POWER FOR ALL FACT SHEET

From Farm to Market: Tackling Value Chain Inefficiencies with Decentralized Renewable Energy in Uganda & Ethiopia

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THE COST OF INEFFICIENCY

1/5

MAIZE PRODUCTION LOST IN ETHIOPIA DUE TO POOR DRYING, PEST DAMAGE, AND SPOILAGE

WHAT DRE CAN DELIVER

+50%

INCREASE IN MATOOKE YIELDS IN UGANDA WITH SOLAR IRRIGATION

18%

BOOST IN DAIRY INCOMES FROM SOLAR LIGHTING

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1. Energy Access is the Missing Link in Agriculture

In Ethiopia and Uganda, agriculture plays a crucial role in securing food, supporting livelihoods, and generating employment. Yet both economies face persistent energy deficits. As of 2023, national electricity access stood at 52% in Uganda and 55% in Ethiopia, with connectivity concentrated along grid networks, while many productive farming areas and emerging economic zones remain underserved (ESMAP, 2025; Kersey et al., 2025). With agriculture contributing 24% of GDP and 68% of jobs in Uganda, and 30% of GDP and 80% of jobs in Ethiopia, these gaps limit productivity and keep value chains underpowered.

Decentralized renewable energy (DRE) offers a practical pathway to agricultural modernization, bringing reliable power directly to farming communities. When coupled with productive uses of energy (PUE) such as irrigation, milling, refrigeration, and mechanization, it can boost yields, cut losses, and create new income and employment opportunities. Unlocking this potential, however, hinges on targeted policy support and investment.

Study at a Glance

This fact sheet draws on a comparative analysis of four agricultural value chains — dairy and matooke in Uganda, maize and teff in Ethiopia — to identify how DRE can reduce losses, raise productivity, and strengthen competitiveness. The research combined techno-economic modeling, field-level data, and stakeholder interviews. Solutions were assessed for cost, payback, and profit impact, and prioritized using a feasibility–impact scorecard that factored in policy readiness, finance availability, and farmer adoption.

2. Every Link in the Value Chain is Held Back by Power Gaps

Despite differences in crops and markets, inefficiencies (see Table 1) follow a common pattern across dairy, matooke, maize, and teff:

Low yields due to manual labor and rainfall dependence.

High post-harvest losses (20–45%) from limited storage and drying.

High processing costs from reliance on diesel-powered technologies.

Fragmented markets with weak transport and limited digital access.

Combined post-harvest losses in dairy, matooke, maize, and teff are likely well above USD 600 million each year — a scale that underscores why tackling inefficiencies is as critical as raising yields (Power for All, 2025).

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WHAT DRE CAN DELIVER

30–50%

YIELD GAINS FROM SOLAR WATER PUMPS

100%

INCOME GAINS FOR TRANSPORTERS ADOPTING ELECTRIC MOTORBIKES

TABLE 1. COMMON INEFFICIENCIES ACROSS VALUE CHAINS

Stage	Dairy (Uganda)	Matooke (Uganda)	Maize (Ethiopia)	Teff (Ethiopia)
Farm	Water scarcity, 30% feed inefficiency	Dry-season yield drops up to 50%	Low mechanization, rainfed reliance	Hand broadcasting, seed wastage
Post-Harvest	35% outlets lack cooling	20–45% losses, no storage	20% losses (USD 392M)	13% losses from pests & rot
Processing	Diesel milk collection centers, underutilized plants	Minimal value addition	Diesel mills 2–3x costlier	High milling costs, weak value addition
Market	Weak export readiness	Fragmented, informal sales	Price asymmetry	Transport costs 2–3x farmgate

3. DRE is Ready to Deliver Today

Across all value chains, DRE directly tackles the recurring bottlenecks that keep farmers trapped in low productivity and thin margins. It cuts post-harvest losses, replaces expensive and unreliable diesel, powers value addition, and connects farmers to markets.

To identify which DRE solutions offer the greatest potential for scale and impact, each was mapped against a Feasibility Index–Economic Impact scorecard (Figure 1). Priority interventions are those that score high on both dimensions. **Feasibility** (x-axis) is a composite index of the technology's policy readiness, farmer awareness, finance availability, implementation autonomy, and popularity of the technology. **Economic Impact** (y-axis), represents the annual profit generated after the payback period—typically under three years. The three interventions that combine strong feasibility with high economic returns are:

- **Solar lights for dairy (Uganda) —** The most feasible intervention, supported by strong policies, high user awareness, and immediate productivity gains (+18% annual profit). They serve as an accessible entry point that can unlock demand for additional productive use technologies.
- **Solar water pumps (Uganda) —** A strong performer on both feasibility and economic impact (+33–50% annual profit), solar pumps stabilize production and reduce rainfall dependence, making them a "resilience investment" when paired with targeted financing.
- **Electric motorbikes (Ethiopia) —** The highest-impact intervention, offering the largest income gains for users (up to +100% annual profit potential) and benefitting from supportive national electric vehicle (EV) policies.

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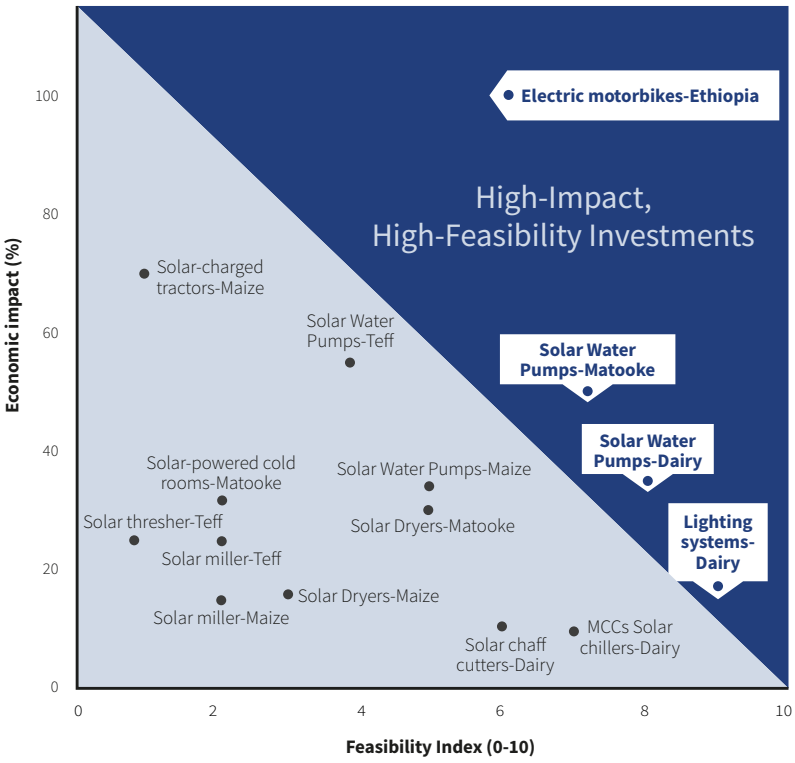
A FAST RETURN ON INVESTMENT

<3 YEARS

PAYBACK TIME FOR MOST DRE INTERVENTIONS

FIGURE 1. INVESTMENT PRIORITIES FOR ENERGY-ENABLED AGRICULTURE



4. Strengthen Systems to Make Solar Work for Farmers

Scaling DRE in agriculture is less about proving technology and more about overcoming the systemic barriers that keep proven solutions out of farmers' reach. The scorecard highlights clear priorities from dairy lighting and solar pumps to electric motorbikes, but their success depends on how well financial, institutional, and policy systems work together over time. Key recommendations to enable DRE to scale sustainably across agricultural systems in Ethiopia and Uganda are outlined below.

Strengthen cooperatives to sustain technologies.

Technologies best suited to cooperative-based management—such as solar pumps or cold storage—only perform if they are managed well. Weak cooperative governance has repeatedly undermined investments in both Uganda and Ethiopia. Strengthening cooperatives and unions through governance training, digital tracking, and service networks is essential, though results will vary and require sustained support. Embedding gender equity is not only fair but practical: women, perform much of the agricultural labor and are often best placed to ensure technologies are maintained and benefits are shared.

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Adapt finance to agriculture's realities.
Agriculture's cash flows rarely match standard loan structures: farmers earn seasonally, cooperatives pool resources unevenly, and processors depend on long-term capital. Financing models must reflect this diversity. PAYGo can bring pumps within reach of smallholders, cooperative leasing can unlock shared assets like threshers and dryers, and blended finance can catalyze larger investments in mini-grids and transport fleets. De-risking these entry points requires early concessional capital to draw in private lenders and scale adoption.

Mainstream energy into agricultural policy.
Energy and agriculture ministries still operate in silos, and DRE is too often treated as a peripheral pilot rather than a mainstream input. Embedding energy targets in agricultural strategies and ensuring extension services teach energy literacy alongside agronomy can start to bridge this divide. Regional trade rules can then amplify these gains, positioning teff for premium export or enabling Uganda's dairy to compete regionally, but coordination across institutions needs to go beyond policies on paper.

Build the foundations for smart agriculture.
Reliable energy unlocks digital tools from PAYGo repayment platforms to IoT sensors that secure cold chains. But digital ecosystems do not automatically follow the arrival of DRE hardware. They require active investment, regulatory clarity, and connectivity that reaches farmers across the urban-rural continuum. Without this, the promise of "smart agriculture" risks deepening inequalities rather than closing them; with it, digital and energy systems can reinforce each other to drive productivity, inclusion, and resilience.

5. DRE is the Cornerstone of Agricultural Transformation

DRE is not a marginal add-on but a foundation of agricultural modernization. Realizing its potential starts with scaling the most feasible, high-impact interventions identified in the feasibility–impact scorecard —such as dairy solar lighting, solar water pumps, and electric motorbikes. These technologies can anchor early investment and build market confidence.

Yet transformation will not come from any single solution. Progress depends on sequencing investments: starting with these high-return opportunities while building the financial, institutional, and policy systems that enable other DRE solutions to advance across the feasibility curve from promising pilots to drivers of agricultural growth.

Every year of delay locks in hundreds of millions in losses and keeps farmers in subsistence. Investing in DRE for agriculture now can turn persistent inefficiencies into drivers of competitiveness and growth, when pursued as part of a broader transformation strategy, rather than a standalone energy agenda.

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