

Commentary

Energy for food, livelihoods, and resilience: An integrated development agenda for Africa

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This article explores the real-time interactions between agriculture, energy, economy, trade, climate resilience, and livelihoods across sub-Saharan Africa and the implications for 2050. It explains the opportunities for an intersectional approach to interventions at the food-energy nexus and provides recommendations for near-term actions urgently needed to safeguard Africa's future.

Agriculture to deliver economic and livelihood relief

The World Bank projects that because of the coronavirus disease 2019 (COVID-19) pandemic, sub-Saharan Africa will face its first recession in 25 years. This comes at a time of unprecedented unemployment rates heightened by the continent's youth explosion. According to the United Nations, Africa's population—the fastest growing and youngest in the world—will double by 2050. Young people, between 15 and 24 years of age, will comprise 840 million alone. Young men and women in this narrow age band now account for over 34% of the continent's working-age population. Over ten million jobless youths pour into the job market every year. Thus, the scale of the current challenge is enormous: amid the pandemic and its economic fallout, African policymakers must develop a two-pronged strategy of saving lives and protecting livelihoods.

Given that more than 32% of the continent's gross domestic product (GDP) comes from agriculture and that food systems account for over 65% of the continent's labor force, much attention is being placed on the potential of the sector to deliver economic and livelihood relief. Estimates suggest that African agribusiness could be a trillion-dollar market, mostly driven by demand in cities, by 2030.¹ Despite this outsized importance, Africa is not a net exporter of food products in that it accounts for a mere 2% of global agriculture exports. According to the Food and Agriculture Organization, this is because growth in sub-Saharan African agricultural output has accrued predominantly from area expansion and intensifi-

cation of cropping systems as opposed to large-scale improvements to productivity, such as farm mechanization and value addition.²

Indeed, productivity per agricultural worker has improved by a factor of only 1.6 in Africa (versus 2.5 in Asia) over the past 30 years.² Smallholder farmers still produce 85% of Africa's agricultural output; more than 75% prepare lands by using only hand tools, and only 5% of cultivated land is under irrigation. Consequently, yields from maize (the continent's most important crop) currently average 2 tons/ha/year versus 8 tons/ha/year in the Americas.³ Further, although processing adds about US\$180 of value per ton of agricultural produce in high-income countries, this value is only US\$40 per ton for sub-Saharan Africa.³ The sector is thus challenged to improve farmer incomes, absorb large volumes of new workers, and deliver on food security given these challenges of productivity and profitability.

Food, trade, adaptation, and Africa's 2050 landscape

According to the Intergovernmental Panel on Climate Change (IPCC), Africa is one of the most vulnerable continents to climate variability, largely because of this strong economic reliance on agriculture and its climate-dependent nature. Relative to those in other regions, African yields are already suppressed, and the IPCC projects that climate-induced yield reductions are highly likely this century, especially for cereal crops such as maize.

Food demand is fairly inelastic, so declines in crop production are likely to increase the prices of local produce. This

in turn can affect patterns of regional and international trade—including agricultural product substitution—disadvantaging African countries and precipitating severe negative welfare effects. Studies that simulate the impact of climate shocks on agricultural trade find that Africa is likely to see the most negative impacts to welfare, the burden of which will be borne by smallholder farmers, further reducing the continent's adaptive capacity.⁴ As such, through a series of interacting feedback loops, the value-addition sector has direct implications for African trade and the continent's ability to adapt to climate change and build resilience.

Because of how these multiple issues are compounding in real time, without immediate and sweeping action Africa will be Earth's most populous continent by 2050—housing over 80% of its poor, 90% of those left without basic energy access, and its most climate-vulnerable populations—all while having contributed less than 5% of global carbon emissions. Framed in this way, African resilience becomes an urgent global justice and equity issue. This is a pivotal time for coordinated action and comprehensive, integrated approaches that meet such multi-dimensional challenges. This paper explores the barriers to agriculture value addition in Africa and illustrates the potential that lies within the food-energy nexus to provide near-term solutions to interconnected challenges.

The missing middle: A potential-performance divide

The “low-input, low-output” nature of agriculture in Africa stems from a

compounding of external forces, geopolitics, economics, and policy that ultimately perpetuate a severe lack of investment at the level of the smallholder farmer. For instance, although the chocolate industry is worth more than US\$80 billion a year, many cocoa farmers in parts of West Africa are poorer now than they were in the 1970s or 1980s.⁵ The cost of farming cocoa on exhausted lands continues to increase in Ghana and Cote d'Ivoire, yet because both countries remain "global price takers" with global prices set on financialized derivatives markets and transmitted along the global commodity chain, there are very limited possibilities for "domestic price making."^{6,7} This leaves a major burden on smallholder producers who have the fewest resources to deal with such risks. Likewise, crop diversification away from cocoa has been historically discouraged, leading to a national debt cycle of supporting farmers.⁵

In East Africa, the collapse of the cooperative as an organizing structure for farmers in Uganda during the agriculture sector's liberalization movement in the mid-1990s has left farmers with little price-negotiating power and with few linkages to the food and beverage multinationals, such as groceries and breweries, which have growing demand from urban consumers.⁸ Given the lack of standards, quality control, and reliability, these companies often resort to importing raw materials, leaving smallholder farmers without ready off-takers. Smallholder farmers are then caught in a cycle with informal middlemen, who are disincentivized from investing in backward linkages.⁸ The lack of market infrastructure has meant little investment in yield improvement, poor post-harvest handling, and minimal local processing. So today, over 60% of Ugandan farmers operate on farmlands of less than 2 ha and with no cash inputs at all for seeds, fertilizer, or irrigation.⁹ Although agriculture accounts for over 70% of employment in Uganda, only 2.8% of jobs are in agro-processing,¹⁰ again illustrating the lack of investment in value addition. Consequently, despite its advantageous resource endowments, agriculture accounts for only 24% of Ugandan GDP even though it employs most of the population.¹¹

These examples demonstrate how the African smallholder farmer has become burdened by both low margins and the in-

dividual responsibility of financing yield improvements and value addition. So although the addressable market for irrigation, cooling, refrigeration, and agro-processing appliances is estimated to be US\$11 billion across sub-Saharan Africa today, when discounted for farmer ability to pay, the serviceable market shrinks significantly to US\$700 million.¹² These supply-chain dynamics are exacerbated by the challenges of land rights, land fragmentation and land scarcity, soil depletion, drought, pests, and disease—all growing more extreme with climate change. Altogether, this leaves the smallholder farmer cash strapped and unable to invest in even the most basic means to improve yield or adapt to climate change, such as resistant seed varieties, fertilizers, or storage. "The net result is that it is simply too difficult for most African farmers to earn enough from farming to shift to high-input, high-output farming."¹³ There is thus a major and growing gap between smallholder farmers, fair markets, and opportunities for value addition. This "missing middle" challenges the sector's sustainability, especially now.¹¹ Experts are concerned that, if left unabated, such challenges could prevent smallholder farmers from effectively benefiting from the recent continental free-trade agreement, leaving them further exposed to increased competition without the ability to access markets, deliver better-quality produce, or engage in value addition.¹⁴ Such a scenario could serve to widen the poverty divide, especially in smaller African countries.

The food-energy nexus: Opportunities and challenges

The paucity of yield improvement and post-harvest value-addition interventions is evident from the agriculture sector's electricity consumption, which accounts for just 2% of the total across the continent.³ Given the growing food market, electricity demand for agricultural activities is expected to double by 2030, reaching as much as 9 GW, demonstrating the primary and post-harvest processing opportunity.³ Value chains that have high electricity value added include maize, rice, cassava, wheat, oilseed, horticulture (pineapple), sugarcane, oil palm, dairy, poultry, tea, flower cultivation, and cotton. Maize, rice, and cassava alone

could represent 83% of the total processing demand, largely from irrigation.³

Investment in power infrastructure, although certainly not the only barrier, is thus important for unlocking this productivity. In Uganda, the lack of access to power, poor reliability, and high electricity costs are regularly cited as the biggest challenges that millers face.¹⁰ Distribution utilities, as well as decentralized energy technologies, such as mini-grids, could service the near-term agro-processing needs of thousands of communities without grid access. According to the World Bank, 1,500 mostly first- and second-generation mini-grids are installed across Africa and 4,000 modern solar-hybrid mini grids are planned, but high cost-reflective tariffs for mini-grids present a major barrier to further penetration. In theory, agro-processing, by acting as an anchor customer and high-energy consumer, could greatly improve the revenue economics for mini-grids, bringing down costs and improving affordability for faster delivery of universal energy access.

Under current policies, an estimated 650 million people will still lack access to electricity in 2030. Importantly, it is projected that nine out of ten of these people without access will be in Sub-Saharan Africa, meaning that by the end of this decade, energy poverty could become an exclusively African challenge.¹⁵ The International Energy Agency projects that mini-grids would be the least-cost solution for electricity connection for 31% of new connections if universal access is to be delivered by 2030, so agro-processing could support the expansion of this access. Productive uses of energy in agriculture could not only expand energy access opportunities and increase incomes for smallholder farmers but also generate strong multiplier effects in the downstream agri-food sector and the broader non-farm economy, as evidenced by countries such as Ethiopia and Rwanda, which have prioritized such intervention.¹⁶ That diversification effect has important gender implications given that rural women, who make up most agricultural labor, are particularly limited in their employment opportunities.

This symbiosis, called the food-energy nexus opportunity, is thus critical for energy access, food security, economic growth, livelihood creation, trade, and

climate adaptation. Large multinationals are now entering the agro-processing sector in Africa, sending a strong market signal, and a wave of clean-energy agro-processing enterprises are also emerging across the continent—from solar-powered maize milling to fruit drying, refrigeration and cold storage, oil pressing, egg incubation, coffee pulping, honey processing, and more. Over 100 firms are developing off-grid solar productive-use appliances in sub-Saharan Africa, and hundreds more are distributing them.¹² There remain, however, many challenges to unlocking this nexus opportunity.¹⁷

Integrated actions needed now to safeguard the future

When explored from these multiple dimensions, the complex interactions and compounding nature of development challenges in sub-Saharan Africa become evident. Although sustainable development agendas for Africa look to 2030, 2050, and beyond, we have demonstrated the real-time nature of feedback loops currently at play. As the IPCC succinctly summarizes, climate change interacts with non-climate drivers and stressors to exacerbate the vulnerability of Africa's agricultural systems, which are at the core of its economic and adaptive capacity. Some progress on managing risks to food production from current climate variability has been achieved, but these will not be sufficient to address long-term impacts.

Although many African countries have implemented government initiatives to improve mechanization, these efforts often focus on yield improvement. Attention to value addition and, moreover, the broader socio-economic and institutional challenges that ensnare the smallholder farmer is underprioritized yet critical and timely. Direct interventions to strengthen the collective organization, power, and market access of smallholder farmers are needed. Policy reforms to encourage commercial cooperatives that can effectively organize production and post-harvest logistics and negotiate higher prices in the market are key. Likewise, financing solutions such as agricultural bank loans tailored to cooperative and smallholder farmer needs are critical for re-building supply chains and growing demand. Both micro- and commercial finance are needed, so designing policy incentives

to attract financial institutions will require deeper analysis of ways in which smallholder farming can be re-integrated into commercial supply chains, the potential markets, and relevant risks.

Likewise, solutions to expand electricity access and reduce barriers of entry into new markets for energy service providers will have multiplier effects across farm and non-farm sectors. Energy policy, targets, and planning to promote rapid expansion of energy access, as well as policy to increase access to finance and support for technology development, will create an enabling environment for service providers and catalyze energy markets. Research on how to tap irrigation potential in a climate-resilient way, given the continent's challenge of water scarcity, is critical. Furthermore, given the potential of agricultural value addition to create much-needed rural employment, it is key to develop appropriate, targeted training programs that are easily accessible by rural communities to encourage the adoption of commercial, adaptive agricultural practices. This will also serve to bolster demand for agro-processing, which itself can contribute to more affordable energy access and its co-benefits. Governments and donors can quickly mobilize resources for widespread training and recruitment programs to ensure that the agriculture workforce is able to leverage access to energy, finance, and other key inputs to enhance productivity.

Finally, the European Union, the African Development Bank, the African Union, and most national governments prioritize local production, fair value chains, education, job creation, and hunger elimination as key policy platforms. Many important initiatives are being implemented toward Agenda 2063; however, far more coordination is needed to align these efforts and to work across sector siloes to design integrated solutions that meet such multidimensional challenges. For instance, demand trends are a major factor in Africa's energy transition, but sectors such as water and agriculture are rarely part of the transition dialogue. In centering and unlocking the food-energy nexus, important opportunities for economic growth, livelihoods, food security, trade, and adaptive capacity to climate change can be

realized. Food and energy sit at the cross-section of critical development challenges and risks that are intensifying every day. Urgent and integrated interventions at this nexus are vital to both near-term economic relief and a prosperous, equitable, and resilient Africa for 2050 and beyond.

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