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Economic analysis of rose in Pune district of Maharashtra

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Abstract

The Present study was undertaken in Pune district of Maharashtra state to study the production and disposal of rose in Pune district. For this purpose, 30 rose cultivators were randomly selected from three tahsils viz., Haveli, Maval and Shirur. The Hi-tech cultivation of rose was highly labour intensive. At the overall level, the hi-tech farm required 1081.15 days of male labour and 2751.09 days of female labour. In the case of other input, as the size of the group increases, input utilization is observed to be increase. In respect of non-subsidized farms for small, medium, and large groups of farms, the cost C was, in accordance with their sizes, Rs. 52,79,409, Rs. 56,89,962, and Rs. 63,66,550, respectively. In terms of gross returns, the small, medium, and large size groups of farms were received returns Rs. 9848400, Rs. 10470180, and Rs. 12609120, respectively. At the overall level the marketing charges incurred for the rose were Rs. 2143058, and in small, medium and large size group it was observed to be Rs. 1643167, Rs. 1695601, and Rs. 2984343, respectively. The Benefit-cost ratio for rose cultivation was found to be 1.40 indicating the profitable nature of the enterprise.

Keywords: Rose, hi-tech cultivation, labour utilization, cost of cultivation, productivity, gross returns

1. Introduction

Horticulture is the field of agriculture that deals with garden crops, primarily fruits, vegetables, and ornamental plants. Horticulture is separated into the cultivation of plants for food (Pomology) and plants for ornament (Floriculture). Floriculture deals with cultivation of flower crops. Floriculture crops are considered high-value cash crops and provide a good income to farmer. In 2020-21, farming for floriculture will be cultivated on about 322 thousand hectares of land. In 2020-21, the production of flowers is anticipated to be 828.09 thousand tonnes of cut flowers and 2151.96 thousand tonnes of loose flowers (APEDA).

The Rose is the most prominent flower on the global market. A sizeable portion of all European markets are comprised of its contributions. The size of the global rose market, which was estimated to be worth \$10.8 billion in 2021, is anticipated to increase at a CAGR of 6.4 per cent from 2021 to 2030. (Dataintelo report). India's climatic conditions is ideal for growing flowers for export during the winter (October to March), when demand in Europe is at its maximum. The floricultural industry in India has the highest potential to meet world demand, earn foreign exchange, and generate employment. Other elements, such as the abundance of land, the low cost of skilled labour and the variety of microclimates found throughout the subcontinent, are also favourable for floriculture. The most popular use for roses is as ornamental plants grown for their flowers in gardens and occasionally indoors. They have also been employed in the commercial production of cut flowers and perfumes. Some are used as scenery plants, for hedging and for other useful purposes such as gain cover and slope stabilization. They also have minor remedial uses.

The study compared the effectiveness of the technology used in high-tech rose cultivation in different locations near the Pune district. Finally, the study examined the issues faced by farmers and high-tech rose cultivators, which will assist rose producers in both regions in selecting the proper technologies. The study's findings will be useful in understanding the cost structure at various production stages, including establishment and maintenance, as well as the flow of returns from the flower crop. The outcome would also be beneficial to individual cut flower growers, helping them improve their choices in order to increase revenue through proper management approaches.

2. Methodology

It was decided to conduct the study in the Pune district of western Maharashtra because flower cultivation in polyhouses is becoming a new venture there. Pune district has the highest concentration of polyhouses out of the six districts in western Maharashtra. A total of 30 polyhouses was selected, and their operation was taken into consideration for the years 2021-2022. With the aid of a schedule specifically created for rose flowers grown in polyhouses, information was gathered from the selected polyhouse owners on different aspects. The data were analysed that used tabular analysis to determine the investment in a polyhouse, the cost, return, and profitability of rose flower cultivation, disposal, the viability of the venture financially and the constraints of marketing and production.

3. Result and Discussion

3.1 Cost of establishment of hi-tech rose

It was observed that the rose garden requires six months to establish. From seventh month, the first harvest has started. The buds had previously been detached to promote vegetative growth. It was revealed that the under controlled conditions the average establishment cost for one hectare of rose garden was Rs 125,108,988. The average cost per hectare has been displayed in Table 1.

At the overall level, polyhouse erection costs contribute Rs. 9375875 and it about three-fourths of the total establishment cost and are the most significant component. After polyhouse erection, planting material, irrigation structures, soil and sand procurement, and land development are the most significant costs at the overall level, which contribute Rs. 817123 (6.53%), Rs. 801506 (6.40%), Rs. 425068 (3.40%), and Rs. 321849 (2.57%), respectively.

Table 1: Item wise per hectare cost of establishment of hi-tech rose cultivation (Rs/ha)

Sr. No.	Particular	Size Group of polyhouses			Overall (N=30)
		Small (N=10)	Medium (N=10)	Large (N=10)	
1	Land development & fencing	340000 (2.69)	366389 (2.91)	300000 (2.36)	321849.31 (2.57)
2	Polyhouse erection	9763000 (77.21)	9600493 (76.19)	9200000 (72.53)	9375875 (74.94)
3	Soil and sand procurement	385000 (3.04)	385000 (3.05)	450000 (3.55)	425068 (3.40)
4	Planting material	865000 (6.84)	833333 (6.61)	800000 (6.30)	817123 (6.53)
5	Construction of store room	96000 (0.76)	150000 (1.20)	152000 (1.20)	132666 (1.06)
6	Cold storage construction	-	-	450000 (3.54)	155000 (1.23)
7	Irrigation structure	775000 (6.13)	805000 (6.39)	806000 (6.35)	801506 (6.40)
8	Electric installation	21200 (0.17)	26400 (0.21)	34650 (0.27)	27416 (0.22)
9	Manure	76250 (0.60)	89583 (0.71)	100556 (0.79)	94486 (0.75)
10	Fertilizers	116600 (0.92)	112500 (0.89)	135000 (1.06)	126931 (1.01)
11	Sprayer	17000 (0.13)	22200 (0.18)	20500 (0.16)	19900 (0.16)
12	Plant protection chemicals	68000 (0.54)	70000 (0.55)	75000 (0.60)	72808 (0.58)
13	Labour charges	121600 (0.96)	139800 (1.11)	159400 (1.25)	140266 (1.12)
	Total cost (Rs.)	12644650 (100.00)	12600698 (100.00)	12683106 (100.00)	12510898 (100.00)
	Subsidy on polyhouse erection @ 50%	4881500	4800246	4600000	4687938
	Net cost	7763150	7800452	8083106	7822960

In respect of the establishment cost of different size groups, the polyhouse erection cost is primary, and it contributes Rs. 9763000 (77.21%), Rs. 9600493 (76.19%), and Rs. 9200000 (72.53%) in small, medium, and large groups, respectively. Planting material was the second prominent cost, which accounts for Rs. 865,000 (6.84%), Rs. 833333 (6.61%) and Rs. 800,000 (6.30%) for small, medium, and large groups of farms, respectively. Irrigation structure units made up a significant portion of the total establishment cost after accounting for planting material for small, medium, and large groups of farms; they were Rs. 7,75,000 (6.13%), Rs. 8,05,000 (6.39%) and Rs. 8,06,000 (6.35%), respectively.

The cost of the soil and sand procurement made up a relatively small portion of the establishment cost, and across the various size groups, it was 3.04 per cent, 3.05 per cent and 3.55 per cent for small, medium, and large groups, respectively. The cost of the sprayer was Rs. 17000, Rs. 22200 and Rs. 20500 for small medium and large size group respectively. Due to their various needs, it varied depending on the size of the groups. Electrical installations followed a similar pattern, with prices ranging from Rs. 21200 to Rs. 34650 for the various size categories. Investment in cold storage facilities was observed only in large farm size groups, accounting for 3.54 percent (Rs. 4500000) of total establishment cost.

In case of polyhouse erection, land development and planting

material cost decreases as the size of group increases. In respect of irrigation structure, electric installation, manure, labour, plant protection and fertilizer cost observed to be increases as the size of group increases. It can be revealed from the above discussion that the pattern of cost on various items of cost of cultivation of rose was more or less same among individual small and medium size group of farms. Whereas it showed some deviation from large farmers because of highly intensive cultivation and latest technology adopted by large sized farms.

3.2 Operation wise labour utilization in hi-tech rose cultivation

Human labour makes up a sizable portion of the total cost among the various cost factors. In hi-tech rose cultivation the amount of labour used varies greatly from one crop operation to the next. The table 5.6 shows that a greater proportion of labour is contributed for major operations like facility operation, weeding, pruning, picking and packing flowers, and bending. Application of fertiliser, pesticides and irrigation are all labour-intensive aspects.

The Table 2 indicate that 1080.65 male and 2751.09 female labour days were required at the overall level for hi-tech rose cultivation. This demonstrates the need for a lot of human labour, particularly female labour, in the rose crop. Flowers were weeded, harvested, graded, and packaged entirely by

female workers, who made up 435.4 days (15.82%), 1116.44 days (40.58%) and 426.08 days (15.48%) of all female labour, respectively, at the overall level. The operation of plant protection consumed the most male labour days i.e., 268.60

(24.85%) because it was a year-round activity that required more labour. In the case of pruning, earthing up and facility operation, each requires 2265.37 days (24.56%), 129.05 days (11.94%) and 55.78 days (23.67%) at the overall level.

Table 2: Per hectare operation wise labour utilization in hi-tech rose cultivation (Man days)

Sr. No.	Name of operation	Small		Medium		Large		Overall	
		Male	Female	Male	Female	Male	Female	Male	Female
1.	Preparation of raised bed	47 (5.74)	-	69.45 (6.77)	-	70.44 (5.15)	-	67.06 (6.20)	-
2.	Planting	56 (6.84)	63 (2.58)	60.51 (5.90)	74.44 (2.78)	80 (5.84)	80 (2.78)	71.92 (6.65)	76.3 (2.77)
3.	Weeding	-	388 (15.91)	-	407.77 (15.25)	-	456.88 (15.89)	-	435.4 (15.82)
4.	Plant protection	250 (30.56)	149 (6.11)	256.67 (25.03)	167.22 (6.25)	277.33 (20.26)	172.77 (6.00)	268.60 (24.85)	168.18 (6.11)
5.	Earthing up	-	94 (3.85)	108.88 (10.61)	-	144.89 (10.59)	-	129.05 (11.94)	-
6.	Pruning	248 (30.31)	-	263.33 (25.67)	-	270.89 (19.79)	-	265.37 (24.56)	-
7.	Bending	-	376 (15.42)	-	405 (15.15)	-	447.33 (15.55)	-	424.98 (15.45)
8.	Grading and packing	-	375 (15.38)	-	429 (16.05)	-	436 (15.16)	-	426.08 (15.48)
9.	Harvesting	-	895 (36.71)	-	1073 (40.14)	-	1182.67 (41.11)	-	1116.44 (40.58)
10.	Facility operation	217 (26.52)	98 (4.01)	266.65 (26.00)	116.11 (4.34)	260 (19)	100 (3.47)	255.78 (23.67)	103.71 (3.77)
11.	Managerial labour	-	-	-	-	265 (19.36)	-	22.87 (2.11)	-
12.	Total	818 (100.0)	2438 (100.0)	1025.49 (100.00)	2672.54 (100.00)	1368.55 (100.00)	2875.65 (100.00)	1080.65 (100.00)	2751.09 (100.00)

(Figures in the parentheses indicates percentage to total)

It is seen from Table 5.6 that, per hectare, male labour utilised for rose cultivation was 818, 1025.49 and 1368.55 human days for small, medium, and large groups of farms, respectively. Whereas the different groups, such as small, medium and large, required 2438, 2672.54 and 2875.65 human days of female labour, respectively. In terms of operation, weeding, harvesting, grading, and packaging, all are entirely dependent on female labour which accounts for 388 days (15.91%), 895 days (36.71%) and 375 days (15.38%) of all female labour, respectively, on a small group of farms. In respect of male labour for small group operations like plant protection, pruning and facility operation accounting, 250 (30.56%), 248 (30.31%) and 217 (26.52%) human days were consumed, respectively.

In medium farm operations, like weeding, harvesting, grading, and packaging, only female labour is required, which accounts for 407.77 days (15.25%), 1073 days (40.14%) and 429 days (16.05%) of all female labour, respectively. Male labour contributions for medium group operations, including plant protection, earthing up, pruning, and facility operation accounting, were 256.67 (25.03%), 108.88 (10.61%), 263.33 (25.67%), and 266.65 (26.00%) human days, respectively. On a large group of farms, the operation, weeding, harvesting, grading, and packaging are all fully dependent on female labour, which accounts for 456.48, 1182.67 and 436 days, respectively, of all female work. In aspects of male labour, 277.33 (20.26%), 144.89 (10.59%), 270.89 (19.791%) and 260 (19%) human days had been used, respectively, for large

group operations like plant protection, earthing up, pruning, and facility operation accounting. It was observed from table 5.6 that the utilisation of male and female labour increases with increase the group size of the farm.

3.3 Item wise per hectare cost of cultivation of hi-tech rose farms (without subsidy)

The per hectare item wise cost incurred for cultivation of rose is worked out and presented in Table 5.8. It is observed from the Table 5.8 that the total per hectare cost of cultivation (Cost C) of rose production at the overall level worked out to be Rs. 5886637 and for the small, medium and large size groups it was found to be Rs. 5279409, Rs. 5689962 and Rs. 6366550 per hectare respectively. This revealed that the cost of cultivation was highest for the large size group, followed by the medium and small size group. The item-wise per hectare cost incurred for the cultivation of roses was worked out and presented in Table 5.8. At the overall level the rental value of land incurred the highest cost (31.79%), followed by amortisation costs of Rs. 1652683 (28.07%), fertiliser costs of Rs. 648370 (11.01%), hired human labour costs of Rs. 570780 (9.70 %) plant protection costs of Rs. 380408 (6.46%), family labour costs of Rs. 255630 (4.34%), electricity charges of Rs. 107631 (1.82%) and other costs. Similarly, input costs A, B, and C were Rs. 1933065 (32.84%), Rs. 5457009 (92.70%), and Rs. 5886637 (100%), respectively.

Table 3: Item wise average per hectare cost of cultivation of hi-tech rose (without subsidy)

Sr. No.	Particulars	Size of farm			
		Small	Medium	Large	Overall
1.	Hired labour				
	a. Male	89600 (1.70)	221108 (3.88)	394532 (6.20)	256108 (4.35)
	b. Female	162600 (3.08)	268222 (4.71)	369680 (5.81)	314672 (5.34)
	Total	252200 (4.78)	489330 (8.60)	764212 (12.00)	570780 (9.70)
	c. Machinery (hrs)	28350 (0.54)	31500 (0.55)	38500 (0.60)	32781 (0.56)
2.	Fertilizer	558000 (10.56)	652000 (11.45)	667000 (10.48)	648370 (11.01)
3.	Electricity charges	80000 (1.51)	87000 (1.52)	122000 (1.92)	107631 (1.82)
4.	Plant protection	352000 (6.67)	377000 (6.62)	388000 (6.09)	380408 (6.46)
5.	Working capital	1270550 (24.06)	1636830 (28.76)	1979712 (31.09)	1739970 (29.56)
6.	Land revenue	2000 (0.04)	2000 (0.03)	2000 (0.03)	2000 (0.03)
7.	Depreciation	11764 (0.22)	15738 (0.28)	18827 (0.30)	17098 (0.29)

8.	Interest on working capital	127055 (2.40)	163683 (2.88)	197971 (3.11)	173997 (2.95)
9.	Cost A	1411369 (26.73)	1818251 (31.95)	2198510 (34.53)	1933065 (32.84)
10.	Amortization cost	1667785 (31.60)	1662295 (29.21)	1675595 (26.30)	1652683 (28.07)
11.	Rental value of land	1639400 (31.05)	1743030 (30.63)	2101320 (33.00)	1871261 (31.79)
12.	Cost B	4718554 (89.38)	5223576 (91.80)	5975425 (93.85)	5457009 (92.70)
13.	Family labour				
	a. Male	196400 (3.72)	137104 (2.40)	92712 (1.53)	120560 (2.05)
	b. Female	237400 (4.50)	165598 (2.91)	102242 (1.60)	135070 (2.29)
	Total	433800 (8.21)	302702 (5.31)	194954 (3.06)	255630 (4.34)
14.	Supervision charges (10% of input cost)	127055 (2.40)	163683 (2.87)	197971 (3.12)	173997 (2.95)
15.	Cost C	5279409 (100.00)	5689962 (100.00)	6366550 (100.00)	5886637 (100.00)

(Figures in the parentheses indicates percentage to cost C)

In the case of small size groups, it was observed that out of the total cost of cultivation, the maximum cost worked out for the amortization cost was accounted to Rs. 1667785 (31.60%), followed by rental value of land Rs. 1639400 (31.05%), fertilizer Rs. 558000 (10.56%), cost of plant protection Rs. 352000 (6.67%), Cost of family labour Rs. 433800 (8.21%), cost of hired labour Rs. 252200 (4.78%), cost of supervision Rs. 127055 (2.40%), electricity charges Rs. 80000 (1.51%) and cost of machinery hours Rs. 28350 (0.54%) in hi-tech rose cultivation. The input cost for a small size group was accounted to be Rs. 1270550 (24.06%) whereas cost A was Rs. 1411369 (26.73%) and cost B was Rs. 4718554 (89.38%) of the total cost (Cost C).

However, in the case of medium size groups, it was observed that out of the total cost of cultivation, the maximum cost worked out for the was accounted rental value of land to Rs. 1743030(30.63%), followed by amortization cost Rs. 1662295 (29.21%), fertilizer Rs. 652000 (11.45%), cost of hired labour Rs. 489330 (8.60%), cost of plant protection Rs. 377000 (6.62%), Cost of family labour Rs. 302702 (5.31%), cost of supervision Rs. 163683 (2.87%), electricity charges Rs. 87000 (1.52%) and cost of machinery hours Rs. 31500 (0.55%) in hi-tech rose cultivation. The input cost for a medium size group was accounted to be Rs. 1636830 (28.76%) whereas cost A was Rs. 1818251 (31.95%) and cost B was Rs. 5223576 (91.80%) of the total cost (Cost C).

Similarly in the case of a large size group, out of total cost (Cost C), the highest cost incurred on rental value of land to Rs. 2101320(33.00%), followed by amortization cost Rs. 1675595 (26.30%), fertilizer Rs. 667000 (10.48%), cost of hired labour Rs. 764212 (12.00%), cost of plant protection Rs. 388000 (6.09%), cost of supervision Rs. 197971 (3.12%), Cost of family labour Rs. 194954 (3.06%), electricity charges Rs. 122000 (1.92%) and cost of machinery hours Rs. 38500 (0.60%) It was also seen that the input cost for a large sized

group was accounted to Rs. 1979712 (31.09%), cost A was Rs. 2198510 (34.53%) and cost B was Rs. 5975425 (93.85%). It can be revealed from the above discussion that the pattern of cost on various items of the cost of rose cultivation was more on the large size groups than small and medium-sized groups of farms. In case of input utilization like plant protection, fertilizer, FYM, labour and electricity utilization observed to be increases as the size of group increases.

3.4. Returns from hi-tech rose

In roses, grading is more essential because it impacts the price directly. It was observed that all growers grade their crop production in accordance with the grade specifications. The corrugated rolling paper type of packaging was utilised for all produce types. The details in these respects are given in Table 4.

It is seen from Table 4, that the total yield obtained from roses per hectare at the overall level was 122132 sets. The yield for small, medium and large size groups of farms was 113600 sets, 119722 sets and 124989 sets respectively. At the overall level, hi-tech gross income amounted to Rs. 11238680. In the small, medium and large size groups of farms they were identified to be Rs. 9848400, Rs. 10470180, and Rs. 12609120 respectively. The price received per set in small and medium-sized polyhouses was Rs. 100, Rs. 80, and Rs. 60 for grades I, II, and III, respectively. In comparison to the others, the large group received Rs. 120 per set price for the first grade and for second and third grade received same price as the other groups of polyhouses.

It is revealed from table 4 that large size group of farms yield was more than other group and it clearly demonstrates that as the size of the farm increased, the rose yield per hectare increased as well. The gross returns showed a similar trend to the per-hectare yield i.e., more gross return as size of farm increases.

Table 4: Per hectare production and gross income of rose in polyhouse

Sr. No.	Grade	Small		Medium		Large		Overall	
		Quantity (Sets)	Value (Rs.)	Quantity (Sets)	Value (Rs.)	Quantity (Sets)	Value (Rs.)	Quantity (Sets)	Value (Rs.)
1	Grade-I	57550 (50.66)	5755000 (58.43)	66707 (55.71)	6670700 (63.71)	76306 (61.05)	9156720 (72.61)	71370 (58.43)	7612800 (67.73)
2	Grade-II	36520 (32.14)	2921600 (29.66)	30926 (25.83)	2474080 (23.63)	26571 (21.26)	2125680 (16.86)	29008 (23.75)	2320640 (20.65)
3	Grade-III	19530 (17.19)	1171800 (11.90)	22090 (18.45)	1325400 (12.66)	22112 (17.70)	1326720 (10.52)	21754 (17.81)	1305240 (11.61)
4	Total Qty.	113600 (100.00)	9848400 (100.00)	119722 (100.00)	10470180 (100.00)	124989 (100.00)	12609120 (100.00)	122132 (100.00)	11238680 (100.00)

3.5. Average cost of marketing

The table reveals that the primary cost component at overall level was commission, which attributed for Rs. 786769 (36.71%) of the total marketing expense. Transport cost was the next significant cost Rs. 730004(34.06 per cent) followed

by cost incurred by grading and packaging Rs. 595952 (27.80%) and other charges Rs. 30332 (1.41%). Additionally, the marketing expenses for various size groups of farms were examined separately.

Table 4: Average cost of marketing (Rs. /Sets of flowers)

Sr. No.	Particular	Size of farm			
		Small (N=10)	Medium (N=10)	Large (N=10)	Overall (N=30)
1.	Cost of Grading and packaging	480590 (29.24)	528836 (31.19)	733263 (24.57)	595952 (27.80)
2.	Cost of Transportation	445022 (27.08)	404136 (23.83)	1337381 (44.81)	730004 (34.06)
3.	Commissions of the agent	689388 (41.95)	732912 (43.22)	882638 (29.57)	786769 (36.71)
4.	Other charges	28166 (1.71)	29716 (1.52)	31061 (1.04)	30332 (1.41)
	Total cost	1643167 (100.00)	1695601 (100.00)	2984343 (100.00)	2143058 (100.00)

(Figures in the parentheses indicates percentage to total cost)

The marketing costs for various products in various size groups of farms, however, did not vary significantly. From table 5.11, it reveals that the cost of commission agents for small, medium and large size groups of farms were Rs. 689388 (41.95%), Rs. 732912 (43.22%) and Rs. 882638 (29.57%), respectively. In respect of transportation cost it was Rs. 445022 (27.08%), Rs. 404136 (23.83%) and Rs. 1337381 (44.81%) for small, medium and large size groups of farms respectively. Similarly, grading cost was Rs. 480590 (29.24%), Rs. 528836 (31.19%) and Rs. 595952 (27.80%) for

small, medium and large group respectively.

In the case of the marketing of products, most of the growers marketed their products through the commission agent. Small and medium-sized groups sell their products in their local market, whereas large groups sell it in distant markets. It is seen from table that marketing cost for rose more in large size group as compare to other two group. Other marketing charges were negligible as compared to others operations charges incurred.

Table 5: Per hectare profitability of cut roses in hi-tech cultivation (without subsidy)

Sr. No.	Particular	Size group of polyhouses			
		Small	Medium	Large	Overall
1.	Cost of cultivation (A)	5279409	5689962	6366550	5886637
2.	Cost of marketing (B)	1643167	1695601	2984343	2143058
3.	Cost of production (A+B)	6922576	7385563	9350893	8029695
4.	Gross returns (C)	9848400	10470180	12609120	11239564
5.	Net returns (C-A+B)	2925824	3084617	3258227	3209869
6.	B.C. ratio	1.42	1.41	1.35	1.40

The details in these respects are given in Table 5.12. It can be seen from the table that, per hectare, total cost of cultivation for roses at the overall level was Rs. 5886637. Among the size groups of farms, the cost C was Rs. 5279409, Rs. 5689962 and Rs. 6366550 in small, medium and large size groups of farms, respectively. The marketing charges incurred for the rose were Rs. 2143058 at the overall level. It was observed to be Rs. 1643167, Rs. 1695601 and Rs. 2984343 in the small, medium and large size groups of farms, respectively. The per-hectare cost of production was Rs. 8029695 at the overall level. It was the highest in the large size group of farms (Rs. 9350893), followed by the medium (Rs. 7385563) and small (Rs. 6922576) size groups of farms. The large size group of rose farms required the highest per hectare cost of production, followed by the medium and small size groups of farms.

At the overall level gross income from hi-tech rose was Rs. 11239564. In the small, medium, and large size groups of farms, it was identified to be Rs. 9848400, Rs. 10470180, and Rs. 12609120 respectively. The output-input ratio at cost of production at the overall level was 1.40, showing the rose cultivation was also in a profitable position. It was highest in the small (1.42), followed by the medium (1.41) and the large (1.35) size groups of farms. This indicates that the cultivation of roses was more profitable in small and medium-sized groups than in large-sized groups of farms.

In the case of small sized groups of rose farms, the net returns at cost of production were the highest, though the per hectare gross return was lower than that of the other two sized groups of farms. Although the returns in the large group was highest, due to the cost of production being the highest in the large group, the per hectare profit was the highest in the small size

group of holdings, followed by the medium and large size groups of farms.

Conclusions

- The initial investment required to established hi-tech rose cultivation is more. (Rs. 12683106 to Rs. 12600698 per ha.).
- A hi-tech rose unit was a labour intensive (3831.74/ha) and positive relationship with a size of farm.
- The per hectare cost of cultivation of hi-tech rose in non-subsidised farms was Rs. 5886637/ha and per hectare cost of cultivation increases as the size of the farm increases.
- In the case of production, large group farms produced more (124989 sets/ha) because they did so on a large scale and utilised additional resources and the latest technologies than the other farms in the group and also, they are selling to distant market for which they getting good price. It clearly indicates that as the size of the farm increases, the rose yield per hectare increased as well.
- Out of the total marketing cost (Rs. 2143058), the contributions of commission (36.71%) and transport (34.06%) were the most significant costs. It has also been observed that as the size of the farm grows, so does the cost of marketing.
- Regarding profitability of hi-tech rose under polyhouses in non-subsidised farm shows feasible result and benefit cost ratio ranges from 1.35 to 1.42.

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