SUNSHINE AGRICULTURE
e-Newsletter

ISSN (E): 2583 – 0821

Sun. Agri.:e- Newsletter, (2025) 5(5), 12-14

Article ID: 385

Growing Vegetables in a Low-Cost Polyhouse: A Hands-On Handbook for Small-Scale Farmers

Shani Kumar[1], SubhashVerma[2], Deepak Kher[3], Ankit Kumar Goyal[4]

[1]Assistant Professor, School of Agriculture, Sanjeev Agrawal Global Educational University, Bhopal, 462022
[2]Assistant Professor, Eklavya University, Damoh, 470661
[3]Dean, School of Agriculture, Sanjeev Agrawal Global Educational University, Bhopal, 462022
[4]Research Scholar, C.S.A.U.A.&T., Kanpur, 208002

Open Access

Available online at
http://sunshineagriculture.vitalbiotech.org/

Article History
Received: 05. 05.2025
Revised: 11. 05.2025
Accepted: 16. 05.2025

INTRODUCTION

As climate change is gaining a stronger impact on traditional farming, there is a corresponding demand for methods that will counteract the risks of unpredictable weather, pest infestations, and declining soil fertility. One such sustainable method is protected cultivation, and among its various types, the low-cost polyhouse is one of its more attractive, budget-friendly options. This inexpensive, straightforward facility maintains a desirable microclimatic condition for crops, enabling farmers, particularly those with limited financial capabilities, to produce high-value vegetables year-round.

What is a Low-Cost Polyhouse?

A polyhouse is a greenhouse that is produced by covering a structure with semi-transparent or transparent sheets of polyethylene. It offers controlled or semi-controlled climatic conditions for plant growth. In contrast to full-size, highly automated commercial greenhouses, low-cost polyhouses are built using locally accessible, cheap materials including:

- Bamboo or wooden poles
- Galvanized iron (GI) pipes
- UV-stabilized low-gauge plastic films

These buildings are not just inexpensive but also low-maintenance, making them very appropriate for rural farming environments.

Table-1. Key Features of Low-Cost Polyhouses

Feature	Details
Cost	₹40 to ₹200 per square meter, depending on materials and size
Size	Ideal for **100 to 500 m²** land parcels
Ventilation	Relies on **passive ventilation** through side and top openings
Water Management	Supports **drip irrigation**, **mulching**, and rainwater harvesting
Crop Suitability	Excellent for **tomato, capsicum, cucumber, leafy greens**, and nursery raising

Advantages of Low-Cost Polyhouses

Protection from Weather

Low-cost polyhouses serve as a good cover against unfavorable weather conditions including heavy rain, hailstorms, frost, and strong gusts of wind. By keeping crops safe from these external factors, farmers are able to prevent crop loss and maintain more uniform production throughout the year.

Pest and Disease Control

The semi-enclosed nature of the internal environment within a polyhouse greatly limits exposure to disease and harmful pests. This reduces the use of chemical pesticides, resulting in healthier yields and lower production expense while encouraging safer and more environmentally friendly farming techniques.

Extended Growing Seasons

By providing a good microclimate, inexpensive polyhouses facilitate farmers to produce crops even during off-seasons. This helps them reap vegetables during times of low market availability, thus achieving better returns and enhanced profitability for the farm.

Improved Yield and Quality

The controlled climate within a polyhouse—temperature, humidity, and light that can be regulated—encourages uniform growth of crops. This results in increased yields per square meter and improved quality produce in terms of shape, size, and color that effectively meet market requirements.

Optimal Utilization of Resources

It involves incorporation of techniques like drip irrigation and mulching to utilize water and nutrients optimally. Up to 60% water conservation is possible and use of fertilizers can be increased, thereby making the process cost-saving and eco-friendly as well.

Construction Guidelines for a Low-Cost Polyhouse

Site Selection

Select a location with good drainage, full sun, and maximum sunlight exposure during the day. Ensure easy water accessibility for irrigation purposes and proximity to roads or marketplaces to enable easy transportation of produce.

Foundation and Frame

Use bamboo poles, wood supports, or galvanized iron (GI) pipes to build the polyhouse frame, depending on budget and availability. Fix the frame firmly using concrete foundations or pegs to allow for stability and wind resistance.

Covering Material

Install 200-micron UV-stabilized polyethylene sheets as the cover material. This material is strong, long-lasting, and offers sufficient light transmission for photosynthesis with protection from destructive ultraviolet light.

Ventilation Design

Install roll-up side curtains or mesh vents along the polyhouse walls to enhance passive ventilation. Proper air circulation assists in the control of temperature and humidity levels, avoiding overheating and the risk of fungal infections.

Irrigation System

Implement a drip irrigation system with inline emitters to supply accurate and consistent water delivery directly to the root zone. Pair this with a simple fertigation unit to provide nutrients effectively with irrigation, maximizing plant health and productivity.

Management Hints for Low-Cost Polyhouses

Temperature Regulation

Open the polyhouse side flaps or roll-up curtains during hot weather to ensure natural ventilation and prevent overheating. Natural ventilation allows plants to grow in an optimal temperature range, minimizing possibilities of heat stress for the crops.

Pest Scouting

Monitor frequently for pest infestation through yellow sticky traps (for flying pests such as whiteflies and aphids) and pheromone traps (for particular pests like fruit borers). Early detection allows timely and selective pest management, limiting the use of broad-spectrum pesticides.

Fertilizer Use

Implements fertigation practices using water-soluble fertilizers or liquid organic nutrients through the drip irrigation system. This provides uniform distribution of the nutrients, improves plant absorption, and minimizes wastage.

Rotation and Hygiene

Implement crop rotation to avoid accumulation of soil diseases and pests. Also, keep the polyhouse clean by clearing plant waste, disinfecting equipment, and sterilizing the structure during intervals between crop cycles to facilitate a healthy environment.

Table-2. Economic Considerations

Input	**Estimated Cost (INR) per 100 m²**
Structure and Polythene	Rs. 10,000 – Rs. 15,000
Drip Irrigation	Rs. 2,000 – Rs. 3,000
Seeds and Inputs	Rs. 1,500 – Rs. 2,000
Labor and Miscellaneous	Rs. 1,000
Total	**Rs. 14,500 – Rs. 21,000**

Potential returns from a 100 m² low-cost polyhouse can exceed Rs. 30,000 per season, depending on crop selection and market prices.

Appropriate Vegetables for Low-Cost Polyhouse Production

Tomato

Tomato is the most commonly cultivated crop in polyhouses based on its high demand in the market and susceptibility to unfavorable weather conditions. Tomatoes exhibit enhanced fruit quality, longer harvesting seasons, and greater yields under protected environments.

Capsicum (Bell Peppers)

Capsicum grows optimally in a controlled setup, where even temperature and humidity conditions facilitate thicker fruit walls, deeper colors, and improved shape. It is a very suitable crop for protected cultivation, particularly during colder seasons.

Cucumber

Cucumber is a rapid growth crop that gains a lot of advantage from the warmth and humidity of a polyhouse. It needs trellising support and frequent harvesting and is noted for high productivity and fast return on investment.

Leafy Greens (Spinach, Lettuce, etc.)

Leafy greens like spinach, lettuce, amaranthus, and fenugreek thrive in low-cost polyhouses, particularly during extreme temperatures. The conditions maintain tenderness, color, and freshness.

Beans and Other Climbers

Pole beans and other climbing crops like gourds (bitter gourd, ridge gourd) do well in polyhouses when supported by adequate trellising systems. These crops are aided by vertical space use and improved pest management.

CONCLUSION

Low-cost polyhouses represent a transformative solution for **small and marginal farmers** aiming to adopt **climate-smart agricultural practices**. With a relatively modest investment, these structures enable farmers to **enhance crop productivity, increase income, and minimize risks** associated with climate variability, pests, and resource scarcity. The integration of technologies such as **drip irrigation, fertigation, and mulching** further improves efficiency and sustainability.

Moreover, with **government support through subsidies and training initiatives**, this technology is becoming increasingly accessible across rural India. As more farmers shift towards protected cultivation using low-cost polyhouses, Indian agriculture can evolve into a **more resilient, profitable, and environmentally sustainable system.**

REFERENCES

Indian Council of Agricultural Research (ICAR). (2020). *Protected Cultivation Technologies in India*. ICAR Publications.

Singh, B., & Jain, R. (2018). Low-cost greenhouse structures for vegetable production: A review. *Journal of Horticultural Research*, **28**(1), 43–50.

National Horticulture Board (NHB). (2021). *Subsidy Guidelines for Protected Cultivation*. Government of India.

Tiwari, G. N., &Goyal, R. K. (2003). *Greenhouse Technology: Fundamentals, Design, Modelling and Applications*. Narosa Publishing House.

Pandey, R., &Meena, M. L. (2019). Protected Cultivation of Horticultural Crops: Present Status and Future Prospects in India. *Agricultural Reviews*, **40**(3), 207–213.