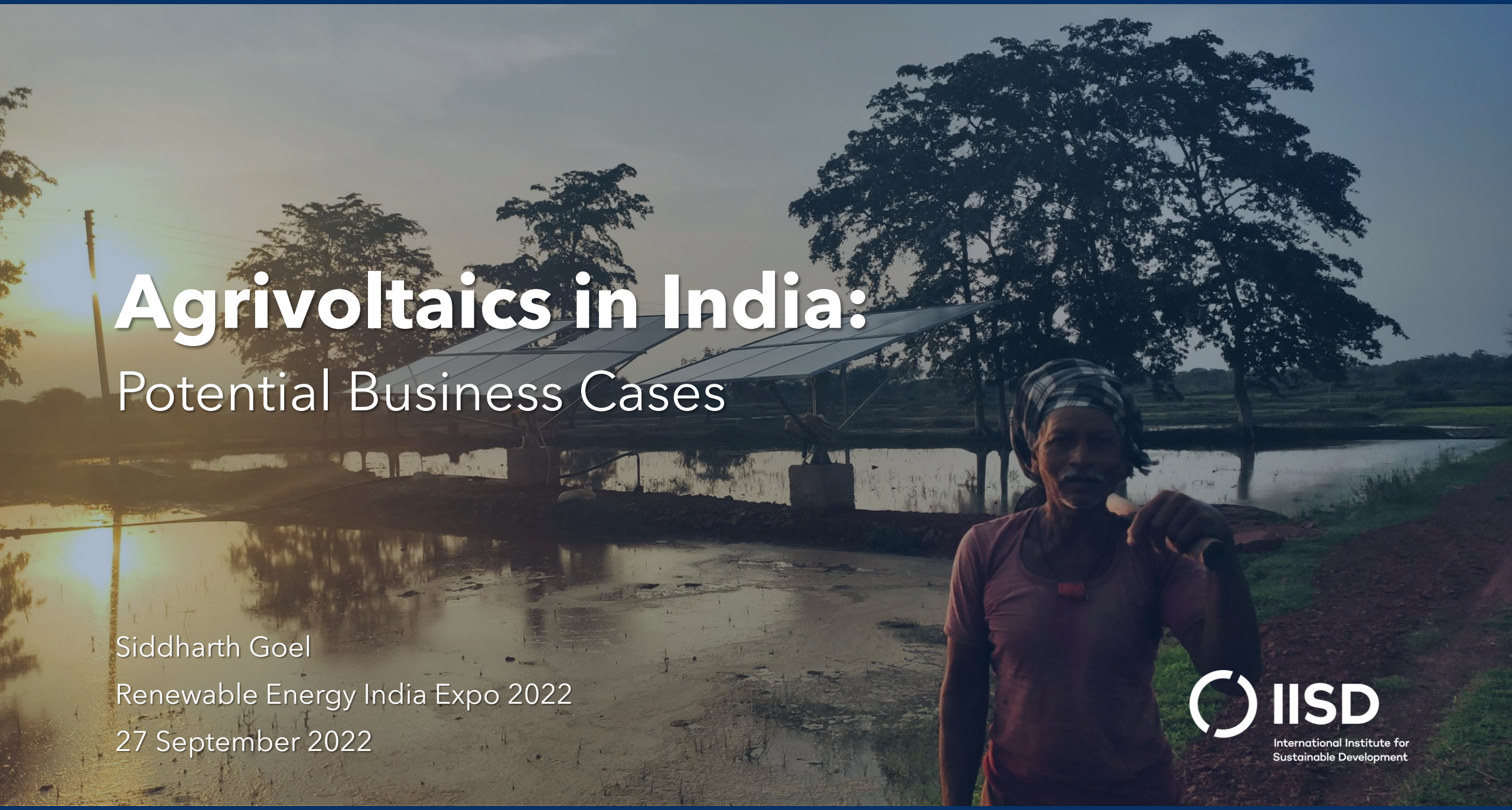


Agrivoltaics in India:

Potential Business Cases

Siddharth Goel

Renewable Energy India Expo 2022

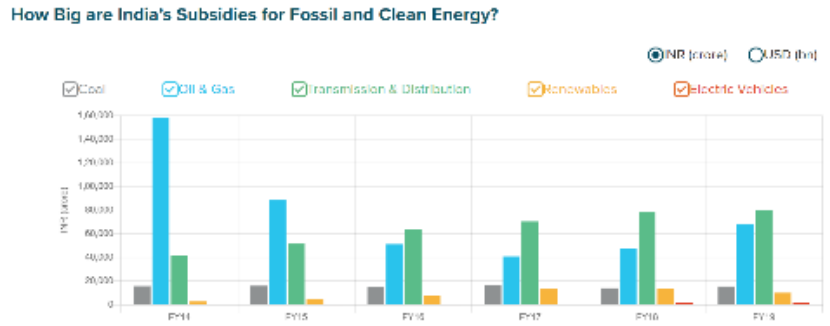
27 September 2022

IISD
International Institute for Sustainable Development

About IISD

Practical knowledge for implementation

Knowledge & data for centre and states



Engagement with decision-makers & influencers

सत्यमेव जयते
नीति आयोग
National Institution for Transforming India

GOVERNMENT OF INDIA
MINISTRY OF NEW & RENEWABLE ENERGY

INVEST INDIA
NATIONAL INVESTMENT PROMOTION AND FACILITATION AGENCY

Strategic communications

Integrated into a 35+ global team

G20

WORLD TRADE ORGANIZATION

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

Other national work programs in...

Canada

Indonesia

South Africa

Global thematic pillars on...

Shifting support

FF phase outs

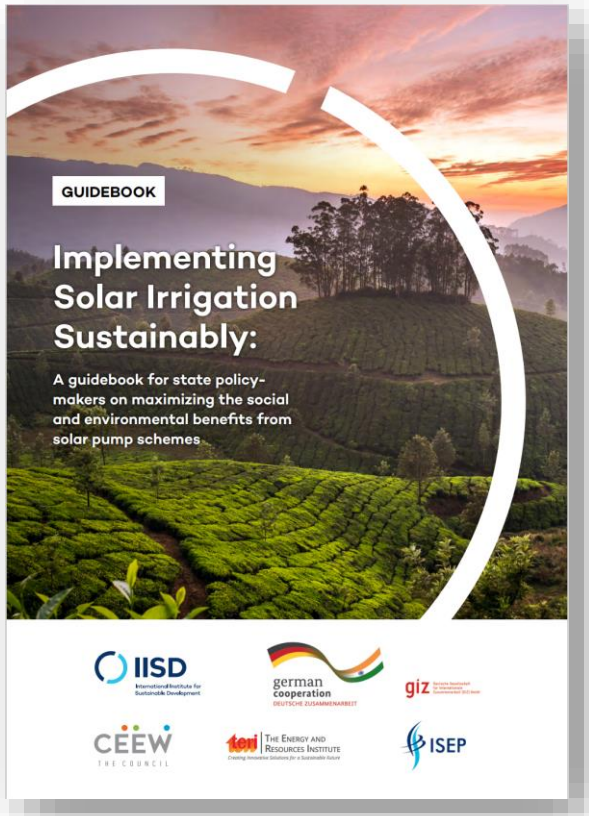
Just transition

Guidebook on PM-KUSUM

Phase- I

Solar pumps

PM-KUSUM Components B & C(IPS)



Phase- II

Solar feeders

PM-KUSUM Components A & C (FLS)

Under development

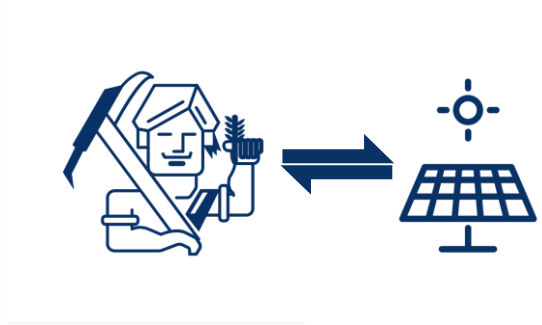
Context-specific business models are key to scale up agrivoltaics

- Agrivoltaics is still in technology demonstration phase → Next phase of pilots should focus on developing business models.
- Unique and complex agroeconomic context → Business models, and definitions and standards should be developed within this context.
- Diversity of technology and deployment designs in agrivoltaics → Business models should build on technology models.

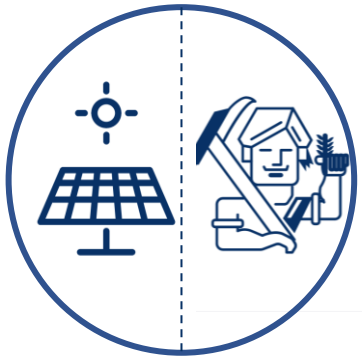
Business models should align incentives of stakeholders

	Developers	Farmers
Incentives	• When land is scarce or land-rent is relatively high, developers can negotiate lower land-rents through agrivoltaics • Services provided by agriculture including lower panel temperature, avoided maintenance works	• Additional income through land rent • Services of shading and protections from natural hazards (like hailstorm)
Costs	• Higher capital cost • Potential decrease in power generation due to design modifications	• Potential impact on crop yield • Decrease in effective land available for cultivation

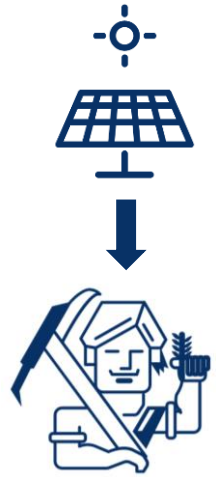
Three broad (potential) business models



Equal partnership between farmer and developer



System wholly-owned and operated by one entity



Developer as the primary promoter and farmer as the secondary partner

Equal partnership model

Business model

Developers enters into agreement with a farmer to set up and operate the power plant while the farmer continues cultivation on the same land.

Suitable factors

Area:

- Areas with high land rent and reasy market available for high-value crops. E.g., peri-urban areas
- Areas where precision farming and new technologies like polyhouses has good adoption

Farmer:

- Growing/willing to experiment with high value crops suitable for agrivoltaics

Developer:

- Willing to experiment different deployment models

Design considerations

Agriculture productivity is the primary design consideration

- Raised structure allowing movement and sufficient airflow
- Maximum sunlight at soil with bifacial panels and orientation

Key risks

- Competition for resources leading to management conflict
- Farmers are locked-in to a cropping system that is compatible with the agrivoltaics structure

Single entity model

Business model

Single entity buys or leases-in an existing farmland to set-up and manage agrivoltaics system.

Suitable factors

Area:

- Areas with good market for high-value crops. E.g., peri-urban areas

Promoter:

- Willing to experiment with agriculture production to maximize agriculture revenue stream

Design considerations

- Total revenue and land-use productivity is the primary design consideration
- High flexibility with regards to type of crops. Can experiment with new crops and other activities like pisciculture, livestock rearing etc.

Key risks

- Agriculture may not be a priority in the long-term, if there is an opportunity to get more revenue through structural modifications

Farmer as secondary partner

Business model

Developer sets up power plant and allows farmers to cultivate in the available area. Both parties gain from the synergies

Huge potential owing to a high concentration of PV plants in arid regions

Suitable factors

Area:

- Can be implemented anywhere
- Arid and semi-arid regions where the ‘shading’ service enables cultivation in all seasons and increases land productivity

Developer:

- Willing to accommodate some design modifications to allow more efficient use of land for agriculture

Design considerations

- Revenue generation from the sale of power is the primary design consideration
- But minor changes like a modest increase in structure height and change in orientation to allow better lighting on ground, can drastically increase the scope of cultivation

Key risks

- Safety and security risks arising from the open access to the solar plant site and agriculture operations

Policy measures can support agrivoltaics scale-up

1. Developing definitions and standards crucial for targeted policy support
    - Identify suitable parameters for classifying a solar plant as agrivoltaics
    - Consider the diversity in technology and business models while developing definitions
2. Explore new financing mechanisms to improve the competitiveness of agrivoltaics
    - Test innovative tariff designs to incentivize land-use productivity
    - Support open access route for agrivoltaics
3. Capacity building support is critical for scaling-up – Agrivoltaics modelling, and crop planning under shade requires capacity building for both developers and farmers
    - Introduce lighthouse/demonstration projects in each state
    - Promote centers of excellence in partnership with knowledge institutions
    - Conduct trainings in the co-management of resources

Thank You!

For more information:

Email: arahman@iisd.org, sgoel@iisd.org
Ph: +91-9176854158