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ECONOMIC PERFORMANCE OF BHAGAR PROCESSING UNITS IN NASIK DISTRICT

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ABSTRACT----------

The agro-processing sector is pivotal in boosting agricultural productivity and rural livelihoods, especially through value addition to crops like millets. This study examines the economic viability and operational dynamics of Bhagar (barnyard millet) processing units in Nasik district, Maharashtra – a region where millet cultivation is integral to the rural economy. With rising interest in climate-resilient and nutritious foods, Bhagar offers strong commercialization potential. The research evaluates cost structures, profitability, and growth patterns across small (<100 quintals), medium (100–150 quintals), and large (>150 quintals) processing units using primary data from 2022–2023 and secondary data from 2012–2023. Findings provide insights into the economic sustainability of Bhagar processing and its role in promoting rural agro-industrial development.

KEYWORDS: *Agro-Industry, Sustainable, Profitability, Production, Processing Unit, Cost.* ----------

INTRODUCTION

Millets are the storehouse of many micro nutrients. These are dietary staple foods and the main source of protein in most of the rural households. Globally, millets are the sixth most cultivated grains after rice, wheat, corn, barley and sorghum. They are very much suited to drought conditions and have great natural biodiversity. These can be cultivated in a variety of locations. They are one of the oldest foods known to humans and possibly the first cereal grain to be used for domestic purpose. Millets are grown on marginal lands by some of the poorest and marginalised communities particularly by tribes in the dry land and hilly region. Most of the fields are inherently bio-diverse and farmer grows millets as a mono crop. They grow millets in combination with a host of pulses, legumes, vegetables and oilseeds.

Small millets are grown across almost every region of India, yet their distribution remains uneven due to regional preferences, climatic conditions, and agronomic practices. Among these, finger millet stands out, with Karnataka alone accounting for 65% of the area and production as of 2019–20, followed by Uttarakhand and Tamil Nadu. Interestingly, Tamil Nadu leads in productivity, achieving 3246 kg/ha, well above the national average of 1697 kg/ha. Other small millets like kodo and little millet are predominantly cultivated in Madhya Pradesh, while foxtail millet is important in Andhra Pradesh and Karnataka. Barnyard and proso millets thrive in the hilly regions of Uttarakhand, the Northeast, and parts of northern and western India. Brown top millet remains limited to small dryland tracts on the Karnataka-Andhra Pradesh border. Overall, Karnataka emerges as the largest producer of small millets, contributing 56% of the national output, with Tamil Nadu and Uttarakhand following. However, states like Madhya Pradesh, despite having substantial acreage, contribute less due to lower yields and fluctuating production trends.

The processing of agricultural products has assumed great importance now a days. India is the producer as well as consumer of the millets in the world. At present consumers are dependent on processing for most of their requirements. Many technological changes have been occurred in the recent past such as the introduction of refrigeration, modern and improved methods of milling and packing food grains. These technological changes have a great impact on the standard.

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Scope and utility of study

This study focuses on Bhagar (Echinochloa spp.) processing units in the Nashik district of Maharashtra, with an emphasis on management practices, processing techniques, marketing strategies, and cost structures. The insights gained are not only relevant to Nashik but can also be applied to similar processing units across Maharashtra and India. The study aims to assess the financial health of these units by analyzing key financial indicators, helping identify areas of strength and weakness. It will support short- and long-term business planning, guide policy recommendations, and provide strategies for improving profitability. Additionally, the findings will aid in promoting agro-based industries, encouraging entrepreneurship, especially among youth, and informing consumers about production costs and fair pricing. The study holds value for business owners, managers, policymakers, researchers, and consumers alike.

METHODOLOGY

The study was carried out to analyse the growth in production, sales, financial performance, and marketing cost of *Bhagar* in Nasik district. The methodology to be adopted for the present investigation is as under,

Study Area

Nasik district of maharashtra was purposively selected. Rushabh, Ashok *bhagar* processing units. So, it has been selected purposively for the study., maintenance of detailed data and records and easy accessibility to data prompted to its selection.

Selection of Processing Units

The processing units were selected purposively for the study year 2023 on the basis of a capacity of *Bhagar* mill.

Sr.No.	Size	Capacity (Quintal)
1	Small	>100
2	Medium	100 to 150
3	Large	<150

Method of Collection of Data

The data was collected from processing unit for the year 2022-2023. The production, sales, financial information and marketing cost of the *Bhagar* was collected through personal interview with special prepared questionnaire**.** For analysis of CAGR, the secondary data from 2013-14 to 2022-23 (10 Years) for production and sales of *Bhagar* was collected from available records of the units.

Sources of Data

The study contemplates to assess the performance of *Bhagar* processing industry obviously, the data on various aspects was required.

The major aspects of data requirements were under:

1. Primary information of the units.
2. Details of production and sale of *Bhagar.*
3. Initial investment of the units.
4. Fixed and operating cost of the units.
5. Repairs and maintenance cost.
6. Fees, taxes, insurance and other relevant expenses.
7. Labours, supervisory staff and decision makers engaged with their bills, salaries and allowances.

Method of Analysis

Financial Performance Analysis

Break even analysis

The break-even point is the level of operation at which total revenue equals to total costs. The break-even point (BEP) in economics, business and specifically cost accounting is the point at which total cost and total revenue are equal, i.e., "even". There is no net loss or gain, and one has "broken even", though opportunity costs have been paid and capital has received the risk-adjusted, expected return.

a) Physical term

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

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b) Monetary term

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

RESULT AND DISCUSSION

4.3 Financial Performance of unit

Under the a forementioned heading, we explore the break-even point for *Bhagar,* the B:C ratio of the unit, compound annual growth rate (CAGR), payback period (PBP) of the units. This section provides practical understanding of the units.

4.3.1 Break-even analysis for *Bhagar* processing units

Table 4.1. Break-even point of selected *bhagar* processing unit

Sr. No.	Particulars	Unit I	Unit II	Unit III
1	Quantity of Final product (Kg)	53790	82200	138420
2	BEP (Kg)	19210.91	27928.38	37339.65
3	Total Returns (Lakh)	56.48	86.31	138.42
4	BEP (Kg)	23.05	32.12	41.07

The break-even point (BEP) represents the production level at which total revenue equals total cost, indicating the minimum quantity required to cover all expenses. The analysis shows that the **BEP increases with the scale of production,** reflecting higher cost structures in larger units.

For Unit I, the **BEP is 19210.91 kg**, requiring a minimum revenue of **₹23.05 lakh** to break even. Similarly, Unit II has a **BEP of 27928.38 kg** with a required revenue of **₹37339.65 lakh**, while Unit III, the largest unit, needs to produce **37.34 lakh kg** and generate **₹41.07 lakh** to reach its break-even point. Despite higher BEP values, **larger units also achieve significantly higher total returns,** ensuring greater profitability beyond the BEP threshold.

4.3.2 Benefit-Cost Ratio

Benefit-Cost ratio is used to compare the relative economic efficiency of different units. 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 whereas project with a benefit-cost ratio lower than 1 have greater costs than benefits, hence they have negative net benefits. A project with a BCR greater than 1.0 is predicted to provide a positive net present value for a corporation and its investors. The information related to total returns, total cost and B:C ratio of unit is presented in the Table 4.2.

Table 4.2. B:C ratio of selected *Bhagar* Processing Units

Sr. No.	Particulars	Unit I	Unit II	Unit III
1	**Total Returns (Rs Lakh)**	6237600	8611900	14715800
2	**Total cost (Lakh)**	5132505.2	6544261.1	10996716
3	**B:C Ratio**	**1.21**	**1.31**	**1.33**

The **B:C ratio** is a key profitability indicator that measures the returns generated for every rupee invested. The analysis shows that all three *Bhagar* processing units have **B:C ratios above 1,** indicating profitability.

The **B:C ratio is 1.21 for Unit I, 1.31 for Unit II, and 1.33 for Unit III.** This means that for every ₹1 spent, the returns are **₹1.21 in Unit I, ₹1.31 in Unit II, and ₹1.33 in Unit III.** While Unit III has the highest B:C ratio, suggesting the greatest cost efficiency, the difference among the units is marginal. This indicates that **scaling up production yields higher total profits, but efficiency in cost management and pricing strategy plays a crucial role in maximizing returns.**

Overall, the results confirm that ***Bhagar* processing is a profitable venture across different scales of operation.** To further improve profitability, **cost optimization, enhanced operational efficiency, and better market strategies** will be key to strengthening the B:C ratio and ensuring long-term sustainability.

Thus, the null hypothesis was rejected and alternate hypothesis state as “Business model significantly affects economic viability.” has been proved and accepted.
These findings are confirmed with the results reported by Navyashree *et al.* (2024) and Balundagi (2019)

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4.3.3 Pay Back Period (Undiscounted measure)

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. This is the length of time required to recover the initial fixed costs of an investment. Simply put, the payback period is the length of time an investment reaches a point. The desirability of an investment is directly related to its payback period. The payback period should not be used to compare investment options unless their size and estimated lifespan are comparable. Longer payback periods result in less desirable investments. The information related to the Payback period of unit is presented in Table 4.3.

Table 4.3. Payback Period of *Bhagar* processing Unit I

Sr. No.	Year	Net Cash outflow (Lakh)	Cash Inflow (Lakh)	Cumulative Cash (Lakh)	Uncovered Cost (Lakh)
		95.4	-95.4		
1	2012-13	33.45	37.2	37.2	58.2
2	2013-14	36.73	41.34	78.54	16.86
3	2014-15	39.11	45.65		
4	2015-16	42.28	49.83		
5	2016-17	45.33	53.14		
6	2017-18	48.67	58.63		
7	2018-19	51.53	62.13		
8	2019-20	53.93	66.78		
9	2020-21	57.78	70.23		
10	2021-22	60.32	74.8		
		PBP	**2 Years 4 Months**		

The **payback period (PBP)** measures the time required to recover the initial investment through net cash inflows. For *Bhagar* Processing Unit I, the total initial investment (net cash outflow) was **₹95.4 lakh**, and the unit generated increasing cash inflows annually. The cumulative cash flow analysis shows that by the **end of the second year and four months into the third year, the entire investment was recovered.**

A **payback period of 2 years and 4 months** indicates a **quick return on investment**, suggesting that *Bhagar* processing is a financially viable business with strong revenue generation. The short PBP also implies lower financial risk, making it an attractive investment option. To further improve cash flow efficiency, **enhancing operational productivity, reducing costs, and expanding market reach** could help shorten the payback period and increase overall profitability.

Table 4.4. Payback Period of *Bhagar* processing Unit II

Sr. No.	Year	Net Cash outflow (₹) Lakh	Net Cash Inflow (₹) Lakh	Cumulative Cash	Uncovered Cost
		-150.90	**150.90**		
1	2013-14	65.89	131.78	131.78	19.12
2	2014-15	69.00	138.00		
3	2015-16	73.98	147.96		
4	2016-17	77.89	155.78		
5	2017-18	80.14	160.28		
6	2018-19	83.67	167.34		
7	2019-20	87.13	174.26		
8	2020-21	90.83	181.66		
9	2021-22	95.33	190.66		
10	2022-23	98.22	196.44		
		PBP	**1 Years 1 Month**		

The **payback period (PBP)** for *Bhagar* Processing Unit II is **1 year and 1 month,** meaning the initial investment of **₹150.90 lakh** was recovered within this short duration. The **net cash inflow in the first year alone was ₹131.78 lakh,** leaving only **₹19.12 lakh** to be recovered, which was achieved within the first month of the second year.

This exceptionally short payback period highlights **high operational efficiency, strong market demand, and effective cost management.** Compared to Unit I, which had a PBP of **2 years and 4 months**, Unit II demonstrates a **faster return on investment, reducing financial risk and increasing profitability.**

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Such a rapid recovery suggests that **expanding production capacity and optimizing market strategies** could further enhance profitability. Maintaining **cost efficiency, competitive pricing, and consistent market growth** will be crucial for sustaining long-term success.

Payback Period of *Bhagar* processing Unit III

The **payback period (PBP) for *Bhagar* Processing Unit III is 2 years and 1 month,** meaning the initial investment of **₹290 lakh** was fully recovered within this period. In the **first two years, cumulative cash inflows reached ₹268.67 lakh,** leaving only **₹21.33 lakh** to be recovered, which was achieved within the first month of the third year.

Compared to **Unit II, which had the fastest PBP of 1 year and 1 month,** and **Unit I, which took 2 years and 4 months,** Unit III shows **moderate investment recovery speed** despite being the largest unit. This indicates that **higher production scale requires a larger initial investment but also generates strong revenue growth.**

The findings suggest that **Unit III benefits from economies of scale, leading to higher profitability overall.** To further optimize financial performance, strategies such as **cost reduction, efficiency improvement, and expanding market reach** can help accelerate cash recovery and maximize returns.

The payback period analysis of the three *Bhagar* processing units reveals varying investment recovery speeds, influenced by scale and operational efficiency. **Unit II demonstrated the fastest payback period of just 1 year and 1 month,** indicating highly efficient operations and rapid revenue generation. **Unit III, the largest unit, had a payback period of 2 years and 1 month,** showcasing the benefits of economies of scale despite requiring a higher initial investment. **Unit I had the longest payback period of 2 years and 4 months,** reflecting a slower but steady recovery of investment. Overall, the results highlight that **larger units take slightly longer to break-even but yield higher long-term profitability.** To enhance financial viability, all units should focus on **cost optimization, production efficiency, and market expansion strategies** to further reduce the payback period and maximize returns.

Table 4.5. Payback Period of *Bhagar* processing Unit III

Sr. No.	Year	Net Cash outflow (₹) Lakh	Net Cash Inflow (₹) Lakh	Cumulative Cash	Uncovered Cost
		-290	**290**		
1	2013-14	136.7	130.67	130.67	159.33
2	2014-15	139.09	138	268.67	21.33
3	2015-16	143.23	146.99		
4	2016-17	147.56	153.56		
5	2017-18	152.45	160.43		
6	2018-19	158.34	177.88		
7	2019-20	162.45	184.78		
8	2020-21	166.78	190.23		
9	2021-22	171.67	197.34		
10	2022-23	176.45	201.98		
		PBP	**2 Years 1 Months**		

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Table 4.6. Net Present Worth and Internal Rate of Return of *Bhagar* Processing Unit I

Year	Cash Inflow (₹) (Lakh)	Cash outflow (₹) (Lakh)	Net Cash outflow (₹) (Lakh)	Discounting factor @35%	Net present value (Rs.)	Discounting factor @40%	Net present value (Rs.)	Discounting factor @45%	Net present value (Rs.)
	-95.4	0	95.4	0.7407	-70.6628	0.7143	-68.1442	0.6897	-65.7974
2012-13	37.2	70.65	33.45	0.5487	18.3540	0.5102	17.0662	0.4756	15.9088
2013-14	41.34	78.07	36.73	0.4064	14.9271	0.3644	13.3844	0.328	12.0474
2014-15	45.65	84.76	39.11	0.3011	11.7760	0.2603	10.1803	0.2262	8.8467
2015-16	49.83	92.11	42.28	0.223	9.4284	0.1859	7.8599	0.1526	6.4519
2016-17	53.14	98.47	45.33	0.1652	7.4885	0.1328	6.0198	0.1076	4.8775
2017-18	58.63	107.3	48.67	0.1224	5.9572	0.0949	4.6188	0.0742	3.6113
2018-19	62.13	113.66	51.53	0.0906	4.6686	0.0678	3.4937	0.0512	2.6383
2019-20	66.78	120.71	53.93	0.0671	3.6187	0.0484	2.6102	0.0353	1.9037
2020-21	70.23	128.01	57.78	0.0497	2.8717	0.0346	1.9992	0.0243	1.4041
2021-22	74.8	135.12	60.32	0.0368	2.2198	0.0247	1.4899	0.0168	1.0134
					10.6473		**0.5782**		**-7.0942**
								Absolute difference	**7.6724**

IRR = (Lower Discount Rate) + (Difference between the two discount rates) *(Present Worth of Cash flow at the lower discount rate/Absolute difference between the present worth of the cash flow at the two discount rates)

= **(40+ 5) *(0.5782/7.6724)**

= 40.38 %

The **IRR of 40.38%** for *Bhagar* Processing Unit I indicates the project can generate an annual return of 40.38% on invested capital. Since this rate is much higher than normal market interest rates or assumed discount rates (e.g., 35% or 40%), the project is considered **highly profitable and financially sound.**

Table 4.7. Net Present Worth and Internal Rate of Return of *Bhagar* Processing Unit II

Year	Cash Inflow (₹) Lakh	Cash outflow (₹) Lakh	Net Cash outflow (₹) Lakh	Discounting factor @40%	Net present value (Rs.)	Discounting factor @45%	Net present value (Rs.)	Discounting factor @50%	Net present value (Rs.)
	150.9	0	-150.9	1	-150.9	1	-150.9	1	-150.9
2012-13	131.78	65.89	65.89	0.714	47.04546	0.689	45.39821	0.666	43.88274
2013-14	138	69	69	0.51	35.19	0.475	32.775	0.444	30.636
2014-15	147.96	73.98	73.98	0.364	26.92872	0.328	24.26544	0.29	21.4542
2015-16	155.78	77.89	77.89	0.26	20.2514	0.226	17.60314	0.197	15.34433
2016-17	160.28	80.14	80.14	0.185	14.8259	0.156	12.50184	0.131	10.49834
2017-18	167.34	83.67	83.67	0.132	11.04444	0.107	8.95269	0.087	7.27929
2018-19	174.26	87.13	87.13	0.094	8.19022	0.074	6.44762	0.058	5.05354
2019-20	181.66	90.83	90.83	0.067	6.08561	0.0512	4.650496	0.039	3.54237
2020-21	190.66	95.33	95.33	0.048	4.57584	0.035	3.33655	0.026	2.47858
2021-22	196.44	98.22	98.22	0.034	3.33948	0.024	2.35728	0.017	1.66974
					26.57707		**7.388266**		**-9.06087**
								Absolute difference	**16.449136**

IRR = (Lower Discount Rate) + (Difference between the two discount rates) *(Present Worth of Cash flow at the lower discount rate/Absolute difference between the present worth of the cash flow at the two discount rates)

= (45 +5) * (7.39/16.45)

= 47.25

The table shows the Net Present Worth (NPW) and Internal Rate of Return (IRR) of a *Bhagar* processing unit (2012-22). NPW is ₹26.58 lakh at 40%, decreasing at higher rates, turning negative at 50% (-₹9.06 lakh). The IRR is 47.25%, indicating strong profitability and financial viability.

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Table 4.8. Net Present Worth and Internal Rate of Return of *Bhagar* Processing Unit III

Year	Cash Inflow (₹) (Lakh)	Cash outflow (Rs.) Lakh	Net Cash outflow (Rs.) Lakh	Discounting factor @20%	Net present value (Rs.)	Discounting factor @25%	Net present value (Rs.)	Discounting factor @30%	Net present value (Rs.)
	290	0	-290	1	-290	1	-290	1	-290
2012-13	130.67	267.37	136.7	0.833	108.8481	0.8	109.36	0.769	83.7041889
2013-14	138.00	277.09	139.09	0.694	95.772	0.64	89.0176	0.592	56.697024
2014-15	146.99	290.22	143.23	0.579	85.10721	0.512	73.33376	0.455	38.72378055
2015-16	153.56	301.12	147.56	0.482	74.01592	0.41	60.4996	0.35	25.905572
2016-17	160.43	312.88	152.45	0.402	64.49286	0.328	50.0036	0.269	17.34857934
2017-18	177.88	336.22	158.34	0.335	59.5898	0.262	41.48508	0.207	12.3350886
2018-19	184.78	347.23	162.45	0.279	51.55362	0.21	34.1145	0.159	8.19702558
2019-20	190.23	357.01	166.78	0.233	44.32359	0.168	28.01904	0.123	5.45180157
2020-21	197.34	369.01	171.67	0.194	38.28396	0.134	23.00378	0.094	3.59869224
2021-22	201.98	378.43	176.45	0.162	32.72076	0.108	19.0566	0.073	2.38861548
					364.7078		**237.89356**		**-35.6496317**
									273.5431917

IRR = (Lower Discount Rate) + (Difference between the two discount rates) *(Present Worth of Cash flow at the lower discount rate/Absolute difference between the present worth of the cash flow at the two discount rates)

= **(25+5) * (237.89/273.54)**

= 29.35

The table presents the Net Present Worth (NPW) and Internal Rate of Return (IRR) of a *Bhagar* processing unit (2012-22). NPW is ₹364.71 lakh at 20%, decreasing at higher rates, turning negative at 30% (-₹35.65 lakh). The IRR is 29.35%, indicating moderate profitability and financial feasibility.

CONCLUSION

Financial Performance

All units demonstrated strong financial health. Internal Rate of Return (IRR) was highest in Unit II (47.25%), followed by Unit I (40.38%) and Unit III (29.35%). Net Present Worth (NPW) remained positive across all units, with Unit III registering the highest at ₹364.71 lakh (at 20% discount rate). These indicators confirm the financial viability of *Bhagar* processing ventures, particularly when operations are efficiently scaled and managed.

Break-even Analysis

The break-even quantity increased with unit size due to higher costs. Unit I required 19.21 tonnes, Unit II needed 27.93 tonnes, and Unit III 37.34 tonnes to cover total costs. However, all units produced well above their BEP, indicating operational stability and sustainable revenue generation beyond the threshold point.

Benefit-Cost Ratio (B:C Ratio)

The B:C ratio, a crucial measure of investment efficiency, improved across the units: 1.21 in Unit I, 1.31 in Unit II, and 1.33 in Unit III. This implies that larger units not only generate higher profits but also utilize their investments more effectively. A B:C ratio greater than 1 in all cases reaffirms the commercial profitability of *Bhagar* processing enterprises.

Payback Period (PBP)

Payback period analysis revealed that Unit II had the shortest recovery time of 1 year and 1 month, indicating high cash flow and early breakeven. Unit III, despite being the largest, had a favourable PBP of 2 years and 1 month. Unit I had the longest PBP of 2 years and 4 months. These results demonstrate that mid and large-scale units are more financially agile and recover their investments faster.

1. Proper financial planning, operational efficiency, and effective cost management are crucial to sustaining profitability.
2. Investment in advanced processing technology and expansion into broader markets can further enhance the unit's viability.
3. The break-even analysis confirms that the units operate above its break-even level, ensuring minimal financial risk.

4. The benefit-cost ratio (BCR) of the units is above 1, indicating that the returns outweigh the costs, reinforcing its economic feasibility.
5. A shorter payback period suggests quick investment recovery, making the business model viable for potential investors.
6. Strengthening the supply chain and reducing dependency on intermediaries can help improve profit margins and operational efficiency.

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