Sustainable Vegetables and Flowers Production Technology (Poly House): Problems & Prospects in Haryana

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ABSTRACT

India is the largest producer of vegetables in the world next to China; its requirements of vegetables are rapidly increasing because of burgeoning population. 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 of quality vegetables necessitate the adoption of protected cultivation. Vast majority (94%) of poly house farmers opined moderate to high prospects of poly house. Increased production and productivity per unit of land, water, energy and labour, high quality and clean products, high water and fertilizer use efficiency, subsidy provision for establishment of high cost infrastructure, round the year employment to the farmers were the major prospective aspects perceived by poly house farmers. While they faced many problems like population explosion of minute insects like mites & white flies, especially the white fly menace, frequent occurrence of windstorms, hailstorms, lack of cold storage facilities in villages, high cost of refrigerated vehicle and problem of nematode infestation were the major serious constraints faced by the poly house growers. The field functionaries must provide continued technical guidance and quality cladding material since technology being capital as well as care intensive with special care for control of white fly and nematode infestations, regarding proper marketing and value addition knowledge and skill to farmers for sustainability of poly house cultivation.

Key words: *Sustainable vegetables and flowers production technology; Poly house;*

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 into low yields and inconsistent quality and quantity produce supply of 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 of quality vegetables necessitate the adoption of protected cultivation. Protected conditions for vegetables, fruits and flowers are created by using different type of structures as per season and location specific like low cost protected structures viz. Plastic low tunnels, walk-in tunnels, low cost green houses are suitable for off-season vegetables and nursery raising in major vegetable growing areas. Insect proof net houses are highly suitable for diseases free seedlings among them most common and widely used are poly house. It is designed to modify the climatic conditions like temperature, humidity, wind velocity etc. along with high soil, water, fertilizer and other inputs use efficiency for growing horticultural crops. The potential of protected vegetables cultivation to meet the demand being highly productive along with conserving resources like water, fertilizer & land. Being eco-friendly it must not be only popularized but out of its sheer necessity. Sincere efforts are made by the government to promote protected cultivation to ensure sustainable food and nutritional security to every Indian citizen and enhancement of income of the farming community

(*Mishra et al.2010*). But there are several constraints and problems which restrict protected cultivation of vegetables (*Sirohi et al.2002*). Therefore, the study was undertaken to know the perception of farmers of Haryana with the following specific objectives:

i. To find out suitable crops under protected cultivation (poly house)
ii. To find out prospects of protected cultivation (poly house)
iii. To identify the constraints faced by the poly house growers

METHODOLOGY

To collect the primary data on "Sustainable vegetables and flowers production technology (poly house): Its problems & prospects", the respondents were selected with the multistage sampling. Zone-6 Trans-Gangetic Plains of the country (comprising the states Punjab, Haryana, Union territories of Chandigarh, Delhi) was purposely selected having largest vegetables and fruits market in Delhi and from selected zone, Haryana state was selected purposively falling in NCR of capital New Delhi and having direct access of investigators. Further two districts namely, Karnal and Panipat were selected purposively being in proximity of National Capital Region of Delhi as well as Centre of Excellence for vegetables itself in Karnal District. Twenty five practising poly house farmers were selected randomly from the list supplied by the respective District Horticulture Office viz. Nagla Megha, Sohana, Manchuri, Badagaon, Raipur Jatan, Tarori, Nilokheri, Phusgargh, Mohiuddinpur, Jundala, Kunjpura, Nali, Jaisinghpura, Peont, Pakka khera, Shekhpura, Chirao, and Karnal from Karnal district and Nara, Joshi, Kavi, Dharamgargh, Khandra, Rasalpur, Bapoli, Shivah, Assan Khurd, and Panipat from Panipat district. A total of 50 poly house farmers were interviewed personally. The data were collected with the help of well-structured pre-tested interview schedule. The data were analyzed and tabulated after applying the statistical techniques like frequency, percentage, weighted mean and rank orders.

RESULTS AND DISCUSSION

Suitable crops grown under protected cultivation (poly house): The farmers of both the districts were growing the major vegetable crops such as cucumber (*Cucumis sativus*), tomato (*Solanum lycopersicum*), capsicum (*Capsicum annum*), chillies (*Capsicum frutescens*) and brinjal (*Solanum melongena*) and gerbera (*Gerbera jamesoni*), lilium (*Lilium longiflorum*), rose (*Rosa*) and marigold (*Calendula officinalis*) flowers. The majority of farmers used to grow cucumber, capsicum and tomato as their main crops and among them cucumber was the most preferred crop. While Lillium, Gerbera and Rose were the major flower crops and rose was found most profitable by the respondent poly house farmers.

Table 1. Socio- personal attributes' profile of poly house farmers (N=50)

Variable	Category	No.	%
Age	Young (up to 37)	24	48.00
	Middle (38-55)	20	40.00
	Old (above 55)	06	12.00
Farming experience	<10 years	23	46.00
	10-20 year	21	42.00
	> 20 years	06	12.00
Occupation	Farming	36	72.00
	Subsidiary	14	28.00
Education	Up to primary	02	4.00
	Up to higher secondary	16	32.00
	Graduates	08	16.00
	Post graduates	24	48.00
Farm size	Up to 5 acres	18	36.00
	6-10 acres	06	12.00
	10-15 acres	05	10.00
	> 15 acres	21	42.00
Information sources use pattern			
Institutional information sources	Research/Extn./Training	11	22.00
	Govt. Department	14	28.00
	Cooperative/Commodity Board	03	06.00
	Corporate/Private Companies/ Industries	15	30.00
	Not used any institutional	07	14.00
Non institutional sources	Friends	01	2.00
	Other poly house farmers	29	58.00
	Farmers associations	03	6.00
	Input dealers	12	24.00
	Agricultural consultants	05	10.00
Media sources	Radio/TV	04	8.00
	Exposure visits	09	18.00
	Internet	26	52.00
	No media	11	22.00
Soil & water testing	Get done	50	100.0
Trainings on protected cultivation	Received	37	74.00
	Not received	13	26.00

About 50 per cent of farmers belonged to young age group followed by middle age and hardly 12 per cent belonged to old age. It can be concluded that technology in reality is adopted by the energetic youth who were not only digitalized but techno-savvy also. Sincere efforts are required for sustainability and viability of such remunerative and protected cultivation technology in era of climate change. Similarly vast majority of farmers (88%) who had up to 20 years of farming experience can also be utilised for promotion of protected farming practices. A large majority of farmers (72%) had farming as their main occupation followed by 28 per cent farmers adopted the subsidiary occupation.

About 50 per cent of farmers had post graduation as their educational qualification followed by higher secondary (32%) which is a good sign that this high tech farming is practiced by educated persons. Pertaining to farm size, 42 per cent respondents belonged to big farmers category who had more than 15 acres of land followed by small farmers category (36%) whereas; 22 per cent belonged to medium category.

Half of the poly house farmers had used research/ extension/training institutes and govt. department as their main source of information among which were centre of excellence for vegetable production, Ghraunda, Karnal and HTI, state horticulture department being mainly concerned with training and subsidy provision. Among non institutional sources other poly house farmers were the main source of information while among mass media sources internet emerged as major source of information among educated youth.

Cent per cent respondents got their soil and water testing before installation of structures which may be attributed to precondition for approval of project. About $3/4^{th}$ of the poly house farmers got pre-training on protected cultivation which was generally of short duration

Table 2. Distribution of farmers on overall prospects perception of poly house technology (N=50)

Category	Score range	No.	%
Low	Up to 12	3	6
Moderate	13-15	34	68
High	16-17	13	26

The overall prospects of poly house technology were found moderate to high since 68 per cent farmers belonged to moderate category followed by 26 per cent to high prospects category whereas, only 6 per cent belonged to low prospects category (Table 2). The main reason was the majority of respondent famers had been

Table 3. Prospects perceived by farmers regarding poly house cultivation (N =50)

Aspect	Yes	No	TWS	WMS	Rank
Increased production and productivity per unit of land, water, energy and labour	50 (100%)	-	100	2.00	I
High water and fertilizer use efficiency	50(100%)	-	100	2.00	I
Provide round the year employment to the farmers	50(100%)	-	100	2.00	I
Subsidy provision for establishment of this high cost infrastructure	50(100%)	-	100	2.00	I
High quality and clean products	49(98%)	1(2%)	99	1.98	II
Helps to overcome adverse climate conditions for production of vegetables	49(98%)	1(2%)	99	1.98	II
Raising healthy seedlings for transplanting in open field	47(94%)	3(6%)	97	1.94	III
Growing off-season vegetables to get better returns	46(92%)	4(8%)	96	1.92	IV
Early nurseries raised to grow early crops	46(92%)	4(8%)	96	1.92	IV
Products are suitable for exports	44(88%)	6(12%)	94	1.88	V
High aesthetic value	42(84%)	8(16%)	92	1.84	VI
Low cost of plant of plant protection measures	39(78%)	11(22%)	89	1.78	VII
Round the year production of vegetables.	38(76%)	12(24%)	88	1.76	VIII
Multiple cropping on the same piece of land	35(70%)	15(30%)	85	1.70	IX
Vertical cultivation of vegetables	27(54%)	23(46%)	77	1.54	X
Maintaining stock plants, grafted plants and micro propagated plants	22(44%)	28(56%)	72	1.44	XI
Easy registration of any organic produce for direct marketing	12(24%)	38(76%)	62	1.24	XII
Opportunity to contract with food processing company	07(14%)	43(86%)	57	1.14	XIII
Disease free production of seeds	5(10%)	45(90%)	55	1.10	XIV

TWS- Total Weighted score WMS- Weighted mean score

Table 4. Constraints faced by poly house growers (N =50)

Constraints	Serious	Not Serious	TWS	WMS	Rank
Population explosion of minute insects like mites & white flies	50(100%)	-	100	2.00	I
High cost and non availability of refrigerated vehicles for transportation	47(94%)	3(06%)	97	1.94	II
Frequent occurrence of wind storms, hailstorms	46(92%)	4(8%)	96	1.92	III
High cost of hybrid seeds	46(92%)	4(8%)	96	1.92	III
Lack of knowledge of value addition processes	45(90%)	5(10%)	95	1.90	IV
Lack of cold storage facilities in villages	44(88%)	6(12%)	94	1.88	V
High initial fabrication cost of naturally ventilated poly house	43(86%)	7(14%)	93	1.86	VI
High cost of nursery raising material like coco pit, vermiculite, perlite etc.	43(86%)	7(14%)	93	1.86	VI
Lack of continued technical guidance by field functionaries	42(84%)	8(16%)	92	1.84	VII
Lack of marketing knowledge/intelligence	42(84%)	8(16%)	92	1.84	VII
Poor quality of cladding material	41(82%)	9(18%)	91	1.82	VIII
Problem of nematode infestation.	31(62%)	19(38%)	81	1.62	IX
High labour wages	26(52%)	24(48%)	76	1.52	X
Solarisation in the month of May & June is essential for poly house	22(44%)	28(56%)	72	1.44	XI
Non feasibility in poor quality water and soil conditions	05(10%)	45(90%)	55	1.10	XII

practicing for the last 2-3 years and also flower growing farmers found the technology more profitable due to crop viability up to five years.

It is evident from the data pertaining to prospects of poly house cultivation presented in Table 3 that increased production and productivity per unit of land, water, energy and labour, high quality and clean products, high water and fertilizer use efficiency, subsidy provision for establishment of this high cost infrastructure, round the year employment to the farmers, helps to overcome adverse climate conditions for production of vegetables, raising healthy seedlings for transplanting in open field were top ranked prospective aspects of the poly house cultivation by farmers. The findings are in congruence with earlier studies of *Singh and Sirohi (2004)* and *Nair and Barche (2014)* which reported increased production and productivity, clean and quality products, high input efficiency, round the year production of vegetables etc. whereas disease free production of seeds, opportunity to contract with food processing company, easy registration of any organic produce for direct marketing, maintaining stock plants, grafted plants and micro propagated plants were lower ranked aspects by the growers. Since vast majority of farmers used to grow vegetable crops and were selling their crop in the local market without value addition.

Population explosion of minute insects like mites & white flies, especially the white fly menace, high cost and non availability of refrigerated vehicle, high cost of hybrid seeds, frequent occurrence of wind storms, hailstorms, lack of knowledge of value addition, and lack of cold storage facilities in villages, were the major serious constraints faced by the poly house growers whereas, non feasibility in poor quality water and soil conditions, solarisation, high labour wages, and problem of nematode were not perceived as serious constraints by them since most of the farmers had water tank with canal irrigation facility, since majority of them were practicing for 2-3 years only. High cost of hybrid seeds, frequent occurrence of wind storms, hailstorms, lack of knowledge of value addition along quality of cladding material had been matter of concern of past studies by *Singh and Sirohi (2004), Nair and Barche (2014)* and *Ghanghas et al. 2015*.

CONCLUSION

The majority of poly house farmers found moderate to high prospects of poly house viz. increased production and productivity per unit of land, water, energy and labour, high quality and clean products, high water and fertilizer use efficiency, subsidy provision for establishment of high cost infrastructure, round the year employment to the farmers were the major prospective aspects perceived by poly house farmers. While they faced the problems like population explosion of minute insects like mites & white flies, especially the white fly menace, frequent occurrence of windstorms, hailstorms, lack of cold storage facilities in villages, high cost and problem of nematode infestation were the major serious constraints faced by the poly house growers. Certain

other concern of poly house farmers were quality of structure a big concern for sustainability as well as viability of this venture and no liability is fulfilled by the company in case of repair of cladding material, electricity connection is commercial besides it being agricultural profession some farmers expressed that solar system with subsidy as best alternative, running foggers is costly as well as they are not fully automatic with sensors which is the main cause of failure of crops in poly house. In old structures there is drastic change in pH of soil a also a big concern probably due to high doses & intensity of fertigation by farmers in curiosity to realize capital invested for structures, Net house is more feasible in both winter & summer and profitable in comparison to poly house structure as per the climatic conditions since rise in temperature a critical for June-July plantations and poor implementation of insurance facilities. On the basis of findings suggestions for policy making are as under-

Researchers

- Effective remedies for control of white fly and nematode infestations to be developed
- Establishment of full automation system of foggers with sensors as per crop requirement in poly house
- Change in pH of soil along with its structure and texture in poly houses is researchable issue for viability period of prevailing cropping system
- Testing of feasibility and profitability of intercropping of flowers as practiced by farmers or even some farmers growing marigold for checking the nematode population
- Testing and validation of supplementation the infrastructure like drip irrigation along with mulching to take vegetable and other crops in open fields

Field functionaries

- Continued technical guidance may be provided by the field functionaries since being capital as well as care intensive technology especially proper marketing and value addition practices were less adopted by farmers
- Majority of farmers got short duration trainings i.e. 3-7 days which is not sufficient for such hi- tech farming so long duration vocational trainings should be organized at centre of excellence for vegetables and other research institutes.

Planners or policy makers

- Insurance cover may be given under crop insurance scheme and also especially for cladding material which is prone to hazards of wind storms and hail storms
- Agricultural electricity connection should be provided instead of commercial since running of foggers is costlier practice in poly house cultivation or solar panel system provision for poly houses instead of commercial connection
- Provision of enforcement laws for getting fulfillment of liabilities well in time by companies especially in case of cladding material and machinery or equipments provided by them.

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