



Types of Greenhouses and Their Effects on Crop Production

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Abstract

After the green revolution, India made enormous strides in agricultural production, but productivity is still poor due to climate change and the intrusion of conventional cultivation practices. Following the green revolution, India's agricultural output increased dramatically; but, because of climate change and the modification of conventional farming methods, productivity is still quite low. The world's food output needs to rise by 70% in order to meet the demand by 2050. Technology has allowed man to produce crops all year round. In this sense, controlling the local environment to maximize crop productivity and improve crop production in terms of quantity and quality-something that is not feasible on open fields-may be the sole alternative available to greenhouse technology. Over the years, greenhouse technology has become increasingly prevalent in this technical advancement. Currently, forward-thinking farmers are embracing commercial protected growing of premium flowers and vegetables (Maitra, 2020). Greenhouse structures are covered with glass or plastic film, transparent and translucent materials. Now, there are two ways of practice followed; one is a fully controlled

environment and the other being a partially controlled one. This technology of using greenhouses to grow plants is of significant importance, especially in areas where the climatic conditions are always on the extreme side and regions of high rainfall. For these various types of greenhouse structures are available for crop production. In general, no single style of greenhouse is seen to be the ideal because each type of greenhouse structure has pros and negatives depending on the application. Consequently, a variety of greenhouse designs that take into account the needs particular to each application, shape, material, and construction are available. Many academics have been interested in greenhouse management technology in recent decades, trying to find the best solution while taking the much-discussed energy consumption and cost reduction into account (Sahdev et al., 2017). Conversely, other scholars concentrate on the latest developments in construction design, geometry, diverse methods of temperature control, and the internal climate needs of agricultural greenhouses (Syed and Hachem, 2019). Nevertheless, the



greenhouse is still one of the essential topics in modern agriculture methodologies, where the technique of management and control is considered the principal area of investigation for achieving a high yield with reducing cost and energy consumption.

Type of Greenhouse based on cost

Low technology greenhouses: - A very small proportion of the farmers use low technology structures for production. The size of the low technology greenhouses is less than 3 metres in total height. The most common type low technology greenhouses involve tunnel houses provide poor ventilation as they do not have vertical walls. This type of structure is relatively inexpensive due to little or no automation is used. However, this type of structure provides basic advantages for crop production as compared to open field production.

Medium technology greenhouses: - Greenhouses with medium technology are usually characterized by vertical walls. The medium technology greenhouses typically have a total height of less than 5.5 meters and a diameter of more than 2 meters but less than 4 meters. Better ventilation is made possible by either the side wall or the roof of these kinds of green houses. They typically use glass or plastic film with a single or double skin, and they also offer medium automation.

High technology greenhouses: - The roof apex of the high-level greenhouse can reach a height of eight meters above ground, while the wall itself is at least four meters high. These structures perform well both environmentally and in terms of crop yield. This building includes side wall vents in addition to adequate roof ventilation. Glass, polycarbonate sheeting or plastic film, either single or double, are utilized as

cladding materials in high-level greenhouses. Environmental controls are automated. There is a tonne of options for both environmental and economic sustainability with these constructions. Use of pesticides also less significantly reduced. High technology structures provide a generally impressive sight and, internationally, are increasingly being involved in agribusiness opportunities. Although these greenhouses are capital intensive, they offer a highly productive, environmentally sustainable opportunity for an advanced fresh produce industry. Investment decisions should, wherever possible, look to install high technology greenhouses.

Type of Greenhouse based on shape

Lean-to type: - When positioned against one or more of the sides of an existing greenhouse construction, a lean-to style of greenhouse is appropriate. The current greenhouse structure's roof has been extended with covering material, properly covering the exposed space. The optimal orientation for sufficient solar exposure is to face southward with the entire building. This kind of greenhouse is restricted to single or double-row plant benches that measure between seven and twelve feet in width overall. Its length might match the building to which it is attached. The lean-to type greenhouse has the benefit of typically being the least priced construction and being adjacent to a heat source, water supply, and electrical outlet.

Even span type greenhouse: - The even span is the common type of greenhouse constructed fully on ground level with the two equal width and pitch of roof slopes. This type of greenhouse structure is used when the size of greenhouse is a small size and attached to a house at one gable end. This type of greenhouse is restricted to 2 or



3 rows of plant benches. The price of an even-span greenhouse structure is more as compared to the cost of a lean-to type, but it has eminent plasticity in design and suitable for more plants.

Uneven span type greenhouse:- This uneven span type of greenhouse is suitable for hilly or undulating terrains. The roofs of the structure are differed in width; which resembles the name of the structure and make the structures adaptable to the side slopes of hill. This type of greenhouses is rarely used as it is not adaptable for automation.

Ridge and furrow type greenhouse: - Two or more A-frame greenhouse structures joined to one another along the length of the eave are used in this sort of greenhouse design. The eave functions as a gutter or ditch to collect and manage snowmelt and rainwater. The side wall is removed in between. The greenhouses appear to have a single, vast interior room. Because there is less exposed wall surface through which heat escapes, the interior space in greenhouse structures minimizes labor, lowers automation costs, improves human management, and uses less fuel.

Saw tooth type greenhouse: - This type of greenhouses is similar to ridge and furrow types, except that this type provides natural ventilation from saw tooth form of the greenhouse. When open the saw tooth vent allows a continuous airflow to reduce the inside temperature or can be closed to optimize the climate control of the growing area.

Types of greenhouses based on covering materials

Glass greenhouses: In glass greenhouses, glass is employed as a covering material. It has the advantage of greater interior light intensity, higher air infiltration rate, lower interior humidity, and good disease

prevention quality as a covering material. Glass greenhouses are constructed using ridge and furrow, lean-to, and even span designs.

Plastic film greenhouses: - Flexible plastic sheets, such as polyvinyl chloride, polyethylene, and polyester, are used to cover this sort of greenhouse. Plastics are more common as a greenhouse covering material since they are less expensive and require less heating than glass greenhouses.

Rigid panel greenhouses: - Quonset type frame, also known as ridge and furrow type frame, is a greenhouse covering material made of polyvinyl chloride rigid panels, fibre glass-reinforced plastic, acrylic, and polycarbonate rigid panels. These materials, unlike plastic or glass, give a more consistent light intensity throughout the greenhouse and are also more resistant to breakage. High-quality panels have a longer lifespan, up to 20 years.

Conclusion

Greenhouses provide fresh vegetables and ornamentals year-round, worldwide; the type and equipment used in any region generally suit the local weather, construction materials availability, and type of crop. A greenhouse's efficiency and output are greatly influenced by its design. The most dependable and extensively used frame material for commercial greenhouse buildings is aluminum, and ridge and furrow greenhouse design offers notable productivity and efficiency in output. Similarly, the most economical covering material for crop cultivation is numerous sheets of polyethylene film.

References

Maitra, S., Shankar, T., Sairam, M. and Pine, S. (2020). Evaluation of gerbera (*Gerbera jamesonii* L.) cultivars for growth, yield and flower quality under protected



cultivation. Indian Journal of Natural Sciences, 10(60): 20271-20276.

Syed, A. M. and Hachem, C. (2019). Review of construction; geometry; heating, ventilation, and air-conditioning and indoor climate requirements of agricultural greenhouse. Journal of Biosystems Engineering, 44: 18- 27

Sahdev, R. K., Kumar, M. and Dhingra, A. K. (2019). A comprehensive review of greenhouse shapes and its applications. Frontiers in Energy, 13: 427-438.

