



Protected Cultivation Of Vegetable Crops As A Livelihood Opportunity In India

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Abstract: Protected cultivation of vegetable crops in India offers significant potential for improving livelihoods by enhancing productivity and quality. By using technologies such as greenhouses and net houses, farmers can protect crops from adverse weather, pests, and diseases, leading to higher yields and better market prices. This approach can also extend growing seasons and allow for year-round production. Additionally, it can create employment opportunities and boost income for rural communities. However, challenges such as high initial costs and technical knowledge requirements need to be addressed to maximize its benefits.

Index Terms – Greenhouse, Net house, Climate, Diseases, Pests

INTRODUCTION

Climate change can lead to adverse climatic condition, because of these adverse changes it effects agricultural production in India. So, for the development of healthy crops and to provide a microclimatic condition to crops, the protected cultivation is practice to mitigating climate risk (Aditya, P., Rao, V, et al.,2023). It is a method of growing crops under a controlled environment and to protect from the adverse conditions using innovative structure like playhouse, net houses, tunnels etc., and also, it's more likely to develop sustainable use of inputs such as fertilizers, pesticides and water utilized more efficiently and improved productivity with better quality. Protected cultivation can help the farmers to produce off season crop production and also it reduces the emission of greenhouse gases (El-Solh, M., Moustafa, A. T., & Aw-Hassan, A.,2011). The protected cultivation technology is involved the controlled environmental factors like temperature, humidity, fertilizers, soil, water, light etc., by this production technology the farmers can look forward to a better and additional earning for high quality produce. the product obtained by this method was three to five times higher than other methods and also it helps to earns lots of money (Gruda, N., Bisbis, M., & Tanny, J.,2019).

As compared to other countries protected cultivation in INDIA is only 0.2 percent, so it considers as a very nascent stage. This technology was developed in the early nineties. After that the National horticulture mission (NHM) developed initiatives programs in INDIA between 2005-06 and 2017-18 and at present day the vegetable production is 11.15% in global (Jayasurya, P., Chatterjee, S., et al.,2021).

The review seeks to conduct its current status into the global arena by inspecting various aspects of this major and become important field of horticulture, so that protected cultivation includes a wide range of agricultural practices. It is the main reason for which outdoor farming is more distressed by weather as compared to indoor farming (Jensen, M. H. et al.,2001).

In the technique of protected cultivation of vegetable crops the land plays the important role. In several parts of Indian people are promote vegetable using protected structures due to various regions among them the climate change is one also. Consequently, protected cultivation is more popular in India (Jethi, R., Srinivas, K.,2012). The crops are grown under protected structure are healthier and more beneficial than open field crops and gives more returns to farmers. Vegetable crop provides various types of nutrients, the changes are done to crop to provide all health benefits.

The production of vegetable crops goes through a remarkable change of increasing from 0.69 billion metric tons in 2003 to 1.75 billion metric tons in 2013. Due to population growth in urban areas, it's expected to produce 60% more than the recent time. Worlds 115 countries uses greenhouse nearly 623 302 hectares from which only 402 981 hectares is used for the production of vegetable crops (Kaushik, R. A., & Ameta, K. D.,2014). During rainy season, insects-proof net houses may be used to cultivate vegetables such as tomatoes, chilies, and sweet peppers without the risk of viruses. Polybrenes have been effective for producing plant in cold desert area (Mehta, K., et al.,2020).

I. NEED FOR PROTECTED CULTIVATION

1. A total of more than 113.5 million tons produced, India horticulture ranks second only to China. This represents a tremendous rise in vegetable production. However, at the end of 2020, it is predicted that the yearly requirement for vegetables would be around 135 million tons.
2. In the northern zone temperature is extremely low about -5 to -30 0c during winters season and heavy snowfall which makes vegetables growing difficult exercise.
3. Due to increase demand on high-quality vegetables.
4. Growing urbanization, industry, and population pressure are making productive land become rarer every day (Negi, V. S., Maikhuri, R. K.,2013).
5. Vegetable cultivation is affected due to biotic and abiotic stress during and after the rainy season. Because of the majority of vegetables suffer significant damages from viruses, bugs, and illnesses, which lower the quality of vegetables.

II. PROTECTED STRUCTURES

There are different types of structures are present for the protected cultivation of vegetable crops.

A. Net house –

Net house is one of the types of protected structure, there are two types of net houses one is shaded net and another one is insect-proofs net. Shade net protect the crop from solar radiation, wilting and these nets are available in 3 colors i.e., black, green and white. Insects net are used to control flying insects and control breeding programs (Nordey, T., et al.,2017).



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B. walk-in-tunnels – It is an arc shaped simple structure of about 2 to 2.5 m height at center and 4m width. These tunnels are suitable for nursery raising of capsicum, beans, tomato, etc.



C. Plastic mulch –

It is a type of practice method for the covering of plant surface to make conditions more conducive for moisture conservation and plant growth, mainly black polythene mulches are used. In this system silver and yellow color films are used to repel insects like aphids and white flies (Prakash, P., et al., 2020).



D. Soil trenches –

Inexpensive and easy construction for cultivating vegetables throughout harsh winters is trench. There is another name present is 'underground solar green dwelling' it typically measures between 5 and 6 meters wide and 2 to 3 meters deep. Vegetables can be grown via trenches, which harnesses soil and solar heat. In the chilly desert regions.

E. Floating plastic covers –

Large open fields are covered with transparent plastic sheet to shield vegetable crops from frost, snow, and cold weather.



F. Hot beds –

The idea underlying the traditional hot beds is the vegetable can be grown in subzero temperature by harnessing the heat produced by failure of manure. Layers of straw and partially decomposing manure are alternated to create these on the ground for off season nursery growing (Sharma, A., Lata, H., et al., 2023).



G. Shade net house –

A shade house is an inexpensively constructed covered structure with gaps for the necessary air, sunshine, and moisture to go through that is surrounded by shade nets or any other woven material. It produces the right kind of microclimate, which is thought to be highly favorable for plant development. The two main parts of a shade net house structure are the cladding material and the frame. The frame of the shade house supports the cladding and is made to withstand wind, rain, and crop weight. Depending on the type of structural material used, a shade net house's life span may range up to five years.



III. FACTORS AFFECTING PROTECTED CULTIVATION

- Climate and soil
- Cost
- Knowledge and skill
- Market demand and profitability

3.1 Advantages Of Protected Cultivation Of Vegetable Crops

- No matter the season, vegetables can be produced all year round. Vegetables can be grown inside the protected structure to overcome an unfavorable climate for their development.
- Vegetable production can occur outside of the seasons, which can greatly boost farmers' profits.
- It facilitates the production of healthy, high- quality vegetable seedlings and early crop stands that are robust and resilient.
- It's help in production of disease-free seed production.
- It makes vegetables farming feasible in regions like high altitude deserts where it is not feasible in open conditions.
- When low-cost covered structures are used for vegetables per unit of areas can rise by about four times.

3.2 Challenges of Protected Cultivation

Farmers are facing different challenges during crops production. Climate change produce challenges and negative impact on vegetable production. Among all the vegetables, tomato is the highly cultivated one in whole world (Singh, A. K., & Sabir, N.,2022).

- Extreme weather like high temperature in summer and high temperature in winter produce physiological impact on different crops.
- Global climate changes especially rainfall and extreme high temperature effects the productivity of vegetable crops.
- Latitudinal and altitudinal shifts in ecological zone effects the production of vegetable crops.
- Extreme conditions effect the soil fertility and increase soil erosion.

- The water availability adversely effects the crop production, like drought causes an increase in solute concentration in the soil leading to an osmotic flow of water out of plant cell.
- Crop yield of majority

3.3 Protected Cultivation Vegetable Crops in India

Vegetable cultivation under the protected structure, the off-season cultivated vegetables gives good returns to the farmers. Production of tomato, chili, sweet paper and other vegetables during rainy season cultivated under insect's proof net houses to protect from viruses. In order to generate ideal microclimates that supports crop production, greenhouse farming and other form of protected cultivation have been developed, this helps to produce crops entire the year. In traditional method temperature is the parameter which is used to overcome from extreme cold condition (Sonawane, Y.R et al.2008).

Advanced commercial greenhouse with controlled climate is very few in India, where the polyethylene houses are increasingly popular tropical and temperate regions. Vegetables growing in greenhouses has been encouraged by a number of private seed companies. India has comparatively little land covered in greenhouses when compared to other countries (Spehia, R. S., et al.,2015).

3.1 Livelihood Opportunity of Protected Vegetable Crops

Protected cultivation refers to agricultural practices that involve growing crops in a controlled environment, such as greenhouses shade houses, or net houses. This method offers several livelihood opportunities, particularly for farmers (Theurl, M. C., Hörtenhuber, S. J.,2017). Here are some key points regarding the livelihood opportunities associated with protected cultivation:

1. Increased Crop Yield and Quality:

Protected cultivation can lead to higher production levels due to controlled environmental conditions, minimizing the impact of weather variability and pests. This can result in greater income for farmers.

2. Diverse Crop Production:

Farmers can grow a variety of high-value crops, including off-season vegetables, fruits, and flowers. This diversification can help farmers stabilize their income and reduce risk.

3. Employment Generation:

The establishment and operation of greenhouse facilities can create numerous jobs in local communities, including roles in construction, maintenance, and ongoing farming operations.

4. Market Access:

Protected crops can meet the demand for fresh produce throughout the year, allowing farmers to access higher-value markets and potentially export markets which were previously inaccessible.

5. Enhanced Resource Efficiency:

Protected cultivation can optimize resource use, including water and fertilizers, leading to sustainable farming practices that can attract investment and funding opportunities.

3.3 Protected Cultivation of High Value Vegetable Crops

Although there are many benefits to growing crops under cover, now a days it's become more and more important to raise high-value cash crops with the best quality product that are cultivated in off season with the additional advantages protected cultivation helps grower to achieve good returns per acre of land (Kumar et al. 2007). Most widely cultivated crops under greenhouses are tomatoes, capsicums, and cucumbers, which also yield better yields (Chandra et al.2000). in Himachal Pradesh, cultivation of cucumber in low-cost plastic greenhouses offers to cultivating crops during a time, this gives security a year-round supply of fresh vegetables while using resources completely (Sharma et al. 2009).

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