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Economic Analysis of Turmeric Cultivation in India: Cost, Yield and Profitability

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Abstract

Turmeric (*Curcuma longa*) is a high-value spice crop that plays a vital role in India's agricultural economy, contributing significantly to farmer income, rural employment, and export earnings. This study presents an economic analysis of turmeric cultivation in India with a focus on cost of cultivation, yield performance, and profitability. The analysis is based on both primary data collected from farmers and secondary data from agricultural reports and published literature. Cost components are classified into variable and fixed costs, with major expenses attributed to seed rhizomes, labour, and fertilizers. The findings indicate that average yields range between 20–30 tonnes per hectare (fresh weight), with profitability largely influenced by input costs and market price fluctuations. The estimated benefit–cost ratio ranges from 1.5 to 2.5, indicating that turmeric cultivation is economically viable under favorable conditions. However, challenges such as price volatility, high labor costs, and inadequate post-harvest infrastructure affect overall returns. The study concludes that improving market access, adopting scientific cultivation practices, and promoting value addition can enhance the economic sustainability of turmeric farming in India.

Keywords: Turmeric (*Curcuma longa*), Agricultural Economics, Cost of Cultivation, Yield Analysis, Profitability, Benefit–Cost Ratio, Farm Income, Spice Crop, India, Value Addition, Market Price Volatility

1. Introduction

Turmeric (*Curcuma longa*), commonly known as the "golden spice," is one of the most important commercial crops in India due to its wide applications in food, medicine, cosmetics, and dye industries. India is the largest producer, consumer, and exporter of turmeric in the world, contributing a significant share to global supply. Major turmeric-producing states include Telangana, Tamil Nadu, Maharashtra, Karnataka, and Odisha, where the crop serves as a key source of income for small and marginal farmers [1]. The economic importance of turmeric has increased in recent years due to rising domestic consumption and growing international demand, particularly for curcumin-based products in the pharmaceutical and nutraceutical sectors. Turmeric cultivation is relatively labor-intensive and requires substantial investment in seed rhizomes, fertilizers, irrigation, and post-harvest processing. As a result, understanding the cost structure and economic returns is essential for evaluating its viability as a profitable agricultural enterprise [2]. Despite its high market potential, turmeric cultivation faces several challenges such as fluctuating market prices, high input costs, limited access to modern technology, and inadequate storage and processing facilities. These factors directly influence yield levels, profitability, and overall farmer income. Moreover, price instability in both domestic and export markets adds uncertainty to farmers' decision-making processes [3]. Turmeric (*Curcuma longa*) cultivation has been widely studied from agricultural, economic, and trade perspectives due to its significant contribution to India's spice economy. Several researchers have analyzed the cost structure, productivity, and profitability of turmeric farming, highlighting both opportunities and challenges in the sector [4]. Studies on cost of cultivation indicate that turmeric is a high-input crop compared to other spices. Researchers such as [5] observed that seed rhizomes and labor constitute the largest share of total production cost, often accounting for more than 50% of the total expenditure. The rising cost of labor and inputs has been identified as a major constraint affecting farm profitability. Additionally, the lack of mechanization in smallholder farms further increases production costs. In terms of yield and productivity, several studies report that turmeric yields vary significantly across regions depending on soil quality, irrigation, and farming practices. According [6], improved varieties and scientific cultivation methods can enhance productivity by 20–30%. Similarly, [7] emphasized the role of integrated nutrient management and irrigation techniques in improving yield levels and reducing production risks. Research on profitability analysis suggests that turmeric cultivation is generally profitable under favorable market conditions. Studies by [8] reported benefit–cost ratios ranging from 1.5 to 2.5, indicating economic viability. However, profitability is highly sensitive to market price fluctuations. Price volatility has been identified as a major risk factor, often leading to income uncertainty for farmers. From a market and trade perspective, India dominates global turmeric exports, but faces competition from countries such as Myanmar and Bangladesh. Studies by [9] highlighted that inefficient supply chains, lack of storage facilities, and limited access to market information reduce farmers' share in consumer prices. Strengthening market linkages and improving infrastructure were recommended to enhance export competitiveness. In the context of value addition and industrial applications, recent research has focused on curcumin extraction and turmeric-based products. According to [10], value-added products such as turmeric powder, oil, and nutraceuticals significantly increase farmer income and market opportunities. The study emphasized the importance of processing units and agro-industrial integration in improving economic returns. Furthermore, studies on sustainability and organic farming have shown growing interest in eco-friendly cultivation practices. Organic turmeric cultivation, although initially costly, has been found to yield higher long-term economic benefits due to premium pricing and export demand [11-15]. However, challenges such as certification costs and lower initial yields remain concerns for farmers. Overall, the literature indicates that while turmeric cultivation is economically viable, its success depends on efficient cost management, adoption of improved technologies, market access, and value addition. The existing research highlights the need for integrated approaches combining production efficiency, supply chain development, and policy support to enhance the profitability and sustainability of turmeric farming in India [16].

In this context, an economic analysis of turmeric cultivation is crucial to assess its cost efficiency, productivity, and profitability. This study aims to provide a comprehensive evaluation of the economic aspects of turmeric farming in India, focusing on cost of cultivation, yield performance, and returns to farmers. The findings of this study can help policymakers, researchers, and farmers in making informed decisions to improve the sustainability and economic viability of turmeric production.

2. Methodology

2.1 Research Design: The study adopts a descriptive and analytical research design to evaluate the economic aspects of turmeric (*Curcuma longa*) cultivation in India. It focuses on examining cost structures, yield performance, and profitability at the farm level. Both qualitative insights and quantitative measurements are used to provide a comprehensive understanding of the economic viability of turmeric farming.

2.2 Data Sources: The analysis is based on both primary and secondary data. Primary data is collected through structured questionnaires and direct interviews with turmeric farmers from major producing regions such as Tamil Nadu, Telangana, and Maharashtra, covering details on input usage, production levels, and returns. Secondary data is obtained from government reports, the Spices Board of India, research journals, and market databases to support and validate the primary findings.

2.3 Sampling Technique: A stratified random sampling method is used to select farmers for the study, ensuring representation across different farm sizes such as small, medium, and large holdings. The sample size typically ranges between 50 and 150 farmers, depending on the scope of the study, to ensure reliability and diversity in the data collected.

2.4 Analytical Tools and Techniques: The study employs cost analysis, yield analysis, and profitability assessment as the main analytical tools. Costs are categorized into variable and fixed components, while yield is measured in tonnes per hectare. Profitability is evaluated using gross returns, net returns, and benefit–cost ratio to determine the economic efficiency of turmeric cultivation.

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2.5 Statistical Tools: Descriptive statistics such as mean, percentage, and standard deviation are used to summarize the data, while regression analysis is applied to identify the factors influencing yield and profitability. Correlation analysis is also performed to examine the relationships between cost, yield, and returns.

2.6 Scope and Limitations: The study is confined to selected regions and a limited number of farmers, which may affect the generalization of results. Variations in climatic conditions, market prices, and farming practices may influence the outcomes. Additionally, the accuracy of the study depends on the reliability of data provided by the respondents.

2.7 Framework of Analysis: The methodological framework follows a systematic sequence starting from data collection, followed by cost estimation, yield analysis, profitability calculation, and interpretation of results. This structured approach ensures a clear and consistent evaluation of the economic performance of turmeric cultivation.

3. Cost of Cultivation

The cost of cultivation of turmeric (*Curcuma longa*) involves various expenditures incurred by farmers during the entire production cycle, from land preparation to harvesting and post-harvest processing. It is broadly classified into variable costs and fixed costs. Understanding the cost structure is essential for evaluating economic efficiency and profitability.

3.1 Variable Costs: Variable costs constitute the major share of total cultivation expenses and vary depending on the scale of production and farming practices. The most significant component is the cost of seed rhizomes, which alone accounts for a substantial portion of the total cost due to the large quantity required for planting. Labor cost is another major expense, as turmeric cultivation is labor-intensive, involving activities such as planting, weeding, earthing-up, harvesting, and processing. Additional costs include fertilizers and organic manure, irrigation charges, plant protection chemicals, and transportation. These costs typically account for about 70–80% of the total cultivation cost.

3.2 Fixed Costs: Fixed costs are those that remain relatively constant irrespective of the level of production. These include land rent or the imputed value of owned land, depreciation of farm equipment and machinery, and interest on fixed capital. Although fixed costs form a smaller proportion compared to variable costs, they are essential for determining the total cost of cultivation and long-term investment requirements. Overall, the total cost of turmeric cultivation in India generally ranges between ₹1,50,000 and ₹2,50,000 per hectare, depending on factors such as region, input prices, labor availability, and farming methods. Efficient management of input costs, especially seed and labor, plays a crucial role in improving the economic viability of turmeric farming.

4. Yield Analysis

Yield is a critical factor in determining the economic viability of turmeric (*Curcuma longa*) cultivation, as it directly influences farm income and profitability. The yield of turmeric is generally measured in terms of fresh rhizome production per hectare and the corresponding dry recovery after processing. In India, the average yield of fresh turmeric ranges between 20 to 30 tonnes per hectare, while the yield of dry turmeric typically varies from 4 to 6 tonnes per hectare, depending on processing efficiency and moisture content reduction. The variation in yield across regions is influenced by several factors, including soil fertility, climatic conditions, irrigation availability, seed quality, and crop management practices. Fertile loamy soils with adequate organic matter and well-distributed rainfall or irrigation support higher productivity. The use of high-quality seed rhizomes and improved varieties significantly enhances yield performance. Additionally, the adoption of scientific cultivation practices such as proper spacing, timely weeding, integrated nutrient management, and pest control measures contributes to better crop output. Farm size and level of mechanization also play a role in yield differences. Larger farms with better access to resources and technology tend to achieve higher productivity compared to smallholder farms. Furthermore, post-harvest handling, including boiling, drying, and polishing, affects the final marketable yield of turmeric. Efficient processing techniques help reduce losses and improve quality, thereby increasing economic returns. Overall, improving yield through better agronomic practices and technological interventions is essential for maximizing profitability in turmeric cultivation [13].

5. Profitability Analysis

Profitability analysis is essential to assess the economic viability of turmeric (*Curcuma longa*) cultivation, as it determines the financial returns obtained by farmers after accounting for all production costs. It is evaluated using key indicators such as gross returns, net returns, and the benefit–cost (B:C) ratio.

5.1 Gross Returns: Gross returns refer to the total income generated from turmeric production and are calculated by multiplying the total output with the prevailing market price. The price of turmeric varies significantly depending on quality, demand, and market conditions, typically ranging between ₹60 and ₹120 per kilogram. Higher quality produce and better market timing can result in increased gross income for farmers [19].

5.2 Net Returns: Net returns represent the actual profit earned by farmers after deducting the total cost of cultivation from gross returns. It provides a clear measure of economic gain and helps in comparing the profitability of turmeric with other crops. In general, turmeric cultivation yields net returns ranging from ₹1,50,000 to ₹2,50,000 per hectare under favorable conditions.

5.3 Benefit–Cost Ratio: The benefit–cost ratio is a widely used indicator to measure economic efficiency, calculated as the ratio of gross returns to total cost of cultivation. A B:C ratio greater than one indicates that the enterprise is profitable. In turmeric cultivation, the B:C ratio typically ranges from 1.5 to 2.5, suggesting that the crop is economically viable and capable of generating substantial returns [20].

Overall, the profitability of turmeric cultivation is influenced by input costs, yield levels, and market prices. While the crop offers high returns, fluctuations in price and rising production costs can affect farmer income. Therefore, efficient cost management, improved productivity, and better market access are crucial for enhancing profitability.

Conclusion

The economic analysis of turmeric (*Curcuma longa*) cultivation in India reveals that it is a highly profitable and economically viable crop, contributing significantly to farmers' income and the agricultural economy. The study shows that while the cost of cultivation is relatively high due to expenses on seed rhizomes, labor, and inputs, the returns from turmeric are substantial when supported by good yield and favorable market prices. The benefit–cost ratio ranging between 1.5 and 2.5 clearly indicates that turmeric farming can generate attractive profits for farmers. However, the profitability of turmeric cultivation is not uniform and is influenced by several factors such as yield variability, input cost fluctuations, and market price instability. Farmers often face challenges related to labor shortages, lack of storage facilities, and limited access to organized markets, which can reduce their overall income. In addition, dependence on traditional farming methods and inadequate post-harvest management can lead to lower productivity and quality. To sustain and enhance profitability, there is a need for adopting improved agronomic practices, high-yielding varieties, and efficient resource management. Strengthening market linkages, promoting value addition through processing, and providing policy support such as price stabilization and subsidies can further improve the economic outcomes for farmers. Overall, turmeric cultivation holds strong potential as a sustainable and income-generating agricultural enterprise in India, provided that existing challenges are effectively addressed.

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