Accelerating rural energy access in Ethiopia: with a focus on productive uses

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Accelerating clean energy access in rural areas
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CGIAR research on rural energy access in Ethiopia

- IFPRI: A regional Energy Systems Model for Ethiopia, Sudan, and Egypt
- IFPRI helped develop an Energy Systems Model for Eth
- IFPRI assessed the relative feasibility to accelerate private SSI with solar versus diesel pumps
- IFPRI/IWMI supported understanding of the cost effectiveness of a hybrid rural decentralized energy systems for productive and other uses
- Valuing the synergies between rural electrification and ag production & processing opportunities in Eth: RMI/IFPRI
- Spatially explicit estimation of energy demand for irrigation by energy types - IFPRI and EEG
Key productive uses of energy in agriculture

- Use of biomass for improving farm productivity vs its use to meet domestic energy needs

- Energy as a requirement for agricultural intensification (irrigation, mechanization, fertilizer) - energy input for ag

- Electricity for value addition
Rural Energy Access in Ethiopia: a background

Clean lighting sources in rural areas

Primary oven (*mitad*) for injera baking in rural areas

Rural cooking and lighting

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Rural households with and without electricity spend the same amount of time on collecting fuel wood, dung, and other biomass.

Removal of dung and crop residues results in loss of soil fertility and productivity

Time spent collecting biomass energy sources reduce labor allocated to agriculture, but it depends on when the biomass is collected and who does the collecting.
Energy input for agricultural intensification

- Ethiopian agricultural mechanization is about 0.1 kW/ha. India’s level of mechanization was approximately 2 kW/ha in 2014, and China’s was over 6 kW/ha.

- Most of the energy in Ethiopia’s agriculture is the one embodied in chemical fertilizers, which has increased significantly in the last two decades.

- Investment in agriculture continues to be GoE’s priority with greater emphasis on infrastructure, including water and irrigation schemes.

- At least 13 ongoing large scale irrigation projects with a combined command area of more than 400,000Ha
Irrigation and energy use in Ethiopia

Diversity of energy options

- Gravity: 51.8%
- Diesel motor pump: 27.5%
- Manual: 7%
- Electric motor pump: 5.3%
- Pressurized pump: 8.4%

O&M cost of irrigation per ha by energy type

- 1078
- 794.3
- 10149
- 7577
- 12774

Irrigated crops by energy type

- Pressurized pump
- Electric motor pump
- Diesel motor pump
- Manual
- Gravity

Net return of irrigation per ha by energy type (2016/17)

- Gravity: 14040.91
- Manual: 24659.19
- Diesel motor pump: 2343.19
- Electric motor pump: 1956.88
- Pressurized pump: 2134.49

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Energy/Electricity for value addition

- Electrification has great potential to help rural small holders power increased agricultural productivity, unlock local processing activities, and create new businesses.

- Borgstein et. al (2020) examined six agricultural production and processing opportunities for rural areas in Ethiopia: horticulture irrigation, grain milling, injera baking, milk cooling, bread baking, and coffee washing.

- These areas have the potential to produce US$4 billion in annual value using electric appliances by 2025.

- Supplying the appliances is itself a US$380 million investment opportunity.

- These six areas can produce an additional US$22 million annual revenue stream for the utility by 2025, by selling more units of power with the same capital investment.
Refine electrification planning to deliver appropriate power and reliability for high-priority productive use areas, both on and off grid.
THANK YOU