

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 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.

What is a Chinese passive solar greenhouse?

A Chinese passive solar greenhouse is a structure with three walls made of brick or clay and only the southern side consisting of transparent material (usually plastic foil). The southern wall allows sunlight to enter, and during the day, the greenhouse captures heat from the sun in the thermal mass of the walls, which is released at night.

How does a Chinese greenhouse perform?

The performance of a Chinese greenhouse depends on its design, the latitude, and the local climate. A recent study observed three types of greenhouses in Shenyang, which is at  $41.8^{\circ}\text{N}$  and is one of the most northern areas where the Chinese-style greenhouse is built (between latitudes  $32^{\circ}\text{N}$  and  $43^{\circ}\text{N}$ ).

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.

Which CSG is best for Chinese solar greenhouse?

Total light interception and daily effective accumulated temperature of Chinese solar greenhouse with different lighting roof shapes. According to the above obtained results, the five CSGs with the optimum performance have been determined (S09, S109, S110, S120, S121).

Similar to high tunnels, Chinese-style solar greenhouse is an important tool for season extension in specialty crop production in China. The structures are facing south, featured by supporting north walls (Figure 1 and 2). The north walls are essential in maintaining temperatures inside the structure. They are made up with materials having good ...

China's greenhouse industry has undergone thousands of years of development history, although the

# China Solar Greenhouse Design

development of modern greenhouses arrived late. After decades of development in China, its greenhouse industry is at the global forefront. China's greenhouse industry is experiencing rapid development, transformation, and upgrading. China ranks first in ...

There is a special type of solar greenhouse that is common in China but largely unknown in the rest of the world. The concept originated in the 1970s and 80s and has been promoted by the government in China. To maximize solar heat ...

Unlock the sun's full potential with passive solar greenhouse designs for an energy-efficient Chinese greenhouse design to grow warm-season plants year-round with little to no extra heating.

This design captures solar energy during the day through the transparent side. At night, the thick walls release stored heat, slowing down heat loss. These greenhouses also use curtains made of materials like straw, ...

There is a special type of solar greenhouse that is common in China but largely unknown in the rest of the world. The concept originated in the 1970s and 80s and has been promoted by the government in China. To maximize solar heat collection, the greenhouse is facing south but has solid walls on its north (back), east and west side. Another ...

The Chinese Greenhouse: Design and Build a Low-Cost, Passive Solar Greenhouse by Dan Chiras (2020) Originally developed in China to feed millions, Chinese greenhouses are earth-sheltered, solar-heated, east-west ...

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A comprehensive explanation of the design principles, development process, and production practice effects of energy-efficient solar greenhouses in China by integrating more than 40 years of research on greenhouse structure and environmental regulation was elaborated in this paper.

Solar radiation is the sole energy source for Chinese solar greenhouse agriculture. A favorable light environment is the foundation of a desirable crop growth environment, and it is key in solar greenhouse design. In this study, a mathematical model is established to quantitatively evaluate the solar greenhouse light environment.

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The Chinese Greenhouse is a full-color comprehensive guide to these passive solar greenhouses for self-sufficiency and growing year-round in soil or aquaponic grow beds with no additional heat. Coverage includes: How to design, build, ...

Chinese-style greenhouses are catching the eye with their unique, energy-efficient designs. LOW TECH MAGAZINE reports that these greenhouses use only solar energy. Even in cold weather, they can keep the inside up to 25°C (45°F) warmer than the outside.

In China, fully passive solar greenhouses for the cultivation of fruits and vegetables in winter season have been successfully implemented since the 1980s. The main feature of the passive solar greenhouse designed and adopted in China is its ability to retain as much warmth as possible, allowing to grow

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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. Then, a 3D dynamic simulation model was developed to optimize greenhouse structure and determine the lighting roof shape that offers better light and temperature ...

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