

POWERING AGRICULTURE:

AN ENERGY GRAND CHALLENGE
FOR DEVELOPMENT





ABOUT POWERING AGRICULTURE

In 2012, the United States Agency for International Development (USAID), Sweden through the Swedish International Development Cooperation Agency (Sida), the Government of Germany (BMZ), Duke Energy Corporation, and the United States Overseas Private Investment Corporation (OPIC) (collectively, the “Founding Partners”) combined resources to create the Powering Agriculture: An Energy Grand Challenge for Development (PAEGC) initiative. The objective of Powering Agriculture is to support the development and deployment of clean energy innovations that increase agriculture productivity and stimulate low carbon economic growth in the agriculture sector of developing countries to help end extreme poverty and extreme hunger.

Powering Agriculture utilizes the financial and technical resources of its Founding Partners to support its Innovator cohort’s implementation of clean energy technologies and business models for households, farms, villages, cooperatives, and industrial facilities in order to:

- Enhance agricultural yields/productivity; (ii) Decrease post-harvest loss; (iii) Improve farmer and agribusiness income generating opportunities and revenues; and/or
- Increase energy efficiency and associated savings within the operations of farms and agribusinesses.

For more information, visit PoweringAg.org



FOREWORD

This was another busy and exciting year for Powering Agriculture: An Energy Grand Challenge for Development (PAEGC). A growing number of innovators have joined the ranks of program graduates, including the final innovators from the first cohort and the first innovators from the second cohort. At the same time, PAEGC is supporting the scale-up of clean energy for agriculture in new ways, for instance through the mobilization of private finance for the sector.

I am pleased to share that this year launched the Powering Agriculture Investment Alliance – a partnership with the impact investors AlphaMundi and Factor[e]– which will catalyze \$25 million in private sector finance for ventures in the clean energy/agriculture nexus. The ultimate objective is, through increased access to private capital, to increase the distribution and supply of clean energy innovations that promote agricultural productivity. By helping to mitigate the high overhead and risk associated with identifying and investing in early stage companies operating in developing countries, PAEGC resources are helping the Investment Alliance partners engage sooner and provide the hands-on support necessary to ready these ventures for follow-on financing.

It has also been rewarding to mark the progress of the PAEGC Innovators in 2018. Pilot demonstrations and field testing continue for most of the second cohort Innovators, with lessons learned and insights gained being translated into product and design refinements. Others have increased sales and expanded into new markets, ensuring that the benefits of their clean energy solution continue to reach growing numbers of end users.

The second PAX Workshop and Innovator Showcase held in Nairobi, Kenya, in January 2018 highlighted just what a talented and hardworking group of innovators PAEGC supports. The week brought together the Powering Agriculture innovation community to allow a sharing of lessons learned. It also made great use of the expertise available in the East African innovation ecosystem to provide workshops designed to help the innovators gain key skills needed to further their understanding of their customers, their markets, and their financing options. The week was capped off with an Innovator Showcase featuring product demonstrations, pitch presentations, and a panel discussion highlighting the importance of the energy-agriculture nexus.

As we enter the final year of the program, I continue to be grateful for the strong partnership of donors upon which Powering Agriculture is founded. We are looking forward to building on the experience of Powering Agriculture through a follow-on initiative – Water and Energy for Food – to be launched in 2019. Building on the learnings and investment in the energy-ag and water-ag nexus, this new initiative will continue the important and necessary work to increase the sustainability of agricultural food value chains.

Sincerely,

Dr. Augusta Abrahamse

Energy Specialist

Program Manager, Powering Agriculture: An Energy Grand Challenge for Development
United States Agency for International Development (USAID)

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EXECUTIVE SUMMARY

This annual report describes the key activities of Powering Agriculture: An Energy Grand Challenge for Development (PAEGC) implemented over the financial year period of October 2017 to September 2018. Powering Agriculture: An Energy Grand Challenge for Development represents a partnership of the United States Agency for International Development with Sweden through the Swedish International Development Cooperation Agency (Sida), the Government of Germany, Duke Energy Corporation, and the Overseas Private Investment Corporation. It was launched in 2012 to support the development and deployment of clean energy innovations that stimulate low-carbon economic growth within the agriculture sector of developing countries to help end extreme poverty and extreme hunger.

Some of the main activities that were implemented during the reporting year period include:

- Innovators representing the 2013 and 2105 cohorts gathered in Nairobi in January 2018 for the 2nd Powering Agriculture Xcelerator (PAX) Workshop and Power Agriculture Innovator Showcase (PAIS).
- The Powering Agriculture Investment Alliance was established, creating a partnership with AlpahMundi and Factor[e] that will catalyze a minimum of US\$25 million in private sector finance for ventures with the potential to achieve transformational development impact in the clean energy/agriculture nexus.
- A variety of knowledge sharing products were published, including “A Powering Agriculture Guide on Financing Types for Innovators”, two studies and associated policy briefs, in partnership with the Food and Agriculture Organization of the United Nations: “The Benefits and Risks of Solar Powered Irrigation – A Global Overview” and “The Costs and Benefits of Clean Energy Technologies in the Milk, Vegetable and Rice Value Chains”.
- The PAX webinar series continued, with a 2-part session entitled “You have the product, what about the team?” Part A: Building the Team and Part B: Keeping Your Team.

- Site visits to 3 of the 13 Innovators from the 2015 cohort were conducted, during which progress was verified and beneficiaries were interviewed.
- The Powering Agriculture East Africa Hub (Hub), managed by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, actively promoted the use of renewable energy solutions and energy efficiency in food value chains in the region. Hub activities focused on capacity building and the development of viable business models, integrating the Innovators' work where possible. The Hub transferred the energy efficiency knowledge gained through its work with Kenya's tea sector to other sectors (dairy) and regions (South-East Asia, East Africa).

In the next financial year (October 2018-September 2019), the first phase of the Powering Agriculture grand challenge will draw to a close with the culmination of the last set of innovator grants and the end of the Powering Agriculture Support Task Order. As part of this culmination, Powering Agriculture expects to accomplish the following major items:

- Publication of technology-focused papers documenting advances in the clean energy/ag nexus and summarizing lessons learned from the Powering Agriculture innovators and
- Site visits to the remaining 2015 Innovators
- Powering Agriculture Final Event
- Powering Agriculture Final Evaluation

ACKNOWLEDGEMENTS

The Powering Agriculture Founding Partners would like to thank the team from the Powering Agriculture Support Task Order, implemented by Tetra Tech ES, Inc., for their assistance in preparing this report.

ACRONYMS AND ABBREVIATIONS

BMC	Biogas Milk Chiller
BMZ	German Federal Ministry for Economic Cooperation and Development
CES	clean energy solution
EE	energy efficiency
FY	fiscal or financial year; in the case of this report refers to October 1, 2017 through September 30, 2018
FAO	Food and Agriculture Organization of the United Nations
GCD	Grand Challenge for Development
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
GLOBEC	Unit for Globally Sustainable Economic Development
GLOBEN	Unit for Global Cooperation on Environment
HoA-REC&N	Horn of Africa Regional Environment Center and Network
ICU	Istituto per la Cooperazione Universitaria Onlus
iDE	International Development Enterprises
KTDA	Kenya Tea Development Agency
M&E	monitoring and evaluation
MOU	Memorandum of Understanding
OPIC	Overseas Private Investment Corporation
PAEGC	Powering Agriculture: An Energy Grand Challenge for Development
PAIS	Powering Agriculture Innovator Showcase
PASTO	Powering Agriculture Support Task Order
PAX	Powering Agriculture Xcelerator
PAYG	Pay-As-You-Go
PV	photovoltaic
PVR	photovoltaic refrigerator
RE	renewable energy
R&D	research and development
SDG	Sustainable Development Goal
Sida	Swedish International Development Cooperation Agency
SME	Small and Medium Enterprises
SPIS	solar-powered irrigation system
UGARF	University of Georgia Research Foundation
USAID	United States Agency for International Development
UVG	Universidad del Valle de Guatemala
VIA	Village Infrastructure Angels
WE4F	Water and Energy for Food

INTRODUCTION

This annual report describes the key activities of Powering Agriculture: An Energy Grand Challenge for Development (PAEGC) implemented over the period of October 2017 to September 2018.

Powering Agriculture: An Energy Grand Challenge for Development continued its work in support of new and sustainable approaches to accelerate the development and deployment of clean energy solutions for increasing agriculture productivity and/or value in developing countries to help end extreme poverty and extreme hunger. The initiative is the result of a partnership of the United States Agency for International Development (USAID) with Sweden through the Swedish International Development Cooperation Agency (Sida), the Government of Germany, Duke Energy Corporation, and the Overseas Private Investment Corporation (OPIC); collectively known as the 'Founding Partners'.



Powering Agriculture follows the Grand Challenges for Development (GCD) model which focuses on defining problems, identifying constraints, and providing evidence-based analysis for a variety of development issues. The Grand Challenges for Development initiative is rooted in two fundamental beliefs about international development:

- Science and technology, when applied appropriately, can have transformational effects; and
- Engaging the world in the quest for solutions is critical to instigating breakthrough progress.

1.1 The Problem

Agriculture continues to be the primary source of livelihood for most households in developing countries. Continued population growth requires that farms and agribusiness produce, process, and transport an increasing amount of food. The Food and Agriculture Organization of the United Nations (FAO) estimates that by 2050 at least 60% more food will need to be produced on the same amount of agricultural land. Clean energy technology that can be used to intensify agricultural production will be crucial in meeting this demand.

Increasing access to clean energy and efficiency technologies will enable farmers to:

- mechanize their operations
- add value to commodities through processing, and
- store fresh produce in refrigerated containers to extend its shelf life.

Powering Agriculture contributes to the 2030 Agenda for Sustainable Development by supporting the following sustainable development goals (SDG):



SDG 1
No Poverty



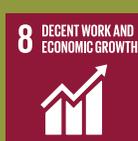
SDG 2
Zero Hunger/
Sustainable Agriculture



SDG 5
Gender Equality



SDG 7
Affordable and
Clean Energy



SDG 8
Economic Growth



SDG 9
Innovation



SDG 13
Climate action



SDG 17
Partnerships for the
Goals

These advancements will lead to:

- more food in the market
- increased incomes for farmers and traders, and
- decreased dependency of the agriculture sector on fossil fuels.

Significant barriers continue to hinder the integration of clean energy technology in agriculture development:

- Farmers are not aware of the variety of new technologies that may be appropriate for them.
- Clean energy technologies are relatively new, therefore farmers have limited access to distributors for installation, parts, and service.
- Farmers often do not have the means to cover high capital costs associated with clean energy upgrades - and financing is seldom available.

Likewise, clean energy enterprises seeking to serve these farmers face a number of barriers:

- Limited access to debt and equity to support business development and growth.
- Low demand due to a lack of awareness by farmers and other customers of the economic and environmental benefits of the technologies.
- The client base of agricultural communities is remote, scattered, and often very poor.
- There are few examples of successful business models that have been effective in delivering clean energy solutions to the agriculture sector in developing countries.

These issues create an unproductive cycle in which suppliers and buyers are not connected, and farmers and agribusinesses are unable to leverage more cost-effective clean energy technologies. Strengthening the links between modern energy service providers and the agriculture sector will create positive feedback loops to increase productivity along major components of the agricultural supply chain:

(1) on-farm productivity; (2) cold storage; (3) transport; (4) post-harvest agriculture processing; and (5) agriculture waste for energy applications.

1.2 The Solution

Energy is critical to almost every aspect of the agricultural value chain. Globally, the food sector consumes 30 percent of total energy supply and generates 20 percent of global emissions.

In order to solve the challenges described in section 1.1, Powering Agriculture was launched in 2012 to:

- support clean energy technology and business model innovations for agriculture;
- ensure that financial intermediaries have the capital they need to help organizations scale their innovations and reach the farmers and farm-related businesses that need these technologies;
- develop partnerships with public and private sector organizations that want to support the goals of the Powering Agriculture program; and
- serve as a clean energy and agricultural information resource for people around the world.

The activities of Powering Agriculture associated with the Innovators supported through the Grand Challenge's two Calls for Innovation are scheduled to run through 2019.

This year the Founding Partners signed agreements with two organizations –AlphaMundi and Factor[e] – to create the Powering Agriculture Investment Alliance. The Investment Alliance will catalyze a minimum of \$25 million in private sector finance for ventures with the potential to achieve transformational development impact in the clean energy/agriculture nexus. Powering Agriculture's activities under the Investment Alliance will continue through 2021. Read more about the Investment Alliance in Section 3.1.



1.3 The Work of Powering Agriculture

Powering Agriculture utilizes a cross-sectoral nexus approach to concurrently focus on the energy and agricultural sectors while providing technical, business acceleration, financing, and policy support to its innovators and other stakeholders.



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TECHNOLOGY & BUSINESS MODEL INNOVATION

Powering Agriculture provides innovation grants (\$500,000–\$2,000,000) to design, pilot and deploy clean energy solutions to different points along the agricultural production cycle.



Powering Agriculture provides on demand, tailored technical assistance using the Powering Agriculture Support Task Order (PASTO) implemented by Tetra Tech.



MAINSTREAMING

Powering Agriculture utilizes the regional Hub managed by GIZ in East Africa. Powering Agriculture collaborates with U.S. Government-led partnerships such as Power Africa and Feed the Future to integrate clean energy solutions within regional/national agriculture production and food security programs.



FINANCING FACILITY

Powering Agriculture leverages funds to mobilize private sector equity and debt investments within the clean energy/agriculture space.



KNOWLEDGE MANAGEMENT

Powering Agriculture serves as a clean energy and agricultural information resource hub for people around the world by providing knowledge products that contain detailed data on the policy, economic, gender, and energy requirements to end extreme poverty and extreme hunger in developing countries.



1.4 The Founding Partners

The Founding Partners have made financial and in-kind contributions to finance the activities of Powering Agriculture. In-kind contributions are technical assistance resources that individual Partners have committed to support the goal of

Powering Agriculture but are managed by the individual Partners themselves. USAID serves as the administrator of Powering Agriculture managing the disbursements of the finances. Table 1.1 provides a description of each Founding Partner.

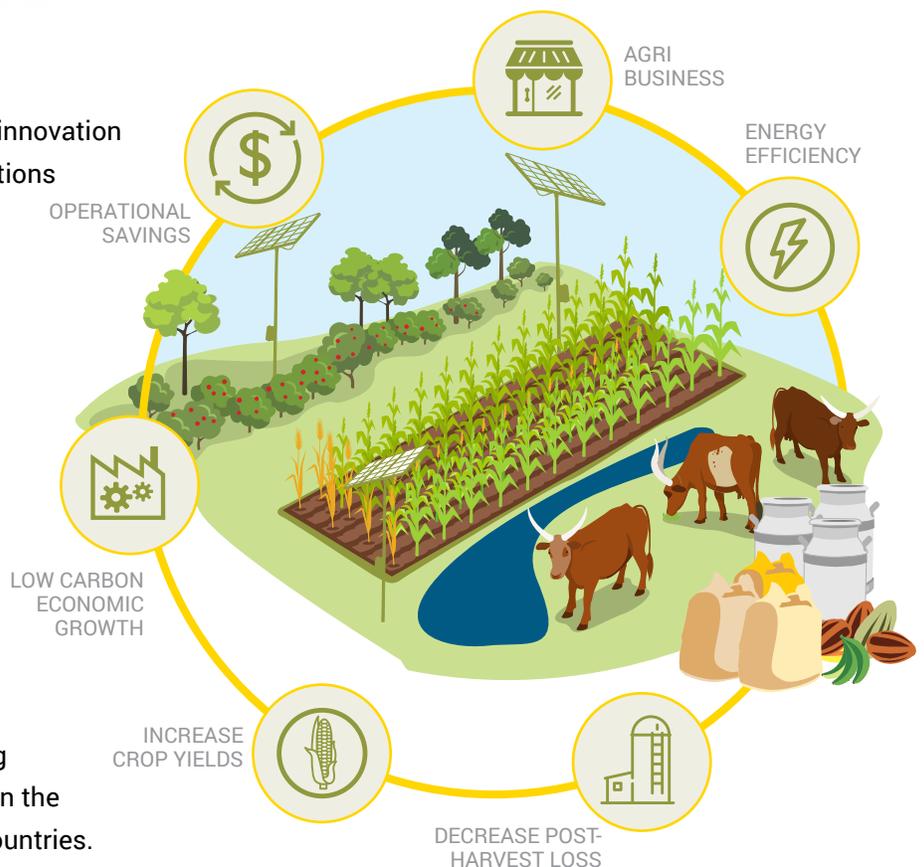
TABLE 1.1. POWERING AGRICULTURE FOUNDING PARTNERS

ORGANIZATION	DESCRIPTION
<p>United States Agency for International Development</p> 	<p>The American people, through the USAID, have provided economic and humanitarian assistance worldwide for nearly 50 years. www.usaid.gov</p> <p>USAID's support and implementation of Powering Agriculture is coordinated by USAID's Bureau for Economic Growth, Education and Environment (E3).</p>
<p>Government of Sweden</p> 	<p>Sweden through the Swedish International Development Cooperation Agency (Sida) –an authority under the jurisdiction of the Swedish Ministry for Foreign Affairs– focuses on improving living conditions for developing nations around the world.. www.sida.se/English/</p> <p>Sweden's support for Powering Agriculture is coordinated by Sida's Unit for Global Economy and Environment.</p>
<p>Government of Germany</p> 	<p>The Federal Ministry for Economic Cooperation and Development (BMZ), develops the guidelines and the fundamental concepts on which German development policy is based. It devises long-term strategies for cooperation with the various players concerned and defines the rules for implementing that cooperation. These are the foundations for developing shared projects with partner countries and international development organizations. All efforts are informed by the United Nations' Sustainable Development Goals. www.bmz.de/en</p> <p>The Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH implements the German contribution to the Powering Agriculture Energy Grand Challenge on behalf of BMZ. The GIZ Project <i>Sustainable Energy for Food – Powering Agriculture</i> is not only contributing to the global initiative but backing up PAEGC efforts by additional pilot projects, research, and capacity development.</p> <p>GIZ Powering Agriculture runs a Nairobi-based hub for East Africa, to take advantage of the vast potential for the energy/agriculture nexus and to capitalize on the fact that most of the Powering Agriculture Innovators are implementing their projects in East Africa. With staff on the ground and close proximity to the American, Swedish, and German embassies and Missions in East Africa, the hub activities include pilot projects and studies as well as capacity building. The hub is meant to function as an accelerator for regional as well as supra-regional knowledge exchange, particularly focusing on the Powering Agriculture Innovators located in the region.</p>
<p>Duke Energy</p> 	<p>Duke Energy, one of the largest electric power companies in the United States, supplies services in a sustainable manner - affordable, reliable, and clean. www.duke-energy.com/</p> <p>Duke Energy's support for Powering Agriculture is coordinated by Duke's Federal Government Affairs unit.</p>
<p>The Overseas Private Investment Corporation</p> 	<p>OPIC is the U.S. Government's development finance institution. It mobilizes private capital to help solve critical development challenges and in doing so, advances U.S. foreign policy. Because OPIC works with the U.S. private sector, it helps U.S. businesses gain footholds in emerging markets, catalyzing revenues, jobs and growth opportunities both at home and abroad. OPIC achieves its mission by providing investors with financing, guarantees, political risk insurance, and support for private equity investment funds. www.opic.gov/.</p> <p>OPIC's support for Powering Agriculture is coordinated by OPIC's Agriculture and Project Finance unit.</p>

2 INNOVATORS

Powering Agriculture held two global innovation calls in 2012 and 2014 to source solutions within the clean energy/agricultural nexus that:

1. Enhance agricultural productivity;
2. Decrease post-harvest loss;
3. Improve farmer and income generating opportunities and revenues; or
4. Increase energy efficiency and associated savings within the operations of farms and agribusinesses – while stimulating low carbon economic growth within the agriculture sector of developing countries.



Tables 2.1 and 2.2 present an overview of the entities referred to as “Innovators” that were selected to receive funding. Fuller descriptions of the 2015 Innovator cohort are provided below. Information about all of the Innovators can be found on the program website: <https://poweringag.org/innovators>

TABLE 2.1 2015 INNOVATOR COHORT INFORMATION

2015 COHORT	INNOVATOR	PROJECT NAME	COUNTRY OF IMPLEMENTATION	START DATE	END DATE	AWARD VALUE
1	Ariya Capital Group Ltd	Powering Agriculture with Renewable Energy	Kenya; Tanzania; Uganda	2/10/2016	8/31/2019	\$1,905,700
2	Claro Energy	Launch low-cost on-demand pay-as-you-go irrigation service using solar trolley systems to cut irrigation costs in half	India	12/3/2015	6/1/2019	\$500,000
3	Futurepump (Kenya) Ltd	Sunflower Pump - A working capital facility & after sales investments to support a growing solar irrigation business in Kenya	Kenya	12/29/2015	12/27/2019	\$1,999,563
4	Governing Council of the University of Toronto	Field Evaluation of Passive Aeration System for Aquaculture	Bangladesh	1/18/2016	11/30/2019	\$500,000
5	Horn of Africa Regional Environment Center and Network	Improving coffee production and quality using Infra-red technology	Ethiopia	2/2/2016	2/2/2019	\$434,780
6	Husk Power Systems	Hybrid Solution- Biomass and Solar PV: Clean Energy Intervention in the food belts of Nigeria and Ghana	Ghana; Nigeria	1/21/2016	12/31/2019	\$1,282,418
7	Istituto per la Cooperazione Universitaria Onlus (ICU)	PV integrated irrigation systems in Jordan and Lebanon	Jordan; Lebanon	12/10/2015	3/31/2018	\$499,688
8	iDE (Bangladesh)	Renewable micro-grids for off-grid fish hatcheries and surrounding communities in Bangladesh	Bangladesh	12/14/2015	12/31/2018	\$499,748
9	KickStart International	To increase access to affordable, high-performance solar-powered irrigation technology amongst poor smallholder farmers in rural Kenya	Kenya	12/10/2015	3/31/2019	\$500,000
10	SimGas Tanzania Ltd	Biogas Milk Chilling to increase productivity and double the income of East African dairy farmers	Kenya; Rwanda; Tanzania	12/11/2015	6/30/2019	\$499,998

TABLE 2.1 2015 INNOVATOR COHORT INFORMATION (CONTINUED)

11	SunCulture	SunCulture: Scaling up distribution of smallholder tailored agro-solar irrigation kits across Africa	Kenya; Tanzania; Uganda; Zambia	12/11/2015	11/30/2019	\$2,000,000
12	Universidad del Valle de Guatemala	Private-Sector Financed Community Solar Power Grids (ComGrids) and Agricultural Accelerators in Off-Grid Communities in Guatemala	Guatemala	12/14/2015	9/30/2019	\$499,008
13	Village Infrastructure Angels	Solar Agro-processing Power Stations for 5000 Households	Indonesia; Papua New Guinea; Philippines; Vanuatu	12/11/2015	6/8/2019	\$1,762,400

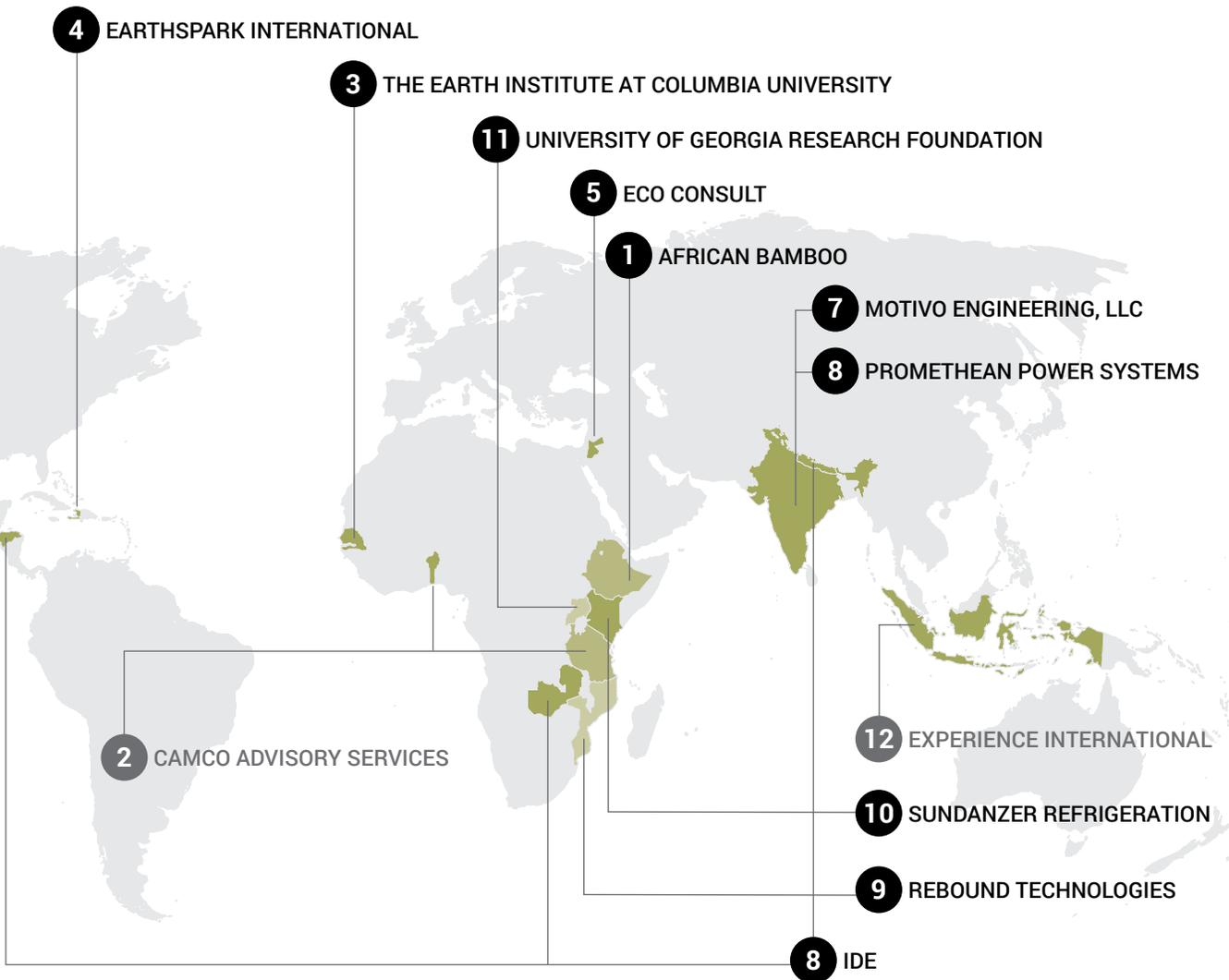
2015 INNOVATOR COHORT MAP



TABLE 2.2 2013 INNOVATOR COHORT INFORMATION

2013 COHORT	INNOVATOR	PROJECT NAME	COUNTRY OF IMPLEMENTATION	START DATE	END DATE	AWARD VALUE
1	African Bamboo (COMPLETE)	Thermal treatment of agricultural goods based on a demand driven and energy-efficient biomass combustion unit	Ethiopia	10/1/2013	9/30/2017	\$1,041,145
2	Camco Advisory Services (CANCELLED)	Biomass Mini-Grids for Palm Oil Producing Communities in Benin and Tanzania	Benin, Tanzania	10/1/2013	6/30/2017	\$999,805
3	The Earth Institute at Columbia University (COMPLETE)	Micro-Solar Utilities for Small-Scale Irrigation in Senegal	Senegal	10/1/2013	3/31/2016	\$1,082,161.67
4	EarthSpark International (COMPLETE)	Smart Grid on Main Street: Powering Agricultural Processing with Sustainable Energy Services	Haiti	10/1/2013	3/31/2017	\$1,091,315
5	ECO Consult (COMPLETE)	Hydroponic Green Farming Initiative	Jordan	10/1/2013	6/30/2017	\$1,149,707
6	iDE (COMPLETE)	Clean Irrigation Solution (CIS) for Increased Agricultural Productivity	Honduras, Nepal, Zambia	10/1/2013	6/30/2017	\$1,499,831
7	Motivo Engineering, LLC (COMPLETE)	Hybrid Agriculture/Road Vehicle with Electricity Storage and Transformation (HARVEST)	India	10/1/2013	5/12/2017	\$861,158
8	Promethean Power Systems (COMPLETE)	Solar-powered Milk Chilling in Rural India	India	10/1/2013	6/30/2017	\$992,980
9	Rebound Technologies (COMPLETE)	Solar Cooling for Horticultural Preservation	Mozambique	10/1/2013	3/31/2016	\$1,375,853
10	SunDanzer Refrigeration (COMPLETE)	Sustainable Milk for Africa through Refrigeration Technology	Kenya	10/1/2013	5/31/2018	\$1,041,145
11	University of Georgia Research Foundation (COMPLETE)	Renewable Energy-Powered Evaporative Cooling for Small-Holder Farmers	Uganda	1/3/2014	3/31/2018	\$1,000,000
12	Experience International (CANCELLED)	Solar Powered Cold Storage and Ice Making Facilities for Fishing Communities in Eastern Indonesia	Indonesia	10/1/2013	04/20/2014	\$1,000,000

2013 INNOVATOR COHORT MAP



Tables 2.3-2.8 provide a more detailed breakdown of clean energy solutions being funded by Powering Agriculture, their areas of focus, and where they are being implemented.

FIGURE 2.3 FOCUS OF INNOVATION

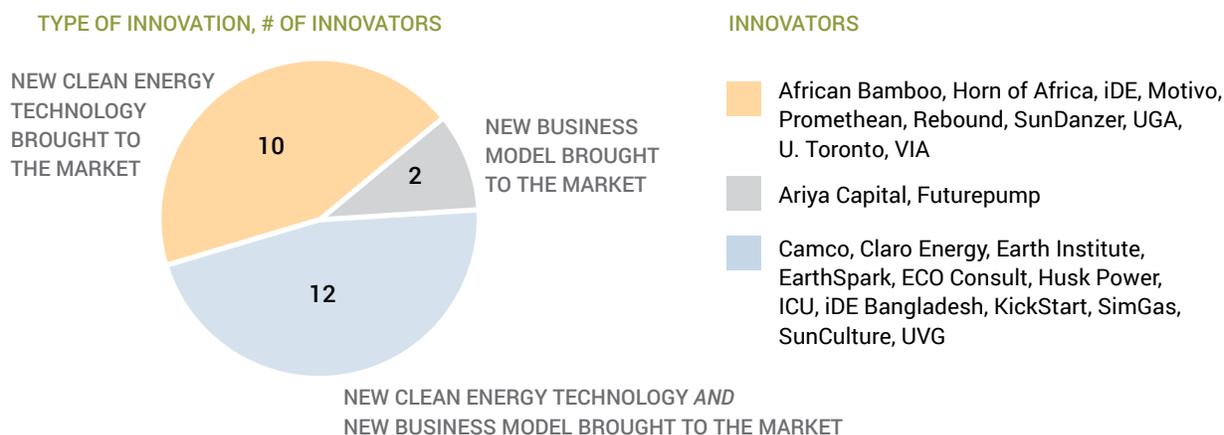


FIGURE 2.4 INNOVATION STAGES ACHIEVED IN FISCAL YEAR 2018

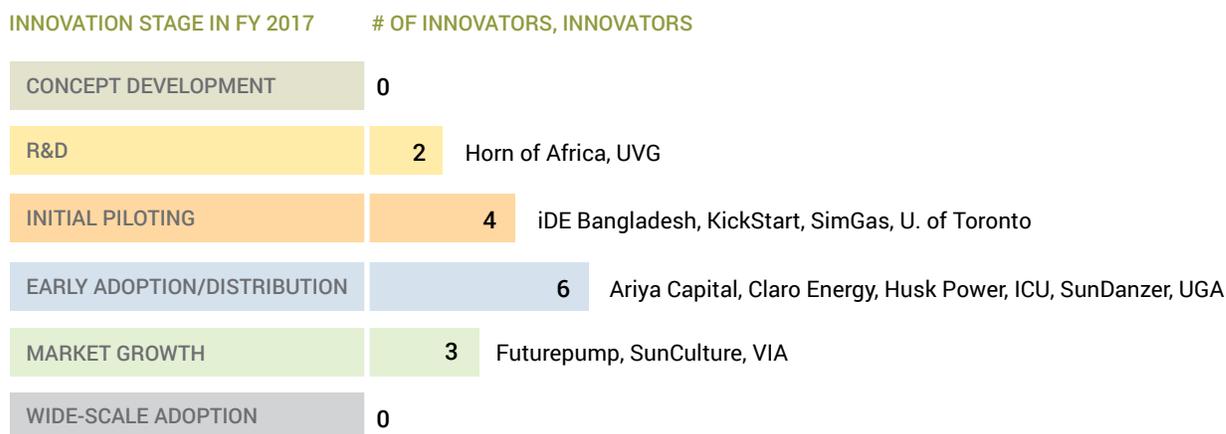


FIGURE 2.5 CLEAN ENERGY SOURCE USED FOR POWERING AGRICULTURE INNOVATIONS



FIGURE 2.6 AGRICULTURAL FOCUS OF POWERING AGRICULTURE INNOVATIONS

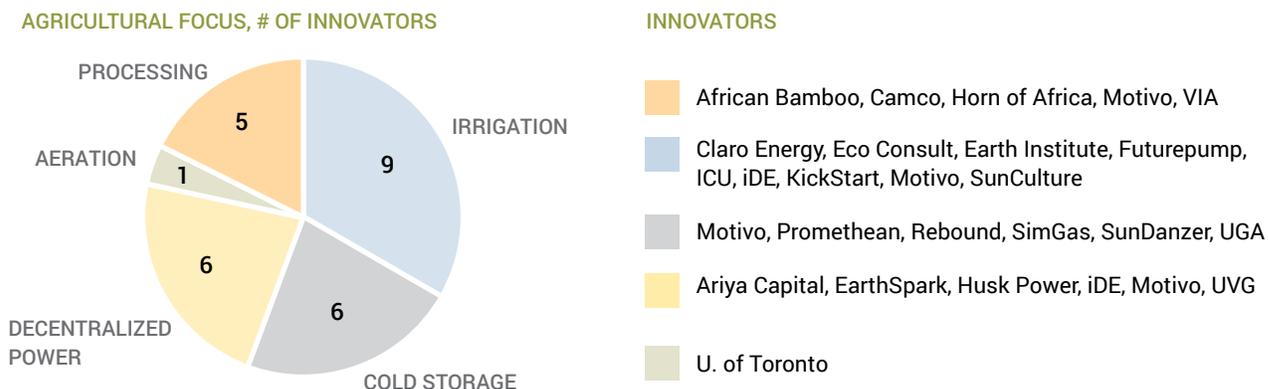
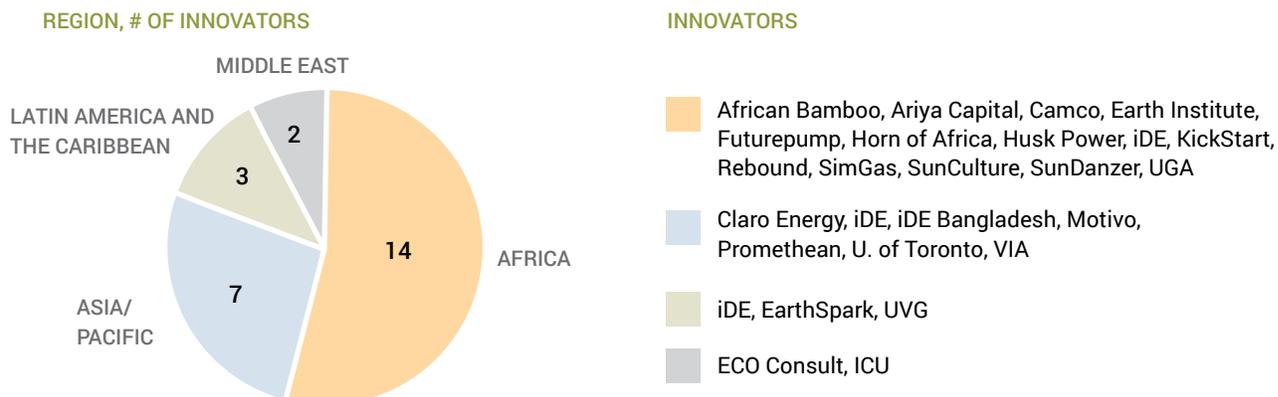


FIGURE 2.7 PRODUCT SEGMENTS FOCUSED ON BY POWERING AGRICULTURE INNOVATORS

PRODUCT SEGMENT	# OF INNOVATORS, INNOVATORS
AGRO-FORESTRY PRODUCTS	2 African Bamboo, Camco
AQUACULTURE	3 iDE Bangladesh, Motivo, U. of Toronto
DAIRY	5 Motivo, Promethean, SimGas, SunDanzer, UGA
FRUIT	1 Horn of Africa
HORTICULTURE	12 Ariya Capital, Claro Energy, Earth Institute, ECO Consult, Futurepump, ICU, iDE, KickStart, Motivo, Rebound, SunCulture, UVG
STAPLE CROPS	6 Claro Energy, EarthSpark, HuskPower, ICU, Motivo, VIA

All of the Powering Agriculture Innovators' projects are being implemented in the Global South; 40 percent of the organizations implementing those projects are incorporated in the Global South.

FIGURE 2.8 REGIONS IN WHICH POWERING AGRICULTURE INNOVATORS ARE WORKING



2.1 Innovator Progress

The Powering Agriculture Initiative promotes the development and deployment of clean energy innovations that increase agriculture productivity and stimulate low carbon economic growth in the agriculture sector of developing countries to help end extreme poverty and extreme hunger. To this end, Powering Agriculture has supported Innovators that:

- Increase the visibility of clean energy solutions
- Have developed new clean energy product prototypes using technology unavailable in developing markets, or have modified existing products in developed markets for use in developing markets
- Have increased access to clean energy asset financing
- Have pushed the boundaries on viable clean energy business model creation.

During the reporting period, the remaining two of the eleven innovators of the 2013 cohort ended their award and graduated from Powering Agriculture: SunDancer and University of Georgia Research Foundation. Nearly all of the 2015 Innovator cohort are now focused on pilot demonstrations and field testing. During the period, many innovators made progress on refining their clean energy solutions and have gained significant insights into the importance of value engineering, incorporating end-user feedback into designs, performance/price trade-offs, and the competitive landscape for their target customers. However, a number of awards have been extended for reasons that include:

- Impacts of government policy on deployment of clean energy solution (CES) (particularly microgrids)



Innovator success is tracked in multiple ways, including:



Completion of project milestones



Achievement of targets for numbers of installations and beneficiaries



Advancing from one stage to the next on the innovation ladder



Creation of and refinement of business models to profitably commercialize their innovation through:



Properly identifying a market segment and value proposition for the technology



Developing a distribution strategy for their innovation



Effectively and sustainably providing after-sales service to customers



- Significant changes to innovator milestones to reflect market conditions and realities on the ground
- Sales numbers that are lower, or growing more slowly, than originally expected

In terms of commercial viability, Powering Agriculture supports a mix of non-profit organizations, research institutions, and private for-profit companies. The latter range from newly incorporated startups to venture-backed companies with tens of millions of dollars raised in equity financing, such as SunCulture, Promethean Power Systems, and Husk Power Systems. One innovator is reaching hundreds of thousands of end users due to a combination of successful product development, an established local presence, and its smart distribution strategy that allows them to reach many end users through a centralized relationship with a small number of food processing companies. Other successful innovators are taking an established product and model and expanding to new countries and markets.

On the earlier side, innovators are looking to identify a sustainable path to growth for their innovation. Generally, the innovators with significant progress towards becoming sustainable have strong local partnerships and intimate knowledge of the local market—needs, including willingness and ability to pay; these are attributes that the earlier innovators must establish for themselves. Typically, they are continuing to develop their technologies and are early in establishing their business operations, including fundamental team and intellectual property infrastructure.

Powering Agriculture Innovators continue to be recognized for their work, as demonstrated by the awards received or listing as finalists over the past year:

AWARDS RECEIVED BY INNOVATORS

Claro Energy – 1st Prize, Asian Entrepreneurship Awards; Kartik Wahi Received Amity Business School's Award for Excellence in Energy Industry

EarthSpark – Allison Archambault received Clean Energy Education & Empowerment (C3E) International award

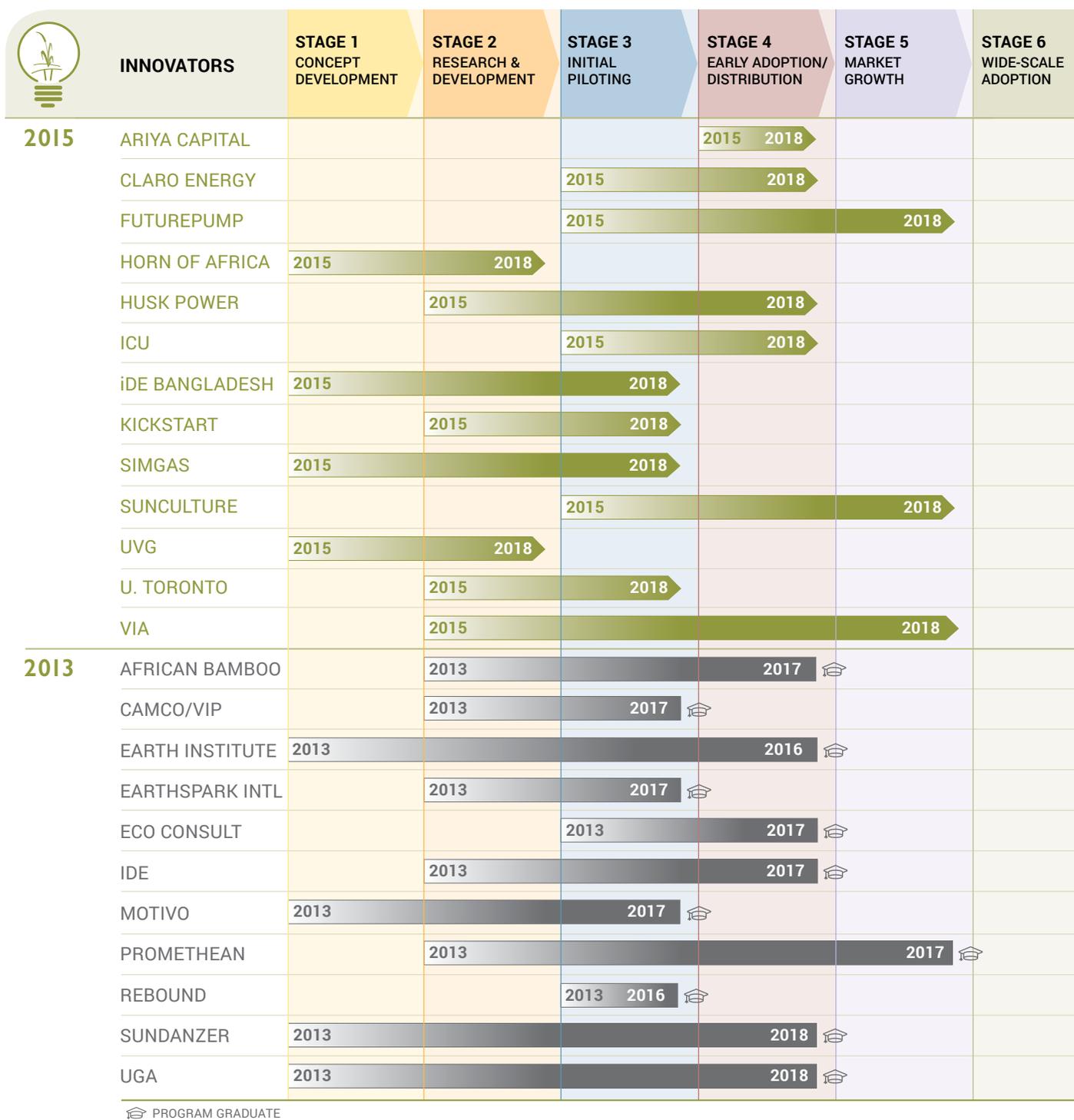
SimGas – Climate and Clean Air Award; Winner of ASME ISHOW Kenya Innovation Showcase

SunDanzer – Winner of Global LEAP Innovation Prizes for demonstrated market-leading advancement in Energy Efficiency and Overall Value, as well as the small refrigerator category.

University of Toronto – Finalist at ASME ISHOW USA Innovation Showcase

Figure 2.1 shows the 2015 Innovators and the 2013 Innovators with active awards during the reporting period, and their progress along the stages of innovation as of September 2018.

FIGURE 2.1 INNOVATORS AND THEIR STAGES OF INNOVATION SEPTEMBER 2018



The following profiles provide a snapshot of each active Innovator’s clean energy solution and their progress to date, as of September 2018. Visit www.poweringag.org/innovators for a more detailed profile of all innovators and the most up to date information about the Innovators’ work including links to news article and video clips

SUNDANZER



CLEAN ENERGY SOLUTION

Recognizing the need for affordable cold-chain technologies, SunDanzer has developed a small-scale portable cooling system tailored for use in the Kenyan dairy market. In rural areas, 85 percent of Kenya's 800,000+ dairy farms do not have access to refrigerated storage and transportation, resulting in less than half of the milk produced reaching dairy processors. The system comprises a photovoltaic refrigerator (PVR) that uses solar energy to cool a chest refrigerator. This uses phase-change materials—substances which are capable of storing and releasing large amounts of energy—as energy storage. SunDanzer also developed milk can blankets to retain the cold temperature as farmers transport the milk to the collection site. With effective cold-chain storage, this clean energy solution aims to increase dairy farm productivity and income by significantly decreasing milk spoilage. This can play a major role in the livelihoods of approximately one million smallholder dairy farming families in Kenya.

www.sundanzer.com www.winrock.com

PROGRESS UPDATE

SunDanzer completed their project in May 2018. Through their Powering Agriculture participation, SunDanzer delivered and installed 60 solar-powered milk cooling refrigerators in Kenya, as well as two units in Rwanda. They developed a second-generation, roof-mounted unit, which was determined to be a more cost-effective option than the original pole-mounted design. The system is comprised of a photovoltaic array, a chest refrigerator with phase change material lining, and water (brine) bags to transfer the heat out of the milk. The system stores energy in the freezing of the phase change material and doesn't use batteries. Most units were installed at dairy farms, with some being deployed to farming households and camel milk processors. In their final project year, SunDanzer prototyped smaller versions of their PVR technology to better serve small farmers' needs and investigated pay-as-you-go options to make financing and payment easier for customers. Users of SunDanzer's refrigerators have stated that the solution has delivered many benefits, including increased financial security for households, increased food preservation, and cell phone charging capabilities (which save time and add to household income).





UNIVERSITY OF GEORGIA RESEARCH FOUNDATION

CLEAN ENERGY SOLUTION

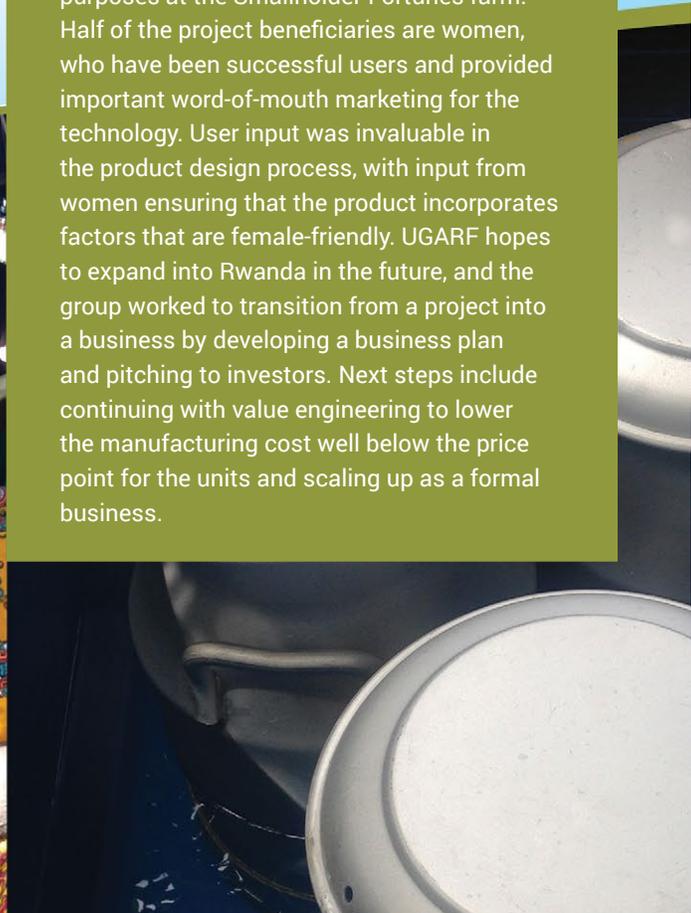
UGARF has developed a two-component device (branded as “EvaKuula”) powered by biogas which is extracted from cow manure. The device delivers a mild heat treatment followed by gentle evaporative cooling process that keeps the milk fresh overnight.

This provides a refrigeration alternative to cold-chain facilities, as there is limited access to electricity, and kerosene and solar-powered options thus far have proved too expensive and difficult to operate in the local context. Partnered with Smallholder Fortunes, UGARF is refining the design of the refrigeration device, and testing it with farmers in Uganda. UGARF is working with local manufacturers to field-test the device and will secure financing and bring production of the units to commercial scale. The EvaKuula brings numerous benefits to smallholder dairy farmers such as decreased milk spoilage, increased production and profits, and biogas for lighting and cooking. Also, by extracting biogas from cow manure, greenhouse gas emissions from fermenting cow manure is mitigated.

www.ovpr.uga.edu/ugarf

PROGRESS UPDATE

UGARF completed their project in March 2018. By the end of their Powering Agriculture participation, UGARF had deployed 43 EvaKuula units in Uganda: 42 benefitting farmers and one installed for research purposes at the Smallholder Fortunes farm. Half of the project beneficiaries are women, who have been successful users and provided important word-of-mouth marketing for the technology. User input was invaluable in the product design process, with input from women ensuring that the product incorporates factors that are female-friendly. UGARF hopes to expand into Rwanda in the future, and the group worked to transition from a project into a business by developing a business plan and pitching to investors. Next steps include continuing with value engineering to lower the manufacturing cost well below the price point for the units and scaling up as a formal business.



DR. WILLIAM KISAALITA

UNIVERSITY OF GEORGIA RESEARCH FOUNDATION

Maintaining a reliable milk cold chain can often mean the difference in making ends meet for smallholder dairy farmers, particularly in the developing world. When access to electricity and traditional refrigerators are not available, centralized milk cooling options may be few and far between, expensive to use, and powered by diesel fuel. This led Dr. William Kisaalita and his team at the University of Georgia Research Foundation (UGARF) to create the “EvaKuula” – an innovative, biogas-powered cold storage device meant to serve and empower rural Ugandan dairy farmers. A 2013 Powering Agriculture awardee, UGARF has already successfully deployed 34 units, and plans on expanding into new product chains and markets in Africa.

Dr. William Kisaalita –a native of Uganda and a Distinguished Professor of Engineering at the University of Georgia– led the “Biogas-Powered Evaporative Cooling for Uganda’s Dairy Industry” project. Having a career-long passion for the potential of what he terms “development engineering”, Dr. Kisaalita worked with his graduate students and Uganda-based Smallholder Fortunes to conceive a cost-effective, user-friendly, and environmentally-benign milk storage device.

Initially, Dr. Kisaalita and his team designed a large capacity milk cooler that used evaporative cooling – or cooling via evaporation of water. However, after testing this technology in western Uganda, he found that its size, weight, and chemical needs prevented widespread adoption by farmers. Prioritizing human-centered design,



the group then re-strategized to create the EvaKuula, which uniquely combines thermisation (sanitization via low level heat) and evaporative cooling in a single, smaller unit. Due to an abundance of organic waste on farms, biogas provides the heat for the former process, while a small fan and water are used for the latter. Farmers were able to see the real potential for this new alternative when Dr. Kisaalita and his team set up a prototype at a lab in the field; since then, the team has measured greater adoption and satisfaction from customers. Currently, nearly half of all beneficiaries are women farmers.

Dr. Kisaalita credits the funding made available by Powering Agriculture with supporting the re-design and ongoing scaling up of the current model. Rather than looking at early iterations as failures, he views them as learning opportunities which can be converted to a public good.

LESSONS LEARNED

According to Dr. Kisaalita, his experience thus far highlights useful lessons for engineers, entrepreneurs, and program managers alike. A

7

LESSONS LEARNED

primary one is the significance of human-centered design: he places high importance on conducting usability tests early in the innovation process, to guide engineering. Although the winding path of innovation can present challenges, actively listening to and consulting farmers who had used the product provided guidance for design, marketing, and scale-up efforts. Dr. Kisaalita now emphasizes the importance of usability in various engineering courses at the University of Georgia. He also highly values the learning that occurs when challenges are met, even when certain quantitative output goals are not met. Thirdly, Dr. Kisaalita highlights the value of utilizing a for-profit model, which ensures accountability of employees to the business, and stimulation of the EvaKuula value chain.

Dr. Kisaalita is particularly motivated by the “multiplier effect”. By inspiring his graduate students to become further involved in expanding the EvaKuula’s reach, they can then pass on lessons learned to future generations of innovators.

Thanks to the EvaKuula’s success and versatility, it is now being used for other products, including water, eggs, and drinks. The UGARF team is planning to expand outreach and sales into neighboring African countries to meet needs of more farmers, led by the goal of having 1,000 units deployed in the next two years.



1. **LISTENING** – Start the conversation with end users from the beginning of a project. Even in the prototyping phase, the end user can provide insights that impact product design; feasibility studies can assist with identifying issues.
2. **UNDERSTANDING CONTEXT** – Knowing how and where the innovation will be used is key. For example, a large milk container is unwieldy and impractical for transport on a bicycle. Identifying this up front “would have avoided cost and disappointment”.
3. **BEING ABLE TO CONNECT DOTS** – Identifying available resources, or seeing a need that hasn’t been filled leads to a product that has a place in the market.
4. **MEASURE OUTCOMES RATHER THAN OUTPUTS** – Qualitative results have value and ‘success’ shouldn’t just be measured on numbers of units, etc. Upfront cost to develop a successful product can be high. Lack of success is an important part of learning process.
5. **SELLING NOT GIVING** – Demonstration of a product often leads to a sale, as results are tangible and value is made visible to the potential user.
6. **EDUCATING AND TRAINING USERS** – Providing end users with the tools and knowledge to successfully use the product ensures that they will make the best use of it and realize the intended benefits.
7. **LEARNING TO MANAGE PAIN POINTS** – For example when using ‘Jua Kali’* service providers, such as a welder. Reliability can be a pain point if a worker doesn’t come when expected or a product isn’t delivered on time. It is important to have a network of resources or a backup plan.

*Jua Kali refers to the informal economy in East Africa. It is a Swahili term that means ‘fierce sun’.

ARIYA CAPITAL GROUP LTD

2015

CLEAN ENERGY SOLUTION

Ariya acts as the power partner for its clients, providing end to end cost-effective, low-risk renewable energy generation, storage, stabilization, and energy efficiency services to local flower and horticulture farms in East Africa with a focus on Kenya. Agriculture is a cornerstone of Kenya's economy, horticulture and the export of flowers are major sources of employment, with energy costs accounting for 15 percent of the input costs. The services provided by Ariya are structured to minimize the up-front investment required by farmers. A mixed technology approach, using various distributed renewable energy (DRE) and energy efficiency solutions, allow flexibility in designing bespoke systems for each user. By helping East African horticulture exporters to increase their bottom line, employees on their farms—ranging from 1,000 to 25,000 per farm and 50% women—and the associated local communities benefit from greater job security and improved living standards. Other impacts include reduced carbon emissions, improved productivity, and reduced water usage resulting from farms using more sophisticated agriculture and horticulture techniques, and where legislation permits, the export of excess power to the grid or through micro-grid designs that permit supply to other local businesses and communities.

www.ariyacapital.com

PROGRESS UPDATE

Ariya has commissioned six systems as of October 2018, totaling over 480kW. On average the systems cover 37% of the clients' energy consumption. All the installed systems are continuing to operate optimally with regular operations and maintenance support and reports being provided to the clients. The majority of Ariya's customers employ more than 50% women. The systems include remote monitoring and are used for power pumping, refrigeration, lighting, irrigation, and fertilizer dispersal. While many farms have access to the national grid, Ariya's systems ensure consistent, reliable power for their operations. Ariya is developing two business models: one that will target smaller clients (100-300kW) and one for larger clients (up to 5 MW), the power solutions provided to larger clients typically also include storage and stabilization. Ariya's award has been extended to August 2019.

CLARO ENERGY

2015

CLEAN ENERGY SOLUTION

Claro Energy is developing a pay-per-use irrigation service that uses a portable solar pump. The portable design will provide affordable, convenient, and on-demand irrigation. This will enable villages in India to irrigate independently to the monsoon patterns or the availability of power to operate ground water pumps. The service will meet the needs of a wide range of farmers who do not own pumps, with no upfront capital costs incurred. The farmer will call a toll-free line, pre-pay, and schedule irrigation service at his field. The project will increase farmers' productivity and income, while decreasing greenhouse gas emissions. Also, the project will create employment in rural, agricultural communities, as villagers have the opportunity to become local irrigation service providers.

www.claroenergy.in

PROGRESS UPDATE

Claro Energy has installed 5 fixed solar systems and 50 trolley systems, all of which are currently being used in fields for irrigation and serving 30-40 farmers per day. A pre-paid card system is now being used for remote activation of the pump/cart systems. Over 900 farmers are benefitting from the systems, with roughly 18% of those being women. Claro has a staff of 12 professionals available to provide technical assistance to users and continues to conduct trainings and demonstrations. Farmer feedback was crucial in the design of the pump, and Claro used this to create a new version of their trolley product. Claro expects to deploy another 25 pumps by the end of 2018. Claro's award has been extended to June 2019.



FUTUREPUMP

2015

CLEAN ENERGY SOLUTION

Futurepump solar pumps are easy-to-maintain solar irrigation pumps, built around a simple piston pump arrangement. Futurepump has gradually improved their product and are now able to provide every pump with five-years warranty and remote monitoring as standard. They will also offer it on finance through partners, in order to lower the upfront barriers to solar technology. The project will have a major impact especially for women and children which take on much of the labor burden of manual irrigation or carrying fuel pumps. Using irrigation water that does not rely on engine pumps productivity can be doubled, in addition, the growing season can be extended through the dry season, during which produce brings higher market prices.

www.futurepump.com

PROGRESS UPDATE

At the end of FY2018, Futurepump had shipped over 1,750 solar pumps from their factory in India to Kenya. By shifting from direct sales to selling through a national network of distributors in Kenya, Futurepump has seen a notable increase in the number of units they have deployed—now over 1,125. Pay-as-you-go financing, implemented through partnerships with two of Kenya's largest banks and remote monitoring of systems, began in early FY2018 and has allowed 350 farmers to buy units on finance. Futurepump has utilized monitoring and evaluation techniques to identify that customers of their solar pumps are expected to save \$100-\$200 a year from reduced fuel and labor costs. Women own 16% of the farms being serviced by Futurepump systems, and they make up 10% of the 90 maintenance professionals Futurepump employs. Futurepump's award has been extended to December 2019.



HORN OF AFRICA REGIONAL ENVIRONMENT CENTER AND NETWORK

2015

CLEAN ENERGY SOLUTION

Horn of Africa's clean energy solution uses biogas digestion of coffee husk and pulp waste to fuel state-of-the-art coffee driers to reduce coffee cherry drying time from several days to hours. In Ethiopia, where coffee accounts for 60 percent of the export earnings, the quality of coffee harvested will be improved with this process by decreasing exposure of coffee to fungi and other undesirable elements. Reduced drying time minimizes the post-harvest loss that occurs when using the conventional sun drying process. The time saved by farmers on coffee processing can be directed to other productive uses which will help them generate additional income.

www.hoarec.org

PROGRESS UPDATE

HoA-REC&N found that neither biodigesters designed for coffee feedstock nor biogas-powered driers are commercially available. In preparation for future efforts to design and prototype these two technologies, HoA-REC&N is assessing the commercial need and feedstock availability. This will include evaluating project partner coffee husk and pulp waste production. With this data, HoA will be able to calculate biogas production rates and demonstrate theoretical technical feasibility. HoA also plans to conduct customer discovery and market research to show that there is commercial need for biogas-powered driers. HoA will also use the information collected from potential customers to create an initial business model for a biogas-powered drier installation company. It is hoped that the technical feasibility, customer and market research, and an initial business plan will serve as the foundation of any subsequent efforts to design, build, and field test a biogas-powered coffee cherry drier.

HUSK POWER SYSTEMS

2015

CLEAN ENERGY SOLUTION

Husk Power Systems builds, owns, operates, and manages a hybrid solution that combines a biomass gasification system with a solar photovoltaic (PV) system. Husk Power System's solution allows access to electricity in rural, off-grid communities in Tanzania and Nigeria and extends the hours available for agricultural operations. The biomass plant uses a proprietary downdraft gasification technology that converts abundant agricultural residue, such as maize cobs, rice husks, coffee husks, and cotton stalks, into electricity. The system powers a mini-grid that produces electricity for residential, as well as agricultural, commercial, institutional, and industrial, needs. The electricity is distributed to rural households and micro-enterprises through a mini-grid system—providing a better quality, cheaper way to meet their needs for energy. Agricultural uses that will be powered include irrigation pumps, agro-processing mills, and drying and heating processes. Agricultural operations are able to continue processing during nighttime hours, while also providing cost effective power to customers during daytime with solar PV and night time with Biomass gasification system.

www.hoarec.org

PROGRESS UPDATE

Husk Power Systems has installed 2 hybrid solar/biomass plants in Tanzania. Three additional hybrid minigrids are being installed and will be commissioned by the first quarter of 2019 – all located in Tanzania. They provide 24/7 power, with a discounted tariff for daytime usage in order to pass on the cost benefits of the lower cost of power generation from solar PV. At each site, 3 professionals are trained to operate the systems. Husk's systems currently use SparkMeter, a product developed as spin-off of the work done by Powering Agriculture Innovator EarthSpark International. Husk Power Systems is in conversations with various partners in Nigeria to identify opportunities.



IDE BANGLADESH

2015

CLEAN ENERGY SOLUTION

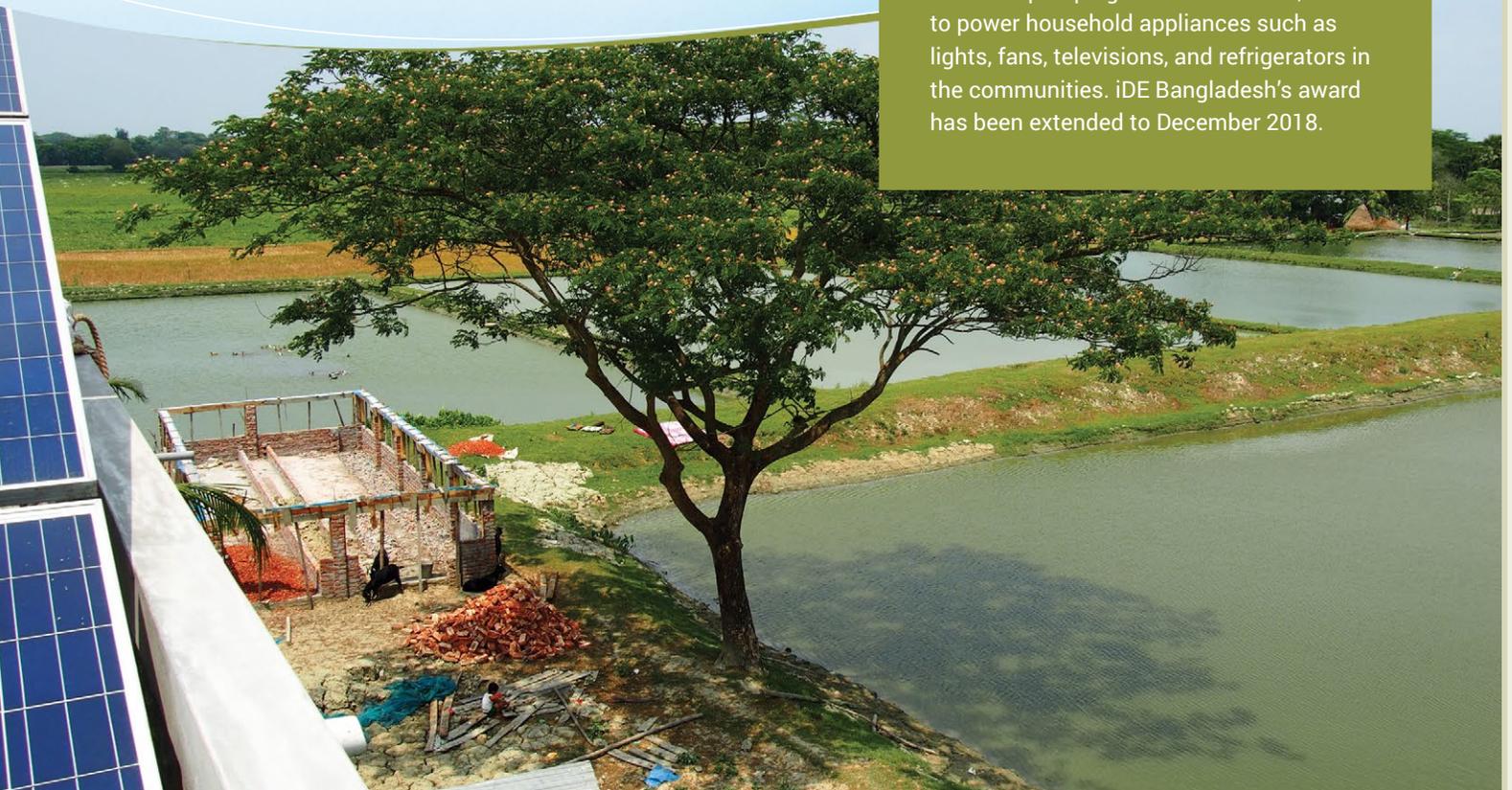
Off-grid fish hatcheries in Bangladesh, and their surrounding communities, rely extensively on diesel and kerosene –both costly and polluting– to provide electricity needed to pump water and provide light. The proposed solution is a micro-grid powered by an economically viable renewable source, solar, that replaces diesel consumption. The solar micro-grid reduces energy costs and increases productivity for hatcheries and Small and Medium Enterprises (SMEs) while also providing domestic energy access.

The systems power hatchery water pumping activities while supplying households with renewable power through an innovative metering technology. The mobile metering and billing system allows users to pay for their electricity using mobile money. The innovative Build-Operate-Transfer business model ensures that hatcheries and surrounding households can afford the technical solution by bringing private sector investment that would otherwise not be attracted to renewable grid development. The use of fish hatcheries as a hub for clean power generation provides a guaranteed, niche market with a higher level of sustainable and economic success.

www.ideorg.org

PROGRESS UPDATE

iDE Bangladesh has facilitated installation of microgrid systems by a private company, Rahimafrooz Renewable Energy Limited, at two fish hatcheries and surrounding communities in Bhola and Patuakhali districts of coastal Bangladesh. As of September 2018, the systems are serving a total of 47 households, 8 SMEs, and 1 local community mosque who have used 4.13 mWh of electricity. The electricity being generated is used for water pumping at the hatcheries, and to power household appliances such as lights, fans, televisions, and refrigerators in the communities. iDE Bangladesh's award has been extended to December 2018.



INSTITUTE FOR UNIVERSITY COOPERATION (ICU)

2015

CLEAN ENERGY SOLUTION

ICU is installing drip irrigation systems powered by PV solar energy at pilot farms in Jordan and Lebanon. As one of the world's driest regions, Jordan and Lebanon have widespread use of inefficient irrigation methods, resulting in the waste of large amounts of water. The system supports fertigation, which provides the possibility of fertilizer distribution through the irrigation system. Farmers will be supported in access to financing for the installation of the system. The CES will provide a complete package for purchase and installation, including training and access to knowledgeable extension agents and companies' staff.

The PV-Drip Irrigation System will result in reduced CO₂ emissions and energy costs. In addition, the drip and fertigation system will reduce water and fertilizer use by up to 30% compared to traditional systems due to efficient and localized application.

www.icu.it

PROGRESS UPDATE

The project has installed 6 PV-Integrated Irrigation Systems in Lebanon, and 4 in Jordan, for a total capacity of 87kW. As a result of the Powering Agriculture project's visibility, ICU's partner in Lebanon has installed an additional 600 kW of solar-powered irrigation systems. Some benefits from use of the systems include farming of previously unused land and extended growing seasons, both of which result in increased income. Fertigation also minimizes over-fertilization, which reduces costs. Through roadshows and other events, ICU demonstrated their clean energy solution to more than 850 people.



KICKSTART INTERNATIONAL

2015

CLEAN ENERGY SOLUTION

KickStart and its partners are designing a clean energy solution with the farmer in mind—a high-performance yet easy to assemble, highly mobile, robust and durable unit that requires minimal maintenance. KickStart will design a foldable, flat pack solar irrigation pump that is easy for farmers to install. KickStart's clean energy solution will not only greatly reduce the cost of the irrigation hardware but, through the introduction of a pay-as-you-go (PAYG) mechanism, will provide farmers with flexible financing options that will further promote affordability and, therefore, demand.

On average, farmers who adopt one of KickStart's best-selling human-powered irrigation pumps increase their household income by 400% and over 1,000,000 people have taken a major step out of poverty as a direct result of using these innovative tools.

www.kickstart

PROGRESS UPDATE

KickStart and its partners have continued the piloting for two solar PV irrigation pump prototypes and three PAYG financing platform prototypes. In FY18, 78 total systems were installed for field testing, with 58 using first-generation pumps and 20 using a second-generation pump prototype. Of the 58 first-generation pump systems, 45 are using a second-generation PAYG prototype while 13 are being financed with a third-generation PAYG prototype. These deployments add to the 21 units KickStart deployed in FY17 to equal nearly 100 systems installed, totaling 12kW of solar PV capacity.

The three PAYG models being tested are based on time passed, time-used and a hybrid model combining both options. The design for their second solar pump prototype builds on lessons learned during the field and lab testing of the first-generation prototype. Across all demonstration sites and private farms, 192 adults are benefitting from the CES, 40 of whom are women. KickStart's award has been extended to March 2019.



SIMGAS TANZANIA

2015

CLEAN ENERGY SOLUTION

SimGas is developing the first off-grid, biogas-powered milk chiller at farm level to help milk supply meet demand: the SimGas Biogas Milk Chiller (BMC). The Biogas Milk Chiller sparks a revolution in the dairy industry; it is the first link towards a reliable milk cool chain from cow to dairy. SimGas offer a solution to provide milk chilling at micro-scale, for farmers with up to 10 dairy cows, that run independently from the power grid, and that comply with the International milk cooling standard. It helps small dairy farmers to reduce milk losses and meet quality standards required to access the formal sector. The BMC runs on biogas, produced with an on-farm biogas digester. The amount of manure produced by a cow creates enough biogas to refrigerate her own milk, while leaving enough biogas to cook a meal for the household. The SimGas BMC will empower small dairy farmers to guide their own development; the milk chiller can greatly improve the income of small dairy farmers, help supply to meet demand, help farmers to access the formal dairy market, and contribute to improved nutrition. In addition, the use of clean energy (biogas) for cooling and other purposes, such as cooking, will help reduce deforestation and carbon emissions.

www.simgas.org

PROGRESS UPDATE

SimGas has been conducting lab and field testing on several different models of milk chillers, with 11 pilot installations in Kenya and Tanzania. Human-centered design research conducted together with IDEO.org was used to modify the milk chiller design, resulting in reduced gas consumption, which allows for extended biogas availability for cooking in addition to cooling. SimGas is currently testing 3 units of this latest prototype design at model farmers of Kenya's largest dairy processor. They plan to install 20 more of these units in 2019 and expect to begin mass production of the BMC in the coming year.



SUNCULTURE

2015



CLEAN ENERGY SOLUTION

As a result of switching to solar irrigation, smallholder farmers will realize significant benefits. These benefits include increased production of higher value produce, cost savings, and more efficient use of time. Time saved on farming and water gathering can be directed to other more productive activities. In addition, SunCulture's system has environmental benefits - in the next year, current SunCulture farmers will save 1.9 billion liters of water and generate over 64,000 kilowatt hours of power annually – all this while growing over 8.4 million kilograms of fresh fruit and vegetables.

www.sunculture.com

PROGRESS UPDATE

Since the beginning of the Powering Agriculture award, SunCulture has deployed AgroSolar Irrigation Kits and RainMakers across East Africa which allowed farmers to provide better nutrition, higher quality education, and healthcare for themselves and their families. Customers also report that they save more than 17 hours per week by switching to the RainMaker. They have trained a total of 106 technicians, agronomists, and area sales representatives that provide agronomy support from planning through harvest, as well as installation and after-sales support to the beneficiary farmers. SunCulture's award has been extended to November 2019.



UNIVERSIDAD DEL VALLE DE GUATEMALA (UVG)

2015

CLEAN ENERGY SOLUTION

UVG uses an innovative approach to developing low-cost utility companies in agricultural communities in Guatemala that are not connected to the grid, called Community Accelerators. Each Accelerator will consist of a localized mini-grid and will be operated by a local service provider company that also provides agribusiness service. This “utility in a box” approach is designed so that private sector financing can be used to fund the establishment of Accelerators, making this clean energy solution scalable in low-income agricultural communities in Guatemala without additional donor funding. The project will facilitate investment into one agricultural community in Guatemala to power agricultural production/processing equipment for coffee producing communities. application.

www.icu.it

PROGRESS UPDATE

The project team is currently designing and installing an initial pilot system in a community that will benefit nearly 500 people. The project has completed an extensive legal and technology development process and is currently starting the build-out of the pilot site. The integrated system for the project contains a complete minigrid solution for the community to power every home in the community and a de-husker to support communal coffee production activities. Future plans include training local producers, as well as seeking further investment for installing systems in other communities. UVG's award has been extended to September 2019.



UNIVERSITY OF TORONTO

2015

CLEAN ENERGY SOLUTION

In many low-income countries aquaculture is a large industry. Improving the quality of aquaculture pond water has the potential to increase fish yields, raise incomes, and improve food security. The University of Toronto's proposed approach is a new aeration method that does not require electricity, has no moving parts, has low maintenance requirements, and is inexpensive to fabricate and deploy in low income countries. The system uses heat that is captured through a solar thermal absorber and transferred to the bottom of the pond to heat the water. The heated water will rise and mix the pond, spreading oxygen-rich water from the top through the entire depth of the pond. The passive aeration system will increase pond dissolved oxygen levels to improve water quality, allow for increased density of fish stock, higher fish yields, as well as larger fish that have a higher market value and demand. At higher levels of dissolved oxygen, fish feed is also used more efficiently, which reduces operation costs.

www.mie.utoronto.ca

PROGRESS UPDATE

Using the Powering Agriculture funding, refinement of the device design has continued in order to use the solar thermal energy more efficiently in the aeration process. In addition, the effects on farmer yields are being evaluated. In 2018, two new versions (versions 3 and 4) of the aeration device were developed. Following the redesign, The University of Toronto refined the original 34 devices deployed. These units were replaced with 34 upgraded devices, which have been placed with 14 farmers. Each installation includes a control pond in addition to the pond with the aerators installed to allow evaluation of the impacts of the device on farmer yields. The University of Toronto has installed 57.54kW of solar capacity to date. The project is now gathering data from the newly installed devices; the test results will be compared with the performance of previous versions. The University of Toronto's award has been extended to November 2019.



VILLAGE INFRASTRUCTURE ANGELS (VIA)

2015

CLEAN ENERGY SOLUTION

VIA is installing solar mills in villages in Indonesia, Papua New Guinea, Philippines, and Vanuatu. These mills will deliver services to up to 10,000 households. These small villages typically do not have access to a electricity or diesel mill for crop processing, and must rely on manual processing, or travel long distances to use a mill. Small mills will be installed, with an appropriate capacity for the village, through a microfinancing program. The mills will be used to process staple crops, such as rice, corn, and cassava, that require processing before eating, and make up the majority of the diet. The time saved in manual labor can be redirected to other efforts that will increase income, particularly for women who are the primary source of labor for agro-processing.

www.villageinfrastructure.org

PROGRESS UPDATE

VIA and its main partner, Project Support Services, have delivered over 650 solar mills to market to date, including 290 as cash sales and 240 on 3-5 year lease agreements, with additional units being ordered. From a target of \$3 million of investment to be mobilized over the award period, VIA has secured over \$2,900,000 and has more under negotiation. VIA has also deployed 6,500 pay-as-you-go lighting kits alongside the solar mills, the first and largest deployment of PAYG solar in the Pacific region. VIA provides seven kinds of solar mills, each suited to a specific task such as a rice huller, corn sheller, flour grinder, or coconut/cassava grater. All seven solar mills have been warmly received by communities, but the cassava grater most of all, as it not only reduced hours of manual processing for women, but apparently has improved the taste of the national dishes, laplap, tuluk and simboro. In FY18 VIA also began the research and development (R&D) for a solar PV rice cooker. VIA's award has been extended to June 2019.



2.2 Powering Agriculture Impact

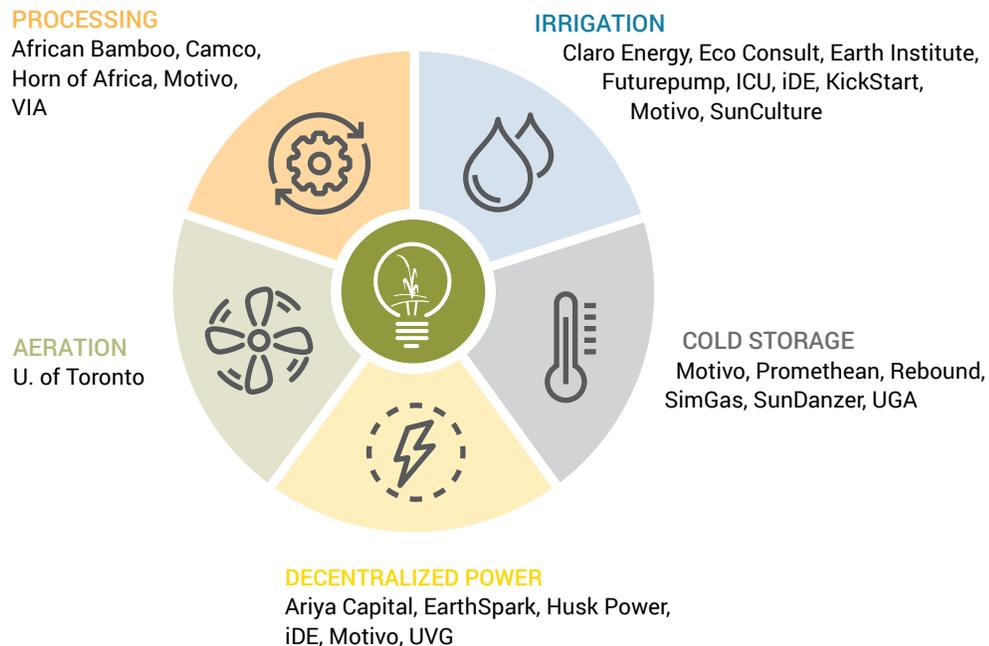
The positive impact of Powering Agriculture continued during fiscal year 2018. Field testing and product refinement continued, with increased commercial sales for several Innovators. The data presented in this section is based on the Innovators' self-reporting against Powering Agriculture's 10 performance indicators.

TABLE 2.1

IMPACT	FISCAL YEAR 2018	POWERING AGRICULTURE TOTAL
	6 clean energy solutions developed (technologies and/or business models)	42
	1,051 kW of clean energy generation capacity installed	1,908kW
	3,049 clean energy systems deployed through Africa, Asia/Pacific, Latin America and Middle East	4,949
	14,083 beneficiaries reached, such as farmers, households and agribusinesses	44,043
Increase in yield obtained by beneficiaries, as a result of Powering Agriculture support		
	USD \$28.63 million additional funding mobilized by innovators in support of their clean energy solutions	\$38.23 million
	833 tCO₂e reduction, as a result of innovators field activities	2,652tCO₂e
	3,734 people trained on operations and maintenance of clean energy systems and their benefits, including 226 women	8,345 people 1,350 women
	7,930 people increased their knowledge of clean energy technologies through attending demonstrations, as a result of Powering Agriculture support, including 1,433 women	45,072 people 14,626 women
	230 professionals provided services to clean energy system users, including 50 women	1,271 professionals 222 women

Innovators Contribution to FY 2018 Results: The following graphs illustrate results achieved by the Innovators aggregated by their agricultural focus as per below.

FIGURE 2.2 **INNOVATOR AGRICULTURAL FOCUS**



The results are presented for both FY2018 and for the life of the grand challenge. The 2018 fiscal year yielded the highest clean energy systems and clean energy capacity installation numbers of the project to date as shown in Figures 2.3 and 2.4, but several other indicators are below FY2017 levels. As the remaining innovators of the 2013 cohort and the first innovator of the 2015 cohort graduated from the program, there are less innovators contributing to FY2018's impact numbers and the grand challenge's overall results. In addition, a few innovators, especially the decentralized generation innovators, are finding it hard to capitalize on initial success or have been hampered by government regulation.

The scale of the systems installed ranged greatly, from 80-watt pumps to a 100-kW roof-top mounted solar array. Solar irrigation innovators installed the highest amount of clean energy capacity due to strong sales numbers from several innovators. However, Ariya Capital, an innovator focused on PV and hybrid systems for the horticulture farmers, was the biggest contributor to the capacity installed under the program, having installed 284 kW of solar capacity across three farms.

Decentralized Power represents the second largest amount of capacity installed under the program, driven by systems installed by Ariya Capital and Husk Power. Targets for the year were suppressed, however, due to delays in installation as a result of challenges navigating shifting government regulations.

FIGURE 2.3 CLEAN ENERGY CAPACITY INSTALLED (KW)

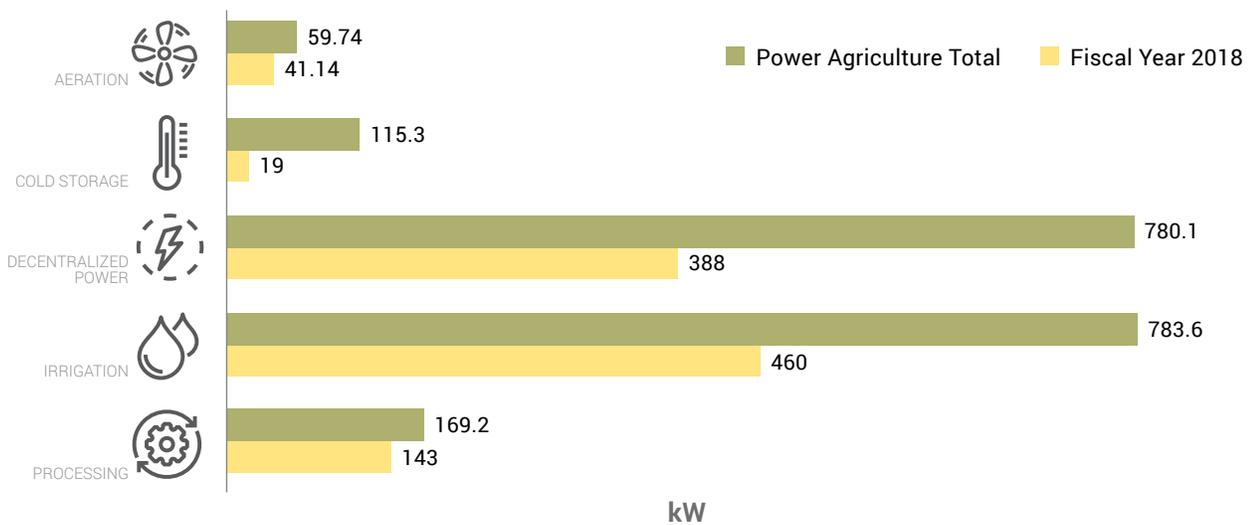
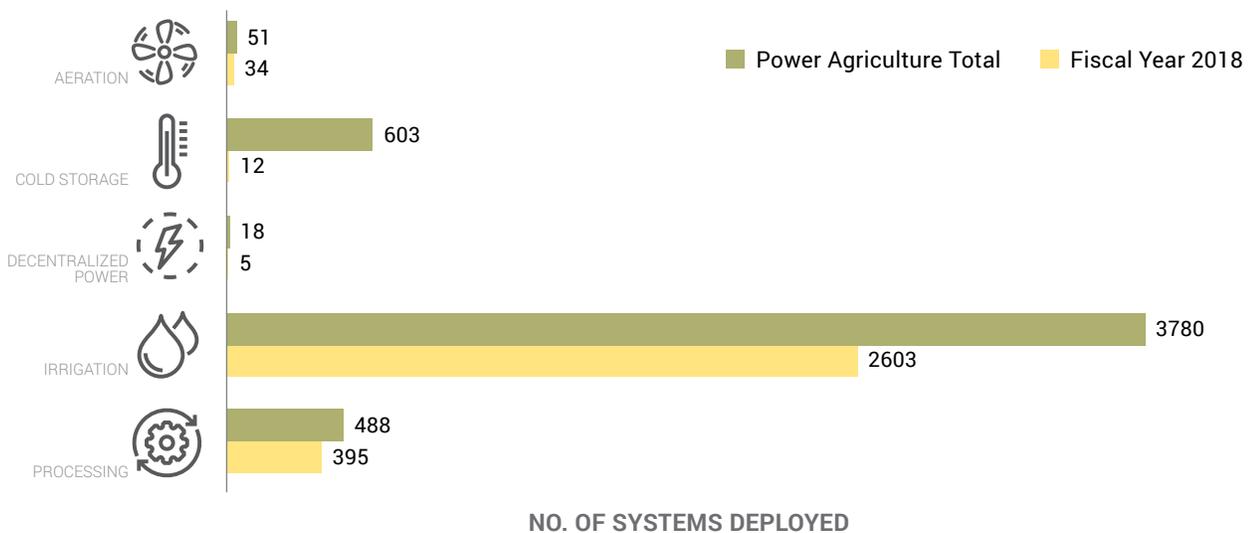


FIGURE 2.4 CLEAN ENERGY SYSTEMS DEPLOYED

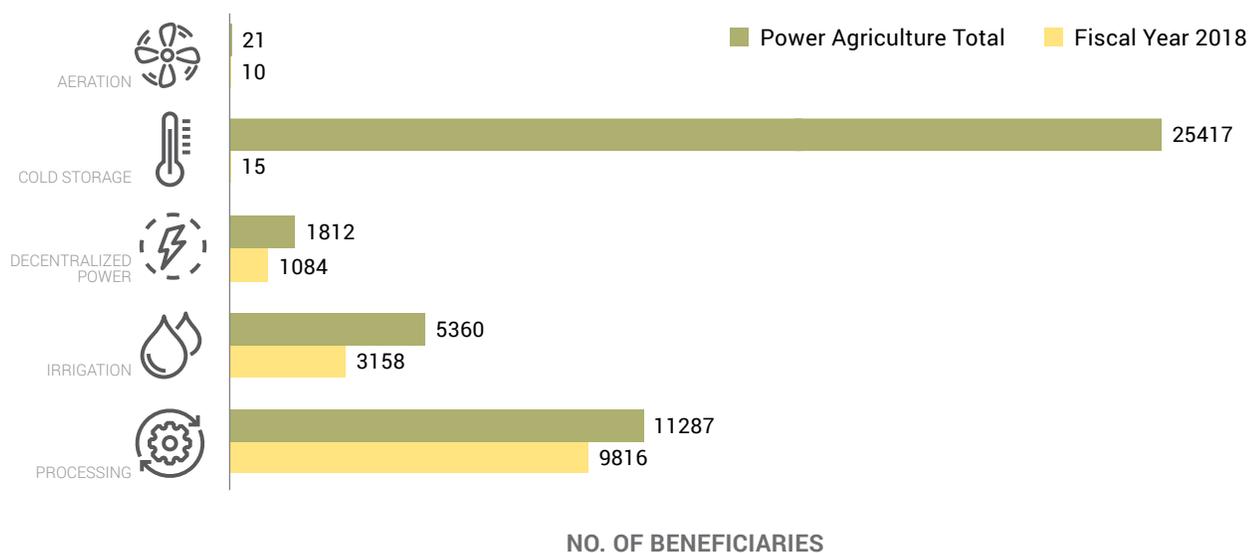


Powering Agriculture has positively impacted households, farmers, and agribusinesses as beneficiaries benefit from the deployed CES units under operation or in use (Figure 2.5).

The largest number of systems deployed has been for irrigation, in part due to the technical maturity of solar irrigation pumps and the continued demand for small, low-power irrigation pumps from small-holder farmers.

Processing represents the second largest number of systems deployed under the program as VIA ramped up its deployment of sub-1kW solar-powered mills in reaction to significant market demand. Cold storage deployment numbers dropped with the graduation of Promethean, who was driving high deployment numbers for cold storage system in FY2017.

FIGURE 2.5 **BENEFICIARIES OF CLEAN ENERGY TECHNOLOGIES**



The technology reaching the largest number of beneficiaries in FY2018 is Processing. This large number is due to the approximately 25 farmers that gain access to the grinding, hulling, and polishing services that a single solar-powered processor provides. Irrigation also reached many beneficiaries primarily due to the high sales numbers realized in FY2018.

The lowest number of beneficiaries reached is in the area of aeration as there is only one innovator within this sub-sector, and they continue to pilot their technology with a small number of farmer/testers.

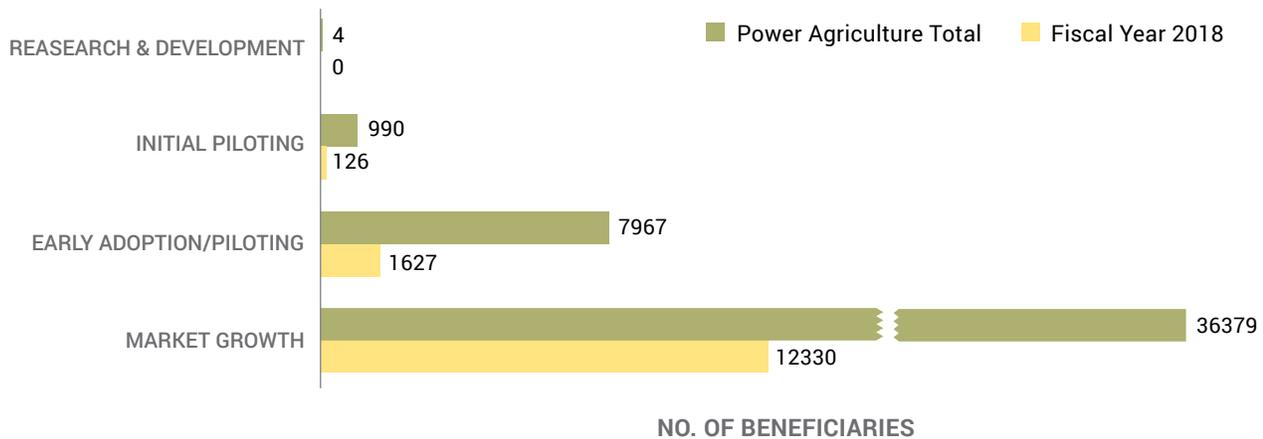
Table 2.1 shows that three innovators advanced into new innovation stages. Despite these advancements, Powering Agriculture Innovators are concentrated in the Initial Piloting and Early Adoption/Distribution development phases. The distribution of the innovators active in FY2018 can be in the following table.

TABLE 2.1 **FY2018 INNOVATION STAGES**

INNOVATION STAGE	FY2018
2 – Research & Development	1
3 – Initial Piloting	5
4 – Early Adoption/Distribution	5
5 – Market Growth	3

Market Growth is defined as an Innovation that has: proof of adoption/uptake in multiple markets, has acceleration partnerships established, and is moving toward a growing user/customer base. The three innovators that are in the Market Growth development stage are: SunCulture, VIA, and Futurepump. These three innovators are characterized by a growing number of systems deployed and a large number of beneficiaries reached. In fact, the number of beneficiaries reached by innovators over the reporting period (and over the life of Powering Agriculture) is strongly correlated with innovation stage, as seen in Figure 2.6.

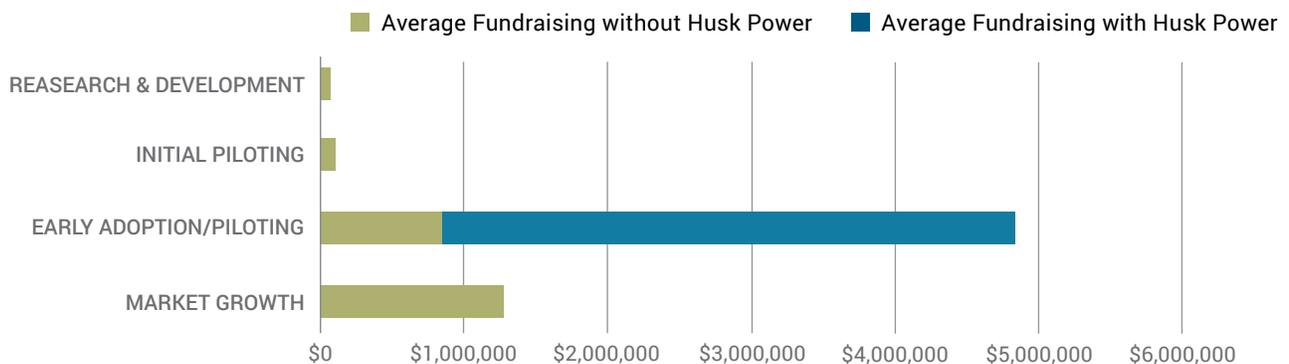
FIGURE 2.6 **BENEFICIARIES BY INNOVATION STAGE**



Characteristics common to SunCulture, VIA, and Futurepump include proof of adoption in their initial market, initial adoption in a new market, and a supply chain to transport their product from manufacturer to a small, but growing, customer base. These characteristics allow these three innovators to access higher levels of financing than other innovators. Innovators that are categorized as Market Growth raised on average 50% more per innovator than Early Adoption/Distribution Innovators, if Husk Power is removed from the dataset. Husk Power is a successful microgrid developer and operator based in India, where it can be considered as

a market growth innovator. As a result, Husk Power is able to raise large amounts of money to fund both its market growth in India and an initial expansion in Africa. Husk is considered early adoption/piloting under Powering Agriculture, however, as the program supports an expansion into two new markets, Tanzania and Nigeria, which require the development of a new business model¹. Husk Power's activities funded under the Powering Agriculture project are considered to be in the Early Adoption/Distribution stage. Figure 2.7 presents Innovator fundraising during the reporting period broken down by innovation stage.

FIGURE 2.7 **FY 2018 INNOVATOR FUNDRAISING**



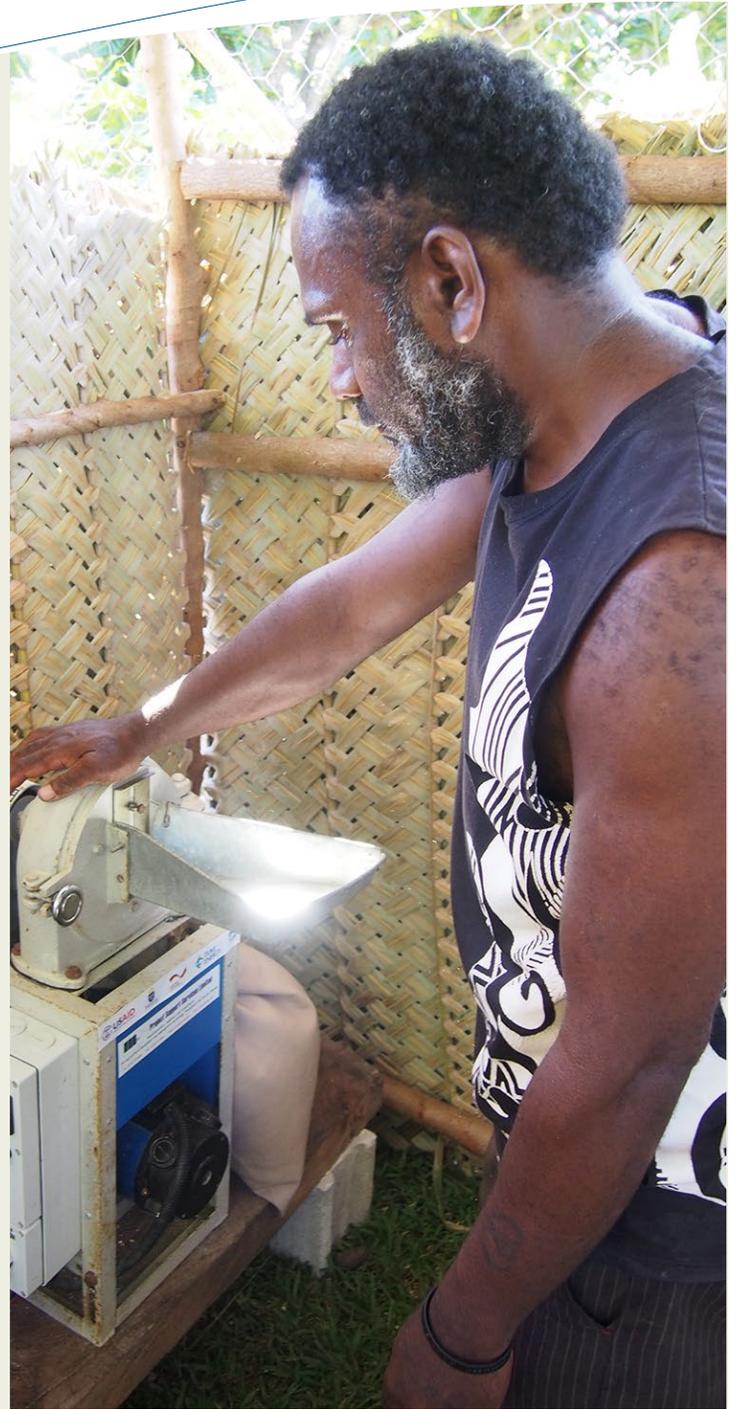
¹ Husk Power is developing a new generation technology and a new business model to match the African market. Those combined to create a new CES which is in the early adoption phase. Husk Power's other products which have been developed in India would be considered to be in the Market Growth phase.

TANE MAURICE PELE ISLAND, VANUATU

VILLIAGE INFRASTRUCTURE ANGELS (VIA)

Tane Maurice lives on Pele Island in Vanuatu. Despite being less than 20 km from the main island Efate, Pele lacks access to an electricity grid. This is not unusual, as nearly three-quarters of homes in Vanuatu don't have electricity².

VIA is working to deliver services to households that do not have access to an electric or diesel mill for crop processing. Tane is a VIA agent and operates three solar-powered agro-processing machines in Pele: cassava grater, flour grinder, and kava mincer. With the support of the community, Tane built a small hut for the VIA machines and installed the solar panels on the roof. Now people in Pele can process their food locally using the machines, saving around 3 hours a day. Previously, people manually processed their vegetables, taking them about 30 minutes to process a kilogram. In addition to the time saved, people in the community like the flavor and consistency of the food prepared with the machines. Some of Tane's clients are making flour from cassava, pumpkin, and moringa. After using the cassava grater, they allow the cassava to dry, and then they process it using the flour grinder. The flour is used to thicken their food and make gravy. Other people are making cakes which they sell in the new local market. Tane and the community are very happy with the machines.



Tane operating the solar flour grinder

² <http://www.worldbank.org/en/news/feature/2015/10/21/power-to-the-people-in-vanuatu>



TOP LEFT: Bags of tea, pumpkin and cassava flour

TOP RIGHT: Tane also sells bags of flour that can be used for cooking, similar bags are sold in the market

MIDDLE LEFT: Drying table with ground pumpkin and cassava

MIDDLE RIGHT: Solar cassava grinder and flour

BOTTOM LEFT: Men in Pele peeling cassava to be processed in the solar machine

BOTTOM RIGHT: Tane's clients in Pele island

2.3 Innovator Support

As in past years, Powering Agriculture provided support to both Innovator cohorts to increase the chances of the successful deployment of their clean energy solutions, both during and after the period of their award.

2.3.1 Implementation Support

Powering Agriculture continued to use the Powering Agriculture Support Task Order (PASTO), which is implemented by USAID contractor, Tetra Tech, to provide a variety of support, including:

- Implementation assistance such as feedback on milestones, guidance on monitoring and evaluation (M&E)
- Assistance with compliance with USAID policies and procedures including award modification
- Templates/manuals/guides for Innovators' use
- Promotion of Innovator progress on the website, on social media (Facebook and Twitter), and to the media
- Site visits to 3 innovators working in 5 countries to verify progress and interview beneficiaries

2.3.2 Business Acceleration Support

The structured program called the Powering Agriculture Xcelerator (PAX) provides customized and individually-tailored acceleration support to the Innovators. This support is provided by VentureWell, in association with Investors' Circle, under the PASTO contract. The program provides:

- **Portfolio managers:** Assigned portfolio managers implement customized work

plans developed based on ongoing innovator specific needs assessment. Regular check-ins with innovators are conducted in order to provide advice, feedback, and suggested action items. Technical Assistance is provided with the end goal of developing and validating a business model and bringing the innovation to market sustainably.

- **Ongoing innovator-specific needs assessment:** Assessments are based on regular check-in discussions with portfolio managers, an internal scorecard tracking system, periodic survey of innovators, observations from in-person workshops, and collaboration with USAID and fellow PASTO supporters.
- **Peer mentoring through cohort groupings:** This is comprised of individual connections among innovators, as well as webinars addressing topics relevant to sub-groups.
- **Investor-readiness assessment and coaching:** Funding needs and strategy are determined, along with identification of and introductions to potential funders.

The goal of the support is to develop and sustain the innovations in the marketplace to realize lasting impact. Innovators pursue different business models in different regions and progress at different speeds through the innovation life cycle; individual support is a critical component of the program's success.

Through PAX, innovators received the following over the reporting period:

- Training on industry best practices from experts through two PAX-organized webinars on building, hiring, and retaining the right team.

- 154 instances of assistance on business issues
- 65 referrals/linkages/partnerships/connections
- Investor guide for innovators to use as a reference document for the variety of financing mechanisms available

Powering Agriculture Xcelerator via individual engagements and support.

In collaboration with PASTO and the Founding Partners, PAX facilitated an in-person workshop at the beginning of Quarter 2 of the fiscal year. This resulted in increased demand for support, inspired by the workshop topics and the opportunity to continue conversations that were started in-person. The in-person workshop allowed for additional momentum to be created and explains the spike in the instances of support during that time period.

Figures 2.8 and 2.9 shows types of support requested and received by innovator. Over the course of the reporting year, 21 innovators engaged in some way with the

FIGURE 2.8 **INNOVATOR TECHNICAL ASSISTANCE**

INSTANCES OF TECHNICAL SUPPORT PROVIDED TO THE INNOVATORS IN FY2018

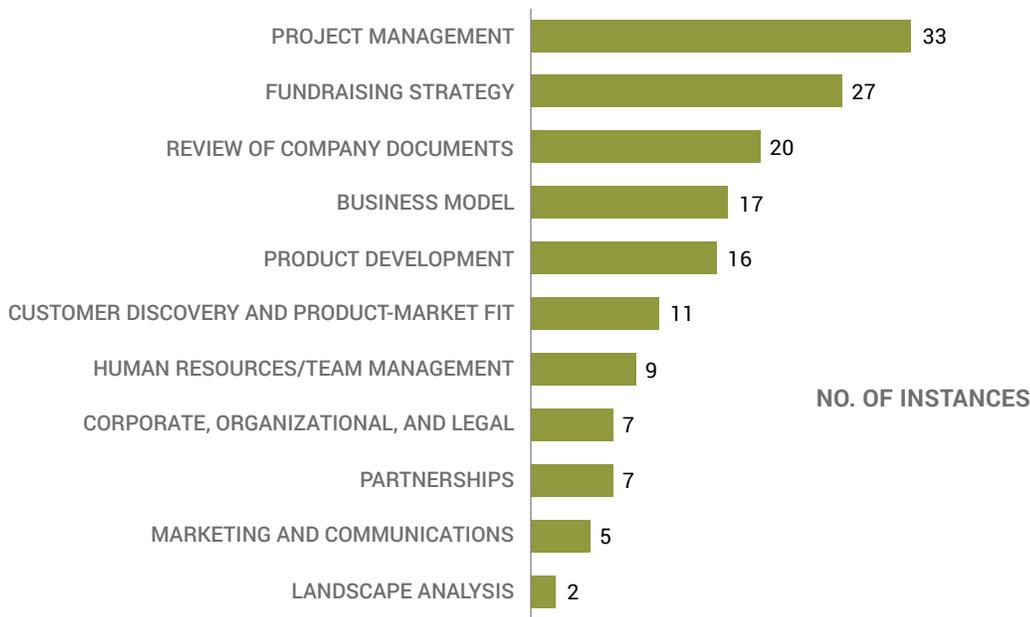
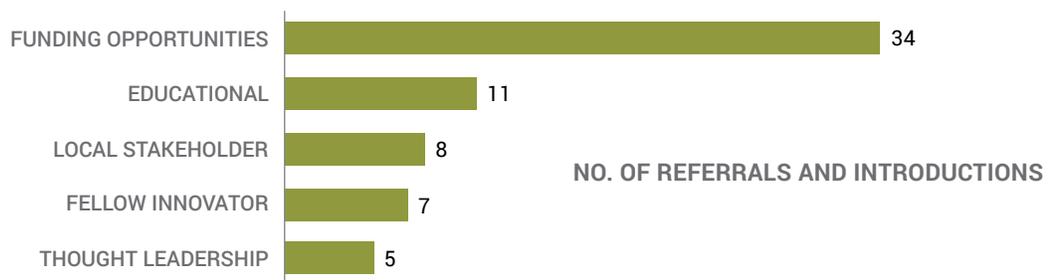


FIGURE 2.9 **INNOVATOR REFERRALS AND INTRODUCTIONS**



URMILA DEVI BIHAR, INDIA

CLARO ENERGY

How Claro Energy's On-demand Mobile Solar Trolley changed the life of a woman farmer.

Urmila Devi is a 53-year-old woman farmer who lives with 11 family members including her husband, 5 children, and 5 grandchildren in Bihar, India. She mainly grows wheat, maize, mustard, and potatoes on her small land holding of less than an acre. Like most farmers in her region she had long relied on diesel-powered irrigation. Typically, Urmila grows crops on land leased from a third party on a profit-sharing basis. The high cost of diesel and pump rentals have cut in to her profit margins. Due to a lack of awareness and limited education, neither she nor her family members were aware of modern, sustainable and economical substitutes. Even though Urmila and her family worked hard in their fields, they were not producing enough food to feed themselves and often had to leave the land under-irrigated due to the high cost of diesel or were dependent on rain.



“ With ever rising cost of diesel, the pump owners have increased the rentals. There is even an additional charge for pipes to irrigate far-off land areas. Farm produce was never enough to feed our 12 family members. Many times we were not able to arrange for 2 meals a day, let alone affording to buy any basic amenities. We could never grow rice on our fields as it requires a lot of water, which we obviously cannot afford. Without any good harvest, how are we supposed to feed our families and overcome poverty? My youngest daughter still goes to school, and in order to provide basic school supplies I have borrowed money from friends and neighbours. ”



A Solution: Solar pumps have been revolutionising the Indian agriculture scenario, but the high upfront costs, even with government subsidies, made it impossible for a marginal-scale farmer like Urmila Devi, and many others at the bottom of the pyramid, to buy a fixed asset. Claro Energy conceptualised their PATVAN- “Irrigation as a Service through movable solar trolley” in 2015. After a successful pilot, Claro partnered with various NGOs who did outreach to farming communities, educated them, and encouraged them to adopt the Pay-As-U-Go system for irrigation. Claro Energy also partnered with women self-help groups to educate women farmers about adopting new technologies for irrigation and farming. As a result, many men and women farmers have shown interest in this new sustainable and affordable technology. With this clean energy solution, the farmers can now irrigate their fields on a pay-per-use basis at significantly lower costs. Claro Energy’s movable solar water-pumping system constitutes an e-rickshaw which has solar panels mounted onto its rear portion. The solar panels are opened up at the farm location and connected to the pump there. This enables water to start flowing. The

system is equipped with a RFID enabled pre-paid card mechanism for collection of money, based on each usage. Smallholder farmers have benefitted from the mobility feature of the solar water pumping system, as irrigation is now available at their farmlands. It has become affordable and provides on-demand irrigation service without any capital investment for the farmers. Instead of owning the diesel pumps, the farmers only pay for the irrigation service based on their consumption using a PAY-GO card mobile money, cash deposits, or directly through micro finance institutions. For every 1,000 liters of water generated through these mobile solar pumps, INR 3 (0.044 USD) is charged to the farmer.

A Happy Result: After adopting Claro’s service model of pay as u go, farmers saw a reduction of up to 70% in their irrigation cost. Initially they used to pay from INR 120-180 (1.75-263 USD) to rent a diesel pump for an hour, excluding transportation and other charges. After switching to the mobile trolleys, the farmers now spend less than half of this, down to INR 50-80 (0.7-1.17 USD). After being informed by a fellow farmer, a beneficiary of Pay-As-U-Go service, Urmila Devi approached the Claro

team. Within 9 months of adopting the service, she was able to save more than INR 4,000 – a huge amount considering geographical and other life style factors. She no longer has to go to door-to-door asking and negotiating for the best price to renting a diesel unit, and she has managed to reduce the waiting period, as irrigation is now available at her farmland on-demand. With adequate irrigation, crop yield has jumped a significant amount with additional cost savings. In her own words, Urmila said



“ With money and time saved, me and my husband can now dedicate our time to more productive usages. We can now utilise it to grow an additional crop. As our irrigation needs are being taken care of, we no more have to travel to fetch diesel, which incurred additional transportation cost. We don't have to bargain and request anyone asking for lower renting prices. After years our family have celebrated Chhath Puja (a local festival) in full grandeur and I got new pair of clothes for my entire family. We've got a new set of stationary items for my daughter for her educational needs. We also got a small section of our house cleaned and renovated. My husband and family have always supported me in this endeavour. They are my pillar of strength. We both now devote our time in gathering more information about the new policies and benefits that government has rolled out for us. Claro team has also advised us about new marketplaces where we can sell our produce and get better prices, which we weren't aware of earlier. I feel very happy in being the change maker and it gives me immense joy now seeing my family smile.

I now feel empowered to educate my fellow female farmers and help in bringing a significant impact in their lives as well. ”

Innovator referrals

This year, PAX made a total of **65** referrals for **18** of the innovators. This year was high impact in terms of referrals to relevant expertise thanks to the in-person workshop held in Nairobi, Kenya, in January 2018. Being located centrally in an impact investing and technology hub opened up many opportunities for introductions and networking. In addition, portfolio managers were able to capitalize on the momentum gained at the in-person workshop held in January 2018. Several introductions and referrals to resources or potential partners or funders were made. The table below shows a summary of the types of referrals made.

PAX Workshop

The Powering Agriculture Xcelerator (PAX) workshop was held in Nairobi, Kenya from January 15-18, 2018. Participants from 21 Powering Agriculture Innovators participated in sessions that addressed barriers to bringing their innovations to market, such as fundraising, market discovery and landscape analysis,

business models, and more. The workshop was facilitated by VentureWell with support from staff from PASTO and Investors' Circle, and the Power Africa Transactions & Reforms Program. Speakers included more than 15 guests from the East Africa ecosystem, along with representatives from Powering Agriculture Founding Partners.

The in-person workshop was an opportunity for small working groups to convene based on affinity groupings such as technology area, region, business model (i.e., requiring customer financing), or university origination.

The workshop was capped off with the Powering Agriculture Innovator Showcase on the morning of January 18th. During the showcase the 21 Innovators demonstrated their technologies to invited guests and the general public from the East African innovation community. Guests received three million 'venture shillings' upon arrival to invest in their favorite innovations. The three innovators with the most venture



shillings received the chance to pitch to the whole audience on stage. The event also included a panel discussion on the Importance of the Ag-Energy Nexus featuring four experts with diverse perspectives. Highlight videos from the Innovator Showcase are available on the [Powering Agriculture YouTube channel](#).

Key Outcomes



Nearly all respondents (95%) indicated the workshop met or exceeded their expectations, and



Two-thirds (63%) stated that their projects would improve “a lot” or “a great deal” as a result of participation.



Almost all respondents (96%) indicated that the workshop was “very” or “extremely effective” in helping them connect with fellow innovators and stakeholders in the field.



A majority of respondents (75%) indicated that they were better able to understand the appropriate funding vehicles and types for their projects.



Almost (70%) of respondents found the workshop to be very or extremely effective in helping them to develop new ideas on how to reach and understand their customers.

Webinars

During the fiscal year, PAX hosted a webinar series centered on team-building, hiring, and retention. The series was entitled: “*You’ve got the product, what about the team that will bring it to scale?*” The Innovators have noted that

hiring takes a significant investment of time and resources. Beyond product and market, team is one of the top considerations for a potential investor or funder. The summary of each webinar is below.

How to build the team: Part A of this webinar series discussed ways to overcome the common challenges associated with hiring in emerging markets, including specific examples of how fellow innovators have found success in building diverse teams of skilled women and men.

How to keep the team: Part B discussed how to maximize your return on investment by minimizing turnover and keeping your employees happy and high-performing. After making the investment in acquiring and hiring talent, how do you maintain, cultivate, and retain it? This webinar covered culture and diversity, including retention of women in the workforce.



Innovator Investor Guide

PAX portfolio managers developed an overview for innovators to use as a reference document for the variety of financing mechanisms available. This [guide](#) was published for use by Innovators as well as the general public.

SAMUEL'S STORY KIGUMO, MURANG'A COUNTY, KENYA

KICKSTART INTERNATIONAL

Samuel is a 26 year old farmer who turned his life around with the help of a test model of KickStart's solar irrigation pump.

After high school, Samuel left his hometown to strike out on his own. Like so many young people his age, he had a hard time making ends meet and jumped from one job to the next, including selling cosmetics, working construction, stocking a store, and running a game business. For some of these jobs, Samuel was required to sleep at his place of work and found himself spending a lot of time with other young people who became restless when business was slow.

After getting into some trouble in the big city, he returned home and took up farming, like his parents. His father saw a test model of KickStart's solar pump at a demonstration and thought it could help keep his son busy. When he told his son that he saw a pump that ran without using petroleum, Samuel couldn't believe it and decided to check it out.

By using the KickStart solar pump test model to irrigate, Samuel became so successful that he took over his parents' land to produce crops that were both more nutritious and more profitable. Today, he grows kale, spinach, tomatoes, and sweet peppers, and has his own livestock and, in his spare time helps out his parents.

Typically, Samuel farms in the morning and the afternoons, and sells his produce in the cooler part of the day. For the rest of the day, he explores opportunities to make even more money and expand his business.



When asked what farming meant to him, Samuel said,

“ Farming is loving yourself. ”

With farming, Samuel says that he is now able to plan his future and be his own boss. And that future is bright – he hopes to rent more land and open up a small shop.





3 PROGRAM ACTIVITIES

The following are highlights of the main program support activities that were implemented during the reporting period.

3.1 Investment Alliance

Powering Agriculture has partnered with AlphaMundi and Factor[e] to form the Powering Agriculture Investment Alliance (Investment Alliance). The Investment Alliance will catalyze a minimum of \$25 million in private sector finance for ventures with the potential to achieve transformational development impact in the clean energy/agriculture nexus.

AlphaMundi and Factor[e] have a track record of making profitable investments in socially and environmentally sustainable enterprises that generate substantial net benefits to society. Both organizations embrace Powering Agriculture's goal of improving lives in the developing world by helping to scale clean energy solutions that increase agriculture productivity and/or value. Powering Agriculture funds are helping to subsidize on-the-ground activities that will enable Factor[e] and AlphaMundi to discover, vet, and engage with earlier-stage ventures – helping build capacity to absorb more private sector capital.

alphamundi

AlphaMundi provides quasi-equity or debt financing as well as targeted technical assistance to energy/ag companies operating in Africa or Latin America. Their support to the Investment Alliance includes:

- **Financing:** The group will prioritize investments in companies with a 3+ year track record of operations, \$500k (USD) or more in annual revenues and demonstrated social or environmental impact.

- **Technical Assistance:** AlphaMundi Foundation can also provide subsidized technical assistance to energy/ag companies. Assistance with governance, management systems, financial planning, fundraising, supply and distribution is available. This support can be pre- or post-investment, but is typically available to early stage companies, as it is intended to build capacity in advance of an increase in private sector capital commitment by AlphaMundi Group.

FACTOR[e] VENTURES

Factor[e] can provide equity seed investments in combination with individualized, one-on-one company engagement and support to select energy/ag businesses world-wide. Their support to the Investment Alliance is focused on:

- **Investment and Engagement Support:** The successful portfolio companies are generally very early stage but will occasionally be slightly more mature companies seeking to pivot from developed markets into developing ones. Factor[e] in particular seeks technology-based companies that align with their thesis around loss reduction and waste minimization as well as sustainable intensification.

Progress Update

Since the Investment Alliance was established:

AlphaMundi has identified and prescreened 14 companies and provided pre-investment technical assistance to 2 companies working in the clean energy-agriculture nexus. They have also provided the equivalent of US\$122,000 in technical assistance and/or R&D support.

Factor[e] commenced their work under the Investment Alliance late in the financial year, but have presented a pipeline of 17 companies and identified and prescreened 11 companies.



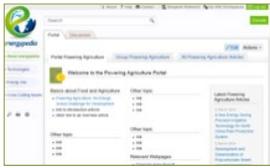
3.2 Mainstreaming

One of Powering Agriculture’s goals is to draw attention to the importance of the clean energy/agriculture nexus and the role that it can play in increasing agricultural productivity. Sharing knowledge and experiences gained through the program and the work of Innovators is an important means of achieving that goal. Powering Agriculture continues to collect and analyze information, and disseminate the findings and lessons learned through a variety of channels. These efforts are described in the following sections.

3.2.1 Raising the Public’s Awareness

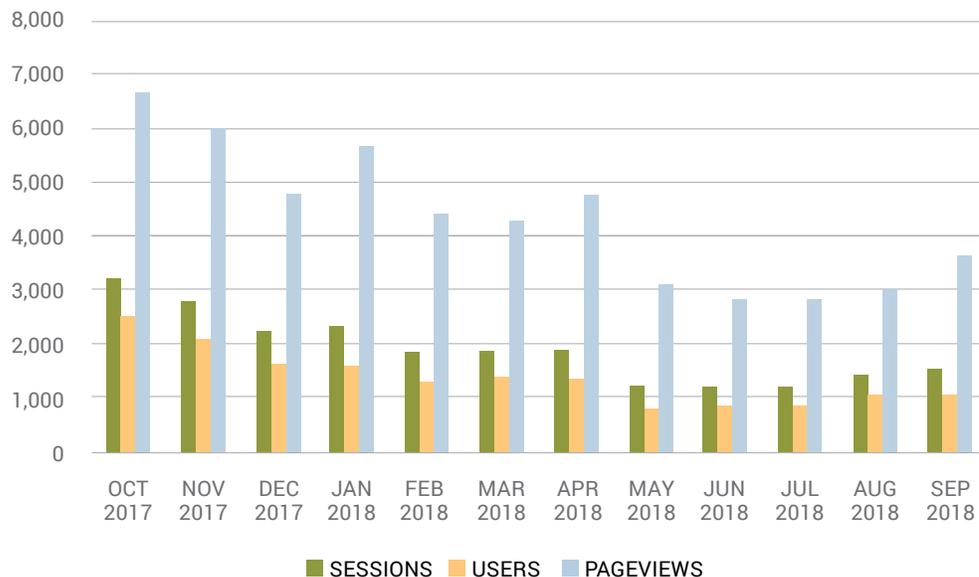
Powering Agriculture continued to: communicate the program’s objectives and activities, share Innovator success stories, build awareness of the clean energy/agriculture nexus, and disseminate results and knowledge from the initiative. These communications activities were conducted using a variety of tools and approaches, as shown in Table 2.1, as well as through stories published in various print and online media outlets, and participation in conferences and workshops.

TABLE 3.1 POWERING AGRICULTURE COMMUNICATION PLATFORMS

PLATFORM		PURPOSE	CONTENTS
Powering Agriculture website www.poweringag.org		Powering Agriculture’s primary public website; Communications and Outreach for Information Dissemination about the program	Official documents Calls for Proposals Outreach information (press releases, news articles, videos, event information) Resources
Powering Agriculture Portal on energypedia.info www.energypedia.info/wiki/Portal:Powering_Agriculture		Networking with experts; Research; mutual knowledge exchange	Thematic pages Articles and reports Studies Event announcements
Powering Agriculture E-Newsletter		To raise awareness of Powering Agriculture, its activities, and the successes of its Innovators	News Success Stories Event announcements
@Poweringag Twitter Account		To raise awareness of Powering Agriculture, its activities and the successes of its Innovators	News Event announcements
Powering Agriculture Facebook Account		To raise awareness of Powering Agriculture, its activities and the successes of its Innovators	News Event announcements Innovator Promotion
Powering Agriculture Dashboard		To inform senior management of the Founding Partners of programmatic and Innovator updates	News Event Announcements Resources

Powering Agriculture Website. The Powering Agriculture website is the principal information repository for program news and information. Website traffic during the reporting year is shown in Figure 3.1

FIGURE 2.1 POWERING AGRICULTURE WEBSITE ANALYTICS



Powering Agriculture Newsletter. Powering Agriculture disseminated 2 editions of its newsletter during the reporting period, as shown in Table 3.2.

TABLE 3.2 POWERING AGRICULTURE NEWSLETTER DATA FY2018

DATE OF NEWSLETTER PUBLICATION	# OF CONTACTS	OPEN RATE (17% – INDUSTRY STANDARD*)	CLICK RATE (8.5% – INDUSTRY STANDARD*)
February 26, 2018	4,782	30%	13%
September 24, 2018*	4,838	36/23%	17/21%

* Due to technical difficulties, the initial distribution of the September newsletter was not received by a large number of subscribers. The issue was addressed, and the newsletter was redistributed on October 8. The open rate and click rate numbers reflect the activity for each mailing (September 24/October 8).

Social Media Activities. The Powering Agriculture Facebook and Twitter accounts were used to post Innovator and program news, along with relevant energy/agriculture nexus stories. Social media was used to promote a variety of activities and resources, including the publication of the Guide on Financing Types for Innovators; the release of the briefs and study prepared through the FAO and Powering Agriculture collaboration “Investing in Sustainable Energy Technologies for the Agrifood Sector” (INVESTA); and release of the Toolbox on Solar Powered Irrigation Systems (SPIS). Table 3.3 presents highlights of the year’s social media activities.

TABLE 3.3 POWERING AGRICULTURE SOCIAL MEDIA ACTIVITY FY2018

OUTLET	FOLLOWERS	NUMBER OF POSTS IN FY2018	HIGHEST CLICKS/ PROFILE VISITS LARGEST REACH/ TOP TWEET	LARGEST REACH/ TOP TWEET
	3,262	123	2,779	Our partner @venturewell's Innovator Insights Series will share valuable findings and best practices drawn from the USAID Saving Lives at Birth Grand Challenge program. Read the fourth installment about the importance of understanding in-country context: bit.ly/2EWtagd pic.twitter.com/ig2E5oQV08
	2,946	37	2,504	<p>¡Por fin llega la traducción al español de la Caja de Herramientas de Sistemas de Riego Solar (SPIS Toolbox)! ¡Averigua todo sobre su diseño, planes de financiación e instalación, etc. en @energypediawiki! https://energypedia.info/wiki/SPIS_Toolbox-Download</p> <p>Great news: Our online toolbox on solar-powered irrigation is now available in Spanish! Head over to @energypediawiki to find out more on financing, sizing, installation, etc. https://energypedia.info/wiki/SPIS_Toolbox-Download</p> <p>Photos from some of our Innovators working in solar-powered irrigation KickStart International Claro Energy SunCulture Futurepump Ltd</p>



Wiki Portal Powering Agriculture. The Energypedia Wiki Portal Powering Agriculture continued its efforts to create awareness and provide an overview on clean energy technologies for the food sector through the publication of articles focused on the nexus of energy and agriculture. Important themes were the role energy efficiency plays in improving agricultural production systems as well as Solar Powered Irrigation Systems. Over the course of the fiscal year, total page views of the portal increased from 77,000 to nearly 101,000. The portal consists of 362 articles on the clean energy/agriculture nexus – 97 of them prepared by Powering Agriculture.

Global Innovation Exchange. Powering Agriculture Innovators have profiles on this platform [<https://www.globalinnovationexchange.org/>] that aims to accelerate innovation in developing countries. The ever-growing database of innovations and funding provides curated content and industry insights for social entrepreneurs, funders who fund them, and other development professionals.



Media Coverage. During the reporting year the Powering Agriculture initiative and its Innovators received coverage in 79 stories by various media as presented in Table 3.4

TABLE 3.4 FY 2018 POWERING AGRICULTURE MEDIA COVERAGE

MEDIA OUTLET – INNOVATOR	TITLE
News Ghana SunCulture	Firm launches solar-powered water pump in Kenya https://www.newsghana.com.gh/firm-launches-solar-powered-water-pump-in-kenya/
Microgrid Knowledge EarthSpark	The Sky Fell in Puerto Rico. The Microgrid Argument is not Chicken Little https://microgridknowledge.com/microgrid-puerto-rico/
CoastWeek.com SunCulture	Firm launches solar-powered water pump in Kenya http://www.coastweek.com/4039-Firm-launches-solar-powered-water-pump-in-Kenya.htm
CNBCAfrica SunCulture	Facebook brings together Kenyan Group leaders to foster new connections https://www.cnbcafrica.com/apo/2017/10/12/facebook-brings-together-kenyan-group-leaders-to-foster-new-connections/
Medium	Power Africa Celebrates World Food Day https://medium.com/power-africa/power-africa-celebrates-world-food-day-ab993519c7a7
Infrastructure News SunCulture	Transforming agricultural output in water scare regions http://www.infrastructurenews.com/2017/10/16/transforming-agricultural-output-in-water-scare-regions/#
Business Insider Kickstart International	World Vision International Wins the 2017 AFP Pinnacle Award Grand Prize for Excellence in Treasury and Finance http://markets.businessinsider.com/news/stocks/World-Vision-International-Wins-the-2017-AFP-Pinnacle-Award-Grand-Prize-for-Excellence-in-Treasury-and-Finance-1004494468
The Bridge Claro Energy	India's solar irrigation startup Claro Energy places first in AEA competition finals http://thebridge.jp/en/2017/11/claro-energy-wins-aea2017
The Conversation	Forget turning straw into gold, farmers can turn trash into energy https://theconversation.com/forget-turning-straw-into-gold-farmers-can-turn-trash-into-energy-86616
Next Billion SunCulture	Making it Rain: Solar-Powered Irrigation and the 'Household Productivity Ladder' https://nextbillion.net/making-rain-solar-powered-irrigation-household-productivity-ladder/
Saveur SunCulture	This Startup Wants to End World Hunger With Solar-powered Irrigation https://www.saveur.com/sunculture-solar-power-irrigation-africa
Clean Energy Education & Empowerment Awards EarthSpark	C3E Award Winners https://c3eawards.org/winners/
Globe Newswire VIA	IoT Innovation in Solar Powered Milling https://globenewswire.com/news-release/2017/11/21/1198225/0/en/IoT-Innovation-in-Solar-Powered-Milling.html
Developing Telecoms VIA	VIA and Eseye partner on rural IoT solar energy initiatives in Africa and Asia-Pac https://www.developingtelecoms.com/tech/iot-m2m-uc/7482-via-and-eseye-partner-on-rural-iot-solar-energy-initiatives-in-africa-and-asia-pac.html
North Star FM Futurepump	Hatoum Trading Company launches Solar Irrigation pump (Future Pump) http://northstarfmonline.com/2017/12/06/hatoum-trading-company-launches-solar-irrigation-pumps-future-pump/

MEDIA OUTLET – INNOVATOR	TITLE
Skoll Kickstart International	A Seed of Maize: Kickstart on Storytelling for Impact http://skoll.org/2017/12/07/kickstart-storytelling-for-impact-seed-of-maize/
Business Line Husk Power Systems	The Power of Small http://www.thehindubusinessline.com/specials/clean-tech/the-power-of-small/article9983240.ece
All Africa African Bamboo	Ethiopia: Bamboo - Untapped Green gold http://allafrica.com/stories/201712200810.html
Daily Nation Futurepump	Research on solar pumps promises better tidings https://www.nation.co.ke/business/seedsofgold/Research-on-solar-pumps-promises-better-tidings/2301238-4245388-sof9k7z/index.html
Hindu Business Line Promethan Power	When the colour of milk is green http://www.thehindubusinessline.com/specials/clean-tech/milk-hudson-agro-tamil-nadu-solar-wind-renewable-energy/article10009020.ece
UNCDF CleanStart Futurepump	4 amazing stories on the magic of solar energy to change lives in Nepal https://spark.adobe.com/page/4dE6puFk1Ac2i/?utm_content=buffer7db95&utm_medium=social&utm_source=twitter.com&utm_campaign=buffer
Your Story Husk Power Systems	Husk Power Systems raises \$20M from Shell, others to scale renewable mini-grids in Africa and Asia https://yourstory.com/2018/01/husk-power-systems-series-c-expansion/
Denver Post Husk Power Systems	Fort Collins energy firm that uses rice husks to power remote villages attracts \$20 million from Shell's venture arm https://www.denverpost.com/2018/01/18/fort-collins-husk-power-systems-shell-technology-ventures/
Greentech Media Husk Power Systems	Shell Technology Ventures Leads \$20 Million Investment in Minigrad Specialist Husk https://www.greentechmedia.com/articles/read/shell-ventures-leads-20-million-investment-in-minigrad-specialist-husk#gs.RBH57WQ
Reuters Futurepump	With solar water, trees grow into a sturdy business in Western Kenya https://www.reuters.com/article/us-kenya-forest-climatechange/with-solar-water-trees-grow-into-a-sturdy-business-in-western-kenya-idUSKBN1F70G6
Ideas to Impact SunDanzer	GLOBAL LEAP'S OFF-GRID REFRIGERATOR COMPETITION AND INNOVATION PRIZE WINNERS ANNOUNCED http://www.ideastoimpact.net/content/global-leaps-grid-refrigerator-competition-and-innovation-prize-winners-announced
Microgrid Knowledge Husk Power Systems	Mini-Grids Foolhardy No Longer, Husk Power Raises \$20M via Engie, Shell & Swedfund https://microgridknowledge.com/mini-grids-husk-power/
ESI Africa SunDanzer	Off-grid refrigerator competition promotes solar energy https://www.esi-africa.com/news/off-grid-refrigerators-competition-promote-use-solar-energy/
Scaling OffGrid SunDanzer	Global LEAP'S OFF-GRID REFRIGERATOR COMPETITION AND INNOVATION PRIZE WINNERS ANNOUNCED http://www.scalingoffgrid.org/ogre-winners-announced
Coloradoan Husk Power Systems	International energy company that makes gas from rice husks moves to CSU's Powerhouse https://www.coloradoan.com/story/money/business/2018/01/24/international-energy-company-makes-gas-rice-husks-moves-csu-powerhouse/1061615001/

MEDIA OUTLET – INNOVATOR	TITLE
ESI Africa Husk Power Systems, EarthSpark	Electrifying the rural world... https://www.esi-africa.com/features/sharedsolar-system-electrifying-the-rural-world-in-africa/
Your Story Claro Energy	Harnessing the sun: startups who are lighting the way ahead for India's renewable energy sector https://yourstory.com/2018/01/solar-energy-startups-india-renewable-energy/
PV Magazine Husk Power Systems	Interview: Power for all through mini-grid systems https://www.pv-magazine-india.com/2018/01/26/interview-power-for-all-through-mini-grid-systems/
Forbes Husk Power Systems	How This Social Enterprise Just Closed \$20 Million in Funding https://www.forbes.com/sites/eshachhabra/2018/01/29/how-this-social-enterprise-just-closed-20-million-in-funding/#1c08c7f252f3
Stanford Social Innovation Review Husk Power Systems	Circular Social Innovation in India https://ssir.org/articles/entry/circular_social_innovation_in_india
Thomson Reuters Futurepump	From solar irons to shavers, off-grid power push aims to light up incomes http://news.trust.org/item/20180131020743-af696/
Newswise Husk Power Systems	Fostering Global Innovation in a Developing Economy: Lessons from India https://www.newswise.com/articles/fostering-global-innovation-in-a-developing-economy-lessons-from-india
Energy World Husk Power Systems	How India can continue to be a leader on energy access https://energy.economictimes.indiatimes.com/energy-speak/how-india-can-continue-to-be-a-leader-on-energy-access/2890
Bakersfield.com Motivo	Tractors and fertilizer, sure, but 51st World Ag Expo offers sci-fi glimpses too http://www.bakersfield.com/news/tractors-and-fertilizer-sure-but-st-world-ag-expo-offers/article_2696ed1e-10e7-11e8-adab-c74d5bfaddcc.html
JSTOR Daily Husk	Running on Rice Husks—how One Entrepreneur Brought Electricity to His Village https://daily.jstor.org/running-on-rice-husks-how-one-entrepreneur-brought-electricity-to-his-village/
Skoll Kickstart International	How Kickstart is Mobilizing an Irrigation Movement in Sub-Saharan Africa http://skoll.org/2018/03/06/how-kickstart-is-mobilizing-an-irrigation-movement-in-sub-saharan-africa/
Entrepreneur Husk	Why Social Enterprise Can Be a Win-Win Scenario for Your Company's Future https://www.entrepreneur.com/article/310240
Scaling Off Grid SunDanzer	Making Solar-Powered Refrigeration a Reality http://www.scalingoffgrid.org/blogs/making-solar-powered-refrigeration-reality
kingabdullah.jo ECO Consult	King holds talks with Dutch PM https://kingabdullah.jo/en/news/king-holds-talks-dutch-pm
IFC SunCulture	Tech Start-ups Help Africa Leapfrog Development Challenges https://www.ifc.org/wps/wcm/connect/news_ext_content/ifc_external_corporate_site/news+and+events/news/cm-stories/tech-start-ups-and-development-in-africa
Dhaka Tribune Promethean Power	Dairy farmers reap benefits of milk chiller technology http://www.dhakatribune.com/bangladesh/nation/2018/03/25/dairy-farmers-reap-benefits-milk-chiller-technology/

MEDIA OUTLET – INNOVATOR	TITLE
Finding Impact SunCulture	FIP 60: David Auerbach Interviews Samir Ibrahim of SunCulture https://findingimpact.com/fip-60-david-auerbach-interviews-samir-ibrahim-of-sunculture/
Impact Alpha Rebound	How investors can get the most climate-change impact for their bucks https://impactalpha.com/how-investors-can-get-the-most-climate-change-impact-for-their-bucks/
CityWealth iDE, Futurepump	Social impact: What are we here for? http://www.citywealthmag.com/news/social-impact-what-are-we-here
Automotive Engineering Motivo	Engineering the Motivo Way http://www.nxtbook.com/nxtbooks/sae/18AUTP04/index.php#/14
Cision PRNewsWire Ariya Capital	Top Women Board Leaders to Convene for WomenCorporateDirectors Global Institute May 8-10 in New York https://www.prnewswire.com/news-releases/top-women-board-leaders-to-convene-for-womencorporatedirectors-global-institute-may-8-10-in-new-york-300628482.html
ESI Africa Husk Power	Kenya launches new platform to accelerate mini-grid industry https://www.esi-africa.com/association-founded-to-accelerate-mini-grid-industry-in-africa/
iShow Innovation Showcase SimGas	Meet our 2018 Kenya finalists https://thisishardware.org/competition/2018/kenya
YourStory Husk Power	Shell Foundation, Zone Startups launch women entrepreneurship programme in the energy sector https://yourstory.com/2018/04/shell-foundation-zone-startups-launch-women-entrepreneurship-programme-energy-sector/
Next Billion Futurepump	For Solar Irrigation to Grow, the Pump Needs to be Innovative – So Does the Warranty https://nextbillion.net/for-solar-irrigation-to-grow-the-pump-needs-to-be-innovative-so-does-the-warranty/
East African Business Times SunCulture	Harnessing solar energy to improve the fortunes of the African farmer http://www.eabusinessimes.com/harnessing-solar-energy-improve-fortunes-african-farmer/
ESI Africa Ariya Capital	Honouring pioneering utilities, projects and people in energy and water https://www.esi-africa.com/honouring-pioneering-utilities-projects-and-people-in-energy-and-water/
This is Hardware SimGas	ISHOW Kenya May 2018 Winners https://thisishardware.org/competition/2018/kenya ; https://www.asme.org/about-asme/news/asme-news/teams-europe-africa-compete-ishow-kenya
SmartFarmer SimGas	Kenyan innovation bags top African hardware competition award http://smartfarmerkenya.com/kenyan-innovation-bags-top-african-hardware-competition-award/
World Food Bank Kickstart	Feature Partner: Kickstart https://worldfoodbank.org/feature-partner-kickstart/
AgFunder News Futurepump	10 Agtech Startups for Smallholder Farmers in Sub-Saharan Africa https://agfundernews.com/10-agrtech-startups-for-smallholder-farmers-in-sub-saharan-africa.html
Decentralized Energy EarthSpark	Haiti to build microgrids with Taiwan loan https://www.decentralized-energy.com/articles/2018/05/haiti-to-build-microgrids-with-taiwan-loan.html

MEDIA OUTLET – INNOVATOR	TITLE
Asian Voice Futurepump	Jitendra Lakhani: Futurepump https://www.asian-voice.com/Volumes/2018/16-June-2018/Jitendra-Lakhani-Futurepump
ASME iShow US University of Toronto	Meet our Finalists ISHOW USA: WASHINGTON, DC JUNE 21, 2018 https://thisishardware.org/competition/2018/social_voting/usa ; http://wshe.es/DzZ1jFzt
Business Day Ariya Capital	What impact investors look for in startups http://www.businessdayonline.com/morecompanies/technology/article/impact-investors-look-startups/
Off-grid Energy Independence Claro	Solar Pumps- Powering The Way Ahead https://www.offgridenergyindependence.com/articles/14649/solar-pumps-powering-the-way-ahead
Your Story Husk Power	These cleantech startups are striving towards leaving a better planet for the future generations https://yourstory.com/2018/07/cleantech-india-startups-listicle/
PVTech Husk Power	Rice, rays and recharge: How an Indian village got 24/7 clean energy https://www.pv-tech.org/editors-blog/rice-rays-and-recharge-how-an-indian-village-got-24-7-clean-energy
WeeTracker SunCulture	Kenya's SunCulture Closes Investment Round Led By EDF Group http://weetracker.com/2018/07/30/kenyas-sunculture-closes-investment-round-led-by-edf-group/
Impact Alpha SunCulture	SunCulture secures backing from EDF Group https://impactalpha.com/sunculture-secures-backing-from-edf-group/
Daily Nation SunCulture	Agri-technology firms in partnership to enhance smallholder farmers' productivity https://www.nation.co.ke/business/seedsofgold/Agri-technology-firms-in-partnership-to-enhance-smallholders/2301238-4700000-c153i1z/index.html
The Better India Husk Power	12000 Households, 350+ Villages: How Crop Waste is Electrifying Rural India! https://www.thebetterindia.com/155140/husk-power-system-renewable-energy-investment/
One Acre Fund Futurepump, SunCulture	5 Digital Innovations Making A Difference Outside The City https://oneacrefund.org/blog/5-digital-innovations-making-difference-outside-city/?utm_source=Email&utm_campaign=Email_5Digital_Unknown
UGA Today UGARF	Dairy Device https://greatcommitments.uga.edu/story/dairy-device/
Climate & Clean Air Coalition SimGas	Meet the 2018 Climate and Clean Air Award Finalists http://www.ccacoalition.org/en/news/meet-2018-climate-and-clean-air-award-finalists-announced
Daily Monitor Kickstart	Irrigation way to go, farmers told http://www.monitor.co.ug/News/National/Irrigation-farmers-market-prices-northern-Uganda/688334-4754760-o973ca/index.html?platform=hootsuite&utm_campaign=social
Your Story Claro Energy	India's focus on solar power may earn it a place in the sun by 2022 https://yourstory.com/2018/09/indias-solar-power-2022/



3.2.2 Training and Conferences

Energy efficiency trainings and audits efforts.

As part of the energy efficiency project focused on the Kenyan tea sector (see Section 3.2.3), 68 Kenya Tea Development Agency (KTDA) tea factories in Kenya have implemented energy audits. During the past year 190 additional staff received training on energy efficiency (EE) measures conducted by The Strathmore University Energy Research Centre. This brings the total to more than 800 KTDA staff trained since the project's inception in 2015, with 17% of trainees being women.

Toolbox on Solar Powered Irrigation Systems.

The Toolbox on SPIS was officially launched in April 2018 at the Forum on Solar Powered Irrigation in Rome, followed by ongoing promotion and training activities. Webpage views of the Toolbox [homepage](#) have increased exponentially (26,000 by September 2018), as have the number of promotion activities and requests for training. To meet training demands, GIZ Powering Agriculture plans to build a network of certified Toolbox trainers around the world. As a first step, a Training of Toolbox Trainers is scheduled to take place in Nairobi, Kenya, in November 2018. In addition,

an E-Learning course on solar irrigation is currently being developed by Ostfalia University, Germany. The 2-month, in-depth course will be held in June 2019. Self-learning videos on the Toolbox will also be available as open access knowledge products. A Spanish version of the Toolbox Tools and Modules has been available online since September 2018, allowing for successful promotion of the Toolbox in Latin and Central America. Training courses were held in La Paz and Potosi, Bolivia, in September 2018 and marked an encouraging start for regional dissemination.

Introductory Trainings on RE and EE in Agriculture.

Founding Partner GIZ developed and piloted an online introductory training on Renewable Energy (RE) and Energy Efficiency in Agricultural Value Chains. The training was part of a postgraduate course held at the University of Weihenstephan, Germany. BMZ funded the training for young professionals from 10 African countries. The training was supported by the GIZ Global Program "Green Innovation Centers for the agriculture and food sector" contributing to the BMZ special initiative "One World-No Hunger".

Solar Forum, Rome. Can solar technologies help in the fight against hunger, climate change, and poverty all at once? Participants of the International Forum on Solar Technologies for Small-scale Agriculture and Water Management discussed this and many other questions in Rome, April 12-13, 2018. 150 participants from governments, international organizations, NGOs, research institutes, financial institutions and private companies from the water, energy, and agriculture sectors came together during the Solar Forum for a rewarding exchange. The event was jointly organized by the FAO and Powering Agriculture in collaboration with the International Fund for Agricultural Development, the International Water Management Institute, and the Research Program on Water, Land and Ecosystems. The Forum's high-level opening session featured the official launch of the Toolbox on SPIS and a study on "The Benefits and Risks of Solar-Powered Irrigation - A Global Overview", jointly developed by GIZ Powering Agriculture and FAO.



3.2.3 GIZ Hub

Powering Agriculture Partner GIZ is managing the Powering Agriculture East Africa Hub (Hub) located in Nairobi, Kenya. Hub activities this year included:

SPIS. The Hub promoted the adoption and utilization of the Toolbox on Solar Powered Irrigation Systems, presenting the Toolbox in several forums. A pilot Training-of-Trainers event is scheduled to take place in Nairobi in November 2018. With a strong focus on women, the objective of the training is to develop a pool of trainers to effectively execute future training events on the Toolbox.

Solar Milk Cooling Systems. The Hub continued to support the deployment of milk cooling systems developed by the University of Hohenheim. Two additional systems, sponsored by the BBV-Landfrauen Internationale Zusammenarbeit GmbH, were installed in Kenya in 2018. These systems are being used to study viable business models that will allow the commercialization of such units.

Energy Efficiency in Tea and Dairy. Tea processing requires intensive energy input that is often costly and unsustainable. This presents an opportunity for significant energy savings. To tap this potential, Powering Agriculture Partner GIZ joined forces with the KTDA, the Ethical Tea Partnership, Taylor's of Harrogate, and Mars Drinks to roll out an EE program in the Kenyan tea sector. For the past 4 years, the partners implemented extensive capacity building activities across all 68 KTDA factories, including exchange trips, inter-factory competitions, energy audits, and research around best practices.

From project start in late 2014 until June 2018, US\$13.5 million in energy costs as well as 1.3 million trees were saved across all KTDA factories. The activities are being scaled to other Kenyan tea companies, as well as to the Kenyan dairy sector.

3.2.4 Gender Inclusion

Powering Agriculture continued its efforts to ensure that gender issues are considered by the Innovators in the design, development, and deployment of their CES. During the reporting period, Powering Agriculture:

Provided on-demand technical advisory support to innovators. This support included individual consultations on the following:

- Advice and resources to support female staffing targets
- Integration of social and gender indicators and questions into baseline surveys to strengthen sex-disaggregated understanding of target farmer market and enable capture of sex-disaggregated impact data, and gender integration in work plan
- Monitoring and evaluation plan formulation to provide better understanding of target market and collection of baseline data to understand impact on men and women beneficiaries

Gender Integration Session, PAX Workshop.

During the January 2018 PAX Workshop, the Gender Specialist facilitated a practical gender integration workshop session with Innovators. The session introduced participants to the Powering Agriculture Gender Guidance and tools.



Presented Powering Agriculture Gender Guides to USAID. Originally published in June 2017, the suite of 6 guides focused on integrating gender into development and deployment of clean energy solutions continued to be useful and of interest to stakeholders beyond the Powering Agriculture cohort. They were shared with USAID's gender specialists in November 2017, and featured in a Power Africa [blog](#) on World Food Day.

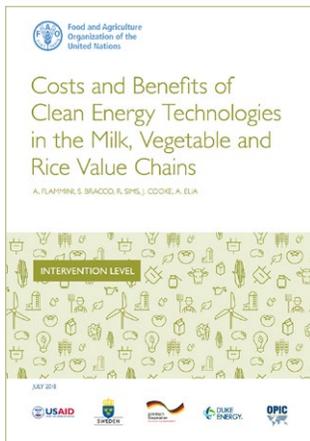
Co-Facilitated PAX Powering Agriculture Webinar. As part of the two-part webinar series on building and keeping a high-impact team, gender was a focus of the discussion in relation the topics of addressing diversity and inclusion best practices, challenges, and tools in recruitment and retaining good talent.

3.3 Knowledge Management

Powering Agriculture continued to produce numerous publications and studies (described below) to reinforce the generation, analysis, dissemination, and application of knowledge on the clean energy/agriculture nexus. These resources serve to further promote the integration of clean energy solutions within agricultural supply chains, and to support the adoption of clean energy solutions in the developing country context. Through the Powering Agriculture Hub in East Africa, the project further works to mainstream knowledge gained from the implementation of Powering Agriculture.

3.3.1 Research and Studies

Powering Agriculture has released the following publications and videos during the reporting period:

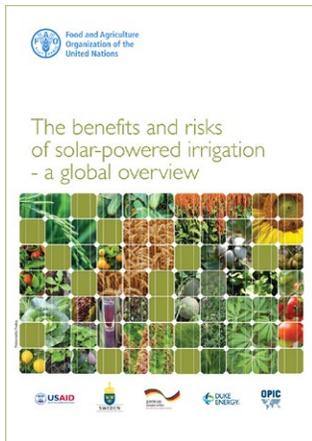


Costs and Benefits of Clean Energy Technologies. FAO and Powering Agriculture Partner GIZ developed the report “The Costs and Benefits of Clean Energy Technologies in the Milk, Vegetable and Rice Value Chains” (Part I: Intervention Level). The report is the follow-up study of the 2015 report “Opportunities for

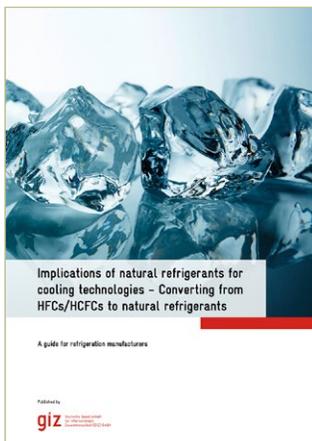
Agrifood Chains to become Energy-Smart” and presents six case studies on different clean energy technologies in three value chains (milk, vegetables, rice) in Kenya, Tanzania, Cambodia, and Papua New Guinea. The case studies include a feasibility analysis of the specific costs and benefits associated with each technology. The study can be accessed here: <https://poweringag.org/docs/costs-benefits-clean-technologies-milk-vegetable-rice-value-chains>. Part two of the series (“Impact at Scale”) is forthcoming.



Policy briefs on Costs and Benefits of Clean Energy Technologies. These 6 briefs on different value chains in Tanzania, Kenya, Tunisia, and the Philippines summarize policy recommendations from the Powering Agriculture Partner GIZ and FAO study “Investing in Sustainable Energy Technologies for the Agrifood Sector”. The briefs focus on the milk, vegetable, and rice value chains. Technologies analyzed range from milk chillers and coolers to biogas digesters for power generation, as well as solar cold storage and water pumping. Find the briefs here: <https://poweringag.org/resources>



Global Study on Solar Powered Irrigation Systems. FAO and Powering Agriculture Partner GIZ joined forces to analyze the evolution and current challenges of SPIS in the study “The benefits and risks of solar powered irrigation – a global overview”. To understand how different countries promote and manage solar-powered irrigation systems, the study presents one state and six country profiles (California, India, Kenya, Mexico, Morocco, Nepal, and Senegal). It further develops recommendations for research and development, capacity building, and structural support needed for further uptake of solar irrigation worldwide. The study can be accessed here: <https://poweringag.org/docs/benefits-risks-solar-powered-irrigation-overview>



Implications of natural refrigerants for cooling technologies. Powering Agriculture Partner GIZ published the study “Implications of natural refrigerants for cooling technologies – Converting from HFCs/HCFCs to natural refrigerants” in cooperation with the GIZ Project Proklima. The guide for refrigeration manufacturers provides arguments for changing to natural refrigerants in energy efficient systems and analyzes the regulatory landscape in the refrigeration sector. The study is available here: https://energypedia.info/images/5/58/Implications_of_natural_refrigerants_for_cooling_technologies.pdf



Introductory Video Clips on Solar Powered Irrigation Systems (SPIS). Powering Agriculture Partner GIZ has released eleven videos on financing, site selection, installation, sizing, operation, and maintenance of solar powered irrigation systems. The clips visualize all aspects of SPIS with simple drawings and audio-visuals. To increase accessibility, selected clips are also available in Hindi and Bengal. The videos can be viewed here: <https://www.youtube.com/playlist?list=PLk8fstMXjJFWgNnW9zX4LxPsCeJz0puKX>



Video: Solar Milk Cooling in Siaya County. Powering Agriculture Partner GIZ has published a video on a dairy farmer’s experience in Siaya County in Kenya. The video looks at the dairy farmers’ challenge not to sell spoiled milk and proposes the solution of solar milk cooling to preserve the milk. The video is accessible here: <https://poweringag.org/news-events/video/solar-milk-cooling-siaya-county-kenya>

3.4 Partners Meeting

The annual Partners Meeting was held at the Sida headquarters in Stockholm, Sweden, on April 24-25, 2018. Representatives from Sida, GIZ, and USAID attended. Representatives from PASTO, PAX, and the new Powering Agriculture Investment Alliance partners, Factor[e] and AlphaMundi, joined for select sessions. The purpose of the meeting was to discuss program progress to date and future implementation decisions. With respect to the latter, the Partners spent an additional day, April 26, discussing Powering Agriculture post-2019 and plans for a new initiative that would encompass the water, energy, and food nexus (see Looking Forward section for additional information).

Key presentations/discussions included:

- Overview of new organizational structures at Sida. The Global Economy and Environment Unit (the unit that previously managed the PAEGC) has been divided into two: the Unit for Globally Sustainable Economic Development (GLOBEC) and the Unit for Global Cooperation on Environment (GLOBEN). PAEGC is now funded and managed by GLOBEC.
- GIZ's "in kind" contributions (hubs, market studies, knowledge management, and FAO work). In particular, GIZ updated the partners on a Solar-Powered Irrigation System Toolbox that it developed in FY18 and will actively promote and disseminate over the remainder of the Program.
- Continued technical program support work administered by PASTO and PAX
- Progress of the Powering Agriculture innovators and measures of their success
- The Powering Agriculture Investment Alliance (developed in FY18), including lively

discussions with representatives from the Investment Alliance Partners, AlphaMundi and Factor[e]

- Experiences and lessons learned from GIZ's Regional Nexus program
- Plans for a final program evaluation of Powering Agriculture.

The Partners agreed on several of key points over the course of the meeting. These included:

- The Partners will be involved in Sida's evaluation of Challenge Funds as a working method. The focus of the evaluation is Sida's and Sida's partner organizations' methods and management of Challenge Funds rather than looking at impacts. Sida will share the draft report, as well as the final report, and invite Partners to participate in a workshop.
- Powering Agriculture will develop a final evaluation that focuses on outcomes and impacts. It will take a bottom-up perspective, understanding how the portfolio of innovators have achieved program-level results.
- The studies conducted as part of the knowledge management activities of Powering Agriculture should to a greater extent be reflected in the Powering Agriculture reporting.
- USAID will scope venues/approaches for a final Powering Agriculture event to be held in the latter half of 2019.

Partners may draw on pooled funds to bridge the gap between the end of Powering Agriculture in December 2019 and the commencement of any follow-on program and provide necessary administrative support for the Investment Alliance, primarily around communications and M&E.

The top half of the page features a blue background with a stylized illustration. On the right, a white sun with a halo is positioned above a dark blue silhouette of a classical building with a pediment and columns. In the foreground, there is a white solar panel on a stand and green silhouettes of crops like corn. A yellow curved line separates the blue header area from the white body of the page.

4 FINANCIAL INFORMATION

The following financial information on Powering Agriculture's budget, contributions, and disbursements is confidential and limited for distribution only to the Powering Agriculture Partners.



5 LOOKING FORWARD

As Powering Agriculture moves into its final year of implementation, a number of activities are planned to usher this phase of the Program to a close and capture key experiences and lessons learned. At the same time, the Powering Agriculture Investment Alliance is ramping up and will continue to catalyze investment in the energy-ag nexus through 2021. Additionally, the Partners are in the planning stage for a follow-on program, Water and Energy for Food (WE4F), that seeks to capitalize on the progress and lessons learned from Powering Agriculture and its sister Grand Challenge, Securing Water for Food.

Powering Agriculture plans to implement the following major activities over the next financial year of October 2018 to September 2019:

- **Site visits to remaining Powering Agriculture Innovators:** A majority of Powering Agriculture innovators will have concluded their projects by September 2019. Each Innovator receives a site visit to verify project progress and capture additional lessons learned. All of the 2013 cohort and a handful of 2015 innovators have received a site visit. The remainder will be visited over the course of the coming year.
- **Powering Agriculture Final Event:** Powering Agriculture will plan a final event to showcase the program and provide a culminating learning experience for innovators. The program anticipates dovetailing this with a widely-attended related event such as SOCAP, to promote visibility and external networking opportunities for innovators.

- **Powering Agriculture Final Evaluation:** Powering Agriculture will develop a final evaluation that focuses on outcomes and impacts. It will take a “bottom-up” perspective, understanding how the portfolio of innovators have achieved program-level results.
- **East Africa Hub Activities:** The 2019 focus of the GIZ Hub will be on consolidating results of various activities: the Hub will roll out specialized training packages for technical staff in all factories of the Kenyan Tea Development Agency; it will institutionalize SPIS toolkit courses in mainstream academic institutions in East Africa; and it will promote local manufacturing of small-scale solar refrigeration systems. From mid-2019 onwards the Hub will be reorganized to take over the WE4F management in East Africa.

Post 2019 and Beyond

Building on significant learning and investments in the energy-ag and water-ag nexus, planning is underway for a follow-on international initiative called Water and Energy for Food - WE4F.

The objective of WE4F is to scale innovations that provide the critical inputs of energy and water for food production in the developing countries, in order to increase the sustainability of agricultural food value chains. Specifically, the WE4F program strives to achieve the following impacts:

- Increase food production through a more sustainable and efficient usage of water and/or energy
- Reduce greenhouse gas emissions per food unit produced

- Increase incomes for women and men in both rural and urban areas
- Scale new innovations in the WE4F nexus
- Increase customer demand for newly developed products or services of the innovators

To achieve these impacts WE4F will work to:

- Improve the capacities of innovators supported
- Mobilize external funding for innovators
- Strengthen the enabling environment for innovators and relevant stakeholders in the targeted regions

It is envisioned that the program will operate out of regional hubs to better reach local actors and be responsive to geographical differences. To maximize the potential of selected innovations to reach scale, the regional hubs will provide a combination of grant funding, technical support, and investment facilitation. At the same time, the regional hubs will work closely with local, national, and regional institutions and networks to promote an enabling environment for private sector entrepreneurship and innovation in the countries and regions of implementation (local policy level).



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