Energy Access-Bass Connection in Ethiopia

Duke Energy Access Project: My Summer Virtual Internship Kalkidan Kebede Masters of International Development and Policy Sanford School of Public Policy August 2020



Outline

- Project Overview
- Learning Curve and Specific Tasks
- Context
- Energy Water and Agriculture Nexus/ Ethiopia?
- Evidence and Review Findings
- Challenges and Opportunities, and
- Interests and Future Plans



EA-BC-Ethiopia: Project Overview



Strategies for Energy, Water and Agriculture in Rural Ethiopia (2020-2021)

- Unique project that integrates 3 most important sectors in Ethiopia
- Started in 2018/2019
- Timing: Summer 2020 Spring 2021
- Course: Energy Class

Background

Increasing access to electricity is a top development priority, yet nearly one billion people lack access to electricity and another billion have unreliable access that hinders productivity and economic development among households, firms and public institutions. In Ethiopia, 56 percent of the population have no access to electricity, and only six percent have electricity access for at least 23 hours per day.

To increase access, the Ethiopian government has implemented the National Electrification Program 2.0. This program, which aims to achieve universal access to electricity by 2025, has been praised for its detail, its focus on off-grid and productive uses of energy and the way it has organized the private sector and the donor community. However, it is unclear how productive use – broadly defined as electricity use that generates increased agricultural, commercial or industrial productivity – should be integrated into development plans.

Off-grid power provision could require higher tariffs and coordination between private and public stakeholders, which are challenging to implement and could result in unintended consequences, such as over-exploitation of groundwater resources. Ethiopia needs tools that help the stakeholders understand the gains of expanding electricity access for productivity, the different modalities that can deliver them, potential tradeoffs of such investment and how energy access investments should be distributed spatially, temporally and across different communities.



Team Leaders

- Justin Baker, Sanford School of Public Policy
- T. Robert Fetter, Nicholas Institute for Environmental Policy Solutions
- Marc Jeuland, Sanford School of Public Policy
- Jonathan Phillips, Nicholas Institute for Environmental Policy



My Learning Curve and Specific Tasks

- Collecting Peer Reviewed Documents on En. Water Ag-Irr.
- Communicating and linking with the NITs
- GERD-Negotiation B/n EES
- Collecting Primary and Secondary Data(Nat. & Intern.)
- Supporting EA and RTI Team
- Developing Course materials (Fall and Spring)
- Selecting Students for the EA-BC project
- Collecting relevant research materials for my MP



June-July-August

Context: Energy Consumption vs Growth/Dev.



World Countries with the largest access deficit, 2010–18

The 20 countries with the largest access deficit, 2010–18

Share of population and total population without access, top 20 access-deficit countries and rest of the world, 2018



Source: World Bank.

Note: A country's "access deficit" is the number of people in the country who lack access to electricity.

Why Ethiopia? Energy Water and Agriculture Nexus?

- Ethiopia: 2nd Populus country in Africa (115M), High Agricultural Dependency, Low level of Productivity (b/c low tech.), High Malnutrition, High Poverty Rate, CC Impact, Youth Migration....
- High investment, transformation, the fastest growing Economy in Africa(B-C19)
- Majority of the population still lives in Rural areas (80%), has no access to drinking water, clean energy access both for light (>50%) and consumption/cooking>85%,
- Ambitious Interest in Economic Transformation and Plan to reach a Lower Middle-Income Level (Universal access to Electricity-by 2025

Evidence and Review Findings

Characteristics of Water resources in Ethiopia: 12 River Basins and almost all are transboundary in nature/Denakil



Data Source: WB, 2020 Report No:AUS1640

Evidence and Review Findings

Resource	Unit	Exploitable Reserve	Exploited Percent	
Hydropower	MW	45,000	<10 percent	
Solar/day	kWh/m²	Avg. 5.5	<1 percent	
Wind power	GW	1,350	<1 percent	
Wind speed	m/s	> 6.5		
Geothermal	MW	7,000	<1 percent	
Wood	Million tons	1,120	50 percent	
Agricultural waste	Million tons	15–20	30 percent	
Natural gas	Billion m ³	113	0 percent	
Coal	Million tons	300	0 percent	
Oil shale	Million tons	253	0 percent	

Source: NES, 2016, updated.

Ethiopian Renewable Energy Programme Targets

- Ethiopian government in 2019 announced the opening of the Energy Market for the Private Sector through the PPP approach
- Ambitious plan to reach to 100 % of the population by 2025 and Offgrid will take 35% of the market share
- Recently announced the commencement of a tender for solar PV Projects
- `4.6 million hh in Ethiopia rely on lighting sources other than the National Grid==70.5 million





Evidence on Impact of Energy, Water & Agriculture Productivity in Ethiopia

	Rain-Fed Yield ton/ha	Irrigated Yield ton/ha	Overview of Crop Types Considered for Prioritization of Value Chains				
Crop			Crop	Area Planted million ha	Number of Planters million	Production million quintals	Export Earnings million US\$
			Cereals	9.7	30.4	255.4	18.5
			Teff	3.0	6.8	52.8	-
		2.2	Barley	1.0	3.5	20.5	-
Head Cabbage	6	26	Wheat	1.7	4.2	46.4	6.6
Tomato	5	30	Corn	2.1	10.6	84.0	11.4
Red Peppers	2	22	Sorghum	1.9	5.4	51.7	0.5
Onion	0	25	Pulses	1.6	8.3	29.8	116.6
Onion	9	25	Soybeans	0.0	1.0.1	0.9	20.7
Garlic	9	29	Oilseeds	0.8	3.3	8.6	352.0
Avocado	5	5*	Coffee	0.7	5.0	4.5	704.0
Danana	0	0*	Vegetables	0.2	6.7	7.4	4.9
Ddiidiid	0	0	Red Pepper	0.2	2.3	2.6	1.1
Mango	7	7*	Cut Flowers	-	-	-	206.8
*All of the herriceted erectory there ere already use			Chat	0.3	2.9	2.4	unknown

Source: RMI Supporting Electrification and Agri. Productivity Simultaneously in Rural Areas Will Have Transformative Impact

Challenges to Access to Energy/Water/Agriculture Productivity...

- Lack of infrastructure and capacity (Majority of the Rural communities lack access to energy and other basic services because of lack of capacity)
- Politics and national policies that exclude the private sector/Ethiopia
- Information and research (access)
- Finance (mobilizing resources to finance those development projects/programs across the different sectors)
- In general, understanding these challenges in depth is important to unlocking the existing potential-EA-Multisectoral Collaboration

Opportunities:

- Abundant Natural Resource Potential (both Renew. and N. Renew)
- Availability of new technologies, inventions and best practices across the world (availability of information, alternative clean energy)
- Political will and commitment
- Continental, Regional and National goals, agendas and targets (SDG, Agenda 2063, NEP I & II)
- Energy, Agriculture and Water Future demand and supply trend
- Marketable Business Opportunities



Interests and Future Plans

- Energy Course (Fall & Spring)
 - Understanding the sector and its linkage with other sectors
 - Off-Grid Solar Market Assessment (Where, how much, which tech...?
 - Identifying Promising Locations & Scaling up Mini Grid, Off-Grid
- Research to forecast future demand, and measure the impact of Off-Grid Renewable Energy to the national economy (ML, AI, BD...)
- Application of Data Science and Machin Learning tools
- In general, Interested to work in related topics for MP

