

Economic Analysis of Garlic Cultivation in Kohima District of Nagaland

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ABSTRACT

Garlic is the second most important spice crop commercially cultivated next to onion in India. This study identified the costs, returns, profitability and constraints associated with garlic production in Kohima district of Nagaland, the second largest producer of garlic among the North-Eastern states of India. Ninety garlic farmers selected randomly from six villages two of which selected purposively from two blocks of Kohima participated the research. The average cost of garlic per hectare was ₹3.06 lakhs, yielding an average gross income of ₹6.23 lakhs. The primary cost components included seeds (67.71%), manures (14.30%), and human labor (12.20%). The average net income for all farmers was ₹2,72,283.06, with the highest income observed in medium farms. Most garlic farmers (84.50%) earned ₹1-2 lakhs annually from cultivation. The benefit-cost ratio was highest in marginal farms (2.48), followed by medi-

um (2.44) and small farms (1.80). Key challenges identified using Garrett's ranking technique included high labor costs, lack of technical knowledge, and insufficient funds. The research findings suggest that garlic cultivation holds promise as a feasible venture, particularly when considering the escalating labor expenses and the necessity for advanced expertise in garlic cultivation techniques and availing possible credit facilities to the farmers.

Keywords Cost, Returns, Constraints, Garrett's ranking, Garlic, Nagaland.

INTRODUCTION

Garlic (*Allium sativum* L.) commercially cultivated, stands as a significant example of bulbous spice and medicinal crops (Panse *et al.* 2013). Garlic, resembling an onion in appearance, possesses a robust flavor and aroma widely utilized in culinary practices for enhancing taste. Moreover, it has been historically and presently employed for medicinal purposes. In tropical areas, it's common to consume both fresh and cooked green parts of garlic, and there's also a trend of using young bulbs in salads (Block 2010). Garlic is also known as Lahsoon, Lissan, Veluthull, Lasun, Rashun, Nohoyo, Vellulli, Lason, Shumandha, Bhutagna and Mahasuda.

Garlic is a valuable commercial crop that contributes significantly to India's foreign exchange earnings. Originally from Central Asia, it is cultivated in temperate regions globally, with approximately 1.6

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million hectares yielding around 28 million tonnes annually.

India is the second-largest producer of garlic in the world. In the fiscal year 2021-22, Madhya Pradesh achieved the highest garlic production in India. Among the North-eastern states of the country, Nagaland is the second largest producer of garlic next to Assam. In 2021-22, garlic production in India amounted to more than 3.5 million metric tons (APEDA 2021). There is also considerable variation in its price from year to year due to supply and demand parameters.

Nagaland boasts a diverse selection of horticultural crops, presenting farmers with abundant options for enhancing crop diversification. Additionally, Nagaland has a rugged terrain and excellent climatic conditions for growing a variety of crops and plants including spices. In Kohima region, garlic can be grown starting from June to November. As of 2020-22 Kohima district has the highest area and production of garlic next to Phek district (Govt of Nagaland 2022). The current study aimed to assess the expenses, income, and profitability along with the constraints associated with garlic cultivation in Kohima district during 2022-23.

MATERIALS AND METHODS

The current study was undertaken in Kohima district, Nagaland, due to the significant presence of garlic farmers in the area, and satisfactory acreage under garlic cultivation as per District Agriculture Office, Kohima. Out of 5 blocks in the district, two blocks, viz. Sechu-Zubza and Jakhama are purposively selected for the study since there is a good number of garlic production in these blocks. From each of the two chosen blocks three villages were selected purposively based on availability of garlic cultivation and fifteen respondents were randomly chosen from each of the six selected villages, totalling 90 respondents for the study.

Cost concept

The cost of cultivation of garlic was calculated using various cost concepts used in agricultural manage-

ment research, including both variable and fixed costs. These are outlined below:

Cost A₁: Hired human labor + value of machine labor + value of plant material + value of manures and fertilizers + irrigation charge + marketing transportation cost + depreciation of implements and farm buildings + land revenue, cess and other taxes + interest on working capital + miscellaneous expenses.

Cost A₂: Cost A₁ + rent for leased land
Cost B: Cost A₂ + rental value of owned land + interest on value of owned capital assets (excluding land).

Cost C₁: Cost B + imputed value of family labor

Cost C₂: 10% of total cost C₁ (It is the managerial function performed by the garlic growers. It is the comprehensive cost of cultivation).

Variable cost: Variable cost includes the cost of human labor, machine labor, plant material, manures and fertilizers, irrigation charges, marketing costs and interest on working capital.

Fixed cost: Fixed costs encompass depreciation costs on fixed assets, land revenue, interest on fixed capital, and the rental value of owned land.

Total cost = Fixed cost + Variable cost

For analyzing income of garlic growers, the following measures will be considered:

Family labor income: Gross Income - Cost B

Net income: Gross income - Cost C₁

Return from management: Gross income - Cost C₂

Benefit-cost ratio on variable cost: $\frac{\text{Gross income}}{\text{Variable cost}}$

Benefit-cost ratio on total cost: $\frac{\text{Gross income}}{\text{Total cost}}$

Garrett's ranking technique (Garrett and Woodworth 1969) was utilized to identify and rank the primary challenges faced by farmers in the cultivation of garlic. In this approach, participants were requested

to prioritize the specific issues they encountered in garlic cultivation based on their own perspectives, which were then translated into Garrett scores. The average score for each constraint had been organized in a descending order to determine their ranking, the highest score being ranked first.

RESULTS AND DISCUSSION

Occupational pattern and land holding

Study of occupational pattern and land holding is especially important for determining the primary occupation through which the garlic growers make a living. The selected garlic growers were divided based on their total land holdings into three categories viz. marginal (less than 1.0 ha), small (1.0-2.0 ha) and medium (2.0- 3.0 ha). As shown in Table 1, it indicates that a maximum number of garlic growers have small farms (45.50%) followed by marginal (32.22%) and medium farms (22.23%).

Table 1 also shows that 76.67% of respondents had agriculture as their primary occupation, 15.55% had service (Government employees) and the remaining 7.78% were engaged in business.

Land use pattern

Land use pattern of sample garlic growers were presented in Table 2. Majority of land was used for garlic cultivation (28.19%) next to fallow land (30.69%). They also used their land for plantation (14.16%), dwelling house (13.98%), rice cultivation (9.30%) and fisheries (3.68%).

Table 1. Distribution of farmers according to occupational pattern and land holding.

Sl. No.	Particulars	Frequency	Percentage (%)
1	Occupational pattern		
	Agriculture	69	76.67
	Services	14	15.55
	Business	7	7.78
	Total	90	100.00
2	Land holding		
	Marginal	29	32.22
	Small	41	45.55
	Medium	20	22.23
	Total	90	100.00

Table 2. Land use pattern of the sample farmers.

Sl. No.	Land use pattern	Area (ha)	Percentage (%)
1	Dwelling house	18.26	13.98
2	Rice	12.15	9.30
3	Plantation	18.44	14.16
4	Fallow land	40.08	30.69
5	Fisheries	4.81	3.68
6	Garlic	36.83	28.19
	Total	130.63	100.00

Income from garlic cultivation

Table 3 shows the annual income obtained by the sample garlic growers from garlic cultivation. Majority of the farmers (84.50%) earned an annual income of ₹1 Lakh to ₹2 Lakhs from garlic cultivation, and only 6.60% of farmers earned more than ₹2 Lakhs per annum.

Economics of garlic production

In conducting cost and return calculations for different farm size groups in the study, the cost concepts employed in farm management studies, including Cost A₁, A₂, B, C₁ and C₂, have been applied (Patidar *et al.* 2018).

Cost breakdown per hectare for each item in cultivation

The cost of cultivation includes every expense incurred by the growers, including input costs like seed and manure, labor costs for people and machines, depreciation on various farm tools owned by the growers, rental value of owned land, and interest on owned fixed assets.

Table 4 shows the detailed per-hectare cost of garlic cultivation for different farms. The per hect-

Table 3. Distribution of farmers based on their annual income from garlic cultivation.

Sl. No.	Income (Lakh rupees)	Frequency	Percentage (%)
1	Less than 1	8	8.90
2	1-2	76	84.50
3	More than 2	6	6.60
4	Total	90	100.00

Table 4. Breakdown of cost of cultivation of garlic for different farm sizes (₹/ha). Numbers in parentheses show the percentage relative to the total.

Sl. No.	Particulars	Marginal	Farm sizes		
			Small	Medium	Average
A.	Variable cost				
1	Seed cost	50,375.90 (65.84)	31,049.10 (69.00)	29,064.02 (68.00)	36,829.76 (67.71)
2	Hired Labor	3,104.71 (4.05)	1,648.78 (3.67)	2,864.98 (6.70)	2,539.49 (4.80)
3	Family labor	7,476.82 (9.77)	3,100.18 (6.90)	2,366.09 (5.56)	4,314.36 (7.40)
4	Manure cost	11,224.18 (14.67)	6,590.15 (14.67)	5,902.83 (13.85)	7,905.72 (14.30)
5	Interest in working capital	4,330.89 (5.67)	2,543.29 (5.67)	2,411.87 (5.67)	3,095.35 (5.67)
	Total variable cost	76,512.52 (31.84)	44,931.51 (18.69)	42,609.81 (17.73)	1,28,343.97 (22.75)
B.	Fixed cost				
1	Depreciation on farm implements	1,732 (1.05)	2,064 (0.50)	2,452 (1.01)	2,082.67 (0.80)
2	Rental value of owned land	1,44,500 (88.22)	3,10,000 (88.69)	2,12,800 (88.26)	2,22,433.33 (88.39)
3	Interest on fixed capital	17,547.84 (10.71)	37,447.68 (10.71)	25,830.24 (10.71)	80,825.76 (10.71)
	Total fixed cost	1,63,779.84 (21.71)	3,49,511.68 (46.33)	2,41,082.24 (31.95)	3,05,341.76 (40.47)
C.	Total cost (A+B)	2,40,292.36	3,94,443.19	2,83,692.05	3,06,142.53

(Numbers in parentheses show the percentage relative to the total.)

are cost of cultivation was ₹3,06,142.53. Seed costs accounted for the highest share i.e. ₹36,829.76 of the total cost, followed by manure cost with ₹7,905.72, family labor with ₹4,314.36, interest on working capital with ₹3,095.35 and hired labor with ₹2,539.4.

Next to high expenses on seed, marginal farms hired more labors other than engaging more family labors. Out of the total cost, variable cost was estimated to be 22.75% and fixed cost at 40.47%.

Table 5. Profit measures of sample growers for different farms (₹/ha).

Sl. No.	Particulars	Marginal	Small	Medium	Average
1	Gross income	5,96,043.44	5,78,400	6,93,190.47	6,22,544.64
2	Family labor income	3,37,299.89	1,47,833.75	3,44,658.66	2,76,597.43
3	Net income	3,29,823.06	1,44,633.57	3,42,292.56	2,72,283.06
4	Return from management	5,69,421.41	5,35,033.36	6,58,100.68	5,87,518.48
5	Benefit cost ratio	2.48	1.40	2.44	2.10
6	Cost A ₁	1,05,243.55	1,07,966.24	1,18,331.81	1,10,513.87
7	Cost A ₂	1,05,243.55	1,07,966.24	1,18,331.81	1,10,513.87
8	Cost B	2,58,743.55	4,30,566.24	3,48,531.81	3,45,947.20
9	Cost C ₁	2,66,220.38	4,33,666.42	3,50,897.91	3,50,261.57
10	Cost C ₂	2,92,842.41	4,77,033.06	3,85,987.70	3,85,287.72
11	Total variable cost (TVC)	76,512.52	44,931.51	42,609.81	54,684.61
12	Total fixed cost (TFC)	1,63,779.84	3,49,511.68	2,41,082.24	1,46,457.92
13	(TVC +TFC)	2,40,292.36	79,443.19	2,83,692.05	2,01,142.53

Table 6. Ranking the constraints associated with garlic cultivation.

Sl. No.	Production problems	Garrett's mean score	Rank
1	High labor cost	67.01	I
2	Lack of technical knowledge	53.48	II
3	Lack of funds	50.32	III
4	Problems of pests and disease	44.57	IV
5	Non-availability of quality seeds on time	32.60	V

Profit measures of farmers

Table 5 reveals the cost and return on sample farms from garlic production. Estimated garlic cultivation costs per hectare for marginal, small and medium farms were ₹2, 40, 292.36, ₹3,94, 443.19, ₹2, 83, 692.05 respectively, with an average of ₹3, 06,142.53. The cost of cultivation was determined to be highest in small farms and no clear pattern was evident among the different farm size categories. Lower cost of medium farm may be due to less expenses in seeds and minimal use of family labor.

Gross income

Marginal farmers achieved a gross income of ₹5,96,043.44, small farmers earned ₹5,78,400, and medium farmers generated ₹6,93,190.47. Notably, medium farmers recorded the highest gross income, while small farmers had the lowest. On average, the gross income from garlic cultivation was ₹6,22,544.64.

Income from family labor

Marginal farmers earned ₹3,37,299.89 from family labor, small farmers earned ₹1,44,833.75, and medium farmers earned ₹3,44,658.66. The average family labor income was ₹2,76,597.43. Among the three groups, medium farmers had the highest family labor income, while small farmers had the lowest. This indicates that medium farmers employed more hired labor compared to the other two groups.

Net income

The average net income for all the sample growers

was found to be ₹2,72,283.06. Net income was increasing with farm size except for marginal farm and was found highest in medium farms (₹3,42,292.56).

Return from management

Return from management was worked out by deducting Cost C₂ from the gross income. The return from management for medium farmers was estimated to be the highest at ₹6,58,100.68, followed by marginal farmers at ₹5,69,421.41 and lowest in small farmers at ₹5,35,033.36. The average return from management per hectare was found to be ₹5,87,518.48.

Benefit-cost ratio

Benefit-cost ratio indicates the economic feasibility of the crop by measuring the return on each rupee invested. The average benefit-cost ratio of all the farms was found 2.10. An upward trend in the benefit-cost ratio was noticed as operational holding increased, except for marginal farms, which exhibited the highest benefit-cost ratio. Similar results were discovered by Murry and Tsopoe (2020) in their research on the economic aspects of Chilli Cultivation in the Wokha district of Nagaland.

Constraints associated with garlic cultivation

The key constraints faced by the sample garlic growers (Table 6) were high labor cost with Garrett's score 67.01 followed by lack of technical knowledge (53.48) and lack of funds (50.32). The farmers also shared about the problems of pests and disease (44.57) and non-availability of seeds on time (32.60).

CONCLUSION

The study focused on identifying the costs, returns, and profitability associated with garlic production in Kohima district of Nagaland. On an average per hectare cost of garlic was ₹3.06 lakhs with an average gross income of ₹6.23 lakhs. Cultivation of garlic is a profitable venture in the region as indicated by the average higher returns on per rupee investment of 2.10. High cost of seed, manures and human labor both hired and family labor were the major cost components of garlic farmers where emphasis to be

given to minimize the cost. Medium farms generated the highest net income from garlic cultivation, with marginal and small farms following behind. Net income in medium farms was more than doubled compared to small farms, indicating a trend of increasing profitability with larger farm sizes. Garlic cultivation holds promise as a feasible venture, particularly when considering the escalating labor expenses and the necessity for advanced expertise in garlic cultivation techniques along with availing credit facilities and quality seeds on time to the garlic farmers.

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