Original Research Article

An analysis of production, economic and social Performance of capsicum growers under protected cultivation

Abstract

The study was conducted in Karnataka regarding constraints and suggestions of protected cultivation among horticulture crop growers in the agricultural year 2019-20. With respect to practice wise production performance, cent per cent of the capsicum growers have fully adopted soil testing practice, irrigation, drainage and supporting system. More than three-fourth of the growers and more than half of the capsicum growers fully adopted pinching and recommended spacing /specification of bed respectively.About economic performance of capsicum growers the average operating cost of cultivation was Rs. 3, 85, 000, gross returns were Rs. 10, 80, 000, net returns were Rs. 6, 95, 000 and B:C ratio was 2.80 were found. The realized crop yield of capsicum under protected cultivation was 36000 kg/ac, which is 47.22 per cent higher than the open field yield (19500 kg/ac).With respect to social performance of the capsicum growers, more than four-fifth of the growers were consulted by the others for information and guidance for cultivation of crops under protected cultivation, eighty per cent of the growers purchasing capacity was increased, two-third of them were recognized by villagers/neighbours because of performance in farming.

Keywords : capsicum, protected cultivation, performance, production, economic, social

INTRODUCTION

India is a predominantly agricultural country. More than two-thirds of India's population is dependent on agriculture for their livelihood. It has become a major source of income. In rural India, it is the biggest source of livelihood for people. Agriculture employs half of the country's labor force and is considered the largest occupation in the private sector.On the one hand, increased urbanization is reducing the availability of agricultural land. On the other hand, the demand for high productivity and returns from arable land is growing rapidly. All of these factors have paved the way for major diversification trends, especially in favor of horticultural crops such as flowers, fruits, vegetables, plantations, spices and ornamental crops.

The cultivation of horticultural crops has improved the economic situation of farmers due to higher returns due to many perennial flower crops, afforestation crops, and seasonal

availability of fruits and vegetables throughout the year. Growing horticultural crops has been identified as an ideal option for improving livelihood security, income, and food security, creating employment and increasing income through added value. In addition, it has played a pivotal role in empowering women by providing employment opportunities in horticulture, floriculture, and mushroom cultivation.

The present agricultural scenario in our country is a mixture of outstanding achievements and missed opportunities. If India has to emerge as the world's economic power, our agricultural productivity should be a benchmark with those of other countries that are currently classed as the world's economic powers. India needs new and effective technologies that can continuously improve the productivity, profitability and sustainability of our farming systems. Lately, there has been a noticeable change in cropping pattern towards high-value horticulture and commercial crops. In order to make horticulture viable and competitive, the emphasis should be on improving the efficiency of resource use in order to improve relative profitability.

Success in horticulture is more technology driven compared to other crops. India is blessed with diverse agro-climatic conditions that helps to grow all kinds of horticultural crops, almost across the year, in one region of the country or the other. However, but the product quality under open-field conditions, especially in the case of high-value flowers and vegetables, is generally below than the domestic and international market standards. Further, sometimes no guarantee of consistent production from opened cultivation, because the crop is exposed to a variety of frequently changing environmental factors. Therefore, to meet the demand of quality-conscious consumers, it is vital to increase the productivity and quality of the produce.What is needed is a revolution in production technology that integrates market quality parameters with production systems, in addition to providing vertical growth in productivity.

The most important technology in this context is Controlled Environment Agriculture (CEA), i.e. protected cultivation techniques (PCT) such as greenhouses, mesh houses, multi-family dwellings and greenhouses. Since time immemorial, humans have been studying ways to grow plants in their natural environment, and mankind has known that crop yields can be increased by wisely changing the environment.

Principle of crop production within protected cultivation.

A crop's yield is determined not only by its genetic makeup, but also by its surrounding microclimate. The microclimate components of crops are sun, temperature, air composition and

the composition of the root and soil environment, tillage, irrigation and fertilization. The structure of the root environment also changes according to the requirements. Despite the closed boundaries, greenhouses allow you to regulate some or several components of the microclimate. The greenhouse lid lets in a small portion of sunlight depending on its transparency.Sunlight falling into the greenhouse is absorbed by greenhouse crops, floors and other objects. These objects in greenhouses emit long-wavelength thermal radiation, which reduces the transparency of coating materials. This phenomenon is commonly known as the greenhouse effect. It is the natural increase in greenhouse temperatures in cold climates that is used to grow seedlings and grow successful crops. The same natural phenomenon in summer requires cooling the greenhouse to maintain favorable temperatures

. There are basically two approaches to increasing productivity. That is, to improve the genetic base and maintain a favorable environment.Harvesting potential is only fully exploited if there are favorable growth conditions in this genetic material. Environment refers to the light, temperature, air composition, and characteristics of the root environment. Traditionally, only the characteristics of the root environment can be controlled by tillage, nutrition, and irrigation. Shelter cultivation is cultivation in which growing conditions are controlled. Greenhouse conditions maintain near-optimal conditions for crop needs, increasing productivity and product quality.To promote PCT on a large scale in the country, central and state governments have developed various programs and strategies, including subsidies. The National Horticultural Mission is focused on promoting the PCT by offering greenhouses, nets, apartment buildings and 50% grants to farmers practicing greenhouses. In this context, research on various aspects related to the growth and development of PCT in India is urgently needed. PCT offers many advantages over field cultivation. This technology is highly productive, can be automated, and promotes efficient use of resources.It is also environmentally friendly and requires no special frills. In this century, sheltered cultivation is likely to become a common commercial practice, not because of its potential, but because of its dire need. This provides an opportunity to directly increase the income of farmers who own very little land. Taking all of this into account, the study was conducted with the following specific objective:Production, Economic and Social Performance of capsicum growers under protected cultivation

Material and Methods

Research design: In the present investigation, ex-post facto research design was used. This design was considered appropriate, as it is a systematic empirical enquiry for measuring the phenomenon, which has already occurred and is continuing. The researcher has no control on independent variables as their manifestation has already occurred or they are inherent and non-manipulative.

Selection of respondents

This study was conducted in 2020-2021 in Chikkaballapur District, part of the Eastern Dry Zone (Zone-V) of the state of Karnataka. The district of Chikkaballapur is made up of five taluks, and Sidlahatta and Chikkaballapur were specially chosen for study because they have larger protected areas compared to the other taluks. The total sample size was 50 people, of which 25 capsicum growers were randomly selected from Chikkaballapura taluk. Similarly, 25 capsicum growers were randomly selected from Sidlagatta taluk.

Quantifying the performance of horticulture crop growers under protected cultivation.

Production performance: An item pool of production performance was prepared by reviewing literatures like package of practices, journals and other publications. After identifying the items that comprises production performance, responses were collected from the farmers selected for the study on three-point continuum namely full adoption, partial adoption and no adoption. Scoring of these respondents was in the order of 2 for full adoption, 1 for partial adoption and 0 for no adoption. The production performance items included in the study are given in appendices. Thus, after computing the production score, the respondents were grouped into low, medium and high categories by taking mean and standard deviation as a measure of check.

Economic performance: Items of activities on economic performance which includes gross income, net income, B:C ratio etc. were prepared by reviewing related literatures. After identifying the items that comprises economic performance, responses were collected from the farmers selected for the study. Gross, net income and B:C ratio was worked out for the data. Following scoring pattern was followed to workout B:C ratio.

Social performance: An item pool of social performance was prepared by reviewing literatures like package of practices, journals and other publications. After identifying the items that comprises social performance, responses were collected from the farmers selected for the study on two-point continuum namely ‘Yes’ and ’No’. Scoring of the respondents in the order of 1 for

'Yes' and 0 for 'No'. The items on social performance included in the study are given in appendices. The aggregate score of each respondent was obtained by adding the respective score for each item. Thus, after computing the social performance score, the respondents were grouped into low, medium and high categories by taking mean and standard deviation as a measure of check.

Overall performance of farmers:Overall performance was calculated by adding observed scores of production, economic status and social status performance of farmers. Thus, after computing the overall performance level score, the respondents were grouped into low, medium and high categories by taking mean and standard deviation as a measure of check.

Statistical analysis

Appropriate statistical tools were used for analyzing the data of investigation. The data collected from the respondents were scored, tabulated and analyzed.

Results and Discussion

Table 1: Practice wise production performance of capsicum growers under protected cultivation. (n=50)

Sl.no	Practices	Full adoption		Partial adoption		No adoption	
		f	%	f	%	f	%
1	Soil testing	50	100.00	0	0.00	0	0.00
2	Recommended Variety	24	48.00	26	52.00	0	0.00
3	Using recommended growing media	22	44.00	28	56.00	0	0.00
4	Recommended spacing and specification of bed	28	56.00	22	44.00	0	0.00
5	Adoption of recommended quantity of nutrients	24	48.00	26	52.00	0	0.00
6	Irrigation and drainage	50	100.00	00	00.00	0	0.00
7	Supporting system	50	100.00	00	00.00	0	0.00
8	Pinching	38	76.00	12	24.00	0	0.00
9	Plant protection measures	23	46.00	27	54.00	0	0.00
10	Harvesting method	21	42.00	29	58.00	0	0.00
11	Grading	19	38.00	31	62.00	0	0.00

A glance at Table 1 shows that cent per cent of the capsicum growers have fully adopted soil testing practices, irrigation and drainage, supporting system followed by more than three-fourth of growers (76.00 %) fully adopted pinching technique. More than half of the (56.00 %) growers fully adopted recommended spacing and specification of bed. Three-fifth of the growers (62.00 %) partially adopted grading in marketing of capsicum. Other practices partially adopted by more than fifty per cent of growers are harvesting method (58.00 %), using recommended growing media (56.00 %), plant protection measures (54.00 %), using recommended variety and application of recommended quantity of nutrients (52.00 %). The probable reason may be soil testing is mandatory for getting subsidy from the department; as a result, all the farmers tested their soil. Irrigation, drainage supporting system, pinching, using recommended varieties, spacing, and nutrients are the most important and crucial operations in protected cultivation. Hence, growers have adopted these technologies for higher yield. Water scarcity is a major problem in the study area hence growers adopted the drip irrigation method of which was recommended for protected cultivation to save the water for year-round cultivation. The probable reason for adoption of these technologies may be that pinching, drainage and supporting system are more crucial operations for enhancing the yield. Hence, they adopt these technologies.

Wankhade (2018) noticed that, education, annual income, source of information and farming experience were found to have positive and significant association with adoption of protected cultivation technology by capsicum growers at 5 per cent level of significance. Whereas, age, land holding is not significant.

Table 2: Economic performance of capsicum under protected cultivation(n=50)

Crop	**Operating cost of cultivation (Rs)**	**Gross returns (Rs)**	**Net returns (Rs)**	**B:C ratio**
Capsicum	3,85,000	1080000 (9000 plants per 4000m2, average yield per plant is 4.0 kg, average price of capsicum per kg is 30)	6,95,000	**2.80**

Table 2 provides the information on economic performance of the capsicum growers under protected cultivation. The data revealed that B:C ratio of capsicum is 2.80 under protected cultivation per 4000 m2. Capsicum has demand round the year and can be transported easily to distant places and can be kept for 10 to 15 days.Sanjeev Kumar *et al.* (2019) observed the establishment cost of polyhouse and cost of cultivation of capsicum in polyhouse for the area of 1000 m^2 was less with 65 per cent and 75per cent subsidy. Net return obtained without subsidy of capsicum cultivation in polyhouse was less as compared to net return obtained with 65 per cent and 75 per cent subsidy.

Table 3: Comparative analysis of capsicum crop yield obtained under open field andprotected cultivation.(n=50)

Average yield obtained (kg/ac)				
Crop	**Protected cultivation (kg/ac)**	**Open field cultivation (kg/ac)**	**Difference**	
			Kg/ac	**Per cent**
Capsicum	36,000	19,500	17,000	47.22

Table 3 reveled the information on comparative yield analysis of capsicum under open field and protected cultivation. The data revealed that the average yield of capsicum per acre under protected cultivation was 36,000 kg/acre, whereas, in open field cultivation it was 19,500 kg/acre. This may be due to micro climate surrounding the plant body is controlled fully or partially as per the requirement of the plants in protected cultivation, as a result, quantity and quality of the produce much better than open field condition. Incidence of pest and diseases and manifold increase in the resource use efficiency in crop production is possible in protected cultivation compared to open field condition. It is extremely difficult to grow capsicum in open field conditions because vegetables are very sensitive to varied climatic conditions. However, under protected cultivation favourable environmental conditions can be created to give protection from adverse conditions. These findings are in line with studies conducted by Singh et al. (2011) and Rao et al. (2013).

Table 4: Yield gap analysis among growers under protected cultivation(n=50)

Crop	Recommended yield (Kg/ac))	Actual yield obtained Kg/ac	Difference	
			Kg/ac	Per cent
Capsicum (n_1=50)	42,000	36,500	5,500	13.10

The data in table 4 revealed that there is 13.10 per cent yield gap was observed in case of capsicum. The yield difference in case of capsicum was 5500 kg/acre compared to recommended yield. This existing yield gap is mainly attributed to the partial adoption of technologies like using recommended variety, using recommended growing media, imbalance applications of nutrients, poor plant protection measures and delayed harvesting. The other reason might be non-transferable component of the technology which is developed in research station could not be fully implemented in farmers filed due to socio-economic and resource constraints. Some of the management practices also might have contributed to the existence of yield gap. Parveen Kumar (2018) found that in protected structures, production of vegetables and flowers are higher than open field conditions and productivity is also higher. Gross and net return were higher in these structures as compared to open conditions.The farmer's inability to take up the recommended management practices due to production, labour, technical, economical constraints within a stipulated time could cause a noticeable decline in output.

Table 5 : Social performance of capsicum growers under protected cultivation(n=50)

Sl.no	Statements	Capsicum growers			
		Yes		No	
		f	%	F	%
1	Serving as resource person in agriculture/horticulture crop production for line departments	37	74.00	13	26.00
2	Others consult for information and guidance	41	82.00	09	18.00
3	Serving as member in Village Panchayath/Taluk Panchayth /Zilla Panchayath	06	12.00	44	88.00
4	Participation in other department programmes increased	20	40.00	30	60.00

5	Recognized by villagers/neighbors because of performance in farming	33	66.00	17	34.00
6	Sent children for higher education	31	62.00	19	38.00
7	Purchasing power has been increased (constructed house/ purchased vehicle/ purchased land)	40	80.00	10	20.00

f - Frequency, %- percentage

Table 5 provides the information on social performance of the Capsicum growers. The data showed that 82.00 per cent of growers were consulted by other farmers due to their experience and adequate knowledge under protected cultivation. Eighty per cent of growers increased their Purchasing power due to the high productive returns under protected cultivation, nearly three-fourth (74.00 %) of growers were served as a resource person in agriculture/horticulture crop production for line departments and 66.00 per cent of growers were recognized by villagers/neighbors because of their performance in protected cultivation. All the social perspectives are one or the other way is correlated with the economic and production performance due to the high productive returns under protected cultivation.

Table 6: overall performance of capsicum growers under protected cultivation(n=50)

Sl. No.	Indicators	Category	Capsicum growers		
			f	%	
1	**Production performance level**	Low (<16.47)	11	22.00	Mean=17.88 S.D.=2.81
		Medium (16.47-19.29)	23	46.00	
		High (>19.29)	16	32.00	
2	**Economic performance level**	Low (<6.53)	12	24.00	Mean=7.02 S.D.=0.98
		Medium (6.53-7.51)	20	40.00	
		High (>7.51)	18	36.00	
3	**Social performance level**	Low (<3.79)	10	20.00	Mean=4.16 S.D.=0.74
		Medium (3.79-4.53)	22	44.00	
		High (>4.53)	18	36.00	
4	**Overall performance**	Low (<26.56)	11	22.00	Mean=28.32 S.D.=3.65
		Medium (26.56-30.20)	26	52.00	

	level	High (>30.20)	13	26.00	

Table 6 provides the information on production, economic and social performance of the capsicum growers under protected cultivation. The data revealed that nearly half of the capsicum growers (46.00 %) belonged to medium production performance level and 32.00 per cent of the capsicum growers belonged to high production performance group. More than one-fifth (22.00 %) of the growers come under low production performance level. The probable reason for medium to high production performance may be that, their education level, participation in more extension activities and contact with extension agents and their willingness to gather more information about protected cultivation along with better scientific orientation, access to credit and subsidy results in better production performance. The findings are line with Murthy *et al*. (2009)

Regarding economic performance, two-fifth (40.00 %) and 36.00 per cent of the capsicum growers comes under medium and high economic performance group respectively. Nearly one-fourth (24.00 %) of them had low economic performance. The probable reason may be that, adoption of recommended scientific production practices under protected cultivation results in the higher cost benefit ratio, fruit quality, weight, less incidence of pest and diseases and yield play a major role in economic performance of the growers. With respect to social performance, more than two-fifth of capsicum growers (44.00 %) and more than one-third (36.00 %) were belonged to medium and high social performance group respectively. One-fifth of the (20.00 %) of them comes under low social performance category. The reason might be that, as the production and economic performance improves, the farmers' social performance also increases in terms of participation in the organizations, serving as resource person, getting recognition and respect in the society, seeking higher education for their children and purchasing power of growers has also improved. More than half of the (52.00 %) of the capsicum growers had medium overall performance level followed by high overall performance level (26.00 %) and low performance level (22.00 %). The findings are line with findings of Choudhary (2016).Kolgane(2018) said that protected cultivation is the concept of growing potential crops in the modified natural environment for ensuring optimum growth of the crop plants without any or least stress and offers great scope to harness this potential of growing the high value crops by

achieving independence of climate and weather, and to grow these crops during off -season and in marginal environments.

Conclusion

The study implies that the production, economic and social performance of capsicum crop growers under protected cultivation technologies is better than open field cultivation. This is a clear pointer to the planners and development organizations to develop low cost playhouse technologies. Creating post-harvest handling, transport, storage and marketing infrastructure for protected cultivation produce, ensuring better returns to farmers and to organize outreach activities like training, demonstration, skill imparting and exposure to successful units to reduce risk in farming.

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