

Hand drawing of greenhouse photovoltaic support structure

What are the design strategies of passive solar greenhouses?

Via literature review and expert interview, this study summarizes the design strategies of passive solar greenhouses into (1) building orientation, (2) architectural shapes, (3) envelope materials, (4) heat storage in passive solar greenhouses, and (5) numerical modeling of passive solar greenhouses.

Can traditional PV systems be used for greenhouse application?

The use of traditional PV systems for greenhouse application has to take into account their integration on existing structures and glazing, as well as the trade-off between PV and plant requirements for the respective electrical and crop production.

Which orientation should a passive solar greenhouse be oriented?

In general, the choice of orientation for passive solar greenhouses is a multifaceted decision influenced by natural and man-made factors. While there is a consensus on optimal orientation for solar gain, adaptive strategies and user-centric considerations are increasingly shaping the final design.

Can photovoltaics be used in greenhouses?

The integration of photovoltaics (PV) into greenhouses is analyzed. Greenhouse energy demands, PV performances and effects on crop growth are reported. The application of organic, dye-sensitized and perovskite solar cells is described. The new PV technologies can promote sustainable, self-powered and smart greenhouses.

How does a passive solar greenhouse affect its performance?

First, the orientation of a passive solar greenhouse significantly influences its performance. Second, greenhouses exhibit various architectural shapes, including single- and multi-span, with transparent and opaque envelopes.

How can PV technology improve the sustainability of greenhouses?

The new PV technologies can promote sustainable, self-powered and smart greenhouses. Reducing the energy demand and dependency on fossil fuels is crucial for improving the sustainability of greenhouses, which are the most energy intensive systems in the agricultural sector.

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