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Enhancing Farmers Income through Protected Cultivation – Comparative Economics of PCT and Open Field Cucumber in Tamil Nadu

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A B S T R A C T

21st century increasing the level of the population essentially needed for a huge amount of foods so countries are pushed into mass production for foods in a direct and indirect way. Technologies are rapid changes in-country domestic level to compete with other countries. In agriculture, technologies are changing different ways to increasing income and avoid losses for farmers. In this study comparative analysis of PCT and open field condition in Tamil Nadu cultivation of cucumber crop. Both primary data and secondary data were collected both 60 samples size for two different methods. Cost of cultivation high in PCT because initial establishment charges high in under PCT method value for 1000 m^2 for cucumber Rs. 207478.26 and open field Rs. 10541.92. Compare to the two methods net returns are high in PCT Rs. 127902.60 and 5958.08 in open field.

Key words: Protected cultivation, Cucumber, Cost of cultivation

All the nations facing problems of poverty, hunger and malnutrition will need to accelerate their agricultural growth for achieving SDGs, especially while aiming at no poverty, zero hunger and a safe environment for all [1]. Furthermore, India is facing second-generation issues such as declining productivity growth, poor soil health, increased pest and disease incidence, rising input costs, drop in farm profits, and the negative effects of climate change after 50 years of the green revolution. Horticulture provides a wider choice for farmers and also complements the food sector, i.e., with potato, tuber crops, banana and vegetables. A new paradigm shift in farming in the recent past has been towards horticulture-based farming systems to ensure greening, environmental services and to provide nutritious food while enhancing farm profitability [2]. The SDG's main aim is to enhance the farmers income and empower the marginal and small farmers, who comprises 70 per cent of the total farmers and have an annual per capita income of less than Rs. 15000 [3].

In India, National Horticultural Mission is a flagship scheme and it covers all sections of horticulture development from nursery to marketing level, various schemes including protected cultivation. High value and exotic vegetables production under protected cultivation technology results in effective use of the resources like, land, water, soil., besides being able to increase the production of quality vegetables. Cucumber is one of the most demanded commodities in domestic and international market and it is widely cultivated through open field condition and PCT methods in the major vegetables growing states like Karnataka, Madhya Pradesh, Andhra Pradesh, Maharashtra, Tamil Nadu, Himachal Pradesh and hilly areas of Uttar Pradesh. India produced 1,246 million tonnes of cucumber in the year of 2017-2018 [4] and in Tamil Nadu, cucumber is grown in Krishnagiri. The Nilgiris, Dharmapuri, Dindigul and Theni districts. The protected cultivation technology enhances the productivity and profitability of crops under the controlled condition [5]. Therefore, the study was carried out with the objective to compare the cost and returns of protected cultivation of cucumber under PCT and open field condition in the selected district of Tamil Nadu.

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MATERIALS AND METHODS

The study was based on primary information collected by the personal interview method using a pre – structured interview schedule from the farmers and secondary data on area under protected cultivation and prices were collected from different sources. Krishnagiri, Nilgiris, Dharmapuri, Dindigul and Theni districts the data were collected from 60 sample respondents who cultivates cucumber under PCT and open field condition. The information related to objective of the study was collected and analyzed using the following tools of analysis.

Cost analysis

Depreciation and interest on fixed capital in respect of assets like building etc., allocated in proportion of area under cucumber in protected cultivation to total cropped area of the farm.

$$\text{Cost of production / quintal} = \frac{\text{Total Cost (}Cost\ C3\text{)}}{\text{Cucumber yield}}$$

$$\text{Returns per rupee of expenditure} = \frac{\text{Net income / unit}}{\text{Cost C3 / unit}}$$

Return

Gross return was calculated by multiplying the total quantity of cucumber sold with the by per quintal. Net income was derived by subtracting the total cost incurred in production from the gross income.

Seasonal price index

The seasonal components are arranged month-wise for each year. The seasonal index for the 12 months is adjusted for their total to 1200 or averaged to 100. Seasonal index is calculated by using the formula:

$$\text{Seasonal index} = \frac{\text{Actual price}}{\text{Seasonal average}} \times 100$$

RESULTS AND DISCUSSION

The results on the study were presented and discussed in two sections i.e., Cost of cultivation and seasonal price index

a) Cost and returns of cucumber
b) To analysis the seasonal price index of the protected cultivation of cucumber

The cost of cultivation of Cucumber was analyzed under the protected cultivation and fully eco-friendly method and the results are presented in this (Table 1-3).

Table 1 Establishment cost of greenhouse per unit (1000 m^2)

Particulars	Amount (₹)	Per cent
Cost of greenhouse		
1. GI Pipes (4 tons)	659567.60	52.58317
2. Gutter sheet/100 kg	9340.60	0.744667
3. Foundation pipe	245678.40	19.58639
4. Clothing material	100990.20	8.051313
Drip irrigation installation cost		
1. Drip in line	121474.00	9.684357
2. Misting	103675.10	8.265363
3. Service line	5638.50	0.449522
4. Misting 1	7967.70	0.635215
Grand total (A + B)	1254332.1	100.00

Table 2 Cost of cultivation of cucumber under PCT and open field condition (1000 m^2)

Category	PCT		Non-PCT	
	Amount (₹)	Percentage	Amount (₹)	Percentage
Human labour wages	35086.75	18.97	1181.37	12.18
Hiring charges for machine labour	1725.75	0.93	313.68	3.23
Cost of seed material	16177.65	8.76	709.63	7.31
Cost of farmyard manures	2760.26	1.49	1143.80	11.79
Cost of fertilizer	18472.23	10		
Incidental and repairs expenditure	0.0	0.00	31.25	0.32
Expenditure of plant protection chemicals	11637.8	6.3	455.5	4.69
Staking and packing materials cost	3421.05	0.59	0.0	0.00
Interest on working capital @ 7%	1562.42	0.85	153.41	1.58
Depreciation on fixed capital	36998.73	20.03	240.75	2.48
Cost A_1	1,27,842.65	69.19	4229.40	43.61
Interest on owned fixed capital @ 12%	30360.35	16.43	1718.60	17.72
Cost B_1	1,58,203.00	85.63	5948.01	61.34
Rental value of unit (1000 m^2)	0.0	0.00	1649.29	17.00
Cost B_2	1,58,203.00	85.63	7597.31	78.35
Imputed value of family labour	9760.5	5.28	1217.5	12.55
Cost C_1	1,67,963.50	90.91	7165.51	73.89
Cost C_2	1,67,963.50	90.91	8814.81	90.91
Managerial cost 10% of C_2	16,796.35	9.09	881.48	9.09
Cost C_3	1,84,759.85	100	9696.29	100.00
Yield in Kgs	14520		1370.75	
Cost of production (per kg)	12.72		7.07	

Cost of cultivation of agricultural and horticultural crops are estimated by using the methods recommended by the directorate of economics and statistics. Cost of cultivation for annual crops is worked out by using the concepts Cost A_1, A_2, B_1, B_2, C_1, C_2 and C_3. But in the case of perennial crops the costs were estimated in establishment cost and operational cost incurred for the gestation period and then cost of cultivation is worked out. In protected

cultivation methods annual crops are cultivated, but it is required huge investment on the greenhouse structure [6]. Hence this study utilized the cost C_3 concepts and introduce the annual establishment cost from the cost involved in establish the structure for its average life period of seven years and for open field condition normal Cost C_3 is used. The greenhouse establishment cost includes two crops compound

a) Establishing cost of greenhouse structure on includes field preparation, cost of GI pipe polythene cost and labour cost to establish the structure.
b) The drip and irrigation system cost involves, drip unit establishment, sprinkler, mist chamber, sprayer and other equipment. The total establishment cost consists of part A and part B. The total establishment cost of the units (1000 m^2) is Rs. 1254332 this part A Constituted 80.96 per cent and irrigation cost accounted 19.03 per cent.

The comparative economics of PCT and open field cucumber cultivation is presented in the above (Table 2). It revealed that the cost C3 for PCT and open field is ₹184759.85 and ₹9696.29 respectively for the area of 1000 m^2 (25 cents). Of this A1 accounted ₹127842.65 (69.19 per cent) for PCT and ₹4229.40 (43.61 per cent) for open field cucumber. It also inferred that in absolute value expenditure on PCT crop was many folds more than that of open field. It indicated that PCT method is high investment intensive [7].

Table 3 Average yield and income of cucumber

Yield and income	PCT	Non-PCT
Average yield (kg/1000 m^2)	14520	1370.75
Average output price (₹/kg)	24	20.00
Gross return (in ₹)	348480	27415
Net Return (in ₹)	163720.2	17718.71
Return on investment	1.8	2.83

Table 4 Seasonal price index

Month	Seasonal price index
January	102.98
February	97.02
March	101.34
April	118.54
May	94.83
June	91.91
July	99.07
August	94.30
September	NA
October	NA
November	NA
December	NA

The average yield of cucumber was 14520 kg and 1375.75 kg respectively for PCT and open field condition. It witnessed that PCT method increased the yield many folds than the open field cultivation. The cost of production per kg was estimated at ₹14.29 and ₹7.67 [8-9]. The gross return earned through PCT method was ₹3,48,480, it was more than 20 times of open field method. The BCR of PCT was 1.8 and 2.83 respectively for PCT and open field cucumber cultivation [10-11].

Returns

The average yield of cucumber was 14520 kg and 1375.75 kg respectively for PCT and open field condition. It witnessed that PCT method increased the yield many folds than the open field cultivation. The cost of production per kg was estimated at ₹14.29 and ₹7.67 [12]. The gross return earned through PCT method was ₹3,48,480, it was more than 20 times of open field method. The BCR of PCT was 1.8 and 2.83 respectively for PCT and open field cucumber cultivation [13].

Seasonal price index

There is a wider fluctuation in the prices of cucumber. Hence, seasonal price index was estimated and presented in (Table 4). The seasonal price index was peak in the month of July and lowest in the month of April. It was also inferred that the seasonal price index was at decreasing trend from January to April and it tend to increase from April to July [14-15].

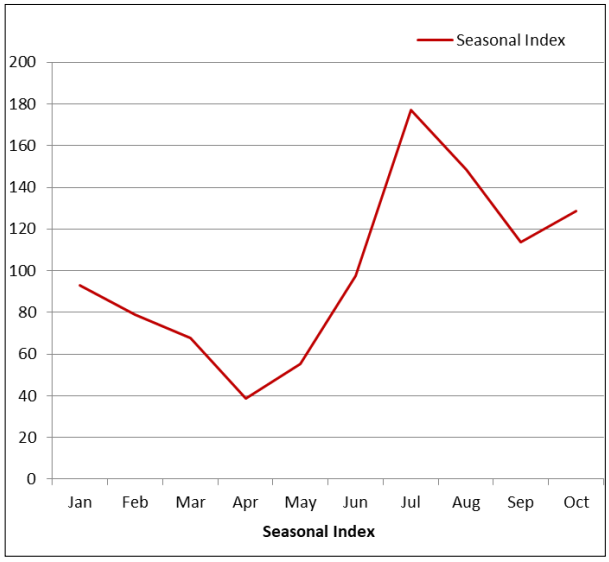

Fig 1 Seasonal price index for cucumber

CONCLUSION

An economic view of protected cultivation of and open field cultivation of cucumber were analyzed and results are concluded that the cost and returns of Cucumber is highly well organized and efficient to make a double the Farmers income in protected cultivation technology. The seasonal price index was at decreasing trend from January to April and it tends to increase from April to July.

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