



# ENERGIZED

Policy innovations to power the transformation of  
Africa's agriculture and food system



**B**etween 1992 and 2013, Ethiopia's electricity expansion indicator increased by 9.10<sup>i</sup>, thereby being slightly above the average of 8 for Africa as a whole. During the same period, agricultural value added per worker grew at an average of 2.36 percent per year. With a score of 48 out of 100 on RISE index<sup>ii</sup> in 2017, Ethiopia rates as a middle performer in terms of policies and regulations that support the access to modern energy, energy efficiency and renewable energy.<sup>1</sup> Nevertheless, within Africa south of the Sahara (SSA), Ethiopia is a leader on policy frameworks for

energy access. The country has been commended for having one of the most advanced and comprehensive National Electrification Programs in Africa, which has provided a strong basis for clear policy frameworks for grid electrification, mini-grids, and stand-alone systems.

## Institutional Innovations

In Ethiopia, responsibility for the production of energy and electricity is shared by the Ministry of Water, Irrigation and Electricity (MoWIE) and the Ministry of Mines and

<sup>i</sup>- This indicator is expressed in logarithm of the difference of number of Nighttime Lights pixels between 1992 and 2013

<sup>ii</sup>- The World Bank's Regulatory Indicator for Sustainable Energy (RISE) assesses countries' policy and regulatory support for each of the three pillars of sustainable energy—access to modern energy, energy efficiency, and renewable energy. RISE classifies countries in three groups based on their score levels as strong performers (those with a score  $\geq 67$ ), middle performers (those with a score  $\geq 34$  and  $< 67$ ), and weak performers (those with a score  $\leq 33$ ).



Petroleum (MoMP). MoMP was established as the Ministry of Mines, Energy and Water Resources in 1977, and has since been reconfigured several times, most recently in 2018. The key functions of MoMP include the promotion of mining, facilitating mining investment, and licensing

and regulation of mining operations—including the exploitation of hydrocarbon and geothermal resources. MoMP also leads the development of new regulations to facilitate greater private sector investment in biofuel development in Ethiopia.<sup>2</sup>

To complement this, MoWIE directs the development and management of Ethiopia's water resources to ensure they contribute to national food security. Specifically, MoWIE promotes the expansion of electricity supply in Ethiopia from hydropower and other renewable energy sources such as solar, biogas, and micro-hydro, through the National Electrification Program (NEP), initiated in 2017.<sup>3</sup> Ethiopia's energy sector is regulated by the Ethiopian Energy Authority (EEA) established in 2013. EEA also manages licensing and import and export of energy to Djibouti, Sudan, and Kenya. The primary authority responsible for the generation, transmission, and wholesale of electricity is the Ethiopian Electric Power Company (EEP), also established in 2013. The EEP operates and maintains more than 12 hydropower plants and three wind power plants across Ethiopia. Although the sector has been opened to private sector investment, much of the investment in generation is still tendered by EEP. A new framework for private sector investment through independent power producers (IPPs) and their regulation is currently being developed in partnership with the USAID-run Power Africa project.<sup>4</sup>

The Ethiopian Electric Utility (EEU), a directorate under MoWIE, is responsible for electricity distribution across the country, including in rural areas. It manages NEP and is required to establish clear cross-sectoral linkages with the productive and social service sectors, such as health, education, and water supply.<sup>5</sup> The Ministry of Trade is responsible for tax reduction mechanisms for importation of off-grid solar technologies by the private sector.<sup>6</sup>

The formulation of rural energy policy is led by the Ethiopia Rural Energy Development and Promotion Centre, which also acts as the executive arm of the Rural Electrification Fund (REF). REF is a permanent financial source set up within the Ministry of Finance and Economic Development in 2003. The fund leverages private sector engagement (including cooperatives, municipalities/local governments, local communities, NGOs, and CBOs) in rural electrification projects that specifically use renewable energy technologies. The fund subsidizes up

to 85 percent of electrification costs and up to 95 percent for renewable energy sources.

A Ministry of Environment, Forest and Climate Change (MEFCC) was established in late 2013 and in put in charge of implementation of the new Climate Resilient Green Economy (CRGE) strategy.<sup>7</sup> MEFCC is supported by the Ethiopian Environment and Forestry Research Commission, which was adapted from its former role in 2014 as an autonomous federal office in order to coordinate, generate and disseminate technologies, information and knowledge on forest development and to mitigate environmental degradation from use of forest products.<sup>8</sup>

## Policy Innovations

Agricultural development has been at the center of Ethiopia's poverty reduction and development strategies for nearly 30 years. Each successive national development plan has also recognized and directly addressed the nation's energy challenges. Ethiopia has been following an Agriculture Development Led Industrialization (ADLI) strategy since 1991, an approach that focuses on rural development and transformation, particularly through agricultural growth, supported with an expansion of infrastructure.

Rooted in ADLI, the Sustainable Development Poverty Reduction Programme (SDPRP) 2002/3-2004/5 explicitly acknowledged the constraints that limited access to electricity place on establishing a strong agro-processing sector, commercial enterprises, and irrigation facilities in Ethiopia's rural areas. The SDPRP began the process of liberalizing the power generation sector to complement government initiatives to achieve universal access by 2025.<sup>9</sup>

### *Electrification as a core element of agricultural transformation*

The subsequent five-year plans—the Plan for Accelerated and Sustained Development to End Poverty (PASDEP) 2005/06-2009/10, the Growth and Transformation Plan (GTP) I (2010-2015), and GTP II (2015-2020) reiterated the vision of modernizing and commercializing agriculture through greater use of technology.<sup>10, 11</sup> GTP I outlined the essential role of electricity as an input for agriculture, irrigation pumping, commercial agriculture production, and processing and highlighted the importance of alternative technologies to meet the country's growing energy needs. The provision of basic services, such as electricity in rural areas, was further bolstered by capital expenditure so as to attract private investment in these areas. Specifically, the Ethiopian Agricultural



Transformation Agency (ATA) was established in 2010 to deliver the agricultural transformation agenda, although there is scope for it to play a stronger role in energy provision for agriculture.<sup>12</sup>

Each national development plan has provided targets for electrification, generation capacity, and guidelines for agricultural development. Moreover, recognizing the detrimental environmental and health impacts of high fuelwood and charcoal use, PASDEP and GTP I also encouraged a transition to cleaner energy sources, particularly in cooking. These development plans have set a high benchmark for the current one, GTP II, which further promotes the modernization of the agriculture sector supported by a vibrant and diverse energy sector.

#### *Preparing for the transition to a green economy*

The Climate Resilient Green Economy (CRGE) strategy was launched in 2011 to underpin Ethiopia's transition to a carbon neutral and climate resilient middle-income economy by 2025. The CRGE, which includes sector specific strategies for agriculture and forestry, water and energy, and transport was mainstreamed into GTP II. The latter focuses on delivering rapid, sustainable, and broad-based growth by boosting agricultural productivity; protecting forests and reforestation; expanding electricity generation from renewable sources of energy; and

leapfrogging to energy-efficient technologies.<sup>13</sup> In addition, MEFCO partnered with Ministry of Finance and Economic Cooperation to establish a national climate fund (CRGE Facility) to mobilize climate finance to achieve these goals.<sup>14</sup>

With focused, pioneering, and comprehensive development plans, electricity access in Ethiopia grew rapidly, connecting 2.3 million customers by 2015, up from 952,000 in 2004/5.<sup>15</sup> Agricultural value added grew at almost 6 percent annually during this time, and the national annual economic growth rate over the last decade has averaged over 9 percent—putting it amongst the highest rates *globally*.<sup>16</sup>

#### **Programmatic Interventions**

##### *Integrating electricity supply with other services to enhance productive capacity*

Ethiopia has had an active rural electrification program since the SDPRP. During the five-year timeframe of the SDPRP, the program sought to extend the central grid to 164 *woredas* (districts) out of about 710 and their environs at a cost of US\$160 million to support irrigation, poultry and livestock keeping, and preservation of produce, as well as the development of small and medium industries such as oil and flour mills. The SDPRP also set targets for



the power sector to improve the quality, adequacy, cost-effectiveness, and efficiency of supply to customers.<sup>17</sup>

Notably, GTP I also initiated the process of developing Agricultural Commercialization Clusters (ACC) and Integrated Agro-Industrial Parks (IAIPs) in Ethiopia, managed by the ATA. IAIPs identify geographies for the production and processing of nine selected agrifood value chains, based on their capacity to create jobs, linkages to the agriculture sector, export potential, and capacity to attract private sector investment. Crops include wheat, maize, sesame, malt barley and horticulture crops such as tomato, onion, banana, mango, and avocado. Each IAIP will benefit from purposeful infrastructure investments such as roads, power, water, communications, drainage and rainwater harvesting to commercialize the production and processing of these crops.<sup>18</sup> By June 2018, four IAIPs were under construction in Amhara, Oromia, SNNPs, and Tigray states, aiming to process animal products, grain and oilseeds, and fruit and vegetables for local and international markets. IAIPs have also drawn interest from international investors from China and India which bring specialization in selected industries and create opportunities for South-South learning and technology transfer.<sup>19</sup>

In addition, Ethiopia's National Electrification Program (NEP) sets 2025 as the target year for universal access to electricity, five years earlier than the target set by the SDGs. In order to meet this target, the EEU will manage a fast-paced grid and off-grid rollout program to scale up connectivity, at a cost of about US\$1.5 billion. In particular, the NEP will build cross-sectoral linkages with other productive sectors such as health, education and water ensuring that secondary schools and primary health centers are fully connected by 2022. It is expected that approximately 65 percent of the population will be connected to the grid while the remaining remote communities will benefit from individual solar and mini/micro grid solutions.<sup>20</sup>

### *Leveraging different energy sources to broaden access*

This builds on the ambitions set by PASDEP, which raised the target by launching the Universal Electrification Access Program to connect 6,000 rural towns and villages—approximately 24 million people—and raise electrification to approximately 50 percent by 2010.<sup>21</sup> GTP I reported that 5,163 towns and rural villages had been electrified by 2010, meeting 78 percent of the PASDEP target. Three hydropower plants were also constructed between 2005 and 2010, adding more than 1,300MW in hydropower generation. In addition, 3 million improved energy-saving biomass ovens and 4.6 million energy-saving lightbulbs were distributed to customers, saving over 26,000 ha of forest from deforestation.<sup>22</sup>

In addition, GTP I initiated processes to expand biofuel production through the Bio-fuel Development Program. The program convenes research institutes, universities, implementing agencies, and the private sector to adapt and promote sustainable development of biofuel technology. GTP I set a target for annual ethanol production from sugar at 304,000 m<sup>3</sup> and 607 MW of electric power by 2015.<sup>23</sup>

With these focused efforts, access to electricity in Ethiopia doubled between 2010 and 2016, from 21.9 percent to 42.9 percent. Rural electrification grew threefold, from 6.6 percent in 2010 to 26.5 percent in 2016.<sup>24</sup> In addition, 77,380 m<sup>3</sup> of ethanol was produced and construction began on four blending facilities during GTP I. As recorded by GTP II, 16.6 million ha had been planted with biofuel crops such as jatropha and castor during GTP I.<sup>25</sup>

Beyond national programs, Ethiopia has also benefited from the Energising Development (EnDev) Partnership Programme. EnDev Ethiopia is co-funded by the German, Dutch, Norwegian, and Irish governments and implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), MoWIE, MEFCC, and other partners. EnDev Ethiopia supports a growing market for modern renewable energy technologies and energy efficiency solutions such as micro hydro (upgraded from water mills), solar PV for health centers, and improved cookstoves. The Programme provides technical assistance in the form of appropriate low-cost designs, capacity building through training of local entrepreneurs and engineers, financial support for the hardware and installation of solar systems, awareness and marketing campaigns for improved cookstoves, and incubation of stove business start-ups. By the end of its second phase in 2017, EnDev Ethiopia had provided access to electricity to 395,000 people, electrified over 100 health centers, and built four micro hydropower stations.<sup>26</sup>

### *Improving energy efficiency and reducing cost*

Ethiopia has also implemented several programs to improve the efficiency of its energy use. EnDev Ethiopia sold 430,000 improved cook stoves and enabled 560 stove producers to establish themselves. Users of improved cookstoves saved up to 50 percent on fuel costs, money which was reallocated to food, education, and other costs. Similarly, stove producers spent their additional income on food and education. With these achievements, the European Union extended an additional EUR 10.35 million (approximately US\$12.1 million) in 2017 to continue this work and contribute further towards the NEP.<sup>27</sup>



This program built upon the achievements of GTP I and the Sustainable Rural Energy Technologies for Households and Productive Uses project. During GTP I, nearly 9 million biomass stoves and more than 2 million solar technologies were also distributed and 11,618 biogas plants were constructed during GTP I. GTP II has set targets for electricity coverage at 90 percent, which would connect about 7 million additional customers by 2020.<sup>28</sup>

Working in tandem with the NEP, the Sustainable Rural Energy Technologies for Households and Productive Uses project aims to disseminate 200,000 solar home systems and 600,000 improved cook stoves in rural communities by 2020. Launched in 2016, the project is working to remove barriers to private sector provision of these off-grid technologies in order to extend their availability. To do so, the project has aligned the legal and regulatory framework with national standards, run an awareness campaign in rural areas about the technologies, created a financial mechanism for rural households, and supported entrepreneurs through a business incubation phase. The project is managed by MoWIE and is estimated to cost more than US\$5.5 million. It is funded by the Global Environmental Fund and co-financed by the UNDP Ethiopia Country Office, the United Nations Capital Development Fund, and the Development Bank of Ethiopia.<sup>29</sup>

With the successes of the 2017 NEP, the Ethiopian government issued an updated plan in 2019, the National Electrification Program 2.0: Integrated Planning for Universal Access. NEP 2.0 focuses on integrated access—grid and off-grid electricity access—and provides an implementation framework through public-private partnerships. The program aims to deliver 8.2 million new grid connections to 6 million beneficiaries by 2025.<sup>30</sup>

Ethiopia is clearly on a pathway for rapid transformation in its energy and agriculture sectors. Importantly, there is a recognition of the links between these two sectors at the highest levels, as demonstrated in the national development plans. While the energy sector is steaming ahead in addressing the overlapping challenges simultaneously, programs at the Ministry of Agriculture and ATA would benefit from clear guidelines on enhancing access to improved energy services. Finally, although significant steps have been taken to diversify Ethiopia's energy mix, the country still relies largely on biomass and waste, which account for 88 percent of total energy supply. At the same time, hydropower is the source for 93 percent of electricity. Since both these sources are extremely vulnerable to climate change, there is an urgency to further and rapidly diversify the sector.



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