CENTRE OF SCIENCE AND ENVIRONMENT

Building India's Future Agri-Energy Ecosystem

NATIONAL ROUNDTABLE

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Beyond Pilots: Scaling Distributed Clean Energy in India Agrivoltaics

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Agrivoltaics Offers a Potential in the TW Range

Fruits Potential	Vegetables Potential	Plantations Potential	Aromatics & Medicinal Potential	Flowers Potential	Spices Potential

Rapidly Increasing Electricity Demand

1. Current demand: **1,532 TWh**^{2024}

2. Projected demand:
   - **6544-8070 TWh**^{2050} (NITI Aayog)
   - **9718-12997 TWh**^{2070} (NITI Aayog)

3. RE capacity:
   - 1892-3200 GW^{2050}
   - 4150-6700 GW^{2070}

India's Solar PV Potential

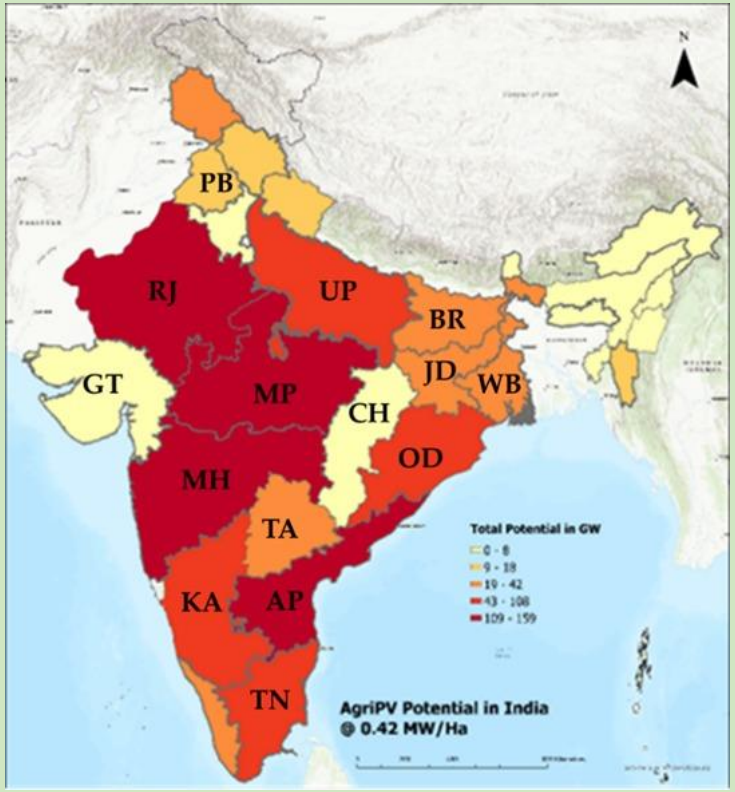
1. Macro Solar

2. Solar Potential Reassessment **~10,830** GW (TERI)

3. Ground-mounted Solar: **~4,900 GW**

4. AgrPV **~1192-2129 GW** (TERI,2026)

Limiting the crops to horticulture and plantations, TERI estimates a total potential of 1.1914 – 2.1283 TW



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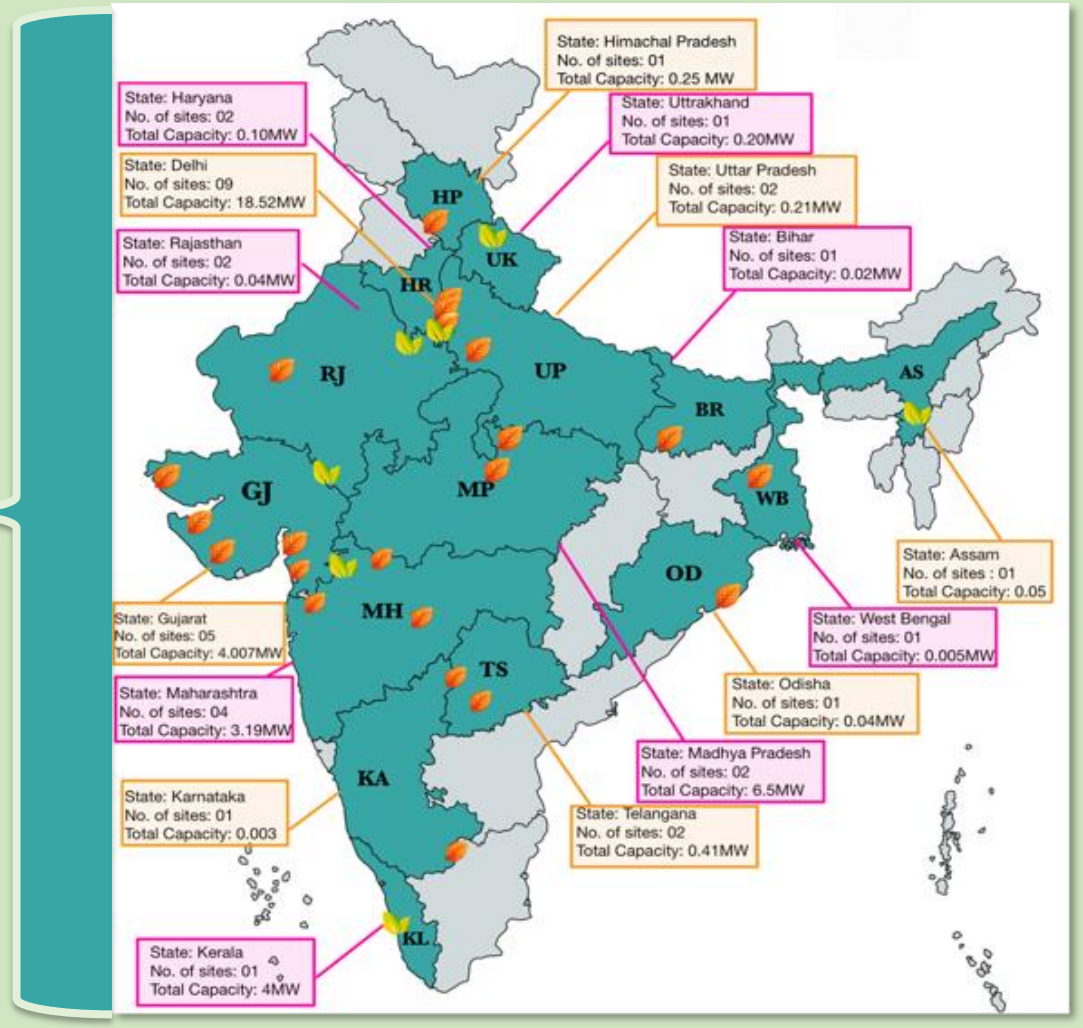
Current Status of AgriPV in India

- **36 operational projects (37.54 MW)**; 10+ pilots underway (Aug,2025)
- **Early leaders:** Delhi, Maharashtra, MP, Gujarat, Kerala
- **Many states still in nascent stage :** HP, UK, Telangana, UP
- **Multiple system designs in use** (elevated, trackers, bifacial, interspace)



Challenges in Scaling Agrivoltaics

Limited Participation of Small Farmers

- Small and marginal farmers often **face barriers to entry** due to **limited awareness**, technical knowledge, and access to institutional support.
- Integrating them effectively into the AgriPV ecosystem remains a key challenge.

Financing Constraints

- **High upfront capital costs** and limited access to affordable credit make AgriPV investments difficult.
- Availability of **concessional financing and risk-sharing mechanisms** remains limited.

Uncertainty in Business Models

- Multiple ownership and operational models exist, but **bankable and scalable business structures are still evolving**.
- Identifying models that balance **farmer benefits, developer returns, and agricultural productivity** remains a challenge.

Policy and Regulatory Gaps

- Dedicated **AgriPV policy frameworks, tariffs, and implementation guidelines** are still evolving.
- While schemes such as **PM-KUSUM** support decentralized solar deployment, **clear pathways for scaling agrivoltaics specifically are still emerging**.

TERI's Work to Support AgriPV

- **Assessment of AgriPV Potential in India**
- **AgriPV Pilot Site Evaluation (15+)**
- **Techno-economic feasibility study for AgriPV + BESS**
- **Preparation of Feasibility Reports & DPRs**
- **Recommendations for AgriPV Scale-up**

Partners: SED Fund | AFEF–ICC | ADB | GIZ/BMUKN | GEAPP | Bloomberg | KPMG | BRPL | ETC | India Agrivoltaics Alliance | PAU


Renkube Plant, Telangana


KVK Plant, Delhi


GroSolar Plant, Dhule


Khare Energy Plant, Sagar

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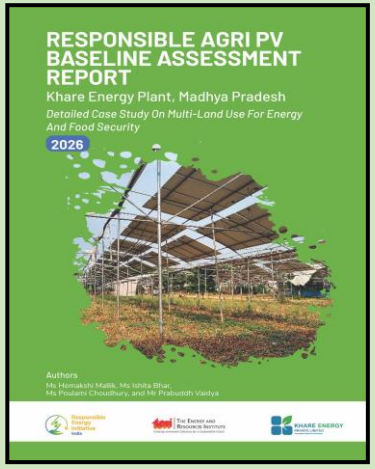
Key Themes for Today's Discussion

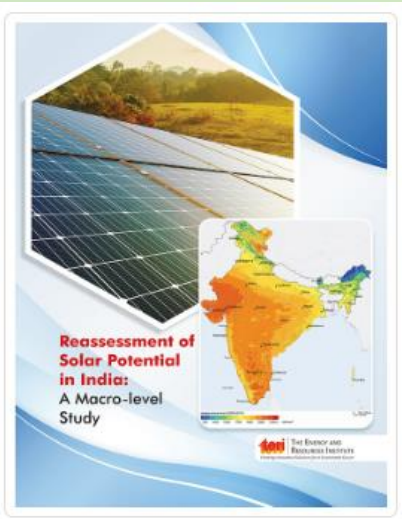
According to the Economic Survey 2025-26: -

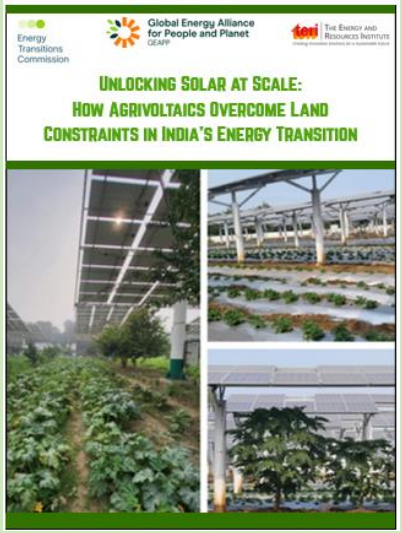
- Agriculture contributes **~20% of India's GDP** and supports **~46% of the workforce**.
- **Irrigated area has increased to ~55.8%**, with government push for **micro-irrigation and solar-powered water systems**, enabling **dual land-use models like AgriPV**.
- Government initiatives aim to **improve productivity in agriculture and allied sectors** through policy measures such as the **Digital Agriculture Mission**.
- Strengthening **extension services and institutional networks** (FPOs, PACS, SHGs) can improve implementation and farmer outreach.

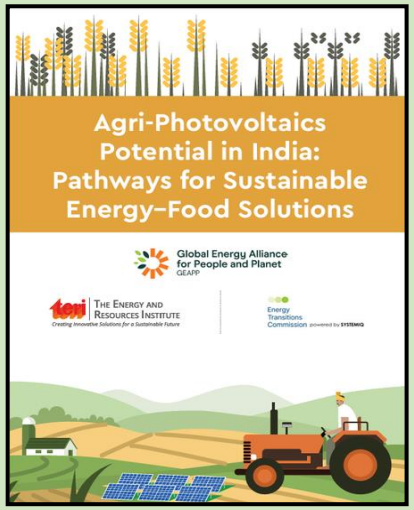
1. **Agrivoltaics as an integrated agri-energy ecosystem** enabling the co-production of food and clean energy.
2. **Policy and regulatory frameworks** needed to accelerate agrivoltaics deployment.
3. **Optimising system performance** through smart planning tools, digital technologies, and AI-based approaches.
4. **Enhancing farmer income, climate resilience, and sustainability** through agrivoltaic systems.
5. **Strengthening cross-sector partnerships** among policymakers, developers, researchers, and farmers for mainstream adoption.

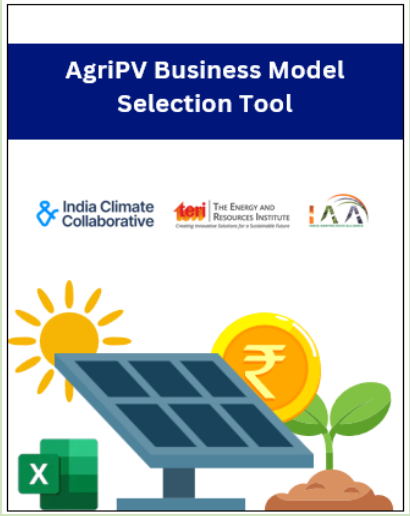
TERI's Work on AgriPV











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Website: https://www.teriin.org/

TERI's Energy Programme

TERI's work in Electricity and Renewables

Thank You!

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Agro-climatic zone–wise distribution of AgriPV-compatible crops in India categorized as cash crops, vegetables, and others

Agro-Climatic Zone (ICAR–NARP)	Representative States / UTs	Cash Crops	Vegetables	Others (Cereals / Pulses / Fruits / Fodder / Medicinal)
1. Trans-Gangetic Plains Region	Delhi, Haryana, Punjab, Western UP	Wheat, Mustard, Onion, Ginger, Turmeric	Tomato, Brinjal, Cauliflower, Okra, Spinach, Lettuce, Bottle Gourd, Fenugreek, Radish, Carrot	Rice, Gram, Millets, Pomegranate, Mango, Fodder (Napier), Medicinal herbs (Aloe Vera, Tulsi)
2. Upper Gangetic Plains Region	Uttar Pradesh (Central & Eastern)	Mustard, Wheat, Gram	Brinjal, Tomato, Potato, Spinach, Cauliflower, Carrot, Gourds, Fenugreek	Maize, Pulses (Lentil, Green Gram, Red Gram), Fruits (Papaya, Guava), Fodder crops
3. Middle & Lower Gangetic Plains Region	Bihar, West Bengal	Ginger, Turmeric, Sugarcane, Spices, Maize	Bitter Gourd, Bottle Gourd, Leafy Vegetables, Potato	Banana, Flowers (Marigold, Chrysanthemum), Medicinal Plants, Dragon Fruit
4. Western Dry (Arid) Region	Rajasthan, Gujarat	Cumin, Coriander, Isabgol, Groundnut, Cotton, Chilli, Sesame	Cluster Beans, Bottle Gourd, Brinjal, Tomato, Cucumber, Zucchini, Ladyfinger	Aloe Vera, Sonamukhi, Sankhpuspi, Mungbean, Moong Dal, Chickpea, Watermelon
5. Central Plateau & Hills Region	Madhya Pradesh, Chhattisgarh	Wheat, Mustard, Garlic, Maize, Groundnut, Barley	Capsicum, Tomato, Spinach, Lettuce, Broccoli, Baby Corn, Potato, Brinjal	Strawberry, Lentil, Green Gram, Red Gram, Sorghum, Fodder (Napier)
6. Western Plateau & Hills Region	Maharashtra	Turmeric, Ginger, Cotton, Lemongrass, Betel Leaf, Mint	Cherry Tomato, Capsicum, Cucumber, Spinach, Methi, Coriander, Basil, Okra	Flowers (Rose, Chrysanthemum, Tuberose, Hibiscus, Marigold), Banana, Rice, Grapes, Citrus, Melons, Watermelon
7. Southern Plateau & Hills Region	Telangana, Karnataka	Lemongrass, Chilli, Onion, Groundnut, Cotton	Cabbage, Broccoli, Carrot, Amaranthus, Tomato, Brinjal, Chilli, Okra, Lettuce, Spinach, Coriander, Beans	Annatto, Maize, Medicinal & Aromatic herbs (Rosemary, Basil, Papaya)
8. Eastern Coastal Plains & Hills Region	Odisha, Andhra Pradesh	–	Leafy Vegetables, Gourds, Tomato	Pineapple, Dragon Fruit, Medicinal & Aromatic Plants
9. Western Coastal Plains & Ghat Region	Kerala, Goa	Turmeric, Ginger	Yam, Long Yard Bean, Cabbage, Cauliflower, Snake Gourd, Bitter Gourd, Bottle Gourd, Tomato, Okra, Pumpkin	Buddha Bamboo, Mango (saplings), Spices, Banana
10. Northern Hill Region	Himachal Pradesh, Uttarakhand	Onion, Turmeric	Eggplant, Cabbage, Okra, Chilli, Brinjal	Ladyfinger (seed), Medicinal & Aromatic Crops (Rosemary, Geranium), Apple
11. North-Eastern Hills Region	Assam, Meghalaya, Manipur	–	–	Medicinal & Aromatic Crops (Ashwagandha, Roselle, Tulsi), Pulses, Horticultural Crops
12. Islands Region	Andaman & Nicobar, Lakshadweep	Coconut	Vegetables (tropical)	Banana, Papaya, Shade-tolerant crops (potential APV sites, not yet demonstrated)