

# Status of Agrivoltaics in India



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नवीकरणीय ऊर्जा मंत्रालय  
MINISTRY OF  
NEW AND  
RENEWABLE ENERGY

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# Agrivoltaics



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- Agrivoltaic is a concept of harvesting maximum synergy between photovoltaic energy and agriculture by installing solar panels on agricultural lands.
- Globally installed 14GW
- 1% of India's agricultural Land can lead to additional 630 GWp at the rate of 450kWp per hectare.



Source: "Guideline Agrivoltaics: opportunities for Agriculture and the Energy Transition"- Fraunhofer ISE

# Agrivoltaics Necessity

- Energy demand projected to increase 50% from 2019 to 2030.<sup>1</sup>
- Agricultural land makes up 60.4% of India's total surface area.<sup>3</sup>
- Renewable energy targets set:
  - India's non fossil fuel energy capacity to 500 GW by 2030
  - India 50% Energy requirement from renewable energy by 2030
  - Net Zero targets by 2070
- Land use estimate for net-zero is between 50,000 and 75,000 km<sup>2</sup> for solar.<sup>2</sup>



Source: 1. India Energy Outlook report 2021

2. 'Renewable energy and land use in India by Mid- century' IEEFA September 2021.

3. <https://www.fao.org/home/en>

# Positive Externalities



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- Dual usage of land to solve the food security and energy security concerns
- Security to Farmers income
- Sustainable solution to water scarcity with, possibilities of rainwater harvesting which could be used for irrigation and panel cleaning purpose.
- Crop coverage in between PV arrays will also check the erosion of soil and reduce the dust load on PV module
- Addresses the rural unemployment issue in India by creating more solar PV jobs and reducing the seasonality character of employment in agriculture sector.
- Agrivoltaics in arid regions has shown an increase in the yield of the agricultural production and improvement in the soil properties

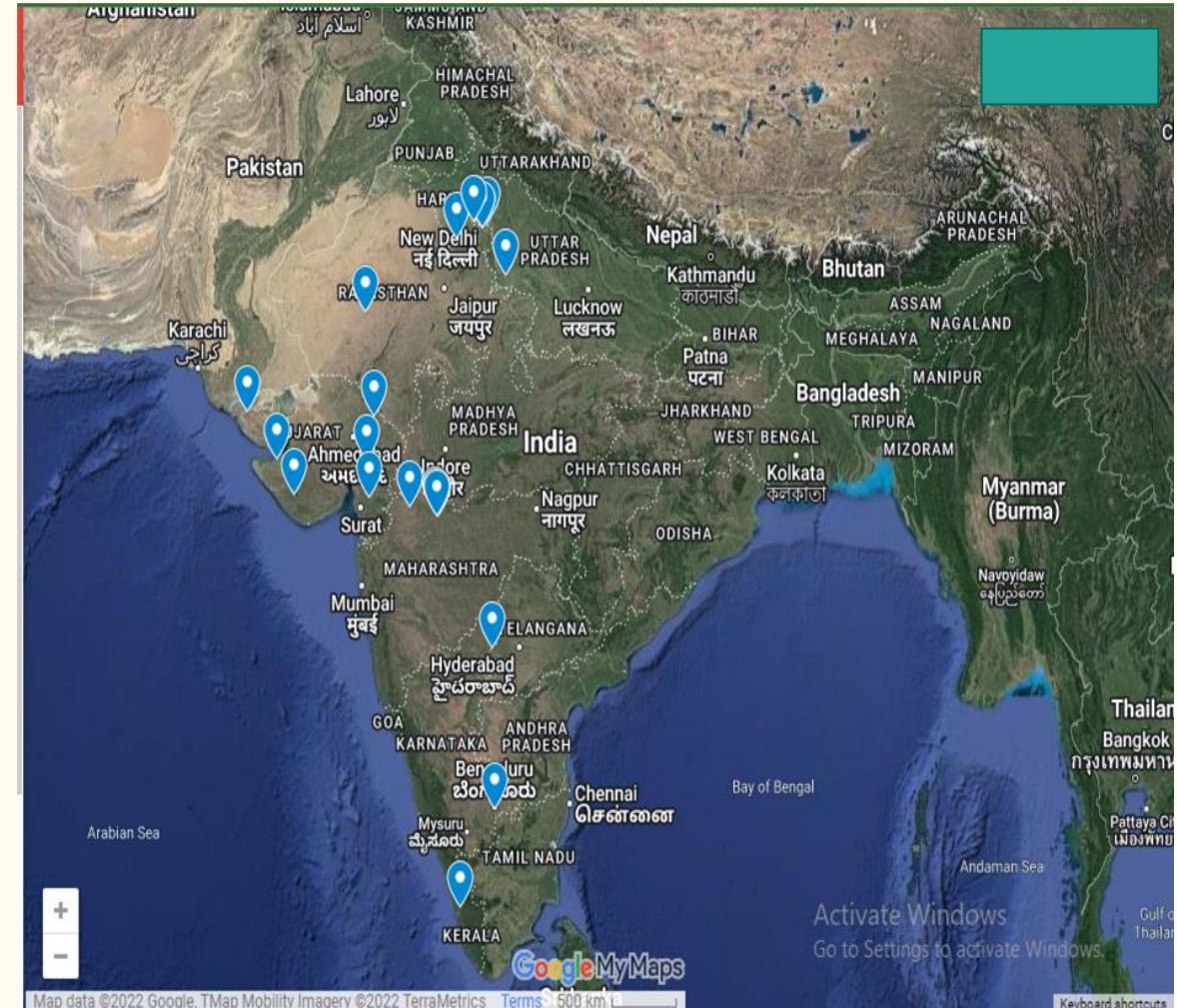
# Pilot Projects in India



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State	Remarks
Gujarat	*Three Plant of 1 MWp each.
Rajasthan	*Rain water harvesting *Tractor accessibility
Uttar Pradesh	* Water used for cleaning is directly used for irrigation * Cabling above ground *Automatic sprinkler *Tractor Ploughing *Variable pressure sprinkler
Telangana	*Water used for cleaning is used for irrigation with Rain gutter
Maharashtra	*Tractor is fully accessible *Banana and rice yield increased
Bangalore	White Heat seal paint to cool the panel and to provide extra light for plant growth



Source: <https://www.agrivoltaics.in/agripv-map-of-india>

# Critical Parameters



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- Crop (light saturation, shade tolerance, micro climate, etc) and climate compatibility
- Land rules and regulations
- Land Size
- Technical expertise
- Demand creation
- Stakeholder's capability
  - Farmers / FPO
  - Discoms
  - Developer



# Crop Mapping



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## Challenges:

- Shading on cultivable land
- Microclimatic impact on crop growth

## Measures:

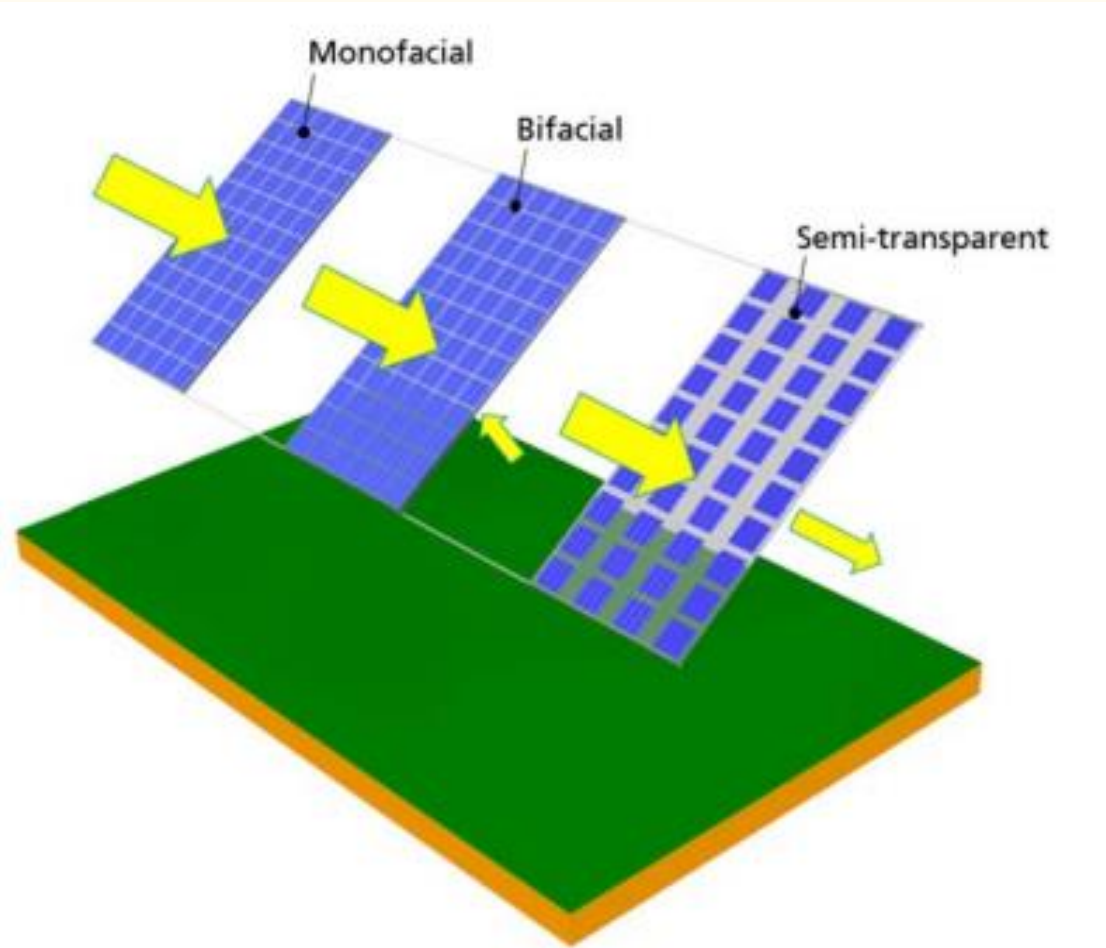
- Crop profiling
- Shadow Analysis



# PV Technologies



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## Classification:

- Open Agrivoltaics
  - Interspace PV
  - Overhead PV
  
- Closed Agrivoltaics
  - Green House

# Possible Intervention



- DPR preparation
- Helpline on crops for Agrivoltaics.
- Awareness Drive may be conducted by MNRE in co-operation with MoAFW/ICAR.
- Project design tool may be developed.
- Local support and hand holding by SNAs of MNRE.
- Procurement based incentives under Component A of PM-KUSUM already available
- Affordable loans through banks
- Handholding and technical support through ICAR

# Assessment of Project Feasibility



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- Agriculture Revenue criteria
- Farmers commitment to lease till the payback period in case of installation by developer
- Farmers willingness to switch crops to accommodate agrivoltaics
- Site condition and Agro Climatic region
- Availability of evacuation infrastructure including right of way.



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Thank You...