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Prospects of Protected Vegetable Cultivation Technologies in Punjab

Kamalpreet Kaur[1], Prabhjot Kaur[2], Ravinder Kaur Dhaliwal[3] and Kulbir Singh[4]

ABSTRACT

A survey was undertaken to study the prospects of protected vegetable cultivation technologies in Punjab covering six districts *viz.* Amritsar, Gurdaspur, Sangrur, Moga, Jalandhar and Kapurthala. From these districts a total of 150 respondents were selected for the purpose of study by probability proportion of protected vegetable cultivation growers in the selected districts. Data were collected by personal interview method. The prospects and satisfaction of the protected vegetable growers were studied. Questions were asked from the farmers regarding the prospects of protected vegetable cultivation. The results reveal that protected cultivation of vegetable gained importance since 2009 in Punjab because majority of respondents adopt this technique during 2009-2013. The data further showed that 34.48 per cent of respondents were willing to increase the area under protected vegetable cultivation due to profitable enterprise. While maximum number of respondents (45.98%) wanted to keep the area constant under protected vegetable cultivation technologies due to non availability of land to increase the area and unable to handle protected structures on more area. Majority of respondents preferred poly house followed by net house for cultivation of vegetables and maximum number of respondents were satisfied from this technology. It may be concluded that it is a profitable enterprise for farmers due to off season production and high yield so maximum number of respondents were willing to keep the area constant or increase the area under protected structures for vegetable cultivation.

Key words: Prospects, protected cultivation, profitable, satisfaction.

INTRODUCTION

Vegetable is any herbaceous plant which can be eaten as raw or in cooked form. Due to its short duration, it can be easily fit into any crop rotation. Due to increasing population and decreasing agricultural land, vegetable cultivation will be more economical. Yield of vegetable crops is high and provides 3-4 times more returns than cereals (Sharma *et al* 2014). Vegetables are highly nutritious crops as they are rich source of proteins (pea, beans leafy vegetables *etc*), minerals (leafy vegetables, cucurbits *etc*), vitamins (tomato, carrot, chilli *etc*), fibres and carbohydrates (potato, sweet potato, legume vegetables etc) (Dias and Ryder 2011).

Productivity of vegetables in India is quite low beside it is second largest producer of vegetables. Hence, there is need to enhance the production and productivity of vegetable crops through modified strategies to meet the appropriate quantity of vegetables in diet. Protected cultivation is one of the best technique to enhance the production, quality and productivity of vegetable crops. Protected cultivation technology is a forcing technique in which plant microclimatic is partially or fully controlled artificially as per the requirement of specific crops to improve the yield potential of crop and to alleviate one or more abiotic stress for optimum growth of crop plants (Satyasai and Viswanathan 1996). By knowing the fact of off-season cultivation of vegetable crops under protected technologies, there is need to study the future of these technologies and the present study was planned to study the prospects of protected vegetable cultivation technologies.

METHODOLOGY

Six districts *i.e.* Amritsar, Gurdaspur, Sangrur, Moga, Jalandhar and Kapurthala of Punjab state was selected for the purpose of present study. A list was prepared with the help of department of horticulture, Punjab for total vegetable growers in selected districts. Total sample sizes

[1] Ph. D. Scholar, Professor, Professor Department of Extension Education, Punjab Agricultural University, Ludhiana, 141004, Punjab
[2] Department of Vegetable Science, Punjab Agricultural University, Ludhiana, 141004, Punjab

of 150 farmers from this list who have adopted protected vegetable cultivation were selected according to probability proportion of number of farmers practicing protected vegetable cultivation. An interview schedule was prepared for data collection. It dealt with the statements to know the prospects of protected vegetable cultivation technologies like willingness of farmers to increase in area, decrease in area and constant area under protected vegetable cultivation technologies. It also dealt with satisfaction of respondents practicing protected cultivation. The data were collected by interviewing the respondents personally by the researcher by visiting the study area. The data were analyzed with the help of statistical tools such as frequencies, percentage methods and SPS software.

RESULT AND DISCUSSION

Year of starting of protected cultivation of vegetables

Any technology becomes meaningful when end users practicing it practically on their farm. The gap between innovation year and adoption year by end user shows technology complexity or compatibility. It means it is easily understood by the farmers if it is adopted in earlier years but if there is gap between year of launch and adoption by farmers then it shows the complexity of technology. The data in the Table1 reveals that 45.33 per cent of the respondents started the protected cultivation of vegetables during the period of 2009-2013. Only nine per cent of the respondents started the protected cultivation of vegetables during the period of 2005-2009 while 45.33 per cent of them started it in the year 2013 and onwards. It is clearly understood from the data that protected cultivation of vegetable gained importance since 2009.

Table 1: Distribution of respondents according to year of start of protected cultivation of vegetables

n=150

Year of start	Frequency	Percentage
2005-2009	14	9.33
2009-2013	68	45.33
2013-2017	68	45.33

Prospects of protected cultivation of vegetables

Prospects play an important role to know the significance of technology in coming years. It determines the satisfaction of farmers from the technology. It refers to individual's willingness to increase/decrease/keep the area constant under protected vegetable cultivation technologies in the coming years. Out of total 150 respondents, 87 respondents were continuing the protected vegetable cultivation and remaining 63 respondents discontinue the protected vegetable cultivation. From 87 respondents who were continue with cultivation of vegetables under protected structures, maximum number of respondents (45.98%) wanted to keep the area constant under protected technologies (Table 2). The data further shows that 34.48 per cent of the respondents were willing to increase the area under vegetable cultivation under protected structures. It can be seen from Table 2 that 19.54 per cent of the respondents were going to decrease the area under protected vegetable cultivation technologies. Similar findings were reported by Yasmin (2009) and results are contradictory with the results of Kumar (2008) that majority of vegetable growers wanted to decrease the area under protected structures.

Table 2: Distribution of respondents according to prospects of protected cultivation of vegetables

n=87

Prospects	Frequency	Percentage
Increase area	30	34.48
Decrease area	17	19.54
Constant area	40	45.98

It can be seen from Table 3 that out of 45.98 per cent of respondents that wanted to keep the area constant under protected cultivation, 47.5 per cent of respondents were willing to keep the area constant due to non availability of land to increase the area followed by the reason of sufficient net income and yield under protected structures. While, 27.5 per cent of respondents reported the reason to keep the area constant that they were not able to handle protected structures on more area (27.5%) because this profitable enterprise involves too much hard work and care. About 17 per cent of respondents consider less market price of vegetable produce followed by not easy to control by five per cent of the respondents and costly repair by two and half per cent of respondents as the reason for keeping the area constant under protected vegetable cultivation technologies.

Table 3: Distribution of respondents according to reasons for shift in area under protected cultivation of vegetables

Area under protected cultivation	Reasons	Frequency	Percentage
Increase (n=30)	Profitable	25	83.33
	Off season and high quality produce with good market price	5	16.67
Decrease (n=17)	Weather uncertainty	1	5.88
	High attack of soil born diseases or nematodes due to same land and high humidity after few years	2	11.76
	Market price is low	5	29.41
	Sale problem (market is far away from field)	9	52.94

	Not easy to control	2	5.00
	No land available to increase the area	19	47.5
Constant (n=40)	Costly Repair	1	2.5
	Less market price	7	17.5
	Sufficient and not able to handle on more area	11	27.5

The data further reveals that out of 34.48 per cent of respondents that wanted to increase the area under protected cultivation, 83.33 per cent of the respondents wanted to increase the area because it is a profitable enterprise followed by 16.67 per cent of respondents due to off season and high quality produce with good market price. It can be seen from the Table 3 that out of 19.54 per cent of respondents that wanted to decrease the area under protected cultivation, 52.94 per cent of the respondents were going to decrease the area under protected vegetable cultivation technologies due to sale problems of good quality produce followed by 29.41 per cent due to low market price of produce. About 11 per cent of respondents were going to decrease area due the various reasons such as high attack of soil born diseases or nematodes due to no land rotation and high humidity after few years *etc.*

It can be observed from the proceeding discussion that sale problem, land limitation to increase the area under protected conditions and profitable business were main reason for decrease, constant and increase the area under protected cultivation of vegetables respectively. Similar results were reported by Singh (2011) that profitability was the main reason for increasing the area under vegetable cultivation.

Percentage increase in the number of protected cultivation of vegetables producers during last eleven years

The results in the Table 4 reveals that out of the total sampled respondents who were producing vegetable by protected cultivation about one per cent of the respondents adopted this enterprise up to the year 2005. The data reveals that per cent addition of the number of farmers adopting vegetable cultivation under protected structures during 2007, 2008 and 2009 was 0.67, 7.33 and 12 per cent respectively. During the year 2010 low increase (4%) in the number of adopters was there for this technology. Again number of adopters increases and there was 12 per cent, 17.33 per cent and 18.67 per cent addition of the number of new respondents adopting this enterprise during the years 2011, 2012 and 2013 respectively. Then in 2014 there was increase of only six per cent in number of new respondents adopting this technology followed by an increase of 18 per cent in year 2015 and two per cent addition in 2016. It indicates that there is no uniform increase in the number of adopters. It can be observed from the study that number of respondents cultivating protected vegetables increased tremendously during 2013 and 2015.

Table 4: Percentage increase in number of respondents of protected cultivation of vegetables

Year	Cum. frequency (%)	Percentage addition per year
2005	2 (1.33)	...
2007	3 (2.00)	0.67
2008	14 (9.33)	7.33
2009	32 (21.33)	12.00
2010	38 (25.33)	4.00
2011	56 (37.33)	12.00
2012	82 (54.67)	17.33
2013	110 (73.33)	18.67
2014	120 (80.00)	6.67
2015	147 (98.00)	18.00
2016	150 (100.00)	2.00

Type and source of information used for protected cultivation of vegetables

There are mainly three type of protected structures in which vegetables are cultivated *i.e.* poly house, net house and low tunnel. Majority of respondents (51.33%) adopted poly house cultivation while 50.67 per cent had adopted net house for cultivation of vegetable crops. Low tunnel as a protected structure was adopted by 13.33 per cent of the respondents (Table 5). About five per cent of respondents had adopted both poly house and low tunnel as protected structures and eight per cent of respondents adopted net house and poly house cultivation. Only two per cent of respondents adopted net hose and low tunnel cultivation for vegetable crops. It can be observed that poly house and net house were most preferred by respondents as compared to low tunnel for off season production of vegetables. Results are in contradictory with Kumar (2008) that majority of respondents adopted net house for cultivation of vegetable crops. Dissemination of information from research institutes to the end users is prerequisite for popularity of new technology. The data in Table 5 further reveals that the various sources for information regarding vegetables cultivation under protected structures were internet, fellow friends, private companies, Punjab Agricultural University (PAU), ICAR-KVK (PAU), horticulture development officer (HDO) and centre of excellence of vegetables, Kartarpur. Majority of respondents (57.33%) came to know about protected vegetable cultivation technologies from fellow friends followed by HDO (22%) and by private companies (6%). Only few respondents i.e. about eleven per cent came to aware about protected cultivation technologies by PAU and ICAR-KVK (PAU) followed by internet (1%). Results are in line with Kumar (2008).

Table 5: Distribution of respondents according type and source of information used for protected cultivation of vegetables

Protected cultivation of vegetables	Category	Frequency	Percentage
Type of Protected cultivation (n=150*)	Poly House	77	51.33
	Low tunnel	20	13.33
	Net house	76	50.67
	Poly house + Low tunnel	8	5.33
	Net House +Low tunnel	3	2.00
	Net house + Poly house	12	8.00
	Internet	2	1.33
Source of information used for protected cultivation (n=150)	Friends	86	57.33
	private	9	6.00
	PAU	8	5.33
	ICAR-*KVK* (PAU)	8	5.33
	HDO	33	22.00
	Centre for excellence of vegetables, Kartarpur	4	2.67

*Multiple Response

Satisfaction from protected cultivation of vegetables

Satisfaction is the end result of adoption of any technology. It predicts the success or failure of any technology. The data in the Table 6 reveals that 50.67 per cent of the respondents were satisfied from protected vegetable cultivation technologies with the reasons that it is profitable, off season production and high yield while 49.33 per cent were not satisfied from it due to weather uncertainty, high speed winds, lack of guidance about protected cultivation and maintenance of structure, difficult to control soil born diseases and most importantly low price of vegetable produce.

Table 6: Distribution of respondents according to satisfaction in protected cultivation of vegetables

n=150

Satisfaction	Frequency	Percentage	Reasons
Yes	76	50.67	• Good quality produce and off season production • High profit • High yield as compared to open field conditions • High profitable if self marketing
No	74	49.33	• Weather uncertainty and sheet is blown off with wind and other structures are affected. • No proper guidance about protected cultivation and maintenance of structure • Difficult to control soil born diseases and minor sized insects (Aphid, Mite) • Low price of produce and high initial cost

Association of socio-personal characteristics with prospects of protected vegetable cultivation technologies

In order to determine the relationship among the independent variables and the dependent variables, chi-squares test was applied to the data and analyzed by using SPS software. The results have been discussed under the following heads.

Risk orientation and prospects

A critical analysis of Table 7 indicates that there is significant association between risk orientation and prospects of protected vegetable cultivation technologies. This may be due to the reason that vegetable cultivation under protected structures is profitable enterprise which generates good amount of income even from small piece of land inspite of costly enterprise (high initial cost for establishment of protected structures) and famers adopt it without knowing its success or failure on their own farm. The data in the Table 7 further depicts that more than four per cent of the respondents having low risk orientation wanted to increase the area under protected vegetable cultivation technologies while only two per cent and 13.33 per cent of the respondents falling in the categories of medium and high risk orientation respectively wanted to increase the area under protected vegetable cultivation technologies. Results are contradictory with Singh (2011).

Table 7: Association of risk orientation with prospects of protected cultivation of vegetables

Risk Orientation	Prospectus				X^2
	Increase	Decrease	Constant	Discontinue	
Below 22	7 (4.67)	7(4.67)	10 (6.67)	33(22.00)	18.536***
22-26	3(2.00)	3(2.00)	3(2.00)	0	
Above 26	20 (13.33)	7(4.67)	27(18.00)	30 (20.00)	

***Significant at 1% level of significance
Figures in parentheses indicate percentages

Innovativeness and prospects

The association between Innovativeness and prospects of protected vegetable cultivation technologies was found to be significant as clear from Table 8. An innovative person is always keen to try new ventures on his farm to increase his income. It may be due to the reason that innovative people are always willing to try and adopt the new ventures on large scales in order to enhance their income. It can also be seen from the Table 8 that two per cent of respondents from lower innovativeness category wanted to increase the area under protected vegetable cultivation technologies while only more than

three per cent and 14.67 per cent of the respondents falling in the respective categories of medium and high innovativeness were willing to increase the area under protected vegetable cultivation technologies. Thus it can be pointed out that more percentage of the respondents having high innovativeness wanted to increase the area under protected vegetable cultivation technologies than those having low innovativeness. Similar results were found by Singh (2011) that association between innovativeness and prospects of vegetable hybrid seed production was found to be significant.

Table 8: Association of innovativeness with prospects of protected cultivation of vegetables

Innovativeness	Prospectus				X^2
	Increase	Decrease	Constant	Discontinue	
Below 12	3(2.00)	2(1.33)	3(2.00)	0	8.423*
12-14	5(3.33)	6(4.00)	13(8.67)	28(18.67)	
Above 14	22(14.67)	9(6.00)	24(16.00)	35(23.33)	

***Significant at 1% level of significance
Figures in parentheses indicate percentages

Economic Motivation and Prospects

A perusal of the data given in the Table 9 indicates that there is significant association between economic motivation and prospects of protected vegetable cultivation technologies. This may be due to the reason that protected vegetable cultivation technology is a profitable enterprise which generates good amount of income even from small piece of land. This is why there is significant association between economic motivation and prospects of protected vegetable cultivation technologies.

The data in the Table 9 further reveals that out of total 34 respondents falling in the category of low economic motivation only four per cent were willing to increase the area under protected vegetable cultivation technologies while 10.67 per cent and more than five per cent of the respondents having medium and high economic motivation respectively were willing to increase area under protected vegetable cultivation technologies.

Thus it is clear from the table that the more percentage of respondents from the category of medium economic motivation was willing to increase the area under protected vegetable cultivation technologies than those having low economic motivation. Singh (2011) also found that there was significant association between economic motivation and prospects of vegetable hybrid seed production.

Table 9: Association of economic motivation with prospects of protected cultivation of vegetables

Economic motivation	Prospectus				X^2
	Increase	Decrease	Constant	Discontinue	
Below 24	6(4.00)	0	3(2.00)	25(16.67)	20.167***
24-37	16(10.67)	4(2.67)	14(9.33)	20(13.33)	
Above 37	8(5.33)	13(8.67)	23(15.33)	18(12.00)	

***Significant at 1% level of significance
Figures in parentheses indicate percentages

Extension Contacts and Prospects

A perusal of the data given in Table 10 indicates that there is significant association between extension contacts and prospects of protected vegetable cultivation. It may be due to the reason that the respondents who do have high degree of extension contacts are regularly motivated by various extension agencies to adopt new ideas on large scales.

Table 10: Association of extension contacts with prospects of protected cultivation of vegetables

Extension contacts	Prospectus				X^2
	Increase	Decrease	Constant	Discontinue	
Below 4	6 (4.00)	3 (2.00)	11(7.33)	35 (23.33)	18.716***
4-5	8 (5.33)	7 (4.67)	11 (7.33)	11 (7.33)	
Above 5	16 (10.67)	7 (4.67)	18 (12.00)	17 (11.33)	

***Significant at 1% level of significance
Figures in parentheses indicate percentages

The data further shows that four per cent of the respondents falling in the category of low extension contacts were willing to increase the area under protected vegetable cultivation while in case of the respondents falling in the respective categories of medium and high extension contacts about five per cent and 10.67 per cent of the respondents were willing to increase the area under protected vegetable cultivation technologies. Thus it clearly shows that more percentage of the respondents having high extension contacts wanted to increase the area under protected vegetable cultivation technologies than those having low extension contacts. Results are in line with Singh (2011) that there is significant association between extension contacts and prospects of vegetable hybrid seed production.

Mass Media Exposure and Prospects

As evident from the Table 11 that there was a significant association between mass media exposure and

prospects of protected vegetable cultivation technologies. It shows that mass media exposure have significant effect on prospects of protected vegetable cultivation technology. The data further reveals that only two per cent of the respondents falling in the low mass media exposure category were willing to increase the area under protected vegetable cultivation technologies whereas more than nine per cent and more than eight per cent of the respondents falling in the respective categories of medium and high mass media exposure were willing to increase the area under protected vegetable cultivation technologies. Results are contradictory with Singh (2011) that there was non-significant association between mass media exposure and prospects of vegetable hybrid seed production.

Table 11: Association of mass media exposure with prospects of protected cultivation of vegetables

Mass media exposure	Prospectus				X^2
	Increase	Decrease	Constant	Discontinue	
Below 10	3(2.00)	2(1.33)	4(2.67)	27(18.00)	27.148***
10-16	14(9.33)	3(2.00)	10(6.67)	16(10.67)	
Above 16	13 (8.67)	12(8.00)	25(16.67)	21(14.00)	

***Significant at 1% level of significance
Figures in parentheses indicate percentages

CONCLUSION

As protected vegetable cultivation is a profitable, employment generating practice and it is also source of income in off-season. Maximum number of respondents was willing to keep the area constant or increase the area under protected structures for vegetable cultivation. There is need to popularized this technology among the farmers by organizing awareness camps.

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