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Adoption level of farmers on protected cultivation technologies in Kalyana Karnataka region of Karnataka

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Abstract

The study was conducted in Koppal and Ballari districts of Kalyana Karnataka region in Karnataka during the year 2020-21 with the sample of 120 farmers. The results regarding the overall adoption of Protected Cultivation Technologies by respondents reported that majority (54.17%) of the respondents had medium level of adoption followed by high (26.67%) level of adoption and low (19.17%) level of the adoption. Since, majority of the respondents belonged to medium level of adoption with respect to adoption of protected cultivation practices. Hence, it is important to design more number of extension activities like demonstrations, study tours, exposure visits by the development departments to convince the farmers about protected cultivation practices for full adoption of the technologies. The extension agency should further intensify the awareness extension activities like demonstration, training, discussion, meetings etc., particularly on improved protected cultivation technologies and motivated them to adopt these technologies.

Keywords: Adoption, protected cultivation technology and Kalyana Karnataka

Introduction

Horticulture is one of the major drivers of growth to provide food, nutritional security along with improving the economic condition of the farmers in the agricultural sector. It provides employment opportunities to major portion of the farming community in India. Fruit crops are relatively resilient to changes in weather conditions and identified to be a major source of livelihood for the farmers in the country. Vegetables are grown mostly by small and marginal farmers which augments the major part of income of farmers. Further, horticulture sector enables the population to enjoy a diverse and balanced diet for health living. This sector has gained importance over the last decade as a major contributor to the growth of agriculture and allied sectors.

Several measures have been taken by the government for the development of the horticulture sector in the country. The improved technologies have been continuously introduced in the country such High-tech horticulture in general and protected cultivation particular among the farming community with an intention to grow the horticultural crops in off-season also by reducing post-harvest losses. Protected cultivation has offered a new dimension to get more income in a limited area. A protected cultivation structure is a framed or an inflated structure covered with a transparent or translucent material in which crops could be grown under the conditions of at least partially controlled environment and which is large enough to permit supervisors and labour to work in carrying out cultural operations.

Indo-Israel project on greenhouse cultivation, initiated at the Indian Agricultural Research Institute (IARI) in 1998 was India's first effort to introduce hi-tech protected farming of high-value horticultural produce in the country later the project has been renamed as Centre for Protected Cultivation Technology (CPCT) and IARI continued to maintain the facility. The centre has been instrumental in designing greenhouse structures, refine and upscale the system to reduce costs besides to suit local conditions.

In India, the area under protected cultivation is presently around 50,000 ha. (Amita, 2020) [1], while the protected vegetable cultivation area is about 2,000 ha. (Chandan and Singh, 2015) [2]. Karnataka State is considered as Horticulture State in the country owing to its excellent soil and climatic conditions and multifaceted expertise in the sector. Total farming families in Karnataka are 78.2 lakh of which nearly 20 lakh farming families are dependent on horticulture sector. The production of vegetables mainly capsicum, European cucumber have increased by almost 5

times. Further, different flower crops such as gerbera, carnation, roses etc., are also grown resulting in higher productivity and supply of flowers throughout the year.

The state is promoting this under Rashtriya Krishi Vikasa Yojane (RKVY), National Horticulture Mission (NHM) and Krishi Bhagya Scheme. The Government has come up with various programmes and policies providing 50 per cent subsidy to farmers practising protected cultivations like greenhouse, net house, poly house etc., In this context, there is a need to undertake a research study on various aspects related to growth and development of PCT in India, extent of adoption by farmers and its socio-economic impact including productivity and sustainability. In present condition agriculture constraints like fragmentation of cultivable land, water scarcity, rapid urbanization, declining crop production and productivity, crashing market prices, declining biodiversity and ever increasing population, demand for food, especially vegetables has increased manifold. 'Protected cultivation' has offered a new dimension to get more income in a limited area in a district.

Several studies have been conducted on horticulture crops in open field condition to know the Adoption, but very few research studies have been conducted on protected cultivation in this regard. Some of the studies shown that, there is a tremendous scope for development of technologies which is suitable for vegetable production under protected cultivation. With this background, the study was undertaken with the following objective to study the extent of adoption of Protected Cultivation Technology.

Methodology

The study was conducted in Koppal and Ballari districts of Kalyana Karnataka region in Karnataka during the year 2020-21. The districts were selected purposively due to maximum area under protected cultivation and also more scope for protected cultivation in these districts. From each district, 60 farmers who have adopted protected cultivation technology were selected for the study. Thus, the total sample of 120 farmers was selected by using simple random sampling

procedure. A structured and pre-tested interview schedule prepared keeping in view the objectives of the study was used for the survey. The data were collected by personal interview and the focused group discussion method was used wherever it was found suitable. The data collected for the study was tabulated, processed and analysed using the suitable statistical methods.

Results and Discussion

Technology wise adoption of Protected Cultivation by respondents

The results regarding the Adoption of Protected Cultivation Technologies by respondents presented in Table 1. The data indicate that most (78.33%) per cent of the framers Fully adopted design and structure followed 13.33 per cent of the respondents partially adopted the technology. With respect to Height of structure (mtrs), majority (59.17%) respondents fully adopted followed by 27.50 per cent partially adopted. Regarding Environment conditioning system-ventilation, majority (60.00%) of the respondents fully adopted followed by 23.33 per cent respondents partially adopted the technology. With respect to Environment conditioning system-heating, most (47.50%) of the respondents partially adopted the technology followed by 40.83 per cent of the respondents fully adopted the technology.

Most of the farmers designs the structure according to the specification given by the financing agency and the design will be done by the private agency hence, most of the farmers fully adopted the design and structure of the PCT. The height of the structure was fully adopted by the farmers and it can be attributed their knowledge regarding the structure. One of the major advantage of the PCT is regulation of environment in the structure to improve the income hence majority of the farmers have fully adopted Environment conditioning system-ventilation technology. The heating requires additional machineries which includes additional cost and that might be the reasons for partial adoption of Environment conditioning system-heating by most of the respondents.

Table 1: Extent of adoption of various components of Protected Cultivation by respondents

(n=120)

S. No.	Particulars	Participant respondents					
		FA		PA		NA	
		F	%	f	%	F	%
A	Design and construction of structure						
1	Design and Structure	94	78.33	16	13.33	10	8.33
2	Height of structure (mtrs)	71	59.17	33	27.50	16	13.33
3	Environment conditioning system-						
	a. Ventilation	72	60.00	28	23.33	20	16.67
	b. Heating	49	40.83	57	47.50	14	11.67
	c. Cooling	27	22.50	76	63.33	17	14.17
4	Light intensity control (use of shade net)	75	62.50	27	22.50	18	15.00
5	Covering material used	62	51.67	43	35.83	15	12.50
6	Irrigation system						
	a. Drip	84	70.00	22	18.33	14	11.67
	b. Sprinkler	32	26.67	54	45.00	34	28.33
7	Misting and fogging	8	6.67	2	1.67	110	91.67
8	Fertigation system	70	58.33	34	28.33	16	13.33
9	Cold storage structure	2	1.67	5	4.17	113	94.17
10	Packaging house	2	1.67	3	2.50	115	95.83
B	Production technology						
1	Soil sterilization	30	25.00	76	63.33	14	11.67
2	Bed preparation	67	55.83	32	26.67	21	17.50
3	Transplanting of seedlings	54	45.00	41	34.17	25	20.83

	a. Age						
	b. Method	75	62.50	32	26.67	13	10.83
4	Plastic mulching	96	80.00	21	17.50	3	2.50
5	Spacing	64	53.33	30	25.00	26	21.67
6	Irrigation time	66	55.00	37	30.83	17	14.17
7	Training and pruning	50	41.67	50	41.67	20	16.67
8	Staking/supporting	67	55.83	36	30.00	17	14.17
9	Deshooting/disbudding/ pinching	70	58.33	34	28.33	16	13.33
10	Use of Plant Growth Regulator	35	29.17	66	55.00	19	15.83
11	Use of insect traps	37	30.83	39	32.50	44	36.67
	Harvesting						
12	a. Method	65	54.17	37	30.83	18	15.00
	b. Time	74	61.67	27	22.50	19	15.83
C	Post-harvest Activities						
1	Grading	67	55.83	34	28.33	19	15.83
2	Cooling	42	35.00	32	26.67	46	38.33
3	Rehydration	37	30.83	33	27.50	50	41.67
4	Packaging and handling	41	34.17	50	41.67	29	24.17
	Transportation						
5	a. Self	70	58.33	34	28.33	16	13.33
	b. Purchaser	44	36.67	39	32.50	37	30.83

Environment conditioning system-cooling was partially adopted by majority (63.33%) of the respondents followed by 22.50 per cent of the respondents adopted fully. Majority (62.50%) of the respondents fully adopted Light intensity control (use of shade net) followed by 22.50 per cent respondents adopted partially. More than half (51.67%) of the respondents fully adopted Covering material in protected cultivation followed by 33.83 per cent respondents partially adopted the technology.

The intensity of the light plays a major role in improving the yield of the crop hence most of the farmers have fully adopted the light intensity control technology. Protection of moisture from evaporation increases the yield hence majority of the farmers have fully adopted the mulching technology in PCT.

The Drip irrigation system was fully adopted by 70.00 per cent of the respondents followed by 18.33 per cent partially adopted. Sprinkler irrigation system was partially adopted by most (45.00%) of the respondents followed 28.33 per cent of the respondents have not adopted the technology. Misting and fogging was not adopted by majority of the respondents (91.67%) followed by 6.67 per cent of the respondents fully adopted it. Fertigation was fully adopted by majority (58.33%) respondents followed by 28.33 per cent of the respondents partially adopted the technology. Cold storage structure was not adopted by most (94.17%) of the respondents and partially adopted by 4.17 per cent of the respondents. Packaging house technology was not adopted by most (95.83%) of the respondents followed by 2.50 per cent the respondents partially adopted the technology.

Most of the farmers are depending on the bore well for irrigation. However, in recent days the ground water level is decreasing. Farmers know the importance of saving irrigation water. In drip irrigation water can be judiciously used hence majority of the farmers have fully adopted the technology. The farmers are cultivating the fruits and vegetables in PCT where misting and fogging is not required hence most of the farmers have not adopted the technology. Fertigation ensures the equal distribution of the fertilizers for the plant and it's an easy way to apply fertilizer in the PCT hence more than half of the respondents have adopted the Fertigation technique. Farmers' practice of selling the crop immediately after the harvest might be the reason for not adopting the cold storage technology and packaging house technology by majority of the farmers.

Soil sterilization technology was fully adopted by most (63.33%) of the respondents partially adopted the technology followed by 25 per cent adopted it fully. Bed preparation technology was fully adopted fully by majority (55.83%) of the respondents followed by 26.67 per cent adopted partially. Consideration of age of seedling during transplantation was fully adopted by most (45.00%) of the famers and partially adopted by 34.17 per cent of the respondents. Method of transplantation was fully adopted by majority (62.50%) of the respondents followed by 26.67 per cent adopted it partially.

Farmers knew the importance of soil sterilization to avoid the incidence of soil borne diseased hence soil sterilization technology was adopted fully by most of the farmers. Bed preparation for growing healthy seedling is an important cultivation practice hence majority of the farmers fully adopted the technology. The right stage of transplantation ensures the plant survival and growth hence most of the farmers fully adopted the consideration of right age for transplantation and also the method of transplantation technology.

Plastic mulching technology was fully adopted by great majority (80.0%) of the respondents followed by 17.50 per cent of the respondents adopted the technology partially. Spacing was fully adopted by majority (53.33%) of the respondents followed 25.00 per cent of the respondents adopted partially. Irrigation time was fully adopted by majority (55.00) of the famers and partially adopted by 30.83 per cent of the respondents. Regarding Training and pruning technology, same percentage of respondents fully adopted as well as partially adopted the technology. Staking/supporting was fully adopted by majority of the respondents and partially adopted by 30.00 per cent of the famers. Deshooting/disbudding/ pinching was fully adopted by majority (58.33%) of the respondents and partially adopted by 28.33 per cent of the respondents. Use of Plant Growth Regulator was partially adopted by 55.00 per cent of the respondents followed by 29.17 per cent fully adopted the technology.

Plastic mulching is a least cost moisture conservation technique and it also reduces the weed growth hence most majority of the farmers fully adopted the technology. Maintaining the recommended spacing between the plants promotes nutrient uptake and reduces the competition among the plants for nutrient uptake hence majority of the farmers have fully adopted the technology. Irrigation at right time and right

quantity reduces water loss as well as promotes the plant growth hence majority of the people fully adopted the technology. Training and pruning helps in maintaining the quality of the produce hence most of the farmers fully adopted the technology. Staking helps in avoiding the break of plant stem as well rotting can be avoided through the staking hence most of the farmers have fully adopted the technology. Farmers might not be aware of Deshooting/disbudding/ pinching in promoting the plant growth hence most of the farmers have partially adopted the technology. The lack of information and high cost of plant growth regulator might be the reason for partially adopting the application of plant growth regulator. Use of insect pest trap was not adopted by most (36.67%) of the people followed by 32.50 per cent of the people partially adopted the technology and 30.83 per cent fully adopted the technology. Harvesting method was fully adopted by Majority (54.17%) of the respondents followed by 28.33 per cent of the respondents have adopted the technology partially. Harvesting time was fully adopted by majority (61.67%) of the respondents followed by 22.50 per cent of the respondents partially adopted the technology. The incidence of the pest and disease is very less in the protected cultivation that might be the reason for most of the farmers for not adopting the insect pest traps by the farmers. Method of harvesting ensures the keeping quality of the produce hence majority of the farmers have fully adopted the harvesting time and harvesting method. Grading technology was adopted fully by majority (55.83%) of the respondents followed by 28.33 per cent of the respondents. Cooling after harvest was not adopted by most (38.33%) followed by 35.00 per cent of the respondents fully adopted the

technology and 32.00 per cent partially adopted the technology. Rehydration technology was not adopted by most (41.67%) of the respondents followed by 30.83 per cent of the respondents fully adopted the technology. Packaging and handling was partially adopted by most (41.67%) of the respondents followed by 34.17 per cent of the respondents fully adopted the technology. Self-transportation was fully adopted by majority (58.33%) of the respondents followed by 28.33 per cent respondents partially adopted it. Purchaser transportation was fully adopted by most (36.67%) of the respondents followed by 32.50 per cent of the respondents partially adopted it and 30.83 per cent have not adopted it. Respondents know the importance of grading in fetching the higher price hence most of the farmers have fully adopted the grading technology. Immediate sale after the harvest might be the reason for not adopting the cooling after harvest technology as well the rehydration technology. The lack of knowledge regarding the packaging might be the reason for not adopting packaging technology by the farmers. Farmers are themselves carrying the produce to the market yard hence most of the farmers have fully adopted the self-transport technology and few farmers have adopted purchaser transportation facility.

Overall adoption of Protected Cultivation Technologies by respondents

The results regarding the overall technology wise adoption of Protected Cultivation Technologies by respondents is presented in Table 2. It is evident from the table that majority (54.17%) of the respondents had medium level of adoption followed by high (26.67%) level of adoption and low (19.17%) level of the adoption.

Table 2: Overall adoption of Protected Cultivation Technologies (PCT) by Respondents (n=120)

Sl. No.	Category	Number	Percentage
1	Low	23	19.17
2	Medium	65	54.17
3	High	32	26.67
Total		120	100

The probable reason for medium level of adoption may be attributed to the fact of knowledge regarding the different technologies in the protected cultivation. The cost reduction and income improvement might have motivated the farmers to adopt the protected cultivation technologies. The production of year round in protected cultivation might have motivated the farmers to adopt the technology. The results are in conformity with the findings obtained by Roy (2007) [3], Gandhi *et al.* (2008) [4], Singh *et al.* (2010) [5], Mamathalakshmi and Nagabhushanam (2011) [6], Mathivanan (2013) [7] and Ahmed *et al.* (2012) [8].

Relationship between profile characteristics of respondents and Adoption of respondents towards Protected Cultivation Technology

Relationship between personal, socio-economic and psychological characteristics of respondents and adoption of Protected Cultivation Technology by respondents is depicted in Table 3. It is clear from the table that, out of 13 independent variables selected for the study, six variables viz. annual income, extension orientation, risk orientation, management orientation, scientific orientation and achievement motivation were found significantly related to adoption of protected cultivation technologies by the respondents at one per cent level of probability and one variable viz, mass media utilization

was found significantly related to adoption at five per cent of probability. The remaining six variables were found have no significant relation with the related to adoption of protected cultivation technologies by the respondents.

Table 3: Relationship between profile characteristics of respondents and Adoption of respondents towards Protected Cultivation Technology (n=120)

Sl. No.	Characteristics	Correlation Coefficient (r)
1	Age	-0092
2	Education	0.318
3	Size of the family	0.118
4	Farming experience	0.152
5	Size of land holding	0.119
6	Annual income	0.393**
7	Social participation	0.146
8	Extension orientation	0.486**
9	Mass media Utilization	0.243*
10	Risk orientation	0.514**
11	Management orientation	0.649**
12	Scientific orientation	0.446**
13	Achievement motivation	0.521**

NS: Non-Significant; *: Significant at 5% level; **: Significant at 1% level.

The possible reasons for obtaining such results could be, when the farmers have high annual income then their investment capacity will be more hence farmers' annual income found to significantly related to the adoption of protected cultivation technologies. The frequent interaction with the extension personnel and exposure to the technologies through participation activities the farmers' knowledge will be improved and then the adoption hence extension orientation is significantly related to the adoption level of the farmers.

Conclusion

The study revealed that the majority of the respondents belonged to medium level of adoption with respect to adoption of protected cultivation practices. Hence, it is important to design more number of extension activities like demonstrations, study tours, exposure visits by the development departments to convince the farmers about protected cultivation practices for full adoption of the technologies. The extension agency should further intensify the awareness extension activities like demonstration, training, discussion, meetings etc., particularly on improved protected cultivation technologies and motivated them to adopt these technologies.

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