

# Productive use of renewable energy for sustainable livelihoods in India

Track 3.3: Inclusive Innovation and Technology Deployment

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Preeti Kumari

*Senior Program Associate, WRI India*





# Key realities shaping rural livelihoods



## Low Incomes

Average monthly agricultural household income from all sources in India is **INR 13,661 (~\$174)**, and **farm income** is **INR 4,476 (~\$57)** (2021-22)<sup>1</sup>



## Small & Marginal Farmers

**Around 86% of farmers are small and marginal** [0.74 hectares], and face challenges due to fragmented land holdings, erratic rainfall, infrastructure gaps, and lower productivity<sup>2</sup>



## Livelihood Vulnerabilities

Intersecting factors like **gender**, **socio-economic status**, and location of people shape vulnerabilities<sup>3</sup>



## Renewable Energy Solutions

**Productive Use of Renewable Energy (PURE)** applications are emerging as enabling solutions to address **critical infrastructure gaps** in the agrifood value chain



<sup>1</sup>NABARD (2024). "All-India Rural Financial Inclusion Survey 2021-22"

<sup>2</sup> NITI Aayog 2018

<sup>3</sup>Rao et al 2020







# Promise of PURE



Fosters livelihood activities, supports microenterprises, promotes value-added endeavors, and extends productive hours<sup>4</sup>.



However, these technologies face barriers to scaling, based on their level of maturity.



# Motivation and inquiry

Limited nuanced information on challenges across various stages of PURE interventions

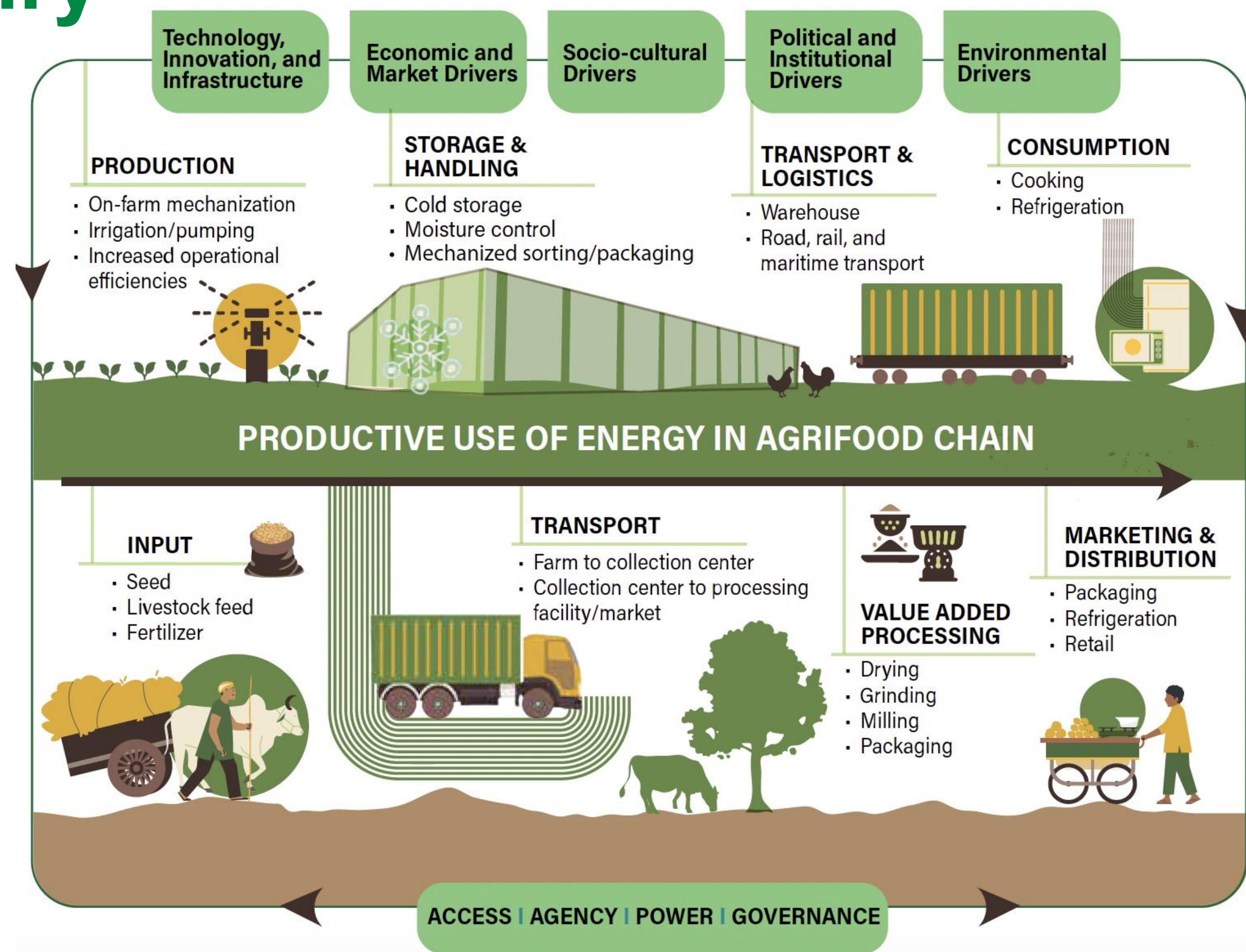
Lack of comprehensive insights from anchor institutions on the functioning of PURE in complex contexts

Emphasis on technical & financial aspects of PURE, the **socio-economic factors** and how they influence PURE are **overlooked**

Various implementation, business, and financial models of PURE integration across value chain stages

Diverse anchor institutions to understand the barriers and opportunities

Issues of differential access, participation, benefit sharing, and power relations





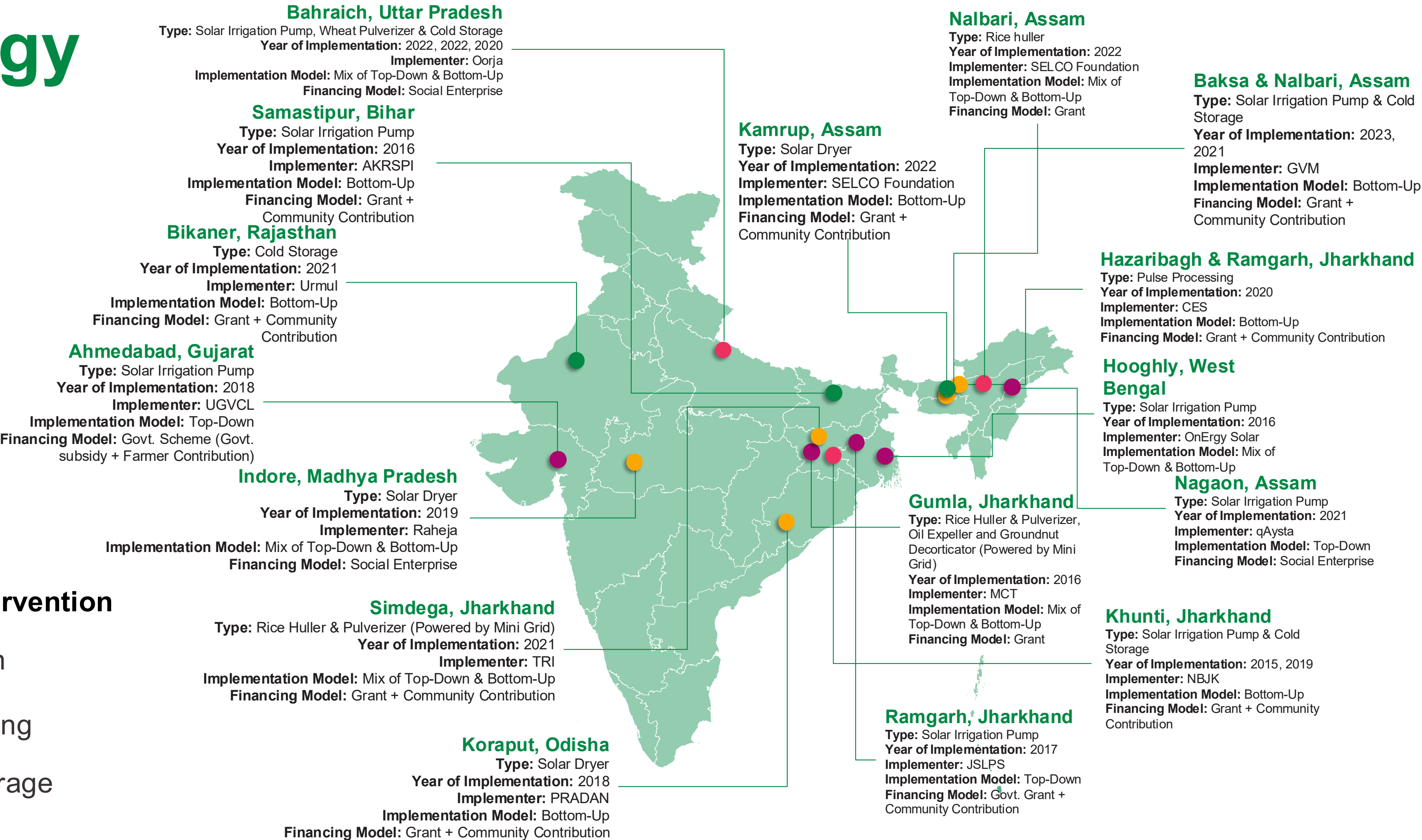
# Methodology

We studied  
**21 PURE-livelihood interventions** across  
**9 states**, deployed by  
16 anchor institutions:

- 9 irrigation pumps
- 4 cold storage units
- 8 agro-processing units

## Type of Intervention

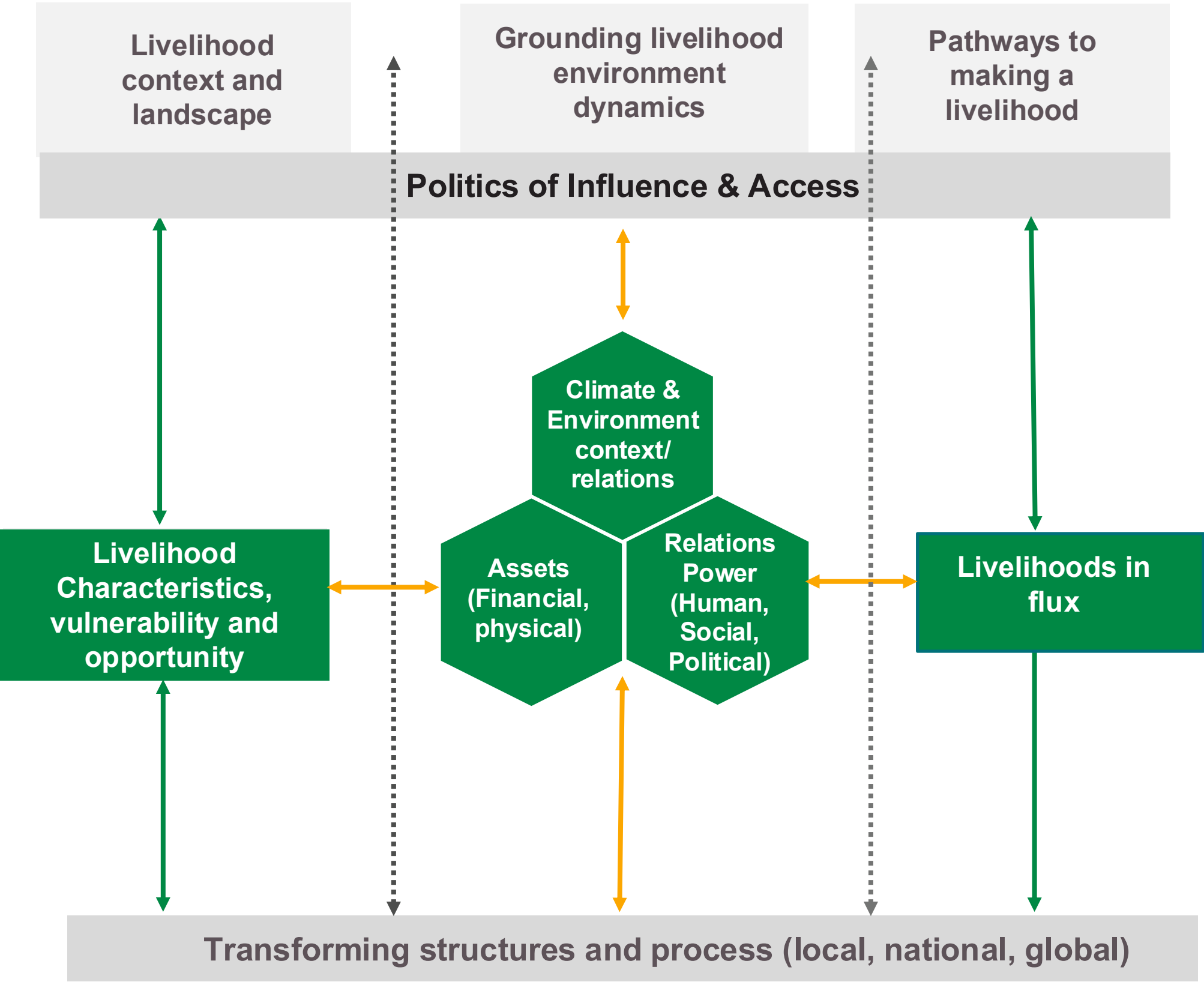
-  Irrigation
-  Processing
-  Cold storage
-  Two or more



**DISCLAIMER:** The map used in this presentation is for illustrative purposes and does not imply the expression of any opinion on the part of WRI India, concerning the legal status of any country or territory or concerning the delimitation of frontiers or boundaries.

Notes: **AKRSPI:** Aga Khan Rural Support Program India, **GVM:** Gramya Vikas Mancha, **JSLPS:** Jharkhand State Livelihood Promotion Society, **MCT:** Minda Charitable Trust, **NBJK:** Nav Bharat Jagriti Kendra, **Oorja:** Oorja Development Solutions India Pvt. Ltd., **PRADAN:** Professional Assistance for Development Action, **Raheja:** Raheja Solar Food Processing Pvt. Ltd, **CES:** Sakhi Mandal Producer Group, Customized Energy Solutions, **TRI:** Transform Rural India, **Urmul:** Urmul Seemant Samiti, **UGVCL:** Uttar Gujarat Vij Company Limited

# Sustainable livelihoods framework



Farm livelihoods are complex, diverse and characteristically multi-stranded, requiring a cross-sectoral understanding



How in different contexts, sustainable livelihoods are achieved through access to a range of livelihood resources, and a combination of livelihood strategies.



One such strategy is access to tailored PURE applications that can help support livelihoods



Implementation of PURE and the emerging shifts amidst the issues of access and power relations.





# Findings



# Technology-wise insights



## IRRIGATION PUMPS

- **Inclusion** based on farmers' ability to invest (in part) or availability of contiguous lands
- **O&M** supported by anchor institutions but managed by farmers
- **Owned and operated** by individual farmers & a group of farmers
- Primarily deployed as **Standalone technologies**
- Varying levels of farmer participation in decision-making



## COLD STORAGE

- Dependence on the anchor institution for **O&M and limited utilization**
- Need for immediate **cash flow limits storage and adoption challenge**, especially among smallholder farmers
- Large facilities **without market linkages** hardly meet the needs of small and marginal farmers
- Need for **year-round crop supply, technical support, and** continuous handholding



## AGRO-PROCESSING

- Significant potential of **being embedded in the local contexts**
- Opportunities for farmers to participate across the value addition
- **Owned and operated by farmer collectives**
- Dependency on anchor institutions increases farmers' income, but **limits farmers' autonomy**
- Models integrated into **SHG/FPO** increase farmer participation

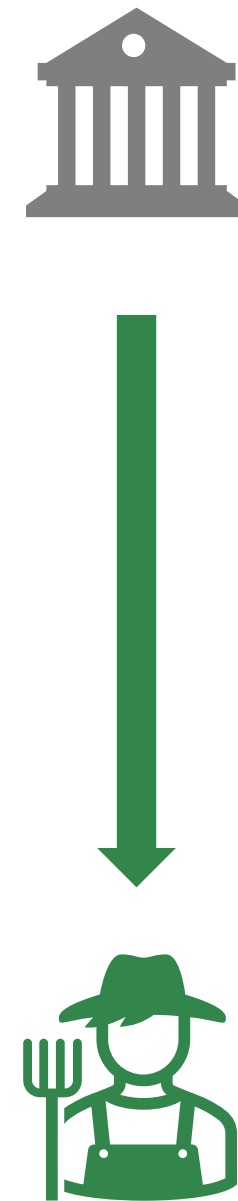




# Implementation model insights across technologies



**Top-Down Delivery Model**



**Bottom-up Participation Model**



**A Mix of Top-Down Delivery Model with Bottom-up Participation**





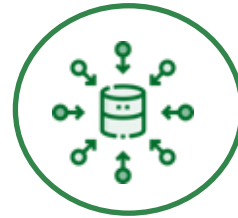
# End-user financing insights



**Capital Expenditure: A mix of resource mobilisation and risk-sharing**



**Government subsidies and donor grants play a critical role**



**Community contribution and low-interest loans from microfinance institutions**



**Charging fee for using the technology, pay-per-use, buyback, or market linkage agreement**



**Community-Based Organizations (CBOs) involvement helped share risks, build local capacity, and strengthen community ownership**



# Key considerations for creating an enabling ecosystem

## ANCHOR INSTITUTIONS

1. **Inclusivity in project design**
2. Long-term focus
3. Post-installation support & farmer capacity building
4. **Strengthening community governance structures**
5. Revenue generating and contextual business models

## POLICY MAKERS

1. **Demand-driven policies**
2. **Integrated/Value chain approach**
3. Data utilization
4. Inclusionary mechanisms
5. Enabling support to the sector



## TECHNOLOGY PROVIDERS

1. Contextual design
2. **Continual capacity building**
3. **Innovations for sustainability**
4. Ensure market linkages
5. Incorporate environmental monitoring

## FINANCIAL ENTITIES

1. Promote sustainable impact
2. **Financing for risk mitigation**
3. **Investing in innovation**
4. Revenue diversification
5. Fund robust monitoring approaches



# Thank you

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