Can DRE-powered cold storage solutions create opportunities for small scale farmers to improve livelihoods?

WRI INDIA

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About WRI India

As an independent research organization, we leverage our data and expertise to inform policy and catalyze change across systems like food, land and water, energy and cities. To enable change at the pace and scale needed, we also work to shift the economic, finance and governance structures that shape people's decisions and behaviors.

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Why store agriculture produce?

- **Loss of food produced**: 20% globally, 40% in India – worth $18.5 billion in 2020-21
- A **crucial concern** revolves around preserving **freshly harvested horticultural produce**
- **Caused by:** Pests, climate variabilities, inadequate harvesting practices, improper handling, lack of cold chain infrastructure and unsystematic market linkages
- **Leads to:** Low incomes, sale at throwaway prices, food left to rot or wasted, food and nutrition insecurity
- **Exacerbated by:** Context-specific dynamics, access issues for small-scale farmers and climate crises

Lamba et al 2021; Efficiency for Access Coalition 2023
Picture source: WRI India; spoilt tomatoes thrown across the side of a rural road.

Why cold storages?

- **Traditional** agriculture produce storage methods in India, though affordable and easy to use, are **prone to significant losses** and primarily used for **storing grains**

- **Cold storages** have been proven to: reduce food loss, minimize distress sales, ensure price stability throughout the year, enhance the export of horticultural produce, boost profits, and ensure food and nutrition security for farmers

Cooper et al. 2021; Bhanot, Kathuria, and Das 2021; Picture source: Indiamart

What is a Decentralized Renewable Energy (DRE) powered cold storage?

- Systems that **generate, store and distribute electricity locally –** persuasive source to power productive appliances in agriculture

- DRE sources have historically provided a faster and more affordable means to supply and enhance electricity access in rural and remote regions

- **Solar** has emerged as a promising low-carbon alternative/complement especially for rural and remote areas

Streimikiene et al. 2021; Picture source: Indiamart

Gaps that DRE-powered cold storages can address?

Cold storages in India are **primarily large-capacity** and used for **single-commodities**

Small-scale farmers with **low quantities of perishable crops** and **inadequate transportation** cannot access these large units located at market gate

Inflexible and **long-term fixed contracts** to store produce limiting marginal and small-scale producers

Existing modern cooling technologies are **capital intensive** and **require reliable electricity.**

Limits **smallholder farmers with unreliable electricity** in **building, owning**, and **operating** these systems.

Islam et al. 2022; Efficiency for Access Coalition 2023

Potential of DRE-cold storage: Inputs from the field

Existing business models **in India** for small-scale storage: upfront purchases by farmer collectives, rental or lease model or pay-as-you-store.

Cold storage closer to the farmgate has improved farmers' access and fosters easy utilization in some locations.

Cold storages run by farmer groups/collectives can provide a more flexible platform for farmers to store.

Aggregation of produce through farmer groups can enable effective year-round utilization of the unit.

Picture source: WRI India

Challenges still persist in large-scale adoption and scaling of DRE cold storages…… Why?

- Maximum utilization of a cold storage dependent on adequate & year-round supply of crops for storage rather than proximity……
- Though cheaper than large-capacity units, DRE-powered units are still expensive and require high upfront costs……
- Installations are fragmented across India with limited standardization and innovation……
- Complex technologies often tend to fail in difficult geographies……
- Cold-storage technology alone is expected to address food loss and livelihood challenges……
- Farmers are attuned to selling fresh produce in the local markets and receiving immediate cash……

….often a challenge for small-scale farmers

….making farmers dependent on external sources of funding

…..restricting price rationalization and thus, adoption.

…..limited capacity building and handholding support post installation.

…..market linkages are often ignored

…..little incentive to shift behavior towards storing agriculture produce, especially perishables.

Five Learning Questions from India

1. Improve agrifood outcomes or force-fit technologies?
2. Contextuality of technologies, intervention design, financial strategies?
3. Intentionally inclusive in selecting end users, crops, value chains, locations?
4. Are we creating enabling support systems for sustainable utilization?
5. Are we investing in generating learning?

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