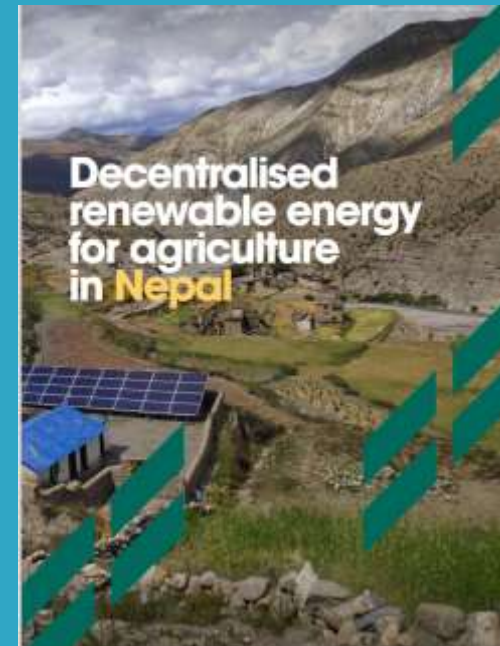


# Empowering Lives and Livelihoods: Decentralised renewable energy solutions for agriculture in Nepal

**Presenter:**

**Kavita Rai, Senior Programme Officer, IRENA**

**TUESDAY, 23 JULY 2025 • 13:00 – 13:30 CEST**



## SPEAKERS



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**The data collection and country co-ordination were facilitated by the Ministry of Agriculture and Livestock Development (MoALD) and the Alternative Energy Promotion Centre (AEPC)**



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# Why focus on the nexus of renewables with agri-food

- Livelihoods of 2.5bn people dependent on agriculture
- 30% share of food systems in world's energy consumption
- 30% energy wasted through food losses at one point or another in the value chain
- 14% of food produced globally is lost between harvest and retail



## Key Energy Entry Points in Agricultural Value Chains



# Empowering Lives and Livelihoods: Renewables for Climate Action

An Initiative launched at COP28 to reinforce resilience in the agriculture and health sectors

1

Connect people and improve livelihoods through renewables

2

Stimulate climate adaptation with mitigation benefits

3

Catalyse systemic energy transformation of agri-food/health

4

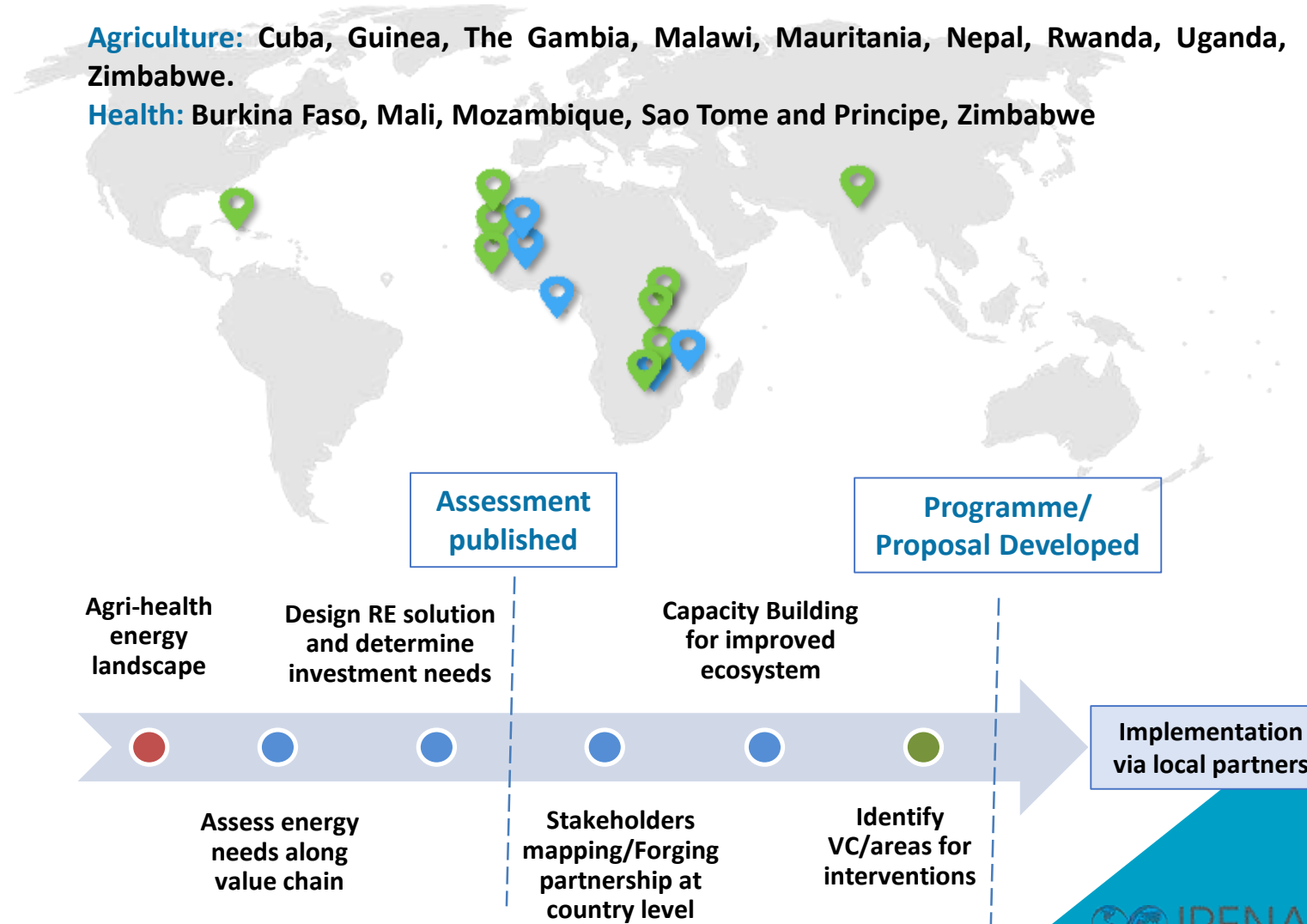
Improve resilience and productivity in agri-food/health

\* Contribute to the 2030 Agenda for Sustainable Development







**Agriculture:** Cuba, Guinea, The Gambia, Malawi, Mauritania, Nepal, Rwanda, Uganda, Zimbabwe.

**Health:** Burkina Faso, Mali, Mozambique, Sao Tome and Principe, Zimbabwe



- ❖ Agriculture contributes 24% of gross domestic product; 62% of population's livelihoods through income and food provision.
- ❖ The sector makes up 1.6% of the national energy consumption (WECS, 2022).
- ❖ Strong reliance on diesel at 90.9%, other fuels being electricity (7.4%), petrol (1.4%), and solar (0.3%).
- ❖ Country's agriculture mechanization priorities taken up through – Agriculture Mechanization Promotion Policy 2014 and the Agriculture Development Strategy 2015 - 2035
- ❖ Farmers have limited access to affordable finance
- ❖ Potential to increase export of the production provided higher yield, cold storage and processing facilities available

# Selection of commodities for study

Commodity	Commodity cluster	Study location	Geographical location	Government priorities	Rationale for selection
 <b>Maize</b>	Cereal	Dang, Lumbini province	Inner-terai	Super zone of PMAMP*	Food & feed supplies and value chain development
 <b>Apple</b>	Horticulture	Jumla, Karnali province	Mid and high hills	Super zone of PMAMP	High post-processing potential and extend market reach
 <b>Fishery</b>	Livestock and Fishery	Bara, Madhesh province	Terai	Super zone of PMAMP	Nutrition richness in diets and market potential
 <b>Millet</b>	Raithane crop	Dolakha and Sindhupalchowk, Bagmati province	Mid Hills	Research station site for the Hill Crops and GoN and project site with raithane ** as a priority	Nutrient-dense, climate resilient, local landraces of priorities of Nepal government

\* **PMAMP: Prime Minister Agriculture Modernization Project** – Identified 15 commodities. The Project seeks to improve productivity and covers all 77 districts. Federal subsidies channeled through it since 2019, promotes mechanization, strengthens the role of Custom Hiring Centers –149 CHCs established in 38 districts by 2020.

\*\* **Raithane crops** are defined as local and aboriginal genetic resources/crops of particular location and or geography. Being put in priority by government as an indigenous-resource, are nutrient dense and climate resilient.



# Decentralised Renewable Energy (DRE)

- Most of the equipment is diesel-powered. Low use of DRE except solar irrigation pumps.
- Most mobile equipment are in the production stage - mostly as accessories run by attaching it to a tractor. More DRE opportunity in non-mobile, post-production stage (exception of water pumping in production).
- Increasing migration is resulting in more women-led households, underscoring the importance of gender inclusion in DRE and agri-equipment.

**Estimated market potentials (in USD)**

<b>Maize: 87 million</b>	<b>Millet: 24 million</b>
<b>Fish: 1.2 million</b>	<b>Apple: 1.1 million</b>

**Irrigation**

Some farmers modified solar irrigation pumps (SIPs) with grid option – time to think solar+grid SIPs.

Groundwater pumping in Terai, whereas, lift irrigation in the hills.



**Cold storages**

Poor operation

- Lack service delivery model (Dang)
- Poor grid quality (Jumla)
- Management conflicts (Bara)

Energy is not the limiting factor for the sustainability of cold storages – need holistic service delivery support.

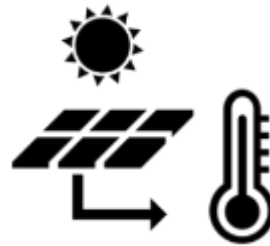


**Solar dryers**

No solar dryers were observed. Yet most consultations highlighted its commercial need.

Costly for individual ownership

Potential for electric + solar dryers for consistent output.





## DRE solutions for Food Value Chain energy needs: Maize

Field observations in PMAMP's Dang superzone showed that almost all of the production stages need reliable electricity for mechanization.

### DRE solutions supplement deficits in grid supply with reliable power

- ❖ Provision of off-grid renewables **to supplement deficit in** grid power supply ensures provision of reliable and uninterrupted power for agri-mechanization.
- ❖ Enhanced maize crop yields avoiding delay in production, mitigating food loss and with proper ecosystem support (including market linkages), strengthen their revenue earning capacities.

**Portable Irrigation Pumps**



**Thresher**



**Solar Bubble Dryer**



## DRE solutions for Food Value Chain energy needs: Apple

Field observations in PMAMP's Jumla superzone shows that 90% of the drudgery from manual tasks in post harvest processes can be reduced from mechanization. Erratic and poor-quality power supply impacts the operational efficiency of the agro business enterprises.

**DRE solutions allow for uninterrupted operations of processes, reduce drudgery with mechanization options**

- ❖ Agri-equipment powered by RE solutions ensure smooth & uninterrupted operations of post harvest processes
- ❖ Reduce drudgery for women



Roller Grader



Pulp maker

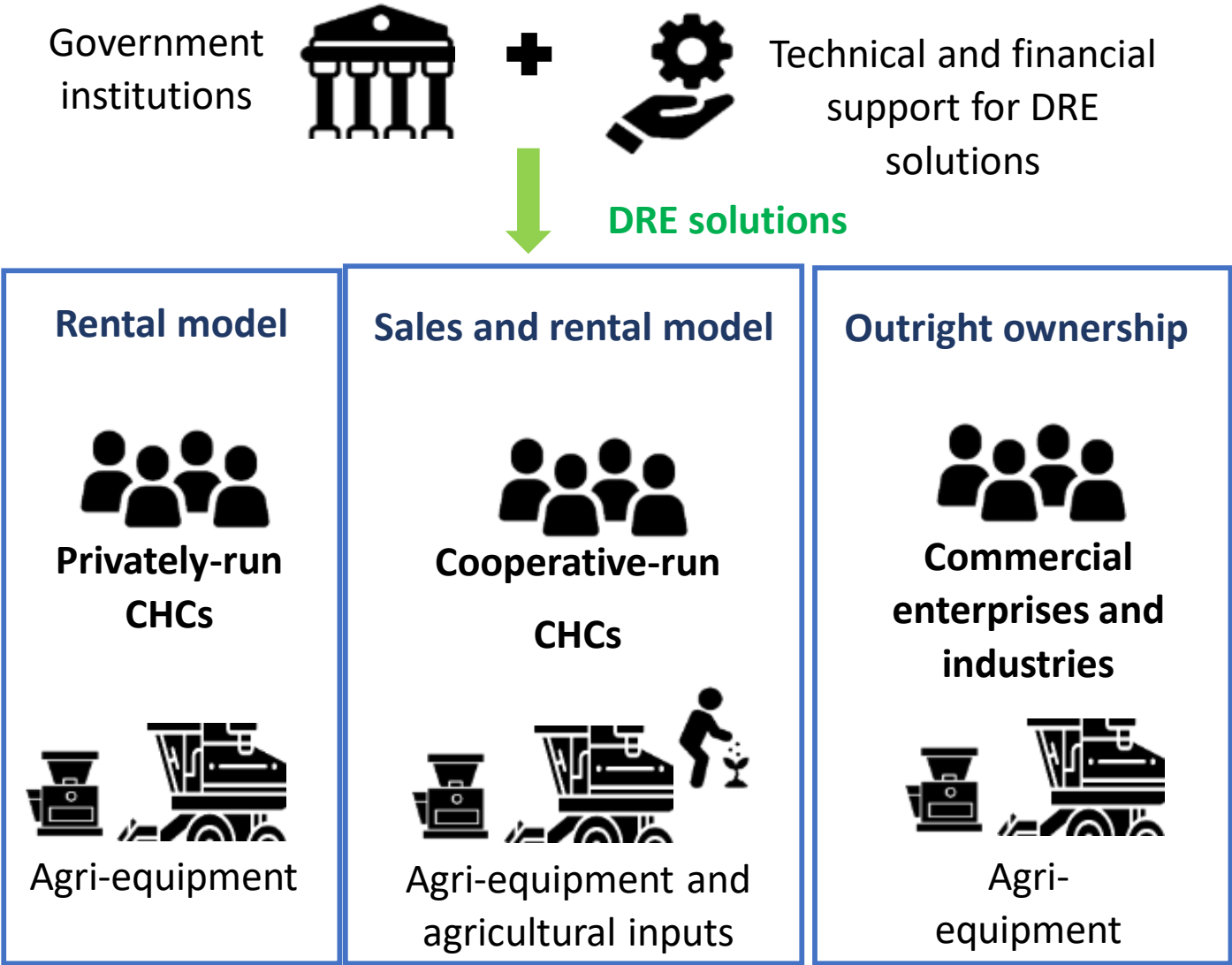


Apple peeler & slicer

Cold Storage



# Current Service Mechanisms for Agri-equipments (and potential DRE deployment)



## Across all technologies

Enhance government co-ordination across three tiers

Understand geographic context and crop variety for appropriate use of agri-equipment/s

Support market mechanisms around high potential opportunities for DRE integration (incl. compatibility with grid)

Build awareness and enhance capacity around utilization of DRE especially inclusion of women

## Technology-specific

Continue to scale up solar irrigation nationwide

Increase adoption of solar and bioenergy-based dryers for value-addition (address technical challenges)

Maximise use of existing DRE-powered mini-grids for agricultural applications

Scale-up DRE powered cold storage. Better educate farmers, ensure technical designs align with their needs

# Stakeholder collaboration for programmatic design & implementation

Type of institutions	Collaboration/ Partnerships required	Roles and responsibilities
<b>Government</b>	Relevant government departments or ministries responsible for agriculture, energy, and entrepreneurship	<ul style="list-style-type: none"> <li>▪ Provide policy support, regulatory guidance</li> <li>▪ Access to grant funding opportunities to local financing institutions (towards subsidized interest rates etc.).</li> </ul>
<b>International Development Organizations</b>	International development organizations or donor agencies	<ul style="list-style-type: none"> <li>▪ Funding support and technical assistance (incl.R&amp;D)</li> <li>▪ Access to global best practices and networks in promoting DRE use in agriculture and entrepreneurship development.</li> </ul>
<b>Regional or Local Financial Institutions</b>	Banks, microfinance institutions, or impact investors	<ul style="list-style-type: none"> <li>▪ Provide financing options and leverage</li> <li>▪ Access to credit</li> </ul>
<b>Implementation Partners</b>	(I)NGOs working in the fields of agriculture, renewable energy, or entrepreneurship.	<ul style="list-style-type: none"> <li>▪ Provide implementation support, resources</li> <li>▪ Community outreach capabilities</li> </ul>

# Stakeholder collaboration for programmatic design & implementation

Type of institutions	Collaboration/ Partnerships required	Roles and responsibilities
<b>Renewable Energy Enterprises</b>	Renewable energy companies	<ul style="list-style-type: none"> <li>Provide expertise in RE technologies, access to equipment</li> <li>Technical assistance or operation and maintenance support to end users (farmer groups, cooperatives, leasing groups, aggregators, and processors)</li> </ul>
<b>Private Sector (Aggregators and Processors esp. in international markets)</b>	Agribusinesses, food processors, or technology providers	<ul style="list-style-type: none"> <li>Offer market linkages (for both local and international markets), distribution channels, and business development support for entrepreneurs in the agriculture sectors.</li> <li>Aggregators and processors can handle certification, marketing, standards and export costs (if market is sizeable)</li> <li>Agri-processors are also a potential beneficiary of using DRE solutions e.g., cold chain, solar drying, etc.</li> </ul>
<b>Cooperatives and other Agriculture Associations</b>	Agriculture associations or cooperatives	<ul style="list-style-type: none"> <li>Facilitate outreach to farmers</li> <li>Provide access to agricultural networks and offer insights into the specific needs and challenges of farmers.</li> </ul> <p><i>Cooperatives leasing out agricultural equipment can provide channels for accessing DRE solutions to farmers and farmer groups.</i></p>
<b>Farmers and Farmer Groups</b>	Local communities and farmers	<ul style="list-style-type: none"> <li>Ensure that the program addresses their needs, incorporates local knowledge</li> <li>Foster community ownership and participation</li> </ul>





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