

# Protected Agriculture

## Climate Smart Agriculture (CSA) Technology Farmer's Guide







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<https://cop.sac.org.bd/about-c-suces/>

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### **Cover Image Source**

Title: Polyhouse - net  
Source/credit: Mamata Pradhan/IFPRI, Location: Bhutan

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## What?

Protected agriculture is a farming technique that involves creating a controlled environment to shield crops from harsh weather conditions, pests, and diseases. This method utilizes structures like greenhouses, tunnels, or nettings to provide plants with optimal growing conditions, allowing farmers to extend the growing season and improve crop quality and yield.

- Protected agriculture is a process of growing crops in a controlled environment.
- Temperature, relative humidity, light can be regulated partially or fully.
- The micro-environment surrounding the plant body is controlled partially/ fully to maximize the yield while saving resources.
- Protected Agriculture (PA) can better optimize the use of resources vulnerable to climate change and build a more robust sustainable food system.
- Polyhouse is a subset of greenhouse in PA.



**Title:** Polyhouse

**Source/credit:** Mamata Pradhan/IFPRI

**Location:** Bhutan



# Why?

- **Weather Protection:** Shields crops from extreme temperatures, wind, hail, and heavy rain, providing a stable environment for growth.
- **Pest and Disease Management:** Prevents pests and diseases from attacking crops, reducing the need for chemical pesticides and promoting healthier plants.
- **Optimized Growing Conditions:** Allows farmers to control factors like temperature, humidity, and light, creating ideal conditions for crop growth and development.
- **Year-Round Production:** Extends the growing season, enabling farmers to cultivate crops year-round or during periods when outdoor conditions are unfavorable.
- **Resource Efficiency:** Maximizes resource use by reducing water consumption, minimizing nutrient leaching, and improving fertilizer efficiency.

# Where can you apply?

Protected agriculture can be implemented in various settings, including -

- **Open Fields:** Polyhouses or tunnels can be set up directly on open fields.
- **Urban Areas:** Rooftop gardens or vertical farms in urban settings.
- **Remote Locations:** Provides a means of farming in areas with harsh climates or limited access to agriculturally-productive land.



**Title:** Greenhouse - Net

**Source/credit:** Mamata Pradhan/IFPRI

**Location:** Sri Lanka



## Commonly used PA technologies

- Forced ventilated greenhouse
- Naturally ventilated polyhouse
- Plastic tunnel
- Shed net house
- Insect proof net house
- Hydroponics
- Mulching & drip irrigation



**Poly House**

**Title:** Polyhouse

**Source/credit:** Mamata Pradhan/IFPRI

**Location:** Bhutan

## Things to remember, before application

- High initial cost (capital cost)\*
- Repair and maintenance
- All operations are intensive
- Requires higher degree of management
- Skilled human resource at local level
- Not all crops are profitable under protected condition

\*Cost might vary country to country



**Mulching & drip irrigation**

**Title:** Polyhouse

**Source/credit:** Mamata Pradhan/IFPRI

**Location:** Bhutan





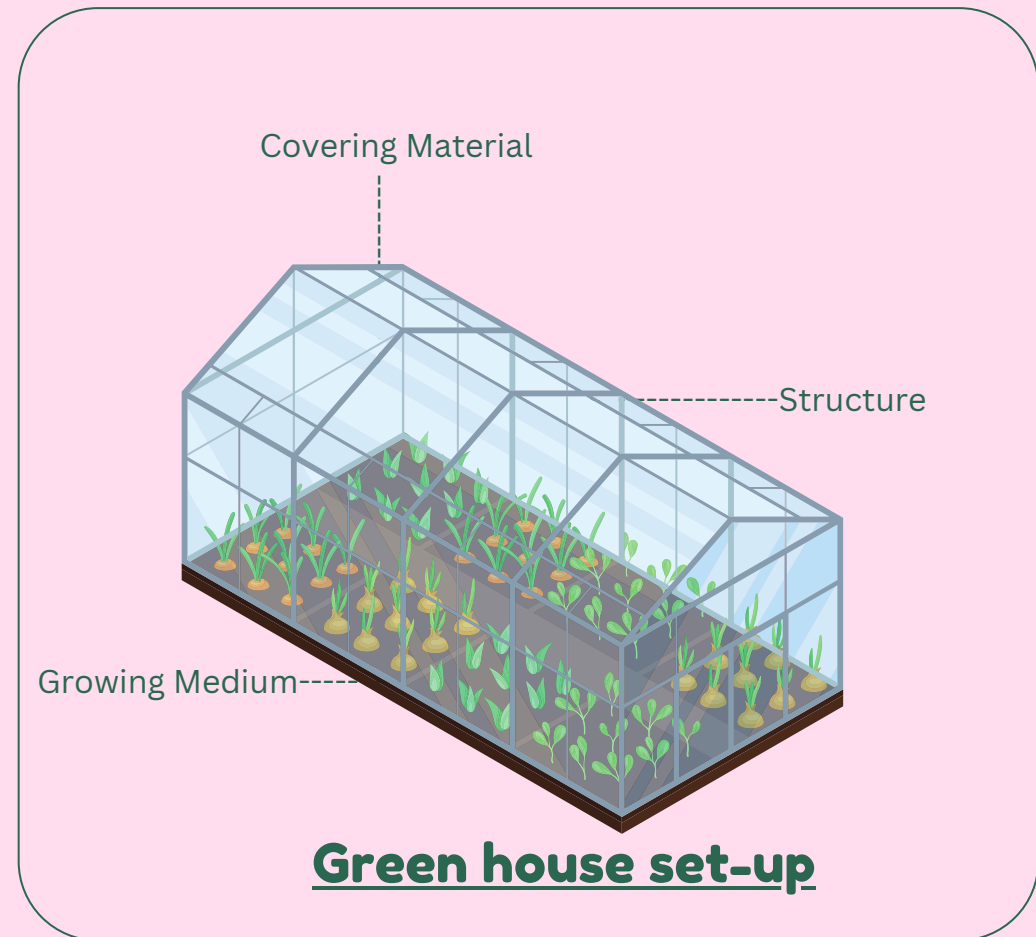
**Title:** Polyhouse  
**Source/credit:** Mamata Pradhan/IFPRI  
**Location:** Bhutan

## Greenhouse

Among all the protected farming options, **greenhouse cultivation provides maximum benefits**. There are 2 types of greenhouse structures -

1. **Forced ventilated (fan )**
2. **Naturally ventilated (open roof)**

Main components of greenhouse includes Frame, Cladding material, Climate control system.



## Main components of Polyhouse

- **Frame Structure:** Greenhouses, tunnels, or nettings serve as the framework that provides physical protection for crops. These structures shield crops from adverse weather conditions such as extreme temperatures, wind, rain, and hail. Greenhouses are permanent structures with rigid frames and coverings, while tunnels are more flexible and can be easily moved or adjusted. Nettings provide protection against insects and birds while allowing airflow.
- **Covering Materials:** Polyethylene film, polycarbonate sheets are commonly used as coverings for protected agriculture structures. These materials regulate light transmission and temperature inside the structure, creating a favorable microclimate for plant growth. Polyethylene film is cost-effective and versatile, while glass offers durability and light transmission. Polycarbonate sheets provide both insulation and durability.
- **Climate Control system:** Ventilation systems, heating, cooling, and irrigation systems are essential for maintaining optimal growing conditions within protected agriculture structures. They allow airflow, regulate humidity levels and prevent heat buildup. They also provide warmth during colder periods to protect crops from frost damage and prevent overheating during hot weather by circulating air or using shading techniques. The irrigation system ensures consistent watering of plants and promote healthy growth and water stress.
- **Growing Medium:** Plants may be grown in soil, or soilless mediums like hydroponics or substrates are commonly used in protected agriculture to grow crops efficiently. These mediums offer better control over nutrient levels and water distribution, promoting faster growth and higher yields. Hydroponic systems use nutrient-rich water to deliver essential nutrients directly to plant roots. Substrates like coco coir, perlite, or rockwool provide support for plant roots and retain moisture.



## Suitable Crop

One can grow almost any crop in protected agriculture, but some popular choices include high-value horticulture crops including flowers, tomatoes, cucumbers, lettuce, peppers, and herbs among others. These crops thrive in the controlled environment provided by protected structures, producing high yields and quality. One can choose crops that suit the local market demand and climate for the best results.

## Suitable Slopes

Protected agriculture is typically implemented on flat or gently sloping lands. This terrain makes it easier to set up and manage structures such as greenhouses or tunnels. Steep slopes may present challenges in construction and maintenance and can affect water drainage and soil stability.

## Suitable Soil

In protected agriculture, both soil and soilless growing mediums like coco coir, perlite, or rockwool are used. Soilless mediums help plants grow faster and healthier by providing better control over nutrients and water. However, soil can also be used as long as it is well-drained and rich in nutrients to support plant growth.

## Suitable Irrigation Type

Efficient irrigation systems like drip or micro-sprinklers are commonly used in PA to save water and give plants the right amount they need. These systems deliver water directly to the plants' roots, minimizing waste and ensuring they get just enough to thrive. Regularly check your irrigation system to make sure it's working well and adjust watering based on your plants' needs and the weather.



**Title:** Greenhouse - Net  
**Source/credit:** Mamata Pradhan/IFPRI  
**Location:** Bhutan





## Remember

- **Maintenance:** Regular maintenance of structures and equipment is crucial to ensure proper functioning and crop health.
- **Pest and Disease Monitoring:** Even in a controlled environment, pests can still be a concern, so monitoring and preventive measures are essential.
- **Crop Rotation and Diversity:** Implementing crop rotation and diversification practices helps prevent soil depletion and reduces the risk of pest and disease outbreaks.

**Title:** Polyhouse

**Source/credit:** Mamata Pradhan/IFPRI

**Location:** Bhutan



# Activity Time

## Activity 01 : Picture your farm

- Try drawing your farm (Need not be perfect) using simple lines, Curves or shapes.
- Try giving a name to your farm as you recognise it based on its size, location or may be based on directions it is facing.
- Write or draw crop names as plan.
- Try pasting a picture/photo if you are not willing to draw at all.

## Activity 03 : Evaluate CSA methods

- Try evaluating adopted CSA methods and keep a track over the year.
- Try keeping as per your real experience.
- Ask Facilitator to guide if you are not able to see significant impact on your farming practice.

**All activities would be performed with the help of facilitators.**

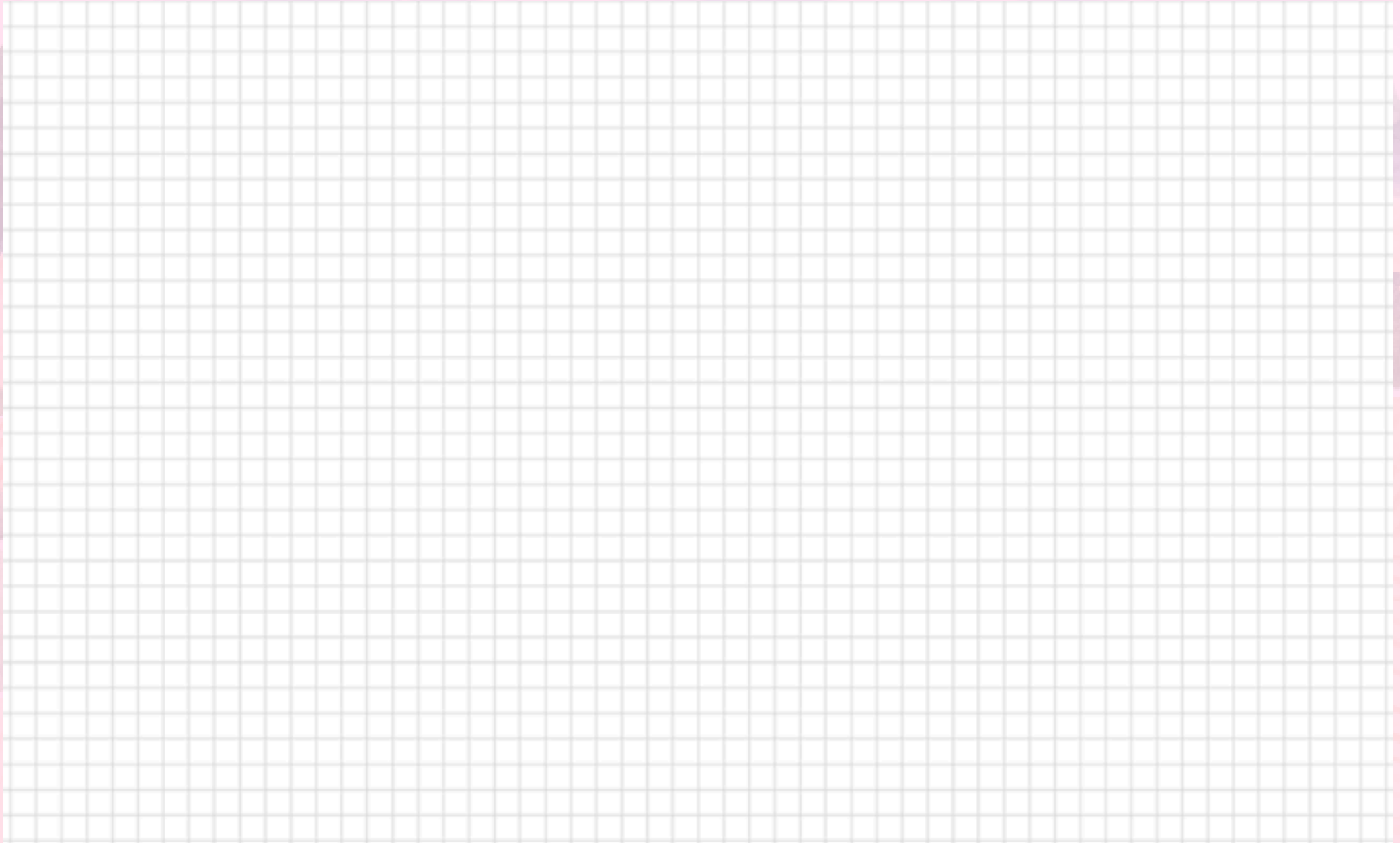
## Activity 02 : Create your farm profile

- Try Filling information of your farm.
- Take help of your facilitator if you can not fill it on your own.
- Try discussing it with other farmers in farmer group.
- Try to learn more about farm profile.

## Activity 04: Feedback form

- Give feedback as it will help your facilitator to help and improve your learning.
- Discuss it with other farmers and learn about their experience as well.
- Ask questions and take help of your facilitator, when you need.

## Activity 01 : Picture your farm (Current conditions)





## Activity 02: Create your farm profile

• Farm type	
• Terrain	
• Area	
• Aspect (Farm facing direction)	
• Physical features	
• Soil Type	
• Inputs needed <ul style="list-style-type: none"><li>◦ Labor</li><li>◦ Machinery</li><li>◦ Water</li><li>◦ electricity</li><li>◦ fertilizer</li><li>◦ pumps</li></ul>	
• Temperature Range (By month)	
• Precipitation Range (By month)	
• Commonly grown crops	
• Natural challenges (climate, pests, invasive species-weeds)	
• Any CSA methods in use	

## Activity 03 : Evaluate CSA methods

(Post-implementation)



Decreased



No impact



Partially Increased



Significantly Increased

### Resources and indicators

• EASE OF TECHNOLOGY USAGE

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• CROP PRODUCTION



• CROP QUALITY



• OCCURRENCE OF PEST



• OCCURRENCE OF WEEDS



• WATER REQUIRED



• FERTILIZER REQUIRED



• LABOR REQUIRED



• INCOME



• WORKLOAD



• FREE TIME AVAILABLE



• USAGE OF CSA METHODS IN FUTURE



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## Activity 04 : Feedback form



Do you have any question/Suggestion?

Fill the feedback form below at end of your training by marking it like this. 😊👍 that is closer to your experience.

1. What do you like the most about this guide?

2. Is there anything that you want to suggest for improvement?

3. Do you have any suggestions for facilitator?

4. How useful are these sessions for you for your farm?



5. How engaging are these sessions?



6. How likely are you to recommend CSA methods to other farmers?



Notes







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**Scan this QR code**  
**using your phone anytime or click**  
**the link for more information.**



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