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Cost, returns and profitability of alphonso mango cultivation in south Konkan region of Maharashtra

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Abstract

The study entitled "Cost, returns and profitability of Alphonso mango cultivation in South Konkan region of Maharashtra" focused on estimating costs, returns and profitability of Alphonso mango orchard. Multistage sampling technique was employed for present study and sample of 120 alphonso mango growers was drawn from Ratnagiri and Sindhudurg districts of South Konkan region in Maharashtra. The study revealed that total labour requirement per hectare at overall level in Alphonso mango orchards was 145.80 man-days. Per hectare cost of cultivation was highest (Rs. 385409) for large group, followed by medium (Rs. 333069) and small groups (Rs. 239184). At overall level, per hectare cost of cultivation (Cost-C) was Rs. 3,01,142. Net returns at cost 'C' were Rs. 234096 at overall level. The B:C ratio was highest (1.85) for large group, with medium group at 1.78 and small group at 1.73. At overall level, it was 1.78.

Keywords: Alphonso, Mango, cost and returns, B:C ratio, Profitability

Introduction

Mango (*Mangifera indica* L.), a member of the Anacardiaceae family, stands as the foremost commercially cultivated fruit crop in the country and is renowned as the 'king of fruits.' India has the richest collection of mango cultivars. The fruit's popularity is attributed to its broad adaptability, high nutritional content, diverse varieties, delightful taste and exquisite flavour. Mango is a rich source of both vitamin A and vitamin C. The world-famous Alphonso mango is commercially grown in the Ratnagiri and Sindhudurg districts of South Konkan region of Maharashtra. The Alphonso mango is a delicacy cherished both domestically and internationally. Alphonso mangoes have gained global recognition and their export is a significant contributor to India's agricultural economy. India is not only a major producer but also a prominent exporter of fresh mangoes, having exported 27872.77 MT of fresh mangoes worth Rs. 32745 lakhs during 2021-22 (APEDA, 2023) [1].

Materials and Methods

Ratnagiri and Sindhudurg districts were purposively selected for this study due to their extensive mango cultivation areas. From each district, three tahsils were selected purposively based on the maximum area cultivated under mango crop. From each selected tahsil, two villages were randomly selected. From each selected village, 10 farmers were randomly chosen for the study. Consequently, the final sample consists of two districts, six tahsils, twelve villages and a total of 120 mango growers. The primary data collected pertained to the agricultural year 2023-24.

To fulfil the stated objectives, the primary data were tabulated and analysed using appropriate statistical and economic tools. The collected data were analyzed and interpreted by simple tabulation, averages, percentages, etc. The standard cost concept was used for calculating cost and returns in mango production.

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

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

Cost C: It includes Cost B plus imputed value of family labour.

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

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

Results and Discussion

The distribution of sample mango growers was done on the basis of number of mango trees in orchard. Out of total 120 sample mango growers, 53 mango growers (44.17%) belonged to small group, 40 (33.33%) belonged to medium group and 27 (22.50%) belonged to large group. On an average, the small group consisting of 139.85 mango trees per orchard. Whereas, the medium group had an average of 336.88 mango trees per orchard and the large group had an average of 896.30 mango trees per orchard. At overall level, the average number of mango trees per orchard was 375.73.

Labour is the most significant input required for mango cultivation. Key operations in a mango orchard include cleaning of orchard, repair of fencing, weeding, watch and ward, manures and fertilizers application, application of plant protection chemicals and harvesting. The operation-wise per hectare physical labour utilization for Alphonso mango orchard at overall level is given in Table 1.

Table 1: Operation wise per hectare labour utilization in Alphonso mango orchard at overall level (Fig. in labour days)

Sr. No.	Operation	Family		Hired		Total Male (a)	Total Female (b)	Total labours (a+b)
		Male	Female	Male	Female			
1	Cleaning of orchard	1.97 (12.61)	1.12 (18.54)	9.37 (9.36)	2.48 (10.31)	11.34 (9.80)	3.60 (11.96)	14.94 (10.25)
2	Repair of fencing	1.23 (7.87)	-	2.40 (2.40)	-	3.63 (3.14)	-	3.63 (2.49)
3	Weeding	-	1.91 (31.62)	-	11.91 (49.52)	-	13.82 (45.93)	13.82 (9.48)
4	Watch and ward	-	-	7.49 (7.48)	-	7.49 (6.47)	-	7.49 (5.14)
5	Manure and fertilizer application	1.63 (10.44)	0.81 (13.42)	9.21 (9.20)	-	10.84 (9.37)	0.81 (2.69)	11.65 (7.99)
6	Application of plant protection chemicals	5.34 (34.19)	-	39.26 (39.22)	-	44.60 (38.54)	-	44.60 (30.58)
7	Harvesting	5.45 (34.89)	2.20 (36.42)	32.36 (32.34)	9.66 (40.17)	37.81 (32.68)	11.86 (39.42)	49.67 (34.07)
	Total	15.62 (100.00)	6.04 (100.00)	100.09 (100.00)	24.05 (100.00)	115.71 (100.00)	30.09 (100.00)	145.80 (100.00)

(Figures in the parentheses indicate percentages to total in respective column)

It is seen from the Table 1 that the total labour requirement per hectare at overall level in mango orchards was 145.80 man-days. Among different operations, harvesting operation demands the most labour, constituting 34.07 per cent of the total labours, followed by the application of plant protection chemicals at 30.58 per cent and cleaning of orchard at 10.25 per cent. The remaining labours were utilized by operations viz., repair of fencing (2.49%), weeding (9.48%), watch and ward (7.49%), manures and fertilizers application (7.99%).

The per hectare physical input utilization by sample mango growers provides a comprehensive overview of the resources applied in Alphonso mango cultivation, including manures, fertilizers, plant protection chemicals, growth regulators and labours. The per hectare physical input utilization by sample mango growers in study area is given in Table 2.

Table 2: Per hectare physical input utilization by sample mango growers

Sr. No.	Particulars	Size groups			Overall (N = 120)
		Small (N = 53)	Medium (N = 40)	Large (N = 27)	
1	Manures (MT)	5.27	6.67	6.80	6.08
2	**Fertilizers (kg)**				
	i) Urea	391.92	506.13	521.48	459.14
	ii) Single Super Phosphate (SSP)	344.64	452.25	462.91	407.12
	iii) Muriate of Potash (MOP)	348.58	447.92	456.35	405.94
3	**Plant protection chemicals**				
	i) Insecticides (lit)	4.18	7.33	9.19	6.36
	ii) Fungicides (kg)	7.68	15.23	20.64	13.11
4	Growth Regulators: Paclobutrazol (lit)	2.14	6.12	6.21	4.38
5	**Human labour (days)**				
	i) Hired labour				
	a) Male	70.14	92.42	138.94	93.05
	b) Female	28.93	22.90	22.98	25.58
	Sub total (a)	99.07	115.32	161.92	118.63
	ii) Family labour				
	a) Male	19.27	25.61	8.47	18.95
	b) Female	9.69	10.24	2.35	8.22
	Sub total (b)	28.96	35.85	10.82	27.17
	Total (a+b)	128.03	151.17	172.74	145.80

It is observed from the Table 2 that, at overall level, the quantity of manures used per hectare was 6.08 MT. Among the different groups, it was maximum (6.80 MT) in large group and minimum (5.27 MT) in small group, while it was (6.67 MT) in medium group. At the overall level, per hectare quantities of urea, SSP and MOP used were 459.14

kg, 407.12 kg and 405.94 kg, respectively.

The plant protection had assumed important place in Alphonso mango cultivation. At overall level, the quantity of insecticides used was 6.36 lit/ha and quantity of fungicides used was 13.11 kg/ha. Whereas, quantity of growth regulator such as paclobutrazol used was 4.38 lit/ha. Among the different groups, quantity of growth regulator used per hectare was maximum (6.21 lit) in large group and minimum (2.14 lit) in small group, while it was (6.12 lit) in medium group.

The labour is the most important input required in mango production. At overall level, total number of hired labour used per hectare was 118.63 man-days with more quantity (93.05 days) male labours as compared to female labours (25.58 days). Similarly, in case of family labour again, male labours were used more (18.95 days) than female labours (8.22 days).

The cost and returns of Alphonso mango orchard provide crucial insights into the financial aspects i.e. expenses incurred and the income generated from mango orchards, helping to understand the profitability and economic viability of Alphonso mango farming across different farm sizes. Table 3 gives the details about per hectare cost and returns of Alphonso mango orchard.

Table 3: Per hectare cost and returns of Alphonso mango orchard (Fig. in Rs.)

Sr. No.	Particulars		Small (N = 53)	Medium (N = 40)	Large (N = 27)	Overall (N = 120)
1	Hired Labour	i) Male	31563 (13.20)	41589 (12.49)	62523 (16.22)	41873 (13.90)
		ii) Female	7233 (3.02)	5725 (1.72)	5745 (1.49)	6395 (2.12)
2	Manures		21080 (8.81)	26680 (8.01)	27200 (7.06)	24320 (8.08)
3	Fertilizers	i) Urea	2743 (1.15)	3543 (1.06)	3650 (0.95)	3214 (1.07)
		ii) SSP	4825 (2.02)	6332 (1.90)	6481 (1.68)	5700 (1.89)
		iii) MOP	12549 (5.25)	16125 (4.84)	16429 (4.26)	14614 (4.85)
4	Plant protection chemicals	i) Insecticides	6270 (2.62)	12828 (3.85)	19759 (5.13)	11003 (3.65)
		ii) Fungicides	5376 (2.25)	12946 (3.89)	19608 (5.09)	10567 (3.51)
5	Growth regulators (Paclobutrazol)		9737 (4.07)	27846 (8.36)	28256 (7.33)	19929 (6.62)
6	Incidental charges		450 (0.19)	550 (0.17)	625 (0.16)	523 (0.17)
	Input cost		101826 (42.57)	154164 (46.29)	190276 (49.37)	138138 (45.87)
7	Land Revenue and other cesses		60 (0.03)	60 (0.02)	60 (0.02)	60 (0.02)
8	Depreciation on implements and machinery		1150 (0.48)	1375 (0.41)	1500 (0.39)	1304 (0.43)
9	Amortization value		38700 (16.18)	38700 (11.62)	38700 (10.04)	38700 (12.85)
10	Interest on working capital (6% per annum)		6110 (2.55)	9250 (2.78)	11417 (2.96)	8288 (2.75)
	Cost-A		147846 (61.81)	203549 (61.11)	241953 (62.78)	186490 (61.93)
11	Interest on fixed capital (10% per annum)		975 (0.41)	1125 (0.34)	1350 (0.35)	1109 (0.37)
12	Rental value of Land (1/6th of the gross value - Land revenue)		69085 (28.88)	98894 (29.69)	118678 (30.79)	89146 (29.60)
	Cost-B		217906 (91.10)	303568 (91.14)	361981 (93.92)	276745 (91.90)
13	Family Labour	i) Male	8672 (3.63)	11525(3.46)	3812 (0.99)	8528 (2.83)
		ii) Female	2423 (1.01)	2560 (0.77)	588 (0.15)	2055 (0.68)
14	Supervision charges (10% of input cost)		10183 (4.26)	15416 (4.63)	19028 (4.94)	13814 (4.59)
	Cost-C		239184 (100.00)	333069 (100.00)	385409 (100.00)	301142 (100.00)
15	Gross returns		414869	593363	712428	535238
16	Benefit Cost ratio at total cost		1.73	1.78	1.85	1.78

(Figures in the parentheses indicate percentages to cost C)

It is seen from the Table 3 that the per hectare total cost of cultivation (Cost- C) was Rs. 239184, Rs. 333069 and Rs. 385409 in small, medium and large groups, respectively. This indicated that the cost of cultivation was maximum in large group, followed by medium and small groups. However, input cost was minimum (Rs. 101826) in small group and maximum (Rs. 190276) in large group. It was Rs. 154164 for medium group. This indicated that input cost increased with the increase in the size of the mango orchard. The costs of hired labour, manures, fertilizers, plant protection chemicals, plant growth regulators, supervision charges, etc. were maximum in large group followed by medium and small groups.

At overall level, per hectare cost of cultivation was estimated to Rs. 301142. Among the different items of cost, rental value of land accounted for the maximum (29.60%) share followed by hired male labours (13.90%), amortization value (12.85%), manures (8.08%), growth regulators (6.62%), MOP (4.85%), supervision charges (4.59%), insecticides (3.65%), fungicides (3.51%), family male labours (2.83%), interest on working capital (2.75%) and interest on fixed capital (0.37%).

For small group, per hectare cost of cultivation was estimated to Rs. 239184. Among the different items of cost, rental value of land accounted for the maximum (28.88%) share followed by amortization value (16.18%), hired male labours (13.20%), manures (8.81%), MOP (5.25%), supervision charges (4.26%), growth regulators (4.07%), family male labours (3.63%), hired female labours (3.02%), insecticides (2.62%), fungicides (2.25%), interest on working capital (2.55%) and interest on fixed capital (0.41%).

For medium group, per hectare cost of cultivation was estimated to Rs. 333069. Among the different items of cost, rental value of land accounted for the maximum (29.69%) share followed by hired male labours (12.49%), amortization value (11.62%), growth regulators (8.36%), manures (8.01%), MOP (4.84%), supervision charges (4.63%), family male labours (3.63%), fungicides (3.89%), insecticides (3.85%), interest on working capital (2.78%)

and interest on fixed capital (0.34%).

For large group, per hectare cost of cultivation was estimated to Rs. 385409. Among the different items of cost, rental value of land accounted for the maximum (30.79%) share followed by hired male labours (16.22%), amortization value (10.04%), growth regulators (7.33%), manures (7.06%), insecticides (5.13%), fungicides (5.09%), MOP (4.26%), supervision charges (4.94%), interest on working capital (2.96%) and interest on fixed capital (0.35%).

The gross returns received at overall level was Rs. 535238. Specifically, for small group it was Rs. 414869, medium group received Rs. 593363, large group amounted to Rs. 712428. The benefit-cost ratio at total cost was highest (1.85) for the large group, with the medium group at 1.78 and the small group at 1.73. At overall level, it was 1.78.

The profitability of mango orchard is a key indicator of the economic viability and success of Alphonso mango cultivation. Profitability of Alphonso mango orchard in study area is given in Table 4.

Table 4: Profitability of Alphonso mango orchard

Sr. No.	Particulars	Small (N = 53)	Medium (N = 40)	Large (N = 27)	Overall (N = 120)
1	Production (qtl/ha)	39.83	44.50	48.85	43.42
2	Gross returns/ ha (Rs.)	414869	593363	712428	535238
3	Production/ farm (qtl/ha)	46.6	103.69	297.5	115.93
4	Gross returns/ farm (Rs.)	485386	1382602	4338740	1429069
5	**Per hectare total costs (Rs.)**				
	i) Cost - A	147846	203549	241953	186490
	ii) Cost - B	217906	303568	361981	276745
	iii) Cost - C	239184	333069	385409	301142
6	**Per hectare net returns over (Rs.)**				
	i) Cost - A	267023	389814	470475	348748
	ii) Cost - B	196963	289795	350447	258493
	iii) Cost - C	175685	260294	327019	234096
7	**Benefit-cost ratio**				
	i) Cost - A	2.81	2.92	2.94	2.87
	ii) Cost - B	1.90	1.95	1.97	1.93
	iii) Cost - C	1.73	1.78	1.85	1.78
8	Cost/ qtl (Rs.)	6007	7485	7891	6937
9	Cost/ kg (Rs.)	60	75	79	69
10	Sale price/ qtl (Rs.)	10416	13334	14584	12327
11	Sale price/ kg (Rs.)	104	133	146	123

It is seen from Table 4 that the per hectare Alphonso mango production was maximum (48.85 qtl) in large group, followed by medium (44.50 qtl) and small (39.83 qtl) groups. At overall level, it was 43.42 quintals. The cost per quintal of Alphonso mango was Rs. 6007 for small group, Rs. 7485 for medium group and Rs. 7891 for large group. At overall level, it was Rs. 6937.

Net returns at cost ‘A’ were maximum (Rs. 470475) for large group, followed by medium (Rs. 389814) and small (Rs. 267023) groups. It was Rs. 348748 at overall level. Similarly, net returns at cost ‘B’ were maximum (Rs. 350447) for large group, followed by medium (Rs. 289795) and small (Rs. 196963) groups. It was Rs. 258493 at overall level. Additionally, net returns at cost ‘C’ were maximum (Rs. 327019) for large group, followed by medium (Rs. 260294) and small (Rs. 175685) groups. It was Rs. 234096 at overall level.

The benefit cost ratio at cost ‘A’ was found to be maximum (2.94) in large group, followed by medium (2.92) and small (2.81) groups. It was 2.87 at overall level. Similarly, the benefit cost ratio at cost ‘B’ was found to be maximum (1.97) in large group, followed by medium (1.95) and small (1.90) groups. It was 1.93 at overall level. Additionally, the benefit cost ratio at total cost of production was found to be maximum (1.85) in large group, followed by medium (1.78) and small (1.73) groups. Whereas, it was 1.78 at overall level. Since the benefit cost ratio exceeds unity, it indicates that Alphonso mango production is a profitable venture. Considering the topography, agro-climatic conditions and the dominance of perennial crops in the cropping pattern of the sample mango growers, the Alphonso mango orchards are playing a crucial role in the farming system. This profitability encourages mango growers to expand the area under Alphonso mango cultivation.

Conclusion

In Alphonso mango cultivation, among the different operations, harvesting operation demands the more labours, constituting 34.07 per cent of the total labours, followed by the application of plant protection chemicals at 30.58 per cent and cleaning of orchard at 10.25 per cent labour. At overall level per hectare cost of cultivation (Cost-C) was Rs. 3,01,142. Out of this cost, input costs represent 45.87 per cent, with Cost-A contributing 61.93 per cent and Cost-B accounting for 91.90 per cent. Net returns at cost ‘C’ were maximum (Rs. 327019) for large group, followed by medium (Rs. 260294) and small (Rs. 175685) groups. It was Rs. 234096 at overall level. The benefit-cost ratio was highest for the large group at 1.85, followed by medium group at 1.78 and the small group at 1.73. This indicates that both gross returns and the benefit-cost ratio increases as the area under mango cultivation increases. As B:C ratio across all groups was more than unity, Alphonso mango cultivation is a profitable venture in South Konkan region of Maharashtra.

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