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Full Length Research Paper

Economic evaluation of greenhouse for cultivation of rose nursery

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Raising of rose nursery is quit difficult due to low temperature in winter season. Looking to the importance and temperature requirement for nursery raising for proper growth in winter, rose (*Rosa-chinensis*) were selected for experiment under arch shape greenhouse. The total construction cost of 80 m^2 arch shape greenhouse was Rs.100000/-. Out of total 80 m^2 floor area, 55 m^2 area is used for plant seedling and 25 m^2 areas is left for movement in the greenhouse carrying out agricultural operations. In 55 m^2 area of greenhouse, 9700 seedling could be raised with 0.075 x 0.075 m spacing in 20 pits. Suitability of the economics of greenhouse, four economic indicators such as net present worth, internal rate of return, benefit cost ratio and pay back period were calculated for rose nursery.

Key words: Net present worth, internal rate of return, benefit cost ratio, pay back period

INTRODUCTION

In Rajasthan state of India, Ganganagari rose is used in temples, gurudwara, draga for the worship of God and Cheti rose used for gulkand production due to its good fragrance. Gulkand made by Cheti rose is very famous in region and it cost is 150 - 200 Rs. per kg. People paid one to two rupees for rose flower before going to worship of God. People want to grow at least one or two plant of such variety of rose in his yard. In local market, selling price is 12 rupees per plant. This cost is lowest as compare to another hybrid verity and hence it is popular in local market. People adopted age-old practice for raising nursery of rose. People used only soil as a media for simple propagation technique. Such practice is not economical to farmer due to its less survival percentage, limited water and improper control of environment.

Plant must be first raised in nursery for successful plantation programme. Production of healthy plants is important where the planting stock is raised and maintain for about some months (Thakur, 1993). Cultivation of nursery also improves the overall growth of plant substantially in terms of height as compare to outside condition. A greenhouse also extends the growing season and used for year round production of this high value plants nursery even in adverse agro-climatic condition and will ensure the optimum utilization of agricultural inputs. Cultivation of nursery inside greenhouse also helps in improving the economic conditions of the farmers of the region. The water requirement also reduces inside the greenhouse. Therefore, this technology will also be useful in the water scarcity area and hence study is therefore undertaken to find out the suitability of greenhouse and their economics for nursery raising, where overall growth of nursery is very important.

MATERIALS AND METHODS

Inside the greenhouse, 20 pits of size 2.75 x 1 m were made. These pits filled with locally available garden soil, sand and vermicompost in 1:1:1 ratio. No chemical were used to control soil properties because of moderate temperature was observed inside the greenhouse. The hard-wood stem cuttings of about 20 - 25 cm (8 to 9 inch) long were prepared from one year old mature shoots by giving a slanting cut at the basal portion about 1 cm below a bud and another round cut was made at the top 3 cm away from the bud. The cuttings were about 10 -12 mm thickness. All cuttings were treated with rootex (Toky and Srinivasu 1994) for 30 seconds and bundles were prepared. After this, cuttings were used for plant-

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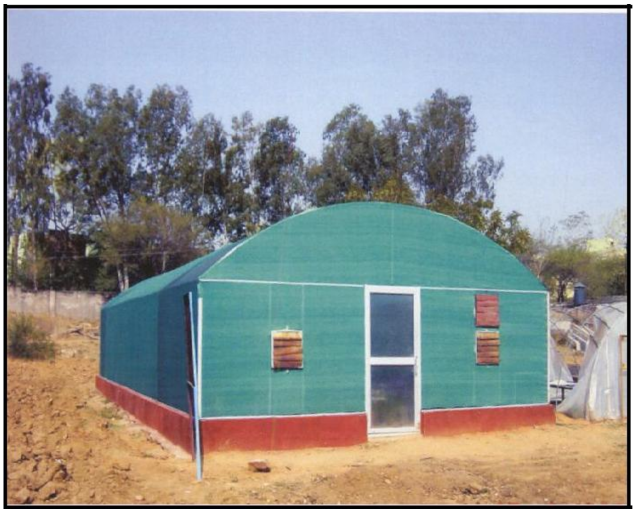

Figure 1. Arch shape greenhouse.

ing in nursery beds shown in Figure 2.

For the success and commercialization of any new technology, it was essential to know whether the technology was economically viable or not. Therefore, an attempt will be made for estimation of economics of the greenhouse. A cost analysis based on the local market conditions was made to calculate the net present worth, internal rate of return, benefit cost ratio and payback period (Kothari and Panwar, 2004) by arch shape greenhouse shown in Figure 1.

Net present worth (NPW)

The NPW is defined as the difference between present worth of savings and cost of investment. The mathematical statement for net present worth can be written as:

$$\text{NPW} = \sum_{t=1}^{t=n} \frac{B_t - C_t}{(1+i)^t} \qquad \text{(Kothari et al. 2001)}$$

Where,

C_t = Cost in each year, B_t = Benefit in each year, t = 1, 2, 3...n, i = discount rate

Internal rate of return

The internal rate of return is threshold rate at which the NPW is zero. Internal rate of return is the discount rate i such that

$$\sum_{t=1}^{t=n} \frac{B_t - C_t}{(1+i)^t} = 0 \quad \text{(Jain et al., 2004).}$$

Benefit cost ratio

This ratio was obtained when the present worth of the benefit stream was divided by the present worth of the cost stream.

The mathematical benefit-cost ratio (Kothari et.al., 2006) can be expressed as:

Preparation of pits | Nursery for rose cuttings

Figure 2. Nursery raised inside the greenhouse

$$\text{Benefit-cost ratio} = \frac{\sum_{t=1}^{t=n} \frac{Bt}{(1+i)^t}}{\sum_{t=1}^{t=n} \frac{Ct}{(1+i)^t}}$$

Payback period

The payback period is the length of time from the beginning of the project until the net value of the incremental production stream reaches the total amount of the capital investment. It shows the length of time between cumulative net cash outflow recovered in the form of yearly net cash inflows.

RESULTS AND DISSCUSSION

Details of cost/ benefit components

Table 1 reflects the quantity of materials required and the details of the cost of construction for 80 m^2 greenhouse. The total cost of construction including polythene sheet is Rs 100000/-. The cost of polythene sheet was Rs 4000/-, which was required to be replaced every five year.

The cost of cultivation includes expenditure incurred for field preparation, fertilizers, pesticide, insecticide, irrigation, routine maintenance such as weeding etc. Because of high humidity inside the greenhouse, less irrigation is required inside the greenhouse as compared to outside. The temperature conditions inside the greenhouse restrict the growth of insects and pests and therefore, no insecticides or pesticides were used inside the greenhouse, whereas, these were used outside the greenhouse whenever required.

To carry out economic feasibility of greenhouse for farmer, it was considered that each crop was grown at a time inside the greenhouse with full capacity. The details of the total cost and benefit for selected crops grown inside the greenhouse are given in Table 2.

Table 1. Cost of construction of greenhouse for 80-m^2-floor area.

S.N.	Particulars	Cost (Rs)
1	Greenhouse construction with cladding with low density, Polythene film (200 µm) UV stabilized, Shade net and structure mainly. (32 Kg polythene, 40 Kg shade net), GI pipe (40mm x 40mm ± 1mm)-(30 pipes), Door size 1.92m x 0.91m x (6’3 x 3’) lockable for poly house, Size L x B x H (center) = 13.11 x 6.10m x 3.23 m, (ie 80 m^2), Exclusive civil work	28848 = 00
2	Evaporative fan and cooling system, Exhaust fan 3 (460 mm), Polymer tank of 200 liter capacity (2 tanks), Wood ash pad 592.5 x 114 x 4.8 cm	15000 = 00
3	Temperature controlling indicator, Digital double set point for poly house (01), Plitz Timer for poly house (01)	21000 = 00
4	Foggers for misting (60) 370 W motor pump with filter pipe (2)	20025 = 00
5	Civil works (on contract basis)	15000 = 00
6	Grand Total	99873 = 00 Say 100000 = 00

Table 2. Details of income and expenditure for rose seedlings under greenhouse conditions.

S. N	Particulars/ Crops	
1	Nursery considering crops in six month	Rose
2	No. of survival plants	6116
3	Total Revenue (Rs)	73392
4	Cost of Common labour (12000)+ Pesticide (200) + Rootex (200) (Rs)	12400
5	Cost of cuttings(Rs)	2550
6	Cost of cultivation (Rs)	14950
7	Initial investment	100000
8	Cost of plastic every five year (Rs)	4000
9	Cost of electricity (Rs)	1200
10	Total operation and maintenance cost Every year(Rs) Every 5th year (Rs)	 16150 20150

Analysis of economic viability

Assumptions were taken for carrying out economic analysis of greenhouse (Kothari and Panwar 2004). The life of greenhouse structure is 20 years and 5 years for its cover. Out of total 80 m^2 floor area, 55 m^2 area is used for plant seedling and 25 m^2 areas is left for movement in the greenhouse carrying out agricultural operations. Discounting rate assumed 11% as compared to bank landing rate of interest. In 55 m^2 area of greenhouse, 9700 seedling could be raised with 0.075 x 0.075 m spacing in 20 pits. Greenhouse will produce 6116 plants based on survival percentage as given in Table 2. Selling price for Rose was Rs 12/- per plant based on average yearly price.

Net present worth

The present worth of total cash inflow and outflow for rose nursery grown under greenhouse condition were calculated and presented in Table 3. It reveals that the NPW of investment made on greenhouse when plants of rose were grown inside the greenhouse is Rs 453221/-.

Based on NPW it concluded that the construction of greenhouse for cultivation of plants rose is economical and there is substantial increase in the income of farmer by growing these plants inside the greenhouse under composite climate of Udaipur.

Table 3. Cash flow for growing rose in greenhouse.

Year	Cash outflow (Rs.)	PW of Cash outflow (Rs.)	Cash inflow (Rs.)	PW of Cash inflow (Rs)	NPW (Rs)
1	2	3	4	5	(5)-(3)
0.0	100000.0	100000.0	0.0		-100000.0
1.0	16150.0	14549.5	73392.0	66118.9	51569.4
2.0	16150.0	13107.7	73392.0	59566.6	46458.9
3.0	16150.0	11808.7	73392.0	53663.6	41854.9
4.0	16150.0	10638.5	73392.0	48345.6	37707.1
5.0	20150.0	11958.0	73392.0	43554.6	31596.5
6.0	16150.0	8634.4	73392.0	39238.4	30603.9
7.0	16150.0	7778.8	73392.0	35349.9	27571.1
8.0	16150.0	7007.9	73392.0	31846.7	24838.8
9.0	16150.0	6313.4	73392.0	28690.8	22377.3
10.0	20150.0	7096.5	73392.0	25847.5	18751.0
11.0	16150.0	5124.1	73392.0	23286.1	18161.9
12.0	16150.0	4616.3	73392.0	20978.4	16362.1
13.0	16150.0	4158.9	73392.0	18899.5	14740.6
14.0	16150.0	3746.7	73392.0	17026.6	13279.8
15.0	20150.0	4211.4	73392.0	15339.2	11127.8
16.0	16150.0	3040.9	73392.0	13819.1	10778.2
17.0	16150.0	2739.6	73392.0	12449.7	9710.1
18.0	16150.0	2468.1	73392.0	11215.9	8747.8
19.0	16150.0	2223.5	73392.0	10104.4	7880.9
20.0	0.0	0.0	73392.0	9103.1	9103.1
TOTAL		**131223.2**		**584444.6**	**453221.4**

Table 4. Computation of payback period for Rose inside the greenhouse.

Year	PW of total cash outflow in 20 years (Rs)	Cash inflow (Rs)	PW of cash inflow (Rs)	Cumulative cash inflow (Rs)
0	131223	Nil	Nil	Nil
1	Nil	73392	66119	66119
2	Nil	73392	59567	125686
3	Nil	73392	42892	143348 (2.2 Years for 131223)

Internal rate of return (IRR)

The internal rate of return for the raising the nursery of rose inside the greenhouse for two years were 53%. Based on this economic indicator cultivation of rose nursery inside the greenhouse was highly beneficial.

Benefit-cost ratio

The benefit cost ratio has been calculated by dividing present worth of benefit stream with the present worth of cost stream as given in Table 5. It comes out for growing plants of rose inside the greenhouse as 4.5. Benefit cost ratio when plants rose was grown inside the greenhouse was high and it is worth constructing greenhouse for its cultivation. The B/C ratio for rose was 4.5 because of its high price in market.

Payback period

Table 4 shows the calculations for pay back period for investment on greenhouse when nursery was cultivated

Table 5. Economic indicators for rose in greenhouse conditions.

S. N.	Economic Indicators/ Plants	Rose
1	NPW (Rs)	453221
2	B/C Ratio	4.5
3	IRR (%)	53
4	Payback period (years)	2.2

inside the greenhouse. As the cumulative present worth of cash inflow up to 4 years is more than the present worth of total cash outflow during life period of greenhouse (20 years). The payback period of separate nursery would have been taken for rose was 2.2 years. The values of the four economic indicators discussed earlier for different crops have also been consolidated and presented in Table 5.

Conclusions

Greenhouse is an effective solution to nursery grower who would be able to recover his investment on greenhouse within a period of 2.2 years. Minimum survival percentage found in rose nursery in greenhouse was 65%. NPW of investment made on greenhouse, the internal rate of return, the benefit cost ratio, when rose nursery grown inside the greenhouse were Rs.453221 /-, 53%, 4.5 respectively.

This type farming gives more income with less effort. It means the greenhouse technology is very useful technology in adverse condition for the economic development of farmers.

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