

RESEARCH PAPER

**Economic analysis of horticulture nursery enterprises in Koppal district of Karnataka**

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**Abstract:** Nursery is a place where plants are grown, nurtured and sold out. In current scenario nursery raising is the most benefited sector, because it needs small area and short time to generate more income. The Koppal district was purposely selected as it occupies prime place in the nursery raising of horticultural crop in the region. The primary data was collected from 30 nursery owners in the study area. The present study aims to analyze the costs and returns of nursery enterprises in Koppal district of Karnataka state. The findings of the study revealed that, the costs involved in the production of seedlings was ₹ 2,64,840.43 and ₹ 6,20,071.01 in small and large sized shade net house, respectively. Of which, variable cost and fixed costs constituted ₹ 2,42,111.04 and ₹ 22,729.39 in small sized and ₹ 5,69,347 and ₹ 50,724.01 in large sized shade net house, respectively. The financial feasibility analysis indicated net present worth of ₹ 1,73,128 and ₹ 2,87,789 with a discounted benefit cost ratio of 2.29 and 2.40 and payback period was estimated to be 1.05 and 1.07 years and the IRR generated in the nursery enterprise was found to be 28 and 30 percent for small and large nurseries which is higher than the prevailing interest rate. According to the study, the ratio of variable costs has a higher share compared to that of fixed costs and also this business has vast potentials of generating employment and income of the owners in rural areas of Koppal district.

**Key words:** BC ratio, Fixed costs, Internal Rate of return, Variable costs

**Introduction**

Horticulture has great scope and is a fast-growing industry; demand for nursery saplings for planting new orchards is even increasing. Plant nurseries are playing a vital role in the progressive development of activities related to environmental improvement. One of the most commercial ventures in the horticulture sector is the nursery business. A nursery is a place where plants are grown, nurtured, and sold. Nursery can also be defined as a place or an establishment for the raising or handling of young vegetable or fruit seedlings until they are ready for more permanent planting. The aim of good nursery management is to provide planting material of the highest possible quality for new development areas and replanting. Nursery production is a basic need in horticulture, and it is currently the most benefited sector because it requires a small area and a short time to generate more income.

In the world, about 115 countries are involved in greenhouse vegetable production commercially. In Asia, China has the largest area under protected cultivation, with 2.5 million hectares under poly houses or greenhouses (Nair and Barche, 2014). India is the home of many different types of vegetables and fruits, and it plays an important role in the production of fruits and vegetables among various countries around the world. Vegetables are the primary sources of nutrition and are consumed by people of all socio economic backgrounds, from the poor to the wealthy.

A major portion of the area under vegetable cultivation in India is now sown with hybrid seeds, which are costly but give higher yields and better-quality produce. In view of the high cost of seeds, most flower and vegetable crops are transplanted after growing in nurseries to achieve maximum germination count and healthy plant establishment. Flower and vegetable crop cultivation faces a number of problems that cause

enormous yield losses. One of the issues that flower and vegetable farmers face is a lack of quality seedlings, which affects the growth, yield, and income of flower and vegetable growers. To put a full stop to all these problems, taking up nursery is the ultimate solution. Keeping in view the above factors, this study was conducted to assess the cost and benefit analysis of horticultural nursery enterprises in Koppal district of Karnataka. The study was carried out in Koppal district of Karnataka, where in nursery rising of horticultural crop is quite predominant. Also Koppal district occupies prime place in the nursery rising of horticultural crops in Kalyana Karnataka region of Karnataka state. The study aims to serve as a better guide and be useful to extension workers, vegetable and flower growers, nursery entrepreneurs, and other stakeholders in flower and vegetable production.

**Material and methods**

Snow ball technique was used to select the nursery owners in the study area. In the beginning Senior Horticulture Officials of Koppal district were consulted to get the list of private nursery owners operating in Koppal district and then the 30 nursery owners were contacted one by one using snow ball technique and collected the information related to the costs and returns involved in the nursery raising of horticultural crops by using well structured per-tested schedule through personal visit.

The sample design was employed for the selection of nurseries, with the district as the unit of analysis. The nursery's size was classified as post classification. The nursery was divided into two sizes: a small nursery with an area up to 1000 square meters and a large nursery with an area more than 1,000 square meters. The above classification was designed to assist in analysis and the reporting of results in a comparable format.

Following data collection via a well-structured questionnaire, all 30 nurseries in the Koppal district were classified as 17 small nurseries and 13 large-sized nurseries.

Shade net house involves long term investment. Shade net house can be maintained economically for about five years. The cost incurred in the shade net house can be broadly classified as i. Establishment cost and ii. Maintenance cost

Establishment cost is the cost incurred during the first year of the establishment of shade net house. The cost incurred comprises cost of land/bed preparation, materials of the shadenet house structure like shade nets, pillars, polythene sheets, PVC pipes, binding iron wire, shading material, shower pipes and all other after care operations.

Maintenance cost includes all the costs incurred annually for the maintenance of shade net house during the productive period of five years. It includes variable cost and fixed cost.

Variable cost is the cost which is incurred at the varied level of production of vegetable and flower seedlings under shade net house. The variable cost includes cost of protrays, seeds, coir pith, fertilizers, plant protection chemicals, irrigation charges, labour cost and interest on working capital.

The fixed cost is the cost which incurred on the fixed assets. The fixed cost includes amortized cost of establishment, rental value of land, depreciation and interest on fixed capital.

Amortized cost of establishment is the proportion of the total cost of establishment of shade net house made in one year to be included under fixed cost component. Amortization of costs was done under 12 percent which reflects bank lending rate. Amortization of investment was calculated by the formula:

$$I = P \frac{i(1+i)^t}{(1+i)^t - 1}$$

Where,

I = Amortized cost of shade net house,

P = Cost of shade net house,

i = Discount rate (12% per annum)

t = life of shade net house (5 years)

Depreciation was calculated by straight line method. The junk value of the assets was considered to be 12 percent of the present value of the assets. The depreciation was calculated by the formula:

$$\text{Depreciation} = \frac{\text{Present value} - \text{junk value}}{\text{Expected remaining life of assets}}$$

The gross returns were computed solely based on the sale of vegetable and flower seedlings.

Gross returns = No. of seedlings sold × Price of seedlings

$$\text{Sale price of seedlings} = \frac{\text{Total value of seedlings produced}}{\text{Quantity of seedlings sold}}$$

Net returns of nurseries were worked out by deducting total costs from gross returns.

Net returns = Gross Returns - Total Costs

Financial feasibility of investment on production of seedlings under shade net house conditions was evaluated by using project evaluation measures. The project evaluation includes discounted and undiscounted measures.

**i. Discounted measures:** Net Present Value (NPV), Benefit Cost Ratio (BCR) and Internal Rate of Return (IRR) are discounted measures of project worthiness.

**ii. Undiscounted measures:** Payback period (PBP) is an undiscounted measure of project worthiness.

A discount rate of 12 percent was used to estimate these parameters. The rate of interest given by the different financial institutions for the investment of long-term projects was used as a decision criterion for selection of discount rate.

**i. Discounted measures**

Net Present Value (NPV) is the difference between the present value of cash inflows and the present value of cash outflows over a period of time. It is simply the net present worth of cash flow stream. NPV of the nursery was estimated by using the following equation:

$$NPV = \frac{P_1}{(1+i)^1} + \frac{P_2}{(1+i)^2} + \dots + \frac{P_n}{(1+i)^n} - C$$

Where,

P = Yearly net cash flow,

i = Discount rate (12%),

t = Time period (5 years)

C = Initial cost of investment (₹)

Benefit cost ratio is defined as the ratio of the present value of the projects future net cash flows to the projects initial cash outlay. It is similar to the Net Present Value approach and it measures the present value of returns per rupee invested. Here, we compared the present worth of costs with present worth of benefits. It was worked out by applying the formula:

$$BC \text{ Ratio} = \frac{\sum_{t=1}^n \left( \frac{B_t}{(1+i)^t} \right)}{\sum_{t=1}^n \left( \frac{C_t}{(1+i)^t} \right)}$$

Where,

B<sub>t</sub> = Discounted benefits,

C<sub>t</sub> = Discounted costs,

i = Discount rate (12 % per annum)

t = Number of years (5 years)

The internal rate of nursery is the discount rate, which makes net present value equal to zero. It is expressed in percent. It is calculated by using the formula:

$$\left( \text{Internal rate of return} \right) = \left( \text{Lower discount rate} \right) + \left( \frac{\text{Difference between the two discount rates}}{\text{Absolute difference between the present worths of the cash flow at the two discount rates}} \right) \times \left[ \frac{\text{Present worth of the cash flow at the lower discount rate}}{\text{Absolute difference between the present worths of the cash flow at the two discount rates}} \right]$$

**ii. Undiscounted measures**

The payback period is the time between the start of the project and the time when the initial investment is recovered in the form of yearly benefits. Payback period (PBP) is the number of years it takes a unit to recover its original investment in a project when net cash flow equals zero. It was estimated by using the straight-forward formula when the cash flows are uniform:

$$P = \frac{I}{E}$$

Where,

P = Payback period of the project in years,

I = Initial investment of the project in <sup>1</sup>

E = Annual net cash income in <sup>1</sup>

Payback period was estimated by using the formula when the cash flows are non-uniform:

$$\text{Payback Period} = \text{Year before recovery} + \frac{\text{Unrecovered costs at the start of the year}}{\text{Cashflows during the recovery year}}$$

**Results and discussion**

**Cost of producing seedlings in small and large-sized shade net houses**

The costs associated with growing seedlings in shadenet houses were calculated individually for small (475 sq. m.) and large (1150 sq. m.) shade net houses, and the specifics are shown in Tables 1. The total cost of producing seedlings under shade net houses was calculated to be ₹ 2,64,840.43 for small-sized shadenet houses and ₹ 6,20,071.01 for large-sized shade

net houses. The total variable costs worked out to be ₹ 2,42,111.04 and ₹ 5,69,347 for small- and large-sized shade net houses, respectively.

Protrays were the major component of variable costs, accounting for 60.13 percent of the total cost (₹ 1,59,267) and 61.64 percent of the total cost (₹ 3,82,240) for small and large shadenet houses, respectively. This was mostly due to the necessity of protrays, which cost ₹ 15 each and are needed every three months. Protrays cannot be utilized for a longer period of time because of their reduced shelf life. Hybrid seed costs were higher in the study area, accounting for the largest portion of variable expenses (second to protrays) (14.82% in small and 15.16% in large), so it can be concluded that seed industry stakeholders should make high-quality seeds at affordable prices available to nursery farmers.

The amortized cost of establishment, which accounts for 4.62 percent (₹ 12,244.1) and 4.46 percent (₹ 27,659.3) of the total cost in both small and large shade net houses, was a significant part of the fixed cost. In both small and large shade net houses, the rental value of the land represented 2.83 percent (₹ 7,500) and 2.71 percent (₹ 16,850) of the total cost, respectively, while interest on fixed costs was accounted for 0.91 percent (₹ 2,435.29) and 0.87 percent (₹ 5434.71) in studied Koppal district.

The gross returns earned by small and large-sized shade net houses were ₹ 4,23,351 and ₹ 9,78,543, respectively. The net returns realized from small and large-sized shade net houses were ₹ 1,58,511 and ₹ 3,58,472, respectively. Similar results were

Table 1. Cost of producing seedlings in shade net houses in the study area

Particulars	Small sized shade net house			Large sized shade net house		
	Total costs (₹ /475sq.m)	Costs (₹ /sq.m)	Percent	Total costs (₹ /1150 sq.m)	Costs (₹ /sq. m)	Percent
<b>Variable costs</b>						
Protrays	159267	335.29	60.13	382240	332.38	61.64
Shower pipes	1256	2.64	0.47	3252	2.82	0.52
Coir pith	14480	30.48	5.46	34752	30.22	5.60
Seeds	39252	82.63	14.82	94204	81.91	15.19
Fertilizers	1610	3.38	0.60	3520	3.06	0.56
Plant protection chemicals	2122	4.46	0.80	4852	4.21	0.78
Labour cost	8285	17.44	3.12	15280	13.28	2.46
Interest on working capital @ 7%	15839.04	33.34	5.98	37247	32.38	6.00
Sub total (I)	242111.04	510	91.42	569347	495.08	91.81
<b>Fixed costs</b>						
Amortization cost of establishment	12244.1	25.77	4.62	27659.3	24.05	4.46
Rental value of land	7500	15.78	2.83	16850	14.65	2.71
Depreciation	550	1.15	0.20	780	0.67	0.12
Interest on fixed capital @ 12%	2435.29	5.12	0.91	5434.71	4.72	0.87
Sub total (II)	22729.39	47.85	8.58	50724.01	44.10	8.04
Total cost (I+II)	264840.43	557.55	100.00	620071.01	539.19	100.00
Gross returns	423351	891	-	978543	851	-
Net returns	158511	334	-	358472	312	-

Table 2. Production and sale of seedlings in small sized shade net house

									(per nursery)	
Years	Type of seedlings	Sale Price (₹ / Seedling)	Seedlings produced (No.)	% change of seedlings produced over previous year	Seedlings sold (No.)	% change of seedlings sold over previous year	Total value (₹)	% change of total value of seedlings over previous year	Gross return (₹)	% change of gross returns over previous year
2017-18	Vegetables	3.30	145580	-	144220	-	475926	-	489444	-
	Flowers	10.28	1442	-	1315	-	13518	-		
2018-19	Vegetables	3.68	148640	2.05	146250	1.38	538200	11.57	554958	11.80
	Flowers	11.25	1685	14.42	1492	11.86	16785	19.46		
2019-20	Vegetables	3.25	142570	-4.25	140080	-4.40	455260	-18.21	466328	-19.00
	Flowers	9.50	1380	-22.10	1165	-28.06	11068	-51.65		
2020-21	Vegetables	2.43	138650	-2.82	137520	-1.86	334174	-36.23	344149	-35.50
	Flowers	8.75	1265	-9.09	1140	-2.19	9975	-10.95		
2021-22	Vegetables	2.75	149950	7.53	148880	7.63	409420	18.37	423351	18.70
	Flowers	10.85	1439	12.09	1284	11.21	13931	28.39		

reported by Patil *et al.* (2017) and Poonam (2021). From the above findings, we can conclude that there was a considerable difference in the total cost of producing seedlings in small and large-sized shade net houses. Protrays were more expensive than seeds in both cases, so the government and private agencies should make available to the farmers protrays with a longer shelf life made of high-quality material at reasonable prices, as well as high-quality seeds at affordable prices.

**Production and sale of seedlings in small and large-sized shade net houses**

Tables 2 and 3 demonstrate the production and sale of seedlings under small and large shade net houses in the Koppal district. The results showed that production and sales of vegetable and flower seedlings were modest in the initial years but have grown with time. The table shows that the sale prices of vegetable and flower seedlings varied, which might be related to fluctuations in demand for seedlings in and around the Koppal district.

In the year 2021–22, small-sized shade net houses produced a total of 1,51,389 seedlings (149,950 vegetable and 1439 flower), of which 1,48,880 vegetable seedlings and 1,284 flower seedlings (Table 2) were sold. In small-sized shadenet houses for the

year, vegetable seedlings were sold for ₹ 2.75 per seedling, while flower seedlings were offered at ₹ 10.85 per seedling. For the year 2021–2022, the total income from the sale of both vegetable and flower seedlings for the small-sized shadenet house was ₹ 4,23,351.

Similarly, for the year 2021–22, a total of 3,50,555 vegetable and flower seedlings were produced in large-sized shadenet houses, comprised of 3,47,690 vegetable seedlings and 2,865 flower seedlings (Table 3). 345248 vegetable and 2683 flower seedlings were sold in the year 2021-22. For the 2021–22 year, vegetable seedlings were sold for ₹ 2.75 per seedling and flower seedlings for ₹ 10.85 per seedling. The total returns for the large shadenet house during the year 2021-22 were ₹ 9,78,543.

The afore mentioned findings showed that both small and large shade net houses produced and sold seedlings at varying rates from year to year. The strong demand for seedlings during the initial years of establishment led to a rise in production, and in order to boost their revenue, they increased the quantity of seedlings they produced in the study area. Due to the COVID-19 pandemic's impact on the nation, seedling output gradually decreased between 2019–20 and 2020–21. The findings revealed that the sale price of seedlings also fluctuated, mostly as a

Table 3. Production and sale of seedlings in large sized shade net house

									(per nursery)	
Years	Type of seedlings	Sale Price (₹ / Seedling)	Seedlings produced (No.)	% change of seedlings produced over previous year	Seedlings sold (No.)	% change of seedlings sold over previous year	Total value (₹)	% change of total value of seedlings over previous year	Gross return (₹)	% change of gross returns over previous year
2017-18	Vegetables	3.30	328450	-	326680	-	1078044	-	1104361	-
	Flowers	10.28	2758	-	2560	-	26317	-		
2018-19	Vegetables	3.68	355958	7.72	353850	7.67	1302168	17.21	1333646	17.19
	Flowers	11.25	2930	5.87	2798	8.50	31478	16.39		
2019-20	Vegetables	3.25	309600	-14.97	296340	-19.40	963105	-35.20	983530	-35.59
	Flowers	9.50	2480	-18.14	2150	-30.13	20425	-54.11		
2020-21	Vegetables	2.43	296865	-4.28	284234	-4.25	690688	-39.44	710822	-38.36
	Flowers	8.75	2410	-2.90	2301	6.56	20134	-1.44		
2021-22	Vegetables	2.75	347690	14.61	345248	17.67	949432	27.25	978543	27.35
	Flowers	10.85	2865	15.88	2683	14.23	29111	30.83		

Table 4. Cash flow and Net Present Value for shade net houses in the study area

Year	Small sized shade net house			Large sized shadenet house		
	Cash inflow	Cash outflow	Discounted net cash flow at 12%	Cash inflow	Cash outflow	Discounted cash flow at 12%
0	-	45,474	-45,474	-	103,008	-103,008
1	423,351	219,366	113,209	978,542	517063	256,020
2	527,550	170,560	182,136	1081,520	591,850	249,830
3	540,260	150,630	142,176	1123,500	575,620	199,921
4	550,450	165,620	100,210	1252,630	587,450	173,213
5	560,450	185,950	69,732	1325,650	601,200	134,893
NPV		173,128		287,789		

result of differences in the demand for and quality of the seedlings. In order to protect the producer during times of excessive and inadequate production, the government should frame a policy to regulate the sale price of seedlings grown in shade net houses.

**Financial feasibility of investment in nursery enterprises**

Table 4 showed the estimates of five years cash inflows and cash outflows of small-sized shadenet house. A properly nurtured nursery can provide good net returns within 10 to 12 months after establishment and the farmer has to incur cost of maintenance during the period with lower returns. The maintenance cost of small-sized shade net house during second and third year was found to be less *i.e.* ₹ 1,70,560 and ₹ 1,50,630, respectively. During second and third year, the nursery owner realized increased returns *i.e.* ₹ 5,27,550 and ₹ 5,40,260, respectively. Which may be due increase in the production of seedlings as there was greater demand for healthy, pest and disease free seedling because it was newly established nursery so there was less chance of occurrence of pest and diseases hence the cost of producing seedlings was also low during second and third year. There after, the maintenance cost incurred on nursery enterprise was more *i.e.* ₹ 1,65,620 and ₹ 1,85,950 for fourth and fifth year, respectively. This may be due to increased production of seedlings and some repairs and replacing of partial shadenet which were damaged due to adverse climatic conditions during fourth and fifth year. And the returns realized during fourth and fifth year was ₹ 5,50,450 and ₹ 5,60,450, respectively.

Similarly, cash inflows and cash outflows of large-sized shade net house were estimated for 5 years. The table indicated that, negative returns realized during establishment period where farmer did not go for production of seedlings. The returns start from first year itself. The maintenance cost of large-sized

shade net house during second and third year was observed to be less *i.e.* ₹ 5,91,850 and ₹ 5,75,620, respectively. During second and third year, the nursery owner realized increased returns *i.e.* ₹ 10,81,520 and ₹ 11,23,500, respectively. This was because of increase in the production of seedlings. Thereafter, the maintenance cost incurred on nursery enterprise was more *i.e.* ₹ 5,87,450 and ₹ 6,01,200 for fourth and fifth year, respectively. This may be due to increased production of seedlings as the cost of the hybrid seeds was high. And the returns realized during fourth and fifth year was ₹ 12,52,630 and ₹ 13,25,650, respectively.

Net present worth is the difference between the present value of series of inflow (returns) and outflows (costs) over the economic life period of the nursery enterprise. Net Present Value (NPV) is an absolute measure that varies depending on the amount of the investment and the discount rate. The net present worth was ₹ 1,73,128 and ₹ 2,87,789 for small and large sized shade net houses, respectively at the rate of 12 per cent discount rate. Thus it could be concluded that investment in nursery enterprise was economically feasible and financially sound. Net Present Value (NPV) selection criterion; the higher the NPV, the greater the return on investment will be. The large shadenet house was therefore more financially feasible than the small shadenet house, even though both the small and large shadenet houses generated good results.

The benefit cost ratio was 2.29 and 2.40 for small and large nurseries, respectively, which satisfies the rule indicating the worthiness of investment in a nursery enterprise. Thus, it could be concluded that investment in nursery enterprise was economically feasible and financially viable. It is important to note that the IRR generated in the nursery enterprise was found to be 28 and 30 percent for small and large nurseries, respectively. It indicated the maximum rate of interest at which the nursery owners could borrow and invest in nursery enterprises.

Further, payback period was estimated to be 1.05 and 1.07 years for small and large-sized shade net houses, which means that the owners of the nursery will recover all their initial investment in 1.05 and 1.07 years, which they made during their establishment year. The study came to the conclusion that investing in a nursery business was both financially and economically feasible based on all four parameters of financial feasibility analysis. Similar findings were reported by Ashoka *et al.* (2019, 2020).

Table 5. Financial feasibility of investment on shade net houses in the study area

Particulars	Small sized shade net house	Large sized shade net house
Net Present Value (NPV) @ 12 % discount rate (₹)	1,73,128	2,87,789
Benefit Cost Ratio	2.29	2.40
Internal Rate of Return (%)	28	30
Pay Back Period (Years)	1.05	1.07

### Conclusion

Raising a healthy nursery is a specialized technology which requires knowledge and skill about various operations and scientific management of nurseries. Horticultural nursery production has become a highly commercialized business, wherein most farmers buy their seedlings from nursery entrepreneurs. Nowadays, farmers prefer the seedling from nurseries rather than raising on their own because of consistency in health, uniformity and vigour of the seedlings. Seedling raising under shade net house was highly economically viable as indicated by net present worth of ₹ 1,73,128 and ₹ 2,87,789 and it was also supported by capital

budget techniques *i.e.*, 2.29 and 2.40 of benefit cost ratio, 28 and 30 percent of IRR and 1.05 and 1.07 years of payback period for small and large nurseries, respectively. Thus, seedling production under shadenet condition was found to be profitable activity gaining interest of eventual entrepreneurs.

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