P-ISSN: 2618-0723
E-ISSN: 2618-0731

NAAS Rating (2025): 5.04
www.extensionjournal.com

International Journal of Agriculture Extension and Social Development

Volume 8; Issue 10; October 2025; Page No. 88-93

Received: 19-07-2025
Accepted: 22-08-2025

Indexed Journal
Peer Reviewed Journal

Economics of production and disposal of pomegranate in Vijayapura District of Karnataka

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DOI: https://www.doi.org/10.33545/26180723.2025.v8.i10b.2508

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Abstract

The study entitled "Economics of production and disposal of pomegranate in Vijayapura district of Karnataka". focused on estimating costs, returns and profitability. A sample of 120 pomegranate growers was selected randomly from the Vijayapura district. The respondents were classified into four groups, *viz*., marginal, small, medium and large farmers. Per hectare cost of cultivation at the overall level was 474519 and highest for the large farmers (Rs. 515469), followed by medium (Rs. 483643), small (Rs. 451576) and marginal farmers (Rs. 447387). Net profits at Cost 'C' were Rs. 408306 for marginal farmers, Rs. 418612 for small farmers, Rs. 458998 for medium farmers and large farmers Rs. 512183. At the overall level, net profits at cost 'C' were of Rs. 449525. The B: C ratio was 1.99 for large, 1.95 for medium, 1.93 for small and 1.91 for marginal farmers, indicating profitability.

Keywords: Pomegranate, cost and returns, B: C ratio, profitability

Introduction

Pomegranate (*Punica granatum*) is an important fruit grown in warm areas of the country, part of the *Punicaceae* family. It is one of the main fruit crops grown in India and is originally from Iran (*Persia*). Pomegranate is a fruit that provides important nutrients like proteins, fats, sugars and minerals that are necessary for good health. It is very nutritious, rich in vitamin B, vitamin A and potassium. In India, people often call it a "desert fruit" and it is popular for making fresh juice. The seeds comprise about 68 per cent of the edible part of the fruit. The whole fruit contains 78 per cent water, 0.7 per cent minerals, 1.6 per cent protein, 14.5 per cent carbohydrates, 14.5 per cent fat and 5.1 per cent fiber. It is enriched with vitamins, providing 0.06 mg of thiamine, 0.1 mg of riboflavin, 0.3 mg of niacin and 16 mg of vitamin C per pulp, along with minerals like 10 mg of calcium, 12 mg of phosphorus and 0.3 mg of iron for every 100g of pulp. The fruit looks attractive and has a sweet and slightly sour taste. It is mainly eaten fresh or used in desserts. Pomegranates are used to make jam, jelly, juice, syrup, wine and even to add flavour to cakes. Pomegranate is valued for its medicinal and nutritional benefits. It is the 10th most consumed fruit in the world. There is a huge opportunity for Indian pomegranates in international markets. (Patil and Karale, 1990) [7].

Pomegranate grows well in different conditions, is strong and hardy, needs less care to grow, gives regular and high yields, has good shelf life, is good to eat and has health benefits. The plant can also be kept dormant during periods of water scarcity. All these reasons show that the area under pomegranate cultivation is increasing in India. To show its importance, the pomegranate was chosen as symbol of the 18th International Horticultural Congress held in 1970.

This fruit does well in dry areas but needs water to grow properly. It is known for its sweet and tangy taste, providing a cool, refreshing juice and is valued for its health benefits. The plant is also attractive with bright red flowers. India is one of the leading producers of pomegranates with 2.23 lakh hectares of land used for growing them and producing about 28.42 lakh MT in the year 2023-24. (Source: indiastat.com).

Methodology (Materials and Methods)

Vijayapura district was purposively selected for this study due to its extensive pomegranate cultivation areas. A multi-stage sampling method was employed, focusing on three major tahsils Indi, Tikota and Vijayapura which have the largest area under pomegranate cultivation. From each tahsil, five villages were randomly selected and from each selected village, eight pomegranate growers were purposively chosen, making up a total sample of 120

farmers. The primary data collected pertained to the agricultural year 2023–24.

To accomplish the stated objectives, the data were tabulated and analyzed using appropriate statistical and economic tools and interpreted through simple tabulation, averages and percentages. The standard cost concept was used for estimating costs and returns in pomegranate production.

Cost A: It includes actual paid out costs by the owner cultivator, inclusive of both cash and kind expenditure.

Cost B: Cost A plus interest on fixed capital, plus the rental value of owned land is to be included in Cost B.

Cost C: It includes Cost B plus the imputed value of family labour and supervision charges.

For estimating profitability, B:C ratio was worked out.

$$\text{B:C ratio} = \frac{Gross\ returns}{Total\ cost}$$

Results and Discussion

The distribution of 120 sample pomegranate growers was conducted based on farm size in the Indi, Tikota and Vijayapura talukas of Vijayapura district. This consists of 30 farmers from marginal (< 1 ha), small (1-2 ha), medium (2-4 ha) and large (>4 ha) farmers.

Labour is an important input in the cultivation of pomegranate as its cultivation is labour-intensive. Key operations involved in growing pomegranate include harrowing, manuring, irrigation, application of fertilizer, weeding, intercultural operation, plant protection, pruning and harvesting. Per hectare operation-wise labour required for the maintenance of a pomegranate orchard is given in Table 1.

Human labour is a crucial input in pomegranate production, as its cultivation is both labour-intensive as well as machinery-dependent. Operations such as harrowing, manuring, fertilizer application, weeding, irrigation, intercultural activities, plant protection measures, pruning and harvesting require substantial labour input and machinery.

Table 1 presents the per-hectare operation-wise labour requirement for the maintenance of pomegranate orchards across different farm sizes marginal, small, medium and large, along with the overall average. The total human labour required per hectare for maintenance ranged from 195.22 to 201.74 man-days with the overall average being 199.08 man-days. Similarly, machinery labour required ranged from 20.90 to 23.20 hours with the overall average being 21.95 hours. Among all operations, the maximum proportion of human labour was used for the application of fertilizers (16.84%), followed by harvesting (16.17%), plant protection (16.47%) and weeding (14.27%). Other significant operations include manuring (12.90%), pruning (11.61%) and irrigation (11.72%), indicating the wide distribution of labour-intensive activities during the orchard's maintenance phase.

For machine labour, harrowing alone required the highest share of machine use at 8.50 hours (38.72%), followed by plant protection at 5.68 hours (25.87%), manuring at 4.37 hours (19.90%) and intercultural operations at 3.40 hours (15.48%). Machine labour was especially used for tasks where manual labour would be less efficient or more time-consuming. The consistency across all farm sizes in the proportion of labour distribution indicates a standardized approach to orchard maintenance. These figures reveal that both manual and mechanical efforts play a crucial role in maintaining pomegranate orchards, with proper labour planning essential for efficient farm management and profitability.

Table 1: Per-hectare operation-wise labour required for the maintenance of a pomegranate orchard

Sr. No	Particular	Marginal		Small		Medium		Large		Overall	
		Human labour	Machinery hours	Human labour	Machinery hours	Human labour	Machinery hours	Human labour	Machinery hours	Human labour	Machinery hours
1	Harrowing	--	8.30 (39.71)	--	8.40 (39.75)	--	8.60 (37.06)	--	8.70 (38.64)	--	8.50 (38.72)
2	Manuring	25.29 (12.95)	4.10 (19.61)	24.55 (12.34)	4.30 (20.35)	26.02 (13.00)	4.50 (19.36)	26.90 (13.34)	4.56 (20.25)	25.69 (12.91)	4.37 (19.90)
3	Irrigation	23.00 (11.78)	--	21.95 (11.03)	--	23.70 (11.84)	--	24.40 (12.10)	--	23.26 (11.69)	--
4	Applications of fertilizer	33.70 (17.26)	--	34.50 (17.34)	--	32.00 (15.98)	--	33.90 (16.81)	--	33.53 (16.85)	--
5	Weeding	27.96 (14.32	--	28.50 (14.33)	--	29.00 (14.48)	--	28.19 (13.98)	--	28.41 (14.28)	--
6	Intercultural operation	--	3.00 (14.35)	--	3.13 (14.81)	--	4.00 (17.24)	--	3.45 (15.32)	--	3.40 (15.48)
7	Plant protection	31.79 (16.28)	5.50 (26.31)	34.05 (17.12)	5.30 (25.08)	34.55 (17.26)	6.10 (26.29	30.75 (15.25)	5.80 (25.76)	32.79 (16.48)	5.68 (25.87)
8	Pruning	22.12 (11.33)	--	23.10 (11.61)	--	23.30 (11.64)	--	24.00 (11.90)	--	23.13 (11.62)	--
9	Harvesting	31.36 (16.06)	--	32.20 (16.19)	--	31.65 (15.81)	--	33.53 (16.63)	--	32.19 (16.17)	--
	Total	195.22 (100.00)	20.90 (100.00)	198.85 (100.00)	21.13 (100.00)	200.22 (100.00)	23.20 (100.00)	201.67 (100.00)	22.51 (100.00)	198.99 (100.00)	21.95 (100.00)

(Figure in parenthesis indicates percentage to total)

Physical inputs for the maintenance of a pomegranate orchard

The group-wise detailed information about per-hectare physical input utilization for pomegranate production is presented in Table 2.

Table 2: Per-hectare physical inputs for the maintenance of a pomegranate orchard (Figures in quantities)

Sr. No	Particulars	Unit	Marginal (N=30)	Small (N=30)	Medium (N=30)	Large (N=30)	Overall (N=120)
1	Hired human labour						
	a) Male	Man days	69.32	69.20	70.02	72.55	70.27
	b) Female		54.19	55.90	53.40	55.15	54.66
	Subtotal		123.51	125.10	123.42	127.70	124.93
2	Family labour						
	a) Male	Man days	44.29	44.40	46.75	45.88	45.33
	b) Female		27.42	29.35	30.05	28.09	28.73
	Subtotal		71.71	73.75	76.80	73.97	74.06
3	Total male labour		113.61	113.60	116.77	118.43	115.60
4	Total female labour		81.61	85.25	83.45	83.24	83.39
5	Total (male + female)		195.22	198.85	200.22	201.67	198.99
6	Machinery	Hour	20.90	21.13	23.40	22.51	21.98
7	Manure	kg	12556	12490	12591	12689	12581
8	Fertilizers						
	Nitrogen	kg	483.34	477.19	482.97	476.31	479.95
	Phosphorus	kg	291.08	284.77	293.42	276.48	286.43
	Potassium	kg	321.95	324.59	331.31	309.87	321.93
9	Plant protection chemicals	lit	44.68	45.54	44.82	41.13	44.04

The per-hectare input utilization for maintaining pomegranate orchards across various farm sizes is presented in Table 2. The table presents the farm size-wise per-hectare human labour utilization in man-days for the maintenance of pomegranate orchard. On average, each farm required 198.99 man-days of total human labour, consisting of 115.60 man-days of male labour and 83.39 man-days of female labour. Hired labour accounted for 124.93 man-days with 70.27 man-days of male and 54.66 man-days of female labour. Family labour contribution was 74.06 man-days in total, including 45.33 man-days of male and 28.73 man-days of female labour. Among the different farm sizes, large farms recorded the highest total labour use at 201.67 man-days, while marginal farms used slightly less at 195.22 man-days. Labour usage patterns were consistent across all categories with male labour generally higher than female labour and hired labour playing a major role in orchard establishment across all farm sizes.

Machinery hours used at the overall level were 21.98 per hectare. For medium farmers, the average was 23.40 hours and for large farmers, it was 22.51 hours, showing slightly higher usage than marginal (20.90) ones. Farmyard manure application at the overall level was 12,581 kg per hectare with consistent use across all farm categories, reflecting uniform soil fertility practices. At the overall level, the application of major nutrients per hectare was at 479.95 kg of nitrogen, 286.44 kg of phosphorus and 321.93 kg of potassium, showing the emphasis on maintaining soil health and crop productivity through balanced nutrient supply.

Plant protection materials were applied at an overall level of 44.04 litres per hectare with usage slightly higher in small farms (45.54 litres) and lower in large farms (41.13 litres), possibly due to variations in pest and disease management approaches. Overall, maintaining pomegranate orchards requires substantial use of human effort, mechanized support, farmyard inputs and crop care measures. Despite some differences based on farm size, the input pattern suggests a broadly uniform management strategy among growers.

Per-hectare cost of cultivation of a pomegranate orchard

The per-hectare cost of cultivation of pomegranate production for marginal, small, medium and large growers was calculated and is presented in Table 3.

The detailed analysis of per-hectare cost incurred in the maintenance of pomegranate orchards across marginal, small, medium and large categories of farms is presented in Table 5.11. At overall level per hectare total cost was Rs. 474519. Then total cost C was Rs. 447387 for marginal farms, Rs. 451576 for small farms, Rs. 483643 for medium farms and Rs. 515469 for large farms. This comprehensive cost structure covers all direct, indirect, capital and imputed expenditures involved in managing and maintaining a productive orchard. Among the total cost, Cost A was at the overall level was Rs. 225995 (47.63%), then Rs. 216653 (48.43%) in marginal farms and increased to Rs. 242437 (47.03%) in large farms. At the overall level, Cost B was estimated at Rs. 420636, accounting for 88.64 per cent of the total cost. The rental value of land was the highest component, contributing 31.35 per cent (Rs. 148752), followed by amortization cost at 7.79 per cent (Rs. 36942) and interest on fixed capital at 1.89 per cent (Rs. 8946). As farm size increased, Cost B also increased from Rs. 395352 to Rs. 459857, indicating that larger farms had higher overall costs, mainly due to increased fixed expenses. This is found to be contradictory to the operation of the farm's activities on the scale of economics. It may be due to the mismanagement of large farms as far as input and other resources are concerned.

Among the operational expenditures, hired human labour remained a major cost component across all farm categories, reflecting the highly labour-intensive nature of pomegranate cultivation. At overall level total cost of hired labour was Rs. 51534 (10.86%) per hectare, consisting of Rs. 35136 (7.40%) for male workers and Rs. 16398 (3.46%) for female workers. This balanced workforce distribution highlights the significant and almost equal

Table 3: Per hectare cost of cultivation of a pomegranate orchard (Figures in Rs.)

Sr. No	Particulars	Marginal (N=30)	Small (N=30)	Medium (N=30)	Large (N=30)	Overall (N=120)
1	**Hired human labour**					
	a) Male	34658 (7.75)	34600 (7.66)	35010 (7.24)	36275 (7.04)	35136 (7.40)
	b) Female	16257 (3.63)	16770 (3.71)	16020 (3.31)	16546 (3.21)	16398 (3.46)
	Subtotal	50915 (11.38)	51370 (11.38)	51030 (10.55)	52821 (10.25)	51534 (10.86)
2	Machinery	12150 (2.72)	12364 (2.74)	13690 (2.83)	13147 (2.55)	12838 (2.71)
3	Manure	53432 (11.94)	55812 (12.36)	56378 (11.66)	57014 (11.06)	55659 (11.73)
4	**Fertilizers**					
	Nitrogen	3391 (0.76)	3394 (0.75)	3442 (0.71)	3989 (0.77)	3554 (0.75)
	Phosphorus	7733 (1.73)	7595 (1.68)	7852 (1.62)	7995 (1.55)	7794 (1.64)
	Potassium	11244 (2.51)	11292 (2.50)	11575 (2.39)	12825 (2.49)	11734 (2.47)
5	Plant protection chemicals	55380 (12.38)	54130 (11.99)	58031 (12.00)	68977 (13.38)	59130 (12.46)
6	Miscellaneous	2250 (0.50)	2540 (0.56)	2870 (0.59)	3290 (0.64)	2738 (0.58)
7	Interest on working capital @ 6%	11790 (2.64)	11910 (2.64)	12292 (2.54)	13203 (2.56)	12299 (2.59)
8	Land revenue	150 (0.03)	165 (0.04)	180 (0.04)	190 (0.04)	171 (0.04)
9	Depreciation on capital assets	8218 (1.84)	8512 (1.88)	8467 (1.75)	8986 (1.74)	8546 (1.80)
10	Cost A	216653 (48.43)	219084 (48.52)	225807 (46.69)	242437 (47.03)	225995 (47.63)
11	Rental Value of Land	132760 (29.67)	134237 (29.73)	156927 (32.45)	171086 (33.19)	148752 (31.35)
12	Interest on fixed capital	8997 (2.01)	8400 (1.86)	8996 (1.86)	9392 (1.82)	8946 (1.89)
13	Amortization cost	36942(8.26)	36942 (8.18)	36942 (7.64)	36942 (7.17)	36942 (7.79)
14	Cost B	395352 (88.37)	398663 (88.28)	428672 (88.63)	459857 (89.21)	420636 (88.64)
15	**Family labour**					
	a) Male	22145 (4.95)	22200 (4.92)	23375 (4.83)	22940 (4.45)	22665 (4.78)
	b) Female	8225 (1.84)	8805 (1.95)	9015 (1.86)	8428 (1.64)	8618 (1.82)
	Subtotal	30370 (6.79)	31005 (6.87)	32390 (6.70)	31368 (6.09)	31283 (6.59)
16	Supervision Charges	21665 (4.84)	21908 (4.85)	22581 (4.67)	24244 (4.70)	22600 (4.76)
16	Cost C	447387 (100.00)	451576 (100.00)	483643 (100.00)	515469 (100.00)	474519 (100.00)
17	Gross returns	855693	870188	942641	1027652	924044
18	Productivity (Output)	108.13	112.13	120.87	125.4	116.63
19	Per quintal cost	4137	4027	4001	4111	4069
20	Benefit-cost ratio	1.91	1.93	1.95	1.99	1.95

(Figure in parenthesis indicates percentage to total)

participation of both men and women in orchard operations. The application of farm yard manure, which is essential for enhancing soil fertility, improving soil structure and supporting long-term productivity, amounted to Rs. 55659 (11.73%) per hectare. Machinery involvement added another Rs. 12838 (2.71%), indicating moderate use of equipment in regular farm activities.

Fertilizer costs per hectare consisted of nitrogen at Rs. 3554 (0.75%), phosphorus at Rs. 7794 (1.64%) and potassium at Rs. 11734 (2.47%), pointing to the considerable nutrient requirements of the pomegranate crop. The expenditure on plant protection chemicals was the highest among all individual inputs at Rs. 59130 (12.46%), emphasizing the importance of continuous protection against pests and diseases. Miscellaneous costs amounted to Rs. 2,738 (0.58%), while land revenue was at the overall level was at

Rs. 171 (0.04%). Depreciation of capital assets, including wear and tear of tools and equipment, was at Rs. 8546 (1.80%) and interest on working capital was Rs. 12299 (2.59%).

The rental value for the use of owned land was at Rs. 148752 (31.35%) per hectare, representing a major share of the overall cost. Interest on fixed capital, which accounts for long-term investment, was Rs. 8946 (1.89%). A uniform amortization charge of Rs. 36942 (7.79%) was applied across all categories to recover long-term establishment costs. Family labour contributed Rs. 31,283 (6.59%) per hectare, of which Rs. 22665 (4.78%) came from male and Rs. 8618 (1.82%) from female family members. Supervision charges, calculated at 10 per cent of Cost A, amounted to Rs. 22600 (4.76%).

In terms of profitability, gross returns per hectare were Rs. 924044 and the cost of production per quintal was Rs. 4069. The overall yield achieved was 116.63 quintals per hectare. The benefit-cost ratio was 1.95, indicating that pomegranate cultivation is economically viable and profitable across all farm sizes, providing nearly double the return over the total expenditure involved.

Per-hectare profitability of pomegranate production

The per-hectare profitability of pomegranate cultivation across marginal, small, medium and large farm sizes is analyzed in Table 4. At the overall level, the average productivity was 116.63 quintals per hectare, generating gross returns of Rs. 924044. The total cost of cultivation (Cost C) across all farms was Rs. 474519, resulting in a net return of Rs. 449525 per hectare. The profitability was highest at Cost A was Rs. 698048 and reduced with the inclusion of imputed costs at Cost B was Rs. 503408 and Cost C. The overall Benefit-Cost Ratio (BCR) was 4.08 at Cost A, 2.20 at Cost B and 1.95 at Cost C, indicating profitable returns under all cost measures.

Table 4: Per-hectare profitability of pomegranate orchard

Sr. No	Particulars	Marginal (N=30)	Small (N=30)	Medium (N=30)	Large (N=30)	Overall (N=120)
1	Productivity (qtls)	108.13	112.13	120.87	125.40	116.63
2	Gross returns (`)	855693	870188	942641	1027652	924044
3	**Total cost (`)**					
	a) Cost -A	216653	219084	225807	242437	225995
	b) Cost-B	395352	398663	428672	459857	420636
	c) Cost-C	447387	451576	483643	515469	474519
4	**Net Returns over (₹)**					
	a) Cost -A	639040	651104	716834	785215	698048
	b) Cost-B	460341	471525	513969	567795	503408
	c) Cost-C	408306	418612	458998	512183	449525
5	Per quintal cost of production	4137	4027	4001	4111	4069
6	Per kg cost of production	41	40	40	41	41
7	Per kg gross return	79	78	78	82	79
8	Per kg net return	38	37	38	41	38
9	**B: C ratio**					
	a) Cost -A	3.95	3.97	4.17	4.24	4.08
	b) Cost-B	2.16	2.18	2.20	2.23	2.20
	c) Cost-C	1.91	1.93	1.95	1.99	1.95

Among different farm sizes, marginal farmers attained a yield of 108.13 quintals per hectare with gross returns of Rs. 855693. Their total Cost C was Rs. 447387, giving a net return of Rs. 408306 and a BCR of 1.91. Small farms had a productivity of 112.13 quintals per hectare and gross returns of Rs. 870188. Their total cost stood at Rs. 451576 with net returns of Rs. 418612 and a BCR of 1.93. Medium-sized farms had a yield of 120.87 quintals per hectare and gross returns of Rs. 942641. With a total cost of Rs. 483643, their net returns were Rs. 458998 and the BCR was 1.95. Large farms achieved the highest yield of 125.40 quintals per hectare and gross returns of Rs. 1027652. With a Cost C of Rs. 515469, their net returns amounted to Rs. 512183 and the BCR was highest at 1.99.

In terms of per unit costs and returns, the average cost of production per quintal was Rs. 4069, varying slightly across farm sizes Rs. 4137 in marginal, Rs. 4027 in small, Rs. 4001 in medium and Rs. 4111 in large farms. The per kg cost of production averaged Rs. 41, while per kg gross returns ranged from Rs. 78 in small farms to Rs. 82 in large farms. Net returns per kg were also highest in large farms at Rs. 41, reflecting scale advantages and efficient farm practices.

Overall, the analysis confirms that pomegranate cultivation is profitable for all categories of farmers. The high BCR values indicate that, despite significant investment, the enterprise yields considerable returns, making pomegranate a viable commercial crop for farmers of varying landholding sizes.

Conclusion

Per hectare, labour utilized for annual maintenance of the pomegranate orchard was 198.99 man-days and 21.95 machine hours. For the maintenance of the pomegranate orchard annually, manure application was 12581 kg per hectare. Fertilizer use consisted of 479.95 kg of nitrogen, 286.43 kg of phosphorus and 321.93 kg of potassium. Plant protection chemicals used were 44.04 litres per hectare. Per-hectare total cost of cultivation (Cost C) was Rs. 474519. While Cost A was Rs. 225995 and Cost B was Rs. 420636. Per-hectare gross return on pomegranate cultivation was Rs. 924044, per hectare total cost of cultivation was Rs. 474519, resulting in a net return of Rs. 449525 and a benefit-cost ratio to the tune of 1.95. The per quintal cost of production was Rs. 4069 and per kg cost was Rs. 41. Per kg gross

returns were Rs. 79 and net returns were Rs. 38.

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