

Advancing Floriculture in India: Impact of Hi - Tech Cultivation on Marginal and Large - Scale Farmers

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Abstract: *The Indian floriculture industry is the 14th largest exporter of floriculture products globally and the second largest flower - growing nation. Despite its potential, India's share in global floriculture exports is minimal at 0.40 in 2018. This study aims to motivate farmers of all sizes in India and worldwide to adopt greenhouse cultivation techniques, known as protected cultivation. These hi - tech methods, such as greenhouses and high tunnels, are crucial in regions with extreme climates, limited water resources, and arable land. Floriculture, on to these techniques can enhance production and sustainability, making floriculture a lucrative business venture. Floriculture provides tremendous scope and opportunities and has become a major ingredient of modern lifestyle. This article highlights the importance of adopting hi - tech cultivation techniques to enhance the productivity and profitability of floriculture, particularly for marginal farmers in India.*

Keywords: Hi - tech Cultivation, Greenhouse, APEDA, GOI, Harness the Power, Triumph, Marginal Farmers

1. Introduction

The Indian floriculture market reached a value of INR 262.1 billion in 2023. India is the second largest flower growing country after China and is at 14th position in exporting floriculture products. However, India's share in global floriculture exports was only 0.40 in 2018, possibly due to gaps in maintaining international quality standards, lack of integrated cold chain management, and unorganized market and distribution channels [12]. Sustainability of the produce is the major issue.

As per the analysis by IMARC Group, the top 5 floriculture companies in India are increasingly focusing on shifting toward virtualized trade networks to offer better logistics coordination with improved information availability in the floriculture supply chain. This allows all the participants involved in the supply chain to access real - time available information, which further aids in ensuring smoother, faster and cost - effective deliveries of perishable and degradable floriculture products, such as cut and fresh flowers.

Agriculture with its allied sectors is the largest source of livelihoods in India. 70 percent of its rural households still depend primarily on agriculture for their livelihood, with 82 percent of farmers being small and marginal means cultivated under 1 - 2 to hectores of land [6]. India's diverse climate, with extreme temperatures and monsoon patterns, makes it well - suited for protected cultivation to extend growing seasons and protect crops from adverse weather conditions. The production and trade of floriculture has increased consistently over the last 10 years. In India, Floriculture industry comprises flower trade, production of nursery plants and potted plants, seed and bulb production, micro propagation and extraction of essential oils. India exported 15, 695.31 MT of floriculture products worth Rs.575.98 Crores 77.84 million USD in 2020 - 21 [1]. To ensure higher production and sustainability of the floriculture produce it is very important

to move towards from traditional way of cultivation to the hi - tech cultivation or green house cultivation, lets harness the power of hi - tech cultivation and achieve a remarkable goal specifically for marginal farmers in India.

2. Research and Methodology

1) Sampling technique:

A proper questionnaire is prepared for collecting data in which all questions related to green house building technology and subsidy by government covering all the aspects related to their economic status. From the house listing schedule, it was found that 73 of the marginal farmers own less than 2 hectares of land, 23 own leased - in land, and 2.70 own leased - out land among the total operational holdings. Out Of the total operational holding under floriculture cultivation 31.41% land has been put to rose (cut flower) cultivation and of which 31.25% is under Tuberose cultivation. Only 37.06% are under Gaillardia & Marigold cultivation.

2) Cost Of cultivation of floriculture under green house and under traditional (open) cultivation:

The evaluation of the cost of cultivation of selected floriculture plants in green house and under open cultivation has been worked out by following cost considerations -

Cost A = All the variable A includes labour., seeds/ floriculture planting material, manures, fertilizers, plant protection measures, irrigation, land revenue, miscellaneous., interest on working capital, green house building material and expenses.

Cost B = Cost A + Interest on fixed capital + Rental or value of land.

Cost C = Cost B + Imputed value of labor

3) Profitability:

The measure of profitability of flower production is important measure in agriculture business to make a comparison between the crops under hi - tech cultivation and under open cultivation. To arrive at the profitability of cut flowers factors like area, yield (number of cut flowers), production cost (including fixed and variable cost), returns (gross income), benefit (net income) and B/C (Benefit cost ratio) etc. have been taken. The production cost was the sum of input and output cost.

4) Break - even analysis:

Analysis has been taken to find the calculate the point at which total costs and revenue are equal. here breakeven quantity (BEP) determines the revenue needed to cover total costs.

BEP quantity measure done such as $[BEP (quantity) = F / (P - V) - - (1)]$

In this methodology break - even quantity of production of Rose, Gerbera, Tuberose has calculated to get normal profit condition of the farmers in this study [11].

5) Sensitivity analysis:

This concept has been employed to examine the sensitivity of the average cut flower growers towards risk and uncertainty of increase in production cost, reduction in yield and reduction in price of flowers, under existing prices, cost and price structure. Sensitivity analysis has been done to find the difference between increase or decrease and actual cost, yield (number of flowers) and price respectively for the rose and another floricultural cultivation. This has been another important measure to check the market situation. The estimated cost, yield and price has been derived as per estimated cost (Actual yield * Actual price) or (Actual cost/Actual price) and finally estimated price (Actual cost/Actual yield).

3. Analysis & Findings**1) Cost of cultivation of flowers:**

With the purpose of comparative study of relative Cost considerations in respect of proposed flowers viz; Rose, Tuberose, Chrysanthemum, Marigold and Gaillardia, the Cost 'A', Cost 'B' and Cost 'C' per sq. m has been worked out. The details are given in table.

Table 1: Comparative Analysis of Cost A, Cost B and Cost C of Selected Flowers

Sr. No.	Expenditure on Cost/Sq. m Area	Rose	Tuberose	Marigold	Giallardia	Chrysanthemum
I	Cost A... Rs. /Sq. m	51.97 (100%)	18.89 (36.34%)	10.68 (20.55%)	11.68 (22.47%)	11.04 (21.24%)
II	Cost B... Rs. /Sq. m	79.23 (100%)	33.16 (41.85%)	20.55 (25.93%)	18.27 (23.05%)	24.09 (30.40%)
III	Cost C... Rs. /Sq. m	80.23 (100%)	34.16 (42.57%)	21.55 (26.86%)	19.27 (24.01%)	25.09 (31.27%)

As seen from table No - 1 Cost A, Cost B, and Cost C per sq. m area in the process of growing of Roses is highest in comparison to other flowers. Therefore, for comparison sake the Cost 'A', cost 'B' and Cost 'C' incurred for growing Roses, under open condition for per sq. m. area has been treated on 100% basis. In this respect, it is seen that for growing of roses under all concerned open units taken together, the Cost A, Cost B, and Cost 'C' for per sq. m area is respectively Rs.51.97, Rs.79.23, Rs.80.23. Followed by Roses., the Cost structure analysis shows that for growing of tuberose in all concerned units, the Cost 'A' per sq. m area is Rs.18.89 which is 36.34% of Cost 'C' incurred for roses. Whereas Cost 'B' for tuberose /sq. m area amounts to Rs.33.16, which is 41.85% of Cost 'B' incurred for Roses. In case of Cost 'C', it is seen that it is Rs.34.16 for tuberose/sq. m area which 42.57% of Cost 'C', incurred for roses. The comparison between Roses and chrysanthemum flowers it is seen that Cost 'A' incurred for grown chrysanthemum /Sq. m area amounts to Rs.11.04 which is 21.24% of Cost 'A' incurred for roses. The comparison of Cost 'B' between chrysanthemum and Roses shows that the Cost 'B' for chrysanthemum has incurred Rs.24.09 which is 30.40% of Cost 'B' incurred for Roses. Cost 'C' indicates that it is Rs.25.09 for growing chrysanthemum in sq. m area which is 31.27% of Cost 'C' incurred in the growing of Roses. The comparison between Roses and Marigold shows that the Cost 'A' for growing Marigold in one sq. m. area amounts to Rs.10.68 which is 20.55% of Cost 'A' incurred for Roses. In the case of Cost 'B' it is seen that the Cost B/sq. m area for Marigold amounts to Rs.20.55 which is 25.93% of Cost 'B' as incurred for Roses. In respect of Cost 'C' it is seen that flowers of Marigold have involved cost of Rs.21.55 for

growing them in 1 Sq. m area which is 26.86% of Cost 'C' incurred for Roses. In the case of flowers of gaillardia, it is seen that it is Rs.11.68for per sq. m area which is 22.47% of Cost 'A' involved for growing roses. The Cost B for gaillardia amounts to Rs.18.27/ sq. m which is 23.05% of Cost 'B' which is incurred for roses. In case of Cost 'C' it is seen that for growing gaillardia/sq. m Cost 'C'; amounts to Rs.19.27 which is 24.01% of Cost 'C' which is incurred for roses. Critical analysis of the said Cost structure indicates that Cost A, which includes all recurrent variable items, is highest for rose which is respectively followed by tuberose, chrysanthemum, gaillardia and Marigold. Analysis of Cost 'B' indicates that it is highest for roses like Cost 'A', which is respectively followed by tuberose, chrysanthemum, Marigold and gaillardia. This analysis of costs shows that Cost 'C' is also highest for growing of Roses which is respectively followed by tuberose, chrysanthemum, Marigold and gaillardia. It is to be critically argued that in the process of growing of floriculture, expenditure on variable items which constitute Cost 'A' matters the most. In the context, it is seen that Cost A/sq. m is highest for Roses which is respectively followed by Tuberose, Chrysanthemum, Gaillardia and Marigold.

2) Profitability Ratio:

The area cultivated with roses is higher than other flowers, followed by Gaillardia, Tuberose, Chrysanthemum, and Marigold. The flower wise total produce and receipt is made by critical observations reveal that, net return from gaillardia grown under is 3.08 times more over Cost A, 1.97 times more over Cost B and 1.73 times more over Cost C/sq. m. Further, the observations reveal that all the selected flowers viz; rose,

tuberose, chrysanthemum, Marigold and gaillardia gave left considerable margin of net return over Cost A, Cost B and Cost C. these observations further reveal that highest net returns per sq. m over Cost A, Cost B, Cost C is from roses

which is followed by net return over these costs from tuberose, Marigold, gaillardia and chrysanthemum respectively.

Table 2: Profitability Ratio (In INR)

Sr. no	Particulars	Rose (No)	Tuberose (kg)	Marigold (kg)	Chrysanthemum (KG)	Gaillardia (Kg)
1	Yeild/ha	1481476	9999.95	11200	25000	18000
2	Production Cost Rs.	811580	351600	255600	265900	207700
3	Returns (Gross Income) Rs.	2481400	799990	560000	750000	360000
4	Net Income (Rs).	1669820	448300	304400	484100	152300
5	B/C Ratio.	2.05	1.27	1.19	1.82	0.73

The flower cultivator’s area under rose has been higher than other flowers. Per hectare production of rose, tuberose, marigold, Chrysanthemum and Gaillardia has been 1481476 (no), 9999.95Kgs, 11200Kgs, 25000Kgs and 18000 (Kg) respectively. Per hectare cost of production cost has been highest for rose followed by tuberose, chrysanthemum, Marigold & Gaillardia respectively. The gross income per hectare for Rose has been Rs.2481400 followed by tuberose (Rs.7, 99, 990), Chrysanthemum (Rs.750, 000), Marigold (Rs5, 60000) and Gaillardia (Rs.360, 000). Net income from Rose has been highest (Rs.16, 69820) followed by chrysanthemum (Rs.4, 84, 100), Tuberose (Rs.4, 48300), Marigold (Rs.304400) and Gaillardia (Rs.1, 52, 300). Gross and net income for Rose has been higher than all other flowers because of low cost involved in procuring planting material, cost fertilizers and plant protection chemicals. Moreover, Rose flower production has been available throughout the year: Benefit - cost been highest for Rose followed by Chrysanthemum, Tuberose & Marigold.

3. Break Even Analysis:

It has been found the break - even quantity of roses 3521 numbers in terms of fixed investment of Rs.5, 19, 710 for per sq. m. flowers price of Rs.248.14 and per hectare variable cost Rs.8, 11, 580. The break - even quantity for Tuberose has been 249.5Kg in terms of fixed investment Rs.1, 88, 990 for per sq. m. flowers at a price of Rs.79.99 and per unit of variable cost

Rs.3, 51, 600. The break - even quantity for Marigold has been 351.1Kg in terms of fixed investment Rs.1, 06, 890 for per sq. m. flowers at a price of Rs.56.00 and per unit of variable cost Rs.2, 55, 600. The break - even quantity for Chrysanthemum has been 228.17Kg in terms of fixed investment Rs.1, 10460 per sq. m. flowers at a price of Rs.75.00 and per unit of variable cost Rs.2, 65, 900. Lastly, the breakeven quantity of Gaillardia has been 548.5 kgs. For Rs.83536.66of fixed investment and a price of Rs.36.00 per kg. of flowers and per unit of variable cost Rs.207700.

4. Sensitivity analysis

In this section analysis has been done to know how much cut flower growers have been satisfied in the above range of cost, yield and prices. The highest difference between actual and increased cost has been found for Rose Rs.16, 69820. Yield differences have been higher in Chrysanthemum 45515kg. The difference between actual and increase of price among flowers are higher in roses followed by chrysanthemum, tuberose, marigold and gaillardia respectively. Thus, sensitivity analysis has been clearly shown. In all types of flowers, it has clearly been observed that the farmer get positive results for increasing cost, yield and price as because they got the positive amount of production than break even quantity of production. Details have been given in Table 3.

Table 3: Sensitivity analysis.

Sr. No	Particulars	Rose	Tuberose	Marigold	Chrysanthemum	Gillardia
1	Cost - Actual (Rs)	811580	351600	255600	265900	207700
	Increased (Rs)	2481400	799900	560000	750000	360000
	Difference (Rs)	1669820	448300	304400	484100	152300
2.	Yeild - Actual	1481476cuts	9999.95kg	11200kg	25000kg	18000kg
	Increased	271044cuts	22750kg	24538kg	70515kg	31198kg
	Difference	122568cuts	12750.05kg	13338kg	45515kg	13198kg
3.	Price – Actual (Rs)	81.15	35.16	25.56	26.59	20.77
	Increased (Rs)	248.14	79.99	56.00	75.00	36.00
	Difference (Rs)	166.99	44.83	30.44	48.41	15.23

5. Discussion

Although roses have been the major floriculture crop, in this study its cultivation has been preferred mostly by the farmers due to its profit margin and production throughout the year. The benefit - cost ratio of Rose has been higher than other floriculture crops in this study, followed by Chrysanthemum, Tuberose, Marigold & Gaillardia. Break - even quantity and sensitivity analyses of cost, production and price have been positive for all crops. This study concludes that floriculture is

a lucrative business and hi - tech cultivation makes a huge difference in the profitability margin for the marginal farmers. As mostly farmers in the study are marginal farmers.

As per National Horticulture Database published by National Horticulture Board, during 2023 - 24 the total area under floriculture production in India was 285 thousand hectares with a production of 3194 thousand MT [4]. Furthermore, the Government of India (GoI) is undertaking numerous initiatives to promote export - oriented businesses by

providing subsidy to new floriculture entrepreneurs across the country. Significant improvements in the cold chain management facilities are expected to create a positive impact on product quality and shelf life of floriculture products, thereby ensuring higher profits for the major players operating in the market [2].

Floriculture Market Forecast the Indian floriculture market size reached INR 262.1 [8] billion in 2023. Looking forward, IMARC Group expects the market to reach INR 714.6 billion by 2032, exhibiting a growth rate (CAGR) of 11.4% during 2024 - 2032 [9].

Initiatives have also been launched for the benefit of exporters by providing cold storage and cargo handling facilities for perishable products at various international airports. Direct subsidy up to 50 percent is also available in cold storage units. A subsidy is also provided by APEDA on improved packaging materials to promote their use [7]. To attract entrepreneurship in the floriculture sector, NABARD is providing financial assistance to hi - tech units at reasonable interest rates [10].

6. Conclusion

The forecast of the Floriculture industry is brighter than expected and booming, Government of India is also providing 50% subsidy on total expenditure with a maximum cut off limit up to 4000 m² per beneficiary for adoption and installing greenhouses under National Horticulture Mission [13]. Floriculture provides tremendous scope and opportunities and has become a major ingredient of modern lifestyle. The floriculture industry is now becoming a commercial business venture with high market value and will be a triumph over traditional farming. India is conferred with several agro - climatic zones conducive to the production of sensitive and delicate floriculture products. During the decade after liberalization floriculture industries took giant steps in the export arena [3]. This study gives us a glance of greenhouse cultivation and its profitability. This study demonstrates the significant potential of hi - tech cultivation techniques in improving the profitability and sustainability of the floriculture industry in India. By adopting these methods, marginal and large - scale farmers can enhance their productivity and market competitiveness, contributing to the overall growth of the sector.

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