

# A Comprehensive Economic Analysis of Aloe Vera Crop Cultivation in Bilaspur District, Chhattisgarh, India

Shubham Kumar Thakur\*, B.C. Jain, Shubhi Singh<sup>1</sup>, Devendra Kurrey<sup>1</sup> and Chandrakala<sup>1</sup>

*Department of Agricultural Economics, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India*

\*Corresponding author: shubhamcks@gmail.com

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## ABSTRACT

This research delves into the economic dynamics surrounding the cultivation of medicinal and aromatic plants (MAPs) within the Bilaspur district of Chhattisgarh, India. Employing a meticulous multistage random sampling approach, respondents were carefully selected for data collection. This region enjoys a climatic advantage conducive to the growth of diverse MAPs. The study scrutinizes the cost and return structure specific to Aloe vera cultivation. Operational costs encompass a gamut of expenses, including labor, materials, seeds, fertilizers, and machinery, while overhead costs encompass fixed capital expenses such as land rental, depreciation, and interest. Notably, Aloe vera yielded 257.32 qtl/ha in small farms, 291.73 qtl/ha in medium-sized ones, and 294.17 qtl/ha in larger farms. The overall gross returns were calculated at ₹ 140,536.67 per hectare, with medium-sized farms reaping the highest net returns at ₹ 64,708.12 per hectare. Unpacking the operational expenses for Aloe vera cultivation, material costs emerged as the predominant component, closely followed by labor and seed expenses. The operational cost per hectare spanned from ₹ 53,380.64 for small farmers to ₹ 60,204.89 for their larger counterparts. Interestingly, overhead costs, including land revenue, depreciation, and interest, remained lower than operational costs across all farm sizes. The research demonstrates a direct correlation between MAP yield and gross returns, underlining the profitability of Aloe vera cultivation, as evidenced by a favorable benefit-cost ratio. These findings serve as a valuable compass for policymakers, farmers, and stakeholders, offering insights that can inform decisions pertaining to MAP cultivation, processing, and marketing. Ultimately, this study has the potential to enhance the economic viability of MAP production in the region.

**Keywords:** MAPs (Medicinal and Aromatic Plants), Cost and Return, Production, Net Return, Cropping Pattern.

This study was conducted in the state of Chhattisgarh, a region that holds a special status as a “Herbal State” according to the Chhattisgarh government’s strategic vision. This designation aims to safeguard medicinal plants, foster their cultivation through non-destructive harvesting practices, stimulate organized trade, and promote industries centered around Medicinal and Aromatic Plants (M&APs).

These initiatives are geared towards generating employment opportunities, uplifting the socio-economic conditions of rural communities, and

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enhancing healthcare accessibility. Remarkably, the Chhattisgarh State Medicinal Plant Board's meticulous evaluation has unveiled the presence of approximately 2,021 M&APs within the state's boundaries. In practical terms, this commitment translates into a sprawling 11,538.64 acres dedicated to the cultivation of medicinal and aromatic plants in Chhattisgarh. This study's primary mission is to unravel the intricacies of cost and return dynamics specific to Aloe-Vera, a revered medicinal and aromatic plant, thriving in the study area. In doing so, it contributes to the overarching goal of harnessing the potential of M&APs to foster growth, prosperity, and well-being throughout the state.

## METHODOLOGY

### Sampling procedure

**Selection of District:** Bilaspur district, one of the 33 districts in Chhattisgarh, was chosen as the focal point of the study based on deliberate consideration.

**Selection of Blocks:** To narrow down the focus, the study zeroed in on Kota and Masturi blocks, handpicked due to their prominence in Medicinal and Aromatic Plants (MAPs) cultivation within the region.

**Selection of Villages:** From the vast pool of 174 villages in Kota and 162 in Masturi, a proportionate method was employed. This involved selecting 2 % of the total villages from each block. Consequently, three villages were chosen from Kota block - namely Changori, Mohandi, and Tilakdih. Simultaneously, three villages from Masturi block were selected: namely Loharsi, Masturi, and Seepat.

**Selection of Respondents:** A total of 47 MAPs producers were identified in Bilaspur district. These were further categorized into 23 small farm-size farmers, 15 medium-sized, and 9 large farm-size farmers. The study meticulously adopted a multistage sampling method to ensure a representative sample.

**Nature and Source of Data:** Primary data was collected through in-depth personal interviews using pre-tested questionnaires with the selected MAPs producers. Additionally, secondary data were obtained from reputable sources including the Department of Horticulture, Directorate

of Economics and Statistics, Government of Chhattisgarh, and various other reliable repositories.

## ANALYTICAL PROCEDURE

### Cost of cultivation

For estimating the Cost of Cultivation of Medicinal and Aromatic crops, this study employs the cost concept classification endorsed by the CACP (Commission for Agricultural Costs and Prices) in Delhi.

**Cost A<sub>1</sub>:** Under the Cost A<sub>1</sub> category, various essential expenses are considered for calculating the Cost of Cultivation of Medicinal and Aromatic crops. This includes expenses like hired human labor wages, permanent labor wages, contract labor wages, hired bullock labor wages, and the imputed value of owned bullock labor. It also considers charges for hired machinery, imputed value of owned machinery, market rates of manures, fertilizers, seeds, and pesticides, as well as costs associated with irrigation, land revenue, taxes, depreciation, interest on working capital, and miscellaneous expenses. Family labor costs are equated with prevailing hired labor charges, while owned bullock labor is valued based on village hire rates.

**Cost A<sub>2</sub>:** Building upon Cost A<sub>1</sub>, it adds the rent paid for leased-in land.

**Cost B<sub>1</sub>:** It includes Cost A<sub>1</sub> or A<sub>2</sub> plus interest on fixed capital (excluding land) and the rental value of owned land.

**Cost C:** This extends Cost B<sub>1</sub> by incorporating the imputed value of family labor.

**Cost B<sub>2</sub>:** Similar to Cost B<sub>1</sub>, it comprises Cost A<sub>1</sub> or A<sub>2</sub>, interest on owned capital invested in the business (excluding land), and the rental value of owned land.

**Cost C<sub>1</sub>:** It encompasses Cost B<sub>1</sub> plus the imputed value of family labor.

**Cost C<sub>2</sub>:** Similar to Cost C<sub>1</sub>, but based on Cost B<sub>2</sub>, it includes the imputed value of family labor.

**Cost C<sub>3</sub>:** This category includes Cost C<sub>2</sub> plus an additional 10 % of managerial costs.

## Profitability Aspects

**Gross income:** Calculated as the main product's value minus that of by-products.

**Farm Business income:** Derived from Gross income after deducting Cost  $A_1$ .

**Family labor income:** Gross income minus Cost  $B_2$ .

**Net Farm income:** Gross income minus Total expenses (Cost  $C_3$ ).

**Benefit-cost ratio:** Calculated as Gross income divided by Total expenses (Cost  $C_3$ ).

**Cost of production (₹/q.):** Determined by subtracting the value of by-products from Total cost.

## RESULTS AND DISCUSSION

Analyzing the cost and return structure in the cultivation of Medicinal and Aromatic Plants (MAPs) is a crucial aspect of planning and development in this sector. The financial outlay for MAP cultivation can be substantial, encompassing expenses like land preparation, planting materials, and labor. However, the investment can yield returns relatively quickly, with some MAPs ready for harvest within months.

Typically, MAPs have an economic life ranging from 3 to 5 years before replanting is necessary due to declining yields. For instance, aloe vera can be harvested after 8 months in the first year and provide multiple harvests annually. Lemongrass, on the other hand, is ready for harvest within 3 months of planting, offering several harvest opportunities each year.

Calculating the cost and returns on a per-hectare basis provides valuable insights into the economic viability of MAP cultivation in specific regions. Moreover, factors such as water availability, climate, and market demand are pivotal in planning and development. With careful consideration and strategic planning, MAP cultivation holds the potential to be both profitable and sustainable.

### Operational Cost

Aloe vera cultivation involves several operational expenses, encompassing the management of working capital. These costs encompass human labor, machine usage, seeds, fertilizers, irrigation

expenses, and interest on working capital. In Table 1, it's evident that material costs were the predominant component, accounting for 40.82 % of the total expenditure in sample farms. Hired labor followed closely, comprising 17.78 % of the total cost. Seed expenses represented 33.56 % of the total cost, with larger farms incurring a higher share (36.16 %) than medium and small ones.

Machine charges contributed 6.56 % to the total cost, with larger farms shouldering a slightly higher burden. Fertilizer and vermicompost costs constituted 4.79 % and 1.67 %, respectively, of the total cost.

The overall operational cost for Aloe vera cultivation per hectare amounted to ₹ 57,471.56, making up 72.03% of the total cost. This figure varied among different farm sizes, with small farms at ₹ 53,380.64, medium-sized at ₹ 58,829.15, and large farms at ₹ 60,204.89. This suggests that operational costs increased as farm size expanded.

In conclusion, managing the operational expenses in Aloe vera cultivation is crucial, with material costs being the most substantial contributor, followed by labor and seed expenses. Understanding these cost dynamics can help farmers optimize their operations and budgets effectively.

### Overhead costs

Overhead costs in Aloe vera cultivation encompass fixed capital expenses, including rental value for owned and leased land, depreciation, and interest on fixed capital. In Table 1, it's evident that rental value for owned land was the primary component, comprising 25.07 % of the total cost. Depreciation charges contributed 0.64 %, while interest on fixed capital accounted for 2.20 % of the total cost.

Interestingly, overhead costs were consistently lower than operational costs across all farm sizes. On average, overhead costs amounted to ₹ 22,316.75, with small farms at ₹ 2,201.62, medium-sized at ₹ 22,327.73, and large farms at ₹ 22,420.89. This data underscores a positive correlation between farm size and overhead costs.

In summary, overhead costs in Aloe vera cultivation are primarily driven by land-related expenses, with larger farms incurring higher overhead

**Table 1:** Cost and return pattern in cultivation of Aloe vera plantation in marginal farms

Sl. No.	Particulars	Small	Medium	Large	Overall
<i>I</i>	<b>Material Costs</b>				
	Planting Material Cost	24143	27139	29054	26778.67
	Manures & Fertilizers Cost	3465.15	3840.72	4150.32	3818.73
	Vermicompost	1214	1419	1376	1336.33
	Miscellaneous @ 2 % of total material cost	576.44	647.97	671.6	632
	<b>Sub-Total</b>	<b>29398.59</b>	<b>33046.69</b>	<b>35251.92</b>	<b>32565.73</b>
<i>II</i>	<b>Labour Costs</b>				
	Human Labour				
	Layout & Preparation	1905.1	2317.09	2412.85	2211.7
	FYM+Fertilizer+Vermicompost Application	1454.76	1672.09	1743.84	1623.6
	Planting	2584.52	2614.76	2776.12	2658.5
	Irrigation	1807.06	1607.81	1415.76	1610.2
	Weeding	2031.89	2411.87	2527.8	2323.9
	Harvesting	3400.54	3851.16	4026.27	3759.3
	<b>Sub-Total</b>	<b>13183.87</b>	<b>14474.78</b>	<b>14902.64</b>	<b>14187.1</b>
<i>III</i>	<b>Family Labour Costs</b>	3605.58	3106.85	1254.64	3334.52
<i>IV</i>	Interest on working capital @ 6 %	2771.28	3037.7	3084.55	2964.51
<i>V</i>	Machine Cost	4421.32	5163.13	5711.14	5231.86
	Sub-Total	10798.18	11307.68	10050.33	10718.73
<b>(A)</b>	<b>Total Variable Costs</b>	<b>53380.64</b>	<b>58829.15</b>	<b>60204.89</b>	<b>57471.56</b>
	<b>Fixed cost</b>				
<i>VI</i>	Land Revenue	50	50	50	50
<i>VII</i>	Depreciation	442.13	516.31	571.11	509.85
<i>VIII</i>	Interest on Fixed Capital @ 7 %	1709.49	1761.42	1799.78	1756.9
<i>IX</i>	Rental Value of land	20000	20000	20000	20000
<b>(B)</b>	<b>Total Fixed Cost</b>	<b>22201.62</b>	<b>22327.73</b>	<b>22420.89</b>	<b>22316.75</b>
	Total Cost (A+B)	75582.27	81156.88	82625.79	79788.31

**Note:** Figures in parenthesis indicate per cent to total cost; Total cost = Cost C<sub>3</sub> (C<sub>2</sub> cost + management cost i.e. 10 % of C<sub>2</sub>).

costs, emphasizing the importance of efficient cost management for all farm sizes.

### Returns from Aloe vera cultivation

Table 2 highlights the progressive increase in gross returns from Aloe vera sales, commencing in the first year of cultivation. The yield exhibited an ascending trajectory, with small farms yielding 257.32 qtl/ha, medium-sized farms producing 291.73 qtl/ha, and large farms achieving 294.17 qtl/ha. The overall gross returns averaged at ₹ 140,536.67 per hectare. Notably, while the gross returns declined to ₹ 128,660.00, ₹ 145,865.00, and ₹ 147,085.00 in small, medium, and

large farms, respectively, the net return peaked at ₹ 64,708.12 in medium-sized farms. The benefit-cost ratio demonstrated profitability, standing at 1.70 in small, 1.80 in medium, and 1.78 in large farms.

Table 3 depicts that the cost A<sub>1</sub> is in increasing trend as the size of land holding of the sampled household increases due to increased expenses in machinery, hired labour, fertilizers and manure, chemicals etc. when cost A<sub>1</sub> is calculated on overall basis then it was found to be 52882.88 ₹/ha. Similar was the fate for Cost B<sub>1</sub> and B<sub>2</sub> as they both also depicted the same trend as the former.

**Table 2:** Returns from Aloe vera cultivation (₹/ha)

Sl. No.	Particulars	Unit	Quantity			
			Small	Medium	Large	Overall
1	Aloe Vera Production	Kg	25732.00	29173.00	29417.00	28107.33
2	Price (per kg.)	₹	5.00	5.00	5.00	5.00
3	Total cost per hectare	₹	75582.27	81156.88	82625.79	79788.31
4	Gross return per hectare	₹	128660.00	145865.00	147085.00	140536.67
5	Net return per hectare	₹	53077.73	64708.12	64459.21	60748.35
6	BC Ratio	—	0.70	0.80	0.78	0.76
7	Input output Ratio	—	1.70	1.80	1.78	1.76

**Table 3:** Cost concept in Aloe vera cultivation for different size of farms (in ₹/ha.)

Sl. No.	Particulars	Small	Medium	Large	Overall
1	Cost A <sub>1</sub>	49401.45	54182.33	55064.86	52882.88
2	Cost A <sub>2</sub>	49401.45	54182.33	55064.86	52882.88
3	A <sub>2</sub> + FL	53007.03	57289.18	56319.5	55538.57
4	Cost B <sub>1</sub>	51110.94	55943.75	56864.64	54639.78
5	Cost B <sub>2</sub>	71110.94	75943.75	76864.64	74639.78
6	Cost C <sub>1</sub>	54716.52	59050.6	58119.28	57295.47
7	Cost C <sub>2</sub>	74716.52	79050.6	78119.28	77295.47
8	C <sub>3</sub>	82188.17	86955.66	85931.208	85025.01

## CONCLUSION

In conclusion, this analysis of Medicinal and Aromatic Plants (MAPs) cultivation, with a focus on aloe vera, underscores the dynamic economic landscape of this sector. MAP cultivation offers an attractive investment opportunity, with various crops maturing quickly and providing multiple harvests. Operational costs, dominated by material expenses, play a pivotal role in budgeting, while overhead costs remain relatively lower. Aloe vera cultivation, in particular, showcases an encouraging increase in gross returns and net income, with favorable benefit-cost ratios. As farm size grows, costs escalate, emphasizing the importance of efficient management.

## SUGGESTIONS

In light of the research findings, it is advisable to focus on optimizing operational costs in aloe vera cultivation, particularly material and labor expenses. Additionally, exploring cost-effective methods for managing overhead costs, such as land rental and depreciation, can enhance overall profitability. Furthermore, for larger farms, efficient machinery

utilization and resource allocation are key areas for improvement to maintain cost-effectiveness.

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