



Protected Cultivation: An Innovative Approach

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Application of plastics in agriculture, known as “Plasticulture” has enormous potential to enhance the productivity of natural resources which has been realised in western countries since 1940s and onwards. Protected cultivation is one of the interventions of plasticulture which is highly promising to provide solution to most of the burning problems faced by agriculture all over the world. Protected cultivation is a process of growing crops in a controlled environment. Protected cultivation is future because Land and Water – Nature’s gift to mankind is not unlimited and free forever.

Indian context, the plasticulture was explored to enhance the productivity of different agricultural production systems, mostly after 1980s after establishment of National Committee on use of Plastics in Agriculture (NCPA). As an important constituent of NCPA, the Indian Council of Agricultural Research was assigned the task for research on the issue, and as a result the All India Coordinated Research Project (AICRP) on Application of Plastics in Agriculture was started in 1988 by ICAR. At present the AICRP is being operated at eleven centres located in different agro-ecologic areas and contributing in research and development on different plasticulture issues as per need and conditions prevailing in mandated areas of the centres.

Protected cultivation is one of answer to most of the burning issues facing Indian Agriculture including adversities due to uncertain and varying climatic conditions, climate change, improper uses and low productivity of natural resources, nutritional security in topographic and climatic disadvantaged areas, environmental pollution due to pesticide use, etc.

It generally refers to providing congenial conditions for better plant growth and enhancing the production level through artificial means.

Why protected cultivation?

Greenhouses are mostly used as rain shelters, particularly in high rainfall areas of India such as North-eastern states and coastal regions. Greenhouses are being commercially used for production of exotic (non-native) and off-season vegetables, export-quality cut flowers and also for raising quality seedlings. Economic returns from the high value agricultural produce can be increased substantially when grown under greenhouse conditions. For the crops under protected environment, the use of chemical pesticides and insecticides can be kept minimal to avoid their residues on the crop produce.

Govt. Initiatives on Protected Cultivation

- Water Management – Drip Irrigation System – Sprinkler Irrigation System

- Protected Cultivation – Greenhouse – Plastic Tunnel – Shade net House – Walk in Tunnels – Plant Protection Nets
- Surface Cover Cultivation – Plastic Mulching – Soil Solarisation
- Water Resource Management – Farm Pond & Reservoir lined with Plastic Films
- Vermi Bed – Organic Farming

Advantages

- Ensures the production of any plant at any place and throughout the year
- Blemish-free high quality product
- Easy to control insect-pests and diseases
- Water requirement reduces
- Labour requirement is less
- Earliness as it reduces crop duration
- Grow crop in any season
- Higher production with better quality of produce
- Minimising the use of pesticides in crop production
- Promotion of high value, quality horticultural produce
- Propagation of planting material to improve germination percentage, healthy, uniform, disease free planting material and better hardening

It makes possible by controlling the climatic conditions by providing full or partial covering surrounding the plant so that plant does not experience higher or low temperatures or humidity, while getting enough light for photosynthesis, optimum fertilisation and watering, and other factors for best growth and production. In the present day context, the interventions include polythene covered greenhouses (polyhouses), shade net houses, insect net houses, low plastic tunnels, row covers, plastic film mulching, etc.

If the recommended and needful package of practices is adopted skilfully with exactness, the any crop can be grown in any season, at any place using protected cultivation technique.

It enables to control climate (temperature, humidity, wind, light intensity etc.), atmospheric gas composition (mainly CO₂ concentration), fertilisation, watering, pest and diseases etc. which results in better plant growth, better reproduction, minimised harmful effects of different factors (climate and agronomy) and higher production with better quality of produce.

Disadvantages

- i. High cost of initial infrastructure (capital cost).
- ii. Non-availability of skilled human power and their replacement locally.
- iii. Lack of technical knowledge of growing crops under protected structures.
- iv. All the operations are very intensive and require constant effort.
- v. Requires close supervision and monitoring.
- vi. A few pests and soil-borne pathogens are difficult to manage.
- vii. Repair and maintenance are major hurdles.
- viii. Requires assured marketing, since the investment of resources like time, effort and finances, is expected to be very high.

Selected Impacts

Tomato yields increased by 192 percent in soilless culture compared to soil-based protected culture in UAE. Hydroponics also saved some 120 m³ of water for each ton of tomato compared to conventional soil systems.

- Cucumber yields increased by 40 percent in soilless closed systems in Oman, and reduced water use and the application of fertilizers and pesticides.
- Across the Arabian Peninsula, hydroponics with optimal crop management increased water productivity fifteen-fold, compared to traditional field production.
- Farmers have been able to recover the cost of greenhouse construction within two years.

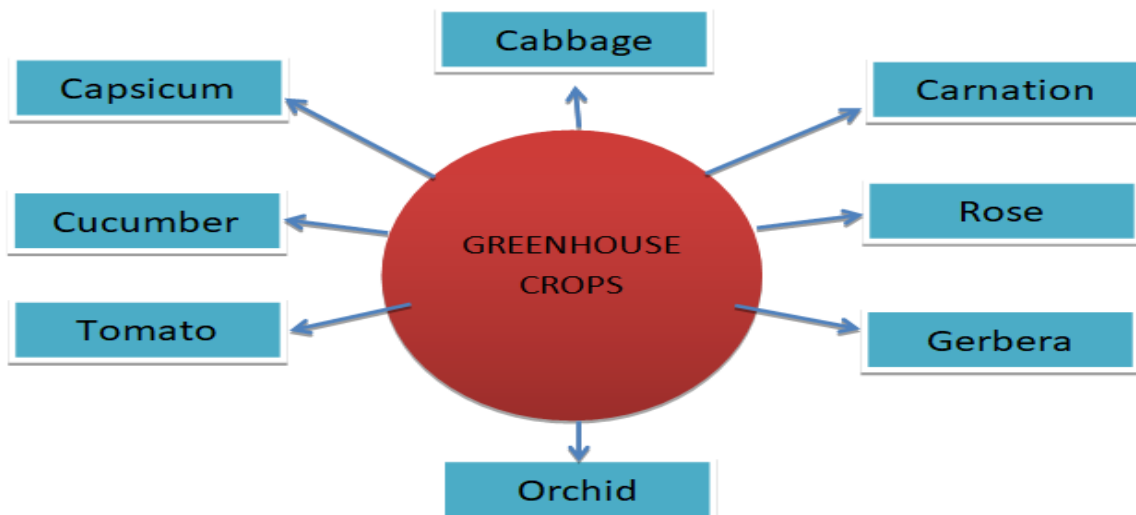
Green house

A greenhouse is a covered structure which protects plants from vagaries of weather or environment i.e. wind, precipitation, excess solar radiation, temperature extremes and considerable attack of pests and diseases.



Principle of greenhouse: The greenhouse is covered with a transparent material such as plastic, PVC sheet or glass. Based upon its transparency the greenhouse cover transmits most of the sunlight. The crop, floor and other objects inside the greenhouse absorb the sunlight admitted inside the greenhouse. These objects in turn emit long wave thermal radiations for which the greenhouse covering material has lower transparency and as a result of this the solar energy is trapped thus leading to increased temperature inside the greenhouse. This is known as greenhouse effect.

Crops covered under Green house:



Advantages

- ♣ Moderates temperature & humidity.
- ♣ Plant propagation is effective.
- ♣ Helps to improve quality and quantity of produce.
- ♣ Reduces infestation of disease/pests.
- ♣ Savings in water and fertilizer requirements as compared to open field cultivation.
- ♣ Reduces gestation period of the crop

Shade net house are considered as one of the major technologies to provide development of healthy grafts/seedlings & hardening for various horticultural crops irrespective of climatic conditions.

Crops under Shade net House

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|----------------|-----------------|--------------|
| 1. Ridge guard | 5. Bottle guard | 9. Anthurium |
| 2. Cucumber | 6. Chilli | 10. Gerbera |
| 3. Okra | 7. Broccoli | |
| 4. Capsicum | 8. Rose | |