Agri-Voltaics

Powering India’s Farms, Growing a Sustainable Future

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At the intersection of agriculture and renewable energy lies an innovative approach to making farmland more productive. Agrivoltaics combines crop cultivation with solar power generation on the same land, enabling farmers to diversify their incomes while contributing to India’s clean energy transition. By bringing food production and solar electricity together, it offers a promising pathway towards efficient land use, greater farm resilience and sustainable rural prosperity.

Solar Power for Agri Farms and a Cleaner Future

Agriculture plays a vital role in India’s economy, serving as a key source of livelihood for approximately 46.1 per cent of the population. The Gross Value Added (GVA) of the Agriculture and Allied Sector is estimated to reach**Rs. 52.08 lakh crore in 2025-26**. Sustaining this vital sector requires reliable and affordable energy for irrigation and other farming operations. Solar power can help meet these everyday needs while advancing India’s clean energy transition.*Click to Read More: The New Era of Indian Agriculture and Al lied Sectors*



India’s vast agricultural land offers significant prospects to integrate solar energy with farming. According to **Land Use Statistics for 2023-24**, the country’s reported area covers **306.96 million hectares**, of which approximately **55 per cent is agricultural land**. The **net sown area stands at 138.99 million hectares**, while the **gross cropped area covers 217.88 million hectares**. This extensive land base offers opportunities to generate solar electricity alongside agricultural production. Farmers can use solar power to operate **irrigation pumps, reduce dependence on conventional electricity and potentially supplementary revenue**by supplying surplus electricity to the grid. For instance, solar-powered irrigation pumps can provide daytime power for watering crops while reducing reliance on diesel-powered alternatives.

Agrivoltaics takes this integration further by bringing together crop cultivation and solar electricity generation on the same land. Solar panels installed above or between crop rows allow electricity generation alongside continued farming. Depending on the crop, panel design and local conditions, partial shading may also help reduce soil moisture loss. This approach can improve land-use efficiency, diversify farm earnings and strengthening both food and energy security. Through research, field demonstrations and policy development, India is exploring ways to adapt agrivoltaics to diverse agricultural conditions. It offers a promising pathway to align farmers’ livelihoods with India’s wider renewable energy ambitions.



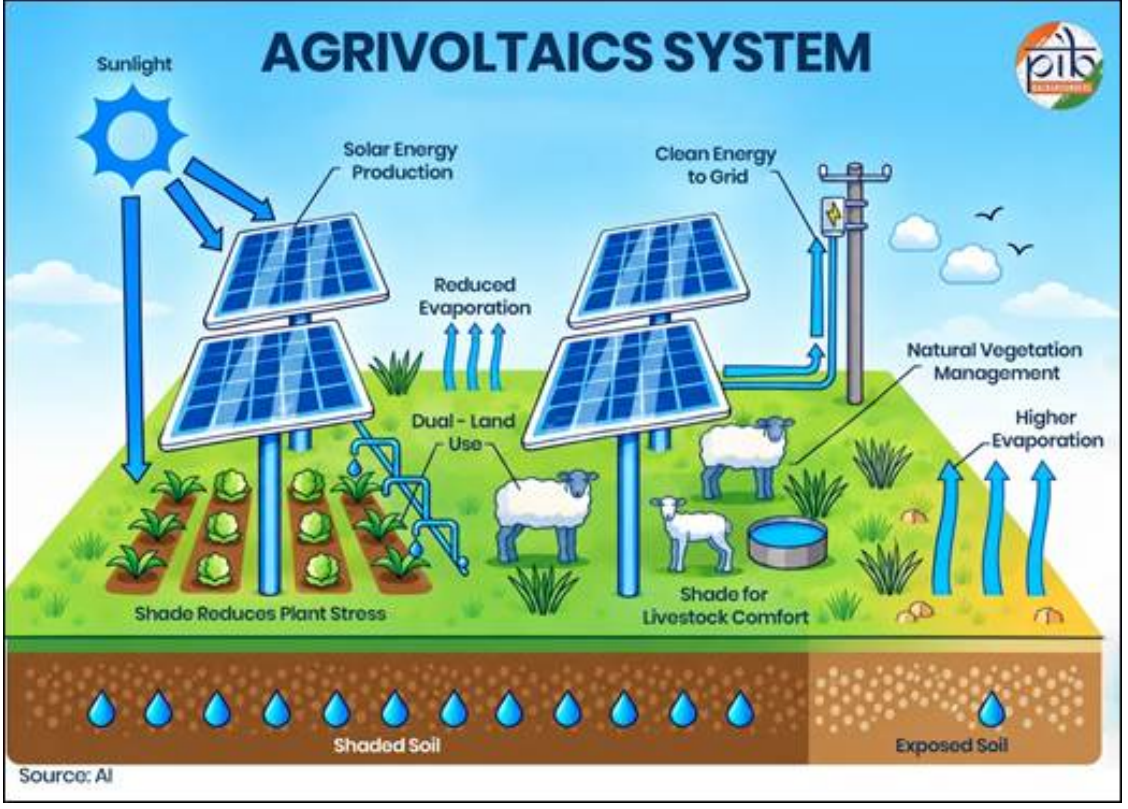
The **Bharat Renewable Energy Summit & Expo (Bharat RE) 2026** is being held from **2–5 November 2026** at **Bharat Mandapam, New Delhi,** under the theme ***'Invest. Innovate. Inspire.'*** The four-day Summit brings together participants from over 130 countries, including more than **40 Ministers, policymakers, investors, financial institutions** and **industry leaders. Nine Countries-** Australia, Denmark, the European Union, France, Germany, the Netherlands, Norway, Sweden and the United Kingdom will participate as Country Partners. **13 Indian States and Union Territories** are participating, showcasing renewable energy potential, investment opportunities, and clean manufacturing capabilities. Key focus areas of the summit includes solar and wind energy, green hydrogen, energy storage, grid integration, domestic manufacturing, digitalisation and artificial intelligence applications in the energy sector. The Summit provides a global platform for clean energy investment, technology partnerships and industry collaboration. It features ministerial discussions, CEO roundtables, investor engagements and an exhibition featuring **over 400 exhibitors.** The event is being held alongside the **9th International Solar Alliance Assembly** and the **4th International Conference on Green Hydrogen,** strengthening international cooperation across the clean energy sector. **Click to Read More**: ***Bharat Renewable Energy Summit & Expo 2026***

Agrivoltaics: Bridging Agriculture and Renewable Energy

Agrivoltaics, also known as **agrisolar** or **dual-use solar**, maximises land-use efficiency, provides shade for crops and creates additional benefits for farmers·

Design and Functioning of Agrivoltaic Systems

An agrivoltaic system integratesagricultural infrastructure with solar installations, adapted to local farming conditions. The technology operates through various key elements:



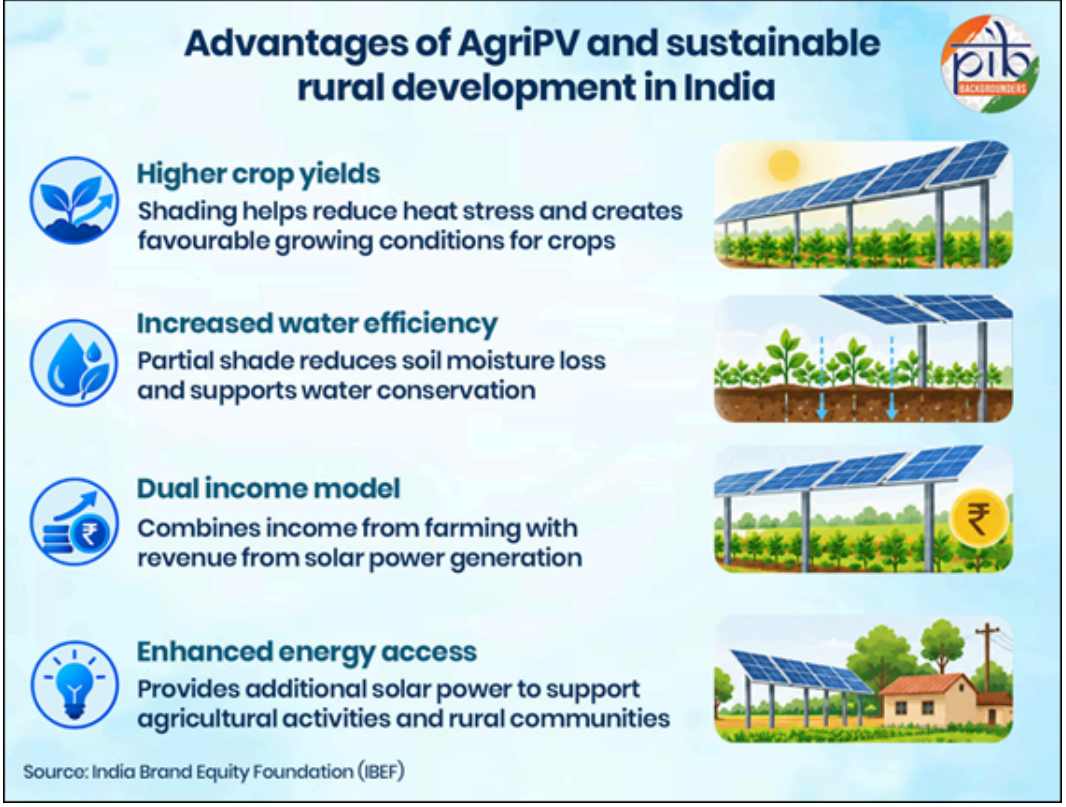
- **Elevated Solar Structures:**Instead of placing solar panels directly on the ground, they are mounted on structures high enough to let sunlight and rain reach the crops below. These elevated solar panels for agriculture also allow farmers to move their equipment underneath without any trouble.
- **Partial shading:**The panels provide shade, which helps protect crops from extreme heat and reduces water evaporation from the soil. This creates a cooler, more stable environment for plants to grow, especially in hot or dry regions.
- **Dual Land Productivity:**Agrivoltaics optimises land use by integrating crop cultivation or livestock rearing with solar power generation, supplying electricity for farm activities and creating an additional revenue stream through surplus power sales to the grid.

Agrivoltaics Development in India

As of August 2025, India had **36 operational agrivoltaics projects** with an **installed capacity of 37.54 megawatts, alongside 10 pilot projects under development**. These Projects span diverse agroclimatic regions and include elevated structures, interspace layouts and tracking systems, reflecting India's evolving approach to integrating solar power generation with agricultural production.

India's Agrivoltaic Potential

India holds significant potential for agrivoltaics. Estimates place the country's agrivoltaic potential between **3,000 GW and nearly 14,000 GW**, highlighting the scale of opportunity at the intersection of agriculture and renewable energy. Agrivoltaic systems can also create profits diversificationfor farmers. In some cases, annual earnings could rise from around **Rs.60,000 per acre to over Rs.1 lakh per acre**.



Scope for Agrivoltaics Developments

- **Land Suitability:** The GIS-based national screening identified **47.35 million hectares** of "restricted cropland" suitable for AgriPV after applying environmental, agronomic, and technical filters, reflecting a conservative, climate-resilient land base.
- **Crop Compatibility:** Fruits, vegetables, spices and medicinal plants offer promising options for cultivation alongside solar installations.
- **High-potential states**include Maharashtra, Rajasthan, Andhra Pradesh, Madhya Pradesh, Karnataka and Uttar Pradesh, which collectively account for nearly 50 per cent of India's estimated AgriPV power generation potential, driven by favourable combinationof cropland availability, solar resource, and agro-climatic conditions.
- **Moderate potential**is observed in Odisha, Tamil Nadu, Kerala, Telangana, Bihar, and West Bengal.
- The southern, western, and central regions exhibit the most favourable combination of solar irradiance, land availability, and horticultural intensity for large-scale deployment.

Government Initiatives in Agrivoltaics Development

The Government of India has undertaken a range of policy, research, technology development, and implementation measures to advance agrivoltaics adoption and expansion across the country.

- **Pradhan Mantri Kisan Urja Suraksha evam Utthaan Mahabhiyan (PM KUSUM):** Launched in February 2019, the scheme encourages solar energy adoption in agriculture, reduces dependence on diesel and creates opportunities for farmers to diversify their earnings. It envisages central financial assistance of approximately **Rs.**34,422 crore. It also enables decentralised solar power

generation and solarisation of agricultural pumps, creating avenues of development for solar energy integration with farming. ***PM KUSUM Scheme***

- **Centre of Excellence on Agrivoltaics:** The National Institute of Solar Energy, in collaboration with the Indian Council of Agricultural Research's Indian Agricultural Research Institute, has established a CoE for agrivoltaics research, demonstration and capacity building. It has undertaken pilot projects, including a 100-kilowatt agrivoltaic system at the Indian Agricultural Research Institute.

India Agrivoltaics Alliance

The **India Agrivoltaics Alliance (IAA**), anchored by the National Solar Energy Federation of India (NSEFI), is a multi-stakeholder platform advancing the dual use of land for solar energy generation and agriculture. Launched in 2023, the Alliance has grown to over 40 members and works with government ministries and industry stakeholders to advance agrivoltaics through policy advocacy, research and on-the-ground implementation. It develops knowledge resources, promotes pilot projects and supports scalable business models to improve land productivity, diversify farmer incomes and strengthen rural energy access.

State-specific Initiatives

Several states are facilitating solar energy in agriculture through region-specific schemes.

- **Mukhyamantri Saur Krushi Vahini Yojana 2.0, Maharashtra:**The scheme drives solar power generation through 16,000 megawatts of solar projects across approximately 35,000 acres of government and private land to support electricity supply to agricultural consumers.
- **Kisan Suryoday Yojana, Gujarat:**Expands solar energy utilisation to meet farmers' electricity needs by providing daytime power supply for agricultural

activities, with a planned supply window of up to 16 hours daily, from 5:00 AM to 9:00 PM, through the phased commissioning of solar and other non-conventional energy generation plants.

- **Surya Raitha Scheme, Karnataka**: The scheme advances solar-powered irrigation pumps and allows farmers to earn from surplus electricity. Solar pumps can help farmers access energy for watering their crops while reducing dependence on diesel-powered pumps.

The Government of India, alongside state governments, is advancing the use of solar energy in agriculture through policy measures and targeted programmes. These efforts are shaping India's agrivoltaics landscape by creating opportunities for the co-location of solar power generation and agricultural production.

Powering Prosperity Through the Convergence of Farms and Clean Energy

Agrivoltaics offers India an opportunity to strengthen agricultural livelihoods while advancing environmental sustainability. By combining food production with renewable energy generation, it can offer scope for more efficient land use, conserve water under suitable conditions and create greater financial resilience. The Government of India's initiatives, including PM-KUSUM and proposed measures to expand agrivoltaics, reflect efforts to connect rural development with clean energy goals. As implementation grows, locally suitable designs, scientific research and farmer participation will be essential to balance agricultural productivity with energy needs. This approach can contribute to a more resilient and sustainable future for India.Greater financial resilience

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