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Exploratory Study of Decline of Lavender Cultivation in Chamba District of Himachal Pradesh: Economic Analysis

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Abstract: This study examined the economic viability of lavender cultivation in Chamba, identifying key challenges confronted by farmers to develop a comprehensive framework for promoting lavender farming. The total cost of establishment of lavender crop was Rs.2.63 lakhs per hectare and total cost of cultivation of lavender from second year onwards was Rs.1.59 lakhs per hectare per year. The net present value of lavender cultivation at 8, 12 and 15 per cent of discount rates was Rs.9.05 lakh, Rs.7.04 lakh and Rs.5.86 lakh, respectively. The BC ratio at discount rate of 8, 12 and 15 per cent was 1.79, 1.73 and 1.68 respectively, which was more than unity indicating the worthiness of investment on lavender cultivation. The IRR for lavender cultivation was 67 per cent. The lavender farmers encountered significant challenges, primarily stemming from poor marketing facilities, high wages of labour and lack of government support. The research recommends developing farmer-centric marketing systems and promoting supportive government initiatives for lavender farmers, encompassing subsidies, training and market connectivity.

Keywords: Net present value (NPV), Internal rate of returns (IRR), Benefit-cost ratio

Lavender (*Lavandula* spp.) is a genus of flowering plants in the mint family, Lamiaceae, known for its fragrant purple flowers and aromatic foliage. Native to the Mediterranean region, lavender thrives in well-drained soils and prefers sunny, dry environment. Cultivated primarily for its essential oils, culinary uses, and ornamental value, lavender offers lucrative opportunities for farmers and entrepreneurs. Its low water and nutrient requirements make it an attractive option for sustainable agriculture. The essential oil extracted from lavender has a wide range of uses, including perfumes, cosmetics and medicinal purposes (Kumar and Verma 2023). The true lavender oil comes from *L. officinalis syn. angustifolia* which is the most highly priced among all the lavender oils. The global production of this oil is approximately 200 tonnes annually.

Lavender was introduced to India by British colonizers, who bought it from Europe for ornamental and medicinal purposes. Post-independence, Indian research institutions, notably, the Indian Institute of Horticultural Research (IIHR), facilitated lavender's cultivation expansion through targeted agronomic interventions, resulting in its establishment in regions with favorable climatic conditions, such as the Nilgiri Hills, Western Ghats and Himalayan foothills. Presently India produces approximately 100-150 tonnes of lavender oil annually, with key cultivation regions including Tamil Nadu, Kerala, Himachal Pradesh, Uttarakhand and Jammu & Kashmir.

Chamba, a picturesque district in Himachal Pradesh, India, is known for its favorable climate and soil conditions, making it an ideal location for lavender cultivation. The Institute of Himalayan Bioresource Technology (IHBT) successfully introduced lavender cultivation in Chamba district, in 2000 and trained over 500 farmers on cultivation, processing and marketing. The introduction of lavender had generated additional income for farmers, created employment opportunities, and contributed to soil and biodiversity conservation. After experiencing a successful introduction and growth phase (2000 to 2010), lavender cultivation in Chamba district experienced a significant decline between year 2010 and 2015. Despite its potential for high returns and employment generation, this decline has raised concerns among policymakers, farmers and researchers, highlighting the need for an in-depth analysis of the economic factors contributing to this trend.

To revitalize this industry, it is essential to assess the economic viability and financial feasibility of lavender cultivation. The present study aims to conduct an in-depth economic analysis of lavender cultivation in Chamba district of Himachal Pradesh, identifying the challenges faced by famers and exploring potential solutions.

MATERIAL AND METHODS

The three stage sampling technique was followed to select the sample. In first stage, two major lavender growing blocks (Salooni and Tissa) of Chamba district were selected purposively.In the second stage of sampling, a list of lavender growing villages from each block was prepared and 10 villages were selected randomly from the list. In third stage, a sample of 6 farmers was selected randomly from each

village, thus making the total sample size of 60 farmers. A schedule containing detailed information on various aspects of lavender cultivation such as area under lavender cultivation, input use pattern, labour use pattern, prices of various inputs, quantity of lavender produce and socio-economic characteristics of lavender growers was prepared. The primary data were collected on these well-designed pre-tested schedules by personal interview method and have been analyzed through the tabular method andother mathematical tools using MS Excel.

Economic analysis and financial feasibility: Cost components of lavender cultivation for a period of 10 years were divided into variable and fixed cost. For the establishment of crop in first year, the variable cost included planting material (cuttings), farm yard manure (FYM), bullock charges, human labour and plant protection charges and interest on working capital. The fixed cost included rental value of land, interest and depreciation on fixed capital. For the subsequent years, the variable cost included only human labour charges and FYM charges. Discounted measures were used in feasibility analysis of lavender crop because it required initial investments and have delayed cash flows over the years. The common discounted measures that were used included:

Net present value (NPV): Net present value (NPV) of an investment is the discounted value of all cash inflows and cash outflows of the project during its life time.

$$NPV = \sum_{t=0}^{n} \{(B_t - C_t)/(1+r)^t\}$$

Internal rate of return (IRR): Internal rate of returnis the rate of return at which the net present value of a stream of payments/incomes is equal to zero.

$$NPV = \sum_{t=0}^{n} \{(B_t - C_t)/(1+r)^t\} = 0$$

Benefit cost ratio (BCR): The benefit cost ratio of an investment is the ratio of the discounted value of all cash inflows to the discounted value of all cash outflows during the life of the project.

$$BCR = \sum_{t=0}^{n} \{(B_t)/(1+r)^t\} / \sum_{t=0}^{n} \{(C_t)/(1+r)^t\}$$

Where, B_t = gross returns in time t, C_t = cost in time t , r = rate of interest, t= time period (1, 2, 3……10 years)

Garrett's ranking technique was employed to analyze the constraints faced by the farmers in lavender cultivation.

RESULTS AND DISCUSSION

Economic analysis and financial feasibility: In the establishment phase, lavender cultivation required 19,990 cuttings per hectare. Lavender is a labour intensive crop and labour requirement was highest i.e. 238 man days per hectare in the first year as compared to subsequent years due to high requirement of labour which were carried out only in the first year such as field preparation, and planting.On an average, 21.83 hours of bullock labour per hectare were used for the field preparation purpose.Around 248 quintals of FYM per hectare was used in the year of establishment as well as in the subsequent years. Plant protection chemicals (Bavistin) were used by a few farmers for controlling the fungal diseases (1750 gram per hectare). Second year onwards, only human labour and farm yard manure were used as major inputs in lavender crop. The amount of these inputs varied from year to year, giving an average of 184.38 man days of human labour and 248 quintals of FYM per hectare per year. The proportion of family labour was more than the hired labour in all the years.

The establishment cost included expenses incurred during the first year of cultivation, such as land preparation, planting materials, soil amendments, pest and disease management and labour costs (Table 1). The total cost of establishment of lavender crop was Rs.2.63 lakh per hectare. Among the total variable cost, planting material was the major component contributing about 37 per cent of the total cost @ Rs. 5 per cutting. The rental value of land is included as a component of fixed cost which occupies 18 per cent of the total cost. In second year, the cost of cultivation reduced to Rs.1.32 lakh per hectare and after that it increased at a slow rate up to tenth yearas human labour was used for most of the farm operations and wages of labour tended to increase over the years. On an average, the total cost of cultivation of lavender from second year onwards was Rs.1.59 lakh per hectare per year. The average yield of lavender dried flowers was 3 quintal per hectare. The gross returns from the lavender cultivation varied from Rs. 3 lakh to Rs. 4 lakh over the period of nine years @ Rs.1200 per kg of dry flowers. The net returns from lavender over the years were around Rs. 2 lakh per hectare.

The net value of lavender cultivation in the first year of cultivation at 8, 12 and 15 per cent of discount rates was Rs.9.05 lakh, Rs.7.04 lakh and Rs.5.86 lakh, respectively (Table 2, 3). The BC ratio at discount rate of 8, 12 and 15 per cent was 1.79, 1.73 and 1.68, respectively, which indicated the worthiness of investment on lavender cultivation. The internal rate of returns (IRR) for lavender cultivation was 67 per cent which was considerably higher than the prevalent bank rate which indicated that lavender cultivation offers lucrative opportunities for farmers seeking to maximize profits.IRR greater than the cost of capital indicates a

Table 1. Year wise costs and returns of lavender cultivation on sample households

Particulars	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Variable cost										
Planting material (cuttings)	99950.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Farm yard manure	24800.00	24800.00	29760.00	29760.00	29760.00	37200.00	37200.00	37200.00	49600.00	49600.00
Bullock charges	5457.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hired labour	14337.00	14313.00	14161.00	15046.50	14535.50	16079.00	18332.00	17876.00	19633.50	23008.50
Plant protection (Bavistin)	2800.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Working capital (1+2+3+4+5)	147344.50	39113.00	43921.00	44806.50	44295.50	53279.00	55532.00	55076.00	69233.50	72608.50
Interest on working capital @ 6%	8840.67	2346.78	2635.26	2688.39	2657.73	3196.74	3331.92	3304.56	4154.01	4356.51
Cash variable expenses (6+7)	156185.17	41459.78	46556.26	47494.89	46953.23	56475.74	58863.92	58380.56	73387.51	76965.01
Family labour	57339.00	40611.00	48569.50	48454.00	49805.00	48786.50	55800.00	56256.00	64935.00	61560.00
Total variable cost (8+9)	213524.17	82070.78	95125.76	95948.89	96758.23	105262.24	114663.92	114636.56	138322.51	138525.01
Fixed cost										
Rental value of land	50000.00	50000.00	50000.00	50000.00	50000.00	50000.00	50000.00	50000.00	50000.00	50000.00
Interest on fixed capital @ 10 %	152.57	152.57	152.57	152.57	152.57	152.57	152.57	152.57	152.57	152.57
Depreciation @ 20%	305.14	305.14	305.14	305.14	305.14	305.14	305.14	305.14	305.14	305.14
Total fixed cost (10+11+12)	50457.71	50457.71	50457.71	50457.71	50457.71	50457.71	50457.71	50457.71	50457.71	50457.71
Total cost (A+B)	263981.88	132528.49	145583.47	146406.60	147215.94	155719.95	165121.63	165094.27	188780.22	188982.72
Yield of dry flowers (q/ha)	0.00	2.50	2.50	2.50	3.50	3.50	3.50	3.00	3.00	3.00
Gross returns @ Rs. 1200/kg	0.00	300000.00	300000.00	300000.00	420000.00	420000.00	420000.00	360000.00	360000.00	360000.00
Net returns	-263981.88	167471.51	154416.53	153593.40	272784.06	264280.05	254878.37	194905.73	171219.78	171017.28

profitable investment, while a lower IRR suggests unviability.

Constraints: The lavender growers in Chamba are confronted with various problems, including high cost of marketing, non-availability of human labour, high wages of labour, changing climatic conditions, etc. These challenges not only affect the yield and quality of lavender but also impact the livelihoods of farmers, leading to reduced incomes from its cultivation and increased vulnerability. During the survey conducted among sampled lavender farmers, a range of problems and constraints that they encountered became apparent. These problems and constraints were classified into four different categories viz., input related problems, labour and machinery related problems, marketing problems and others. In the problems related to production, the scarcity of FYM was ranked first because there was a high requirement of farm yard manure for lavender cultivation as the use of chemical fertilizers was limited (Table 4). In problems related to human labour and machinery, high wages of labour was ranked first followed by non-availability of labour.Marketing of the produce was most severe problem faced by the lavender farmers. In the problems related to marketing, first rank was given to the problem of procurement agencies being at longer distance followed by problem in disposal of produce due to lack of specialized agencies and lack of other marketing facilities in the area. There were many other problems related to marketing like high transportation charges, low prices of produce and lack of proper marketing information that negatively affected the cultivation of lavender. The other problems related to lavender cultivation were lack of government support to the farmers, lack of processing facilities, lack of timely transfer of technologies, lack of motivation among the farmers for a different crop and climate change.

Table 2. Year wise cash flows generated in lavender cultivation on sample households (Rs. / ha)

Years	Cost	Gross returns	Net returns
1	263981	-	-263981
2	132528	300000	167472
3	145583	300000	154417
4	146406	300000	153594
5	147215	420000	272785
6	155719	420000	264281
7	165121	420000	254879
8	165094	360000	194906
9	188780	360000	171220
10	188982	360000	171018

Table 3. Financial feasibility of lavender cultivation on sample households

Particulars	Discounting factors(%)		
	8	12	15
Net present value (Rs.)	905470	704698	586090
Benefit cost ratio	1.79	1.73	1.68
Internal rate of return (%)	67	67	67

Table 4. Problems and constraints faced by lavender farmers on sample households (Garrett's score)

Problems	Mean score	Rank
(Garrett's score)		
Production problems		
Scarcity of FYM	65.40	1
High cost of planting material	40.73	3
Non-availability of planting material	59.27	2
Lack of irrigation facilities	34.60	4
Related to labour and machinery		
Non-availability of human labour	60.80	2
High wages of labour	62.97	1
Non-availability of bullocks/machinery	39.7	3
Bullocks/machinery charges are high	36.53	4
Marketing problems		
Disposal of produce is difficult due to lack of specialized agencies	62.77	2
Procurement agencies at longer distances	65.37	1
High transportation charges	40.8	4
Lack of marketing facilities	61.13	3
Low prices of produce	40.00	5
Lack of marketing information	29.93	6
Others		
Lack of timely and appropriate transfer of technology	32.50	5
Lack of government support	62.33	1
Climate change	42.83	4
Lack of motivation among farmers for a different crop	59.17	2
Lack of processing facilities	53.17	3

CONCLUSION

Lavender cultivation can be a profitable venture with BC ratio of more than unity and considerably high internal rate of returns (67%).To unlock the full potential of lavender crop, the government should prioritize providing adequate marketing facilities to lavender farmers. To enhance the productivity and profitability of lavender farming, it is imperative to transfer modern knowledge and best practices to farmers. The government and private sectors should invest in distillation units for essential oil extraction, drying and packaging

facilities, extraction units for lavender honey and wax, and manufacturing units for lavender based cosmetics and pharmaceuticals.

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