Fraunhofer ISE

Fraunhofer Institute for Solar Energy Systems ISE

Integrated Photovoltaics

Dual Use of Land with Agrivoltaics

R&D for the Energy Transition

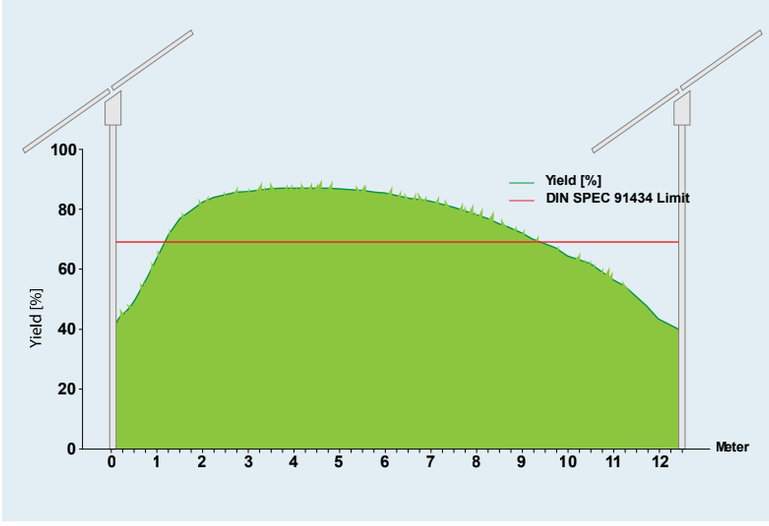
Agrivoltaic Systems Create Synergies

Agrivoltaic systems enable the simultaneous production of renewable energy and agricultural products on the same area. This makes it a key technology for preventing competition for land and meeting the growing demand for solar power.

Agrivoltaics not only increases land efficiency through the dual use of land. Targeted light management also increases the resilience of agricultural production. Agrivoltaics thus provides agricultural businesses with additional income and promotes the economic development of rural areas.

Our Services

- GIS-based potential analyses and site suitability analyses
- Agricultural analyses and PV yield forecasts
- Light simulation / conceptual agrivoltaic design
- Workshops and knowledge transfer
- DIN SPEC 91434: technical and legal conformity assessment
- Quality assurance and monitoring
- Optimization of self-consumption of PV electricity
- Social and environmental impact studies, feasibility studies
- Technology transfer to other countries and climate regions



Harvest yield effects of PV module position in grassland with different shading effects.

Vertical agrivoltaic system in Merzing-Willingen, Germany. © Universität Hohenheim

High Potential for Agrivoltaic Systems

In recent years, agrivoltaics has developed very dynamically in almost all regions of the world. Government subsidy programs in Japan, China, France and the USA, among others, led to an increase in globally installed agrivoltaic capacity from approx. 3 MW_p to over 14 GW_p. The estimate of technical potential for Germany is around 1700 GW_p.

Intelligent Lighting Management

To harvest solar energy and crops on the same area, a balanced ratio of light and shade is required. Fraunhofer ISE has developed models and concepts to optimize yields in form of energy production and agricultural products through targeted light management.

By selecting and adapting module types, mounting frames and installation parameters, it is ensured that the respective plants receive sufficient light throughout the day and year.

Sun Protection in Times of Climate Change

Central elements of agrivoltaic research are interactions and synergies between the fields of agriculture and photovoltaics. An adapted PV system design with targeted light management and the selection of suitable plant species can stabilize or even increase agricultural yields. Particularly in increasingly dry periods, crop failures can be reduced or avoided altogether. The need for irrigation is reduced due to partial shading, and wind erosion decreases. The PV substructure can also be used for protective nets or foils or even replace these. The resilience of fruit and vegetable cultivation to hail, frost and drought increases.

Detailed Studies and Planning

Dual land use for agriculture and photovoltaics is accompanied by high legal, economic and social requirements. The know-how of the interdisciplinary team of agrivoltaics at Fraunhofer ISE provides the ideal basis for the development and implementation of agrivoltaic projects.

Selection of Current Projects on Agrivoltaics

"SynAgri-PV" –
Support for the Market Launch of Agrivoltaics in Germany

As part of this funded project by the Federal Ministry of Education and Research (BMBF), Fraunhofer ISE is investigating how agrivoltaic systems can be designed without negatively impacting agricultural use. To this end, we are developing testing methods that meet the requirements of DIN SPEC 91434. A particular focus is placed on the effects of shading and altered water availability on agricultural yield. Our goal is to enable a sustainable and efficient combination of agriculture and photovoltaics.

"Agri-PV BW" –
Model Region for Agrivoltaics in Baden-Wuerttemberg: First Implementation Phase

In the first phase of implementation, five agrivoltaic systems with a focus on pome and soft fruit will be planned, constructed and researched throughout the state of Baden-Wuerttemberg in Germany. The installed capacity of the three research and two practical demonstration systems is expected to reach 1700 kWp. The experience gained during the realization of the plants will be compiled in the form of manuals for farmers and regulatory authorities in cooperation with the Kehl University of Applied Sciences.

Further Information

Project website "SynAgri-PV"

Project website "Agri-PV BW"

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