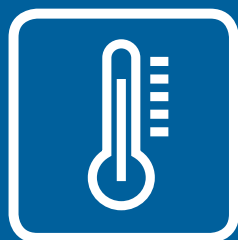


# POWERING AGRICULTURE:

AN ENERGY GRAND CHALLENGE  
FOR DEVELOPMENT



## NAVIGATING POLICY AND REGULATION IN THE CLEAN ENERGY-AGRICULTURE NEXUS: A GUIDE FOR COMPANIES TO ENGAGE POLICYMAKERS



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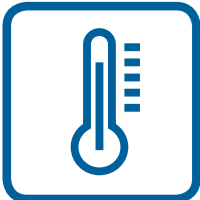
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# EXECUTIVE SUMMARY

Innovators and entrepreneurs are introducing new technologies and business models that hold great promise for increasing agricultural productivity, reducing post-harvest loss, and boosting farmer incomes in emerging markets. In the same way off-grid solar home systems' commercialization has reached hundreds of millions of users,<sup>1</sup> there is great potential for clean energy-agriculture solutions to grow exponentially given the right market conditions. Governments have an integral role to play in developing, modifying, and increasing the transparency of policies and regulations to facilitate the growth of agriculture-focused clean energy technologies.



This guide covers three clean energy-agriculture technologies – water pumping, cold storage, and agro-processing – and details common policy challenges experienced by Powering Agriculture innovators and other companies working in this space. Based on more than 30 interviews and a policy dialogue that convened businesses and other stakeholders, this guide presents key policy and regulatory issues in four topic areas: 1) promoting ease of business operations, 2) stimulating market growth, 3) recognizing and rewarding quality, and 4) strengthening private sector-government partnerships. Figure 1 summarizes tangible actions prioritized based on inputs from companies delivering solutions in this space.

Figure 1 KEY IDENTIFIED TOPIC AREAS IN CLEAN ENERGY-AGRICULTURE POLICY AND REGULATION<sup>2</sup>



# I. INTRODUCTION

Smallholder farmers require sustainable practices and technologies to increase agricultural productivity.<sup>3</sup> The Food and Agriculture Organization of the United Nations (FAO) estimates that by 2050, food production levels must rise by 170 percent to accommodate a forecasted 130 percent increase in the global population.<sup>a</sup> In parallel, land desertification and water scarcity caused by unsustainable agriculture practices and climate change are intensifying: according to the FAO, the African continent will lose two-thirds of its arable land at the current desertification rate.<sup>4</sup> Farmers who depend on traditional rainfed agriculture are vulnerable to the uncertain duration and frequency of harvest periods.<sup>5</sup> Lack of cold storage infrastructure in emerging economies results in 30 to 40 percent of total food production being lost before it reaches markets.<sup>6</sup> Traditional fossil fuel-based agricultural equipment (e.g., diesel motors and pumps) are often poorly suited to smallholder and off-grid farmer populations due to issues such as over-capacity, high recurring fuel costs, and negative environmental impacts. To address these challenges, many parts of the world require significant changes in their agricultural practices.

Private sector companies are developing innovative technologies and business models to deliver clean energy solutions for agricultural use. By using low-power clean energy systems, smallholder farmers can mechanize operations, extend arable land, prolong produce shelf life, and add value to raw products. This helps farmers increase crop production and reduce post-harvest losses to increase their income, spur economic growth, and promote greater food security and resilience.

Companies, however, experience multiple policy and regulatory challenges, ranging from the inconsistent interpretation of customs and tariff rules to lending policies and regulations that hinder access to finance. Such issues can significantly impede growth in the clean energy-agriculture nexus.

This guide was designed to empower entrepreneurs and advocacy associations involved in clean energy-based water pumping, cold storage, and agricultural processing to start or continue a dialogue with policymakers and major donors to develop policies and programs that enable the nexus to grow and deliver transformative services to communities. It is based on experiences compiled from innovators<sup>b</sup> supported by Powering Agriculture: An Energy Grand Challenge for Development and

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<sup>a</sup> When compared to 2005-2007 levels.<sup>3</sup>

<sup>b</sup> Innovators are Powering Agriculture-supported organizations that design, pilot, and deploy clean energy-agriculture solutions at different points in the agricultural production cycles of developing countries.

other companies working in this space. The Powering Agriculture team interviewed over 30 entrepreneurs, donors, and stakeholders operating in sub-Saharan Africa, Latin America, and South Asia. However, given that a majority of Powering Agriculture innovators work in East African markets, this guide provides a broad regional perspective but illustrates many key issues and insights through an East Africa regional lens. Additionally, Powering Agriculture, in collaboration with the Global Off-Grid Lighting Association (GOGLA) and the non-profit organization CLASP, hosted its policy roundtable event with the purpose of distilling key areas in policy and regulation that impact the timely delivery of quality clean energy services in Nairobi, Kenya.

A number of pressing policy and regulatory issues are clustered into the following themes and discussed in detail below: 1) promoting ease of business operations, 2) stimulating market growth, 3) recognizing and rewarding quality, and 4) forming private sector-government partnerships.



Participants gathered at policy roundtable event in Nairobi, Kenya in September 2019. Photo courtesy of Powering Agriculture.

## 2. WHY SHOULD GOVERNMENTS SUPPORT PRIVATE SECTOR CLEAN ENERGY-AGRICULTURE SOLUTIONS?

Energy is a crucial input to virtually all steps of the agricultural value chain, including food production, processing, transport, and consumption. Energy enables farmers to mechanize operations, process raw products to add value to commodities, and extend shelf life. Approximately 30 percent of global energy is consumed by the agriculture sector, and increasing agricultural productivity to meet growing food demand – particularly in emerging economies – will depend on greater access to reliable energy products and services.<sup>7</sup>

While the agriculture sector can grow using either clean energy or more traditional fossil fuel sources, the former can often produce benefits at less economic and environmental costs. Deployment of distributed clean energy services like solar water pumping, cooling, and agro-processing technologies enable agricultural activity at lower costs when the full product lifetime is accounted for (including up-front costs, fuel, and operation and maintenance). It also reduces greenhouse gas emissions when compared to grid or diesel fuel-based solutions. Aggregated on a national level, these services can bolster economic growth and food security.<sup>c</sup>

A government can make relatively small policy development investments to leverage private sector deployment and produce significant benefits. Smart government policies can allow companies and farmers to pay for clean energy-agriculture services themselves.



### 2.1 Water Pumping

Solar water pumping can **increase farm profits** significantly, allowing farmers to irrigate crops outside of the traditional rainy season when compared to rainfed agriculture, and avoid the cost of fuel when compared to diesel-fueled irrigation. In India, an 18-month survey of 450 subsidized solar water pumps estimated that farmers who previously depended on rain for irrigation produced more and better crops: 45 percent of participants saw their incomes increase by 50 percent.<sup>8</sup> Another study revealed that the return on investment for horticulture farmers using solar water pumps

<sup>c</sup> The FAO tracks food security through four dimensions: availability, access, stability and utilization of food.<sup>49</sup>

is 150 to 250 percent due to greater yields and increased harvest times.<sup>9</sup> In one example, 163 Kenyan and Ugandan smallholder farmers who switched from diesel-powered pumps to solar water pumps achieved savings of \$268 per acre annually.<sup>10</sup>

Beyond financial gains, many **economic and environmental benefits** can be quantified. The FAO conducted a cost-benefit analysis of 11,000 solar water pumps in Kenya and found a number of advantages along the agricultural value chain when compared to diesel pumps.<sup>11</sup> For example, at the household level, replacing diesel-powered water pumps avoided \$82 in fuel costs and freed 113 hours per year. Across the value chain, 387 skilled labor jobs were generated, and approximately 2,000 metric tons of carbon dioxide equivalent per year were abated (or, \$420,000 per year). Over ten years, the initial investment of \$7 million had an economic net present value (NPV) of \$10 million.

Similarly, Powering Agriculture interviews with solar water pump users in Kenya revealed that solar pumps allow farmers to increase their land's **productive efficiency** (e.g., kilograms (kg) of crops per hectare) because solar pumps make more water available than manually-powered technologies. This allowed some farmers to replace maize with other **higher-value crops** or better irrigate their traditional crops without increasing the irrigation area.

Many parts of the world that have been accustomed to reliable periods of rainfall are finding that the regular rainy season is unpredictable. Clean energy-agriculture technologies can help farmers address this challenge. For example, solar-powered water pumps can give farmers better **access to deeper water sources**, allowing them to preserve both their crops and livestock, and **guard against drought**. A 2019 Powering Agriculture site visit to Kenya showed that farmers with solar water pumps were able to more easily extract water from groundwater sources during the dry season compared with manual and diesel-powered pumping.



Solar water pumping in Kenya. Photo courtesy of Futurepump.





## 2.2 Cold Storage

In developing countries, 40 percent of produce is lost before reaching the market due to factors such as post-harvest spoilage and transportation.<sup>12</sup> Cold storage can unlock benefits across the cold chain to mitigate these losses from immediate post-harvest at the farm gate to transportation, logistics, and longer-term storage.

Solar photovoltaic (PV)- and biomass-based technologies can sustain these benefits at lower financial and environmental costs than diesel or other traditional energy sources. The decentralized clean energy-based chilling and freezing of meat, fish, and vegetables offer sustainable solutions that significantly **increase shelf life, reduce losses, and increase small farmers' ability to negotiate better prices**. This is especially the case in grid-poor or off-grid settings. For example, a Nigeria-based cold storage company claims that its solar-powered walk-in cold rooms extend the shelf life of fresh produce from two to 21 days while reducing post-harvest losses.<sup>13</sup>

The FAO led a cost-benefit analysis of biogas-powered milk chillers in Tanzania.<sup>10</sup> When compared to a no-chilling baseline, the chillers **reduced milk losses** by 45 percent and increased revenue by \$792 per year from **selling milk in the evening**. When compared to Tanzanian national grid use, each chiller **reduced greenhouse gas emissions** by about 40 kg of carbon dioxide. Over the course of its ten-year lifetime, a capital investment of \$1,600 per chiller resulted in an NPV of \$6,271.



A solar-powered cold room prototype at Owerri Relief Market, Imo State, Nigeria. Photo courtesy of ColdHubs/Ikegwuonu.



## 2.3 Agro-Processing

Low-power agro-processing machines are used for drying, milling, and processing a variety of fruit, grains, and rice, **extending their shelf lives** for consumption and sale. Clean energy-powered processing units can deliver these services at lower lifetime costs than diesel-powered mills. For example, a Powering Agriculture case study shows that when including capital and operational costs, a solar PV-powered hammermill that processes about 200 kg of flour per day has lifetime costs of \$14,500. This can displace a 7.5 kilowatt (kW) hammermill with a capital cost of \$1,600 (and a lifetime cost of approximately \$45,000, including fuel and maintenance).<sup>14</sup> 80 percent of surveyed farmers who use solar PV-powered mills in Indonesia observed increases in income due to the added value of their produce.

Clean energy-powered agro-processing also provides **valuable times savings for farmers**. An innovator that provides solar-based agricultural processing units in Southeast Asia reported that surveyed customers in Indonesia now have more than two hours freed up for other productive activities when compared to manually milling rice and cassava.<sup>15</sup> Decentralized solar PV food processors reduce the time spent on processing and can be placed more accessibly. A solar PV processing innovator working in Southeast Asia had a time savings of 273 and 289 hours spent on processing corn and rice, respectively, by Indonesian customers using their units. This enables quicker access to food and more time for other income-generating activities.<sup>15</sup>

Agro-processing also **increases food security**. Solar energy-milled flour and fruits can be dried and stored for up to one year and safely stored during disasters like cyclones, when grid power or diesel fuel may not be available.<sup>14</sup> Additionally, many remotely located farmers may not have access to food processing units that are usually located in more densely populated centers. Small-scale on-site agro-processing units can help farmers process foods like corn and rice more consistently, therefore improving resilience.



Solar PV-powered corn threshing in Vanuatu. Photo courtesy of Village Infrastructure Angels.

### 3. WHAT ARE INNOVATOR PRIORITIES FOR POLICY SUPPORT?

Powering Agriculture innovators and other companies working in the clean energy-agriculture nexus recounted numerous policy and regulatory barriers and opportunities.



Roundtable participants prioritizing policy and regulation opportunities in Nairobi, Kenya in September 2019. Photo courtesy of Powering Agriculture.

These were prioritized and grouped into four categories, and are described in the following sections based on the innovators' experiences. Each section details the most prevalent policy-related challenges for companies to operate effectively, then outlines actions that can address these challenges and provides insights into the proposed actions.

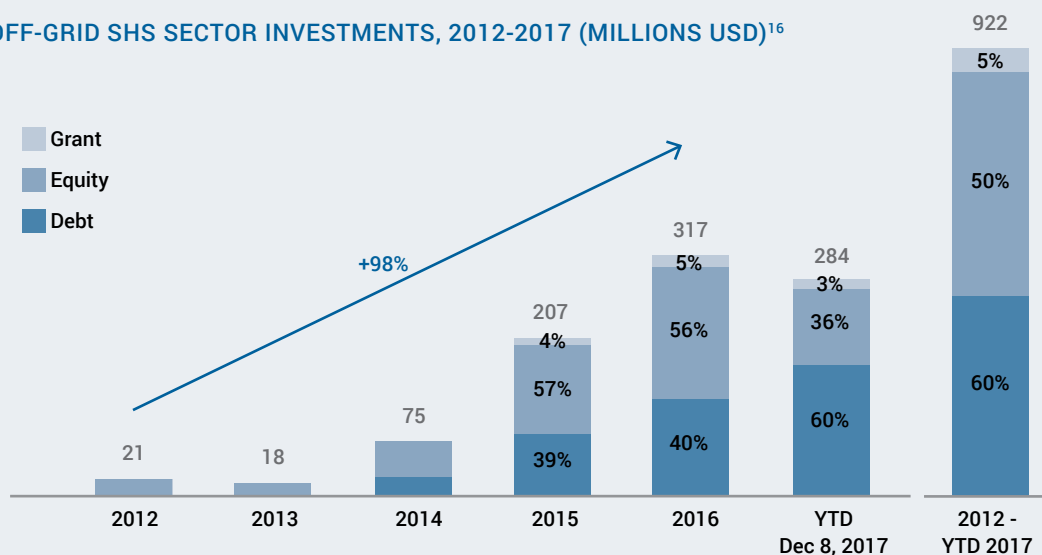
Note that the proposed actions are not relevant for all markets and stages of market development. The clean energy-agriculture nexus in many countries is nascent; therefore, companies face growing pains of developing appropriate technologies and business models, promoting farmers' awareness of their benefits, and accessing financing. As markets mature, companies grow and develop stable business models, establish their reputation, and begin accessing commercial financing. Still, new challenges (e.g., appropriate pricing of technology and lack of understanding by commercial banks) arise. As a result, government interventions that aim to support the market to scale and sustain growth also need to adapt. The solar home system (SHS) sector illustrates this progression in a range of markets (Box 1) where different interventions have proven to be effective at different stages of market maturity.

## LESSONS FROM THE SOLAR HOME SYSTEM INDUSTRY

The SHS industry offers a window into the potential future of the clean energy-agriculture nexus, showing how governments and international financial institutions have intervened in emerging markets. As a new technology, off-grid solar greatly benefited from government support. In early years of the off-grid SHS sector's growth, donor-backed grants and favorable tax regimes played an important role in investment in companies.<sup>16</sup>

As with clean energy-agriculture companies, many SHS enterprises had difficulty financing their products. These companies did not have access to traditional lending sources (e.g., microfinance and small bank loans) since financial institutions did not understand SHS business models. As a result, SHS companies became quasi-financial institutions to their customers and subsequently heavily reliant upon donors and angel investors. As the market matured, equity and debt became the majority of investments in the sector, as seen in Figure 2.

Figure 2 OFF-GRID SHS SECTOR INVESTMENTS, 2012-2017 (MILLIONS USD)<sup>16</sup>

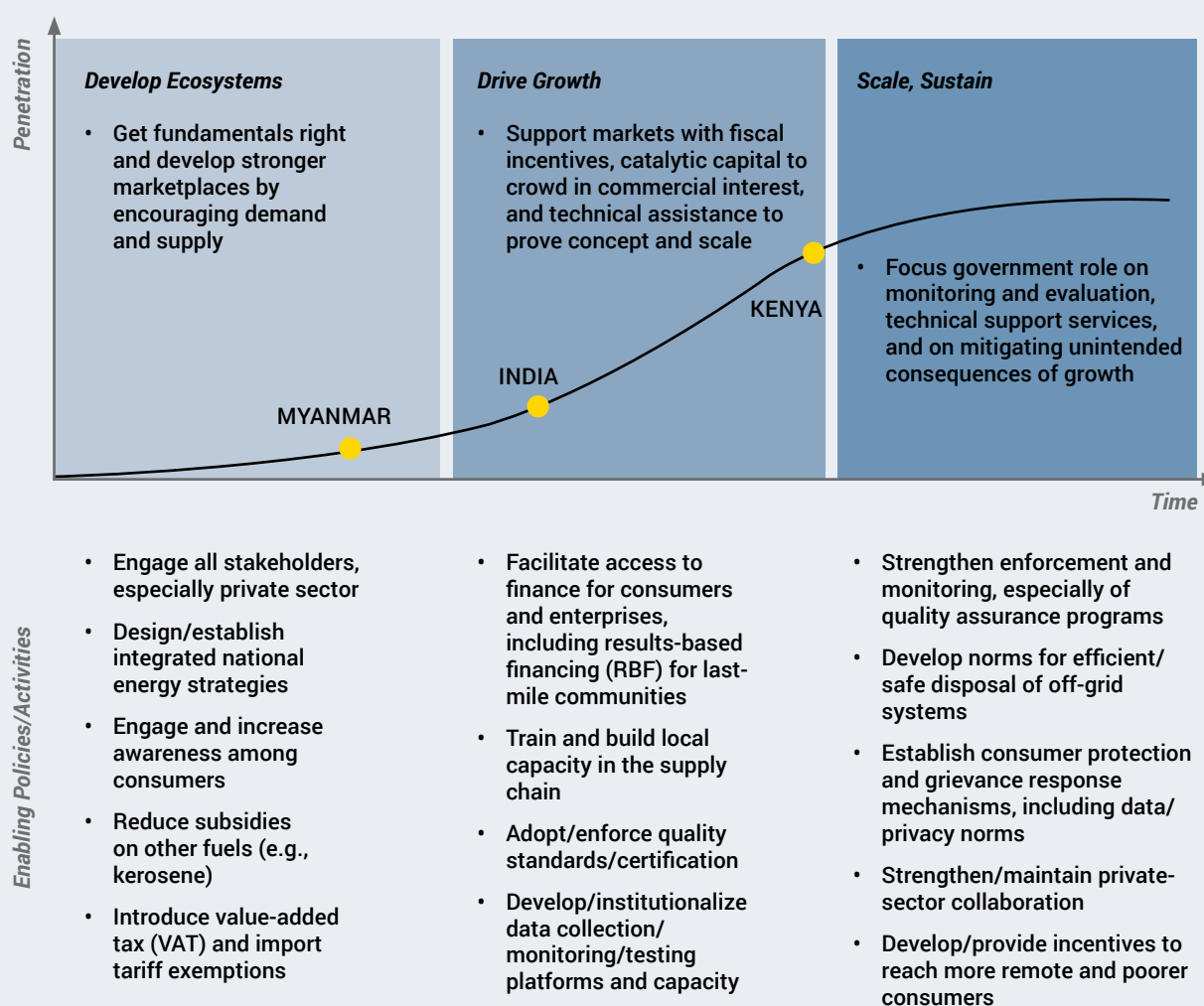


Avg. size of top five transactions	2.8	2.4	9.8	21.3	31.7	25.4
Avg. size of overall transactions	1.4	1.0	3.1	5.6	4.0	5.0
Number of transactions	15	18	24	37	79	57

## LESSONS FROM THE SOLAR HOME SYSTEM INDUSTRY

The past eight to ten years illustrate the evolving nature of policies that have allowed the SHS sector to develop in emerging markets, as seen in Figure 3. Broadly, policy supporting the sector has evolved from developing ecosystems to driving market growth and, finally, scaling and sustaining growth. This presents lessons and a path forward for the relatively newer clean energy-agriculture nexus.

Figure 3 ILLUSTRATIVE EVOLUTION OF POLICY AND REGULATION IN THE SOLAR HOME SYSTEM SECTOR<sup>16</sup>



## 3.1 Promote Ease of Business Operations

Running an efficient and profitable business requires an accurate prediction of costs. This is especially true for small businesses that cannot easily weather unexpected costs. For example, innovators noted different waiting periods and duties applied to consignments of the same product when importing to countries of operation. At best, these challenges increase the time and cost to get products to market, which ultimately affects farmers. At worst, they prevent companies from entering or operating in markets, which prevents entire populations from benefiting from such services. This section highlights the policy areas companies felt most limited their ability to conduct business.

### CLARIFY CUSTOMS AND TARIFFS

The challenge that innovators most frequently cited was the inconsistent application of customs and tariffs at the border. For example, companies are being charged different tariffs from one consignment to the next, even though the shipments contained the same product. Additionally, they encounter problems with paperwork that result in delays and storage fees at the port. A solar water pump innovator in Tanzania noted that since its product straddles both energy and agriculture, the applicable customs regime is not clearly defined. This has resulted in long waits to retrieve consignments from ports. Another solar water pump innovator in Kenya reported the tax exemption process recently changed with limited warning and clarity, causing delays in clearing shipments of solar PV panels and controllers. In another example, an agricultural processing innovator based in Kenya found that although solar PV equipment is exempt from value-added tax (VAT), if a consignment also includes other product components like batteries or charge controllers, all contents are taxed. This company suggested that classifying the product as a clean energy-agriculture appliance would ease import operations.

These examples illustrate that companies often lack current knowledge on how to navigate customs applications and rely on transport agents to liaise with authorities and advise on tariffs. Furthermore, while tariff and duty regimes for clean energy-agriculture products may exist, they are not always universally understood or accurately applied.

#### *Clarify Customs and Tariffs: Way Forward*

**DEVELOP TOOLS THAT INCREASE TRANSPARENCY AND EFFICIENCY AT BORDERS:** Invite small- and medium-sized enterprises to work with customs and revenue authorities to develop simple-to-use tables listing all products classified as clean energy-agriculture technologies.



#### *Clarify Customs and Tariffs: Insights*

Many countries are moving towards greater transparency and efficiency at their borders. For example, the “One Window” importation framework in Kenya includes Harmonized System (HS) codes for solar water pumps and refrigerators. The Kenyan Renewable Energy Association (KEREAA) has working

### Clarify Customs and Tariffs: Way Forward

Outline clear and public processes and procedures for how each product should be treated when it enters ports, and ensure accountability in their application.

Include processes to escalate issues for the private sector to log and track complaints.

Engage customs officers to ensure accuracy and consistency, and train customs officers and transport agents on the correct tariffs to apply at borders.



### Clarify Customs and Tariffs: Insights

group meetings on customs issues with government authorities including the Kenya Revenue Authority (KRA) and the Kenya Bureau of Standards (KEBS). KRA encourages private companies to bring concerns to its attention and has strict time scales for resolving disputes. It also has a “registered importer” system. Nevertheless, challenges continue to exist, particularly in the consistent application of procedures. Therefore, complementary measures to ensure consistency, accountability, and the necessary resources for the application of rules are continuously explored.

## FACILITATE ACCESS TO FOREIGN CURRENCY AND INVESTMENT

A key concern for many companies is the ability to access hard currency to buy product stock and other services from abroad and then repatriate it to repay international investors. Central bank regulations and lengthy procedures can dramatically affect business operations. For example, an agricultural processor working in Papua New Guinea noted it took several months to move capital into the country in local currency for operations and back out into foreign currency for product procurement. This, in addition to currency fluctuation and duties applied to solar PV components, hurt operations and resulted in the company moving to Kenya. Another interviewee, a cold storage company in Nigeria, noted that transferring and exchanging foreign currency into Nigerian naira was complicated and lengthy. Delays like these can potentially impact company growth and the delivery of products to consumers.

Policies that limit access to foreign investment are also important to consider. Such rules are in place to protect and ensure functioning local markets, but often disproportionately affect nascent markets. For example, an innovator operating in Tanzania noted that an investment that exceeded five percent of the company value triggered an antitrust check by the government. The company had to spend considerable capital and four to six months of time to work with lawyers on filing required paperwork.

**STREAMLINE FOREIGN EXCHANGE (FOREX) AND INVESTMENT RULES:**

Streamline policies, regulations, and procedures that limit access to foreign currency and investment to ensure international transactions become faster and more predictable. If forex is capped or regulated in-country, provide an exemption for the clean energy-agriculture nexus.



Positive policies attract companies and investment and can greatly influence where companies decide to base their operations. In the absence of conducive policies, financing programs can provide short-term solutions.

For example, in Ethiopia, foreign currency investments are restricted for international companies and off-limits for local companies. International investors must obtain special permission as part of a complex process that lacks transparency. To address this, the World Bank worked with the Development Bank of Ethiopia to create a forex debt facility for off-grid energy companies to gain access to inventory financing.<sup>17</sup> It lends to local companies in U.S. dollars to overcome barriers of limited foreign currency and working capital. The facility has reported early success, but the country's broader fiscal policy must be reviewed to become more transparent and conducive to foreign currency.

**REMOVE POLICY AND REGULATORY BARRIERS TO LENDING**

Governments regulate lending to support liquid markets and protect consumers from predatory practices. However, government policies can sometimes limit the flow or increase the cost of capital to companies that seek to provide innovative financing options to traditionally underserved markets. Some prominent examples include:

**Interest rate caps.** Caps on loan interest rates can stymie credit flows by excluding riskier loans. For example, in 2016 the Kenyan Parliament introduced a 14.5 percent cap and 7.35 percent deposit rate floor on commercial lending interest rates charged by financial institutions registered in Kenya.<sup>18</sup> The intent was to reduce the cost of borrowing and ultimately expand access to credit. However, the cap unintentionally caused a collapse of credit access for micro-, small-, and medium-sized businesses, particularly in the trade and agriculture sectors. Increasingly, banks rejected riskier consumer loan requests. For example, one large institution cited seven out of ten rejections versus four out of ten prior to the cap's implementation.<sup>19</sup>



**Microfinance regulation.** Several innovators referenced Tanzania’s Microfinance Act, which regulates small-scale financing and forces companies to become microfinance institutions to finance clean energy-agriculture products (and other off-grid products) to customers. The Act introduces new screening, registration, and capital requirements for microfinanciers. For example, a microfinancier cannot open or close a place of business without prior approval from the Bank of Tanzania.<sup>20</sup> The Bank also has the power to revoke microfinance licenses if an institution violates its license or the content of the legislation. One Tanzania-based solar water pumping company that incorporates end-user financing as a key component of its value proposition noted that these new requirements have made extending loans much more difficult.

**Taxes levied or rules on mobile money.** A Uganda-based solar water pumping innovator noted that a recent one percent tax levied on mobile money payments discouraged customers from using mobile money in pay-as-you-go (PAYGO) transactions. The United Nations Capital Development Fund observed a ten to fifteen percent reduction in mobile money transaction volumes per customer in the SHS industry as a result of the tax.<sup>21</sup> Similarly, many countries in West Africa consider PAYGO companies to be electric utilities, claiming that they are selling a kilowatt of energy instead of a consumer good, and therefore should be subject to regulations. As a result, companies are prevented from operating in certain areas or using such financing models.



An M-PESA-based transaction in Kenya. Photo courtesy of Reuters/Thomas Mukoya.

*Remove Policy and Regulatory Barriers to Lending: Way Forward*

**REVIEW RELEVANT FINANCIAL**

**REGULATIONS:** Review national and regional financial regulations that constrain lending or limit PAYGO, and evaluate amendments to remove barriers or make certain segments of the clean energy-agriculture nexus are exempt.



*Remove Policy and Regulatory Barriers to Lending: Insights*

Governments must balance consumer protection across the nexus while ensuring consumers can benefit from financial inclusion and innovation, particularly for priority sectors such as energy and agriculture.

To achieve this balance, Kenya recently removed the aforementioned interest rate cap set in 2016. Top banking executives cited declining access to credit as a motivation for the decision.<sup>22</sup>

## 3.2 Stimulate Market Growth

Many governments aim to stimulate market growth in the agriculture and energy sectors through policies, programs, and interventions to facilitate access of consumers to these services. For example, the United States Department of Agriculture (USDA) provides up to \$30 billion in loans and crop insurance to farmers, to account for both crop yield and price fluctuations.<sup>23</sup> USDA also provides market assistance loans specifically to farms that make less than a set annual amount, allowing recipients to use their commodities as collateral. Similarly, the Rural Electrification Act of 1936 enabled USDA to provide direct loans and guarantees to rural cooperatives, municipalities, and companies to construct electrical generation, transmission, and distribution in rural areas. As a result, the proportion of electrified farms ballooned from 10 percent to 90 percent over 20 years.<sup>24</sup> This was largely due to the Rural Electrification Act of 1936.<sup>25,24</sup>

In the clean energy-agriculture nexus, there are many interventions that can stimulate the market depending on market actor challenges and maturity. Innovators prioritize interventions that address the following four challenges: high up-front costs of products, high end-user costs, lack of technology awareness, and limited access to financing.

### LOWER DUTIES AND PROVIDE TARIFF EXEMPTIONS

Addressing duties and tariffs is key to ensuring product entry into markets, particularly when demand has not yet been established. Many clean energy-agriculture products cost several hundred dollars, placing them out of reach for rural smallholder farmers. Tariffs and VAT can represent a significant portion of product cost to end users. For example, VAT and import tariffs for off-grid solar products can make up as much as 40 percent of total product costs.<sup>26</sup> Research from the Schatz Energy Research Center and social enterprise 60 Decibels estimates that import duties and VAT specifically account for over 30 percent of the total system cost of off-grid refrigerators for consumers in sub-Saharan Africa, Asia, and South America.<sup>27</sup>

#### *Lower Duties and Provide Tariff Exemptions: Way Forward*

**CONSIDER REDUCTIONS AND EXEMPTIONS ON IMPORT DUTIES, TARIFFS, AND VAT, WITH LIMITED TIMEFRAMES:** Import duties, tariffs, and VAT can improve product affordability when such costs/savings are passed on to consumers. Targeted tax exemptions or reductions can also reduce companies' unit costs



#### *Lower Duties and Provide Tariff Exemptions: Insights*

Several innovators noted this would be the single-most helpful policy issue to address.

Through its advocacy work, KEREAs successfully removed VAT and import duties for solar PV products. In Sierra Leone, Power for All also successfully

### Lower Duties and Provide Tariff Exemptions: Way Forward

and support their ability to scale product deployment.



### Lower Duties and Provide Tariff Exemptions: Insights

campaigned for VAT removal for solar PV products.<sup>28</sup>

Tariff and duty exemptions that target the agriculture sector are sometimes hard to implement. It is relatively simple to offer a tax exemption or reduced tariff for a solar panel. However, items such as batteries, pumps, and motors are not guaranteed to be used solely for agricultural purposes, potentially complicating a tax exemption application. For targeted exemptions, verification would have to happen (such as refrigerators to be used for agricultural purposes). This can be costly and/or impractical.

## DESIGN SMART SUBSIDY PROGRAMS TO LOWER END USER-COSTS

As the client base evolves from early adopters to mainstream consumers, high product acquisition costs are a key barrier. To reduce the cost of clean energy-agriculture technologies, manufacturers and distributors must increase the volume of products they sell while delivering their services reliably. Yet, many companies are still refining their product offerings and business models. Additionally, operations are expensive in most target markets, particularly in last-mile communities due to limited supply chains, spare parts, and repair services, among other factors. A few innovators noted they have not been able to achieve a price point that makes their products truly accessible to the smallholder farmer market they seek to serve.

Subsidies and other approaches that lower prices as companies work to increase operational efficiency through economies of scale can play a key role in establishing these markets. In some cases, governments may even choose to employ long-lasting subsidies to products that provide multifaceted development impacts if price puts these products permanently out of the target market's reach.

For example, in 2019 the Indian government announced the Kisan Urja Suraksha evam Utthaan Mahabhiyan (KUSUM) program, which dedicates nearly \$4.7 billion for renewable energy-agriculture initiatives. A large component of this includes subsidizing 17,500 off-grid solar water pumps and supporting the transition of 10,000 grid-tied electric pumps to solar PV to reduce smallholder farmers' dependence on diesel-powered pumps and contribute to India's sustainable energy goals. KUSUM addresses sustainability issues of traditional up-front subsidies by allowing distribution companies

(DISCOs) to buy back the electricity from farmers at a set tariff during off-harvest seasons. Farmers can also take part in net metering schemes if available.<sup>29</sup> These schemes can address sustainability by providing an additional incentive to properly maintain assets in the long term and ensure income beyond the initial equipment purchase.



A multi-kilowatt solar water pump installation in India. Photo courtesy of Claro Energy.

However, innovators also note that the design of subsidies is crucial to their success, and a poorly designed subsidy regime can also undermine market growth. For instance, abrupt removal of a subsidy might cause a price jump that frustrates customers and negatively impacts willingness to pay. One innovator also noted that the anticipation of a subsidy can be problematic, as customers might delay purchase if they believe a large subsidy may be imminent.

#### *Design Smart Subsidy Programs to Lower End-User Costs: Way Forward*

##### **DESIGN PRIVATE SECTOR FRIENDLY, SMART SUBSIDY PROGRAMS:**

Governments can design subsidies to reduce companies' market entry costs to remote areas where rural customers would otherwise not be reached. When designing such subsidies, governments should work with the private sector to identify the appropriate equipment to include in the programs. The subsidies should be tailored to the consumer in terms of affordability, service, and productivity, and should include exit strategies.<sup>30</sup> For example, time-bound subsidies that gradually phase out can



#### *Design Smart Subsidy Programs to Lower End-User Costs: Insights*

Innovators and governments engaged in interviews and the roundtable event were supportive of results-based financing (RBF)<sup>d</sup> subsidy schemes that facilitate market entry by reducing the unit cost of products. Such schemes can avoid market distortions by aiding companies (rather than artificially lowering product prices directly for consumers) with clear and transparent timelines and providing incentives that do not exceed the retail market prices of products.<sup>32</sup>

One example of RBF implementation is the Kenya Off-Grid Solar Energy Access Project (KOSAP), which has established

<sup>d</sup> An RBF instrument links financing to pre-determined results, meaning funds are disbursed once the agreed-upon results are verified. Companies registered for RBF schemes provide their unit sales to receive a certain percentage of their product cost as a grant paid retrospectively. Companies are generally not paid upfront and receive reimbursement after providing evidence of sale. To address cash flow limitations, some schemes now provide up-front payments. Capacity building may be needed to help early-stage innovators put their distribution and monitoring systems in place to comply with the verification procedures.

reduce market distortions and avoid shocks to the market once the subsidy is removed. Additionally, environmental considerations should be built into subsidies. For example, KUSUM has been cited to lack proper monitoring and mitigation of potential over extraction of groundwater.<sup>31</sup>



three RBF schemes and debt facilities for off-grid solar and clean cookstove appliances up to 2023. Funded by Kenya's Ministry of Energy and managed by the Netherlands Development Organization (SNV) and SunFunder, KOSAP provides private sector actors with market entry grants.<sup>33</sup>

A second example of RBF programming is the Global Lighting and Energy Access Partnership (LEAP)-RBF, a bulk procurement incentive program designed to catalyze the uptake of high-quality appliances. The 2019 program focuses specifically on off-grid solar water pumps and refrigerators and is administered by CLASP, a non-profit organization that seeks to accelerate the availability and affordability of efficient, high-quality appliances while maximizing energy services. CLASP's Global LEAP-RBF seems promising for early market development: previous versions of the program supported the procurement of 264,852 off-grid refrigerators, televisions, and fans in East Africa and Bangladesh.

## **PROMOTE MARKET AWARENESS**

Innovators note that governments can provide much-needed support in creating market awareness of clean energy-agriculture technologies and their benefits. In nascent markets, the private sector is often forced to educate farmers about the benefits of mechanization, clean energy technologies, mobile banking, et cetera. Governments can more credibly and effectively deliver such market information as a public good for farmers. Furthermore, at the policy roundtable event, innovators welcomed awareness campaigns to protect consumers from counterfeit products, encourage transition from diesel to clean solutions, and more generally help consumers make informed decisions (see "Recognize and Reward Quality" on page 21).

*Promote Market Awareness:  
Way Forward*

**FUND MARKET AWARENESS PROGRAMS:**

Create a favorable environment for clean energy-agriculture products by ensuring potential customers know and understand these products. For example, donors and governments can fund technology demonstrations, trainings, extension work, and other outreach activities. Governments are also well-placed to protect consumers from counterfeit products, encourage the transition from diesel to clean energy, and generally help consumers make informed decisions.



*Promote Market Awareness:  
Insights*

During a visit to Kenya, Powering Agriculture staff learned that farmers typically hear about and pursue clean energy-agriculture products through demonstration days and word of mouth.

As an example, Power for All, SNV, Practical Action, Hivos, and the Renewable Energy Association of Zimbabwe held a monumental solar fair that enabled hundreds of farmers, local officials, and community members to learn more about decentralized productive use energy appliances.<sup>34</sup>

**POWER FOR ALL**

This event is proudly brought to you by **Power for All** implementing partners: Practical Action, SNV, ZERO, Renewable Energy Association of Zimbabwe (REAZ) and Hivos

**RENEWABLE  
ENERGY  
TECHNOLOGIES**

**EXHIBITION  
2016**



An advertisement for the Power for All multi-stakeholder solar fair in Zimbabwe. Photo courtesy of Power For All.

## INCREASE ACCESS TO FINANCE FOR COMPANIES AND END USERS

As product sales increase and the market matures, companies seek long-term, commercial financing to sustain growth and face new challenges. As companies expand, several challenges occur or increase significantly.

**Forex risk.** Companies often borrow or buy equipment in foreign currency and are paid in local currency. In some countries, this can represent a significant forex risk. Some innovators noted that due to their small size it is impossible for them to hedge against currency risks, resulting in fluctuations that can increase purchase prices considerably. As a result, borrowing in local currency could mitigate this challenge.

**Limited capacity of financial institutions.** Financial institutions, especially local ones, often lack the capacity to evaluate risks and structure lending instruments to companies operating in the nexus.

**Lack of working capital and end-user financing solutions.** Innovators noted they have difficulty accessing loans for day-to-day operations, for their clients to borrow and purchase equipment or services, or to extend credit to their clients. For example, a biogas and cold storage innovator operating in Tanzania and Kenya unsuccessfully secured partnerships with multiple finance institutions and savings cooperatives for customer financing. After several years, the company modified its business model to offer loans to customers. However, this contributed to a continuous shortage of working capital, which the company cites as a key contributing factor in its decision to declare bankruptcy.

Governments and donors can accelerate market growth by helping to lower the risk of investments, reduce the cost of capital, and develop trust and appetite for clean energy-agriculture technologies. Interventions (e.g., local currency facilities, working capital loans, loan guarantees, first-loss schemes, and seed capital) are designed to increase access to finance, reduce the cost of capital for entrepreneurs, and ultimately reduce consumers' costs.

### *Increase Access to Finance for Companies and End Users: Way Forward*

#### **ESTABLISH LOCAL CURRENCY FACILITIES:**

The most direct way for companies to reduce forex risk is to borrow in local currency. Donors and governments can work with local financial institutions (often microfinance or agriculture-focused) to mobilize lending in local currency for clean energy-agriculture. These loans can also address limited access to working capital.

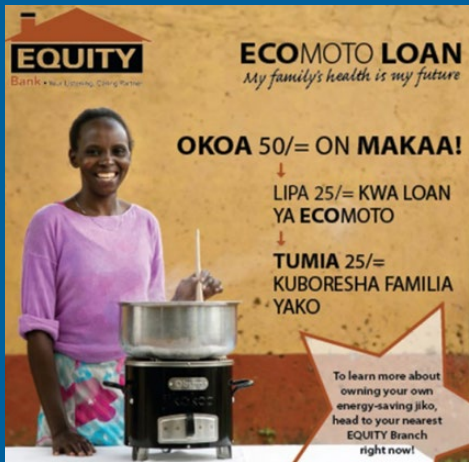


### *Increase Access to Finance for Companies and End Users: Insights*

Announced in 2019, the African Development Bank (AfDB)'s Distributing Energy Services Companies financing program aims to facilitate local currency lending for companies that provide distributed energy solutions and make risk mitigation instruments available to local lenders.<sup>35</sup> One motivation behind the program is to ease companies' access to financing. In Côte d'Ivoire, Zola Côte d'Ivoire (ZECI) is piloting this approach to scale SHS sales.<sup>36</sup>

**INCREASE FARMERS' ACCESS TO CREDIT:**

Local financial institutions are reluctant to lend to companies during the early stages of market development when long-term performance data has yet to materialize. Therefore, governments should consider grants to increase the overall amount available to borrow.



EcoMoto loan market collateral. Photo courtesy of USAID and Winrock International.

**DE-RISK AND MOBILIZE INVESTMENT:**

Governments and donors can use instruments to de-risk investment and leverage much needed capital from financiers.

*Loan guarantees:* Clean energy-agriculture equipment often has relatively low (or rapidly depreciating) value and is not easy to repossess or reclaim after a loan default. A loan guarantee scheme can reduce or remove the need for the lender to collect collateral.

*First-loss schemes:* These instruments offer partial insurance for customer non-payment. While not all losses




Financial institutions see new products as risky and will be more likely to lend to smallholder farmers through mechanisms specifically tailored to them.

Kenya Equity Bank established “EcoMoto,” a loan facility with support from the International Finance Corporation (IFC) and Lighting Africa/Kenya program. The regime enables consumers to directly apply for loans dedicated to purchase solar lanterns, SHS, and cookstoves from their mobile phones with loan confirmation responses within 24 hours.<sup>37</sup> By 2017, the platform had contributed to over 11,500 improved cookstove sales.<sup>38</sup>

A leading solar water pump company based in Kenya noted that a first-loss scheme would be the single-most helpful policy item to support the scaling of their operations. With a first-loss scheme, the company could partner with a financier and extend loans to farmers. The scheme would grant the financier a measure of confidence in giving out the loans and would help the company build a productive credit profile while growing its client base.

The Powering Agriculture Investment Alliance intends to catalyze at least \$25 million in private sector finance for ventures in the clean energy-agriculture nexus. Powering Agriculture Investment Alliance Partners AlphaMundi and Factor[e] identify, screen, and invest in companies through technical assistance, grants, and equity investments.





*Increase Access to Finance for Companies and End Users: Way Forward*

are covered, companies can use such instruments to limit exposure.<sup>39</sup>

*Blended finance:* Donors often work with financing institutions, venture capitalists, and private equity investors to provide early-stage funding to reduce the companies' costs to scale and allow them to leverage other funds. These programs also help financiers in more easily building their investment pipelines.



*Increase Access to Finance for Companies and End Users: Insights*

Powering Agriculture's funding of the two partners helps reduce overhead costs that underpin the necessary screening and due diligence for making investments.<sup>40</sup>

### 3.3 Recognize and Reward Quality

Consumers often lack access to information about clean energy-agriculture technology performance, efficiency, and reliability. For this reason, industry rewards and recognition of best practices and technologies are important elements that grant consumers the ability to assess cost versus quality and make informed purchasing decisions.



*Recognize and Reward Quality: Way Forward*

**SUPPORT AWARDS PROGRAMS:** Support ongoing or new awards programs that recognize high-quality clean energy-agriculture appliances. This will produce much-needed market intelligence for customers and distributors who are making purchasing decisions.



*Recognize and Reward Quality: Insights*

The Global LEAP Awards program, a multi-donor-funded program implemented by CLASP, conducts robust, data-driven product quality testing to promote appropriately designed, highly energy-efficient appliance technologies. This data-driven information is being developed in partnership with the private sector and can guide national and regional conversations. See Box 2 for a profile on the Global LEAP Awards.

## DEVELOP VOLUNTARY QUALITY STANDARDS

**Recognition of high-quality appliances.** In the event of an equipment breakdown or a poor customer experience, farmers may not be willing to purchase another clean energy-agriculture appliance. A biogas company based in Kenya discussed the need for product differentiation, pointing to standards as a reliable source of third-party information for farmers' purchasing decisions. With such objective information made public, consumers can better understand the cost versus quality trade-offs in the products they purchase.

**Voluntary standards.** Product quality standards – energy performance, efficiency, and safety – can protect consumers and allow them to make informed purchasing decisions. However, there are risks in prematurely fixing standards. Given the nascent nature of the clean energy-agriculture nexus, innovators are still refining their product offerings. Mandatory standards during this technology development phase could place a financial burden on companies and stifle innovation. For example, an agro-processing innovator in Kenya noted that the low-power solar processing industry is very young, and it would be untenable to be required to spend funds and time on a mandatory product testing and certification process while the company rapidly tests new product models and refines its design.

**Safety and minimum performance standards.** As the market and technology matures, mandatory standards can incorporate safety and minimum performance criteria to protect consumers. For example, agro-processing machines may use rotating blades and motors that could potentially pose safety issues if not properly addressed.


## BOX 2

### GLOBAL LEAP AWARDS<sup>8</sup>

Recognizing that considerable technical and market development is needed for off-grid energy appliances, the Global LEAP Awards uses a competition-based approach to identify and promote the world's best off-grid appliances. Nominated products are tested in accredited laboratories. An expert panel then evaluates products on their affordability, quality and durability, off-grid suitability, service delivery, and energy performance. Finalists and winners attain access to potential investors and financing programs, including the Global LEAP-RBF incentive mechanism and other innovation prizes. CLASP administers the Global LEAP Awards.



A solar water pump installation. Photo courtesy of Global LEAP Awards.



*Develop Voluntary Quality Standards:  
Way Forward*

**INCORPORATE LAB AND FIELD TESTING DATA IN THE DESIGN OF VOLUNTARY STANDARDS:**

Develop a roadmap to create a standards and testing regime that correlates with the overall maturity of the nexus. Implement a collaborative process with the private sector to ensure competing interests are weighed, and sensitize companies and consumers.

The process can start by using early product quality testing data to consider and set voluntary standards. Such a regime would further recognize high-quality products without hindering design improvements. Several innovators and donors favor initial voluntary standards to support the progression of more refined standards when the market has matured. In addition to promoting quality, minimum requirements can help to qualify products for donor- and government-funded incentive schemes.



*Develop Voluntary Quality Standards:  
Insights*

Standards have been implemented around the world to incentivize energy efficiency for appliances such as refrigerators, air conditioning, and motors. Standards for off-grid appliances, including lighting and cookstoves, have been adopted or are being considered in 19 countries.<sup>41</sup>

The Global LEAP Awards testing regime provides a robust source of lab and field testing data that can inform voluntary standards development.

Governments can work with private and non-profit organizations that are already compiling robust sales and product quality data to establish recognition programs and voluntary standards to help innovators differentiate their products while still allowing for product offering refinement. GOGLA collected sales and business operations data from 93 member companies to publish its latest *Global Off-Grid Solar Market Report*, a semiannually produced report on product trends and analysis.<sup>42</sup> The association also publishes a product showcase platform on its website to spotlight members' innovative technology offerings.

*Develop Voluntary Quality Standards:  
Way Forward*

**PRIORITIZE SAFETY AND FIELD CONDITIONS IN MANDATORY STANDARDS REQUIREMENTS:** As the clean energy-agriculture nexus matures, use product testing data and local conditions in considering mandatory standards. These can prioritize factors like safety and minimum performance.



*Develop Voluntary Quality Standards:  
Insights*

In 2018, the Nigerian Alliance for Clean Cookstoves, the Standards Organization of Nigeria (SON), and a host of other stakeholders agreed on minimum energy performance standards for improved biomass cookstoves. SON cited an influx of substandard cookstoves entering the Nigerian market and the negative health impacts of wood-based stoves as motivations for the standards to be put in place.<sup>43</sup>

The requirements must be contextually appropriate and tailored for end use. One biogas and cold storage innovator working in East Africa developed a milk chiller that maintained optimal temperatures for 72 hours. This amount of time met European standards, but far exceeded the approximately 12 hours needed by target customers and significantly increased the cost of the product.

## DEVELOP A LABELING FRAMEWORK

Labeling lets consumers compare products and services. Without such information, consumers may pursue lower-quality clean energy-agriculture products without the benefit of associated cost savings. Labeling programs need to consider a variety of factors, from performance to after-sales service offerings. For example, cold storage customers want to know the differences between a product's energy efficiency, life expectancy, guarantees, warranties, and after-sales service.

*Develop a Labeling Framework:  
Way Forward*

**DEVELOP A PRODUCT LABELING ROADMAP:** Develop and implement a labeling roadmap that works in parallel with standards. At this early stage of the market, it is important not to add



*Develop a Labeling Framework:  
Insights*

Labeling can provide important comparative data about products for individual consumers. According to a policy brief from the Efficiency for Access Coalition, an adequate labeling regime can

### Develop a Labeling Framework: Way Forward

onerous costs to entrepreneurs or to consider programs that subsidize costs associated with testing and labeling.

**CONSIDER WARRANTY DURATION AND CONDITIONS:** Product warranty is key in delivering consumer protection. It can also solidify both the value proposition of the clean energy-agriculture nexus as a service and a company's long-term relationship with the consumer as opposed to being just an equipment provider.

**ENSURE LABELING ENFORCEMENT:** This allows labeling to be monitored at various points along the supply chain. For imported goods, checks should be made at customs borders; non-compliant goods should be identified and excluded from the market.

**LEAD CUSTOMER EDUCATIONAL CAMPAIGNS:** Awareness campaigns centered around labeling are needed to ensure that consumers understand the different parts of a label so they are making informed choices.



### Develop a Labeling Framework: Insights

raise business and consumer awareness of product performance to enable more informed purchasing decisions.<sup>44</sup>

In Kenya, Uganda, Ethiopia, and India, among other countries, import standardization marks (ISMs) or similar identifiers are used to verify a product meets certain national standards. The Kenyan ISM, for example, uses a quick response code that consumers can use to check the validity of a product's certification before purchasing it.



An Import Standardization Mark (ISM) from the Kenya Bureau of Standards. Photo courtesy of the Efficiency for Access Coalition.

## 3.4 Strengthen Private Sector-Government Partnerships

Many innovators note that direct exchanges with governments on policy are beneficial to express difficulties and better understand rules, regulations, and government programs. Government officials also expressed keen interest in receiving thoughtful concepts from the private sector. However, since the clean energy-agriculture technology space spans different sectors (e.g., energy, agriculture, and water), appliances can vary widely by end use. As a result, companies are varied in their product offerings and business models and do not have a clear-cut institutional home or single point of entry to government counterparts. Governments should employ a collaborative approach that involves clear channels of communication to efficiently aggregate and engage these different voices.

## STRENGTHEN THE VALUE PROPOSITION

For a fruitful exchange between the government and the private sector, the value proposition of the nexus and the importance of government support must be clearly articulated and supported. Several innovators voiced the need to better communicate the value of the services they provide to farmers and governments. Establishing and quantifying the benefits of such services can ensure that government and donors deliver data-informed policies and programs for supporting the clean energy-agriculture nexus. However, innovators highlighted that governments are better placed to aggregate data across the nexus to establish and quantify benefits to farmers and actors across the supply chain, and, ultimately, the country.

### *Strengthen the Value Proposition: Way Forward*

#### **BUILD THE VALUE PROPOSITION FOR CLEAN ENERGY-AGRICULTURE**

**APPLIANCES:** To deliver conducive policies, governments can be best guided by a data-driven understanding of the costs and benefits of interventions. Metrics such as the return on investment of a particular policy or program can help government counterparts understand the value for money of different policy and program interventions.



### *Strengthen the Value Proposition: Insights*

The Powering Agriculture website hosts studies and thought leadership pieces on the benefits of the clean energy-agriculture nexus, including documents produced by the FAO on the costs and benefits of solar water pumps, cold storage, and biodigesters in Kenya and Tanzania.<sup>11</sup> Such studies highlight results from targeted government investment in clean energy-agriculture nexus, which can be replicated in other countries and updated as needed.

## FORM CROSS-GOVERNMENTAL WORKING GROUPS

Given the cross-sectoral nature of the clean energy-agriculture nexus, the private sector may struggle to identify which ministry or entity to approach when proposing elements to shape government policy. For example, a solar water pump can be supported by policies encouraging agricultural production, access to water, irrigation, livestock, rural electrification, and renewable energy access, each of which may be the purview of a different agency. On the other hand, some policies may be developed in one agency but require input from others. For instance, several innovators noted that the development of new HS codes for clean energy-agriculture appliances could benefit from input by multiple government agencies, such as the ministries that oversee energy, agriculture, and water sectors as well as organizations involved in standards.

**FORM EFFECTIVE INTRA-GOVERNMENTAL WORKING GROUPS:**

Develop cross-government coordination working groups with a variety of stakeholders when developing policies and programs. Designate a government champion that has influence in one of the key ministries (e.g., energy, agriculture, water, and finance) to convene and empower policymakers.

**ENGAGE INDUSTRY ASSOCIATIONS:**

Work with industry clusters or associations that aggregate the needs, challenges, and opportunities for partnership, while understanding nuances and differing needs of their members.

Different channels exist for governments and the private sector to engage. For effective collaboration and the delivery of tangible solutions, it is important to identify and engage appropriate groups.



The Kenya Private Sector Alliance (KEPSA) was created for the government to communicate directly with the private sector. KERECA has a seat at KEPSA and raises off-grid issues for KEPSA to convey to the government. Likewise, the government provides KEPSA with policy and draft regulations for KEPSA's comment on behalf of the private sector in an effort to foster a private sector friendly enabling environment. KERECA members must be active at KEPSA meetings to ensure their voices are heard. KEPSA represents both the renewable energy sector and agricultural subsectors such as dairy and horticulture in the clean energy-agriculture nexus.

The Community of Champions initiative is designed to be an open exchange between private and public sectors with donors for collaborative work on enabling policy environments for energy access in Africa.<sup>45</sup> The Community holds frequent in-person events and webinars on government policy and private sector experiences related to off-grid energy. The initiative was co-created by GOGLA, the World Bank, Shell Foundation, Power Africa, the U.K. Department for International Development, and Sustainable Energy for All.

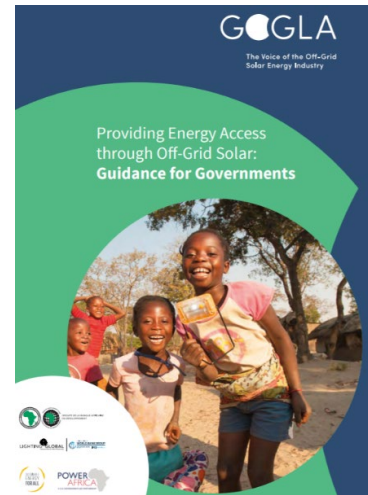
The East African Centre of Excellence for Renewable Energy and Energy Efficiency (EACREEE) was created to deal multiple countries' procedures for promoting new ideas and influencing cross-ministerial policies.<sup>46</sup> They are often engaged in various regional policy-making processes.

International advocacy organizations like GOGLA partner with local associations providing technical assistance and publish impact data collected from their members, providing a good understanding of regional nexus issues.

## ENGAGE STAKEHOLDER GROUPS WHO REPRESENT PRIVATE SECTOR VIEWS IN THE POLICYMAKING PROCESS

Innovators want a voice in the policymaking process, and requested that governments seek to include the private sector in such processes to better capture the realities of consumers and their markets. However, most companies may not have the experience, resources, or time to engage in policy ideation and development. Many innovators noted that early-stage companies are already stretched thin in resources and capital.

To ensure their engagement, several innovators noted that they collaborate with national renewable advocacy organizations. These associations have had considerable success in certain countries in influencing policies on tariff and import duties – particularly for solar PV appliance components. However, innovators cited that these broader organizations are not always representative of the clean energy-agriculture nexus since innovators are often much smaller and less commercial than other association members.



A guidance note on off-grid solar. Photo courtesy of GOGLA.

### *Engage Stakeholder Groups Who Represent Private Sector Views in the Policymaking Process: Way Forward*

**SUPPORT THE DEVELOPMENT OF WORKING GROUPS FOCUSED ON THE CLEAN ENERGY-AGRICULTURE NEXUS:** Creating working groups with a specific focus on clean energy-agriculture can help distill unique barriers and solutions to unlock the nexus that may be otherwise overlooked. Such working groups can aggregate the diverse voices within the clean energy-agriculture nexus for efficient engagements with government.



### *Engage Stakeholder Groups Who Represent Private Sector Views in the Policymaking Process: Insights*

GOGLA is predominantly made up of solar lighting manufacturers and distributors with few members that focus solely on productive use products. However, it has initiated a productive use working group that started a dialogue between key players in the solar water pumping and cooling sectors. The group may also help frame key themes on a global scale. GOGLA has several working groups, including one focused on policy. GOGLA staff noted that their most successful groups are those with specific goals and action-oriented plans to ensure that members' time is spent wisely, as well as those with committed champions.





*Engage Stakeholder Groups Who Represent Private Sector Views in the Policymaking Process: Way Forward*

**INCLUDE CREDIBLE ASSOCIATIONS IN THE POLICYMAKING PROCESS:**

Governments should identify credible associations that can help aggregate nexus challenges, opportunities, and data, and engage them in the policymaking and validation processes.



*Engage Stakeholder Groups Who Represent Private Sector Views in the Policymaking Process: Insights*

National renewable energy associations including KEREA and GOGLA have noted the recent interest from companies, donors, and governments in productive use appliances. These organizations are interested in leading conversations on clean energy-agriculture policy and regulation issues. Box 3 provides a profile of GOGLA.

Kenya's constitution mandates stakeholder participation at all stages, and multi-stakeholder panels advise on new policy proposals. Regional bodies should also be engaged in policy development for productive use appliances, particularly in the harmonization and sharing of best practices across countries in a single region. These include the Southern African Development Community, East Africa Community, and Economic Community of West African States' Centers for Renewable Energy and Energy Efficiency (EACREEE, SACREEE, and ECREE, respectively). For example, both EACREEE and SACREEE partnered to organize a knowledge exchange forum with a specific focus on sharing the successes and challenges in renewable energy for productive use.<sup>47</sup>

Leading organizations with experience in testing, standards development, and labeling for productive use appliances, like CLASP, can also play an important role in advising such dialogues. Box 4 profiles the GIZ East Africa Hub, a Nairobi-based center that aims to support clean energy-agriculture companies in policy advocacy.

## GLOBAL OFF-GRID LIGHTING ASSOCIATION



Established in 2012, GOGLA is the international trade association for the off-grid solar energy industry. With a membership of over 160 companies across the globe, GOGLA generates market intelligence for the off-grid solar sector, organizes events and other media for knowledge sharing and networking, advocates for enabling policy environments, and contributes to appliance standards and guidelines. The association's membership includes multiple solar water pumping and cold storage companies.

GOGLA has confirmed the potential for the productive use of energy to support livelihoods through income generation, new employment, and food security, as mentioned in its publications. The association has confirmed its interest in establishing a working group that is specifically focused on advocating for policy and regulation that benefits productive use companies.<sup>48</sup>



Powering Agriculture innovator SunDanzer's East-West facing panels create a flatter PV curve. Photo courtesy of SunDanzer.

## DEUTSCHE GESELLSCHAFT FÜR INTERNATIONALE ZUSAMMENARBEIT GMBH (GIZ) EAST AFRICA HUB



GIZ has over 50 years of experience in a wide range of areas, including economic development and employment promotion, agriculture, energy and the environment, and peace and security. GIZ works to foster successful engagement between governments, businesses, civil society actors, and academia.

In 2020, the Water and Energy for Food (WE4F) initiative will launch its East Africa Hub in Nairobi, Kenya. WE4F is an international initiative by the German Federal Ministry for Economic Cooperation and Development (BMZ) and implemented by GIZ, the U.S. Agency for International Development (USAID), the Swedish International Development Cooperation Agency (Sida), and the Ministry of Foreign Affairs of the Kingdom of the Netherlands. Its goal is the scaling of small and growing enterprises (SGEs) working on innovative solutions in the water, energy, and agriculture/food sectors.

The WE4F East Africa Hub has been commissioned specifically to support SGEs in East Africa through a call for funding, business development support networks, the piloting of new technologies and service approaches, and policy advocacy, including on standards and customs. The Hub thereby builds on ongoing work with productive use appliance manufacturers and distributors in the energy sector.



Access to clean energy-agriculture technologies can increase crop yields and incomes for farmers in developing countries. Photos courtesy of GIZ and Claro Energy.

## 4. CONCLUSION

Clean energy-agriculture services have the unique potential to spur economic growth, increase national food security, and serve national development and environmental objectives in a cost-effective manner. Private sector companies are developing innovative technologies and business models to address farmers' pumping, cooling, and processing needs. However, this nascent nexus faces challenges that can dramatically change companies' business models and hinder their ability to enter markets or achieve scale.

Many of these challenges are related to policy and regulatory frameworks and their implementation in the countries where they operate. Challenges in policies and regulations include: customs and tariffs, access to foreign capital and investment, access to loans, the ability to lend to customers and use mobile money, and the ability to differentiate high-quality products from low-quality ones. Governments can effectively support the growth of this nexus by using policy and regulation levers in promoting ease of business, stimulating market growth, recognizing and rewarding quality, and including the private sector in the policymaking process. The topics presented in this guide provide a starting point for an effective partnership between the public and private sectors to scale commercial activity in the clean energy-agriculture nexus.

## Annex I: Participants

Table 1 presents the companies, donors, government agencies, and other stakeholders that participated in both interviews (conducted between June and August 2019) and the policy roundtable event (held at the Laico Regency Hotel in Nairobi, Kenya on Thursday, September 19, 2019). Insights from both efforts contributed to the production of this guide.

**Table 1 POLICY ROUNDTABLE ACTIVITY PARTICIPANTS**

ORGANIZATION	INTERVIEWEE	ROUNDTABLE ATTENDEE
Agsol	X	X
African Minigrid Developers Association		X
Azuri Technologies	X	X
Claro Energy	X	
CLASP	X	X
ColdHubs	X	
CrossBoundary	X	
DFID: Africa Clean Energy	X	
DFID: Transforming Energy Access	X	
DGridEnergy	X	
East African Centre of Excellence for Renewable Energy and Efficiency		X
Energy Saving Trust	X	
Enviu		X
Factor[e]	X	
Futurepump	X	X
GIZ	X	X
GONGLA	X	X
Green Mini Grid Facility	X	
InspiraFarms	X	
Kenya Bureau of Standards		
Kenya Ministry of Energy and Petroleum		X
Kenya Renewable Energy Association		X
Kenya Revenue Authority		X
Kickstart International	X	
Lorentz		X
USAID Power Africa Off-Grid Program	X	X
Promethean Power Systems	X	
Rockefeller Foundation	X	
Savanna Circuit Tech		X
S4S Technologies	X	
Selco Foundation	X	
SimGas	X	
Simusolar	X	X
Sistema.bio	X	X
SolarNow	X	
SunCulture	X	X
Sunny Irrigation		X
Sure Chill	X	
Tanzania Renewable Energy Association		X
Village Industrial Power	X	
Village Infrastructure Angels	X	
Uganda Solar Energy Association		X
USAID: Power Africa Off-Grid Program	X	X
USAID: Powering Agriculture: An Energy Grand Challenge		X

## 5. REFERENCES

1. Benjamin Attia and Isaac Maze-Rothstein, *Strategic Investments in Off-Grid Energy Access: Scaling the Utility of the Future for the Last Mile* (Wood Mackenzie, February 2019), <https://www.energy4impact.org/file/2086/download?token=9-hw5RF1>.
2. Mikael Matossian, Key Identified Topic Areas in Clean Energy-Agriculture Policy and Regulation, figure, October 2019.
3. Powering Agriculture: An Energy Grand Challenge for Development, "Powering Agriculture Fact Sheet," March 2016, <https://poweringag.org/sites/default/files/PAEGC-factsheet-3mar16.pdf>.
4. Busani Bufana, "The High Price of Desertification: 23 Hectares of Land a Minute," *Inter Press Service*, June 15, 2017, <http://www.ipsnews.net/2017/06/the-high-price-of-desertification-23-hectares-of-land-a-minute/>.
5. "Rainfed Agriculture," Issue Summary, International Water Management Institute, <https://www.iwmi.cgiar.org/issues/rainfed-agriculture/summary/>.
6. "Seeking End to Loss and Waste of Food along Production Chain," FAO in Action, Food and Agriculture Organization of the United Nations, <http://www.fao.org/in-action/seeking-end-to-loss-and-waste-of-food-along-production-chain/en/>.
7. Ralph Sims, Alessandro Flammini, Manas Puri, and Stefania Bracco, "Energy-Smart" Food for People and Climate, (Rome: Food and Agriculture Organization of the United Nations, June 2012), <http://www.fao.org/3/a-i2454e.pdf>.
8. Shikha Suman, *Evaluation and Impact Assessment of the Solar Irrigation Pumps Program in Andhra Pradesh and Chhattisgarh* (Hyderabad: Shri Shakti Alternative Energy, January 2018), <https://www.ssacl.co.in/images/Library/files/Solar-Pumps-Impact-SSAEL-Report.pdf>.
9. "Solar Water Pumps," Competitions, Global LEAP Awards, <https://globalleapawards.org/solar-water-pumps>.
10. François Lepicard, Olivier Kayser, Jessica Graf, Simon Brossard, Adrien Darodes de Tailly, and Lucie Klarsfeld McGrath, *Reaching Scale in Access to Energy: Lessons from Practitioners* (Hystra, August 2017), <https://www.adb.org/sites/default/files/publication/372436/access-energy-lessons.pdf>.
11. Alessandro Flammini, Stefania Bracco, Ralph Sims, Jeanette Cooke, and Agata Elia, *Costs and Benefits of Clean Energy Technologies in the Milk, Vegetable and Rice Value Chains* (Rome: Food and Agriculture Organization of the United Nations, July 2018), <http://www.fao.org/3/I8017EN/i8017en.pdf>.
12. "Key Facts on Food Loss and Waste You Should Know!," SAVE FOOD: Global Initiative on Food Loss and Waste Reduction, Food and Agriculture Organization of the United Nations, <http://www.fao.org/save-food/resources/keyfindings/en/>.
13. "The Solution," Solar Powered Cold Storage for Developing Countries, ColdHubs, <http://www.coldhubs.com/>.
14. Augusta Abrahamse, Headley Jacobus, Mikael Matossian, Sandra Chavez, and Ethiopia Haileyesus, *Technology Case Study: Clean Energy Agro-Processing* (Washington: Powering Agriculture: An Energy Grand Challenge for Development, February 2020), <https://poweringag.org/docs/technology-case-study-clean-energy-agro-processing>.
15. Village Infrastructure Angels and Sumba Sustainable Solutions, *Agro-Processing Mills and Solar Lights in Rural Villages on Sumba Island: Final Monitoring and Evaluation Report* (Village Infrastructure Angels, September 2019).
16. Dalberg Advisors, *The 2018 Global Off-Grid Solar Market Trends Report* (Washington: International Finance Corporation, January 2018), [https://www.lightingglobal.org/wp-content/uploads/2018/03/2018\\_Off\\_Grid\\_Solar\\_Market\\_Trends\\_Report\\_Full.pdf](https://www.lightingglobal.org/wp-content/uploads/2018/03/2018_Off_Grid_Solar_Market_Trends_Report_Full.pdf).
17. Overseas Development Institute, *Accelerating Access to Electricity in Africa with Off-Grid Solar* (London: Overseas Development Institute, January 2016), <https://www.odi.org/sites/odi.org.uk/files/odi-assets/publications-opinion-files/10247.pdf>.

18. Emre Alper, Benedict J. Clements, Niko A. Hobdari, and Rafael Moyà Porcel, *Do Interest Rate Controls Work? Evidence from Kenya* (International Monetary Fund, May 2019), <https://doi.org/10.5089/9781498313957.001>.
19. Paolo Mele and Toby Couture, *Taking the Pulse: Understanding Energy Access Market Needs in Five High-Impact Countries* (Washington: Sustainable Energy for All, Practical Action Consulting, and E3 Analytics, August 2017), <http://hdl.handle.net/11283/620756>.
20. Venolia Rabodiba, "Introduction of a New Microfinance Act in Tanzania: What Impact Will It Have on the Housing Sector?," *Centre for Affordable Housing Finance in Africa*, July 24, 2019, <http://housingfinanceafrica.org/documents/introduction-of-a-new-microfinance-act-in-tanzania-what-impact-will-it-have-on-the-housing-sector/>.
21. Anna Ferracuti, "Understanding the Consequences of Mobile Money Taxes in Uganda," *United Nations Capital Development Fund*, August 29, 2018, <https://www.uncdf.org/admin/editors/ArticleItem/Index/3892?articleTitle=understanding-the-consequences-of-mobile-money-taxes-in-uganda>.
22. Morris Kiruga, "Kenya Lifts Interest Rate Cap, Equity Bank to Benefit the Most," *The Africa Report*, November 8, 2019, <https://www.theafricareport.com/19842/kenya-lifts-interest-rate-cap-equity-bank-to-benefit-the-most/>.
23. "Federal Farm Subsidies: What the Data Says," Data, USAFacts, June 5, 2019, <https://usafacts.org/articles/federal-farm-subsidies-what-data-says/>.
24. Gabriel Davies and Matt Tilleard, "What's the Problem with Subsidizing Private-Sector Rural Electrification?," *Greentech Media*, February 22, 2019, <https://www.greentechmedia.com/articles/read/subsidizing-private-sector-rural-electrification>.
25. "Powering Sustainable Rural Communities," Electric Programs, United States Department of Agriculture Rural Development, <https://www.rd.usda.gov/programs-services/all-programs/electric-programs#>.
26. GOGLA, *Providing Energy Access through Off-Grid Solar: Guidance for Governments* (GOGLA, January 2019), [https://www.gogla.org/sites/default/files/resource\\_docs/energy\\_access\\_through\\_off-grid\\_solar\\_-\\_guidance\\_for\\_govts.pdf](https://www.gogla.org/sites/default/files/resource_docs/energy_access_through_off-grid_solar_-_guidance_for_govts.pdf).
27. CLASP, *Practical Guidelines for Shipping Off-Grid Appliances* (Energy for Access Coalition, December 2019), [https://storage.googleapis.com/clasp-siteattachments/EforA\\_ShippingGuide\\_Final.pdf](https://storage.googleapis.com/clasp-siteattachments/EforA_ShippingGuide_Final.pdf).
28. Sophie Johnson, "The Challenges of Developing an Enabling Environment for Off-Grid Development" (PowerPoint presentation, Energy Sector Management Assistance Program Knowledge Exchange Forum 2017, London, November 30, 2017). [https://www.esmap.org/sites/default/files/Presentations/ESMAP%20KEF%202017\\_Sophie\\_Johnson.pdf](https://www.esmap.org/sites/default/files/Presentations/ESMAP%20KEF%202017_Sophie_Johnson.pdf).
29. Scientist-E Jeevan Kumar Jethani to All Concerned, Guidelines for Implementation of Pradhan Mantri Kisan Urja Suraksha evam Utthan Mahabhiyan Scheme, July 22, 2019, Government of India, Ministry of New and Renewable Energy, Office Memorandum, F. No. 32/645/2017-SPV Division, <https://mnre.gov.in/sites/default/files/webform/notices/KUSUMguidelines.pdf>.
30. Energising Development, *Driving Markets to Scale: Lessons Learned from Stimulating Energy Access Markets with Results-Based Financing* (Eschborn: Deutsche Gesellschaft für Internationale Zusammenarbeit, March 2017), [https://endev.info/images/3/34/EnDev\\_RBF\\_lessons\\_learned\\_report\\_2017.pdf](https://endev.info/images/3/34/EnDev_RBF_lessons_learned_report_2017.pdf).
31. Chandra Bhushan, Priyavrat Bhati, Mandvi Singh, and Pratha Jhawar, *Silver Bullet: Redesigning Solar Pump Programme for Water and Energy Security* (New Delhi: Centre for Science and Environment, August 2019), <https://www.cseindia.org/silver-bullet-9643>.
32. Marco Hüls, Marcel Raats, Josh Sebastian, Martijn Veen, and John Ward, *Results-Based Financing: A Promising New Tool for Energy Access* (Washington: World Bank Group, January 2017), <http://documents.worldbank.org/curated/en/793121494941318265/pdf/BRI-P148200-PUBLIC-FINALSEARSFResultsBasedFinancing.pdf>.
33. Api Podder, "SNV and SunFunder Partner to Manage New US\$ 48M RBF and Debt Facilities for Solar and Cook Stoves on Behalf of Kenya Government," *MySocialGoodNews*, June 11, 2019, <https://mysocialgoodnews.com/snv-and-sunfunder-partner-to-manage-new-us-48m-rbf-and-debt-facilities-for-solar-and-cook-stoves-on-behalf-of-kenya-government/>.
34. Susie Wheeldon, "Zimbabwe: Solar Fair Success," *Power for All*, October 1, 2016, <https://www.powerforall.org/news-media/events/zimbabwe-solar-fair-success>.

35. Fatma Ben Abda and Akane Zoukpo-Sanankoua, "African Development Bank Approves New Financing Program for Energy Providers, 4.5 Mln People in Sub-Saharan Africa to Benefit from Off-Grid Power by 2025," *African Development Bank Group*, July 12, 2019, <https://www.afdb.org/en/news-and-events/african-development-bank-approves-new-financing-program-energy-providers-45-mln-people-sub-saharan-africa-benefit-grid-power-2025-25545>.
36. Power Africa, *Off-Grid Solar Market Assessment: Côte d'Ivoire* (Power Africa Off-Grid Project, October 2019), [https://www.usaid.gov/sites/default/files/documents/1860/PAOP-CIV-MarketAssessment-Final\\_508.pdf](https://www.usaid.gov/sites/default/files/documents/1860/PAOP-CIV-MarketAssessment-Final_508.pdf).
37. Lighting Africa, "EcoMoto: Turning on the Lights in Kenya in Under 48-Hours," *Lighting Africa*, April 29, 2018, <https://www.lightingafrica.org/ecomoto-turning-lights-kenya-48-hours/>.
38. Winrock International and the United States Agency for International Development, *Equity Bank's EcoMoto Loan Program* (Winrock International, September 2017), <https://www.winrock.org/wp-content/uploads/2017/09/EquityBankProfile.pdf>.
39. Davinia Cogan and Simon Collings, *Crowd Power: Can the Crowd Close the Financing Gap?* (Energy 4 Impact, July 2017), <https://www.energy4impact.org/file/1883/download?token=aft0NCOX>.
40. "Powering Agriculture Investment Alliance," Powering Agriculture: An Energy Grand Challenge for Development, August 30, 2018, <https://poweringag.org/investment-alliance>.
41. "Standards & Labeling", Impact, CLASP, <https://clasp.ngo/impact/standards-labeling>.
42. Silvia Francioso et al., *Global Off-Grid Solar Market Report: Semi-Annual Sales and Impact Data* (GOGLA and Lighting Global, October 2018), [https://data.gogla.org/sites/default/files/GOGLA\\_Sales-and-Impact-ReportH1-2019\\_Public\\_DEF-Web.pdf](https://data.gogla.org/sites/default/files/GOGLA_Sales-and-Impact-ReportH1-2019_Public_DEF-Web.pdf).
43. Standards Organisation of Nigeria, "Nigerian Alliance for Clean Cook-Stoves and SON Agree Standards for Improved Biomass Cook-Stoves," *Standards Organisation of Nigeria*, December 18, 2017, <https://son.gov.ng/nigerian-alliance-for-clean-cook-stoves-and-son-agree-standards-for-improved-biomass-cook-stoves>.
44. Energy Saving Trust and CLASP, *Promoting High Performing Off-Grid Appliances* (Efficiency for Access, June 2019), [https://storage.googleapis.com/e4a-website-assets/Promoting\\_High-Performing\\_Off-Grid\\_Appliances.pdf](https://storage.googleapis.com/e4a-website-assets/Promoting_High-Performing_Off-Grid_Appliances.pdf).
45. Shell Foundation, "A Community of Champions - Supporting Ongoing Exchange Between Public, Private and Development Sectors," *Shell Foundation*, September 23, 2019, <https://shellfoundation.org/news/a-community-of-champions-supporting-ongoing-exchange-between-public-private-and-development-sectors/>.
46. "EACREEE's Legal Status," About, East African Centre of Excellence for Renewable Energy and Energy Efficiency, <https://www.eacreee.org/content/eacreees-legal-status>.
47. EEP Coordination Office, "Knowledge Exchange Forum in Johannesburg," The Energy and Environment Partnership, March 29, 2019, <https://eepafrica.org/knowledge-exchange-forum-in-johannesburg/>.
48. GOGLA, *Productive Use of Off-Grid Solar: Appliances and Solar Water Pumps as Drivers of Growth* (GOGLA, May 2019), [https://www.gogla.org/sites/default/files/resource\\_docs/gogla\\_pb\\_use-of-off-grid-solar\\_def.pdf](https://www.gogla.org/sites/default/files/resource_docs/gogla_pb_use-of-off-grid-solar_def.pdf).
49. "Food Security and the Right to Food," Sustainable Development Goals, Food and Agriculture Organization of the United Nations, <http://www.fao.org/sustainable-development-goals/overview/fao-and-the-post-2015-development-agenda/food-security-and-the-right-to-food/en/>.

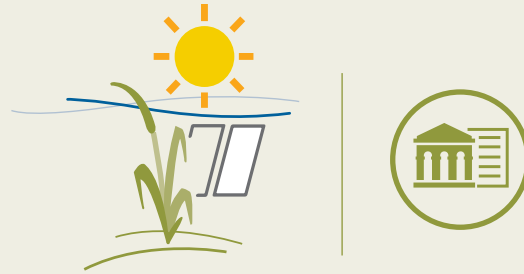




Private sector engagement in policy and regulatory decisionmaking in the clean energy-agriculture nexus can improve smallholder farmers' access to technologies that increase crop yields. Photo courtesy of Powering Agriculture.

# POWERING AGRICULTURE:

AN ENERGY GRAND CHALLENGE FOR DEVELOPMENT



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Further information about Powering Agriculture can be found at [PoweringAg.org](http://PoweringAg.org)

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