79 per hectare. Machinery labour (₹87,648.00/ha), seed rhizomes (₹52,319.22/ha) and rental value of owned land (₹99,134.74/ha) were the major cost components. The average yield was about 66.77 quintals per hectare, generating gross returns of ₹594,782.26 per hectare. The net returns were estimated at ₹196,242.47 per hectare, while farm business income and family labour income were ₹345,777.67 and ₹238,764.36 per hectare, respectively. The benefit-cost ratio was 1.49, indicating that turmeric cultivation was economically profitable in the study area. Processed produce also contributed substantially to farm returns, with polished fingers generating ₹415,337.01 and fresh mother sets contributing ₹179,445.25 per hectare.

The study concludes that turmeric cultivation has considerable income-generating potential in Nanded district. However, the high expenditure on machinery, planting material and other production inputs emphasizes the need for efficient resource utilization and cost-effective production practices. Improved post-harvest processing, quality input availability, better market linkages and improved price realization can further enhance the profitability and economic sustainability of turmeric cultivation.

Keywords: Turmeric, cost of cultivation, returns, profitability, benefit-cost ratio, cost C₃, Nanded district, Maharashtra

Introduction

Agriculture continues to be a major source of employment, income and livelihood for a large section of the rural population in India. With increasing commercialization and diversification of agriculture, farmers are gradually shifting towards high-value crops that offer better income and value-addition opportunities. Among these crops, spices occupy an important position due to their domestic demand, industrial applications, export potential and processing opportunities. Turmeric (*Curcuma longa* L.) is one of the most important spice crops cultivated in India and has considerable economic importance for farmers as well as the agricultural economy. Turmeric belongs to the family Zingiberaceae and is primarily cultivated for its underground rhizomes. It is widely used as a spice, colouring agent and raw material in food,

pharmaceutical, cosmetic and nutraceutical industries. The presence of curcuminoids, particularly curcumin, has further increased its commercial and industrial importance. The growing demand for turmeric and its value-added products provides opportunities for farmers to enhance farm income through improved production, processing and marketing practices.

India occupies a leading position in the production, consumption and export of turmeric. The crop generates employment and income at different stages, including land preparation, planting, intercultural operations, harvesting, curing, drying, polishing and marketing. However, turmeric cultivation is relatively input-intensive and involves substantial expenditure on seed rhizomes, labour, machinery, fertilizers, plant protection, irrigation, harvesting and post-

harvest operations. Therefore, the profitability of turmeric depends not only on yield but also on the efficient management of production costs and the price realized by growers.

Maharashtra is an important turmeric-producing state, particularly in the Marathwada region. Turmeric cultivation has expanded in several parts of the state owing to suitable agro-climatic conditions, irrigation facilities in selected areas, farmers' experience and established marketing networks. The crop contributes to agricultural diversification and provides an important source of cash income to farm households. However, the economic returns from turmeric cultivation vary according to input use, production technology, labour requirements, yield, market prices and post-harvest practices.

Nanded district is an important agricultural region of Marathwada and is also associated with turmeric production and trade. During 2023–24, the district had approximately 223 hectares under turmeric cultivation, with production of about 3,245 quintals and productivity of nearly 5,000 kg per hectare, as reported by KVK Nanded. The presence of production and trading activities makes Nanded an appropriate location for examining the economic performance of turmeric growers.

The cultivation of turmeric involves considerable investment, particularly in seed rhizomes, hired labour, machinery, fertilizers and plant protection inputs. Rising input prices and labour costs can substantially increase the total cost of cultivation, while fluctuations in yield and market prices may affect the returns received by farmers. Hence, estimation of the different cost components and returns is essential for determining the economic viability of turmeric production. Measures such as gross returns, net returns, farm business income, family labour income and benefit-cost ratio provide useful indicators of profitability.

Post-harvest processing is another important determinant of the economic value of turmeric. The major operations include curing, drying and polishing, which improve the quality, appearance, storability and marketability of the produce. Although these operations involve additional expenditure on labour, machinery, fuel and other resources, appropriate processing can enhance the value realized by farmers. In particular, polished turmeric fingers may obtain better market prices because of their improved appearance and quality. Thus, the economics of turmeric should be examined by considering both cultivation costs and returns obtained from processed produce.

The economic assessment of turmeric cultivation is therefore important for identifying major cost components, evaluating resource-use efficiency and determining the profitability of the crop. Such an analysis can help farmers make informed production decisions and identify opportunities for reducing avoidable expenditure. It can also provide useful information to agricultural extension agencies, researchers, traders and policymakers for developing measures aimed at improving production efficiency, post-harvest management, market access and farmers' income.

In this context, the present study entitled "Cost and Returns of Turmeric Growers in Nanded District of Maharashtra" was undertaken to examine the economic performance of turmeric cultivation at the farm level. The study focuses on the estimation of input use, cost of cultivation, different cost

concepts, gross and net returns and profitability of turmeric production. The study also considers the importance of post-harvest processing and the major factors influencing the economic performance of turmeric growers. The findings are expected to provide an empirical basis for understanding the profitability of turmeric cultivation and for suggesting suitable measures to improve the economic sustainability and income potential of turmeric growers in Nanded district

Objective of the study

1. To estimate the cost of cultivation and returns from turmeric production in Nanded district

Materials and Methods

The study was conducted in Nanded district of the Marathwada region of Maharashtra, which is predominantly an agricultural district with favourable conditions for diversified crop production, including turmeric. The district is characterized mainly by black cotton soils and receives support from irrigation sources such as the Godavari and its tributaries in selected areas. Turmeric is an important commercial crop in the district, providing income and employment opportunities to farming households. The availability of suitable soils, agricultural resources and established marketing facilities makes Nanded an appropriate location for analysing the cost and returns of turmeric cultivation.

A multistage sampling procedure was followed for the selection of turmeric growers for the present study in Nanded district of Maharashtra. Nanded district was purposively selected considering its importance in turmeric cultivation, favourable agro-climatic conditions and commercial significance of the crop. From the district, three talukas having comparatively higher area under turmeric cultivation were purposively selected based on secondary information obtained from the District Agriculture Office and related sources. Subsequently, three turmeric-growing villages from each selected taluka were chosen through simple random sampling, giving a total of nine villages. From each selected village, turmeric growers were randomly selected from the available list of farmers, with due consideration to the presence of turmeric cultivation in the village. Thus, 10 turmeric growers were selected from each village, resulting in a total sample of 90 turmeric growers for the study.

Estimation of Cost and Returns

The cost and return structure of turmeric cultivation was analysed using the cost concepts recommended by the Commission for Agricultural Costs and Prices (CACP). Both actual and imputed costs were considered to obtain a comprehensive assessment of the economics and profitability of turmeric cultivation. The analysis was carried out on a per-hectare basis.

Cost Concepts

The following cost concepts were used for estimating the cost of turmeric cultivation:

Cost A₁

Cost A₁ comprises the actual paid-out expenses incurred by the farmer in cash and kind for turmeric cultivation. It includes expenditure on hired human labour, bullock and

machine labour, seed rhizomes, farmyard manure, fertilizers, plant protection chemicals, irrigation, land revenue, depreciation on farm assets and interest on working capital.

Cost A₂: Cost A₂ is obtained by adding the rent paid for leased-in land to Cost A₁.

$\text{Cost A}_2 = \text{Cost A}_1 + \text{Rent Paid for Leased-in Land}$

Cost B₁: Cost B₁ includes Cost A₁ along with interest on owned fixed capital, excluding the value of owned land.

$\text{Cost B}_1 = \text{Cost A}_1 + \text{Interest on Owned Fixed Capital}$

Cost B₂: Cost B₂ includes Cost B₁ together with the rental value of owned land and rent paid for leased-in land.

$\text{Cost B}_2 = \text{Cost B}_1 + \text{Rental Value of Owned Land} + \text{Rent Paid for Leased-in Land}$

Cost C₁: Cost C₁ is obtained by adding the imputed value of family labour to Cost B₁.

$\text{Cost C}_1 = \text{Cost B}_1 + \text{Imputed Value of Family Labour}$

Cost C₂: Cost C₂ is obtained by adding the imputed value of family labour to Cost B₂.

$\text{Cost C}_2 = \text{Cost B}_2 + \text{Imputed Value of Family Labour}$

Cost C₃: Cost C₃ accounts for the managerial function performed by the farmer and is calculated by adding 10 per cent of Cost C₂.

$\text{Cost C}_3 = \text{Cost C}_2 + 10\% \text{ of Cost C}_2$

The above cost concepts were used to determine the complete cost structure of turmeric cultivation, from paid-out expenses to the imputed value of family resources and managerial functions.

Returns from Turmeric Cultivation

The economic returns from turmeric cultivation were estimated using the following measures:

1) Gross Returns: Gross returns represent the total monetary value of turmeric production obtained per hectare.

$\text{Gross Returns (₹/ha)} = \text{Quantity of Output (q/ha)} \times \text{Price Received (₹/q)}$

Gross returns indicate the total income generated from turmeric cultivation before deducting the cost of production.

2) Net Returns: Net returns represent the surplus obtained after deducting the total cost of cultivation from gross returns.

$\text{Net Returns (₹/ha)} = \text{Gross Returns} - \text{Total Cost of Cultivation}$

Net returns were used as an important indicator of the profitability of turmeric cultivation.

Income Measures

1) Farm Business Income: Farm business income represents the return available to the farmer after meeting the paid-out costs of cultivation.

$\text{Farm Business Income (₹/ha)} = \text{Gross Returns} - \text{Cost A}_1 \text{ (or A}_2\text{)}$

It reflects the return to land, owned capital, family labour and management after meeting the paid-out expenses.

2) Family Labour Income: Family labour income represents the return remaining after accounting for Cost B₂.

$\text{Family Labour Income (₹/ha)} = \text{Gross Returns} - \text{Cost B}_2$

This measure indicates the return accruing to family labour and farm management.

Profitability Measure

1) Benefit-Cost Ratio (BC Ratio): The benefit-cost ratio was used to assess the economic efficiency and profitability of turmeric cultivation. It was calculated as:

$\text{BC Ratio} = \text{Gross Returns} / \text{Total Cost of Cultivation}$

A BC ratio greater than 1.00 indicates that the gross returns obtained from turmeric cultivation are higher than the total cost incurred, indicating economic profitability.

Assessment of Economic Viability

The different cost concepts, returns measures and profitability indicators were used collectively to assess the economic viability and profitability of turmeric cultivation among the selected turmeric growers in Nanded district of Maharashtra.

Results and Discussion

Input use Pattern of Turmeric cultivators (per hectare)

Turmeric crop is a long-duration crop; it requires around 9 months, and the requirement for both human and machine labour is high. Consequently, labour expenses form a substantial portion of the total cultivation costs. Throughout the farming process, physical resources are directly converted into the final yield. Because the total output depends heavily on the volume of resources applied, achieving maximum profit requires precise management. It is crucial that these inputs are optimally utilized—meaning they must neither be wasted through over-utilization nor restricted through under-utilization.

Table 1: Input use Pattern of Turmeric cultivators (per hectare)

Sr. No.	Particulars	Unit	Physical quantity	Rate (in Rs)
1	Hired Labour			
a)	Male	man days	26.71	500/day
b)	Female		44.87	300/day
2	Machine	hrs	27.39	3200/hr
3	Plant Protection			
a)	Saaf		2.18	800
b)	Hitlist		1.33	800
c)	Steric k	kg/lit/gm	0.65	1200
d)	Pendimethalin		0.65	400
e)	Biomix		3.95	210
f)	Other		0.8	239.9
4	Fertilizer			
a)	DAP		148.5	26.44
b)	Urea		127.5	4.13
c)	Ammonium sulphate	kg	26	7.33
d)	10 26 26		116	11
e)	MOP		148	26.06
f)	SSP		182	4.8
g)	Limboli		131	12.08
h)	Other		91	3.95
5	Rhizomes	qt	11.23	4658.88
6	Family Labour			
a)	Male	man days	9.18	500/day
b)	Female		5.67	300/day

Note: All cost calculations are presented as per hectare basis

Table 1 presents the per hectare physical quantity of various inputs utilized by the turmeric cultivators, along with their respective rates. Regarding labour and machinery, turmeric cultivation relied heavily on hired labour, requiring 44.87 female and 26.71 male man-days per hectare. In contrast, family labour utilization was lower, at 9.18 male and 5.67 female man-days. Additionally, the average machine power used was 27.39 hours per hectare, while the primary seed material (rhizomes) requirement was 11.23 quintals per hectare.

In terms of chemical and organic fertilizers, Single Super Phosphate (SSP) was applied in the highest quantity at 182 kg per hectare. This was followed by DAP (148.5 kg), MOP (148 kg), Limboli (131 kg), Urea (127.5 kg), and the 10:26:26 mixture (116 kg). For plant protection, the major inputs utilized were Biomix (3.95 kg/lit/gm), Saaf (2.18 kg/lit/gm), and Hitlist (1.33 kg/lit/gm).

Cost of Cultivation of Turmeric

The cost of cultivation encompasses all direct and indirect expenses such as labour, rhizomes, fertilizers, and machinery required to grow a crop. It is essential for calculating profitability, optimizing resources, and guiding agricultural policies.

Table 2: Cost of Cultivation of Turmeric

Sr. No.	items	Unit	Quantity	Rate per unit (Rs)	Total cost (Rs)
1	Hired human labour (male)	man days	26.71	500.00	13355.00
	Hired human labour (female)	man days	44.87	300.00	13461.00
2	Machinery labour	hrs.	27.39	3200.00	87648.00
3	Rhizomes	qt	11.23	4658.88	52319.22
4	Fertilizer				
	Dap	kg	148.5	26.44	3926.34
	Urea	kg	127.5	4.13	526.57
	Ammonium sulphate	kg	26	7.33	190.66
	10:26:26	kg	116	11.00	1276.00
	MOP	kg	148	26.06	3856.88
	SSP	kg	182	4.80	873.60
	Limboli	kg	131	12.08	1582.48
	Other	kg	91	3.95	359.45
5	Plant protection				
	Saaf	kg	2.18	800.00	1744.00
	Hitlist	lit	1.33	800.00	1064.00
	Steric k	gm	0.65	1200.00	780.00
	Pendimethalin	lit	0.65	400.00	260.00
	Biomix	lit	3.95	210.00	829.50
	Other		0.80	239.79	191.83
6	Miscellaneous charge				351.52
7	Total working capital				184595.98
8	Depreciation on implements				45817.18
9	Interest on working capital @ 10%				18459.60
10	Land revenue				131.83
11	Cost A1				249004.59
12	Cost A2				249004.59
13	Interest on fixed capital @ 10%				7878.57
14	Cost B1				256883.16
15	Rental value of owned land				99134.74
16	Cost B2				356017.9
17	Family labour (male)	man days	9.18	500	4590.00
	Family labour (female)	man days	5.67	300	1701.00
	Total Family labour				6291.00
18	Cost C1				263174.16
19	Cost C2				362308.90

20	Management Cost @ 10% of Cost C2				36230.89
21	Cost C3				398539.79
22	Main produce yield	qt	66.77		594782.26
23	Gross Income				594782.26
24	Net Income				196242.47
25	Benefit cost (B:C) ratio				1.49

Note: All cost calculations are presented as per hectare basis

Table 2 reveals the per hectare cost of cultivation, yield, and income for turmeric farmers. The total cost of cultivation (Cost C3) was calculated at Rs 398,539.79 per hectare. The analysis shows that turmeric requires high initial investments. Among the operational expenses, machinery labour (Rs 87,648.00) and seed rhizomes (Rs 52,319.22) were the most significant cost contributors, pushing the total working capital to Rs 184,595.98. Additionally, the rental value of owned land accounted for a substantial fixed cost of Rs 99,134.74.

Looking at the standard cost concepts, the direct paid-out costs (Cost A1/A2) stood at Rs 249,004.59. The cost progressed to Cost B2 (Rs 356,017.90) when accounting for the rental value of owned land, and reached Cost C2 (Rs 362,308.90) after including the imputed value of family labour (Rs 6,291.00 total for male and female).

In terms of returns, turmeric cultivation proved to be a highly rewarding enterprise. The average main produce yield was 66.77 quintals per hectare, generating a gross income of Rs 594,782.26. After deducting the total costs (Cost C3), farmers earned a robust net income of Rs 196,242.47 per hectare. Consequently, the Benefit-Cost (B:C) ratio stood at 1.49, indicating that for every rupee invested, the farmer received a return of Rs 1.49, confirming the economic viability and profitability of the crop in the study area.

Profitability Measures of Turmeric Production (Rs/ha)

Profitability of turmeric production was assessed using gross returns, net returns, farm business income, family labour income and the benefit-cost (B:C) ratio to determine the economic viability and overall profitability of turmeric cultivation.

Table 3: Profitability Measures of Turmeric Production (Rs/ha)

Sr. No.	Particulars	Computation formula	Average value (Rs)
1	Gross Income	Total return	594782.26
2	Farm Business Income	Gross income – Cost A2	345777.67
3	Family Labour Income	Gross income – Cost B2	238764.36
4	Net Income	Gross income – Cost B3	196242.47
5	Benefit-Cost Ratio (B:C)	Gross income/Cost C3	1.49

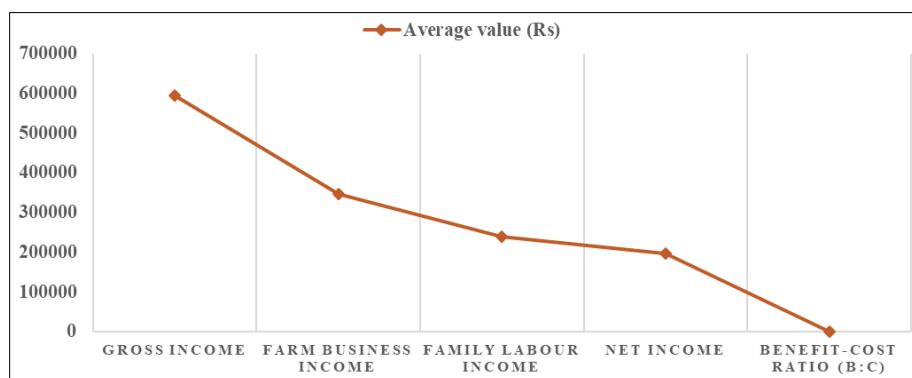


Fig 1: Profitability Measures of Turmeric Production (Rs/ha)

Table 3 presents the per hectare profitability measures of turmeric cultivation. Overall, the crop generated a total return or gross income of Rs 594,782.26. Breaking down the specific income measures, the farm business income stood at Rs 345,777.67, while the return to family labour (family labour income) amounted to Rs 238,764.36. After deducting the total costs, the final net income achieved was Rs 196,242.47 per hectare. Consequently, the Benefit-Cost (B:C) ratio was recorded at 1.49, indicating a profitable return of Rs 1.49 for every rupee invested in production.

Breakdown of cost concepts for Turmeric cultivators (per hectare)

The cost of turmeric cultivation was estimated to assess the expenditure incurred by farmers in the production process. The total cost was classified into different cost concepts

based on the nature and components of expenditure incurred per hectare. These cost concepts provide a systematic basis for analysing the cost structure and profitability of turmeric cultivation. The major cost concepts considered were Cost A₁, Cost A₂, Cost B and Cost C, which include various paid-out expenses, rental value of owned land, interest on fixed capital and the imputed value of family labour.

Table 4 presents the per hectare breakdown of cost concepts for turmeric cultivation. The direct paid-out expenses (Cost A₁ and Cost A₂) stood at Rs 249,004.59, contributing 62.48 per cent to the total cost (Cost C₃). Factoring in fixed capital interest and land rental value brought Cost B₁ to Rs 256,883.16 and Cost B₂ to Rs 356,017.90. After including the imputed value of family labour (Cost C₁ and Cost C₂) along with a 10 per cent management cost, the final total cost of cultivation (Cost C₃) reached Rs 398,539.79.

Table 4: Breakdown of cost concepts for Turmeric cultivators (per hectare)

Sr. No.	Cost concept	Items include	Cost value (Rs/ha)	% Contribution to Cost C3
1	Cost A1	Paid out costs	249004.59	62.48
2	Cost A2	Cost A1+Rent paid for leased-in land	249004.59	62.48
3	Cost B1	Cost A1+ interest on fixed capital	256883.16	64.66
4	Cost B2	Cost B1+Rental value of owned land	356017.90	89.33
5	Cost C1	Cost B1+imputed value of family labour	263174.16	66.03
6	Cost C2	Cost B2+imputed value of family labour	362308.90	90.91
7	Cost C3	Cost C2+ management cost (10% of Cost C2)	398539.79	100.00

Per hectare Returns from Turmeric cultivation (Rs/qt)

The returns from turmeric cultivation were estimated to assess the economic performance and profitability of the crop. The returns per hectare were calculated by considering the quantity of turmeric produced and the price received per quintal. The analysis provides a clear indication of the

income-generating potential of turmeric cultivation and helps in evaluating the economic efficiency of farmers. Previous studies have also used yield, price received, gross returns and net returns as important indicators for assessing the profitability of turmeric production.

Table 5: Per hectare Returns from Turmeric cultivation (Rs/qt)

Sr. No.	Particulars	Quantity (q)	Rate (Rs/q)	Total value (Rs/q)	% Contribution to Total Returns
1	Polished fingers	31.63	13131.11	415337.01	30.17
2	Fresh mother sets	36.13	4966.67	179445.25	69.83
	Total	67.76	-	594782.26	100

Note: Figures in parentheses indicate percentage of the total marketed surplus

Table 5 presents the per hectare obtained from turmeric cultivation. Overall, a total yield of 67.76 quintals per hectare generated a gross return (total value) of Rs 594,782.26. Breaking down the total returns by produce type, polished fingers contributed the major share of the income. A quantity of 31.63 quintals of polished fingers was sold at a premium rate of Rs 13,131.11 per quintal, generating Rs 415,337.01. Additionally, the fresh mother sets yielded 36.13 quintals, which added Rs 179,445.25 to the overall returns at a rate of Rs 4,966.67 per quintal.

Conclusion

The analysis of input use, cost structure and profitability of turmeric cultivation revealed that turmeric is a highly input-intensive but economically viable crop in the study area. Turmeric cultivation required substantial use of hired labour, machinery, rhizomes, fertilizers and plant protection inputs, indicating the importance of efficient input management for reducing production costs. The total cost of cultivation (Cost C3) was estimated at Rs 398,539.79 per hectare, with machinery labour, rhizomes and rental value of owned land constituting major components of the total cost.

The profitability analysis showed that turmeric cultivation generated a gross income of Rs 594,782.26 per hectare and a net income of Rs 196,242.47 per hectare. The farm business income and family labour income were Rs 345,777.67 and Rs 238,764.36 per hectare, respectively. The Benefit-Cost ratio of 1.49 indicated that turmeric cultivation was profitable and economically feasible, with a return of Rs 1.49 for every rupee invested.

The returns analysis further showed that polished fingers were an important contributor to total returns, generating Rs 415,337.01, while fresh mother sets contributed Rs 179,445.25. Overall, the findings demonstrate the strong income-generating potential of turmeric cultivation. However, the relatively high expenditure on machinery, rhizomes and other production inputs highlights the need for efficient resource utilization, timely availability of quality

inputs, improved production practices and better market realization. Strengthening these aspects can further improve the profitability and economic sustainability of turmeric cultivation among farmers in the study area.

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