

Case Study

Economic Viability of Mentha Processing Units - A Case Study of Punjab

Dipanshi Agarwal^{1*}, J.M. Singh¹ and Aniketa Horo²

¹Department of Economics and Sociology, Punjab Agricultural University, Ludhiana, Punjab, India

²Department of Agricultural Economics, Narayan Institute of Agricultural Sciences, Gopal Narayan Singh University, Jamuhar, Sasaram, Rohtas, Bihar, India

*Corresponding author: dipanshi-aes@pau.edu (ORCID ID: 0000-0001-5790-9221)

Received: 13-12-2022

Revised: 07-02-2023

Accepted: 27-02-2023

ABSTRACT

Mentha crop undergoes distillation in the processing units to yield mint oil, which in turn is a highly valued commodity extensively used in the cosmetic industry. Therefore, the present study was conducted in the year 2020 to investigate the viability of mentha processing units (MPUs). For this, four mentha processing units in the Moga district of Punjab were closely studied and it was found that these MPUs were working at less than their full capacity and utilizing obsolete processing technology, thus earning themselves marginal profits. These MPUs can be turned into profitable enterprises by the adoption of the latest technology, increasing the level of mechanization and motivating the farmers to increase the supply of mentha through improved practices, thus enabling the processing units to run at full capacity and alleviate their efficiency.

HIGHLIGHTS

- A profit-loss statement summarizing the revenues and costs incurred by mentha processing units.
- The processing units were in hand to mouth situation with low financial and profitability ratios.

Keywords: Mentha, viability, processing units, Punjab

Medicinal and aromatic plants remain in heavy demand due to the high returns generated from the oil extracted from them and throughout India the large-scale distilleries were established. India is a leading producer of mentha which is an aromatic crop mainly grown in *the rabi* season. Mentha is one such crop known for its cool flavor and aroma. Leaves of the mentha plant are its economic part, as they undergo a distillation process to yield mint oil which on further processing gives various chemical compounds like L-Menthol (crystals and flakes), neo-menthol, L-limonene, methyl acetate, menthone, alfa-pinene, pipritone, mint terpenes, etc. These compounds are used by numerous industries as raw materials in soaps, shampoos, toothpaste, ice creams, candies, etc. The first mentha processing unit was established in Phoolbehar in the

Nainital district in 1973 by Hindustan Richardson Ltd., a US-based Multi-National Company (MNC). Following its footsteps, many other units came up in Chandausi, Sambhal, and Moradabad in Uttar Pradesh. Out of the four species, menthol mint and peppermint are mainly cultivated in India, the respective oils obtained from them are menthol and piper ton. India produces around 80 percent of the world's mint oil and exports 75 percent of it, thus being the largest producer and exporter of mint oil. On looking at other agro-processing units, the pickle-making unit in Varanasi was making an annual net return from processing @ ₹ 1.01 lakhs

How to cite this article: Agarwal, D., Singh, J.M. and Horo, A. (2023). Economic Viability of Mentha Processing Units - A Case Study of Punjab. *Econ. Aff.*, 68(01): 635-640.

Source of Support: None; **Conflict of Interest:** None



with 23 percent additional returns over expenditure (Sen and Baranwal, 2003). Likewise, in Haryana, profit margins for cotton ginning were ₹ 212.9 per quintal, for rapeseed-mustard, were ₹ 108.59 per quintal, and for dal milling were ₹ 36.52 per quintal (Singh and Grover, 2003). Processing plants can earn more profits by undergoing modernization and mechanization and thereby reducing labor requirements and processing time (Banerjee and Srivastava, 2014). Thus, the present study was conducted to investigate the viability of mentha processing units in Punjab and suggest necessary policy implications.

METHODS AND METHODOLOGY

The study was conducted on primary data for the year 2020. Data were collected from four mentha processing units denoted as MPU-I (Mentha processing unit-I named Gagda mentha plant), MPU-II (Mentha processing unit-II named A.K. Traders), MPU-III (Mentha processing unit-III named Mentha plant, Kaunke Kala), and MPU-IV (Mentha processing unit-IV named Nirmal mentha plant and seed farm) situated in Moga I block of Moga district in Punjab. This block was specifically selected owing to its largest share in the area under the mentha crop (ENVIS Centre: Punjab). To access the viability of these units, a profit loss statement was prepared for each unit and financial ratios were calculated.

A schedule was created to gather information on each processing unit's operations, including mentha oil handling, distillation process and charges, market prices, and fixed and variable costs.

Then to work out the total cost and returns incurred by the processing units, an economic analysis was carried out which includes the:

1. **Total variable cost** = cost at which oil was purchased + distillation + market labor charges for distillation + machinery labor charges for distillation + oil and lubricants charges + repair and maintenance charges + other miscellaneous charges.
2. **Total fixed cost** = Present value of distillation tanks and machinery + depreciation charges + rent of land + permanent labor charges + taxes + interest on capital investment.

3. **Total revenue** = Oil sold*price of per liter of oil.

Total returns included the quantity of oil distilled and the price at which per liter of oil was sold to the collecting agents.

Finally, profit and loss statement was estimated using the following ratios:

1. **The efficiency ratio** (expenses excluding interests/ revenue) indicates the processing unit's short-term performance i.e., how efficiently a processing unit uses and manages its assets to generate revenue. An increase in the efficiency ratio suggests that either the processing unit's revenue is decreasing, or its expenses are increasing, therefore a ratio of 0.5 or less is desirable.
2. **The Pre-tax profit or operating income** indicates the amount of processing units' revenue which will eventually turn into profit. The higher the operating income, the higher the revenue generated by a unit while managing expenses.
3. **The times interest earned ratio (TIE)** indicates the ability of the processing unit to meet its debt obligation on account of its current income. The higher the amount of cash left with the unit after paying its debts, the higher will be the TIE and the unit can continue to invest in the business.
4. **The EBIT (earnings before interest and taxes)/ operating profit/ operating earnings** indicate the profitability of the processing unit. Here the taxes and interest expenses are excluded, and the focus is on the processing unit's ability to earn from its operations.
5. **The profitability ratios** indicate the financial well-being of a processing unit as they measure the efficiency of a processing unit in turning its sales into profits.
 - (a) The gross margin ratio $\{(total\ revenue - total\ variable\ cost) / total\ revenue\}$
 - (b) The operating margin ratio (operating income/ total revenue)
 - (c) Net profit margin (profit/ total revenue).

6. The financial ratios

- (a) Asset Turnover Ratio indicates the sale generated by the processing unit for every rupee invested in total assets. (Total Revenue/ Present value of distillation tanks and other machinery)
- (b) Returns on Assets Ratio indicating a return in profit of each rupee invested in assets. (Asset turnover *Net profit margin)

RESULTS AND DISCUSSION

General information on the four mentha processing units in the current study has been discussed in Table 1. The average oil recovery percent was found to be 0.5 percent and around 25 litres of oil was recovered from a shift of 4 to 6 hours. On average, three shifts take place every day for one month. The average shelf life of the extracted mint oil is supposed to be 10 years. The average distillation time for Peppermint was revealed to be 12 hours per drum whereas for Koshi it was 18 hours. A new multi-utility distillation unit has been developed by CIMAP (Central Institute of Medicinal and Aromatic Plants) which is better than traditional distillation units in terms of generation of more steam, more heating surface area, more oil recovery (15-20%), lesser time of distillation and lesser cost of installation (Krishna *et al.* 2014). A study on agro-processing industries in Himachal Pradesh advocated for the development of processing industries in regions with cheap and plentiful raw materials by the way of strengthening direct connections through contract farming models, guaranteeing a liberal credit policy to revamp

processing units, and encouraging the formation of small industry consortia or associations for shared marketing and sales endorsement (Sharma *et al.* 2010).

Total variable cost

The monthly operational cost of carrying out the distillation process in different units has been summarised in Table 2. It was observed that the total variable cost in the case of the 2nd mentha processing unit was highest followed by the 4th, 3rd, and 1st units. Based on a study on herbal industrial units in Punjab, it was found using multiple regression analysis that expenses on raw materials have a high positive effect on gross returns (Singh and Dhillon, 2018).

Total fixed cost

Sunk or fixed costs of the four processing units are depicted in Table 3. These costs are called fixed or sunk costs as they have already been incurred and cannot be altered. Moreover, such costs must be borne each year whether the unit is functional or not. The analysis revealed that the 2nd mentha processing unit had the highest total fixed cost, followed by the 4th, 3rd, and 1st units, as infrastructure and machinery costs contribute significantly to fixed costs. Additionally, the 2nd mentha processing unit had the highest fixed cost because it incurred rent over a 5-acre area.

Total revenue generated by mentha processing units based on oil extraction yields

Table 4 provides an overview of the revenue generated by the four mentha processing units. The

Table 1: General information about the four mentha processing units of Punjab

Particulars	MPU-I	MPU-II	MPU-III	MPU-IV
Name	Gagda mentha plant	A. K. Traders	Mentha plant, Kaunke Kala	Nirmal mentha plant and seed farm
Location and area	Daudhar, 3 acres	Akhada, 5 acres	Kaunke kala, 3 acres	Daudhar, 3 acres
Tank capacity (Tonnes)	181	342	181	402
Market arrivals (Tonnes)	2000	6000	2819	5000
Number of drums	9	17	12	20
Oil extracted (litres)	10000	30000	15000	25000
Capacity to extract oil (litres)*	20250	38250	27000	45000
% increase in capacity possible	1.03	0.28	0.80	0.80

*Capacity to extract oil is calculated by multiplying oil recovered per shift (25 litres), the number of shifts per day (3), days per month (30), and the number of drums of the respective processing unit.

Table 2: Monthly operational cost incurred by the four mentha processing units

Particulars	MPU-I			MPU-II			MPU-III			MPU-IV		
	P	K	T	P	K	T	P	K	T	P	K	T
Drums per day	5	4	9	10	7	17	5	7	12	12	8	20
Total oil extracted ('000 liters)	7	3	10	22	8	30	5	10	15	15	10	25
Total cost at which oil is purchased (lakhs)	136.5	21	157.5	440	56	496	95	70	165	300	70	370
Distillation cost (lakhs)	14	4.5	18.5	44	12	56	10	15	25	30	15	45
Market labor and transportation charges (lakhs)	1			3			1.5			2.5		
Machinery labor charges for distillation (lakhs)	6			18			9			15		
Electricity charges	1			3			—			3		
Oil and lubricants charges (₹)	50000			70000			710000			65000		
Repair and maintenance charges (lakhs)	3			5			3.5			5		
Miscellaneous charges (₹)	50000			55000			40000			50000		
Total variable cost (lakhs)	188			582.25			211.5			441.65		

(P, K, and T refer to Peppermint, Koshi, and Total, respectively); Where, the cost at which oil is purchased is the price paid to the farmers for the purchase of mentha. (Koshi @ ₹ 1,000-1100/ha and Peppermint @ ₹ 2,200-2,400 /ha); Distillation cost is the cost incurred for extracting oil from mentha leaves. (Koshi @ ₹ 150/ha and Peppermint @ ₹ 200/ha); Market labor charges are the wages given to laborers for manual work like; loading, unloading, handling of cans, transportation, etc. (@ ₹ 10/litre); Machinery labor charges for distillation are the wages given to skilled laborers who are specially hired to look after the distillation process. (@ ₹ 60 per litre); Oil and lubricant charges are the charges of diesel to operate the unit and other lubricants used for the smooth functioning of machinery; Repair and maintenance charges include all the expenses in buying new equipment or in the repair of the existing one.

Table 3: Fixed costs incurred by the four mentha processing units

Particulars	MPU-I	MPU-II	MPU-III	MPU-IV
Present value of distillation tanks and other machinery (lakhs)	18	40	25	45
Depreciation charges (lakhs)	1.6	3.92	2.45	4.01
Rent of land (lakhs)	1.5	2.5	1.2	—
Charges of permanent labor employed (₹)	20000	24000	22000	24000
Taxes (₹)	50000	70000	51000	60000
Interest on capital investment (lakhs)	2.16	4.8	3	5.4
Total fixed cost (lakhs)	5.96	12.16	7.38	10.25

Where, the present value of distillation tanks and machinery is the present value of equipment bought several years back; Depreciation charges are taken @ 2 percent per annum using straight-line end method. It is an accounting method to calculate the cost of machinery over its useful life. It is calculated as such; Depreciation = (Cost new – Salvage value)/ Total expected life; Rent of land is the amount paid each year for a lease-in land. (@ ₹ 50,000/acre); Permanent labor charges are the wages given to labor hired permanently to look after the processing unit in the off-season. (@ ₹ 10,000/labor); Taxes are paid for the selling of oil as a part of GST; Interest on capital investment is the interest that would be paid to the creditor if the loan was taken for the purchase of assets. It is taken @ 12 percent of the present value of distillation tanks and other machinery.

data shows that the 2nd unit generated the highest returns, followed by the 4th, 3rd, and 1st units. This is due to the 2nd unit's higher extraction of peppermint oil, which yields approximately ₹ 2400 per litre, compared to Koshi oil, which yields approximately ₹ 1000 per litre.

Profitability and financial ratios of mentha processing units

Table 5 showcases the profits earned by each processing unit and tells about their viability condition. Profit indicates the net returns of any company gained after meeting its expenses.

Here, the highest profit was earned by the 2nd mentha processing unit followed by 4th, 1st, and 2nd. Likewise, a similar pattern was observed in the case of pre-tax profit and EBIT. The efficiency ratio of all the units was almost similar and greater than 0.5 indicating that the units' short-term performances were not good, and they were not able to manage their expenses efficiently. The TIE ratio of all the mentha processing units lies in the range of 2 to 4 indicating the poor condition of the units. It showcased that not much cash was left with the processing units to invest in the business. Likewise, all the profitability and financial ratios were meager, thereby indicating that neither the

Table 4: Revenue generated from the mentha processing units

Particulars	MPU-I			MPU-II			MPU-III			MPU-IV		
	P	K	T	P	K	T	P	K	T	P	K	T
Oil sold ('000 litre)	7	3	10	22	8	30	5	10	15	15	10	25
Rupees/ litre	2400	1000		2400	1000		2400	1000		2400	1000	
Total revenue (lakhs)	168	30	198	528	80	608	120	100	220	360	100	460

(P, K, and T refer to Peppermint, Koshi, and Total respectively); Where, Oil sold refers to quantity of sale of mentha oil (both Peppermint and Koshi); Rupees/litre denotes the price of each litre of Peppermint and Koshi oil; Total Revenue denotes earnings of each MPU from both variety of oils.

Table 5: Profitability and financial ratios of the mentha processing units

Particulars	MPU-I	MPU-II	MPU-III	MPU-IV
Total fixed cost (lakhs)	193.96	594.41	218.88	451.9
Total revenue (lakhs)	198	608	220	460
Profit/loss in rupees (lakhs)	4.04	13.59	1.12	8.1
Pre-tax profit/ operating income (lakhs)	4.54	14.29	1.63	8.7
Efficiency ratio	0.97	0.97	0.98	0.97
EBIT (lakhs)	6.7	19.09	4.63	14.1
Times interest earned ratio	3	3.98	1.54	2.61
Gross margin	0.05	0.04	0.04	0.04
Operating margin	0.02	0.02	0.0074	0.02
Net profit margin	0.02	0.02	0.0051	0.02
Asset turnover	11	15.20	8.80	10.22
Returns on assets	0.22	0.34	0.0448	0.18

revenue generated made a profit, nor there were many sales per rupee of investment. According to a study by Sekhon *et al.* (2003) on the rice processing industry in Punjab, the major constraints faced by rice mills were poor quality of raw material having high moisture content, government delays in the announcement of levy prices, etc. Another study on Gur (jaggery) industry showed that small units earn only marginal profits and medium and large units are profitable but all of them hold a significant scope in alleviating unemployment and improvising the standard of living (Dwivedi, 2010).

CONCLUSIONS AND POLICY IMPLICATIONS

MPU-II performed best overall. MPU-I had higher profit than MPU-III despite lower revenue, and better financial ratios than MPU-III and MPU-IV due to lower expenditure on distillation tanks. This allowed MPU-I to generate more sales and profit per rupee invested.

However, the profitability and financial ratios of all MPUs were insignificant. The MPUs' basic designs caused minimal profits due to high

repair and maintenance needs. Lack of regulation for furnace temperature and recycling of water contributed to the issue. Iron drums rusted over time, contaminating the oil and reducing its value. Storing mentha oil in plastic cans also harmed its quality. Additionally, all units worked below full capacity for mentha processing.

To address these issues, training modules should be created to teach better practices for handling oil distilleries. Replacing old iron drums with galvanized iron cans can improve oil quality and increase market prices. Farmers should also expand mentha cultivation and take two harvests to allow processing units to operate at full capacity. Establishing a stable price mechanism for the mentha crop can encourage continued cultivation.

REFERENCES

- Krishna, A., Kumar, V., Singh, S., Singh, P. and Yadav, R. P. 2014. Impact assessment of aromatic crops distillation technology by the Indian cultivators: A case study. *Int. J. Curr. Sci.*, **13**: 67-73.
- Banerjee, S. and Shrivastava, S.L. 2014. Economic analysis of cashew nut processing in India. *Econ. Aff.*, **59**(3): 429-437.

- Dwivedi, A.K. 2010. An Empirical Study on Gur (Jaggery) Industry (with special reference to operational efficiency & profitability measurement). *Indian Institute of Management Working Paper*, (2010-12), 03. <https://dx.doi.org/10.2139/ssrn.1783403>
- ENVIS Centre: Punjab <http://www.punenvvis.nic.in/index3.aspx?sslid=7564&subsublinkid=5817&langid=1&mid=1> (Last Accessed on 23rd March, 2023).
- Sekhon, M.K., Rangi, P.S. and Kaur, M. 2003. Rice Processing Industry in Punjab: Problems and their Remedies. *Ind. J. Agril. Econ.*, **58**(3): 544-553.
- Sen, C. and Baranwal, M. 2003. Economic Analysis of Small Scale Agro-Processing-A Case Study of Pickle Making Unit in Varanasi. *Ind. J. Agril. Econ.*, **58**(3): 603.
- Sharma, K.D., Pathania, M.S. and Lal, H. 2010. Value chain analysis and financial viability of agro-processing industries in Himachal Pradesh. *Agril. Econ. Res. Rev.*, **23**(347-2016-16944): 515-522.
- Singh, S. and Dhillon, S.S. 2018. Socio-Economics of herbal industrial units in Punjab. *Ind. J. Econ. Dev.*, **14**(3): 448-455.
- Singh, S.P. and Grover, R.K. 2003. An economic analysis of agro-based industries in Haryana. *Ind. J. Agril. Econ.*, **58**(3): 625.