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Intensive production in solar greenhouses in Southern Europe is a model for sustainable food production worldwide.

The continued commitment to technological innovation in solar greenhouses enables intensive production with a sustainable and highly efficient use of natural resources.

In recent decades, global food production needs have increased considerably. Land used for cropland, pasture and plantations has grown exponentially to the detriment of many natural areas. As a result of this agricultural expansion, energy, water, and fertiliser consumption has increased considerably, and biodiversity has decreased significantly, sometimes compromising environmental sustainability.

However, models, such as the solar greenhouses on the coast of Almeria and Granada in Spain, are examples of productive efficiency and sustainability. This model is based on a virtuous circle where technological innovation allows intensive production with optimal and sustainable use of natural resources, promoting biodiversity and preserving natural spaces.

Technological innovation

Thanks to the clean energy of sunlight and continuous technological innovation, the productivity per unit of surface area, water and agricultural inputs of this model are very high. The more than 3,000 hours of sunshine per year that the region enjoys and the innovative composition of the plastic covers allow the crops to grow without fossil fuels throughout the year, even in the most adverse climatic periods of the winter.

Less than 5% of the greenhouses in Almeria and Granada use some form of heating, and nobody uses artificial lighting, so the energy needed comes almost exclusively from the sun. We use hardly any other sources of energy or fossil fuels for production, which translates into a very positive environmental impact.

Today's plastic covers integrate compounds with specific functions in their different layers. Some enhance the entry of photosynthetically active sunlight, which is vital for crop growth. Others allow infrared to be retained, which helps reduce low night-time temperatures. Others block the wavelengths of light necessary for pests to see and make it difficult to live inside the greenhouse. They also incorporate compounds that strengthen their resistance to ultraviolet radiation, extending their useful life by up to 4 seasons.

Combining traditional techniques such as sanding the soil, whitening the roofs or collecting rainwater with a high degree of automation of the climate control systems, localised irrigation, and fertilisation allows highly efficient use of water and fertilisers, achieving spectacular yields. For

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example, the water footprint of solar greenhouses, as measured by water use, is 20 times lower than the average for the rest of national agriculture¹.

Intensive production

Crop yields in solar greenhouses are six times higher than in extensive open-air cultivation. To obtain production volumes similar to those obtained in the 36,000 hectares of solar greenhouses would require around 180,000 hectares of land. Greenhouse production allows the preservation of natural areas. For example, solar greenhouses in Almeria represent only 3.4% of the land in the province, where more than 49% of the land remains protected as natural areas².

Apart from the significant increase in the use of cultivated land required by extensive models, harvesting crops during the winter and most of the autumn and spring would be impossible. In addition, the absence of protective structures would negatively influence the quality of the products.

Environmental sustainability

The production model of solar greenhouses has an impact on the efficient management of natural resources and has important implications for environmental conservation and the fight against climate change. In this sense, we can cite the contribution of the albedo effect of the bleached plastic roofs against global warming³ (in the last 30 years, the local temperature has fallen by 1°C) or the vast CO₂ sink⁴ that the crops represent (1 hectare of greenhouse absorbs 8-10 tonnes of CO₂ per year or the equivalent of the daily emission of 8 cars).

This model also favours animal biodiversity, especially arachnids, insects and many other invertebrates, and botanical biodiversity, fostering reintroduction and conservation of native species. Lined up in outer hedges, in rows around the inner edges of the greenhouse or between crop rows, the indigenous plants serve as hosts for beneficial fauna or as a natural barrier keeping pest populations at crop-friendly levels.

"Almost all greenhouses use auxiliary fauna for pest control or pollination. Therefore, the use of pesticides is minimal, with 14% of the crops already certified for organic production. There is a significant contribution of natural enemies of pests from 'bugs' that appear spontaneously from the surroundings. There is a tendency to plant green areas with indigenous shrubs and abundant flowering," says Jan van der Blom, head of the agroecology department of the Association of Fruit and Vegetable Producers' Organisations of Andalusia (APROA).

¹ Galdeano-Gómez, E.; Aznar-Sánchez, J.A.; Pérez-Mesa, J.C. (2016): "Economic, social and environmental contributions of intensive agriculture in Almería". Almería: Cajamar Caja Rural

² Consejería de Medio Ambiente y Ordenación del Territorio (2017): Statistics: Biodiversity and protected natural spaces. Online: <http://www.juntadeandalucia.es/medioambiente/site/portalweb/> [Accessed: 28 May 2018].

³ Campra, P.; García, M.; Cantón, Y.; Palacios-Orueta, A. (2008): "Surface temperature cooling trends and negative radiative forcing due to land use change toward greenhouse farming in southeastern Spain". *Journal of Geophysical Research Atmospheres*. 113; D18109

⁴ Mota, C.; Alcaraz, M.; Martínez, M.C.; Carvajal, M. (2017): "Research on CO₂ absorption by the most representative crops in the Region of Murcia".

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What is a solar greenhouse?

A solar greenhouse is a closed structure covered with a plastic film through which the sun's rays shine, giving the plants the light they need to maintain the right temperature for their development during the winter months so that they can carry out photosynthesis. In the process, the plants produce nutrients from the CO₂ they absorb from the air and release enormous amounts of oxygen into the atmosphere. Solar greenhouses are very different from the production methods used in other greenhouses, which use fossil fuel-based heating and lighting systems that consume up to 30% more energy and are therefore harmful to the environment.

About CuteSolar

CuteSolar is a promotion programme funded by the European Union (EU) and supported by a consortium of Andalusian fruit and vegetable growers' associations (APROA), the Spanish inter-branch fruit and vegetable association (HORTIESPAÑA) and the Assembly of European Fruit and Vegetable Growing Regions (AREFLH). The aim of the information and promotion campaign, which will run until 2022, is to inform consumers about the sustainable and environmentally friendly production and cultivation methods of EU fruit and vegetables, the high standards of greenhouse technology and the quality of fruit and vegetables from southern Spain.

The programme, with a total investment of €1.95 million, is co-financed by the proposing organisations and the European Union, will run for three years (2020-2022) and will be implemented in Spain, Germany and Belgium.

Disclaimer

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Contact:
Sam Jaspers
+32 499 28 34 00
