Future of Farming - Polyhouse Farming

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Abstract

The adverse effects of the green revolution on soil fertility, emergence of new insect pests and diseases and declining water table level have tempted the farmers to consider alternate methods of cultivation which could curb the adverse effects and provide an opportunity to grow crops throughout the year. Protected Cultivation Technology was one such alternative which seemed promising to the farmers. Based on this, Krishi Vigyan Kendra, Patiala conducted training for growers and end-users on the use of complete technology for protected cultivation of high-value vegetables and flowers, including IPM, post-harvest handling, on-farm value-addition, packaging, etc. and marketing. By adopting hi-tech farming practices, Mr. Meharban Singh, a farmer, has become an icon for other farmers of the region. His adoption of modern practices is very rewarding both economically and socially. He is very satisfied with the technological intervention. Judicious use of pesticides on his vegetables has helped him in getting a good price in the market and has enabled him to create a niche for himself. Other farmers of the adjoining areas often seek guidance from him regarding cultivation of vegetables etc. and he personally encourages them to adopt crop diversification as a means to conserve the environment and increase income.

Keywords: Protected cultivation, Polyhouse

Background

Since ancient times, agriculture is an outdoor or open field production of crops. Open field production is climate and weather dependent. In fact, growth and development of crops under a particular set of climate parameters defines geographical location, productivity and production period of different crops. The magnitude of impact of climate and weather on agricultural productivity and quality of produce is appreciated by farmers and the scientific community, including horticulturists. Abiotic and biotic environments govern crop production potential and quality of products. Among the major constraints in production of horticultural crops are temperature (hot or cold), sunlight duration and quality, water deficiencies or excesses, atmospheric moisture (relative humidity), weeds,

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deficiency of nutrients, heavy winds, carbon dioxide and a host of diseases and insect pests. There are ecological optima for obtaining production potential of each of the crops. Deviation from these conditions results in yield losses partially and sometimes totally. However, near optimal climatic conditions could be created by controlling the climate with the help of greenhouse using different protected structures/methods/devices and such cultivation under controlled environmental conditions is termed as protected cultivation.

Protected cultivation is one of the most promising areas of agriculture in the current context. It is an upcoming and alternative production system involving high-tech and intensive practices mainly for meeting urban and export demands of horticultural and ornamental crops for food, nutrition and economic security. Burgeoning population, fragmentation of land holdings, depletion and erosion of natural resources are all adversely affecting agricultural productivity. Protected cultivation offers several advantages to grow high-value crops with improved quality even under unfavorable and marginal environments. It has the potential of fulfilling the requirements of small growers as it can increase the yield manifold per unit area. The crops can also be grown round the year, including off-season with increased profitability. The technology has already been adopted in many parts of the country. On the contrary, increasing trend of entrepreneurial mindset and commensurate opportunities of respectable business for educated youth among progressive farmers is opening up an exciting combination of brighter side of agriculture in India vis-à-vis protected cultivation. Besides, protected cultivation is one area where Government initiatives have been far more forthcoming though not as complimentary for human resource development and technical support to the farmers adopting protected cultivation.

Introduction

Though India is the largest producer of vegetables in the world next to China, its requirements of vegetables are rapidly increasing because of burgeoning population. India has a wide spectrum of diverse agro climatic conditions but vegetable cultivation practices in our country have been generally restricted to regional and seasonal needs with the technology and practices predominantly of traditional nature, which results in low yields and inconsistent quality and quantity produce supply in the markets. The factors such as adverse climatic conditions, high potential of vegetables, fruits and flowers, agro inputs availability, small and fragmented land holdings and increased demand for quality vegetables necessitate the adoption of protected cultivation. The adverse effects of the green revolution

on soil fertility, emergence of new insect pests and diseases and declining water table level (Jain 2010) convinced the farmers to consider alternate methods of cultivation which could curb the adverse effects of green revolution and provide an opportunity to grow crops throughout the year. Protected Cultivation Technology was one such alternative which was promising to the farmers. The only option is vertical expansion through increased productivity and cropping intensity using protected farming with environment control measures, quality seeds, fertilizers and plant protection measures (Paroda 2013, Gowda 2009, NAAS 2001, GOH 2013, Singh and Brahma 2012, Singh *et al*. 2005, Singh *et al*. 2004). India has entered into an era of greenhouse vegetables cultivation more recently and the total area under protected vegetable production is not more than 10000 ha (Mayanglambam and Nisha 2013). Protected cultivation offers several advantages to grow high-value crops with improved quality even under unfavorable and marginal environments. It has the potential of fulfilling the requirements of small growers as it can increase the yield manifold per unit area. The crops can also be grown round the year, including off-season with increased profitability.

The objectives of polyhouse farming are to promote the horizontal spread of latest technology among the farmers; promote production of off season vegetables and to increase the income per unit area.

The problems faced by the farmers are more or less the same in the majority of the villages of the district. However, the degree and intensity vary from village to village or farmer to farmer. As the climate of the district is congenial for off-season tomato cultivation most of the farmers grow tomato, cabbage and cauliflower during the *Kharif* season for getting more profit. Due to the cultivation of local degenerated variety, poor nutrient management, micronutrient deficiency, increasing pest incidence *etc.* the farmers are unable to get the desired level of yield and profit and used to face extreme difficulties to maintain their family. Increasing price of agro inputs, exploitation by middlemen and declining trend of market price were further intensifying the problem.

In view of this, Krishi Vigyan Kendra, Patiala conducted training for growers and end-users on the use of complete technology for protected cultivation of high-value vegetables and flowers, including IPM, post-harvest handling, on-farm value-addition, packaging, *etc.* and marketing. Adoption of improved package of practices in a holistic way, by using technologies such as design of structures and drip fertigation system, modern nursery raising and complete production

technology are extremely important and need to be adopted for enhancing production and raising income.

Data were collected from trainees who attended training programmes conducted by KVK with the help of a well-structured interview schedule. The data were analyzed and tabulated after applying statistical techniques like frequency, per centage, weighted mean and rank orders, and may be seen below.

a) No. of Training Courses Organized

Year	No. of training courses organized	No. of Participants
2012-13	4	95
2013-14	5	120
2014-15	5	105
2015-16	6	145
Total	**20**	**465**

b) No. of Method Demonstrations conducted

Year	Demonstration Area						Participants
	Design of structures	Installation of drip fertigation system	Nursery raising	Layout of plants	Training and pruning of plant	Method of harvesting & packaging	
2012-13	4	4	4	4	4	4	95
2013-14	5	5	5	5	5	5	120
2014-15	5	5	5	5	5	5	105
2015-16	6	6	6	6	6	6	145
Total	**20**	**20**	**20**	**20**	**20**	**20**	**465**

(c) Extension Activities organized

Year	Kisan Goshti	Exposure visits	Radio/TV talks
2012-13	7	4	5
2013-14	6	5	7
2014-15	5	5	5
2015-16	8	6	6
Total	**26**	**20**	**23**

By adopting hi-tech farming practice, Mr. Meharban Singh has become an icon for other farmers of the region. His progressiveness in adopting modern practices has been very rewarding both economically and socially. He is very satisfied with the technological intervention.

Success Story

Mr. Meharban Singh, a farmer of Village Saholi is a hard working youth, whose zeal to work, improve and innovate is an example to be followed by others. He

is a self cultivating farmer owing 12 acres of land where different agricultural enterprises had been adopted like polyhouse cultivation of vegetable crops (4 poly houses of 16,000 mt^2 area) and rest of the land is utilized for diversified open cultivation of vegetable crops.

Output

He adopts the latest technologies and takes regular consultations from the KVK scientists, PAU Ludhiana, IARI and other sources of knowledge. He also attends short trainings and vocational training conducted by the KVK from time to time. He visits other farmers and cultivators of repute to know what practices they are following and then tries to improve his net return in each crop by minimizing the cost of cultivation and through judicious use of inputs. He has adopted diversified cropping system and dropped cereal-cereal monoculture. He has his own compost unit and recharge well and he recycles all the agricultural waste and tries to conserve resources. Improvements effected are:

- Adopted foliage spray of fertilizers with power-sprayer for better results and lower costs in horticulture
- Regular soil & water testing for proper usage of fertilizers and crop selection
- Water Management through drip irrigation, underground pipes and water storage tank
- Mulching of tomato crop with paddy straw (available in plenty) to control weeds and conserve soil moisture.
- Crop rotation developed for better productivity:

  Paddy > Ash Gourd

  Paddy > Capsicum

  Green fodder > Tomato > Green fodder

  Green fodder > Ash Gourd > Pulses

  Green fodder > Tomato > Cucumber
- Use of water storage tank for fishery
- Use of Cold Room (set up at own farm) for increasing shelf-life and quality of fresh vegetables and holding vegetables for longer duration for getting better returns.
- Developing marketing strategy by exploring different markets for fresh vegetables and use of pick-up van for timely supplies to vendors.

- Use of vermicompost in own farm as well as for marketing through small attractive packets of different weights.

The productivity levels achieved during the last five years may be seen in Table 1.

Table 1. Productivity Levels achieved in major income generating activity during the last five years

Name of the crop/ activity	Variety	Productivity level (q/ha)				
		2012-13	2013-14	2014-15	2015-16	2016-17
Tomato/ drip irrigation + mulch film	Avinash-2, 1001,524,7730 avinash-3, himshekher	625	695	705	898	1050
Capsicum	Indra , Bharat, Asha	375	445	459	600	700
Ash gourd	Kiran	360	400	450	459	520
Cucumber	Multistar, king star, kian, kuk	500	650	700	800	1100
Vermicompost	Red worms	230/ 2000sq.ft	235/ 2000sq.ft.	240/ 2000sq.ft.	250/ 2000sq.ft.	500/ 2000sq.ft
Wheat	PBW 343, DBW 17	45	47.5	50	53.75	58.0
Paddy	PR 118, 114	78.0	75.0	81.5	80.0	84.0

Outcome

- Increased farm productivity of participating farmers and an annual income generation of more than Rs 50,000/1,000 m2 of cultivation area.
- Increased local employment opportunities in on-farm and off-farm activities reducing distress migration (10-12 persons).
- Increased livelihood options to participant families (>2 options per family).
- Inclusion in basic banking facility to build a capital base for farmers.
- Wider and easier access to finance for setting up village based enterprises.
- Better realization of price of farm products through post-harvest management, value-addition and market linkages.
- Empowered and vibrant people's organizations addressing their own developmental issues
- Ujjagar Singh Dhaliwal Award, by PAU, Ludhiana (2007) and Progressive Farmers' Award by Mehram group of publications, Nabha (2010) Chief Minister Award, by PAU, Ludhiana

Self-Employment and Local Direct Marketing

There has been concern in the recent years regarding the efficiency of marketing of fruits and vegetables in India. It is believed that poor efficiency in marketing channels and poor marketing infrastructure are leading not only to high and fluctuating consumer prices, but also to only a small proportion of the consumer rupee reaching the farmers.

There is also substantial wastage, deterioration in quality and frequent mismatch between demand and supply spatially and over time. With growing demand and accompanying supply response, fruits and vegetables have assumed great importance.

Off-Season Market

The off-season vegetable market in the entire region is a key focus area. For example during monsoons the local production of tomato is negligible. The tomato prices during June-October range from Rs. 15 to 20/kg and demand in towns like Patiala touches 30-40 tonnes/day whereas tomato price in peak season (November-March) comes down to Rs. 1-2/kg, providing no commercial gains to farmers.

Spread effect on Fellow Farmers

Other farmers of the adjoining areas often seek guidance from Mr. Meharban Singh regarding cultivation of vegetables *etc.* and he personally encourages them to adopt crop diversification as a means to conserve the environment and increase income. The farmer has motivated hundreds of the other farmers of the adjoining areas for the cultivation of vegetable crops like tomato, cucumber, capsicum, etc to fetch more profits. He is also running a Farmer's Feld School sponsored by ATMA at his farm for 20 trainee farmers. He is invited to deliver lectures during various training programmes/ seminars for farmers at KVK Patiala. He also participates in radio / TV talk shows and contributes to print media for propagation of floriculture and diversification in the state. Inspired by his achievements, several farmers from different places all over Punjab/Haryana/U.P. have ventured into horticulture/ vermiculture to improve their earnings.

Table 2. Activity wise income, cost-benefit ratio, gross and net income for last five years

Name of the crop	Area (ha)	Gross Income	Expenditure	Net Income	BC ratio
(i) Field Crops					
Paddy	2	175000	45000	130000	3.89
Wheat	2	125000	37500	87500	3.33
Green Fodder	2	30000	5000	25000	6.00
(ii) Horticulture Crops					
Cucumber	1	325000	48000	277000	6.77
Tomato	1.5	250000	50000	200000	5.0
Cucurbits	2	450000	75000	375000	6.00
Capsicum	1.5	480000	120000	360000	4.00

(iii) Livestock					
Dairy – 10 Cows		970000	620000	350000	1.56
(iv) Fisheries					
	0.4	185000	45000	140000	4.11
(v) Any Other					
Vermi-compost	2000 ft^2	200000	40000	160000	5.00

Impact

Mr. Meharban Singh along with other vegetable growers started their own registered Self Help Group "Innovative Farmers Group". All the members in the group are having 80 per cent area under drip and sprinklers. The group helps each other in marketing, sharing information *etc.* They have distributed among themselves the markets where one is supposed to sell, though this keeps changing if there is surplus demand (then others are invited *etc.*). Presently, the group has over 60 members. Presently, the farmers of Patiala District are cultivating vegetables in poly-net houses spread over 52 acres of land.

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