

Name of Facility or centre	Polyhouse
Academic year of establishment	2021-22
School Name	School of Agriculture
Incharge Name	Dr. Shveta Sakariya

Introduction

A polyhouse, also known as a greenhouse, is a structure designed to create and maintain an ideal environment for plant growth. Typically made of transparent materials like polyethylene or glass, polyhouses regulate temperature, humidity, and light, allowing crops to thrive regardless of external conditions. They're widely used in agriculture for extending growing seasons, protecting plants from adverse weather, and optimizing yields.

Vision and Impact

The vision of polyhouses in agriculture is to revolutionize farming by providing controlled environments that optimize plant growth and productivity. By offering protection from extreme weather conditions, pests, and diseases, polyhouses enable farmers to grow high-quality crops year-round, regardless of geographic location or climate. This technology promotes sustainable agriculture practices by reducing water usage, minimizing chemical inputs, and increasing crop yields per unit area.

The impact of polyhouses is significant across various aspects:

- **Increased Yield:** Polyhouses allow for precise control of environmental factors such as temperature, humidity, and light, resulting in higher yields compared to traditional open-field farming.
- **Resource Efficiency:** By utilizing resources more efficiently, including water and fertilizers, polyhouse farming reduces waste and environmental impact.

- **Year-round Production:** With polyhouses, farmers can extend their growing seasons or even cultivate crops year-round, increasing overall production and ensuring a consistent food supply.
- **Quality Assurance:** The controlled environment in polyhouses helps maintain consistent quality and reduces the risk of crop damage or contamination, ensuring higher-quality produce for consumers.
- **Economic Opportunities:** Polyhouse farming creates opportunities for farmers to diversify their crops, access new markets, and generate additional income streams.
- **Climate Resilience:** In regions prone to extreme weather events or climate change impacts, polyhouses offer a buffer, protecting crops and livelihoods from adverse conditions.

Overall, polyhouses represent a modern approach to agriculture that addresses food security, sustainability, and economic development challenges.

Infrastructure and Facilities

The infrastructure and facilities of a polyhouse typically include:

- **Frame Structure:** The frame of a polyhouse is usually made of durable materials such as galvanized steel, aluminum, or wood. It provides the framework for the entire structure and supports the covering material.
- **Covering Material:** Polyhouses are covered with transparent materials like polyethylene film or polycarbonate sheets. These materials allow sunlight to enter while providing insulation and protection from external elements.
- **Ventilation System:** Adequate ventilation is crucial for regulating temperature and humidity inside the polyhouse. Ventilation systems may include side vents, roof vents, or fans to facilitate air circulation.

- **Irrigation System:** Efficient water management is essential in polyhouse farming. Irrigation systems such as drip irrigation or sprinklers deliver water directly to the plants' roots, minimizing water wastage and ensuring proper hydration.
- **Shading System:** To regulate light intensity and prevent overheating, polyhouses may be equipped with shading systems. These can include shade nets or retractable curtains that provide partial shade when needed.
- **Crop Support Structures:** Depending on the type of crops grown, polyhouses may feature support structures such as trellises, racks, or hanging systems to optimize space utilization and support plant growth.
- **Accessories:** Other accessories commonly found in polyhouses include benches or tables for holding pots or trays, nursery beds for seedling propagation, and storage facilities for tools and equipment.

Together, these infrastructure and facilities create an environment within the polyhouse that promotes optimal plant growth, crop protection, and productivity throughout the year

Photos





Research and Development Focus

The research and development focus of polyhouse technology encompasses several key areas aimed at improving efficiency, sustainability, and productivity. Some of the primary areas of focus include:

- **Climate Control Optimization:** Research aims to develop advanced climate control systems that can precisely regulate temperature, humidity, CO₂ levels, and light intensity within polyhouses. This involves exploring innovative technologies such as AI-driven control systems, sensors, and actuators to create optimal growing conditions for various crops.
- **Energy Efficiency:** There is ongoing research into energy-efficient heating, cooling, and lighting systems for polyhouses to reduce operational costs and environmental impact. This includes exploring renewable energy sources such as solar power and improving insulation to minimize heat loss.

- **Water Management:** Research focuses on enhancing water use efficiency through the development of advanced irrigation systems, water recycling and reuse techniques, and moisture sensors for precise irrigation scheduling. The goal is to minimize water wastage and ensure optimal hydration for crops.
- **Crop-Specific Solutions:** Tailored research is conducted to develop polyhouse systems optimized for specific crops, taking into account their unique environmental requirements, growth patterns, and pest management strategies. This includes breeding programs to develop new crop varieties suited for polyhouse cultivation.
- **Integrated Pest Management (IPM):** Research aims to integrate biological control methods, such as the use of beneficial insects and biopesticides, with cultural and physical control measures to manage pests and diseases in polyhouses effectively. This reduces reliance on chemical pesticides and promotes environmentally sustainable pest management practices.
- **Nutrient Management:** Studies focus on optimizing nutrient delivery systems, including fertigation (combining irrigation and fertilization), to ensure plants receive the right balance of essential nutrients for healthy growth. Research also explores sustainable sources of nutrients, such as organic fertilizers and nutrient recycling.
- **Data Analytics and Decision Support:** Research explores the use of data analytics, machine learning, and modeling techniques to analyze environmental data collected from polyhouses and provide growers with real-time insights and decision support for optimizing crop production.

By focusing on these areas, researchers aim to advance polyhouse technology, making it more efficient, sustainable, and economically viable for farmers around the world.

Collaborations and Applications

Collaborations and applications of polyhouse technology span various sectors and industries, driving innovation and addressing diverse challenges. Here are some examples:

- **Agricultural Research Institutions:** Collaborations between polyhouse manufacturers and agricultural research institutions facilitate the development of cutting-edge technologies and practices. Researchers work together to study crop responses to controlled environments, optimize climate management systems, and improve crop varieties for polyhouse cultivation.
- **Government Agencies:** Governments often collaborate with polyhouse manufacturers and farmers to promote sustainable agriculture practices, increase food security, and support rural development initiatives. This collaboration may involve providing subsidies, technical assistance, and policy support to encourage the adoption of polyhouse technology.
- **Academic Institutions:** Universities and academic research centers collaborate with polyhouse manufacturers to conduct research, train students, and disseminate knowledge about controlled environment agriculture. These collaborations contribute to advancements in crop science, engineering, and environmental sustainability.
- **Industry Partnerships:** Polyhouse manufacturers collaborate with technology companies, suppliers, and service providers to integrate innovative solutions into their products and services. This includes partnerships to develop advanced climate control systems, automation technologies, and data analytics platforms for optimizing polyhouse operations.
- **Farmers and Growers Associations:** Polyhouse manufacturers collaborate with farmers and growers associations to provide training, technical support, and market access for polyhouse-grown produce. These collaborations help farmers

adopt best practices, improve crop quality, and access premium markets for their products.

- **Research and Development Partnerships:** Polyhouse manufacturers collaborate with research institutions, startups, and technology companies to develop new products, technologies, and services for controlled environment agriculture. These collaborations drive innovation and accelerate the adoption of polyhouse technology in diverse applications.

These collaborations and applications demonstrate the versatility and potential of polyhouse technology to address global challenges and create sustainable solutions for agriculture and food production.



Incharge



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