Economic Evaluation of Protected Cultivation Technology (PCT) for Horticulture Crops.

P. Gamanagatti[1]; B. Patil[2]

1: UNIVERSITY OF AGRICULTURE SCIENCES BENGALURU, DEPARTMENT OF AGRICULTURE ECONOMICS, India, 2: University of agricultural sciences dharwad, Agricultural economics, India

Corresponding author email: agripavan@gmail.com

Abstract:

ABSTRACT Protected Cultivation Technology (PCT) is used to protect plants from adverse climatic conditions. The economics of PCT was evaluated for the year 2013-14 using 90 PCT farmers i.e. thirty farmers each from Rose, Gerbera and Capsicum. The per hectare establishment cost was seen high in Rose i.e. $ 175,217 followed by Gerbera ($ 155,211) and Capsicum ($ 123,689). The cost C of Rose was $ 142144 followed by Gerbera ($ 92,427) and Capsicum ($ 24,765). The subsidy amount share to the total establishment cost was 28.92, 31.21 and 40.81, per cent for Rose, Gerbera and Capsicum respectively.While yield obtained from PCT crops were 88.97 and 47.99 lakh numbers/ha in Rose and Gerbera. Whereas 82,655 kgs of Capsicum yield was obtained. The gross return received from PCT crops was seen high in Rose i.e. $ 475,582 /ha, followed by Gerbera ($ 210,048) and Capsicum ($ 46,269). In all PCT farms, B:C ratio was more than unity and IRR ranged from 16 to 45 per cent which revealed that cultivation of crops under PCT is profitable. Hence, Govt. needs to encourage developing PCT structures using indigenous technologies with low cost materials viz. quality galvanized iron pipes and plant material.

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JEL Codes: D24, C12

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Protected Cultivation Technology (PCT) is used to protect plants from adverse climatic conditions. The economics of PCT was evaluated for the year 2013-14 using 90 PCT farmers i.e. thirty farmers each from Rose, Gerbera and Capsicum. The per hectare establishment cost was seen high in Rose i.e. $ 175,217 followed by Gerbera ($ 155,211) and Capsicum ($ 123,689). The cost C of Rose was $ 142144 followed by Gerbera ($ 92,427) and Capsicum ($ 24,765). The subsidy amount share to the total establishment cost was 28.92, 31.21 and 40.81, per cent for Rose, Gerbera and Capsicum respectively**.**While yield obtained from PCT crops were 88.97 and 47.99 lakh numbers/ha in Rose and Gerbera. Whereas 82,655 kgs of Capsicum yield was obtained. The gross return received from PCT crops was seen high in Rose i.e. $ 475,582 /ha, followed by Gerbera ($ 210,048) and Capsicum ($ 46,269). In all PCT farms, B:C ratio was more than unity and IRR ranged from 16 to 45 per cent which revealed that cultivation of crops under PCT is profitable. Hence, Govt. needs to encourage developing PCT structures using indigenous technologies with low cost materials viz. quality galvanized iron pipes and plant material.

Key words : PCT, Rose, Gerbera, Capsicum, Subsidy

Introduction

The present Indian agricultural scenario is a mix of outstanding achievements and missed opportunities. To emerge as an economic power in the world, our agricultural productivity needs to be equal on par with economic powers of the world. Hense, India is in dire need of new and effective technologies which can continuously improve the productivity, profitability and sustainability of our farming systems. In this context, the one of the most important segment is Controlled Environment Agriculture (CEA) *i.e.* Protected Cultivation Technologies such as greenhouse, net house, poly house and glass house etc.

Infact, the concept of Controlled Environment Agriculture (CEA) was not a novel idea and has been in use since, in some of the regions where the climatic conditions are extremely adverse for crops, man has developed various methods for growing some specific high value crops termed as Protected Cultivation Technology (PCT). It is used to protect the plants from the adverse climatic conditions such as wind, cold, precipitation, excessive radiation, extreme temperature, insects and diseases etc. by creating an ideal micro climate to the plants, by erecting a greenhouse/ glasshouse/ nethouse/ poly house etc.,

About 115 countries in the world are into greenhouse vegetable production commercially. The world scenario shows the area under protected cultivation to be nearly 623,302 hectares while total estimated world greenhouse vegetable production area is 402,981. Of the total world greenhouse vegetable area, soilless/hydroponic culture systems account for 95,000 ha (Hickman 2011).

In Asia, China and Japan are the largest users of greenhouses. The development of greenhouse technology in China has been faster than in any other country in the world. With a modest beginning in late seventies, the area under greenhouses in China has increased to 51,000 ha. Out of this 11,000 ha is under fruits like grapes, cherry, Japanese persimmon, fig, loquat, lemon and mango. The majority of greenhouses use local materials for the frame and flexible plastic films for glazing. Most of the greenhouses in China are reported to be unheated and the use of straw mats to improve the heat retention characteristics.

Japan has more than 40,000 ha under greenhouse cultivation of which nearly 7500 ha is devoted to only fruit orchards. Greenhouses in Japan are used to grow a wide range of vegetable and flowers with a considerable share of vegetable demand being met form greenhouse production. Even a country like South Korea has more than 21,000 ha under greenhouse for the production of flowers and fruits.

Thus, greenhouses permit crop production in areas where winters are severe and extremely cold such as Canada and Russia. It also permits production in areas were summers are extremely intolerable as in Israel, United Arab Emirates, Kuwait. In the Philippines greenhouses make it possible to grow crops despite excessive rains. Thus in essence greenhouse cultivation is being practiced and possible in all type of climatic conditions.

In India, the use of PCT started only during 1980's and was mainly used for research activities. It was to a great extent because of India's emphasis so far had been on achieving self-sufficiency in food grain production. However, in recent years in view of the globalization of international market and tremendous boost and incentive that is being given for export of agricultural produce, there has been a spurt in the demand for Protected Cultivation Technology.

India is bestowed with diverse agro-climatic and ecological conditions, which are favorable to grow all types of commercially important flowers generally found in different parts of the world. It also enjoys the best climate in selected pockets for floriculture during winter months. About 253.65 thousand hectares area was under cultivation in floriculture in 2011-12. Productions of flowers are estimated to be 1.652 million tonnes loose flowers and 750.66 million tonnes cut flowers in 2011-12. Floricultural exports from India during 1997-98 was Rs. 81.20 cr., Rs. 96.60 cr. in 1998-99, Rs. 105.15 cr. in 1999-00, Rs. 190.63 cr. in 2000-01 and it has increased to Rs. 296.04 cr. in 2010-11. Presently the country has exported 27.14 thousand tonnes of floriculture products to the world for the worth of Rs. 423.43 crores in 2012-13.In spite of this increase in India's exports, its share in the international flower trade has not increased during 1995 to 2000 and has remained at around 0.35 per cent. The main importing countries of Indian floricultural products are

Netherlands, USA, Japan, Germany, Denmark, Egypt, Singapore, Switzerland, France, Australia, UAE, Belgium and Sri Lanka. (APEDA 2013)

To promote Protected Cultivation Technology in the country in a large scale, both central and state Governments have come up with various programs and policies including subsidies. National Horticulture Mission (NHM) is emphasizing on promotion of PCT by providing fifty percent subsidy to greenhouse/ net house/ polyhouse/ glasshouse growers in this context, it would be worthwhile to undertake research study on various issues related to the productivity, profitability the farmers in PCT adoption. The important research issues that are to be addressed are as follows a) to study the pattern of investment in PCT. b) to assess the cost and returns in the production of major crops. c) to examine the financial feasibility in the PCT.

Materials and methods

Rose and Gerbera are being one of the major cut flower under protected cultivation technology and Capsicum was the another major crop grown under PCT; these crops were selected based on its market potential and the role they play in Floriculture in Karnataka state of India. Purposive random sampling technique was selected with in which, information regarding samples of PCT adopted farmers were collected from meeting each district horticulture offices and thirty sample farmers for each crop were selected from study area. The primary data required for the study was collected through personal interview method with the help of pre-tested and well structured schedules and data pertained to the 2013-14 crop year. In addition, samples with more deviation such as most sophisticated technologies like highly technology oriented, automated and soil-less cultivation were not included to make the unity sample size. Budgeting technique has been employed for analysis of the level of input utilisation, cost of cultivation per hectare and cost of production of PCT crops. The financial analysis carried out by following formulas

Net Present Value

The present value of an investment is the present value of projects net cash flows less its initial cash outflow. Net present value was estimated using the formula:

N

$$NPV = \sum_{t=0} B_t (1 + d)^{-t} - I$$

Where,

B_t = Incremental net cash flow of the project during the n^{th} year

N = Economic life of the project

d = Discount rate

I = Initial cost of the investment

T = Number of years

Benefit-Cost Ratio (BCR)

It is defined as the ratio of the present value of the projects' future net cash flows to the project's initial cash outlay. It is similar to the Net present value approach and it measures the present value of returns per rupee invested.

$$BCR = \frac{\sum_{t=0}^{N} B_t / (1 + d)^t}{\sum_{t=0}^{N} I}$$

Where

B_t = Incremental cash flow of the project during year t

I = Initial investment

t = Number of years

N = Economic life of the project

d = Discount rate

In the present study, the discount rate 'd' used for calculating Net Present Value and Benefit-Cost ratio were assumed as the opportunity cost of the capital invested in the PCT crop production.

Internal Rate of Return

It is defined as the discount rate that equates the present value of the future net cash flows from an investment project with the project's initial cash outlay. The internal rate of return is expressed mathematically as:

$$\sum_{t=1}^{N} B_t (1 + d)^{-t} - I = 0$$

Where

B_t, N, I, t and d as stated earlier

IRR was calculated using the below mentioned formula:

$$\text{IRR} = \left[\text{Lower discount rate}\right] + \left[\text{Difference between two discount rates}\right] \left[\frac{\text{Present worth at the lower discount rate}}{\text{Absolute difference between net worths of two discount rates}}\right]$$

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 discussion

The PCT usually require high investment In view of this, an attempt has been made to analyze in detail per hectare investment and cost of cultivation of Rose, Gerbera and Capsicum under PCT units. The investment pattern in establishment of PCT unit presented in table 1, revealed that, total establishment cost was high in case of Rose PCT units i.e. $ 175217 followed by Gerbera ($ 155211) and Capsicum ($ 123689). As PCT unit require high investment in that most important component of the establishment cost was buildings and PCT structures. Which was seen high in Rose farms ($ 121505) constituted about 69.34 per cent of the total establishment cost. Followed by Gerbera ($ 111093) and Capsicum ($ 110083) having a share of 71.58 and 89.00 per cent respectively. The structure frames are made of metal and the quality of structure frame material should be best enough to sustain the climatic variations and this Structure frame alone constituted nearly 77.78 per cent of

the total establishment cost in Capsicum PCT unit. The Rose farms invested more on structure frame work ($ 99691). Whereas, it was less in Gerbera farms ($ 96084), followed by Capsicum ($ 96200). Cultivation of crops under PCT requires fertigation units were most of the fertilizers used were water soluble and these fertilizer have to be supplied with irrigation, among the fertigation unit formed 1.49 per cent of the total establishment cost in Rose farms. It was 1.45 per cent and 1.27 per cent, for Capsicum and Gerbera PCT units respectively.

With respect to other costs incurred by PCT farms, there were a few costs which were incurred by these farms for their Commercial cultivation motive. The PCT units are most favorable to tear so it has protected from animals and high wind so the fencing is required. Among them Fencing formed major cost of $ 1977 in Rose farms, followed by Gerbera ($ 1342) and Capsicum ($ 791). During adverse climatic conditions there is need for misting to cool the PCT units and also for fertigation there is need for automatic electrical installation, it ranged from $ 1527 to $ 1134 across different PCT units in the study area.

For PCT unit establishment, the Rose PCT farms spent more on plant materials i.e. $ 39288, it was around 22.44 per cent of the total establishment cost followed by Gerbera ($ 33701) having share of 21.71 per cent to the total establishment cost. Investment on plant material was seen high because they had to import them by paying royalties from the exporting country which makes plant material costly. Plant material cost was seen low in Capsicum farms which is about $ 4145, because Capsicum plant material is available in local market at affordable prices compare to other crops.

The material cost during establishment period comprises Manure, Fertilizer and plant protection chemicals (PPC). The establishment period of PCT crops was found to be six months. The first harvest is started from the four to six month onwards, Where the material cost was seen high in Rose farms ($ 41160) having 23.49 percent share to the total establishment cost, followed by Gerbera ($ 35206) and Capsicum ($ 5563) having 22.68 and 4.50 per cent to the total establishment cost respectively. As PCT unit require high investment, Government has helped the farmers to adopt PCT by giving subsidy and share of subsidy amount to the total establishment cost was 28.92, 31.21 and 40.81, per cent for Rose, Gerbera and Capsicum respectively**.** The similar results were observed in studies carried out by Sudhagar (2013) reported that plant material cost was the major investment

cost component. Where, plant material share to the total establishment cost was 23.64 and 22.21 per cent for Gerbera and Rose. PCT structure cost to the total establishment cost was 49.49 and 40.92 for Gerbera and Rose.

Fertilizer application under PCT, the crops yield has been increased by giving more quantity of fertilizer compared to open cultivation. It was observed that relatively more quantity of potash was used in the PCT farm which is used to increase yield of crops. The frequent use of FYM will help to improve the soil health as PCT crops are more dependent on chemical water soluble fertilizers, where FYM used was more in case of Rose (23.12 tonnes/ha), Gerbera (18.56 tonnes/ha) compared to Capsicum (8.34 tonnes/ha). Inside PCT units, favourable conditions exist for the pest and diseases to grow faster compared to open environment. Whenever the pest and diseases were observed farmers could take up controlling measures and preventive measures. The crop protection chemicals use was highest in Rose farms about $ 675843, followed by Gerbera ($ 449907) and Capsicum ($ 152937).

The average apportioned establishment cost presented in table 2, for one hectare of PCT unit was found to be high in Gerbera of $ 23820 followed by Rose ($ 22750) and Capsicum ($ 16500). Since the life period of different investment components were used for calculation, the most important component of the apportioned establishment cost was buildings and PCT structures which was seen highest share in Rose i.e. 40.59 per cent to lowest share in Gerbera i.e. 34.80 per cent of the total establishment cost. Of these structure framework alone constituted nearly 29.15 per cent of the total establishment cost in Capsicum, followed by Rose (21.91 %) and Gerbera (20.17 %). With respect to other costs incurred by PCT farms, there were a few costs which were incurred, among them miscellaneous formed major cost to the tune of $ 2520 in Rose farms,

The items, which could not be apportioned for next years as they were utilized in that production year only, those items were included directly to the total apportioned establishment cost and their life period was assumed one. The similar results were observed in studies carried out by Jethendra (2007) reported that plant material share to the total apportioned cost was 17.24 per cent in hi-tech units of Rose.

The results presented in the table 3 revealed that, cultivation of crops under PCT requires more labour. The human labour used to the extent of 5081.98 days /ha in Rose

farms followed by Gerbera (3307.67 days/ha) and Capsicum (1166 days/ha). Because most of the operations such as harvesting/picking and pruning were human labour intensive. The use of machine labour in PCT farms was seen high, as bed preparation, PPC spray and weeding requires machine labour and it was used to the extent of 96.43 hours/ha in Rose followed by Gerbera (49.01 hours/ha) and Capsicum(8.63 hours/ ha).

The item wise per hectare cost of cultivation of PCT crops were worked out and presented in the table 4 revealed that, the cost of cultivation i.e. cost C of Rose worked out to $ 142144, followed by Gerbera ($ 92427) and Capsicum ($ 24765). This may be attributable to the fact that Gerbera and Rose farms having high plant material cost which has increased the apportioned cost than their counterparts. The share of apportioned cost in Gerbera and Rose PCT farms was 69.99 per cent and 67.61 per cent respectively.

As these PCT units being commercial cultivation of crop where intensive use of hired labour has been observed for timely operation of cultural practices and to carry out harvesting/picking operations. The hired human labour share to the total cost of cultivation was seen high in Capsicum PCT units i.e. 4.58 per cent of male and 5.69 per cent of female labour share to the total cost of cultivation followed by Gerbera (2.02 per cent of male and 5.18 per cent of female labour) and Rose (2.30 per cent male and 5.29 per cent female labour). In Rose PCT units the cost A was $ 118322, followed by Gerbera ($79714) and Capsicum ($ 21348). The cost B was $ 139427 in Rose farms, followed by Gerbera ($ 90306) and Capsicum ($ 24143).

These PCT crops' products has marketed by using good packing material to create its demand in the market because of this Rose farms realized more marketing cost than other PCT farms of $ 45716. Followed by Gerbera ($ 23691) and Capsicum ($ 473). The similar results were observed in studies carried out by Sreedhara (2013) reported that in PCT of Capsicum, labour cost was Rs. 10291/0.1 ha. The amortized establishment cost accounts Rs. 31389/ 0.1 ha with the 56.99 per cent share to the total cost of cultivation. Pattanashetti (2012) reported that in PCT Gerbera total cost of cultivation was Rs.112666/ 560 m^2 and non recurring cost was Rs. 36100/ 560 m^2.

It revealed from the table 5 that per hectare total yield obtained from PCT crops 88.97 and 47.99 numbers in Rose and Gerbera respectively. Whereas 82655 kgs of Capsicum fruit yield has obtained. Since, PCT farms use the advanced technology which

favored the crops and employed more resources, they realized more yield. As this increased yield per hectare gave them more returns. Which was seen high in Rose cultivation i.e. $ 475582 /ha, followed by Gerbera ($ 210048) and Capsicum ($ 46269).

The returns are dependent on season wise market demand, according to that there was price fluctuation for produce. Among the different PCT farms the output-input ratio which gave profitability of investment at cost D was highest in Rose (2.53) followed by Capsicum (1.83) and Gerbera (1.81). As stated earlier, marketing cost formed important cost because of that the cost of production would give better picture with more than a unity of output-input ratio, showing the PCT cultivation was profitable venture. The output-input ratio with subsidy was seen high in Rose (2.79), followed by Capsicum (2.12) and Gerbera (1.98). The output-input ratio was greater than unity indicating thereby the cultivation of crops under PCT was profitable when both direct and imputed costs are taken into account. Per flower cost of production was the lowest in Rose (1.33), followed by, Gerbera (1.52) and Capsicum (19.24). Government subsidy has helped the PCT adopted farmers to reduce the cost of production which in turn helped to get good returns. The similar results were observed in studies carried out by Satish (2013) reported that gross returns from Rose cultivation under PCT was Rs. 169.9 lakhs/ ha. Sreedhara (2012) reported that, a gross return from PCT Capsicum was Rs. 154734/ 0.1 ha and a net return realized was Rs. 115279/ 0.1 ha.

All PCT crops were seen financially feasible at 10, 12 and 15 per cent of discount rate (table 6). In all the PCT farms the B:C ratio was more than unity which shows that cultivation of crops under PCT was profitable venture. The PCT unit establishment had high establishment cost, even with huge amount of investment in this business the payback period analysis revealed that in case of Capsicum it is 6.19, followed by Gerbera (5.25) and Rose (3.20). Payback period including subsidy in case of Capsicum it is 3.66, followed by Gerbera (3.61) and Rose (2.27). The internal rate of returns of investment made in PCT crops cultivation ranged from 16 to 45 per cent. So the results of internal rate of returns also revealed that it is profitable to invest in the PCT crop cultivation. The similar results were observed in studies carried out by Satish (2012) reported that rose cultivation under PCT showed the 1.39 benefit –cost ratio and internal rate of return was 63 per cent. Where, net present value was Rs. 160.91 lakhs/ha.

The study revealed that the investment in PCT is a profitable business from the farmer's point of view and essential for strengthening the PCT crop production in domestic market. Since technology is capital intensive, requires financial help in terms of subsidy. PCT farms have advantage of surplus subsidy amount to utilize which will further enhance their income.

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Table 1. Investment pattern in PCT crop cultivation **($ / ha)**

Sl. No.	Particulars	Rose (n=30)	Gerbera (n=30)	Capsicum (n=30)
1	Structure frame	99691 (56.90)	96084 (61.91)	96200 (77.78)
2	Polysheet	12486 (7.13)	11662 (7.51)	11321 (9.15)
3	Shade net	2351 (1.34)	1718 (1.11)	1621 (1.31)
4	Packaging structure	3849 (2.20)	1163 (0.75)	672 (0.54)
5	Office buildings	3127 (1.78)	465 (0.30)	269 (0.22)
A	Buildings and PCT structure	121505 (69.34)	111093 (71.58)	110083 (89.00)
6	Sprayers	358 (0.20)	285 (0.18)	298 (0.24)
7	Fertigation unit	2612 (1.49)	1979 (1.27)	1989 (1.45)
8	Bore wells	3118 (1.78)	1888 (1.22)	1744 (1.41)
9	Trolleys	88 (0.05)	57 (0.04)	75 (0.06)
B	Fertigation system and equipments	6176 (3.52)	4209 (2.71)	3906 (3.16)
10	Generators	353 (0.20)	233 (0.15)	200 (0.16)
11	Fence	1977 (1.13)	1342 (0.86)	791 (0.64)
12	Electrical installation	1527 (0.87)	1248 (0.80)	1134 (0.92)
13	Miscellaneous	2520 (1.44)	1880 (1.21)	2012 (1.63)
C	Other cost	6377 (3.64)	4703 (3.03)	4137 (3.34)
14	Labour	531 (0.30)	474 (0.31)	420 (0.34)
15	Plant material	39288 (22.44)	33701 (21.71)	4145 (3.35)
16	Manure	394 (0.22)	295 (0.19)	245 (0.20)
17	Fertilizer	605 (0.35)	442 (0.28)	474 (0.38)
18	Plant protection chemical	342 (0.20)	294 (0.19)	279 (0.23)
D	Material cost	41160 (23.49)	35206 (22.68)	5563 (4.50)
	Total establishment cost	175217 (100.00)	155211 (100.00)	123689 (100.00)
	Subsidy	50679 (28.92)	48438 (31.21)	50478 (40.81)
	Establishment cost with subsidy	124538	106773	73211

Note: Figures in the parentheses indicate percentage to total

Table 2. Apportioned cost of establishment of PCT Unit **($ / ha)**

Sl. no	Particulars	Life (year)	Rose (n=30)	Gerbera (n=30)	Capsicum (n=30)
1	Structure frame	20	4985 (21.91)	4804 (20.17)	4810 (29.15)
2	Polysheet	4	3122 (13.72)	2916 (12.24)	2830 (17.15)
3	Shade net	4	588 (2.58)	430 (1.80)	405 (2.46)
4	Packaging structure	10	385 (1.69)	116 (0.49)	67 (0.41)
5	Office buildings	20	156 (0.69)	23 (0.10)	13 (0.08)
A	Buildings and PCT structure		9235 (40.59)	8289 (34.80)	8126 (49.25)
6	Sprayers	5	72 (0.31)	57 (0.24)	60 (0.36)
7	Fertigation unit	8	327 (1.43)	247 (1.04)	224 (1.36)
8	Bore wells	10	312 (1.37)	189 (0.79)	174 (1.06)
9	Trolleys	5	17 (0.08)	11 (0.05)	15 (0.09)
B	Fertigation & equipments		727 (3.20)	504 (2.12)	473 (2.86)
10	Generators	10	35 (0.16)	23 (0.10)	20 (0.12)
11	Fence	10	198 (0.87)	134 (0.56)	79 (0.48)
12	Electrical installation	5	305 (1.34)	250 (1.05)	227 (1.37)
13	Miscellaneous	1	2520 (11.08)	1880 (7.89)	2012 (12.19)
C	Other cost		3058 (13.44)	2287 (9.60)	2337 (14.17)
14	Labour	1	531 (2.33)	474 (1.99)	420 (2.55)
15	Plant material	*	7858 (34.54)	11234 (47.16)	4145 (25.12)
16	Manure	1	394 (1.73)	295 (1.24)	245 (1.48)
17	Fertilizer	1	605 (2.66)	442 (1.86)	474 (2.87)
18	Plant protection chemical	1	342 (1.50)	294 (1.24)	279 (1.69)
D	Material cost		9729 (42.77)	12739 (53.48)	5563 (33.72)
	Total apportioned cost		22750 (100.00)	23820 (100.00)	16500 (100.00)
	Subsidy		3519 (15.47)	3310 (13.50)	3422 (20.74)
	Total with subsidy		18359	20434	13070

Note: Figures in the parentheses indicate percentage to total

- Five years for Rose,. 3 years gerbera, one year Capsicum

Table 3. Resource utilization in PCT crop cultivation **(Per ha)**

Sl. No.	Resources	Unit	Rose (n=30)	Gerbera (n=30)	Capsicum (n=30)
1	Family human labour				
	a. Male	days	744.77 (41.97)	544.61 (48.09)	134.17 (27.29)
	b. Female	days	148.12 (4.48)	164.77 (7.58)	82.44 (12.22)
	Total family labour		892.89 (17.57)	709.38 (21.45)	216.61 (18.58)
2	Hired human labour				
	a. Male		1029.83 (58.03)	587.96 (51.91)	357.39 (72.71)
	b. Female	days	3159.26 (95.52)	2010.33 (92.42)	592.00 (87.78)
	Total hired labour		4189.09 (82.43)	2598.29 (78.55)	949.39 (81.42)
3	Total human labour				
	a. Male	days	1774.60 (100.00)	1132.57 (100.00)	491.56 (100.00)
	b. Female	days	3307.38 (100.00)	2175.10 (100.00)	674.44 (100.00)
	Total human labour		5081.98 (100)	3307.67 (100)	1166.00 (100.00)
4	Machine labour	hours	96.43	49.01	8.63
5	F.Y.M	tonnes	23.12	18.56	8.34
6	Fertilizers				
	i. N	Kg	1472.96	979.94	210.45
	ii. P	Kg	1347.52	628.90	213.17
	iii. K	Kg	1689.44	1191.69	253.06
	Micro nutrients	Kg	1015.70	402.39	87.96
7	Crop protection chemicals	$	675843	449907	152937

Note: Figures in the parentheses indicate percentage to total

Table 4. Cost of cultivation of PCT crops **($ /ha)**

Sl. no.	Item of cost	Rose (n=30)	Gerbera (n=30)	Capsicum (n=30)
1	Hired human labour			
	a. male	3270 (2.30)	1867 (2.02)	1135 (4.58)
	b. female	7522 (5.29)	4787 (5.18)	1410 (5.69)
2	Machine labour	689 (0.48)	350 (0.38)	168 (0.68)
3	Manures	140 (0.10)	112 (0.12)	50 (0.20)
4	Fertilizers	3723 (2.62)	3337 (3.61)	795 (3.21)
5	Insecticides and pesticides	676 (0.48)	450 (0.49)	153 (0.62)
6	Fertigation	188 (0.13)	125 (0.14)	53 (0.22)
7	Land revenue	1 (0.00)	0 (0.00)	0 (0.00)
8	Depreciation implements	4844 (3.41)	3252 (3.52)	833 (3.37)
9	Apportioned establishment cost	96184 (67.61)	64688 (69.99)	16500 (66.62)
10	Interest on working capital @7%	1086 (0.76)	747 (0.81)	252 (1.02)
	Cost A	118322 (83.24)	79714 (86.25)	21348 (86.21)
11	Rental value of land	7639 (5.37)	1536 (1.66)	484 (1.95)
12	Interest on fixed capital @14%	13466 (9.47)	9056 (9.80)	2310 (9.33)
	Cost B	139427 (89.09)	90306 (97.70)	24143 (97.49)
13	Family labour			
	a. male (casual)	2364 (1.66)	1729 (1.87)	426 (1.72)
	b. female(casual)	353 (0.25)	392 (0.42)	196 (0.79)
	Cost C	142144 (100.00)	92427 (100.00)	24765 (100.00)
14	Marketing cost	45716	23691	473
	Cost D	187860	116119	25237

Note: Figures in the parentheses indicate percentage to Cost C

Table 5. Average per hectare cost, returns and net profit in PCT crop production.

($ /ha)

Sl. No	Particular	PCT crops		
		Rose (n=30)	**Gerbera (n=30)**	**Capsicum (n=30)**
1	Production (No)	8897680	4799295	82655
2	Total cost			
	Cost A	118322	79714	21348
	Cost B	139427	90306	24143
	Cost C	142144	92427	24765
	Cost D	187860	116119	25237
3	With subsidy	170266	106189	21816
4	Total return	475582	210048	46269
5	Net income at	0	0	0
	Cost A	357260	130333	24920
	Cost B	336155	119741	22126
	Cost C	333438	117620	21504
	Cost D	287722	93929	21031
	With subsidy	305316	103859	24453
6	Income –input ratio			
	Cost A	4.02	2.64	2.17
	Cost B	3.41	2.33	1.92
	Cost C	3.35	2.27	1.87
	Cost D	2.53	1.81	1.83
	With subsidy	2.79	1.98	2.12

Table 6. Financial feasibility in PCT crop cultivation ($)

Measure of investment	**Rose**		**Gerbera**		**Capsicum**	
A.Net present worth						
Discount rate						
10 percent	283476	329540	94889	138921	47476	93365
12 percent	224635	269889	65349	108603	27873	72937
15 percent	158111	202175	31937	74079	5794	49683
B. Benefit ratio						
Discount rate						
10 percent	1.63	1.81	1.22	1.35	1.16	1.36
12 percent	1.55	1.74	1.17	1.31	1.10	1.32
15 percent	1.44	1.64	1.09	1.24	1.02	1.25
C. Payback period (years)	3.20	2.27	5.25	3.61	6.19	3.66
D. Internal rate of returns	32	45	19	29	16	28