सत्यमेव जयते

Nanaji Deshmukh Krishi Sanjeevani Prakalp (PoCRA)

Maharashtra Project on Climate Resilient Agriculture

(Project of Government of Maharashtra in Partnership with the World Bank)

DETAILED PROJECT REPORT

(Template)

Turmeric Powder Unit

Prepared as a part of

Memorandum of Understanding (MoU-IV)

Between

Nanaji Deshmukh Krishi Sanjeevani Prakalp (PoCRA)

And

Indian Institute of Technology, Bombay

2022

Project Management Unit (PMU), PoCRA

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1 Introduction: Turmeric as commodity

Curcuma Longa L. is the scientific name for turmeric. It is a member of the "Zingiberaceae" family. It's a South East Indian and Indonesian native. It's a common ingredient in foods, pharmaceuticals, and other products. It's also used in the textile business to make oils, ointments, and poultices, as well as in cosmetics to make natural and herbal creams, lotions, and hair dye. Turmeric, the principal spice powder in Indian cuisine, is often regarded as the world's most powerful herb for combating and possibly reversing disease. Turmeric is an annual crop, although it is produced as an erect perennial crop. It's widely utilized in the food, textile, pharmaceutical, and cosmetic sectors. Turmeric is grown in both tropical and subtropical climates.

1.1 Composition of turmeric

The detail chemical composition is mentioned in Table 1-1

Table 1-1 Composition & Nutritive Value of Turmeric (per 100 g of edible portion), fresh weight basis

Principle	**Nutrient Value**	**Percentage of RDA**
Energy	354 Kcal	17%
Carbohydrates	64.9 g	50%
Protein	7.83 g	14%
Total Fat	9.88 g	33%
Cholesterol	0 mg	0%
Dietary Fiber	21 g	52.5%
Vitamins		
Folates	39 µg	10%
Niacin	5.140 mg	32%
Pyridoxine	1.80 mg	138%

Riboflavin	0.233 mg	18%
Vitamin A	0 IU	0%
Vitamin C	25.9 mg	43%
Vitamin E	3.10 mg	21%
Vitamin K	13.4 µg	11%
Electrolytes		
Sodium	38 mg	2.5%
Potassium	2525 mg	54%
Minerals		
Calcium	183 mg	18%
Copper	603 µg	67%
Iron	41.42 mg	517%
Magnesium	193 mg	48%
Manganese	7.83 mg	340%
Phosphorus	268 mg	38%
Zinc	4.35 mg	39.5%

Source: USDA National Nutrient Database

1.2 Production of turmeric in PoCRA district

The production turmeric in PoCRA region has increased significantly in last 5 years from 1.23 lakh metric tons in 2016-17 to 2.71 lakh metric tons in 2020-21. The area under cultivation of turmeric in the region has increased from 7.12 thousand hectare to 52.16 thousand hectare in 2020-21. In last 5 years, the average annual production of turmeric in PoCRA region has been 3.52 lakhs tons. Table 1-2 shows major species grown the PoCRA region and their range of curcumin content. Figure 1.1 Table 1-1shows the production distribution of Turmeric in PoCRA and non-PoCRA districts

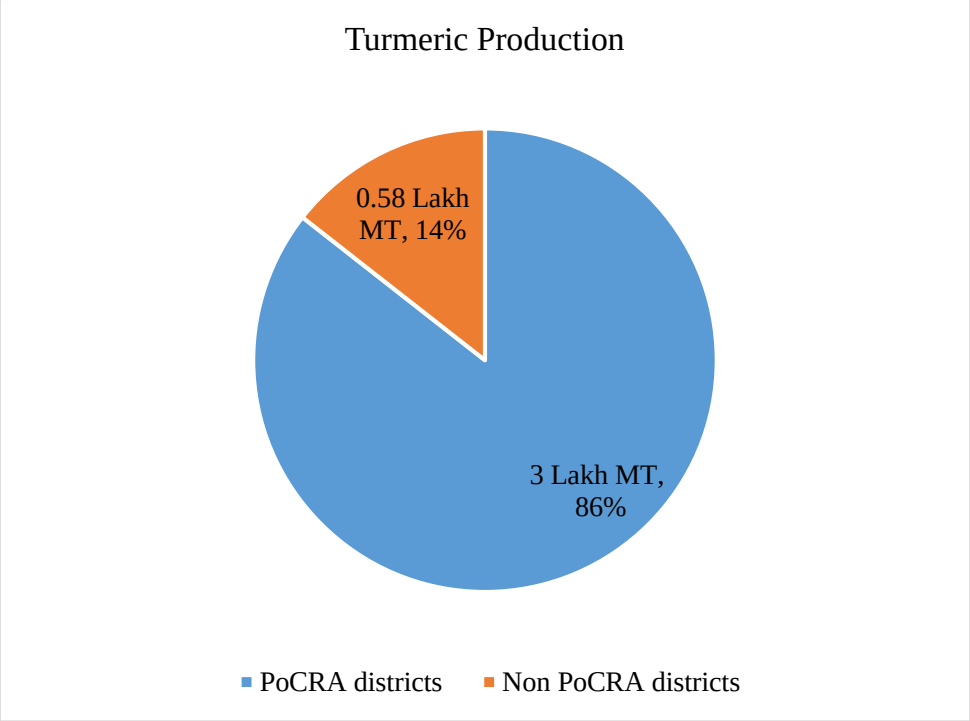


Figure 1.1 Production of Turmeric in Maharashtra with respect of PoCRA and Non-PoCRA districts

Table 1-2 Spices of turmeric in PoCRA region

Species of turmeric	**Approx curcumin content**
Pratibha	3.5-7.7 %
Selam	2.2-5.9 %
Rajapuri	2.8-4.4 %
Krishna	1.6-3.5 %

Figure 1.2 shows the distribution of turmeric in PoCRA region. The three major producing districts are Hingoli, Washim and Yavatmal. Since the quality of turmeric is dependent on its curcumin content, the species that are grown in the region need to be considered.

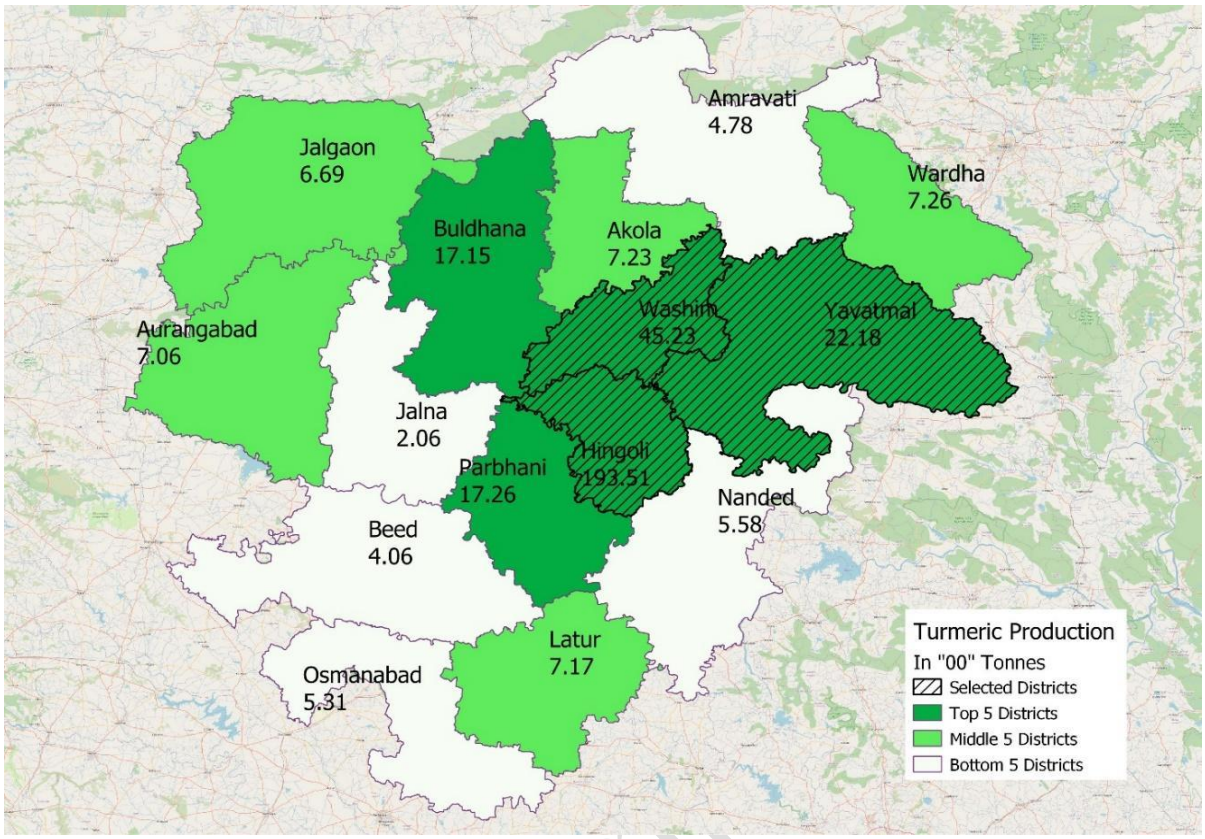


Figure 1.2Production of Turmeric in PoCRA districts

1.3 Quantum of turmeric in visited FPCs

The field work suggested that the quantum of soybean in FPCs was variable and a summary of the observed quantum is presented in Table 1-3. Four categories of quantum being <10MT/annum, 10-100MT/annum, 100-500MT/annum and >500MT/annum was made. Most of the visited FPCs dealt in >100MT/annum. The purpose of field visit as stated in section 16 was to understand ground realities and current practices of FPCs. Moreover, the field work was a sample survey comprising of a small sample size, therefore generalization of quantum based on geography, capacity of FPCs etc would be inappropriate.

Table 1-3 Quantum of Turmeric in visited FPCs

Quantum Commodity	**<10 MT/annum**	**10 to 100 MT/annum**	**100 to 500 MT/annum**	**> 500 MT/annum**
Turmeric	2 (H-2)	1 (H-1)	2 (A-1 , H-1, L-1, W-1)	1 (H-1)

A- Aurangabad, H- Hingoli, , L- Latur, W- Washim

The current soybean related activities in most of the FPCs comprised on trading. No other processing activities were observed during field visits.

2 Proposed value added product

Given the high medicinal value and multiple uses in various industries such as nutraceuticals, textile, food etc. turmeric and its value added products have the potential to seek high prices as well as have high demand in the market. Figure 2.1 shows the potential value added products of turmeric rhizomes. The most commonly used is turmeric powder. Other popular products are curcumin powder, oleoresin and volatile oil. The subsequent sections describe processing of turmeric powder and curcumin powder along with oleoresin from dried turmeric rhizomes.

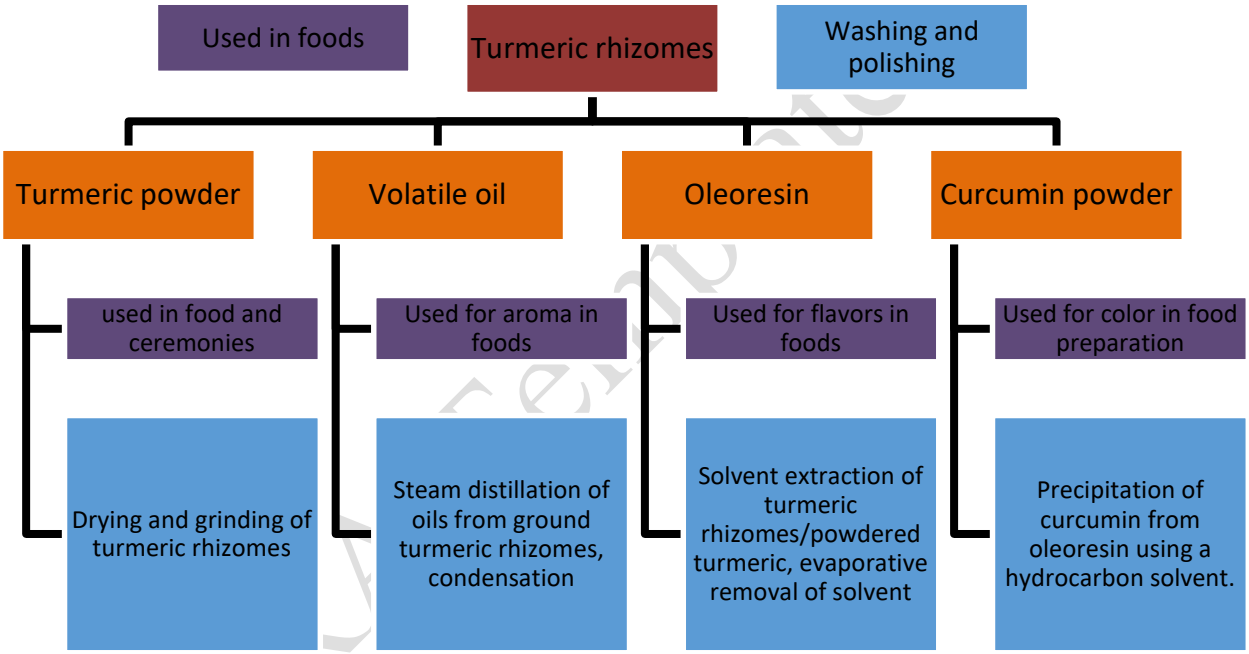


Figure 2.1Potential value added products of turmeric rhizome

The turmeric is most commonly consumed as its powder. The detail process of getting turmeric powder from the cultivated rhizomes along with the financial and sensitivity analysis is given in the following section.

2.1 Market demand and Potential of Turmeric powder and Curcumin

India is the world's leading producer, consumer, and exporter of turmeric. Turmeric was grown on 1.94 lakh hectares in India in 2016-17, with a production of 10.51 lakh tonnes. Turmeric production is estimated to be over 11 lakh tonnes per year worldwide. India leads the global production scenario with 78 percent, followed by China (8 percent), Myanmar (4

percent), and Nigeria and Bangladesh, which together account for 6% of global production. With a share of around 76 percent of total worldwide output and 90 percent of global trade, India is effectively a monopolistic provider to the world. Among Indian states, Maharashtra is second top producer and contributes around 18.57% in the total turmeric production.

The increasing urbanization offers huge market for readily available Turmeric powder packaged attractively and merchandised in organized urban platforms such as departmental stores, malls, super markets. Moreover, the increasing demand for natural products as food additives makes turmeric powder an ideal candidate as a food colorant, thus increasing demand for it

Curcumin has been shown to lower blood cholesterol in studies conducted over the previous five decades. The major yellow bioactive component of turmeric, curcumin (diferuloylmethane), has been proven to have a wide range of biological activities. Its anticancer activity is primarily mediated by apoptosis induction. Curcumin's potential as a therapy for Alzheimer's disease, viral infections, inflammation, malignancies, gastrointestinal disorders, and other conditions has prompted much research and development. It is certainly clear that the medicinal properties of curcumin generates its huge demand in the pharmaceutical industry. India is the world's largest producer of curcumin, accounting for more than 80% of global production. The worldwide curcumin showcase measure is anticipated to reach USD 99.3 million by 2024 and USD 151.9 million by 2027, growing at a CAGR of 12.7%. The pharmaceutical application segment led the market in 2020 with the highest revenue share of more than 51%. The segment is estimated to expand further at the fastest CAGR from 2020 to 2028. For many centuries, curcumin has been widely used in traditional Asian herbal medicines to treat infections and inflammation. The cosmetics application segment is estimated to have significant growth over the forecast period.

Sudden outbreak of the COVID-19 pandemic has led to the increasing utilization of curcumin in the healthcare sector based on its anti-inflammatory, anti-oxidative, anti-fungal, and anti-bacterial properties that help in treating the viral infection. Global market for curcumin was record at over USD 70 million in 2020 and will expand at more than 11% CAGR through 2027. In Europe, the application of curcumin in the pharmaceuticals sector accounted for a share of 57.2% in terms of revenue in 2019 owing to increasing focus on the marketing of capsules/tablets that offer aid to the immune system, joint, and digestive health.

Some of the major players in the global curcumin market include Arjuna Natural Pvt Ltd., Biomax Life Sciences Limited., Helmigs Prima Sehejtera, Herboveda India Pvt. Ltd., Hindustan Mint & Agro Products Pvt. Ltd., Konark Herbals & Healthcare, Rosun Natural Products Pvt. Ltd., Sabinsa Corporation, Star Hi Herbs Pvt. Ltd., SV Agrofood, Synthite Industries Ltd., and Wacker Chemie AG.

Since, PoCRA region, especially Hingoli has recently become the epicentre of turmeric trade in the state, availability of raw material for processing should be comfortable. Also, the established demand of turmeric powder and curcumin in regional, national and international markets make turmeric powder and curcumin proposition advantageous for the FPCs.

3 Techno-economic analysis of turmeric powder

The following section describes the process and financial analysis of turmeric powder manufacturing plant.

3.1 Process flow diagram

The process involved in manufacturing turmeric powder are as follows: boiling, drying, polishing, grinding, sieving and packaging. Figure 3.1 presents the process flow diagram.

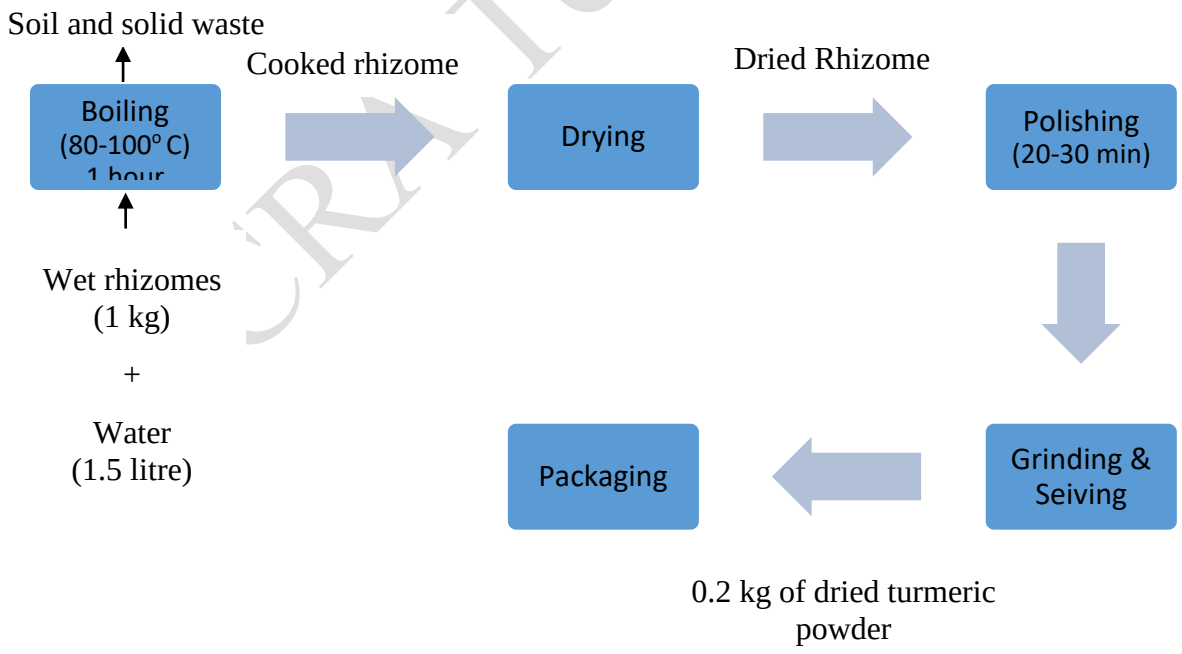


Figure 3.1 Process flow diagram of turmeric powder processing

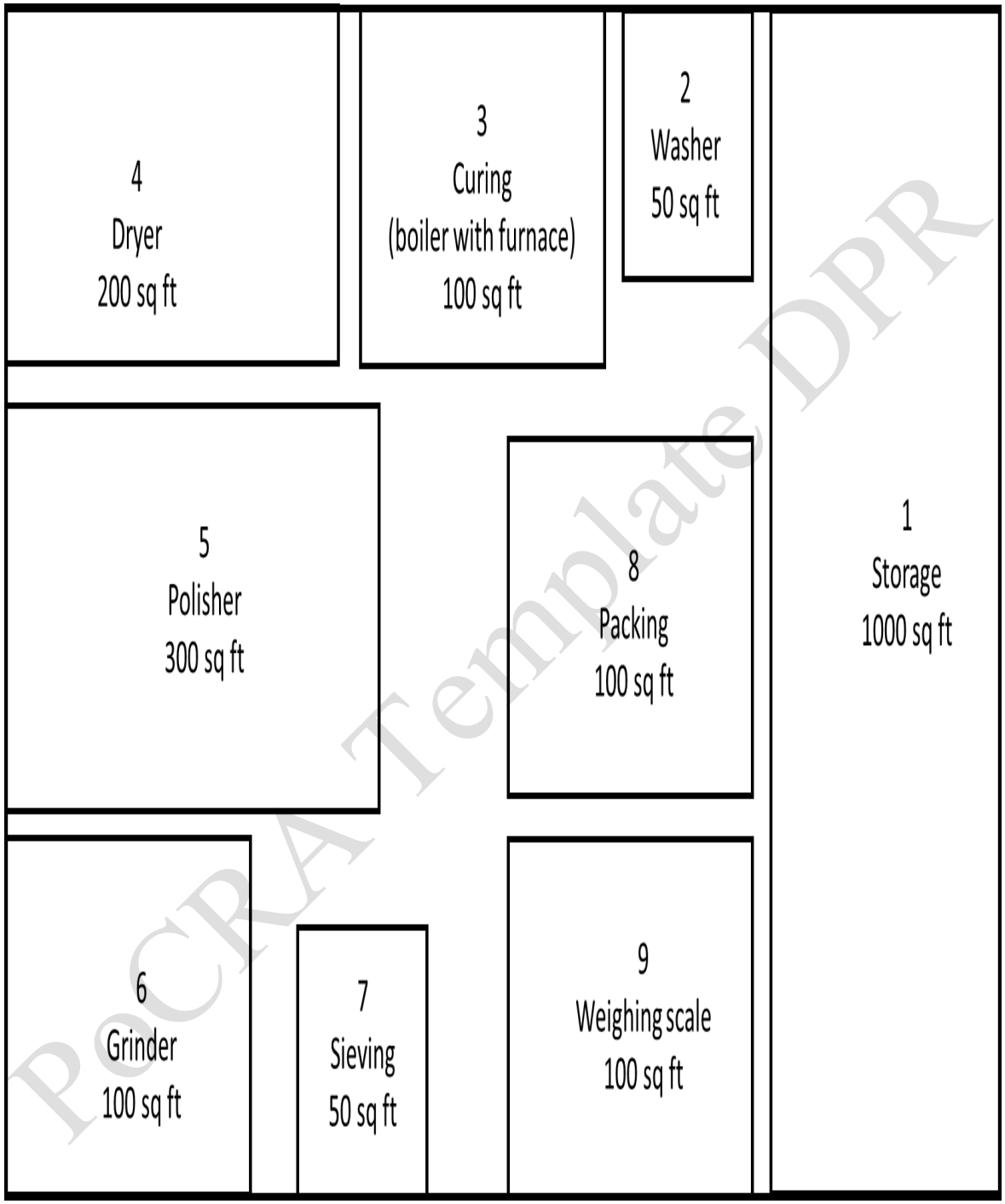
Boiling is the first post-harvest operation to be performed during turmeric powder processing which involves cooking of fresh/wet rhizomes in water until soft before drying. Boiling destroys the vitality of fresh rhizomes, avoids the raw odour, reduces the drying time and yields uniformly coloured product. An effective cooking time of 45 to 60 minutes for fingers and 90 minutes for mother rhizomes is considered essential at around 80-100o C. The next process is drying which involves removal of moisture from cooked rhizome. Different technologies for drying are available such as vacuum drying, microwave drying and solar drying. The choice of dryer depends on the economics of the plant. Usually, at farm level, the most common drying technique is sun drying however in a processing unit sophisticated drying such as vacuum and microwave is preferred. Dried turmeric has poor appearance and rough dull outer surface with scales and root bits.

The appearance is improved by smoothening and polishing the outer surface by manual or mechanical rubbing. Usually 5 to 8%of the weight of turmeric is the polishing wastage during full polishing and 2 to 3% during half polishing. The polished turmeric fingers are subjected to grinding. Grinding is one of the most common operations used to prepare turmeric powder for consumption and resale. The main aim of particular spice grinding is to obtain smaller particle sizes, with good product quality in terms of flavour and colour. There are different ambient grinding mills and methods available for this process; such as hammer mill, attrition mill and pin mill. Ground spices are size sorted through screens, and the larger particles can be further ground. The screens usually used are 60 - 80 mesh size.

The turmeric powder is packed in packaging materials that deal with the common deteriorating factors of turmeric powder such as hygroscopicity, loss of aroma/ flavour, discoloration, insect infestation and microbial contamination. The volatile oil present in the spice product has a tendency to react with the inner/ contact layer of the packaging material, at times leading to a greasy and messy package with smudging of the printed matter.

3.2 Plant Layout

Figure 3.2 presents the layout of turmeric processing unit.



Built up area: 2500 sq ft, Storage area: 1000 sq ft

Figure 3.2 Plant layout of turmeric processing unit

3.3 Financial analysis

Table 3-1 presents the financial analysis for a Turmeric powder processing unit of 200 kg/hr capacity. The assumptions and costs are considered after through study of literature and contact with manufacturers/vendors. Since, the availability of wet rhizome is limited to 3 to 4 months per year, therefore this analysis considers 120 days of plant operation per year. To effectively utilize the plant capacity (since it is operating for 120 days only), two work shift of 8 hours each is used for the analysis and based of these considerations, the annual raw material requirement (wet rhizomes) is estimated to be around 384 tonnes. The fixed cost (capital investment) include the cost of machinery, civil construction, taxes and pre-operative expenses. It is assumed that the land is already available with the FPC and only civil construction cost is applicable. The operating or variable cost include the salaries of staff, cost of raw material, power/electricity, maintenance and contingency. The costs of individual items is mentioned in Table 3-1.

As mentioned in the process flow diagram in Figure 3.1, 1 kg of wet rhizome produces 0.2 kg of turmeric powder. Therefore the annual production of the plant at full capacity is 76.8 tonnes. Assuming a wholesale selling price of turmeric powder as Rs. 160 /kg, the annual income of the plant is estimated as Rs. 1,22,88000. Considering the life of plant as 10 years, the Net Present Value (NPV) is calculated to be Rs ₹ 1,07,00,670 at a discount rate of 10%. The calculation indicate an internal rate of return (IRR), benefit to cost ratio (BCR) and discounted payback period (DPBP) as 33%, 1.49 and 3.37 years respectively. Since, the value of IRR is in the acceptable range while BCR is more than one, it could be inferred that the turmeric powder processing unit of the proposed capacity is convincingly profitable.

Table 3-1 Financial summary of turmeric powder processing unit (2q/hr)

Value addition intervention- Turmeric powder processing unit		**Remarks/Details**	**Values**
A. Plant capacity per annum (MT)			384
A.1	*Plant capacity per hr (kg)*		200
A.2	*Number of operating days*		120
A.3	*Number of shifts per day*	8 hrs per shift	2
A.4	*Raw material input per annum*		384000
B. Capital Investment			

B.1	*Cost of machine excluding taxes (Washer, curing boiler, dryer, polisher, grinder, siever)*			3626100
B.2	*Accessories*			
	B.2.1	Packing machine		574350
	B.2.2	Weighing scale		20000
	B.2.3	Utensils		114900
B.3	*Land (plant area-sqft)*		Land already available with FPC-Assumed	2500
	B.3.1	Civil Work including water tank and electrical work	Construction cost 200/sqft + utility cost 300/sqft (Electrical)	1250000
B.4	*Pre-Operational Expenses*			
	B.4.1	GST	18%	5115670
	B.4.2	Licencing, registration, documentation, accountant fees		300002
	B.4.3	Training, Installation and delivery charges	10% of equipment cost	433531
	B.4.4	iii. Office Furniture & Equipment		50000
	B.4.5	iv. Miscellaneous		50000
B.5	*Total Capital Investment*			7199204
C. Annual Expenses				
D.1	*Interest on Loan@ 10%pa*		Considering x% of capital cost is loaned by FPC	287968
D.2	Salaries			247000
	D.2.1	Manpower cost	3 per shift-Rs.8000/month, 1 manager-Rs.15000/month	207000
	D.2.2	Marketing cost per annum	40000 per annum	40000
D.3	*Raw Material cost*			
	D.3.1	Raw Turmeric cost		5760000
	D.3.2	Packaging material	1/- per kg of produce	384000
D.4	*Power Consumption*			
	D.4.1	Unit consumed per annum		100363
	D.4.2	Cost of Electricity	Rs. 10/kWhr	1003635

D.5	*Cost of water*		1 kg rhizome = 1.5 litre water, Plain water at Rs. 0.12/litre	69120
D.6	*Maintenance*			30000
D.7	*Contingency*		5% of total fixed cost	359960
D.8	*Depreciation*			
	D.8.1	Depreciation on Furniture	at 10%	5000
	D.8.2	Depreciation on Machines	at 10%	422044
	D.8.3	Depreciation on Civil work	at 10%	125000
D.9	*Total Annual Expenses (D.1 : D.8)*			8693727
E. Total production per annum			20% recovery from wet rhizomes	76800
F. Cost of Production			Rs/kg	113.19
G. Annual Income (Full capacity)			Turmeric powder selling price - Rs. 160/kg	12288000
H. Economic Indicators			Plant life: 10 years. Capacity Utilization : Year 1- 50% , Year 2 – 65%, Year 3 – 80%, Year 4 onwards 100%	
G.1	*Net present value (NPV)*		In Rs.	₹ 1,07,00,670
G.2	*Internal rate of return (IRR)*		%	33
G.3	*Benefit to cost ratio (BCR)*			1.49
G.4	*Discounted payback period*		In years	3.37

3.4 Sensitivity analysis

To understand the impact of fluctuation of variables on the returns, a sensitivity analysis is done. Those variables are chosen which might vary in real time situations. These variables are cost of wet rhhizome, cost of packaging material, turmeric powder selling price, capital investment, operating days and plant capacity. A variation of ± 30% in the variables is considered for this analysis while its impact on the BCR is studied. The plant capacity is varied at 100 kg/hr, 200 kg/hr (base case) and 300 kg/hr. The analysis is done by changing one variable at a time while keeping others constant.

Figure 3.3 shows the results of the sensitivity analysis. The base case-200 kg/hr is taken as benchmark to understand the variation due to each variable. As seen in Figure 3.3, turmeric powder selling price is the most sensitive variable as it causes the highest variation. Similarly, in the order of sensitivity, wet rhizome cost, operating days and plant capacity are the next

three sensitive variables. Cost of packaging material turns out to be the least sensitive, meaning that by changes in cost of packaging material doesn't affect the BCR significantly as compared to other variables. It could also be observed in Figure 3.3 that the BCR in certain scenarios is less than 1, suggesting that those scenarios should be avoided to prevent losses.

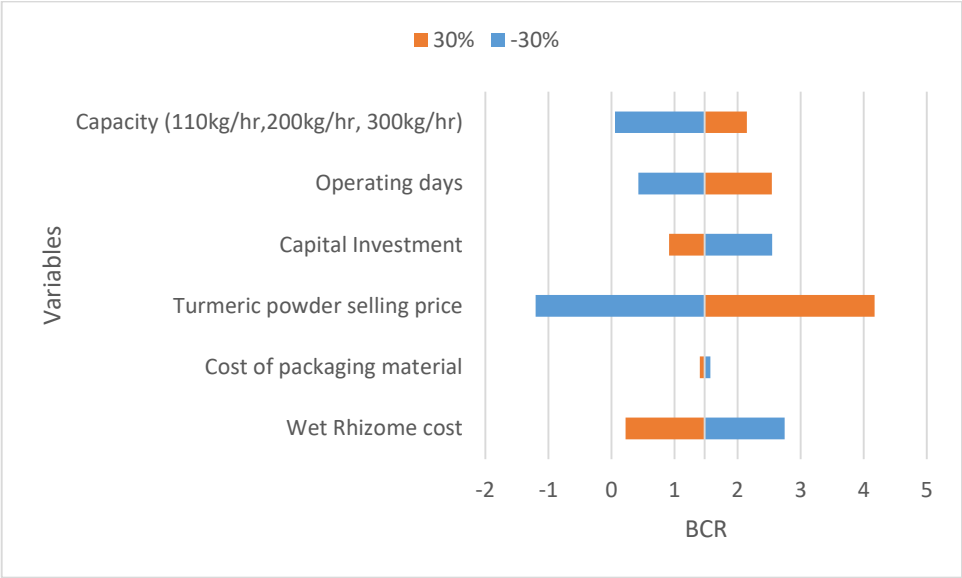


Figure 3.3 Sensitivity analysis of Turmeric powder processing unit

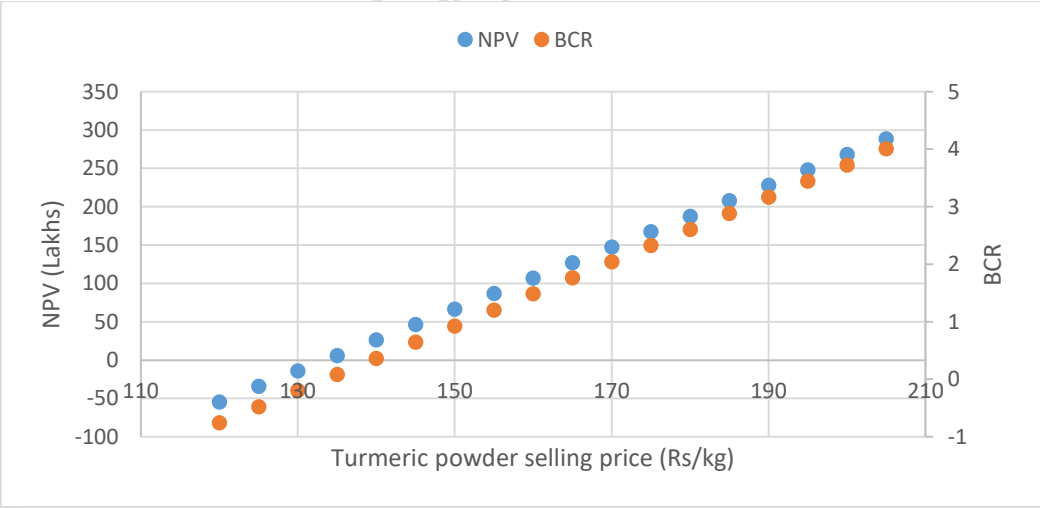


Figure 3.4 NPV and BCR vs Turmeric powder selling price

Since turmeric powder selling price is observed to be the most sensitive parameter, another study is performed to understand the variation of turmeric powder selling price with NPV and BCR. The purpose of this study is to identify threshold values of turmeric powder selling price, below which the turmeric powder should not be sold to avoid losses. The cost of production of turmeric powder is estimated as Rs. 113.19/kg which means selling turmeric powder higher

than Rs. 113.19/kg would be profitable. However, as suggested in Figure 3.4, for positive NPV, the turmeric powder selling price should be above Rs. 133.47/kg. Also, considering a BCR more than 1, the minimum value for selling turmeric powder should be more than Rs. 151.3/kg. It could be inferred that an appropriate price for selling the turmeric powder should be above Rs. 151.3/kg while to achieve a BCR of 2, 3 and 4 the prices should be Rs. 169/kg, Rs. 187/kg and Rs. 205/kg respectively.

As mentioned above, turmeric is also processed to get curcumin powder and oleoresin which contribute as the mail component which give medicinal properties to the commodity. The following section explains detail techno-economic analysis of curcumin extraction plant along with financial analysis.

3.5 Conjoint analysis

Three cases of raw material prices (fresh rhizome) are developed for conjoint analysis.

Low – Rs. 12/kg

Baseline – Rs. 15/kg

High - Rs. 18/kg

The effect on NPV of variation in raw material price and turmeric powder selling price is shown in Figure 3.5. Similarly, the effect of variation in raw material price and operating days in shown in Figure 3.6. The project viability is negative (NPV<0) in high case with low milk selling price and less operating days. Therefore these scenarios should be avoided for profit viability.

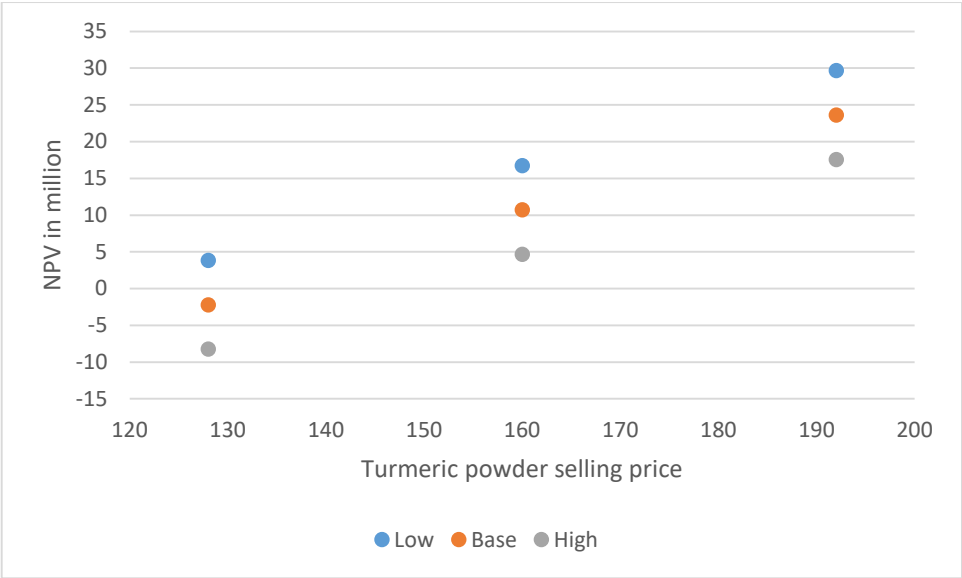


Figure 3.5 Effect of turmeric powder selling price and raw material price on NPV

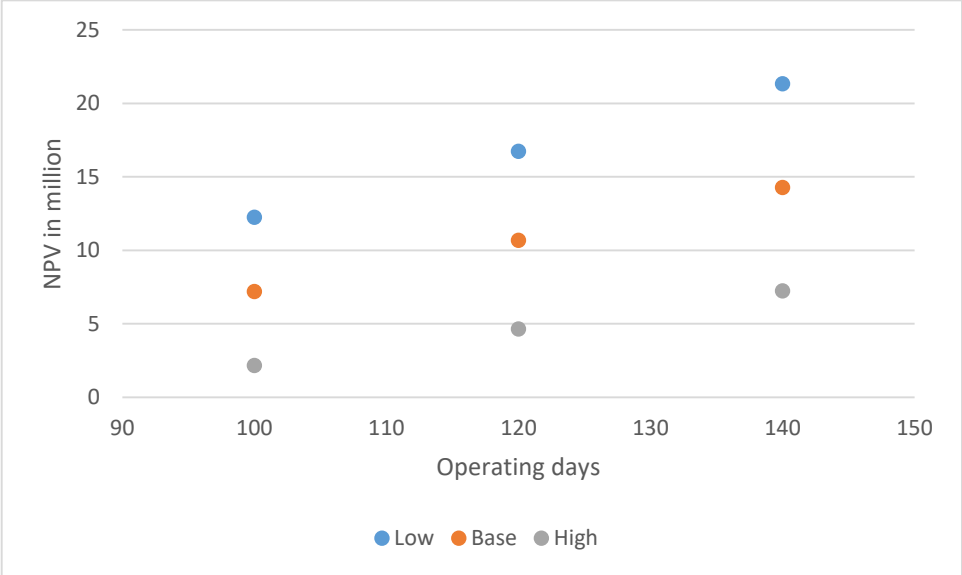


Figure 3.6Effect of operating days and raw material price on NPV in turmeric processing plant

3.6 Breakeven points

The project is profitable only when the selling price of turmeric powder is above ₹155/kg. The project is profitable when the selling price of turmeric powder is at least ₹130 in case of low case scenario, ₹ 140 in case of base case scenario and ₹ 150 in case of high case scenario.

3.7 Monte Carlo simulation (Uncertainty analysis)

A Monte Carlo simulation has advantages over sensitivity analysis to estimate the uncertainty in a project. The parameters that may vary in soymilk processing plant simultaneously are as mentioned in Table 3-2.

Table 3-2 Range of uncertain parameters considered for Monte Carlo simulation of turmeric powder processing unit

Parameter	**Min**	**Max**
Fresh Rhizome (Raw material)	12	18
Turmeric powder selling price	140	180

The simulation results in terms of NPV and BCR are shown in Figure 3.7 and Figure 3.8respectively. Ten thousand scenarios are generated using the range of uncertain parameter to capture every possible real life scenario. The blue bars indicate a favourable scenario while a red bar is an unfavourable scenario. A probability that among all the scenarios, the plant would have a positive NPV is 100% while that the plant will have a BCR greater than one is 69%.

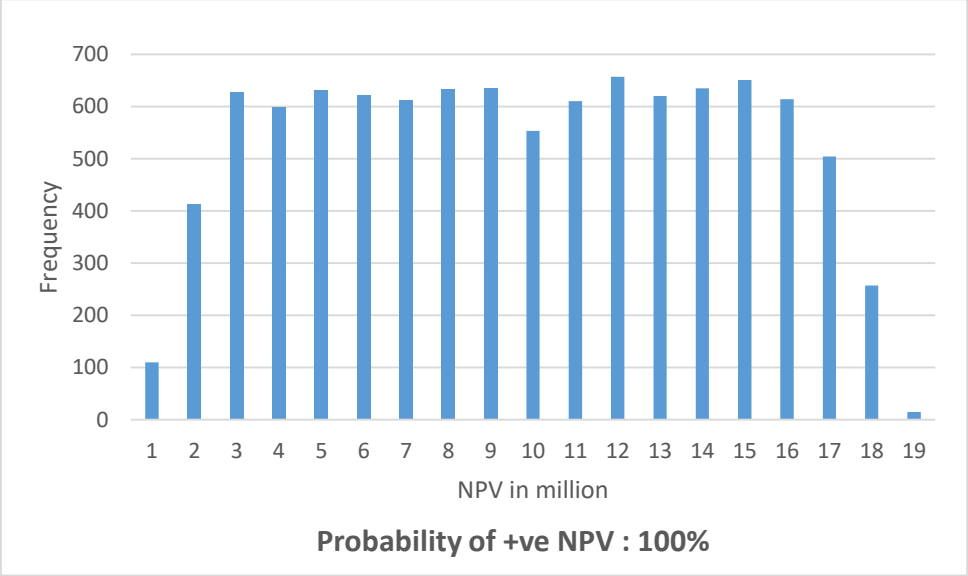


Figure 3.7 Histogram showing Monte Carlo simulation w.r.t to NPV for turmeric powder plant

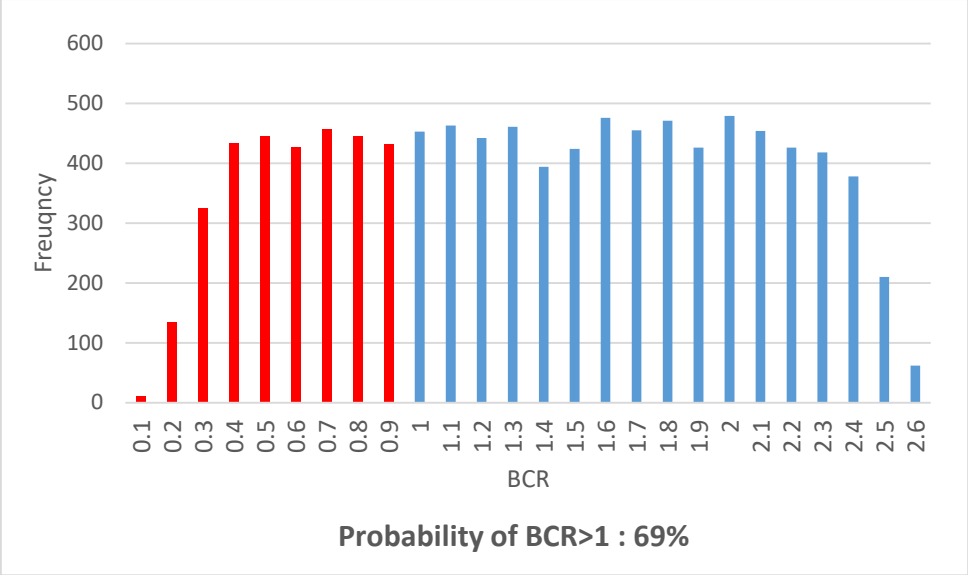


Figure 3.8Histogram showing Monte Carlo simulation w.r.t to BCR for turmeric powder

4 SWOT analysis

Strength	Weakness
• Processing is simple and equipment are easily available in local markets • Shelf life of finished product (Turmeric powder) is high	• Fresh rhizome availability is limited to 90-120 days • The curcumin content is highly dependent on turmeric variety
Opportunities	**Threats**
• Huge demand in regional, national and international markets • Advanced technologies are available to upgrade and improve the recovery rate	• Informal and non-standardized processing units sell turmeric powder at very cheap rates with adulteration. • Local nexus of traders could reduce the profit margin

5 Forward and Backward linkages

Following is the list of Turmeric powder wholesaler:

Sohan Enterprises, Post Jejuri, Palkhi Maidan, Taluka Purandar, Vetaleshor Nagar Near Palkhi Maidan, Pune - 412303, Maharashtra, India

Radha Kishan Gobind Ram Ltd, C 23, Lawrance Road Industrial Area Delhi - 110035, India

Gandhi Spices Private Limited, Para Bazar, Golpith Chowk, Satta Bazaar, Rajkot - 360001, Gujarat, India

The entrepreneur must provide tentative supplier list and quotations with respect to his project. However, there are many machinery suppliers available within India for Turmeric powder processing machineries and equipment. Following is the list of Turmeric powder processing equipment suppliers

Boilers

Microtech Boilers Private Limited Plot No. 105, Road No. 7, GIDC, Kathwada Ahmedabad - 382430, Gujarat, India

Ashoka Machine Tools Corporation, D- 62-67, Epip Site- V, Kasna G. Buddha University, Greater Noida - 201301, Uttar Pradesh, India

Brickvision Equipments Private Limited 201, 202 Mahakalika Complex, Katraj Bypass, Ambegaon Pune - 411046, Maharashtra, India

Dryers

Acufil Machines, S. F. No. 120/2, Kalapatty Post Office Coimbatore - 641 035 Tamil Nadu India Tel: +91 422 2666108/2669909

Bombay Engineering Works, 1 Navyug Industrial Estate 185 Tokersey Jivraj Road Opposite Swan Mill, Sewree (W) Mumbai 400015 India Tel: +91 22 24137094/24135959

Planters Energy network (PEN), No 5, Power House 3rd Street, N R T Nagar Theni 625531 Tamil Nadu India Tel: +91 4546 255272

Slicing machines

Central Institute of Agricultural Engineering, Nabi Bagh Berasia Road Bhopal 462 038 Madhya Pradesh India Tel: +91 755 2737191 Eastend Engineering Company 173/1 Gopal Lal Thakur Road
Calcutta 700 035 India Tel: +91 33 25536937

Gardners Corporation 158 Golf Links New Delhi 110003 India Tel: +91 11 3344287/3363640

Cleaning/abrasive machines

Central Institute of Agricultural Engineering India (see above)

Gardners Corporation India (see above)

Rajan Universal Exports Post Bag no 250 162 Linghi Chetty Street Chennai 600 001 India Tel: +91 44 25341711/25340731/25340751

Milling and grinding machines

Central Institute of Agricultural Engineering India (see above)

Gardners Corporation India (see above)

Premium Engineers PVT Ltd India (see above)

Rajan Universal Exports PVT Ltd India (see above)

Packaging and labelling machines

Acufil Machines India (See above)

Gardners Corporation India (see above)

Gurdeep Packaging Machines Harichand Mill compound LBS Marg, Vikhroli Mumbai 400 079 India Tel: +91 22 2578 3521/577 5846/579

6 List of Statutory Clearances Required

The following table mentions the list of statutory clearances required to set up the processing unit of soy milk/tofu.

S.NO.	Approval and Clearances required	Departments/Offices to be consented
1	State Investment Promotion Board, Stage – I clearance	Department of Industries

2	Environmental clearance	Maharashtra State Pollution Control Board
3	GST registration	Commercial Taxes
4	Change in land use	Land revenue department
5	Sanction and supply of power	DISCOM
6	Sanction and supply of water	

7 Food safety standards for turmeric powder processing unit

FSSAI have certain regulations for turmeric rhizome and powder to ensure food safety. The rhizome be in natural state or machine polished. The product shall have characteristic odour and flavour and shall be free from mustiness or other foreign flavours. It shall be free from mould, living and dead insects, insect fragments, and rodent contamination. The product shall be free from Lead Chromate added starch and any other extraneous colouring matter. The Indian standards for turmeric follow the Agmark Specifications (Agricultural Directorate of Marketing) to ensure quality and purity of the products. As per Agmark standards, turmeric rhizome shall conform to the following standards:— (i) Extraneous matter Not more than 1.0 percent by weight (ii) Defective Rhizomes Not more than 5.0 percent by weight (iii) Moisture Not more than 12.0 percent by weight (iv) Insect damaged matter Not more than 1.0 percent by weight (v) Test for lead chromate Negative

The powder shall have characteristic odour and flavour and shall be free from mustiness or other foreign odour. It shall be free from mould, living and dead insects, insect fragments, and rodent contamination. The powder shall be free from any added colouring matter including Lead Chromate and morphologically extraneous matter including foreign starch. As per

Agmark standards, turmeric powder shall conform to the following standards: — (i) Moisture Not more than 10.0 percent by weight (ii) Total ash on dry basis Not more than 9.0 percent by weight (iii) Ash insoluble in dil. HCl on dry basis Not more than 1.5 percent by weight (iv) Colouring power expressed as Not less than 2.0 percent by weight curcuminoid content on dry basis (v) Total Starch Not more than 60.0 percent by weight (vi) Test for lead chromate Negative.