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Financial appraisal of turmeric value addition in Maharashtra

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Abstract

The present study conducts an economic evaluation of Kohinoor Turmeric Mill, located in Wai, Satara, for the financial year 2022-23, with a focus on its operational performance and supply chain efficiency. Primary data were collected from the General Manager, encompassing cost structures, returns, and critical financial indicators including the Benefit-Cost Ratio (BCR), Net Present Value (NPV), Internal Rate of Return (IRR), Break-Even Quantity (BEQ), Payback Period (PBP), and various marketing metrics such as cost, margin, price spread, and efficiency. The unit employed a total of 41 workers (24 males and 17 female), reflecting a gender-inclusive workforce. Capital investment was strategically allocated toward land, building, and essential machinery, including polish drums, weighing, and packaging equipment. The unit achieved a substantial production volume of 1337.30 tons of turmeric powder, generating gross returns of ₹2808.33 lakhs against a total cost of ₹1451.47 lakhs, thereby realizing a net profit of ₹1356.86 lakhs. The calculated BCR was 1.94, NPV stood at ₹115.765 lakh, IRR was 28.19%, and the payback period was estimated at 3 years and 2 months. Production exceeded the break-even quantity, indicating economic viability. Comparative analysis of marketing channels revealed higher efficiency in Channel-II over Channel-I. The findings underscore the potential of agro-processing units to drive rural economic development. Policymakers are encouraged to support such enterprises through access to affordable finance, skill development, and improved market infrastructure. Strengthening supply chain linkages and promoting efficient marketing strategies can significantly enhance profitability and sustainability in the agro-processing sector.

Keywords: Economic viability, BCR, NPV, IRR, BEQ, turmeric

Introduction

India, often referred to as the “Spice Bowl of the World,” cultivates 63 of the 107 spices recognized globally. Among these, turmeric (*Curcuma longa*) holds a prominent position due to its historical significance, extensive culinary usage, and medicinal properties. Turmeric remains a vital component in Indian cuisine across all socio-economic strata and continues to contribute substantially to the national and global spice trade.

Historically, spices have played an integral role in shaping India’s economic landscape, a trend that persists despite advancements in production technologies and evolving market dynamics. The global demand for Indian spices, particularly turmeric, remains robust, driven by their culinary, therapeutic, and industrial applications.

The global turmeric market is projected to reach a valuation of USD 4,419.3 million by 2023, with an anticipated compound annual growth rate (CAGR) of 5.5%, potentially exceeding USD 7,579.2 million by 2033. India retains its position as the world’s leading producer, consumer, and exporter of turmeric. In the fiscal year 2021-22, India exported approximately 1.37 lakh tonnes of turmeric, with key importing nations including Bangladesh, the United Arab Emirates, the United States, Malaysia, Morocco, and Iran.

Domestically, turmeric cultivation is concentrated in Maharashtra, Telangana, Karnataka, Tamil Nadu, Andhra Pradesh, Madhya Pradesh, Odisha, Mizoram, Assam, and Gujarat. Maharashtra leads in production, with Sangli and Satara emerging as pivotal regions. Notably, Sangli—often dubbed the “Saffron City”—has been a major turmeric trading center since the early 1900s, attributed to its distinct agro-climatic conditions that enhance the spice’s pigmentation and aroma.

Kohinoor Turmeric Mill, located in Wai, Satara, represents a key enterprise in the regional turmeric industry. The unit specializes in value-added turmeric products and demonstrates a commitment to quality and customer satisfaction. With strategic plans for diversification and market expansion, the unit aims to broaden its client base and reinforce its position in the domestic and international markets.

Materials and Methods

Selection of Study Area

The present study was conducted at Kohinoor Turmeric Mill, located in Wai, Satara district of Maharashtra. The unit was purposively selected due to its established presence in turmeric processing and its relevance to the objectives of the study.

Data Collection

Primary data pertaining to the fiscal year 2022-23 was collected through a structured questionnaire administered via personal interviews with the unit’s management. The data encompassed production volume, sales, cost structure, financial performance, and marketing expenditures associated with turmeric powder processing.

In addition, to analyze the Compound Annual Growth Rate (CAGR) of production and sales, secondary data for the ten-year period from 2012-13 to 2021-22 were obtained from the unit’s official records and documentation.

Sources of Data

The study aimed to comprehensively evaluate the performance of the turmeric processing industry; hence, data were collected on multiple operational and financial parameters. The major data components included:

1. General information about the enterprise, including ownership, scale, and operational structure.
2. Annual production and sales figures of turmeric powder.
3. Initial capital investment, detailing expenditure on land, building, and machinery.
4. Fixed and variable operating costs, including raw material procurement, utilities, and processing expenses.
5. Maintenance and repair costs for machinery and infrastructure.
6. Statutory and administrative expenses including taxes, insurance premiums and service fees.
7. Human resource expenditure, comprising wages, salaries, and allowances paid to laborers, supervisory staff, and managerial personnel.

Method of analysis

Production cost and returns

In order to calculate the Production of different masala products, percentages, averages and tabular analysis which were be used. The relative economic efficiency of the individual products was judged on the basis of its production cost and net returns.

$$IRR = \text{Lower discount Rate} + \frac{\text{Difference between two discount rate} \times \frac{\text{NPW at lower discount rate}}{\text{Difference between NPW at two discount rates}}}{\text{Difference between two discount rate}}$$

Benefit: cost ratio

The efforts were made to estimate benefit cost ratio to compare the relative economic efficiency of different brands. It is the ratio of total returns to total cost. Projects with a benefit-cost ratio greater than 1 have greater benefits than costs; hence they have positive net benefits.

$$B:C \text{ ratio} = \frac{Tr}{Tc}$$

Where,

B: C = Benefit cost ratio

Tr = Total return (₹)

Tc = Total cost (₹)

Financial performance analysis

Break even analysis

The break-even point is where total revenue equals total costs, resulting in no profit or loss. Break-even analysis helps determine this point by comparing costs to the selling price per unit.

a. Physical term

$$BEP = \frac{\text{Fixed cost}}{(\text{Selling price per kg} - \text{Variable cost per kg})}$$

b. Monetary term

$$BEP = \frac{\text{Fixed cost}}{(1 - \text{Variable cost per kg/selling price per kg})}$$

Net present value

Net Present Value (NPV) is the difference between the present value of cash inflows and outflows over a period of time. It's a capital budgeting tool used to determine the profitability of an investment or project. If NPV is positive, the project is accepted; if negative, it's rejected.

$$NPV = + \frac{P1}{[1+i]t1} + \frac{P2}{[1+i]t2} - \frac{Pn}{[1+i]tn} - C$$

Where,

P = Net cash flow, i = Discount rate

t = Time period, c = Initial cost of investment

Internal rate of return

The internal rate of return of an industry is the discount rate, which makes net present value equal to zero. The internal rate of return (IRR) is a metric used in financial analysis to estimate the profitability of potential investments. IRR is a discount rate that makes the net present value (NPV) of all cash flows equal to zero in a discounted cash flow analysis. IRR calculations rely on the same formula as NPV does. It will calculate by using the formula,

Payback period (Undiscounted measures)

Payback period (PBP) is the number of years it takes for a company to recover its original investment in a project, when net cash flow equals zero. In the calculation of the payback period, the cash flows of the project are estimated. The payback period is then a simple calculation.

$$PBP = \frac{\text{Total capital investment}}{\text{Average net return}}$$

Growth rate analysis

In order to study the trends in production and sales of turmeric powder. The functional form of the compound growth rate analysis is,

$$Y = ab^t \dots (1)$$

Where,

Y = Dependent variable for which growth rate is estimated.

A = Intercept

b = Regression coefficient

t = Time variable

$$\ln Y = \ln a + t \ln b + Ut$$

The per cent compound growth rate (g) is derived using the relationship,

$$g = (\text{Anti In of } b - 1) \times 100$$

Pattern of growth rates over the years will identify using the 'b' coefficient. If coefficient will statistically significant and positive, then growth of the estimated parameters over the years will accelerating. If it is negative, it will be implied that, growth will be decelerating over the year.

Marketing cost and marketing margin

In order to calculate the marketing cost of turmeric powder, percentages, averages and tabular analysis was used. The relative economic efficiency of the individual brands will judge on the basis of its production cost and net returns.

Total marketing cost

Marketing costs are the all expenses that the company makes to market and sell its products and develop and promote its brand. These marketing costs or expenses include expenses incurred to change the title of goods, promotion of goods, inventory costs, distribution of goods etc. The marketing cost is also used to determine the risk associated with budgets.

To calculate the marketing cost of the unit some basic statistical tools will use to get exact result. The formula used to estimate the total marketing cost is given below. It is taken from the report Corporate finance and accounting report given by Chris murphy in 2019.

$$C = C_f + C_{m1} + C_{m2} + \dots + C_{mn}$$

Where,

C = Total Marketing cost

C_f = Cost paid by the producer from the time the produce leaves the farm till he sells it.

C_{mi} = Cost incurred by ith middleman in the process.

Marketing margin

The marketing margin of a product is the difference between

what a company pays for the product and what it charges for the product. The margin is influenced primarily by shifts in retail demand, farm supply and marketing input prices. But other factors also can be important, including time lags in supply and demand, market power, risk, technical change, quality and spatial considerations.

$$MT = \sum (S_i - P_i) / Q_i$$

Where,

MT = Total marketing margin

S_i = Sale value of a product paid by ith firm

P_i = Purchase value of a product paid by ith firm

Q_i = Quantity of product handled by ith firm.

Price spread

The difference between the price paid by the consumer and the price received by the producer for an equivalent commodity is known as price spread. It involves various costs incurred by various intermediaries and their margins. Marketing costs are the actual expenses required in bringing goods and services from the Producer to the consumer.

$$\text{Price spread} = \text{Consumer price} - \text{Net Producer price}$$

Marketing efficiency

Marketing efficiency is the ratio of the total value of goods marketed to the total marketing cost. The higher the ratio, higher is the efficiency. The marketing efficiency was worked out using Acharya's modified marketing efficiency which is as follows:

$$MME = \frac{FP}{(MC + MM)}$$

Where,

MME- Modified marketing efficiency

FP - Net price received by producer

MC - Marketing cost

MM - Marketing margin

Results and Discussion

I. Production cost of turmeric powder

a) Capital investment

Table 1 provides information on the initial capital investment of Kohinoor Turmeric Mill. The total capital investment was 453.00 lakh. Building had the highest share (46.80 %), followed by machinery and equipment (23.40 %) and then land (23.18 %).

Table 1: Total capital investment of unit

Sr. No.	Particular	Amount (₹ Lakh)	Percentage (%)
1	Land	105.00	23.18
2	Building	212.00	46.80
3	Machinery and Equipment	106.00	23.40
4	Furniture and computers	4.30	0.95
5	Vehicles	25.70	5.67
	Total	453.00	100.00

b) Cost of different machinery

Table 2 provides information on the machinery of the unit and its cost. The total cost of different machineries was 106 lakhs. The total cost of different machineries was 106 lakhs. Highest share in cost belongs to Solar Power Plant (23.58

%), followed by Power Automatic Plant (18.87 %), then Greeding machine and Polish drum (15.09 per cent each), then Pulverizer (10.38 %), whereas share of other machineries is 16.99 per cent.

Table 2: Cost of different machinery

Sr. No.	Items	Quantity	Amount (₹ Lakh)	Percentage (%)
1	Polish drum	8	16.00	15.09
2	Weighing machine	8	0.80	0.75
3	Packaging machine	4	0.20	0.19
4	Pulverizer	2	11.00	10.38
5	Belt conveyor	2	5.00	4.72
6	Hoist	2	2.00	1.89
7	Greeding machine	2	16.00	15.09
8	Power automatic plant	1	20.00	18.87
9	Crain	1	5.00	4.72
10	Dust collector	1	5.00	4.72
11	Solar power plant	1	25.00	23.58
	Total	32	106.00	100.00

c) Total fixed cost of unit

From Table 3, it is evident that the total fixed cost of a unit for the 2022-23 year was 91.25 lakh. It was for Taxes: ₹

27.42 lakh (30.05%), followed by Depreciation on building: ₹ 21.20 lakh (23.23%) and Interest on fixed capital: ₹ 21.10 lakh (23.12%)

Table 3: Total fixed cost of unit

Sr. No.	Particular	Amount ₹ (Lakh)	Percentage (%)
1	Opportunity cost of land @5%	5.25	5.75
2	Depreciation of building @10%	21.20	23.23
3	Depreciation of machinery @10%	10.60	11.62
4	Depreciation of Furniture and Computers@10%	0.43	0.47
5	Depreciation on vehicles @10%	2.57	2.82
6	Interest on fixed capital @10%	21.10	23.12
7	License fees	0.68	0.75
8	Insurance	2.00	2.19
9	Taxes	27.42	30.05
	Total fixed cost	91.25	100.00

d) Total operating cost of unit

Table 4 presents the total operating cost of the unit during

2022-23, amounting to 75.68 lakh. Salary constitutes ₹ 61.33 lakh, which is 81.04% of the overall operating cost.

Table 4: Total operating cost of unit

Sr. No.	Particular	Amount (₹ Lakh)	Percentage (%)
1	Salary	61.33	81.04
2	Fuel charges	1.90	2.51
3	Hamali charges	0.85	1.39
4	Repair and maintenance	2.00	2.64
5	Telephone expenses	0.10	0.13
6	Travelling expenses	1.89	2.50
7	Office expenses	1.17	1.55
8	Professional fees	1.08	1.16
9	Advertisement	1.80	2.38
10	Employee insurance	1.65	2.18
11	Miscellaneous expenses	1.91	2.52
	Total	75.68	100.00

e) Cost of raw material

From Table 5, it is evident that raw turmeric finger accounts for 100.00% of the cost for processing turmeric powder. With 1573.30 tons of raw material, 1337.30 tons of the final products are produced, indicating a recovery rate of

85%. The quantity of the final product being less than the quantity of raw material used in production is a common observation in processing industries due to losses during processing.

Table 5: Total cost of raw material for preparing turmeric powder

Sr. No.	Name of Product	Raw material (000 kg)	Rate per kg (₹)	Raw material total cost (₹ Lakh)	Final product (000 kg)
1.	Raw turmeric	1573.30 (100.00)	80	1258.64	1337.30 (85.00)

f) Costs of turmeric powder production

Table 6: Costs of turmeric powder production

Sr. No.	Particulars	Raw material total cost (₹ Lakh)	Quantity of final product (000 kg)	Raw material cost per kg (₹)
1	Raw Material	1258.64	1337.30	94.12
2	Fixed Cost	91.25	1337.30	6.82
3	Operating Cost	75.68	1337.30	5.66
4	Packaging Cost	25.90	1337.30	1.94

From Table 6, it is observed that the per kilogram raw material cost for Turmeric powder was 94.12, the fixed cost was 6.82 per kilogram, and the operating cost was 5.66 per kilogram. The total packaging cost for turmeric powder is not provided, but the per kilogram packaging cost is 1.94.

g) Per Kilogram total production cost and net returns

From Table 7, the total production cost per kilogram of turmeric powder was ₹108.54, while the net returns from one kilogram of turmeric powder were ₹101.46

Table 7: Per kilogram net returns from turmeric powder (₹)

Sr. No.	Name of product	Total cost of production per kg	Rate of final product per kg	Net return per kg
1	Turmeric powder	108.54	210.00	101.46

h) Total cost and total returns of turmeric powder

From Table 8, it can be seen that the total cost of production for turmeric powder was ₹1451.47 lakh, while the total

returns from its sales amounted to ₹2808.33 lakh, resulting in a net profit of ₹1356.86 lakh.

Table 8: Total cost and Total returns of turmeric powder (Lakh)

Sr. No.	Name of product	Total cost	Quantity of final product (000 kg)	Total returns	Net returns
1	Turmeric powder	1451.47	1337.30	2808.33	1356.86

II. Financial performance

Exploring the break-even point (BEP), Net Present Worth (NPW), Internal Rate of Return (IRR), Benefit-to-Cost (B:C) ratio, and Payback Period (PBP) for the unit can provide valuable insights into its operations and financial viability. These metrics help assess the unit's profitability, efficiency, and financial health. If you have specific data or calculations related to these metrics, feel free to share them for further analysis and discussion.

a) Break-even analysis for turmeric powder

From Table 9, it is concluded that the actual production of turmeric powder is more than the break-even point in both physical and monetary terms. The unit appears to produce more than its break-even quantity, indicating that the unit is risk-free in turmeric powder production. The physical break-even point for turmeric powder is 82.79 tons, while the unit actually produces 1337.30 tons.

Table 9: Break-even point

Sr. No.	Name of product	Quantity of final product (000kg)	BEP (000 kg)	Total returns (₹ Lakh)	BEP (₹ Lakh)
1	Turmeric powder	1337.30	82.79	2808.33	173.85

b) Net present worth of unit

Net Present Value (NPV) is a crucial metric in investment analysis, representing the difference between the present value of cash inflows and outflows over the anticipated lifetime of an investment. NPV is calculated based on ten-year data related to total cash outflow of the unit from 2012-13 to 2021-22. The NPV is positive at discount factors of 15%, 20%, and 25%, indicating the project's profitability. This positive NPV leads to the acceptance of the project, as it signifies that the investment will yield returns higher than the initial investment.

c) Internal Rate of Return

The Internal Rate of Return (IRR) is a financial metric used to evaluate the profitability of an investment. It is the discount rate at which the Net Present Value (NPV) of all cash flows from the investment equals zero. In simpler terms, IRR is the rate at which an investment breaks even in terms of present value of cash inflows and outflows. A higher IRR typically indicates a more attractive investment opportunity.

$$IRR = \frac{\text{Lower discount Rate} + \text{Difference between two discount rate} \times \text{NPW at lower discount rate}}{\text{Difference between NPW at two discount rates}}$$

- IRR = {25 + 5 x 115.765 / [115.765 - (-66.728)]}
- IRR = {25 + 5 x 115.765 / 181.493}
- IRR = {25 + 5 x 0.638}
- IRR = {25 + 3.189}
- IRR = {28.19}

The Internal Rate of Return (IRR) for the unit's production and sale of turmeric powder was calculated to be 28.19%. This means that for an initial investment of 100, the unit owner would receive 128.19 in return. The IRR study indicates that for the original investment of 1052.09 lakhs, the unit has the potential to deliver a return of 28.19% over its life. Since the IRR of 28.19% is higher than the bank interest rate, it suggests that the unit is profitable for the owner, encouraging further investment in the business. Similar results were found by Mane S.P. (2023) and Balgudi (2021).

D) Benefit-cost ratio

The B:C ratio for Turmeric powder was 1.94, which is greater than 1, this means that project have greater benefits than costs and hence they have positive net benefits and indicate that unit is running in a profitable manner.

III. Compound annual growth rate of production and sales of unit

The Compound Annual Growth Rate (CAGR) for production and sales of Kohinoor Turmeric Mill over ten years (2012-13 to 2021-22) was calculated to be 5.268% and 5.359%, respectively. These CAGR values indicate a consistent and substantial growth rate for both production and sales of the unit over the specified period, reflecting positively on the unit's performance and potential for future growth.

Table 10: CAGR of production and sales of unit

CAGR of production	5.268***
CAGR of sales	5.359***

*** Significant at 1 per cent level

IV. Total marketing cost, marketing margin and price spread

The study compared the marketing costs, margins, and price spreads of turmeric powder through two channels. Channel-I (Producer-Wholesaler-Retailer-Consumer) had a total marketing cost of ₹30.34 per kilogram, while Channel-II (Producer-Retailer-Consumer) had a lower cost of ₹26.54 per kilogram. In Channel-I, the marketing margins per

kilogram were ₹78.42 for the producer, ₹26.50 for the wholesaler, and ₹36.20 for the retailer. In Channel-II, the margins were ₹78.42 for the producer and ₹36.50 for the retailer. The price spread, indicating the difference between the producer price and the consumer price, was ₹70/kg for Channel-I and ₹40/kg for Channel-II. This suggests that Channel-II is more cost-effective, with lower marketing costs and a smaller price spread, compared to Channel-I.

Table 11: Marketing cost of Turmeric powder (₹)

Sr. No.	Particular	Channel - I (P-W-R-C)		Channel - II (P-R-C)	
		500 g	1000 g	500 g	1000 g
A	Cost incurred by producer				
1	Production cost	54.27	108.54	54.27	108.54
2	Labour charges	1.40	1.00	1.40	1.00
3	Transportation charges	1.20	0.90	1.20	0.90
4	Miscellaneous charges	2.15	1.60	2.15	1.60
5	GST (18 %)	9.77	19.54	9.77	19.54
	Sub total	68.79	131.58	68.79	131.58
6	Margin of Producer	51.21	78.42	51.21	78.42
7	Selling price	120.00	210.00	120.00	210.00
B	Cost incurred by Wholesaler				
1	Purchase price	120.00	210.00		
2	Labour charges	1.30	1.00		
3	Transportation charges	0.75	0.50		
4	Miscellaneous charges	1.50	2.00		
	Sub total	123.55	213.50		
5	Margin of wholesaler	11.45	26.50		
6	Selling price	135.00	240.00		
C	Cost incurred by retailer				
1	Purchase price	135.00	240.00	120.00	210.00
2	Labour charges	1.30	1.00	1.30	1.00
3	Transportation charges	1.50	1.30	1.50	1.00
4	Miscellaneous charges	1.20	1.50	1.20	1.50
	Sub total	139.00	243.80	124.00	213.50
5	Margin of retailer	16.00	36.20	16.00	36.50
6	Consumer price	155.00	280.00	140.00	250.00
7	Price spread	35.00	70.00	20.00	40.00

Conclusion

The financial appraisal of Kohinoor Turmeric Mill reveals a strong economic foundation and promising growth trajectory. The unit demonstrates efficient capital allocation, particularly in infrastructure and machinery, contributing to cost-effective production of turmeric powder. Key financial indicators such as a high benefit-cost (B:C) ratio, favorable internal rate of return (IRR), and an acceptable payback period reflect prudent financial management and sustained market demand. Furthermore, the adoption of Channel-II for marketing has contributed to enhanced operational efficiency and profitability. These findings highlight the critical role of strategic investment decisions, market-oriented approaches, and operational optimization in ensuring the economic sustainability and scalability of agro-processing enterprises. In view, the case of Kohinoor Turmeric Mill underscores the significance of targeted support for agro-processing units through access to affordable capital, infrastructure development, and market linkage facilitation. Policymakers should consider promoting decentralized agro-processing enterprises by offering financial incentives, capacity-building programs, and marketing infrastructure. This would not only enhance rural entrepreneurship but also contribute to value addition, employment generation, and income stability in agricultural communities.

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