

# Protected Cultivation of High Value Vegetables and Cut Flowers: A Value Chain Approach

## Environmental and Social Safeguards Management

### A. Basic information

#### 1. Project statistics:

**Component code** : **2**  
**Name of Consortium Leader** : **Dr. H. S. Gupta (Director IARI)**  
**Name of CPI** : **Dr. Balraj Singh**  
**Name of Co-PIs** : **Dr. M. Hasan**

**Mailing address** : **Centre for Protected Cultivation Technology,**  
Indian Agricultural Research Institute, Pusa,  
New Delhi - 110012  
Phone 91-011-25842481  
Fax- 91-011-25846420, 25842481  
Email- drbsingh2000@yahoo.com  
incharge\_cpct@iari.res.in

**Consortium partners** :

1. G.B. Pant University of Agriculture and Technology, GBPUAT, Pantnagar, Uttarakhand
2. Rajasthan Agricultural University, RAU, Bikaner, Rajasthan
3. National Centre for Integrated Pest Management (NCIPM), PUSA Campus, New Delhi

**2. Date of Start** : First March 2009

**3. Planned Duration** : Three Years Four Months

**4. Project cost** : **Rs. 603.3405 lakh**

#### 5. Project Objectives:

- (Design and Development) To build infrastructure (greenhouses, net houses, shade nets, nurseries, drip fertigation system) for protected cultivation of high value vegetable i.e. tomato, capsicum, cucumber, and flower crops i.e. gerbera and chrysanthemum in different agro-climatic locations with the aim of developing model production systems.
- (Production and Processing) To standardize production technologies for tomato, capsicum, cucumber, gerbera and chrysanthemum under protected cultivation including IPM, grafting of vegetable seedlings and the use of drip fertigation and super absorbents for improving water and nutrient use efficiency.
- (Post-Harvest and Value Addition) To standardize post-harvest, on-farm value addition for high value vegetables i.e. tomato, capsicum, cucumber and cut flowers i.e. gerbera and chrysanthemum grown under protected cultivation.

- (Value Chain and Marketing Linkages) Field level evaluation of the value added products and development of effective linkages of marketing high value horticultural produce including establishment of cool chain management system.
- (HRD) To strengthen human resources for development of entrepreneurial skills for commercialization of protected cultivation technologies

## **6. Brief project description:**

(Design and Development) The first objective of the project to build infrastructure for protected cultivation of high value vegetable and flower crops in different agro-climatic locations with the aim of developing model production systems and development of indigenous varieties for high value vegetables is rather self-explanatory. The protected structures are highly variable depending upon the need, budget, climatic conditions of the regions and the crops. The level of technology has also a long term bearing on the overall performance and the economics of the production chain. Integrated nutrient and water management of the protected structures are critical component. The project aims to establish model protected structures and drip fertigation system relevant for different crops in different adopted regions of the project domain. Even the pest situations in these greenhouses/polyhouses may vary depending upon the type of structure planned. For instances, the designs used in the Uttaranchal region of the country are prevalent with curtains/side windows with large holes which leads to continuous influx of pests mainly the sucking pests which are difficult to manage. Also, the planting beds are not prepared scientifically leading to the establishment of the soil-borne pathogens in the polyhouses. Therefore, if these structures are established with rich supplementation/inundation of bioagents from the beginning will discourage the soil-borne pathogens. Thus, the greenhouses would be able to sustain the pest/pathogens for longer duration reducing the losses due to pests over a period of time.

(Production and Processing) The second objective to standardize production technologies for tomato, capsicum, cucumber, gerbera and chrysanthemum under protected cultivation including IPM, grafting of vegetable seedlings and the use of absorbents for effective water and nutrient use efficiency would address the key issues in the standardization of production technologies for these crops. The production technologies for most of these crops have been worked upon in IARI, New Delhi, however, these technologies need to be standardized for different targeted regions – especially the tarai region, where lot of protected cultivation is coming up in a big way, and semi-arid areas like Rajasthan where such technologies are in fledgling state. The need to boost indigenous varieties or suitable and easily available exotic varieties and standardization of the production protocols is the need of the hour as the protected cultivation has already begun in a big way and is definitely going to stay in horticulture crops in times to come. Since the disease and depression situations due to pests in older greenhouses is a major biotic concern and is responsible for high losses would also be addressed in the project. State of art plant protection technologies especially the healthy planting material, appropriate varieties, pest monitoring and need-based integration of various plant protection strategies would be resorted to for minimizing losses due to pests. Currently, the growers of the polyhouses are depending on calendar based pesticide sprays in polyhouses due to grave pest situations and have little choice else than chemicals leading to serious environmental concerns. Thus, pest mitigation in polyhouses with minimized pesticide use in terms of need would reduce lot of pesticide load in the prevalent ecosystems. Apart from that, techniques like grafting to obviate soil borne pathogens is one of the latest and

dependable technologies against the soil borne pathogens and root-knot nematodes and it has been already applied successfully in several countries especially South Korea and Japan.

The third objective to standardize post-harvest, on-farm value addition for high value vegetables and cut flowers grown under protected cultivation is equally important as the post harvest losses in high value crops are all the more avoidable. Appropriate and state of art post harvest management protocols would be tested and devised to minimize such losses.

The fourth objective of value chain would involve field level evaluation of the value added products and development of effective linkages of marketing high value horticultural produce including establishment of cool chain management system. The cool chain management and proficient and professional marketing of the produce with the help of established industry as the associated partners would ensure minimized losses and catering to upmarket through quality produce would definitely spruce up the economical viability of the production to consumption chain.

The fifth and last objective of strengthening human resources for development of entrepreneurial skills for commercialization of protected cultivation technologies is very important in Indian context. With the shrinking land resources and sizable number of farmers and agri-production houses coming up the need of protected cultivation is not duly and commensurately compensated with the need of trained human resources. Also, the technology has hitherto centered around a few places in Maharashtra, Karnataka and Uttaranchal. Therefore, the need to develop and standardize the production technologies of protected cultivation of high value crops has to evolve while keeping in view the development of strong human resource and entrepreneurship skills to sustain the overall development in favour of holistic development of a paradigm of these production systems in the form of an industry which has growers, technologists, entrepreneurs, labour, market and knowledge in synchronized and mutually profitable and proficient mode.

## 7. Environmental category issues in the subproject

- Social:
- Environmental

## 8. Safeguard policies triggered (World Bank policies)

Safeguard Policies Triggered (World Bank Policies)		
	Yes	No
Environmental Assessment (OP/BP 4.01)	[X]	[ ]
Natural Habitats (OP/BP 4.04)	[ ]	[ ]
Pest Management (OP 4.09)	[ ]	[ ]
Cultural Property (draft OP 4.11-OPN 11.03 -)	[ ]	[ ]
Involuntary Resettlement (OP/BP 4.12)	[ ]	[ ]
Indigenous Peoples (OD 4.20)	[ ]	[ ]
Forests (OP/BP 4.36)	[ ]	[ ]
Safety of Dams (OP/BP 4.37)	[ ]	[ ]
Projects in Disputed Areas (OP/BP 7.60)	[ ]	[ ]
Projects on International Waterways (OP/BP 7.50)	[ ]	[ ]

## **B. Risk analysis and related issues**

- Adoption of protected cultivation by upper strata of growers only - due to heavy initial expenditure. Also the cost of produce is often higher limiting the consumption by upper strata of society.
- High input-based cultivation in terms of knowledge and resources limit newer entrepreneurs.
- Currently very high level of fertilizer and pesticide incurrence which can be reduced through GAP and IPM.
- Adoption of calendar based package of practices recommended by suppliers of planting materials involves excessive use of pesticides and is, thus, a huge environmental risk. Therefore, it has to be replaced with environment friendly IPM practices with minimum and need based applications of pesticides.
- Intensive application of suitable bioagents may help in managing the soil-borne pathogens in new greenhouses only, while extremely sick greenhouses may be difficult to manage without the use of required pesticides.
- The structures of existing greenhouses may not be suitable for particular crop due to biotic or abiotic stresses and the change in structure may not be financially or temporally viable for the adopted grower.
- Suspected lack of confidence among growers for the cool-chain management facilities and its paraphernalia after the project support is withdrawn.
- Consumer's response may not be overwhelming, without very active promotional exercise.
- Disposal of different types of plastics to be used in the protected cultivation.

**9. Impact assessment :** Given below, and adequately addressed

**10. Potential indirect and/ or long-term Impacts due to anticipated future activities in the project areas (assessment of anticipated conflict/ complementarily with the current as well as those proposed for the next five years in the areas of activities of the sub-project):**

- Protected cultivation is an upcoming and alternative production system involving high-tech and intensive practices mainly for urban and export demands of horticultural and ornamental crops for food, nutritional and economic security.
- Percolation of high technological regime imbibed through project implementation would entail long-term benefits to conventional agriculture besides quality production of vegetable and ornamental crops under protected cultivation.
- Reduction in the use of pesticides by the growers would not only mean less expenditure on this head but also quality production of healthy and nutritious produce.
- Establishment of cool-chain management system would empower local growers to seamlessly venture into top domestic and export markets.
- Indirect benefits of the project would include establishment of entrepreneurial skills of high tech agriculture that would bring about social and economic paradigm shift in overall agri-production and agri-business environment.
- Rural entrepreneurship will help in reducing migration to urban areas through enhanced employment and income generation.

**11. Identify the key stakeholders and describe mechanisms for consultation with and to them done/ disclosure so far done including pre-project consultations with stake holders workshop before formulating the full proposal, discussing the full proposal with some stakeholders before submission to the PIU:**

**Public Institutes (Consortium Partners)**

1. G.B. Pant University of Agriculture and Technology, GBPUAT, Pantnagar, Uttarakhand
2. Rajasthan Agricultural University, RAU, Bikaner, Rajasthan
3. National Centre for Integrated Pest Management (NCIPM), PUSA Campus, New Delhi

**NGO's, Associate partners: Public Institutions:**

1. IFFCO Foundation , Noida

**Private Participation (Private partners):**

1. M/S ACME Rural Mission, Gurgaon
2. M/s Bharti Del Monte, Gurgaon (Old Name: Field Fresh Foods Pvt. Ltd)
3. M/s Bharti Wal-Mart, Gurgaon

**12. Chronology of meetings/ activities held in connection with preparation of the concept note & full proposal**

S. No	Date & Location	Programme	Participants	Remarks
1.	18.05.2008	Preparation of concept notes at Institution level	Different divisions and concerned scientists	Selection of only 5-6 concept notes at Institution level for NAIP
2.	26.05.2008	Meeting at lead centre scientists	Lead centre CPI and all Co-PI's.	Concept note finalized.
3.	26.05.2008	Presentation of the concept notes before a committee chaired by the director of the Institute.	Director, Joint Director (Res.) and different scientists of the Institute from different divisions.	Concept note approved by Director IARI.
4.	29.05.2008	Concept note of the sub-project was selected by the Institute for submission to the NAIP.	Scientists of the lead centre and consortium partners.	Concept note was submitted by the lead centre CPI to NAIP
5.	30.09.2008	Concept note submitted to NAIP	NAIP officials	Concept note was approved/ accepted by the NAIP with some comments for submission as a full proposal.
6.	11.09.2008 12.09.2008	Participation of lead centre CPI and one Co-PI of consortium partners in the project proposal writing and winning workshop at NAARM, Hyderabad	Dr. Balraj Singh and Dr. Naved Sabir	Project proposal presentation approved and applauded at Hyderabad

7.	20.09.2008 & 26.09.2008	Meeting of partners before submitting the full proposal	All CPI's of lead centre and partners.	Consensus on objectives, technical programme and overall project proposal
8.	30.09.2008	Submission of full proposal to NAIP	All project partners	Submitted proposal on due date.
9.	20.11.2008	TAG, NAIP project presentation	All project partners and NAIP officials under the chairmanship of Dr. K. L. Chadha	Project approved with minor modification
10.	29.12.2008	RPC, NAIP project presentation.	All project partners and NAIP officials under the chairmanship of Dr. K. V. Raman	Project approved with minor modification.
11.	6.02.2009	PMC, NAIP project presentation	NAIP officials under the chairmanship of DG, ICAR Dr. Mangala Rai	Project formulation was appreciated and approved

### 13. Measures to address the issues

A document on safeguard matrix, GAP protocols and safety instruction boards would be prepared and displayed at vantage points. Education and training of growers and end users on the use of complete technology for protected cultivation of high value vegetables and cut flowers including IPM, post harvest handling, on farm value addition and marketing will be conducted in the sub project.

Awareness of risk related factors will be addressed to the stakeholders through orientation sessions on topics such as adoption of Improved package of practices in holistic ay, by using technologies such as design of structures and drip fertigation system, modern nursery raising, complete production technology, IPM, post harvest handling of the high quality produce, on farm value addition, packaging etc. Issues like safe disposal of pesticide containers, polythene and other non-degradable byproducts, judicious use of pesticides and biosafe inputs, crop health, workers' safety, healthy packaging interventions and projection of GAP issues will be addressed across all the stakeholders. The same would be duly inculcated through training/ HRD programmes for addressing such environment safety and biosafety issues especially in the unorganized sector including utilization of biodegradable packaging materials as far as possible.

#### **14. Consultation/ disclosures to be done in future:**

The project launch workshop would set the stage for local mechanisms of consultation/disclosures for the stakeholders of the project. The baseline studies would provide the bench-mark for subsequent impact assessment of the project achievements vis-à-vis different objectives and expectations. Regular meetings with the co-investigators/collaborators/industry/partners/stakeholders would streamline all the activities of the project. Active feedback through all the working tiers would provide constant monitoring efficacy. Detailed uniform proforma for all the tiers would ensure uniform data collection for meaningful, scientific evaluation of all the activities/experimentations. The consultation/ disclosures will be done as per NAIP guidelines depending on the progress of the project. Training, demonstration programmes and workshops on various themes relevant to production technology, primary processing, post-harvest product preparations, packing, labelling, nutritional benefits awareness, cool-chain management, marketing aspects *etc.* The efforts to develop software based databases on production protocols would facilitate knowledge transfer across different working partners. Assistance of different related organizations will be taken.

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**Consortium PI**

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**National Coordinator**

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**National Director**

**Annexure I: Environmental safeguard: Activities, issues, impact and mitigation measures**

Activities <sup>1</sup>	Issues	Anticipated level of Impacts <sup>3</sup>		Mitigation measures (Negative Impact) <sup>4</sup>
		Positive	Negative	
1. Baseline survey	Timely and accurate data collection	-	-	
2. Design and development of protected structures and drip fertigation system	Region specific and cost effective design	4	-	
3. Standardization of production technology	Availability of soil-less media for nursery	4	1	Use of cost effective easily available materials like vermin-compost
4. Crop and region specific IPM interventions and GAP protocols	Healthy planting material, crop hygiene, appropriate plant protection, judicious pesticide use, GAP protocols	4	-	
5. Demonstration and transfer of technology	Region and location specific cost effective technology demonstration and transfer	4	-	
6. On farm value addition	Packaging and handling	4	-	
7. Establishment of cool chain management system	Nil	-	-	
8. Development of marketing linkages	Nil	-	-	
9. Entrepreneurial skill development	Nil	-	-	

## Annexure II: Social safeguard: Activities, issues, impact and mitigation measures

Activities <sup>1</sup>	Issues	Anticipated level of Impacts <sup>3</sup>		Mitigation measures (Negative Impact) <sup>4</sup>
		Positive	Negative	
1. Baseline survey	Timely and accurate data collection	-	-	
2. Design and development of protected structures and drip fertigation system	Region specific and cost effective design	4	-	
3. Selection/development of indigenous varieties of few high value vegetable and flower crops	Availability, acceptability, marketability and time constraint	4	-	
4. Standardization of production technology	Region and crop specific production technology	4	-	
5. Crop and region-specific IPM intervention and GAP protocols	Health of Environment and Workers' health. Healthy planting material, crop hygiene, appropriate plant protection and GAP protocols. Crop/region specific IPM interventions	4	1	Awareness about pests/natural enemies and judicious use of pesticides and safe disposal of pesticide containers; no-use of banned pesticides
6. Demonstration and transfer of technology	Lack of knowledge about protected cultivation technology; Increase in income levels and employment generation	4	-	
7. On farm value addition	Income generation and rural employment	5	-	
8. Establishment of cool chain management system	Post harvest management leading to economic profitability	4	-	
9. Development of marketing linkages	Poor marketing knowledge/opportunities	4	-	
10. Entrepreneurial skill development	Lack of knowledge, Export potential	4	-	