

# Construction of Double Roof Solar Greenhouse in China

Can a Chinese solar greenhouse maximize solar energy utilization?

Given the aging of greenhouse facility, there is a need for investigating the transformation of existing greenhouses to maximize solar energy utilization. In this study, Chinese solar greenhouse (CSG) in the Beijing area served as an optimized prototype. A mathematical model was established to determine the range of CSG vertex positions.

How do Chinese-style greenhouses work?

Energy Efficiency: Chinese-style greenhouses primarily use solar energy as the heat source, reducing reliance on artificial heating, especially during cold winters. By capturing and storing solar heat, these greenhouses maintain warmth at lower costs.

How do Chinese passive solar greenhouses work?

Today's Chinese Passive Solar Greenhouses often use solid walls of bricks or clay on three sides. The fourth side, usually facing south, is transparent, often with plastic film. This design captures solar energy during the day through the transparent side. At night, the thick walls release stored heat, slowing down heat loss.

How to optimize Chinese solar greenhouse?

The greenhouse optimizing strategy combined lighting, heat storage and safety. The average solar radiation and temperature increased by  $5.4 \text{ MJ m}^{-2}$  and  $3.1 \text{ }^{\circ}\text{C}$ . The cost of optimizing Chinese solar greenhouse can be repaid in 1.6 years. The proposed framework can be applied to solar greenhouses at any latitude.

How much does a Chinese solar greenhouse cost?

In summary, a basic 100-square-meter Chinese Passive Solar Greenhouse could cost roughly between \$6,580 and \$16,250, or about \$6.11 to \$15.09 per square foot. Remember, this is a ballpark figure excluding labor and transport costs. Actual costs of a Chinese-style greenhouse might reach \$10-\$20 per square foot.

Can Chinese solar greenhouses be repaid in 1.6 years?

The cost of optimizing Chinese solar greenhouse can be repaid in 1.6 years. The proposed framework can be applied to solar greenhouses at any latitude. Given the aging of greenhouse facility, there is a need for investigating the transformation of existing greenhouses to maximize solar energy utilization.

**Keywords:** double-slope greenhouse; structural roof design; lighting

1. Introduction The double-slope solar greenhouse represents an advancement over the traditional south-facing solar greenhouse by incorporating an additional north-facing greenhouse that shares a common rear wall, resulting in a yin-yang layout [1]. The south-facing

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Beam Tunnel Green House for Winter, Winter Tomato/Cucumber Greenhouse with ...

The company is mainly engaged in various kinds of greenhouse, agricultural facilities, agricultural engineering design, production, sales and service of greenhouse materials; Construction of intelligent multi-span greenhouse, solar greenhouse, plastic greenhouse, glass greenhouse, scientific research greenhouse, experimental greenhouse, special-shaped ...

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Statistics show that between 2008 and 2018, the cold temperate zone of Northeast China saw an increase in greenhouse construction area from 85209.19 ha to 177584.77 ha; the arid northwest region saw an increase in greenhouse construction area from 25749.61 ha to 118855.52 ha; and the Yellow Sea and Huaihai regions saw an increase in greenhouse construction area from ...

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In modern farming, greenhouse cultivation plays an important role in ensuring food security, as well as the quality and efficiency of agricultural products (Forkuor et al., 2022) 2019, global greenhouse infrastructure spanned 1.3 million hectares, with China representing 60.4% of this area (Tong et al., 2024), predominantly in the form of solar greenhouses in northern regions.

Chinese solar greenhouses are agricultural facilities that have been used in north China for crop cultivation without additional heating during severe cold weather 1 the end of 2017, the total ...

1. Introduction. The Chinese solar greenhouse (CSG) is a greenhouse that can operate year-round without heating equipment. It relies on the north wall to store heat during the day and on the external insulation to maintain the indoor temperature at night, making it widely used in the cold areas of northern China [1,2]. As an eco-friendly and sustainable energy ...

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