

# 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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RESEARCH  
PROGRAM ON  
Water, Land and  
Ecosystems



# CGIAR research on rural energy access in Ethiopia

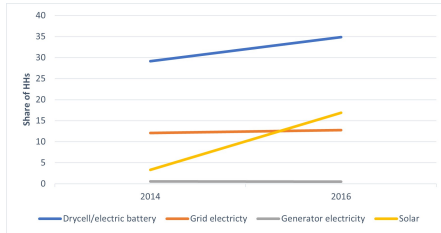
- IFPRI: A regional Energy Systems Model for Ethiopia, Sudan, and Egypt
- IFPRI helped develop an Energy Systems Model for Eth
- IFPRI assessed the relative feasibility to accelerate private SSI with solar versus diesel pumps
- IFPRI/IWMI supported understanding of the cost effectiveness of a hybrid 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

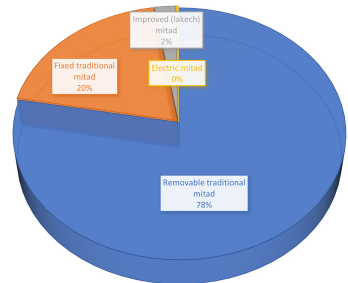
- Use of biomass for improving farm productivity vs its use to meet domestic energy needs
- Energy as a requirement for agricultural intensification (irrigation, mechanization, fertilizer) - energy input for ag
- Electricity for value addition

# Rural Energy Access in Ethiopia: a background

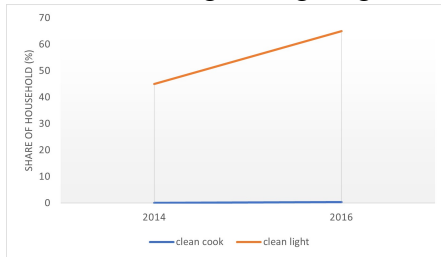
## Clean lighting sources in rural areas



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



## Rural cooking and lighting



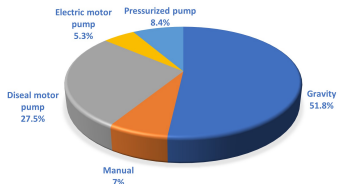
- Rural households with and without electricity spend the same amount of time on collecting fuel wood, dung, and other biomass.
- Removal of dung and crop residues results in loss of soil fertility and productivity
- Time spent collecting biomass energy sources reduce labor allocated to agriculture, but it depends on when the biomass is collected and who does the collecting.

# Energy input for agricultural intensification

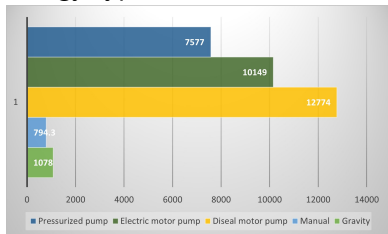
- Ethiopian agricultural mechanization is about 0.1 kW/ha. India's level of mechanization was approximately 2 kW/ha in 2014, and China's was over 6 kW/ha.
- Most of the energy in Ethiopia's agriculture is the one embodied in chemical fertilizers, which has increased significantly in the last two decades.
- 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

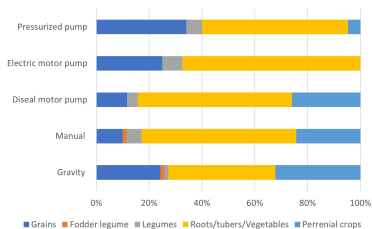
## Diversity of energy options



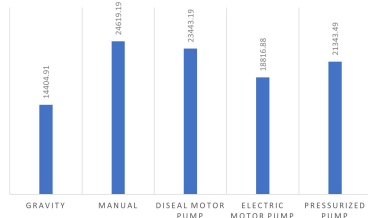
## O&M cost of irrigation per ha by energy type



## Irrigated crops by energy type



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

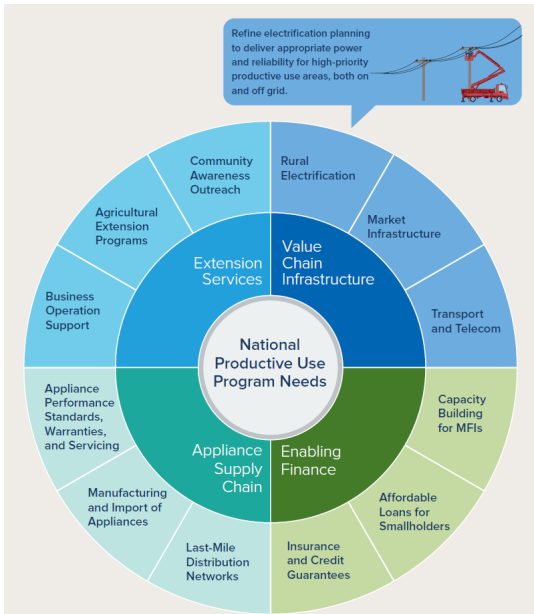


# Energy/Electricity for value addition

- 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.



# What needs to happen? Borgstein et. al (2020)



THANK YOU