



Productive Uses of Energy in Ethiopia

Agricultural Value Chain
and Electrification
Feasibility Study



Executive Summary / May 2021

Executive Summary

The major institutions in the Ethiopian energy space and the agencies that support them recognize that productive use of electricity is key to achieving national targets of universal electrification.¹ Yet, there is less alignment on which activities to electrify and what support is needed to enable adoption of productive uses throughout rural communities in Ethiopia. This alignment is critical to efficiently support projects and initiatives that successfully push productive uses forward.

This study builds a shared understanding of and a common language to assess opportunities for productive use. Specifically, it identifies opportunities to electrify agricultural productive uses today, how they can be developed through feasible business models, and the strategies and initiatives stakeholders can use to overcome barriers to deployment.

But the approach used is just as important as the questions asked. Productive use initiatives must start with understanding ground realities and responding to end-user needs. Our analytical approach recognizes ground realities to ensure that recommendations connect to end-user needs. To do so, the study explores prevalent activities, community practices, and economic returns that indicate demand and local capacities in and potential benefits for rural communities. We also consult directly with end-users through field surveys as well as through planned field visits and community workshops in the next stage of the project.

Grain-Flour Milling

There is an immediate opportunity to electrify diesel-fuel milling for various crops in rural Ethiopian communities. Grain flour milling, particularly for maize and wheat, uses inputs that are produced



in high volumes and that are already commonly mechanically processed before sale into robust local markets. This opportunity requires little to no market development support to be implemented today and at widespread scale.

This study considered five value chains across Amhara, Oromia, and Southern Nations, Nationalities, and Peoples Region (SNNPR), including more than 250 field interviews with community heads, farmers, processors, and traders in more than 51 rural communities. Based on this data collection, we evaluated value chain activities with electrification potential for each crop across four dimensions: existing local capacity for the activity, presence of a market for the product, availability of electric equipment and ease of retrofitting electric components, and scalability of the activity.

¹ The National Electrification Program 2.0 (2019), developed by the Ministry of Water, Irrigation, and Energy (MOWIE) explores the agriculture-energy nexus and establishes high-level strategies to explore and develop productive uses. MOWIE and the Ethiopia Electric Utility Company (EEU) will electrify productive uses of energy to accelerate energy access in the US\$500 million Access to Distributed Electricity and Lighting (ADELE) Project.

Considering these factors, prospective productive use activities can be divided into three tiers based on their readiness for electrification and implementation (see Exhibit ES 1):

Exhibit ES 1 Summary of Tier Classifications for Value Chain Activities across Five Crops Analyzed in the Study

Focus Crops	Priority Value Chain Activities for Electrification with Minigrids					
	Mechanical Threshing and Cleaning	Mechanical Hulling	Flour and Meal Milling	Mechanical Drying	Other	
Maize						
Wheat						
Teff					Injera making	
Barley					Brewing	Malting
Dairy					Butter making	Milk Chilling

Tier 1
Immediate

Tier 2
Medium-Term

Tier 3
Long-Term

The study finds that electrifying grain milling almost **halves energy costs and doubles profit margins**. Electrifying **grain milling can also improve minigrid economics**, boosting revenues and reducing cost of service by 8%-13% depending on the time of use or seasonality of loads. This can be achieved through a fee-for-service business model, which is outlined in detail within the study.

A fee-for-service business model connects processors with knowledge and support to seize this economic opportunity.

The fee-for-service business model builds upon widely prevalent practices and brings together actors commonly found in the Ethiopian agriculture space. Importantly, it relieves the energy service provider from assuming an additional burden at this nascent stage of the minigrid market. The fee-for-service model is led by a facilitator who enables processors to invest in equipment by educating processors and linking them with finance providers who make an equipment loan (or lease) to the processor. While the processor is ultimately responsible for the credit and operational risk, the facilitator builds awareness about the investment opportunity and provides business development training to support loan applications and equipment selection.

Exhibit ES 2 Preliminary Design of National Productive Use Program

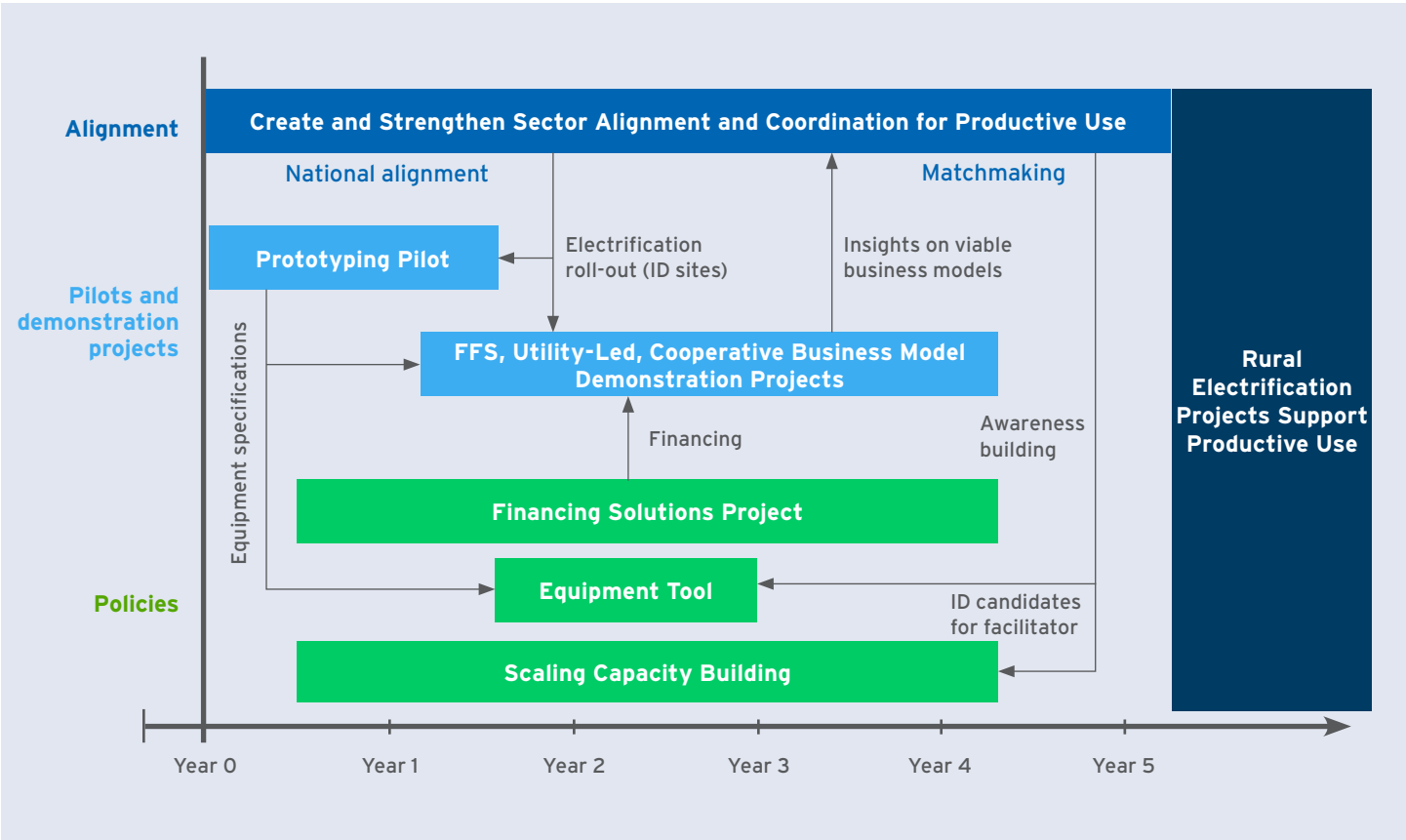
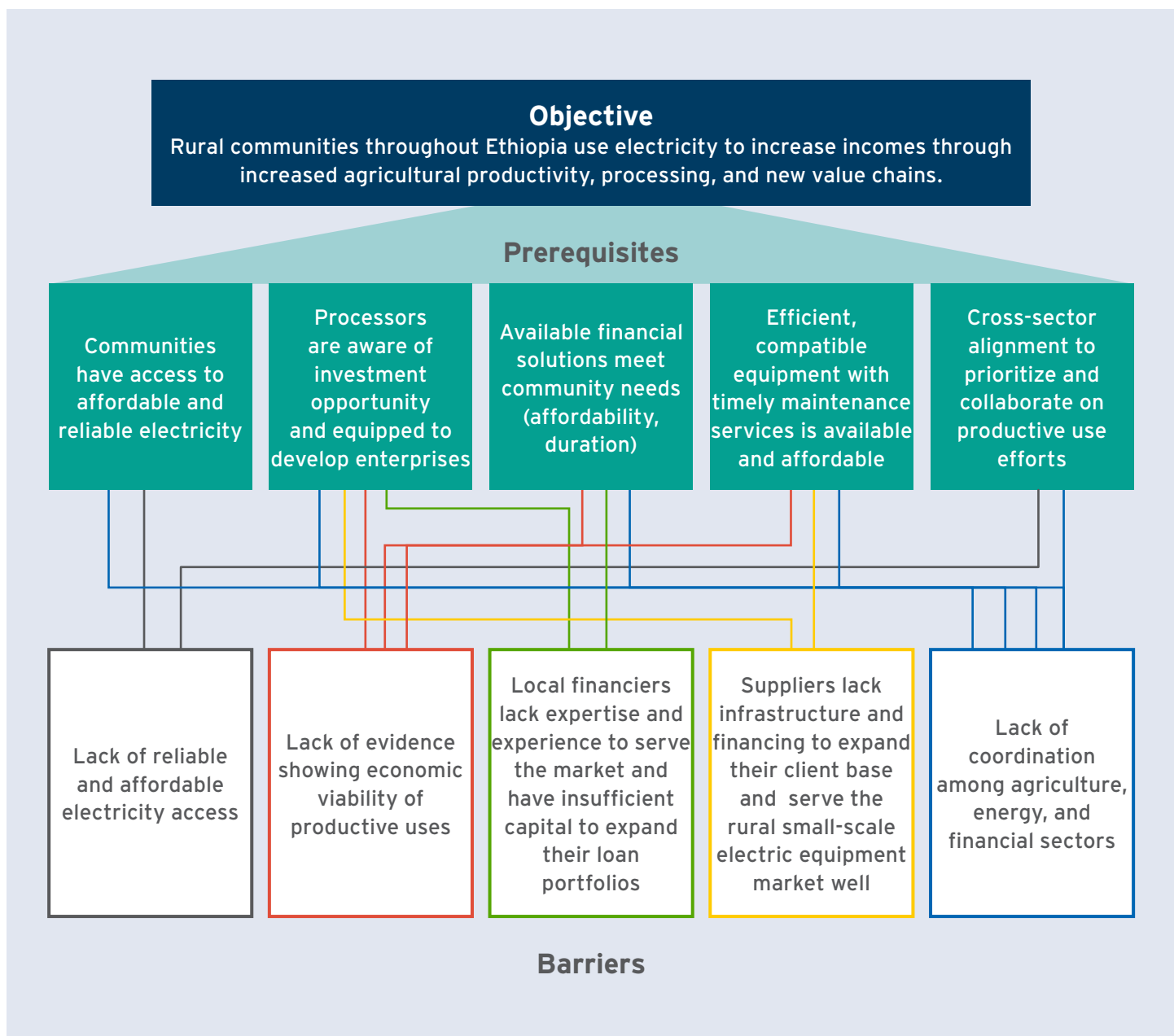


Exhibit ES 3

Mapping of Prerequisites and Barriers to Scale Productive Uses



Scaling Productive Uses through a National Productive Use Program

We propose a preliminary design of the National Productive Use Program to achieve the following prerequisites for electrifying productive uses at scale:

Prerequisite 1: Communities have access to affordable and reliable electricity. Affordable and reliable electricity access is the foundation for electrified productive uses. Nearly all experts we consulted and over 80% of agro-processors we surveyed noted the lack of reliable electricity to operate equipment as the most or second-most important barrier rural entrepreneurs face.

Prerequisite 2: Processors are aware of investment opportunities and equipped to develop enterprises. Without robust examples showing the technical and financial viability of electric equipment in rural communities, processors will be unwilling to invest in electric equipment. Beyond the desire to purchase electric equipment, processors also need to be aware of the opportunities available to finance equipment and have the skills to select equipment and develop a business plan.

Prerequisite 3: Available financial solutions meet community needs. About 60% of survey respondents identified lack of access to credit among the top two barriers preventing them from upgrading their business and only 2 of the 63 grain millers we surveyed had obtained a loan in the past. Most local finance providers do not serve the appliance financing market for agricultural productive uses in rural areas.

Prerequisite 4: Efficient, compatible equipment with timely maintenance services is available and affordable. Additional research is needed to test locally available electric equipment to ensure compatibility with minigrid systems, operator requirements for efficiency, and end-consumer product preferences. Equipment suppliers we consulted noted difficulties in providing prompt repairs in remote areas. This risk of delays in repairs

and foregone revenues will demotivate would-be processors from purchasing equipment.

Prerequisite 5: Cross-sector alignment helps stakeholders prioritize and collaborate on productive use efforts. As noted previously, there is a lack of awareness and alignment on which opportunities for productive use to prioritize and a lack of coordination among stakeholders in the agriculture, energy, and financial sectors to mobilize investment.

We propose a preliminary National Productive Use Program that ensures these prerequisites are met by aligning cross-sectoral actors, generating an evidence base, and developing supportive policies. The program is made up of the following projects and scaling mechanisms:

- **Align and connect cross-sectoral actors.** *The Create and Strengthen Sector Alignment and Coordination for Productive Use* project will open dialogue across the energy, agriculture, and finance sectors to identify opportunities to develop productive uses.
- **Prove and demonstrate the viability of equipment and business models.** A series of pilots and demonstration projects will build the evidence base to show the technical and financial viability of equipment and business models. *The Electric Mill Prototyping Pilot* will fine-tune and field-test equipment in minigrid communities and establish the specifications to ensure equipment compatibility with minigrid systems and equipment operator and end-consumer preferences. The business model demonstration projects will recruit private actors to implement recommended business models around Tier 1 activities and demonstrate financial viability.
- **Develop supportive policies** for an enabling ecosystem. Technical advisory, capacity building, and funding support will lubricate the ramp-up of productive uses in specific hubs through the pilots and demonstration projects and then provide the platform solutions needed to replicate productive uses in rural communities across Ethiopia.

Ground Consultation and Field Testing

The next steps to finalize the National Productive Use Program focus on ground consultation and field testing. We will do this by completing the following:

- 1. Carry out community and national consultation (Design Sessions).** The Design Sessions will use a three-tiered approach for connecting with end-users. The first two tiers will focus on understanding the barriers and opportunities at the community level. Together these tiers will lead to the design of highly actionable community solutions and projects rooted in ground realities and priorities. The third tier will convene national level stakeholders to build on and connect these community-level solutions with top-down broader actions to support and scale implementation of community-level projects.

Throughout the execution of these tiers, the team will facilitate discussions with end-users and co-producers to build on the preliminary design presented in this study and finalize the National Productive Use Program.

- 2. Implement a Data Pilot.** This will build a database and insights to estimate potential load and revenue growth for a minigrid system serving milling loads, and better understand milling profitability and end-consumer preferences. The team will use this information to fine-tune the financial models and design of the pilots and demonstration projects proposed in the preliminary productive use program.
- 3. Disseminate study results.** The team will lead cross-sectoral engagement across the agriculture, electricity, and finance sectors to share results, build consensus, and connect projects to actors and funding to prepare for implementation.



The prospects for electrification in Ethiopia are bright. Increased attention from government, development partners, and the private sector is driving increased investment in energy access. However, it is critical that these projects include business models that electrify agricultural productive uses. An effective national productive use program will unlock local economic development and can serve as a springboard toward realizing the full potential of rural electrification.

Scarlett Santana, Zihe Meng, Kester Wade, Patience Bukirwa, Francis Elisha, *Productive Uses of Energy in Ethiopia: Agricultural Value Chain and Electrification Feasibility Study*, RMI, 2021, <http://rmi.org/insight/productive/uses/of/energy/in/ethiopia>.

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