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Economic feasibility of protected cultivation

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Abstract
The protected cultivation technology has given growers a powerful management tool for production of crops. The objective of growing crops under protected conditions is to extend the cropping seasons and to protect crops against adverse environmental conditions such as extreme temperatures and rainfall and also from diseases and pests. Poly house schemes / projects gave new options to farmers. The project components include construction of location-specific poly houses of different models with irrigation facility through micro irrigation system, creation of water sources individually and collectively by the group of farmers. This paper reviews the assessment of project viability on protected cultivation and the policy suggestions. The viability of the protected cultivation projects were analyzed using different subsidy rates (Table.3). The net present value is highest in 80% subsidy rate whereas 50% and 25% subsidy rates are not feasible. The benefit cost ratio also higher in 80% subsidy rate. Hence, provision of 80% subsidy to the farmers in protected cultivation schemes is feasible. The farmers need to be educated and trained before starting poly house on their farms. The training should include important aspects of design and layout, selection of site, proper installation of irrigation/fertigation units, selection of crop/variety and good crop management practices. The farmers should select the crops with due consideration of the trends in the market prices.

Keywords: Economic feasibility, protected cultivation, technology

Introduction
Green house structures are generally covered by sheet glass, fibre glass or plastic sheets. Such materials have energy capturing characteristics, all designed to maximum light transmission and energy retention inside. The objective of growing crops under protected conditions is to extend the cropping seasons and to protect crops against adverse environmental conditions such as extreme temperatures and rainfall and also from diseases and pests. However, it was in 15th to 18th centuries when Green House farms first appeared on the scene primarily in England, Netherlands, France and China. By the end of 19th century, the commercial green house technology was well established in many countries. Thus, protected cultivation technology has given growers a powerful management tool for production of crops. Generally high value commercial crops are grown under protected cultivation as protected cultivation requires high level of technology and adequate economic returns over investment. As such, quality, productivity and remunerative prices are the major considerations for selecting poly house crops. Moreover, precise environment and control over nutrient application push plants to new limits of growth and high productivity. It has been found that per square meter yield of vegetable crops can be pushed to 5 to 6 times over yield realized under open field conditions.
Thus, poly houses technology protects crops against cold, rain, hailstorms, and wind providing plants with congenial environment compared to open field conditions. Even new crops not indigenous to area can be introduced and crops can be grown out of season throughout the year. As mentioned earlier, yield and quality is also much higher than under open field conditions. Integrated nutrient management and low use of pesticides and chemicals under controlled conditions further not only decrease the input cost per unit output but also reduce the residual effect to some extent.
Keeping this in view, this paper reviews the assessment of project viability on protected cultivation and the policy suggestions.

Protected Cultivation Projects
Poly house schemes / projects gave new options to farmers. The project components include construction of location-specific poly houses of different models with irrigation facility through micro irrigation system, creation of water sources individually and collectively by the group of farmers.
The subsidy rate may given as 80 &, 50% or 25% or sometimes 100%. However, success of the scheme would depend upon the profitability and need based facilitation with regard to

technical support, construction, utilization and maintenance of poly houses and above all the marketing infrastructure. Since, protected cultivation is purely a commercial agri-business venture with substantial initial investment. Therefore, it is the value realized rather than physical output that matters most to the entrepreneurs. The application of corporate and business principles in production and marketing rather than traditional farming norms could ensure long term sustainability and financial viability. The production scientists, planners and entrepreneurs must be fully aware of the sophisticated techniques to evaluate the commercial farm enterprises like protected cultivation.

Methodology for Economic Viability

Protected cultivation involves both long term and short term investments. The long term investment is needed to construct poly house structures, land development, and install irrigation / fertigation units, purchase equipments and other accessories. The short term capital investment is required to purchase planting material, manures and fertilizers, plant protection inputs and to meet labour charges for performing various operations. Therefore, the economic evaluation can be accomplished in the following way.

Project Feasibility and Economic Viability Analysis of Poly House Project (Long Term)

Project analysis is a powerful tool to examine the long term financial feasibility of a project. All the long term investment projects should be evaluated by employing this technique to ascertain their economic viability. Following concepts / criteria are used to examine the economic viability of a long term project such as poly house project:

1. Discount rate
2. Net Present Value
3. Benefit Cost Ratio
4. Pay Back Period
5. Internal Rate of Return

Results

Poly House Designs and Investment

There are three common designs of poly house technology followed in the state viz., low cost using local material (bamboo) or GI structure of 105 m^2 (or even 6 or 40 m^2), medium size of 250 m^2 and high cost high –tech with size 500 m^2 and above (Table.1).

Table 1: Ploy House Designs and Fixed Capital Investment (Rs. / unit)

Particulars	Low Cost (Bamboo)	Medium (GI Pipe)	Size 500 (GI Pipe)
Size (sq mt.)	105 (15x7)	240 (20x12)	500 (50 x 10)
Investments	40,000	3,20,000	6,00,000
Structure (Pipes, irrigation equipments, etc.,)	20,000	2,60,000	5,00,000
Poly sheet (120 GSM)	5,000	15000.00	30000.00
Miscellaneous	15,000	45000.00	70000.00
Farmer's Investment (80% Subsidy)	8,000	64000.00	1,20,000

The dimension may vary as per the lay of land but size design of 15 x 5 m, 20 x 12 m and 50 x 10 m have been found technically more convenient. The investment on structure of poly house varies as per design and size. In low cost total investment was around Rs. 40,000 while in medium and large size, the investment came out to be Rs. 3,20,000 and Rs. 6,00,000 respectively. The major proportion of investment is on erecting the structure and installing irrigation and other equipments. In 80% subsidy the farmers share was meager amounting to just Rs. 8,000, Rs. 64,000 and Rs. 1,20,000 in different types of poly houses, respectively.

Keeping in view the effective cropping area, the plant density varied from crop to crop. The plant density in case of capsicum came out to be 450 for low cost, 1000 for medium and 2000 for large size of poly house designs. The recommended use of FYM and vermicompost is 100 q/ha and 50 q/ha respectively. The employment days generated per ploy house would be 80 man days in large. However, labour requirement may vary depending upon soil type and crops grown.

Financial Feasibility Analysis of Poly House

The financial viability of long term investment projects need to be analyzed by taking into consideration the time value of money (Table.2).

Table 2: Project Economics (500 sq mt, 80% subsidy)

Year	Ct+C0	Bt	Nt	Df (10%)	PCt	PBt	NPV (DF 10%)	NPV (DF 55%)	NPV (DF 56%)
0	120000		-120000	1	120000	0	-120000	-120000	-120000
1	45400	112500	67100	0.909	41273	102273	61000	43290	43013
2	45400	112500	67100	0.826	37521	92975	55455	27929	27572
3	45400	112500	67100	0.751	34110	84523	50413	18019	17675
4	45400	112500	67100	0.683	31009	76839	45830	11625	11330
5	45400	112500	67100	0.621	28190	69854	41664	7500	7263
6	45400	112500	67100	0.564	25627	63503	37876	4839	4656
7	45400	112500	67100	0.513	23297	57730	34433	3122	2984
8	45400	112500	67100	0.467	21179	52482	31303	2014	1913
9	45400	112500	67100	0.424	19254	47711	28457	1299	1226
10	45400	112500	67100	0.386	17504	43374	25870	838	786
					398963	691264	292300	476	-1582

It is well established fact that present worth of money is certainly higher than the same amount receivable in future. Therefore, we should discount the benefits streams receivable over the future period to find present values while comparing with the present level of investment. Generally market rate of interest is taken as the discount factor to deflate future benefits / costs accruing from the project. The project analysis has been carried out for capsicum (colour) grown in large size

poly house and similar technique can be adopted for other crops and small / medium size also. It was found that with 80% subsidy the project was highly beneficial to growers with Net Present Value of Benefits worth Rs.2,92,300 (Table 2). The benefit cost ratio was quite high. The financial viability of the project is further strengthened through high internal rate of return (55.23%). The investment made can be recovered in the third year of completion of the poly house. At 50% subsidy, the project is financially viable though there would be decrease in the level of viability indicators. However, with 25% or no subsidy the protected cultivation may not be viable under existing level of technology and market prices (Table 2). This clearly shows that to promote sustainable development of protected cultivation, either subsidy has to be continued or cost reducing technologies have to be developed.

Table 3: Financial Viability Indicators under Different Subsidy Rates

Viability Indicators	Subsidy rate		
	80%	50%	25%
NPV	292300	112300	-37699
BCR	1.73	1.19	0.95
IRR	55.23	18.15	8.01
Pay back	III Year	VII Year	-

The viability of the protected cultivation projects were analyzed using different subsidy rates (Table.3). The net present value is highest in 80% subsidy rate whereas 50% and 25% subsidy rates are not feasible. The benefit cost ratio also higher in 80% subsidy rate. Hence, provision of 80% subsidy to the farmers in protected cultivation schemes is feasible.

Discussion

To promote protected cultivation, and for development of commercialized agriculture, marketing of farm products has become even more important than the adoption of modern practices for increasing physical output from agriculture. This is so because it is the value of output that matters most in high investment projects rather than more physical output. Only better returns, stable prices and attractive terms of trade would induce the grower to adopt protected cultivation technique. The growers who are able to market their produce in the right form, at the right time and place for the price emerge successful while the rest compromise their due shares to middlemen or traders. There is ample evidence to show that agricultural production has also increased significantly in those areas where there is well – developed, efficient and assured marketing and procurement system prevalent.

There is no denying the fact that protected cultivation has vast potential for commercialization of agriculture through vegetable farming that is highly remunerative and best suited to hills and to the labour abundant small sized land holdings in this state. The vegetable commodities produced in poly houses have high demand in the markets of neighboring plains due to better quality and off-season supply. But being fragile and highly perishable in nature, vegetable commodities need quick and efficient marketing system and supply chain management.

Since poly house commodities are high value specialized commodities, these also need specialized and efficient marketing. The growers must follow emphasis on proper marketing functions and selection of appropriate supply chain. Even while selecting a crop variety we have to keep an eye on the marketing practices, supply chairs and price trends in the past. The post harvesting operations viz., cleaning, pre-cooling, grading, packaging and transportation need due consideration in marketing process. Even the spike length of fruit, placement in a pack, transit temperature, etc., may affect the quality and price per se. it is rightly said that fresh commodities are living and thus need favourable conditions and delicate handling.

Conclusions and Policy Suggestions

Protected cultivation is a new farming concept which may ensure higher income, employment and descent living standards even on marginal and small land holdings. However, protected cultivation at the same time is highly capital and knowledge intensive requiring substantial initial investment and scientific skills. High productivity, profitability and equally efficient marketing system are the prerequisites for success and sustainability. The following strategic interventions would further promote the adoption of protected cultivation:

1. The viability of the protected cultivation projects were analyzed using different subsidy rates. The net present value is highest in 80% subsidy rate whereas 50% and 25% subsidy rates are not feasible. The benefit cost ratio also higher in 80% subsidy rate. Hence, provision of 80% subsidy to the farmers in protected cultivation schemes is feasible.
2. The farmers need to be educated and trained before starting poly house on their farms. The training should include important aspects of design and layout, selection of site, proper installation of irrigation/fertigation units, selection of crop/variety and good crop management practices.
3. The farmers should select the crops with due consideration of the trends in the market prices. The growers should analyze the past trends and develop necessary market intelligence like altering the supply seasons of certain vegetable commodities to avoid peak seasons gluts by adjusting sowing/harvesting time.
4. The protected cultivation of vegetable commodities in early or late seasons could prove to be a bonanza to farmers to reap the benefits of lean season high prices.
5. Promotion of farmers'/private Mandies, contract farming, setting of market extension cell and Standard Grading Bureau in the principal markets may be implemented to help farmers marketing commodities produced in poly houses. After the implementation of poly house technology, it is now turn of marketing endeavors which will decide the profitability and success of protected cultivation.

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