Status of Agrivoltaics in India

Agrivoltaics

- 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.[1]
- Agricultural land makes up 60.4% of India's total surface area.[3]
- 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^2 for solar.[2]

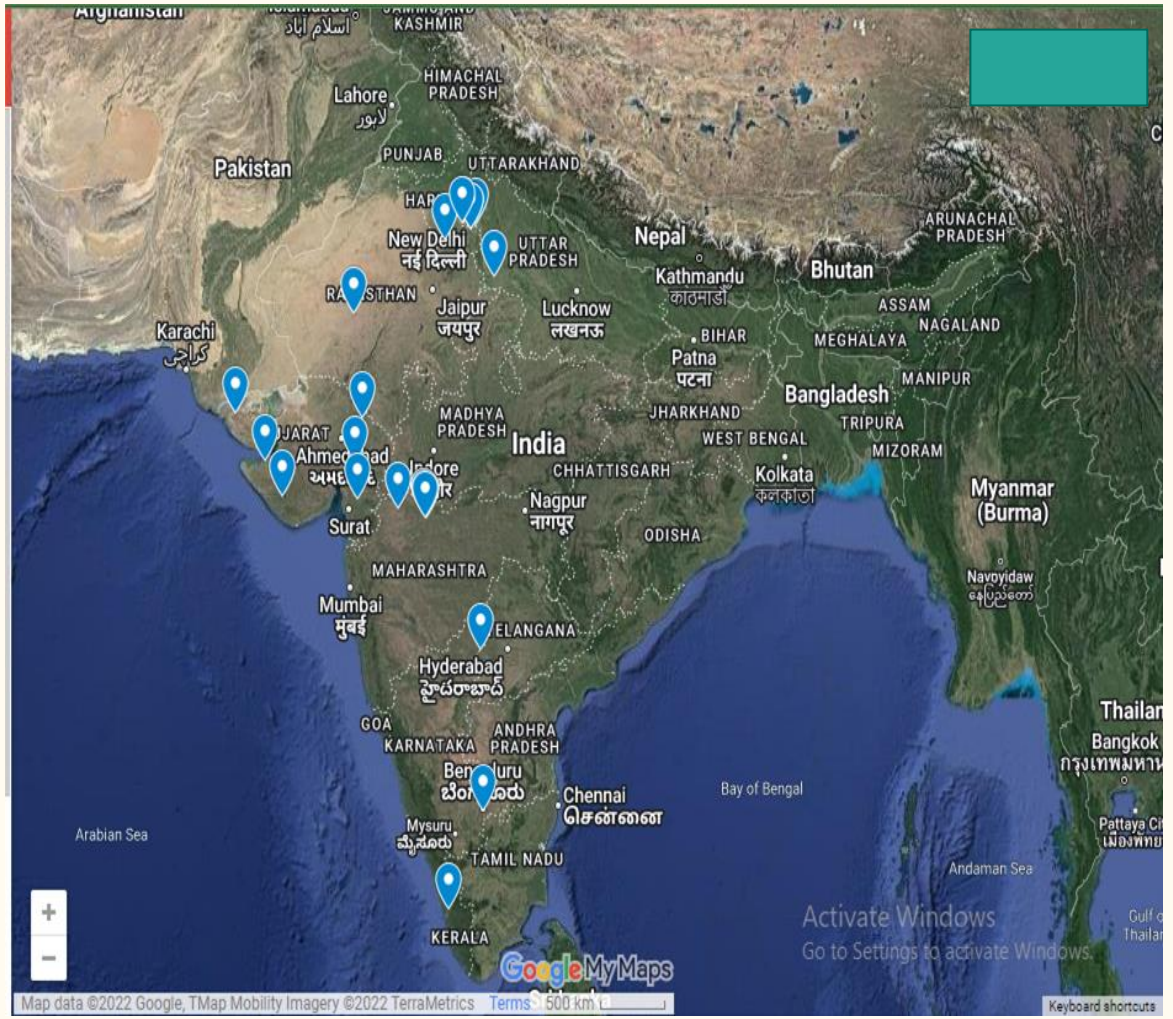
Source: 1. India Energy Outlook report 2021
2. 'Renewable energy and land use in India by Mid- century' IEEFA September 2021.
3. https://www.fao.org/home/en

Positive Externalities

- 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

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

- 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

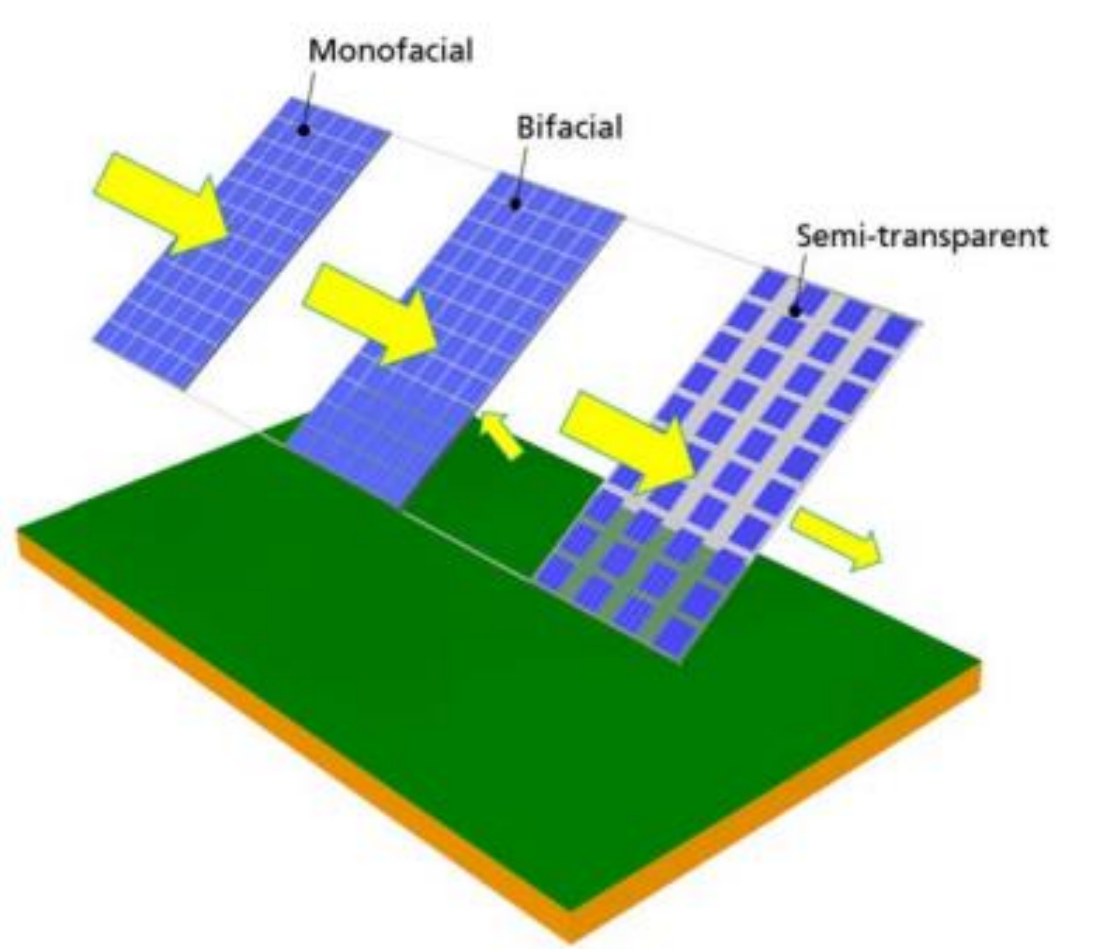
Challenges:

- ➢ Shading on cultivable land
- ➢ Microclimatic impact on crop growth

Measures:

- ➢ Crop profiling
- ➢ Shadow Analysis

PV Technologies



Classification:

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

Source : ‘Solar Energy Advancement in Agriculture and Food production system’ - Shiva Gorjian & Pietro Elia Campana

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

- 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.


Thank You…