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Comparative Economics of Rose Cultivation under FPO and Non-FPO Systems in Rajasthan

Anil Singh Rawat*[1], Sheela Kharkwal[2], Gopesh Kumari[3] and Priyesh Ranjan[4]

[1] Ph. D. Scholar, Department of Agricultural Economics, C. P. College of Agriculture, Sardarkrushinagar Dantiwada Agricultural University, S. K. Nagar - 385 506, Gujarat, India
[2] Assistant Professor, Department of Agricultural Economics, Sri Karan Narendra Agriculture University, Jobner, Jaipur - 303 329, Rajasthan, India
[3] Ph. D. Scholar, Department of Agricultural Economics, Swami Keshwanand Rajasthan Agricultural University, Bikaner - 334 006, Rajasthan, India
[4] Ph. D. Scholar, Department of Agricultural Economics, Indira Gandhi Krishi Vishwavidyalaya, Raipur - 492 012, Chhattisgarh, India

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Abstract

Farmer Producer Organizations (FPOs) play an important role in improving farmers' access to inputs, credit, technology, and markets through collective action. However, limited evidence exists on their impact in perennial floriculture crops. The present study assessed the economics of rose cultivation under FPO and non-FPO systems in Rajasthan. Primary data were collected during 2023–24 from 80 rose growers (40 FPO and 40 non-FPO farmers) in Pushkar region of Ajmer district. The study compared establishment cost, maintenance cost, returns, discounted feasibility indicators, and production constraints. The total establishment cost was lower for FPO farmers (₹1,75,499/ha) than non-FPO farmers (₹1,79,560/ha). Maintenance cost during Years 2–10 was ₹8,69,178/ha for FPO farmers and ₹8,85,081/ha for non-FPO farmers. FPO farmers consistently realized higher returns, with cumulative gross returns of ₹61.77 lakh/ha compared to ₹50.28 lakh/ha for non-FPO farmers. Discounted analysis showed higher profitability among FPO farmers, with Net Present Value of ₹28.52 lakh/ha, Benefit–Cost ratio of 5.37, and Payback Period of 1.35 years, against ₹21.87 lakh/ha, 4.28, and 1.46 years, respectively, for non-FPO farmers. Major constraints included high planting material cost, shortage of skilled labour, lack of quality seedlings, and inadequate processing facilities. The study concludes that FPO participation enhances profitability and investment efficiency in rose cultivation.

***Key words*:** FPO, Rose cultivation, Economics, Profitability, Rajasthan

Agriculture plays a key role in the Indian economy, contributing about 16 per cent to the Gross Domestic Product (GDP) and supporting nearly 46 per cent of the population [1]. Within agriculture, the horticulture sector is a high-value segment that offers strong potential for income diversification, efficient resource use, and improved farm profitability. It contributes nearly one-third of the agricultural GDP while using a relatively smaller share (18 per cent) of cultivated land, indicating its economic efficiency [2]. Floriculture, an important part of horticulture, has expanded in response to rising domestic demand and export opportunities. It includes the cultivation and marketing of cut flowers, loose flowers, ornamental plants, and landscaping species. The sector has become commercially viable due to urbanization, changing consumer preferences, and increased demand for flowers in social, cultural, and industrial uses such as perfumes, cosmetics, and value-added products. Among floricultural crops, rose holds a leading position because of its diverse uses and strong market demand. In India, rose cultivation is widely practiced and contributes to both domestic consumption and export potential. However, despite a large production base, India's share in global rose trade remains low, indicating scope for improving productivity, quality, and market integration.

In Rajasthan, floriculture is expanding, particularly in districts such as Ajmer, where agro-climatic conditions support rose cultivation. The Pushkar region of Ajmer district is known for traditional rose farming, which supports local livelihoods and supplies raw materials for products such as rose water, Gulkand, and essential oils. As a perennial crop with a long economic life, rose cultivation requires high initial investment and continuous maintenance, making its economic evaluation more complex than that of seasonal crops. Farmer Producer Organizations (FPOs) serve as an institutional mechanism to strengthen the economic position of small and marginal farmers. Through collective action, FPOs improve access to inputs, credit, technology, and markets while reducing transaction costs and increasing bargaining power. In recent years, the Government of India has promoted FPOs to improve farmers' income and market participation. Previous studies confirmed the economic potential of floriculture and the advantages of FPO participation. Research on flower crops indicated high profitability, particularly in rose cultivation.

***Correspondence to:** Anil Singh Rawat, E-mail: rawatsaanil99@gmail.com; Tel: +91 7357444600

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Bante *et al.* [3] reported a high input–output ratio for rose, while Kankal *et al.* [4] and Gauraha *et al.* [5] found favorable benefit–cost ratios, confirming its commercial viability. Studies on protected cultivation also reported higher returns from rose production, albeit with higher investment requirements [6].

Evidence on FPOs across crops showed that member farmers often incurred lower production costs and earned higher returns than non-members. Studies by Gautam and Panday [7], Rai *et al.* [8] and Hussain *et al.* [9] demonstrated improved profitability among FPO members due to better access to inputs and markets. Similar findings were reported in studies on chilli, maize, and tapioca, where FPO participation improved marketing efficiency and increased farmers' share in the consumer's rupee [10-12]. These findings indicated that FPOs reduced transaction costs and strengthened farmers' market position. Despite this evidence, limited research had examined floriculture and FPO participation together, particularly for perennial crops such as rose. Most studies had focused either on floriculture economics or on FPO performance in seasonal crops. In addition, the long-term economic analysis required for perennial crops was often absent. This created a gap in understanding how FPO membership influenced costs, returns, and constraints in rose cultivation. Therefore, the present study analyzed the economics of rose cultivation in the Pushkar region of Ajmer district and compared FPO and non-FPO farmers. It also identified key production constraints faced by stakeholders in the rose value chain. The findings aim to support policy decisions and improve the profitability of floriculture in the region.

MATERIALS AND METHODS

Sampling design

A multistage purposive sampling design was adopted to select the study area, Farmers' Producer Organizations (FPOs), and respondents. Ajmer district of Rajasthan was selected purposively due to its highest share in area and production of rose in the state, with 2,325 MT produced from 695 hectares during 2022–23 [13]. In the next stage, two FPOs: Devnagar and Motisar (Pushkar), associated with Krishi Vigyan Kendra (KVK), Ajmer, and actively engaged in rose production and marketing were selected. A sampling frame of rose growers was constructed with support from FPO records. From this, 20 farmers were selected from each FPO, with preference given to those associated with KVK since FPO inception to ensure consistent exposure and reliable farm-level data. For comparison, 40 non-FPO farmers were selected from the same villages, yielding a total sample of 80 respondents. The purposive design and experience-based selection introduce potential selection bias and limit external validity; therefore, the findings are interpreted as context-specific rather than statistically generalizable.

Analytical framework

The cost structure of perennial crops differs fundamentally from that of seasonal crops due to the intertemporal separation of investment and returns. While seasonal crops involve a single production cycle, perennial crops require substantial initial investment followed by a stream of costs and returns over multiple years. Accordingly, and consistent with established methodologies [14-16], the economics of rose cultivation was analyzed by decomposing total costs into establishment and maintenance components. Establishment costs include all expenditures incurred from land preparation up to the stage of first harvest. Since rose cultivation typically commences yielding within the first year, the initial year was operationally defined as the establishment phase. In contrast, maintenance costs comprise all recurring expenditures incurred after establishment to sustain productivity and economic viability over the crop's productive life. A detailed classification of cost components under both phases is presented in (Table 1).

Table 1 Cost components of rose cultivation under establishment and maintenance phases (₹/ha)

	Cost component	Establishment phase	Maintenance phase
A.	Variable Costs		
1.	Field preparation (Ploughing, planking, levelling)	✓	–
2.	Labour costs		
	Preparation of seedlings	✓	–
	Layout and opening of pit	✓	–
	Replacing of dead plants	–	✓
	Hoeing and weeding	✓	✓
	Fertilizer and FYM application	✓	✓
	Plant protection measures	–	✓
	Harvesting	–	✓
	Packing (gunny bags)	–	✓
	Others, if any	✓	✓
3.	Material costs		
	Seedlings	✓	✓
	Irrigation charges	✓	✓
	Plant protection chemicals	✓	✓
	Fertilizers	✓	✓
	FYM	✓	✓
	Harvesting equipment	–	✓
	Packaging materials (gunny bags)	–	✓
	Others, if any	✓	✓
4.	Transport of produce (field to home)	–	✓
5.	Interest on working capital (@ 7% per annum)	✓	✓
6.	Risk margin (@ 10% per annum)	✓	✓

B.	Fixed Costs		
7.	Depreciation on implements	✓	✓
8.	Rental value of owned land	✓	✓
9.	Interest on fixed capital	✓	✓
	Total cost (₹/ha)	Establishment cost	Maintenance cost

The analysis was conducted under a set of explicit assumptions to ensure methodological consistency. The economic lifespan of the rose crop was assumed to be ten years, reflecting prevailing agronomic practices in the study area. Establishment costs were incurred in the initial year, while maintenance costs and returns were considered on an annual basis thereafter. Rose yielded returns only after second year Gross returns were estimated by multiplying the quantity of output with the average price received by farmers. Rose cultivation did not generate significant by-products; therefore, returns were derived solely from the main product. Net returns were computed as the difference between gross returns and total costs. Wholesale price index (WPI) was used to create costs and returns streams till 10 years on the basis of second year data. To calculate NPV, B:C ratio and payback period these streams were discounted at 10 per cent interest rate.

Depreciation on farm implements, excluding tractors and their accessories, was estimated using the straight-line method, defined as the difference between purchase price and salvage value divided by the expected life of the asset. Crop-specific depreciation was apportioned based on the share of area under rose in relation to the total cropped area.

To identify the constraints faced by farmers in rose production, Garrett's ranking technique was employed. The ranks assigned by respondents were converted into percent positions using the standard formula:

$$\text{Percent position} = \frac{100(R_{ij} - 0.5)}{N_{ij}}$$

Where;
R_{ij} = Ranking given for i^{th} item by j^{th} individual farmer
N_{ij}= Number of items ranked by j^{th} individual farmer

The corresponding Garrett scores were obtained from established conversion tables. The mean score for each constraint was then calculated and used to rank the constraints in descending order of importance.

RESULTS AND DISCUSSION

Establishment costs

As presented in (Table 2), the total establishment cost of rose cultivation was lower for FPO farmers (₹175,499.36/ha) than for non-FPO farmers (₹179,559.96/ha), and the difference was statistically significant ($p < 0.01$). Although the difference was modest (about 2.26%), it indicates a consistent cost advantage for FPO farmers during the establishment phase.

Table 2 Establishment costs of rose cultivation (₹ / ha)

S. No.	Cost components	FPO farmers	Non-FPO farmers	t_{cal}- value	P value
A.	Variable costs				
1.		Labour costs			
(i)	Field preparation	10033.31 (5.72)	10220.56 (5.69)	-1.83*	0.07
(ii)	FYM application	7191.56 (4.10)	7245.36 (4.03)	-0.26	0.78
(iii)	Layout and opening of pits	13044.24 (7.43)	13593.18 (7.57)	-3.07***	0.00
(iv)	Transplanting and packing of pits	7647.49 (4.36)	7775.07 (4.33)	-0.43	0.66
(v)	Fertilizer application	231.14 (0.13)	234.75 (0.13)	-0.13	0.91
(vi)	Weeding	9774.43 (5.57)	10068.03 (5.61)	-1.86*	0.06
(vii)	Plant protection chemical application	1503.03 (0.86)	1634.40 (0.91)	-0.66	0.50
	Total labour costs	49425.20 (28.16)	50771.35 (28.28)	-1.61*	0.10
2.		Material costs			
(i)	Seedling	58675.01 (33.43)	59300.33 (33.03)	-1.43	0.15
(ii)	Irrigation	6000.00 (3.42)	6000.00 (3.34)	-	-
(iii)	Plant protection chemical	3937.13 (2.24)	5089.91 (2.83)	-2.88***	0.00
(iv)	Fertilizer	2672.01 (1.52)	2742.76 (1.53)	-1.86*	0.06
(v)	FYM	9137.53 (5.21)	9302.98 (5.18)	-1.34	0.18
	Total material costs	80421.68 (45.82)	82435.80 (45.92)	-3.08***	0.00
3.	Interest on working capital @7%	9089.28 (5.18)	9324.5 (5.19)	-2.50**	0.01
4.	Risk margin @10% of working capital	12984.60 (7.40)	13320.70 (7.42)	-2.50**	0.01
	Total variable costs	151920.76 (86.57)	155852.36 (86.76)	-2.50**	0.01
B.	Fixed costs				
1.	Depreciation	1435.10 (0.82)	1552.40 (0.86)	-0.61	0.54
2.	Rental value of own land	20000.00 (11.40)	20000.00 (11.14)	-	-
3.	Interest on fixed capital @10%	2143.50 (1.22)	2155.20 (1.20)	-0.61	0.54
	Total fixed costs	23578.60 (13.43)	23707.60 (13.24)	-3.53**	0.01
	Total establishment costs (₹/ha)	175499.36 (100.00)	179559.96 (100.00)	-2.77**	0.01

Note: Figures in parentheses represent percentages of total establishment costs
*Significance levels: ***p < 0.01; **p < 0.05; *p < 0.10

Variable costs dominated the overall cost structure, accounting for 86.57 percent and 86.76 percent of total establishment costs for Farmer Producer Organization (FPO) and non-FPO farmers, respectively. Within this category, material costs formed the largest share (45.82% for FPO and 45.92% for non-FPO). Among material inputs, seedling costs

contributed the highest proportion (33.43% and 33.03%, respectively), highlighting the capital-intensive nature of rose cultivation. Seedling expenditure did not differ significantly between the groups. However, FPO farmers incurred significantly lower costs on plant protection chemicals ($p < 0.01$) and marginally lower fertilizer expenses ($p < 0.10$), suggesting relatively better input-use efficiency. Labour costs accounted for 28.16 percent and 28.28 percent of total costs for FPO and non-FPO farmers, respectively. The overall difference in labour costs was marginally significant ($p < 0.10$). However, specific operations showed clearer differences. Layout and opening of pits differed significantly ($p < 0.01$), while field preparation and weeding were significant at the 10 percent level. These patterns suggest improved operational efficiency among FPO farmers rather than major differences in labour use. Derived cost components followed a similar trend. Interest on working capital accounted for 5.18 percent for FPO farmers and 5.19 percent for non-FPO farmers. Risk margin accounted for 7.40 percent and 7.42 percent, respectively. Both components were significantly lower for FPO farmers ($p < 0.05$), reflecting proportional savings from reduced variable costs.

Fixed costs represented a smaller share of total establishment costs, at 13.43 percent for Farmer Producer Organization (FPO) farmers and 13.24 percent for non-FPO farmers. These costs were largely similar across both groups. This similarity is mainly due to identical rental values of land and non-significant differences in depreciation and interest on fixed capital. Therefore, the observed cost advantage for FPO farmers is primarily driven by savings in variable costs. Overall, the results indicate that FPO membership improves cost efficiency during the establishment stage, mainly through moderate reductions in input and labour costs. However, the relatively small magnitude of the difference calls for cautious interpretation of its economic significance. In addition, since the sample includes relatively experienced Farmer Producer Organization (FPO) members, part of the observed efficiency may reflect farmer-specific managerial ability rather than institutional effects alone.

Maintenance costs

The maintenance phase of rose cultivation (Years 2–10) reflects a substantial convergence in production costs between FPO and non-FPO farmers (Table 3). The total maintenance cost was estimated at ₹869,177.99 per hectare for FPO farmers and ₹885,080.79 per hectare for non-FPO farmers. Although Farmer Producer Organization (FPO) farmers incurred lower absolute costs, the difference was statistically non-significant ($p = 0.24$), indicating that membership advantages observed during the establishment stage become less pronounced during the recurring production phase.

Table 3 Total maintenance costs of rose cultivation for FPO and non-FPO farmers (Years 2–10) (₹/ha)

S. No.	Cost components	FPO farmers (₹/ha)	Non-FPO farmers (₹/ha)	t- value	p- value
1.	Cutting and pruning	220813.96 (25.40)	225911.88 (25.52)	-3.32***	0.00
2.	Fertilizer application	5231.37 (0.60)	6213.00 (0.70)	-2.47**	0.01
3.	Weeding	118753.93 (13.66)	119508.70 (13.50)	-0.11	0.90
4.	PPC application	29526.92 (3.40)	33461.57 (3.78)	-1.86*	0.06
5.	Harvesting	31200.34 (3.59)	31951.41 (3.61)	-2.20**	0.03
	Total labour cost	407694.81 (46.66)	417046.55 (47.12)	-1.27	0.20
6.	Plant protection chemicals	37230.85 (4.28)	38081.88 (4.30)	-0.28	0.77
7.	Irrigation	63399.00 (7.29)	63399.00 (7.16)	–	–
8.	Fertilizer	23787.83 (2.74)	23842.67 (2.69)	-0.04	0.96
	Total material cost	124417.68 (14.31)	125323.44 (14.16)	-0.23	0.81
9.	Interest on working capital	37096.13 (4.27)	37965.86 (4.29)	-0.98	0.33
10.	Risk margin	52994.38 (6.10)	54237.00 (6.13)	-0.98	0.33
	Total variable cost	620034.61 (71.34)	634572.85 (71.70)	-0.98	0.33
11.	Rental value of land	211330.00 (24.31)	211330.00 (23.88)	–	–
12.	Depreciation	15163.98 (1.74)	16404.49 (1.85)	-0.61	0.54
13.	Interest on fixed capital	22649.40 (2.61)	22773.45 (2.57)	-0.61	0.54
	Total fixed cost	249143.38 (28.66)	250507.94 (28.30)	-1.88*	0.06
	Grand total	869177.99 (100)	885080.79 (100)	-1.71	0.24

Note: Figures in parentheses represent percentages of total maintenance costs.
*Significance levels: ***p < 0.01; **p < 0.05; *p < 0.10

Variable costs constituted the dominant share of total maintenance expenditure, accounting for 71.34 percent of total cost for FPO farmers and 71.70 percent for non-FPO farmers. This confirms that recurrent operational expenses remain the principal determinant of cost structure in perennial rose cultivation. Within variable costs, labour expenses represented the largest component, contributing 46.66 percent and 47.12 percent of total costs, respectively, thereby emphasizing the labor-intensive nature of rose production. Among labour operations, cutting and pruning emerged as the most important activity, accounting for 25.40 percent of total cost for FPO farmers and 25.52 percent for non-FPO farmers. Farmer Producer Organization (FPO) farmers incurred significantly lower expenditure on this component ($p < 0.01$), suggesting improved labour organization, better scheduling of intercultural operations, or more efficient workforce management. Similarly, costs related to fertilizer application ($p < 0.05$) and harvesting ($p < 0.05$) were also significantly lower for FPO farmers. Expenditure on plant protection chemical application was marginally lower among FPO farmers ($p < 0.10$). However, despite these component-level differences, total labour cost did not vary significantly between the two groups ($p = 0.20$), implying that savings in selected operations were offset by similarities in other labour-intensive activities such as weeding. Material costs accounted for a comparatively smaller share of total expenditure, comprising 14.31 percent for FPO farmers and 14.16 percent for non-FPO farmers. Differences in total material cost were statistically non-significant ($p = 0.81$). Major input components such as irrigation and fertilizer remained nearly identical across groups, indicating that the scope for reducing purchased input costs during the maintenance phase is relatively limited. This may be attributed to standardized input requirements once orchards are established and production practices become routine.

Derived cost items, including interest on working capital and risk margin, represented 4.27 percent and 6.10 percent of total cost for FPO farmers, compared with 4.29 percent and 6.13 percent for non-FPO farmers, respectively. These differences were statistically non-significant ($p = 0.33$), reflecting the close similarity in working capital requirements between the two categories of farmers. Fixed costs accounted for 28.66 percent of total maintenance cost for FPO farmers and 28.30 percent for non-FPO farmers. The rental value of land remained the largest fixed cost component and was identical for both groups, while depreciation and interest on fixed capital showed only minor variation. Although total fixed cost displayed marginal significance ($p < 0.10$), the economic magnitude of the difference was small and unlikely to materially influence profitability outcomes. The results suggest that the cost advantages associated with FPO membership are more visible during the establishment stage than during the maintenance stage of rose cultivation. While FPO farmers demonstrated lower expenditure in selected labour operations, these efficiencies were insufficient to generate a statistically significant reduction in total maintenance cost. This indicates that Farmer Producer Organizations may be more effective in facilitating initial input access, coordination, and start-up cost reduction, whereas long-term recurring costs in perennial flower production are shaped more by biological production requirements and prevailing market conditions than by institutional membership alone.

Variable costs constituted the largest share of total maintenance costs, accounting for approximately 71 percent in both groups. Within this, labour costs alone contributed about 46–47 percent, indicating the highly labour-intensive nature of rose cultivation. Among labour operations, cutting and pruning emerged as the dominant component, accounting for approximately 25 percent of total costs, followed by weeding and harvesting. FPO farmers incurred significantly lower costs in specific labour operations such as cutting and pruning ($p < 0.01$), fertilizer application ($p < 0.05$), and harvesting ($p < 0.05$), suggesting the presence of localized operational efficiencies. However, these differences did not translate into statistically significant variation in total labour costs ($p = 0.20$).

Material costs accounted for around 14 percent of total costs and showed no significant difference between FPO and non-FPO farmers, indicating that the role of FPOs in reducing input costs becomes limited during the maintenance phase. Similarly, fixed costs comprised approximately 28–29 percent of total costs, with the rental value of land being the dominant component, and remained nearly identical across both groups. The absence of a statistically significant difference in total maintenance costs suggests that the cost advantage associated with FPO membership is not sustained over time. While certain operational efficiencies persist, they are insufficient to influence the overall cost structure. The findings indicate that FPO membership generates measurable cost advantages during the establishment phase; however, these benefits diminish in the maintenance phase, where cost structures between FPO and non-FPO farmers tend to converge. This suggests that FPOs are more effective in facilitating input access and initial cost reduction rather than ensuring sustained efficiency gains in perennial crop production systems.

Economics of rose cultivation

The gross returns from rose cultivation exhibited a steady upward trend over the study period, reflecting progressive crop maturity, higher flower yield, and better market realization with advancing plantation age. Over the productive life cycle (2nd to 10th year), FPO farmers realized substantially higher gross returns compared to non-FPO farmers in every year (Table 4). Gross returns for FPO farmers increased from ₹5,82,780.73 per hectare in the second year to ₹8,10,065.22 per hectare in the tenth year, whereas corresponding returns for non-FPO farmers rose from ₹4,74,352.12 to ₹6,59,349.45 per hectare.

Table 4 Per hectare economics of rose cultivation (₹/ha)

Year	FPO Cost	FPO Gross return	FPO Net return	Non-FPO cost	Non-FPO gross return	Non-FPO net return
1*	175499.36	-	-175499.36	179559.96	-	-179559.96
2	82257.89	582780.73	500522.84	83762.91	474352.12	390589.21
3	85836.11	606091.96	520255.85	87406.60	493326.21	405919.61
4	89414.33	635231.00	545816.67	91050.28	517043.81	425993.53
5	92992.54	658542.23	565549.69	94693.97	536017.90	441323.93
6	96578.99	681853.46	585274.47	98346.03	554991.98	456645.95
7	100157.21	710992.49	610835.28	101989.72	578709.59	476719.87
8	103735.43	734303.72	630568.29	105633.41	597683.67	492050.26
9	107313.64	757614.95	650301.31	109277.09	616657.76	507380.67
10	110891.86	810065.22	699173.36	112920.78	659349.45	546428.67
		t= 28.69***			p=0.0002	

*Significance levels: ***p < 0.01

The cumulative gross returns during the productive period were estimated at ₹61,77,475.76 per hectare for FPO farmers and ₹50,28,132.49 per hectare for non-FPO farmers, indicating that FPO farmers earned about 22.86 percent higher returns than non-FPO farmers. This superiority may be attributed to improved access to quality inputs, collective marketing, stronger bargaining power, and adoption of better production practices facilitated through Farmer Producer Organizations. Rose cultivation involved high initial establishment costs in the first year, amounting to ₹1,75,499.36 per hectare for FPO farmers and ₹1,79,559.96 per hectare for non-FPO farmers. Since no commercial returns were realized during the establishment year, income generation effectively commenced from the second year onward. Thereafter, both groups earned positive and rising net returns throughout the remaining years. Among FPO farmers, net returns increased from ₹5,00,522.84 per hectare in the second year to ₹6,99,173.36 per hectare in the tenth year. Similarly, non-FPO farmers realized net returns ranging from ₹3,90,589.21 to ₹5,46,428.67 per hectare during the same period. In all years, FPO farmers consistently outperformed non-FPO farmers in terms of profitability. These findings suggest that participation in FPOs considerably enhances farm income and economic efficiency in rose cultivation. The results are in conformity with earlier studies [17-18], which also reported higher gross and net incomes for FPO member farmers compared to non-members.

Table 5 Discounted economic analysis

Particulars	Farmer Producer Organization (FPO) farmers	Non-FPO farmers
Net present value (NPV)*	₹28,52,296.00	₹21,87,331.00
Benefit–cost ratio (B:C)*	5.37	4.28
Payback period (Years)**	1.35	1.46

To evaluate the long-term economic feasibility of rose cultivation, annual streams of costs and returns were discounted at the rate of 10 percent. The discounted investment indicators, namely Net Present Value (NPV), Benefit–Cost ratio (B:C), and Payback Period, are presented in (Table 6). The discounted analysis revealed strong economic viability under both production systems. The Net Present Value (NPV) was estimated at ₹28,52,296.00 per hectare for FPO farmers and ₹21,87,331.00 per hectare for non-FPO farmers. The higher NPV for FPO farmers indicates superior long-term profitability and stronger investment performance under collective institutional arrangements. Likewise, the Benefit–Cost ratio was estimated at 5.37 for FPO farmers and 4.28 for non-FPO farmers. This implies that every rupee invested in rose cultivation generated returns of ₹5.37 for FPO farmers and ₹4.28 for non-FPO farmers in present value terms. Thus, rose cultivation was financially rewarding under both systems, but markedly more efficient among FPO farmers. The Payback Period was shorter for FPO farmers (1.35 years) than for non-FPO farmers (1.46 years), indicating quicker recovery of initial establishment costs by FPO members. Faster payback further strengthens the case for FPO-based rose cultivation as a more resilient and attractive investment option. The discounted indicators confirm that rose cultivation is a highly profitable enterprise, and institutional participation through FPOs significantly improves financial returns, investment efficiency, and long-term sustainability.

Production constraints faced by farmers

Among Farmer Producer Organization (FPO) farmers, the most severe constraint was high cost of planting material (mean score 73.90), followed by shortage of skilled labour (68.65), lack of quality planting material (59.50), and non-availability of skill training in rose production (56.78). Other constraints included lack of processing facilities, inadequate technical knowledge of timing of operations, untimely irrigation supply, shortage of specialized intercultural equipment, and irregular power supply.

Table 6 Constraints reported by Farmer Producer Organization (FPO) farmers

S. No.	Constraints	Mean score	Rank
1.	High costs of planting material	73.90	I
2.	Shortage of skilled labour	68.65	II
3.	Lack of quality planting material	59.50	III
4.	Non-availability of skill training in rose production	56.78	IV
5.	Lack of processing facilities	43.95	V
6.	Lack of knowledge about timing of different operations	43.05	VI
7.	Non-timely supply of irrigation facilities	42.00	VII
8.	Lack of specialized intercultural operations equipment	40.78	VIII
9.	Lack of power supply	21.40	IX

Constraints reported by non-FPO farmers

For non-Farmer Producer Organization (Non-FPO) farmers, the most serious problem was shortage of skilled labour for technical operations such as pruning and training (74.38), followed by high labour cost (67.88), poor access to quality planting materials (58.10), and lack of storage facilities (56.30). Other constraints included irrigation problems, inadequate plant protection knowledge, lack of intercultural machinery, weak access to financial institutions, and delayed farm subsidies.

Table 7 Constraints reported by non-FPO farmers

S. No.	Constraints	Mean score	Rank
1.	Skilled labour shortage (training, pruning etc.)	74.38	I
2.	High cost of labour	67.88	II
3.	Quality planting materials	58.10	III
4.	Lack of storage facility	56.30	IV
5.	Irrigation facility	45.50	V
6.	Lack of plant protection measure doses	43.05	VI
7.	Intercultural equipment	42.45	VII
8.	Access to financial institutions	40.95	VIII
9.	No timely availability of farm subsidies	21.40	IX

Comparative implications

The constraint pattern suggests that Farmer Producer Organization (FPO) farmers mainly faced input-price and technology-related issues, whereas non-FPO farmers experienced broader institutional and market-access problems. This indicates that FPO membership partially mitigates problems related to finance, storage, and subsidy access, but challenges such as skilled labour shortage and high planting material cost remain common across both groups. Strengthening nursery infrastructure, skill training, mechanization support, and labour-saving technologies would substantially improve profitability and sustainability of rose cultivation. The study concluded that rose cultivation is a highly profitable perennial enterprise in Rajasthan, with Farmer Producer Organization (FPO) members performing better than non-FPO farmers in terms of lower establishment cost, higher returns, superior investment feasibility, and faster recovery of initial investment. Although cost differences narrowed during the maintenance phase, FPO farmers consistently realized higher income due to better access to quality inputs, improved

production practices, collective marketing, and stronger bargaining power. Major constraints such as high planting material cost, shortage of skilled labour, inadequate quality seedlings, and limited processing facilities continue to affect both groups. Therefore, policy efforts should focus on strengthening and expanding FPOs in floriculture clusters, promoting certified nurseries for quality planting material, organizing skill development programmes on pruning and crop management, encouraging mechanization for labour-intensive operations, and developing storage, processing, and market infrastructure for value addition. Improved access to institutional credit and targeted subsidies for perennial flower crops would further enhance adoption and profitability. Strengthening such institutional and infrastructural support can significantly improve farmers' income, generate rural employment, and promote sustainable floriculture development in Rajasthan.

CONCLUSION

The study revealed that rose cultivation is a highly profitable perennial enterprise in Rajasthan, with Farmer Producer Organization (FPO) members demonstrating clear economic advantages over non-FPO farmers. FPO farmers incurred relatively lower establishment costs due to improved input-use efficiency and better operational management, particularly in labour and plant protection expenses. Although cost differences narrowed during the maintenance phase, FPO farmers consistently achieved higher gross and net returns throughout the productive life cycle of the crop. Discounted economic indicators such as higher Net Present Value, superior Benefit–Cost ratio, and shorter payback period further confirmed the greater financial viability of rose cultivation under the FPO system. The findings suggest that collective institutional support through FPOs enhances profitability through better access to quality inputs, improved production practices, and stronger market linkages. However, major constraints including high planting material costs, shortage of skilled labour, lack of quality seedlings, and inadequate infrastructure continue to limit the full potential of rose cultivation. Therefore, strengthening FPOs, promoting certified nurseries, improving skill development, encouraging mechanization, and expanding storage and marketing infrastructure are essential for enhancing income, sustainability, and long-term growth of floriculture in Rajasthan.

LITERATURE CITED

1. Press Information Bureau. 2025. Highlights of Economic Survey 2024-25. Government of India, New Delhi.
2. Department of Agriculture and Farmers Welfare. 2021-22. Horticulture Statistics at a Glance 2021-22. Ministry of Agriculture and Farmers Welfare, Government of India, New Delhi.
3. Bante PK, Ulemale DH, Tale SG, Gedam PJ, Yuwanate SL. 2023. Economics of production of selected flowers in Nagpur district. *The Pharma Innovation Journal* 12(4): 2060-2066.
4. Kankal AP, Deshmukh RG, Mishra S, Raut MS, Nikam YR. 2021. Production of rose in Akola district of Maharashtra. *Journal of Pharmacognosy and Phytochemistry* 10(1S): 579-583.
5. Gauraha AK, Chandrakar MR, Joshi SK. 2018. Economics of major flowers in Chhattisgarh plains. *Journal of Pharmacognosy and Phytochemistry* 7(3): 3301-3302.
6. Pachiyappan P, Kumar P, Reddy KV, Kumar KN, Konduru RS, Paramesh V, Niranjan S. 2022. Protected cultivation of horticultural crops as a livelihood opportunity in western India: An economic assessment. *Sustainability* 14(12): 7430.
7. Gautam Y, Panday H. 2023. Assessing the comparative economics of chickpea: FPO in Banda district of Bundelkhand region. *Asian Journal of Agricultural Extension, Economics and Sociology* 41(5): 44-50.
8. Rai RK, Gupta BK, Kalia A, Gautam Y, Panday H. 2023. Assessing the comparative economics of chickpea: FPO in Banda district of Bundelkhand region. *Asian Journal of Agricultural Extension, Economics and Sociology* 41(5): 44-50.
9. Hussain I, Baruah A, Das R. 2021. A comparative economic analysis of farmer producer company's member farmers vis-a-vis non-member farmers. *Indian Journal of Economics and Development* 17(3): 562-568.
10. Manaswi BH, Kumar P, Prakash P, Kar A, Anbukkani P, Jha GK, Rao DUM. 2019. Impact of farmer producer organizations on organic chilli (*Capsicum frutescens*) production in Telangana. *Indian Journal of Agricultural Sciences* 89(11): 1850-1854.
11. Basavaraj G, Nayak P, Gracy CP. 2022. Do institutional interventions benefit farmers-evidence from marketing maize through farmer producer organization in Davangere district of Karnataka. *Economic Affairs* 67(3): 361-369.
12. Kavibharathi SM, Kumarasamy N. 2022. A study on resource use efficiency and economic returns for tapioca in case of member and non-member farmers of FPOs in Karur district of Tamil Nadu. *International Journal of Farm Sciences* 12(2): 88-93.
13. Department of Horticulture, Government of Rajasthan. 2022-23. District-wise area and production of horticultural crops in Rajasthan. Government of Rajasthan.
14. Chand K, Jangid BL. 2007. Economic viability of henna in semi-arid Rajasthan. *Agricultural Economics Research Review* 20: 137-146.
15. Lokappa DGS, Patil SS, Hiremath GM, Narayan RPJ. 2018. Financial feasibility of fig cultivation (*Ficus carica* Linn.) in North-Eastern Karnataka, India. *Economic Affairs* 63(2): 347-352.
16. Amale AJ, Zore AV, Khunt AK. 2019. Economic feasibility of pomegranate production in Marathwada region of Maharashtra state. *International Journal of Current Advanced Research* 8(4): 18068-18071.
17. Suneesha G. 2018. A study on performance of Farmer Producer Organizations (FPOs) in Kurnool district of Andhra Pradesh. *MBA Thesis*, Acharya N. G. Ranga Agricultural University, Guntur, Andhra Pradesh.
18. Suneesha G, Devi IB, Prabhavathi Y, Lavanyakumari P. 2019. Economics of groundnut cultivation on FPO and non-FPO farms in Kurnool district of Andhra Pradesh. *The Journal of Agricultural Science* 5(1): 59-65.