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**Dev Shaynee Vashisath**  
Department of Agricultural  
Economics, Extension Education  
and Rural Sociology, CSK HPKV  
Palampur, Himachal Pradesh,  
India

**Harbans Lal**  
Department of Agricultural  
Economics, Extension Education  
and Rural Sociology, CSK HPKV  
Palampur, Himachal Pradesh,  
India

**Nikhil Chandel**  
Amity University, Noida,  
Uttar Pradesh, India

**Mohd Faruk**  
ICAR-Indian Agricultural  
Research Institute, Pusa,  
New Delhi, India

## Economics of ornamental plant nurseries in Kangra district of Himachal Pradesh

**Dev Shaynee Vashisath, Harbans Lal, Nikhil Chandel and Mohd Faruk**

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### Abstract

In the current scenario, residents of hilly regions, particularly in Himachal Pradesh, are increasingly turning toward indoor cultivation of ornamental and potted plants. The present study focuses on the economic assessment of ornamental plant nurseries in Kangra District, H.P. A representative sample of 40 nurseries was selected using simple random sampling. The main ornamental plants cultivated in these nurseries included annuals, perennials, houseplants, and bulb plants. On average, each sample nursery had around 34,510 potted plants, with annuals forming the largest share (69.13%), followed by houseplants (18.65%) and perennials (10.05%).

The total cost of cultivating ornamental plants, including both fixed and variable expenses, was estimated at ₹9,58,339 per nursery. Human labor and planting materials or seeds constituted the major cost components. The Net Present Value (NPV) of ornamental plants, calculated at a 10% discount rate, was ₹ 30.15 lakh. The Benefit-Cost (B:C) ratio for all potted plants was 1.49, while the Internal Rate of Return (IRR) was an impressive 255%.

However, the study identified key challenges such as low awareness levels, shortage of skilled labor, and insufficient technical knowledge and training among nursery owners. To address these issues, it is recommended that efforts be directed toward enhancing awareness through targeted extension education programs and practical demonstration trials.

**Keywords:** Ornamental plant nurseries, pot plants, NPV, IRR and BCR

### Introduction

A nursery is a systematically managed site established to produce seedlings and nurture them until they reach the desired stage for final planting. Nurseries can differ in size, types of seedlings produced, business value, infrastructure, and operational methods (Munjuga *et al.*, 2013) <sup>[9]</sup>. One of the primary functions of a nursery is to supply high-quality planting material by propagating plants through various techniques to meet the aesthetic needs of flower enthusiasts, hobby gardeners, and commercial floriculturists.

A well-planned nursery not only enhances the beauty and value of its surroundings but also serves as an attractive destination for visitors, particularly in urban areas. Such spaces inspire people to cultivate ornamental plants in homes and offices, helping to reduce air pollution and maintain ecological balance for a healthier environment and a sustainable future.

Recognizing the potential of floriculture, the Himachal Pradesh government has introduced a ₹ 150 crore plan to promote this sector over the next five years (Anonymous, 2018) <sup>[2]</sup>. Under the 'Himachal Pushp Kranti Yojna,' various incentives are being provided to progressive and innovative farmers to encourage them to adopt floriculture as a profitable venture. According to the State Department of Horticulture, the total area under floriculture in Himachal Pradesh was approximately 705.77 hectares in 2018-19.

Specifically, the area dedicated to pot plants in the state has shown consistent growth from 12.2 hectares in 2011-12 to 29.15 hectares in 2018-19. Correspondingly, production rose from 0.61 million pots in 2011-12 to 1.36 million in 2017-18 (Directorate of Horticulture, Shimla). The main floriculture hubs are located in the districts of Solan, Kangra, and Mandi. In 2018-19, Kangra district had 109.02 hectares under flower cultivation, which included 2.15 ha of carnation, 38.75 ha of marigold, 3.00 ha of liliun, 16.44 ha of rose, 2.83 ha of gerbera, 13.68 ha

**Corresponding Author:**  
**Mohd Faruk**  
ICAR-Indian Agricultural  
Research Institute, Pusa,  
New Delhi, India

of seasonal flowers, and 11.12 ha of potted plants.

Given this context, the present study was undertaken to analyze the cost and return structure as well as the financial viability of ornamental plant nurseries in Kangra District, Himachal Pradesh.

### Objectives

1. To carry out benefit-cost analysis of ornamental plant in nurseries.
2. To study the supply chain and marketing of ornamental plants and analyse constraints.

### Literature Review

#### a. Work done abroad

Perkins (1973) <sup>[10]</sup> conducted a study on the economics of ornamental nursery management in Florida and observed that, despite challenges such as inflation and increasing market competition, nurseries in the region managed to enhance their profitability. Between 1965 and 1971, the average profit of Florida nurseries rose significantly from US \$4,909 to US \$18,183.

Jorgensen (2004) <sup>[16]</sup> highlighted that the ornamental nursery industry generates substantial employment opportunities for both skilled and unskilled workers. Due to its relatively less physically demanding nature, it offers equal job prospects for men and women. Additionally, the ornamental plant business holds strong potential for earning foreign exchange through exports.

Fakayode *et al.* (2008) <sup>[4]</sup> examined the viability and resource utilization of ornamental plant nurseries in Nigeria. Their study emphasized that floriculture and ornamental plant production can play an important role in boosting food production and household income in the country. Like other agricultural sectors, the cultivation of ornamental crops contributes significantly to the economic growth of developing nations. Ornamental gardens, in particular, serve as vital sources of income and employment, with the revenue from the commercial sale of flowers and decorative plants making a meaningful contribution to Nigeria's economy.

Munjuga *et al.* (2013) <sup>[9]</sup> defined a nursery as a well-organized site intended for producing and nurturing seedlings until they reach the stage suitable for final planting. Nurseries, according to their study, play a key role in supporting agricultural development programs.

Similarly, Adedundun and Adeniyi (2015) <sup>[9,1]</sup> investigated the ornamental plant nursery business in Nigeria and identified the shortage of adequate land as the most common constraint faced by nursery operators. They also reported insect infestations as another significant problem. The study found that the asset ratio was above average, with an interest rate of 12.3 percent.

#### Work done in India

Subrahmanyam (1986) <sup>[14]</sup> conducted a study on the economics of chrysanthemum flower cultivation in Karnataka. The findings revealed that the total cost of cultivation, which included marketing, input, and fixed costs, averaged around ₹21,500 per hectare, indicating the high capital requirement for growing this crop. Input costs constituted about 46% of the total expenditure, followed by marketing costs at 44%. Human labor mainly hired—accounted for nearly half of the total input cost.

Karthikeyan and Chandrakandan (2000) <sup>[6]</sup> carried out a study to analyze the socioeconomic profile of 108 cut flower growers from major floriculture regions in Coonoor, Kotagiri, and Ooty taluks of the Nilgiris district, Tamil Nadu. The study found that

the main challenges faced by growers included inadequate technical knowledge and skills related to high-tech production and post-harvest handling (95.23%), lack of infrastructure for post-harvest management (85.71%), and unavailability of consistent and reliable export-oriented market information (76.19%).

Singh and Ram (2003), in their study on the “Economics of Liliun Cultivation under Shading Net in Himachal Pradesh,” reported that the total cost of raising Asiatic lilies amounted to ₹ 8,25,109.83, or ₹ 1,37,518.31 per 2,500 sq.m. per year. The gross return was ₹ 11,94,600 (₹ 71,421.91 per 2,500 sq.m. per year), resulting in net returns of ₹ 3,69,490 per year. The annualized net return was ₹ 61,581.69. The initial investment, including capital and planting material costs, was ₹2,14,532. The benefit-cost ratio (B:C) was 1.45, confirming the economic viability of liliun cultivation under shade nets, while the payback period of 3.48 years indicated that the total investment could be recovered within that time.

Tale *et al.* (2003) <sup>[15]</sup> examined the economics of flower marketing in the Nagpur district of Maharashtra. They found that the total expenditure per kilogram of flowers was lowest for zendu (marigold) and highest for tuberose. Consumers paid the least for marigold, gallardia, and annual chrysanthemum, and the most for budded roses. Producers received between 52% and 62% of the consumer price, with the highest profit margin (86%) from simple roses and the lowest (56%) from gallardias. Commission agents held a 5.5% share in consumer prices but earned a profit margin of 97.28%. Their share in the consumer price varied up to 31%, while retailers' shares ranged from 4.2% to 9.3%, indicating that intermediaries like commission agents and retailers earned disproportionately high profits.

Sahu *et al.* (2011) <sup>[11]</sup> analyzed the growth of floriculture and its impact on the socio-economic conditions of floriculturists in Panskura and Kolaghat blocks of Purba Medinipur district, West Bengal. The study identified key constraints such as inadequate cold storage facilities, poor road conditions, fluctuating demand and prices, scarcity of quality seeds and fertilizers, damage to flowers caused by fly ash from the Kolaghat Thermal Power Plant, and lack of training opportunities for farmers.

Makadia *et al.* (2012) <sup>[7]</sup> investigated rose cut flower cultivation in South Gujarat and found that the average total cost and net return per acre were ₹ 70,137 and ₹ 54,749, respectively. The average price per flower was ₹ 1, yielding net returns of ₹0.44 per flower over cost C2. The input-output ratios for cost A, cost B, cost C1, and cost C2 were 1:2.15, 1:2.05, 1:1.96, and 1:1.78, respectively, indicating strong profitability.

Sharma *et al.* (2014) <sup>[12]</sup> assessed the economic feasibility and challenges of flower cultivation in Kangra, Sirmaur, and Mandi districts of Himachal Pradesh. The study revealed that major issues included lack of training and technical knowledge, non-availability of quality planting materials, poor post-harvest management, inadequate cold storage facilities and high storage costs, lack of organized markets, and high transportation expenses.

### Methodology

The present study was carried out in the Kangra district of Himachal Pradesh, utilizing both primary and secondary data collected during the research period. Primary data were obtained through a well-structured and pre-tested interview schedule using the personal interview method. The selection of ornamental plant nurseries was done using the Simple Random Sampling (SRS) technique. A complete list of ornamental nurseries in the district was procured from the office of the

District Horticulture Officer, Dharamshala. Out of a total of 47 nurseries operating across the district, a manageable sample of 40 nurseries was selected for detailed analysis.

Secondary data related to the study were gathered from various published and unpublished sources, including official records and reports. Simple tabular analysis was employed extensively to examine demographic characteristics, socio-economic features, nursery inventory, input utilization, and production patterns of ornamental plants. Basic mathematical tools such as averages, percentages, and proportions were used to analyze, compare, and interpret the collected data effectively.

**Analytical framework:** To achieve the objectives of the present study, various mathematical and statistical techniques were applied for data analysis. Tabular analysis was widely used to examine the socio-economic characteristics and to conduct the economic evaluation. The literacy rate and dependency ratio were computed using the following formulas:

### Literacy Rate

$$\text{Literacy rate (\%)} = \frac{\text{Total number of literate persons}}{\text{Total population} - \text{non school going population}} \times 100$$

### Dependency ratio

$$\text{Dependency ratio} = \frac{\text{Number of dependents}}{\text{Total Workers}}$$

To evaluate the financial feasibility of investment in ornamental plant nurseries economic indicators, viz., net present value, benefit cost ratio and internal rate of return were used, with the following equation/formulae-

### Net Present Value

$$NPV = \sum_{t=1}^n \frac{R_t}{(1+i)^t}$$

Where,

$R_t$  = Net cash inflow or outflow during a single period  $t$

$i$  = Discount rate or return that could be earned in alternative investments

$t$  = Number of timer periods

### Benefit Cost Ratio

BCR = Gross returns/Total costs

While doing investment analysis, BCR is worked out by using the following formula.

Benefit-Cost Ratio = PV of benefit expected from the project/PV of the cost of the project

### Internal Rate of Return (IRR)

$$IRR = \text{Lower discount rate} + \left( \frac{\text{Difference between the}}{\text{two discount rates}} \right) \times \left| \frac{\text{flows at lower discount rate}}{\text{Absolute difference between}} \right|$$

## Findings and Discussion of the study

**Demographic profile:** Demographic characteristics such as family size and structure, workforce availability, occupational pattern, and literacy status serve as key indicators in determining the social and economic profile of the selected households. The average family size among the sampled nursery owners was found to be five members. A majority of the respondents (85%) belonged to nuclear families, while only 15% were part of joint families (Table 1).

The data further indicate that, on average, about 90% of family members were literate. Approximately 28% of them had received education up to the secondary level. Moreover, over 29% of the family members were graduates, followed by 11.17% who had attained postgraduate qualifications.

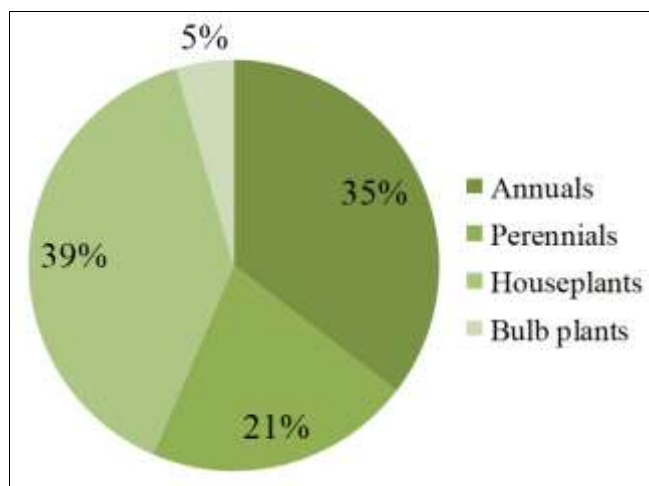
**Table 1:** Demographic profile of nursery owners

| Particulars                      | Per cent |
|----------------------------------|----------|
| Average family size              | 4.93     |
| Male                             | 52.79    |
| Female                           | 47.21    |
| Family structure                 |          |
| Nuclear                          | 85.00    |
| Joint                            | 15.00    |
| Education status                 |          |
| Non-school going                 | 3.55     |
| Illiterate                       | 6.09     |
| Upto secondary                   | 27.41    |
| Above secondary                  | 22.84    |
| Graduate                         | 28.93    |
| Post graduate                    | 11.17    |
| Literacy rate                    | 96.95    |
| Occupational status              |          |
| Flower nursery                   | 85.00    |
| Business/shop                    | 5.00     |
| Govt service                     | 2.50     |
| Private service                  | 2.50     |
| Agriculture along with livestock | 5.00     |

**Inventory of ornamental pot plants in sample nurseries:** The inventory of ornamental plants maintained in the sample nurseries is presented in Table 2. It is evident from the data that, on average, annuals constituted the largest share of total ornamental plants (69.13%), followed by house plants (18.65%) and perennials (10.05%). The overall average number of potted plants per nursery in the study area was recorded at 34,510.

**Table 2:** Inventory of all ornamental plants

| Plants      | No.   | Percent |
|-------------|-------|---------|
| Annuals     | 23857 | 69.13   |
| i Summer    | 14181 | 37.54   |
| ii Winter   | 9676  | 31.59   |
| Perennials  | 3469  | 10.05   |
| iii Trees   | 1958  | 5.67    |
| i Shrubs    | 723   | 2.10    |
| ii Climbers | 788   | 2.28    |
| Houseplants | 6436  | 18.65   |
| i Flowering | 5028  | 14.57   |
| ii Foliage  | 1408  | 4.08    |
| Bulb plants | 748   | 2.17    |
| Total       | 34510 | 100.00  |



**Input use pattern in production/raising of ornamental plants:** Table 3 presents the details of total working capital, which includes both material and non-material costs such as labor and electricity expenses, estimated at ₹ 8,78,226 per

nursery. Among the different components, seed/planting material emerged as the largest cost item, accounting for about 55% of the total working capital. This was followed by polytubes/pots, which represented approximately 28% of the total cost.

Among other material inputs, the expenditure on growing mixture, farmyard manure, fertilizers (organic and chemical), fertigation, pesticides, and staking materials constituted 2.41%, 1.47%, 1.34%, 0.47%, 2.43%, and 0.05%, respectively, of the total working capital. The human labor charges contributed 5.41%, while electricity costs accounted for 1.26% of the total. These findings align with those of Bhattacharya (1997) <sup>[17]</sup>, who reported that investment in plant materials alone represented about 25% of the total establishment cost, and a low-cost greenhouse required an investment of ₹ 70,000, half of which could be recovered through subsidy.

The allocation of total working capital across various categories of potted plants indicated that the highest share was spent on perennial pot plants (54.53%), followed by houseplants (22.71%), annuals (12.55%), and bulb plants (10.21%).

**Table 3:** Input use pattern in production/raising of ornamental plants

| Particulars                         | Annuals     |         | Perennials  |         | House plants |         | Bulb plants |         | Total       |          |
|-------------------------------------|-------------|---------|-------------|---------|--------------|---------|-------------|---------|-------------|----------|
|                                     | Amount (Rs) | Percent | Amount (Rs) | Percent | Amount (Rs)  | Percent | Amount (Rs) | Percent | Amount (Rs) | Per cent |
| <b>Material cost</b>                |             |         |             |         |              |         |             |         |             |          |
| Seed/Planting material              | 9000        | 8.16    | 371717      | 77.61   | 87500        | 43.88   | 18875       | 21.06   | 487092      | 55.46    |
| Polytubes/pots                      | 57450       | 52.10   | 71050       | 14.83   | 70265        | 35.24   | 50200       | 56.02   | 248965      | 28.35    |
| Growing mixture                     | 12716       | 11.53   | 8457        | 1.77    |              | 0.00    |             | 0.00    | 21173       | 2.41     |
| FYM/manure                          | 5700        | 5.17    | 2700        | 0.56    | 3300         | 1.65    | 1200        | 1.34    | 12900       | 1.47     |
| Fertilizer nutrient                 | 3555        | 3.22    | 3637        | 0.76    | 2996         | 1.50    | 1586        | 1.77    | 11774       | 1.34     |
| i) Chemical fertilizers             | 975         | 0.88    | 977         | 0.20    | 876          | 0.44    | 506         | 0.56    | 3334        | 0.38     |
| ii) Organic fertilizers             | 2580        | 2.34    | 2660        | 0.56    | 2120         | 1.06    | 1080        | 1.21    | 8440        | 0.96     |
| iii) Fertigation                    | 1234        | 1.12    | 1189        | 0.25    | 1091         | 0.55    | 617         | 0.69    | 4131        | 0.47     |
| iv) Pesticides                      | 5828        | 5.29    | 6818        | 1.42    | 5754         | 2.89    | 2990        | 3.34    | 21390       | 2.43     |
| v) Staking material (Nylon threads) | 460         | 0.42    | -           | -       | -            | -       | -           | -       | 460         | 0.05     |
| Human labour                        | 7998        | 7.25    | 6967        | 1.45    | 22750        | 11.41   | 9800        | 10.94   | 47515       | 5.41     |
| Electricity charges                 | 2763        | 2.51    | 2763        | 0.58    | 2763         | 1.39    | 2763        | 3.08    | 11052       | 1.26     |
| Total                               | 110259      | 100.00  | 478935      | 100.00  | 199415       | 100.00  | 89617       | 100.00  | 878226      | 100.00   |

**Labour utilization pattern in ornamental plants:** Table 4 presents details on the total labor employed in the production and maintenance of ornamental plants across the sample nurseries. The data indicate that a total of 480 man-days of labor were utilized for all categories of ornamental plants. Among these, hired labor accounted for 268 man-days (55.83%), while family labor contributed 212 man-days (44.17%). The maximum hired labor requirement was observed in the case of annuals, with 78 man-days employed. In terms of total labor distribution across different categories, annuals accounted for

the largest share (27.08%), followed by perennials (26.04%) and houseplants (25.83%). The greater labor demand in annuals was attributed to the higher number of annual potted plants raised compared to other ornamental categories.

These findings are in line with those reported by Subrahmanyam (1986) <sup>[14]</sup>, who observed that input costs constituted about 46% of the total cultivation cost, followed by marketing costs at 44%. Furthermore, human labor predominantly hired represented nearly 50% of the total input expenditure, emphasizing its significant role in ornamental plant production.

**Table 4:** Labour utilization pattern in ornamental plants (Man days/nursery/annum)

| Particulars | Family labour | Hired labour | Total labour |
|-------------|---------------|--------------|--------------|
| Annuals     | 52            | 78           | 130 (27.08)  |
| Perennials  | 58            | 67           | 125 (26.04)  |
| Houseplants | 59            | 65           | 124 (25.83)  |
| Bulb plants | 43            | 58           | 101 (21.04)  |
| Total       | 212 (44.17)   | 268 (55.83)  | 480 (100.00) |

**Note:** Figures in parentheses indicate percentage to total.

**Cost and returns from all ornamental pot plants on sample nurseries:** Analyzing the costs and returns of an agricultural enterprise is crucial, as it provides valuable insights into its profitability, economic feasibility, and potential areas for improving operational efficiency. The details of costs and

returns from ornamental plant production in the sample nurseries are presented in Table 5.

The total cost of production or raising all potted plants was estimated at ₹9,58,339 per nursery. The total output value of ornamental plants, calculated by multiplying the number of pots

by their respective unit prices, was ₹ 14,23,193. Consequently, the net return over total cost was found to be ₹ 4,64,854, while the return over variable cost amounted to ₹ 5,29,598.

These findings are consistent with those reported by Singh (2008), who observed that the cost of cultivation for gladiolus was ₹ 3,56,643 per hectare, yielding a net income of ₹ 1,38,630 per hectare.

A comparison of the output-input ratios among different categories of ornamental plants revealed that the highest ratio was recorded for annuals (1.52), followed by perennials and

houseplants (1.22), and bulb plants (1.18). The overall output-input ratio for all ornamental plants combined was 1.49, indicating economic viability and profitability of ornamental nursery operations.

Similar findings were reported by Usman *et al.* (2013)<sup>[18]</sup>, who found that the Benefit-Cost (B:C) ratio for small, medium, and large farmers was 2.64, 2.51, and 2.36, respectively, suggesting that ornamental crop production can be a lucrative enterprise across varying scales of operation.

**Table 5:** Cost and returns from all ornamental pot plants on sample nurseries (Rs./nursery)

| Particulars                | Annuals | Perennials | Houseplants | Bulbplants | Total   |
|----------------------------|---------|------------|-------------|------------|---------|
| Total variable Cost        | 112189  | 487316     | 202905      | 91185      | 893595  |
| Total Fixed Cost           | 64744   | 64744      | 64744       | 64744      | 64744   |
| Total cost (1+2)           | 176933  | 552060     | 267649      | 155929     | 958339  |
| <b>Returns</b>             |         |            |             |            |         |
| Quantity for sale          | 12200   | 11850      | 10900       | 9180       | 44130   |
| Average Price (Rs/plant)   | 22      | 57         | 30          | 20         | 32.25   |
| Gross return               | 268400  | 675450     | 327000      | 183600     | 1423193 |
| Returns over total cost    | 91467   | 123390     | 59351       | 27671      | 464854  |
| Returns over variable cost | 156211  | 188134     | 124095      | 92415      | 529598  |
| Output-input ratio         | 1.52    | 1.22       | 1.22        | 1.18       | 1.49    |

**Investment analysis parameters:** Investment analysis provides a comprehensive assessment of the financial performance and feasibility of an agricultural enterprise by evaluating the present values of costs and returns. In the present study, three key financial indicators Net Present Value (NPV), Internal Rate of Return (IRR), and Benefit-Cost Ratio (B:C Ratio)—were calculated to assess the economic viability of ornamental plant nurseries.

The analysis revealed that the NPV of ornamental plant production, computed at a 10% discount rate, was ₹ 30.15 lakh, indicating a highly profitable venture. The B:C ratio for all potted plants was found to be 1.49, signifying that the returns exceeded the costs by 49%. Moreover, the Internal Rate of Return (IRR) was calculated to be an impressive 255%, further confirming the strong financial attractiveness and sustainability of ornamental plant nursery enterprises.

**Table 6:** Investment analysis

| Particulars        | Units      | All pot plants |
|--------------------|------------|----------------|
| NPV                | Rupees     | 3015026        |
| Benefit-cost Ratio | Ratio      | 1.53           |
| IRR                | Percentage | 255.42         |

### Implication of study

The socio-economic survey of nursery owners in the study area revealed that the average family size was 4.93 persons, consisting of 52.79% males and 47.21% females. A majority of the families (85%) were nuclear, while only 15% followed a joint family system. The overall literacy rate among the sample nursery households was notably high at 97%. About 28% of the family members had education up to the secondary level, while more than 40% were graduates or held higher qualifications. On average, each nursery maintained around 34,510 ornamental potted plants. The total working capital, including both material and non-material costs, was estimated at ₹ 8,78,226 per nursery. Among the cost components, seed/planting material formed the largest share, contributing about 55% of the total working capital.

In terms of labor utilization, a total of 480 man-days were employed across all categories of ornamental plants. Out of

these, 268 man-days (55.83%) were contributed by hired labor, while 212 man-days (44.17%) came from family labor. The maximum labor requirement (78 man-days) was recorded for annuals, primarily due to their larger production scale compared to other ornamental categories.

Regarding the costs and returns, the total cost of production for all potted plants was ₹9,58,339 per nursery, while the total output value computed by multiplying production with prevailing market prices was ₹ 14,23,193. The net returns over total cost were ₹ 4,64,854, and the returns over variable cost were ₹ 5,29,598. The overall output-input ratio was 1.49:1, indicating that for every rupee invested, the return was ₹ 1.49.

The investment analysis further revealed that the Net Present Value (NPV) of ornamental plants at a 10% discount rate was ₹ 30.15 lakh, while the Benefit-Cost (B:C) ratio stood at 1.49. The Internal Rate of Return (IRR) was exceptionally high at 255%, exceeding the prevailing interest rates offered by lending institutions. Since the IRR was significantly higher than the opportunity cost of capital, the findings clearly indicate that investment in ornamental plant nurseries is financially viable and economically profitable.

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