

INNOVATOR GUIDEBOOK:

Navigating Business Models for
the Bottom of the Pyramid in
Water and Energy for Food

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ACRONYM LIST

AI	Artificial Intelligence
BOP	Bottom of the Pyramid
CSM	CleanStar Mozambique
CSR	Corporate Social Responsibility
DIV	Development Innovation Ventures
DRC	Democratic Republic of Congo
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
HCD	Human-Centered Design
KPIs	Key Performance Indicators
Lab	U.S. Global Development Lab
M&E	Monitoring and Evaluation
MNCs	Multinational Corporations
MFI	Micro-Finance Institutions
NGO	Nongovernmental Organization
OECD	Organisation for Economic Co-operation and Development
PAEGC	Powering Agriculture: An Energy Grand Challenge
ROI	Return on Investment
SDG	Sustainable Development Goal
SME	Small and Medium Enterprise
SMS	Short Message System, also known as text message
SWFF	Securing Water for Food
USAID	United States Agency for International Development
USD	United States Dollar
WASH	Water, Sanitation, and Hygiene
WE4F	Water and Energy for Food



PIONEERING BUSINESS MODELS FOR THE BOTTOM OF THE PYRAMID IN WATER AND ENERGY FOR FOOD

In the nexus of water and energy for food (WE4F) in emerging markets, innovators are pioneering creative business models that improve the lives of communities in the bottom of the pyramid (BOP) while generating profit to scale further and accelerate their efforts. Working in the BOP market segment in rural communities is difficult. Despite an estimated worldwide market size of four billion people, it is difficult to capitalize on the potential of the bottom of the pyramid—especially in farming communities—due to a myriad of factors ranging from poor roads and ability to pay to lack of information about the customer’s needs, interests, and desires.

Entrepreneurs Find a Way

Entrepreneurs across the world are finding ways to overcome these complex business challenges using innovative business models that increase farmer incomes, increase the efficiency of water and energy in each unit of food produced, and create job opportunities across new value chains.

While the Silicon Valley startup community has Eric Ries’ *Lean Startup* principles and Peter Thiel’s *Zero to One* findings, WE4F pioneers do not have one clear approach on how to scale business models. The biological considerations in agriculture production and the time it takes to test and iterate products for farming are quite different from a lifestyle-based app. While there are innovations at scale in the agriculture sector in developed markets, lives are dependent on successful harvests in BOP markets, so approaching business models should be done with the greatest care. Entrepreneurs need to have a deep understanding of the dynamics within a BOP ecosystem to be successful.

Formalizing Innovator-to-Innovator Learning

Without a standardized methodology, entrepreneurs are learning from many different sources, especially from each other on the sidelines of innovation challenges and conferences and through one-on-one video calls. During these peer-to-peer exchanges, innovators discuss a range of different tools and tactics, such as how to best set up distribution channels in areas without paved roads, managing small manufacturers operating in the informal economy, and how to retail products and services across a wide, hard-to-reach geographic area. They talk about what has worked; which difference-makers they met; and equally important, their lessons learned from failures.

These discussions are valuable but limited to the select few who are fortunate enough to have access to them. If the world is going to meet the Food and Agricultural Organization’s (FAO) requirement to double the world’s food supply by 2050, the number of successful entrepreneurs in WE4F must grow. This growth is even more important for the BOP, where the agriculture sector employs 65 percent of poor working adults; however, globally, this sector only accounts for just 6.4 percent of the global gross domestic product (GDP).

Goals of the Innovator Guidebook

Based on extensive secondary research and over 30 interviews with entrepreneurs, the goal of this Innovator Guidebook is to capture and frame these peer-to-peer exchanges around business models designed for the bottom of the pyramid in Water and Energy for Food. This resource is not a step-by-step manual, but curation of key considerations, lessons, and tools to help innovators think through the different dynamics and challenges when designing, testing, or accelerating a business model within this context.

This guidebook is designed to introduce current and future innovators to different tools, tactics, examples, and resources. Drawing from many relevant and proven tools and tactics from the business and development communities, innovators will learn how these lessons and resources that can be adapted to strengthen business models designed for the BOP in the WE4F context.

EMERGING MARKETS SPEND MUCH MORE ON LABOR FOR LESS GDP THAN MATURE MARKETS

Country	Population (in millions)	Labor % in Agriculture	Agriculture as % of GDP
India	1300	47%	15%
USA	329	.7%	.9%
Indonesia	262	32%	14%
Pakistan	207	42%	24%
Nigeria	203	70%	21%
Bangladesh	159	42%	14%
Ethiopia	108	72.7%	34%
Australia	32	4%	4%

An Experience-Based Resource Guide to Navigating Business Models for the Bottom of the Pyramid in Water and Energy for Food

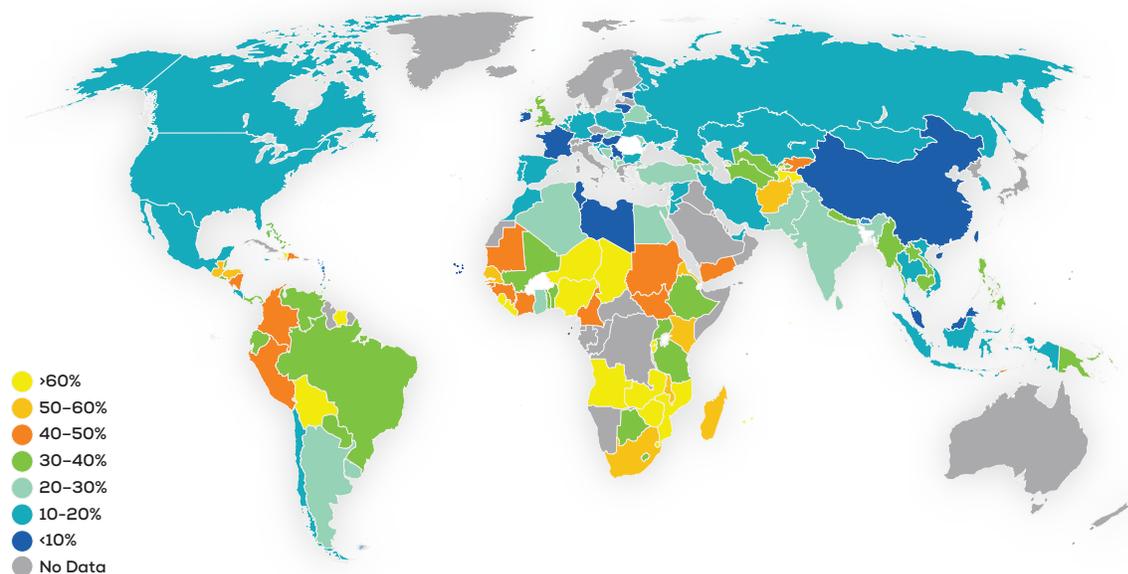
While designed primarily for innovators and entrepreneurs, this guidebook is also designed for donors, implementing partners, investors, and service providers (e.g., incubators and accelerators) that believe in the power of enterprise-driven solutions as part of the answer to complex WE4F development challenges in emerging markets. This guide is specifically designed for readers to turn to the sections most relevant to their needs.

As you apply the lessons learned in this guidebook, we encourage you to experiment, learn, and—most importantly—share your successes and failures with the broader community through blogs, social media, over coffee, and through the formal proceeding and on the sidelines of events. Each step will take us toward alleviating poverty, raising farming incomes, and producing food that is more energy- and water-efficient.

Hold On, Who Exactly is the BOP?

The bottom of the pyramid (BOP) is a socio-economic group that consists of four billion people who live in relative poverty with annual incomes below \$3,000 in local purchasing power. Their incomes in current U.S. dollars are less than \$3.35 a day in Brazil, \$1.89 in Ghana, and \$1.56 in India. Together, the BOP has the potential to be a \$5 trillion global consumer market.¹ By industry, the food sector is valued at \$2,900 billion for the BOP market, significantly larger than any other industry, such as water (\$20 billion), information and communication technology or ICT (\$51 billion), health (\$158 billion), transportation (\$179 billion), housing (\$332 billion), and energy (\$433 billion).²

POPULATION LIVING BELOW NATIONAL POVERTY LINE



This socioeconomic group is exceptionally diverse (encompassing different languages, gender norms, needs, purchasing power, etc.) and includes both the very poor and the working poor. Our research indicates that targeting the working poor is often strategic for innovators operating in these markets. In BOP communities, these individuals typically have slightly higher incomes, education, and assets that position them as early adopters to new business models and technologies. Early adopters can influence the purchasing habits and behaviors of the rest of the community. From a business perspective, many innovators reported that the working poor provide a greater chance for a return on investment (ROI) and building a profitable, sustainable business than starting by engaging with extremely poor customers.

When working with the BOP, it is important to keep in mind that while we often think of poverty in terms of limited resources, there are multiple dimensions that a business should take into account: resources, opportunities, power, voice, and human security. To effectively serve BOP populations, entrepreneurs should consider not only their customers' ability to afford a product or service, but also how constraints related to insecurity, marginalization, or control of household or community resources affect their ability to access a product or service and use it to improve their standard of living.³

1 ["The Next 4 Billion: Market Size Business Strategy at the Base of the Pyramid," International Finance Corporation. The World Bank Group. Web. 18 June 2019.](#)

2 ["The Next 4 Billion: Market Size Business Strategy at the Base of the Pyramid," International Finance Corporation. The World Bank Group. Web. 18 June 2019.](#)

3 ["SIDA Poverty Toolbox," Swedish International Development Cooperation Agency. Web. 27 June 2019.](#)



TACKLING THE CHALLENGES OF POVERTY THROUGH MARKET-BASED INNOVATIONS

OECD Secretary-General Angel Gurría said, “Modern economies are built with ideas and knowledge, as much as with capital and labor.”⁴ Innovation drives not just economic growth, but also poverty alleviation as new products and services drive productivity gains, which increases incomes and decreases the cost of living. The same holds in the WE4F sector. Innovation increases crop yields, decreases the cost of inputs, and mitigates risks related to weather, pests, and disease, ultimately making smallholder farming more lucrative and less precarious.

The initial poverty alleviation evidence from innovation programs focused on helping social entrepreneurs reach the BOP, like Securing Water for Food (SWFF) and Powering Agriculture (PAEGC), is making a difference for millions of people in the BOP. From the U.S. Agency for International Development (USAID) data alone, there are many promising results, such as:

- **SWFF** spurred the dissemination of technology and practices that led to more than six million tons of food produced and a decrease of agricultural water consumption of 18.6 billion liters.
- **Feed The Future** (FTF) has supported the deployment of over 900 innovations resulting in \$2.6 billion in incremental agricultural revenue gains by smallholder farmers. While not innovation-focused, FTF estimates over 23.4 million people have been moved above the poverty line with poverty rates declining by 20 percent in the areas in which they work.
- **PAEGC** grants spurred an additional \$38.23 million in investment funding for BOP-targeted innovations from third-party investors. PAEGC installed 1,908 kilowatts of clean energy generation projects targeting the agricultural sector.
- **FTF Partnering for Innovation** helped businesses access hard-to-reach agribusiness markets, leading to \$65 million in sales and reaching 1.4 million smallholder farmers.

Market Creating Innovations Defined: Innovations that serve people for whom either no products existed or existing products were neither affordable nor accessible can spur the development of entirely new markets, raising domestic revenue for the state and creating thousands of new jobs through complex chains of reactions.

Market-creating innovations have the power to transform value chains associated with the water and energy for food nexus. They can lead to the development of new distributors, manufacturers, and retail outlets that lead to new employment, taxable revenue for the government, and development of new infrastructure.

⁴ Gurría, Angel. “Globalisation and Rising Competition: Challenges for the Czech Economy.” *Organization for Economic Cooperation and Development (OECD)*, 24 Apr. 2008. Web. 14 June 2019.

The microfinance industry, for example, makes credit accessible to a population previously considered too risky to be considered for lending. In addition to creating accessible loans, this innovation led to the development of thousands of financial institutions and tens of thousands of jobs, and facilitated the growth of other industries whose products and services suddenly became accessible to low-income microfinance customers. Altogether, supporting market-based innovations has the power to spur complex reactions within emerging markets that not only increase income for the BOP, but also make the overall economy more resilient.

Overcoming Food Insecurity with Innovation

Current agricultural practices cannot keep pace with the increased demand for food as the global population increases over 27 percent from 7.7 billion people to 9.8 billion. Expanding more land for farming and improving agricultural inputs will not generate the same return the world witnessed under the Green Revolution in the 1950s and 1960s. The challenges facing food production are much more complicated today. We need to increase yields with less land while also finding new methods to connect farmers to sustainable energy and water resources. The design, testing, and acceleration of new technologies and practices must be done to meet the exponentially growing demand for sustainably-produced food.

While many governments, multilateral institutions, and nongovernmental organizations (NGOs) are concerned about growing food insecurity, many entrepreneurs worldwide believe there are immense business opportunities in tackling these complex challenges. These entrepreneurs are rolling out products and services that boost agricultural productivity and resiliency while also increasing the incomes of farmers in the BOP and raising their social standing and access to additional resources. The donors supporting the Securing Water for Food Grand Challenge recognize that even small increases in earning power can represent a substantial increase in individual farmers' economic well being.

THE BOP MARKET: RESILIENT AND CREATIVE

Due to their social and economic context, the BOP does not initially jump out as a hot market for entrepreneurs in more established markets. However, as C.K. Prahalad first introduced in his 2004 landmark book, *The Fortune at the Base of the Pyramid*, when aggregated, the value of the market is quite significant, totaling \$5 trillion today with a market size of approximately four billion people.⁵ In line with Clay Christensen's *Innovator's Dilemma* theory, competition in this market is also favorable in that some products and services are not competing with established competitors but with the status quo, such as traditional ways of fertilizing crops. Despite this opportunity, accessing the BOP market is difficult and arguably much more complex than working within established markets that have proven business models.

In agriculture with rural areas lacking services commonly available in cities, the challenge is even more daunting. Lack of or poor infrastructure, cold chain systems, logistics companies, and mountainous terrain are just some of the challenges facing distribution. In manufacturing, many innovators work with small enterprises operating in the informal sector that may lack the equipment, staff, and skills to produce standard quality parts and products at volume within a short time-frame. Others are challenged by bureaucracy, levies, and transport costs to import parts. In retail, entrepreneurs struggle to learn how to market their solutions to customers in areas that are hard to reach, cover a wide geographic area, or have embedded socio-cultural barriers that limit marginalized groups (e.g., women, certain ethnic groups) from voicing their needs to external stakeholders.

Innovators continue to find ways to overcome these challenges as they recognize they could be the first mover to introduce their product or service to the BOP market. They see opportunity while others see a myriad of problems. In Bangladesh, EnerGaia—in collaboration with USAID—identified marginalized women in rural BOP communities who are typically cut out of farming and market activity as potential spirulina producers. Local companies are taking advantage of open source technology, can adapt quickly to local market conditions, and have the insider knowledge to adapt to the local context. One survey indicated that 73 percent of executives at large multinational corporations (MNCs) view local businesses as more effective competitors than other MNCs in emerging markets.⁶

The savviest innovators are pioneering business models for the BOP as proven models may not exist. They have the opportunity to potentially create lifetime customers, especially if they can improve a farmer's income. There are an increasing number of innovators targeting the BOP but there is a wide range of entry points so direct competition is often limited if not rare. Emerging markets are bustling with entrepreneurs who are finding smart ways to overcome challenges in the WE4F nexus with innovative

5 Carney, Brian, "Estimated BOP Market by Sector." World Resources Institute. Oct 2008.

6 Santos, Jose. "Why Local Companies are Winning in Emerging Markets." *INSEAD Knowledge*. 28 Jan 2016. Web. 18 June 2019.

business models that increase a farmer's income by lowering the cost of inputs, increasing agricultural productivity, and/or connecting them directly to buyers.

Developing relationships with BOP customers also opens doors for the distribution of future products or services. For example, Ghanaian firm Burro took advantage of its market presence to move beyond selling rechargeable battery subscriptions to an expanded product line including irrigation pumps, solar systems, and food processing equipment.



COMMON BUSINESS CHALLENGES, UNIQUE SOLUTIONS

In each country, the BOP market segment is distinct and unique, but there are common barriers to sustained growth throughout emerging markets. Many innovators struggle to introduce and retain BOP customers in rural communities due to the following barriers:

Ability to Pay: Technology and equipment to increase agricultural productivity are often capital intensive and difficult for BOP farmers to afford. Moreover, farmers' annual income is often earned entirely during harvest seasons, then spent over the intervening months, making large-scale purchases a risky financial step. As low-income consumers, their challenge is a lack of access to finance driven by a perceived lack of creditworthiness by large-scale institutions or the high transaction costs. Ultimately, this may render small-scale loans unprofitable for large institutions. Successful BOP enterprises must find ways for farmers to afford their product or service through organizing customers to enable volume discounts. For example, a water stress data service may look to sell to a farmer cooperative instead of individual farmers to spread data capture costs across enough farmers. The cooperative can afford the service, the farmers benefit from the new data, and the business captures a profit.

BOP consumers in developing countries are sometimes accustomed to receiving assistance for free. This "beneficiary mindset" can make it difficult to convince them something is worth paying for. Innovators must clearly demonstrate the value for money of the product or service and understand that partnerships with donors or governments that give your product away for free may have an adverse effect on your target customers' willingness to pay in the future.⁷

Unfamiliarity with BOP Customers: Knowing your customer is one of the most fundamental prerequisites to a successful business, but also one of the easiest to overlook. This is particularly true at the BOP, where customers often have values and priorities that differ dramatically from wealthier counterparts. The table below shows how these two groups differ:

BOP Customers	Middle Class Customers
<ul style="list-style-type: none">• Prefer to save first and spend more later• Define cost effectiveness by price and flexibility• Rely on word-of-mouth and branding to gauge reliability and quality	<ul style="list-style-type: none">• Prefer to spend more at first and save later• Define cost effectiveness by price and quality• Are willing to take small risks on purchasing untested but promising products and brands

7 Casado Caneque, Fernando, and Stuart L Hart. *Base of the Pyramid 3.0*. 2017. Greenleaf Publishing.



Collecting data from a large number of people presents both logistical and socio-cultural challenges. Poor roads and low population density make it difficult to reach enough people with a market survey. Potential customers may not be willing to trust or share feedback and experiences with people they do not know, even when presented with how a new product may help them. Smallholder farmers think carefully before purchasing new products or trying new practices because their livelihoods depend on making smart calculated investments. In addition, unfamiliar markets challenge innovators to correctly price their products and services and forecast revenue.⁸ For example, a contract farming business model could lose revenue, if they miscalculate local market prices for key crops.

Scaling Challenges: Despite an overall large value of over \$5 trillion, the BOP market is highly fragmented and unique, comprised of different cultures, languages, needs that are different from one location to the next. This complexity means that classic scaling strategies, most coming from the technology sector in developed economies, will either not work, or need significant adaptation for the BOP context. For innovators looking to unlock the market power of the BOP, there are many models focused on high volume, low margin sales. This model can and has worked for some, but the solution must incorporate and address multiple unique economic, social, political, and cultural variables in each market.

Distribution: BOP business models in WE4F sectors typically face high distribution costs, particularly when operating in the agricultural sector across rural areas. Customers are widely distributed, difficult to reach, and accessible only through underdeveloped logistics networks. Because smallholder farmers typically live in thinly populated communities, traditional distribution strategies incur substantial costs in order to reach a relatively small number of customers. Similarly, unreliable or poorly maintained infrastructure—roads, power, water, etc.—in BOP contexts can lead to unanticipated or unmanageably high operational costs.⁹ Innovators have overcome this challenge by tapping into creative distribution networks, such as donkeys, porters, and motorbikes. In northern India, the *New York Times* covers how [Amazon.com](https://www.amazon.com) has recruited hundreds of small motorbike-based logistics companies to sell its products in the country's hard-to-reach Himalayan region.¹⁰

8 MacMillan, Ian C., and James D. Thompson. "The Social Entrepreneur's Playbook" Wharton Digital Press. 2013.

9 MacMillan, Ian C., and James D. Thompson. "The Social Entrepreneur's Playbook" Wharton Digital Press. 2013.

10 Goel, Vindu. "Delivering Amazon Packages to the Top of the World." *The New York Times*. 2 July 2018. Web. 18 June 2019.

DISTRIBUTION ACTORS IN EMERGING MARKETS

Channel	Definition	Example
Wholesalers	Marketing intermediaries who sell your product in exchange for a fee or commission	Individuals who purchase fertilizer from factories and sell to brokers, retailers, and contractors in a set of communities
Brokers/ Agents	Marketing intermediaries who purchase products in bulk and sell to retailers or contractors	Individual who sells microinsurance on behalf of a larger insurance agency
Retailers	Resellers who sell products and services to the end-user	A farming equipment shop selling plows to local farmers
Contractors	Resellers who bundle products and services sold to the end-user	A small business that builds a low-tech irrigation system
Community Entrepreneurs	Trusted community members who market your product or service to their neighbors	An individual who goes farm-to-farm during planting season to treat seeds with bioensure (a product to increase resistance to abiotic stressors)
Government	Governments can act as a direct channel to end-users, by purchasing your products directly or paying you to deliver a service	A district commissioner who purchases plows and gives them to their constituents

Bureaucracy and Governance Issues: For innovators targeting the BOP in low- and middle-income countries, successfully introducing new products and services requires navigating complex local legal frameworks, socio-political contexts, and bureaucratic channels. These can be conflicting and unclear, and at times, challenges related to local politics or legality can raise significant obstacles to an innovation's success and scale. In agriculture, innovators may need to collaborate with national, provincial, and local government bodies as well as a multitude of ministries, such as Agriculture, Industry, and Commerce. Even a helpful and supportive government agency may have structures and processes that are difficult to navigate. In Myanmar, [Farm Tech's](#) solar dryer solution was off to a promising start, but the foreign registration process increased overhead costs and played a major factor into its demise.

Risk Aversion: Smallholder farmers typically operate within very thin margins. As a result, BOP consumers in agriculture are often perceived as risk-averse customers and hesitant to change established practices or invest in new technologies, even when the practice or technology is proven. This hesitation can be attributed to many different reasons impacting their behaviors and attitudes toward a solution, such as cultural barriers, social norms, ancestral traditions, and general mistrust of outsiders. For instance, smallholders may not be interested in increasing production if they do not have sufficient access to markets. Similarly, women in low-income households may be interested in pesticide storage solution to keep their children and livestock safe, but are not empowered to make purchasing decisions within the family unit.

Many innovators overcome these barriers through partnerships with trusted community insiders to minimize the customer's perceived risk associated with a new product or service. Similar to behavior change communication strategies implemented by NGOs and donors in these markets, these approaches build trust and support from the bottom-up within the targeted communities. In Ethiopia, [Aybar Engineering](#) worked with the trusted Ministry of Agriculture to host a series of six plowing competitions that demonstrated the value of their plow. As a result, they sold over 500 plows at the competitions.

Exogenous Factors: Unanticipated disease, violence, political instability, and inclement weather can quickly wipe out gains from BOP adoption of an innovation in agricultural value chains.¹¹ A farmer who purchases a product or service only to see their crops fail may be unwilling to make future purchases. Even if the new service had no bearing on the crop failure, a farmer may not want to invest in an activity whose output is beyond their control. MicroEnsure recognized this vulnerability and introduced affordable protection for BOP customers, including micro-health, political violence, crop, and mobile insurance.

These barriers inhibit the spread of innovation and challenge entrepreneurs serving the BOP, but they are far from insurmountable as many of the companies cited in this guidebook demonstrates. At the same time, many ventures targeting the BOP market have failed, but generated important lessons from their experiences.

11 *"Growing Prosperity: Developing Repeatable Models to Scale the Adoption of Agricultural Innovations," Bain & Company, Inc. and Acumen. 2014. Web. 14 June 2019.*



LEARNING FROM FAILURE

Failures, setbacks, and necessary pivots are inevitable when trying to develop new solutions for new markets, especially rural communities in emerging markets. Unfortunately, many of these stories are only shared informally among disappointed investors, entrepreneurs, and donors. On-demand tractor companies failed because they overlooked that their target customers all need tractors at roughly the same time. Similarly, promising businesses suddenly shut down due to foreign registration woes or over-dependence on grant funding.

Failing is hard, but many investors believe that these failures are actually assets on a founder's resume because the lessons learned are tremendously helpful to inform future decision-making.¹² With this in mind, this section discusses two cases studies of agritech businesses in Africa that started off quite strongly but then ultimately failed. [CleanStar Mozambique](#) shows how a company was doing everything right to meet the needs of its customers and stakeholders in Mozambique, but despite early successes, the decision to concentrate its services and products led to its downfall. In another case, [Mobisol](#) developed a suite of BOP-targeted services in rural communities, but lack of knowledge and understanding of their customer needs and market led them to insolvency.

From Glory to Liquidation: CleanStar Mozambique

Following a USAID research experiment in 2005, CleanStar Mozambique (CSM) launched in 2007 to increase food and energy security among smallholder farmers. The social enterprise aimed to offer alternatives to charcoal-based cooking that contributed to deforestation. CSM sold cookstoves and biofuel based on cassava sourced from smallholder farmers. CSM realized that to be successful, they had to integrate their business within a complex agroforestry ecosystem. Selling the cookstoves generated additional income for smallholders, and biofuel from cassava produced from the bottom up looked to mitigate the problems of climate change and deforestation.¹³

Within its first five years, CSM had over 1,000 farmers and raised over \$21 million from institutional partners and investors, which included expansion and the building of a new ethanol-based cooking fuel production facility.

By 2013, CSM's success had led to a new round of investments, which seemingly prompted changes to its business model. The company adopted a new name—NewFire Africa—and a new focus on cookstove and biofuel sales while they suspended agro-forestry work and ethanol production. This decision to limit revenue sources and focus on addressing the needs of the BOP in just one part of the ecosystem played

12 Zach, Zachi. "Why Investors Love Failed Entrepreneurs." CTECH. September 2017.

13 Casado Caneque, Fernando, and Stuart L. Hart. *Base of the Pyramid 3.0*. 2017. Greenleaf Publishing.

a major part in the eventual liquidation of NewFire Africa two years later.¹⁴ Altogether, CSM is a cautionary tale, adding to the long list of failed BOP ventures that attempted to operate rural communities in emerging markets, but ultimately failed due to their inability to respond to the complicated dynamics at play in the broader ecosystem.

Mobisol Grows to Insolvency

Starting with the simple pay-as-you-go solar home system prototype in 2011, Mobisol aimed to help alleviate poverty by providing sustainable and affordable energy solutions. The enterprise provided households and micro-enterprises with solar systems and grew quickly in the African business environment.¹⁵

Mobisol grew rapidly into a global enterprise with over 750 employees and 85,000 customers spanning 12 countries. A pioneer provider of household and micro-enterprise solar systems, Mobisol raised \$90 million from investors such as the International Finance Corporation (IFC) and the Netherlands Development Finance Company (FMO). Recently, Mobisol's product offerings included a range solar home systems; five different household appliances such as chargers, fans, and televisions; and an enterprise software system for other businesses using the pay-as-you-go model.

In April 2019, just eight years after their first prototype launched, Mobisol filed for insolvency proceedings. According to an article in the Financial Times, the enterprise held too much capital and had unfavorable unit economics that coupled with droughts and commodity price declines in key markets lead to enterprise failure. While this may seem like bad luck, many entrepreneurs from these countries attest that these inclement conditions are actually recurring features of the rural livelihood ecosystem, which is only getting more frequent with climate change in some cases. Any market assessment for the BOP should anticipate these events in their business model rather than considering them as anomalies. Some of the errors that lead to this result included rapid diversification of revenue streams without understanding customer needs, a multi-year payback system, and offering a warranty service that was heavily used in an attempt to be more competitive.¹⁶

As statistics show, the majority of startups fail, and these two tales highlight the additional complexity of meeting customer needs in rural communities in emerging markets and growing an enterprise. While no perfect solution will work in all contexts, certain attributes will increase the chances of success, including acting with intention, being flexible and coachable, integrating feedback loops, and developing a system for constant planning. To learn more about failed startups, *CB Insights* maintains a [compilation of startup failure post-mortems](#) analyses by founders and investors.**

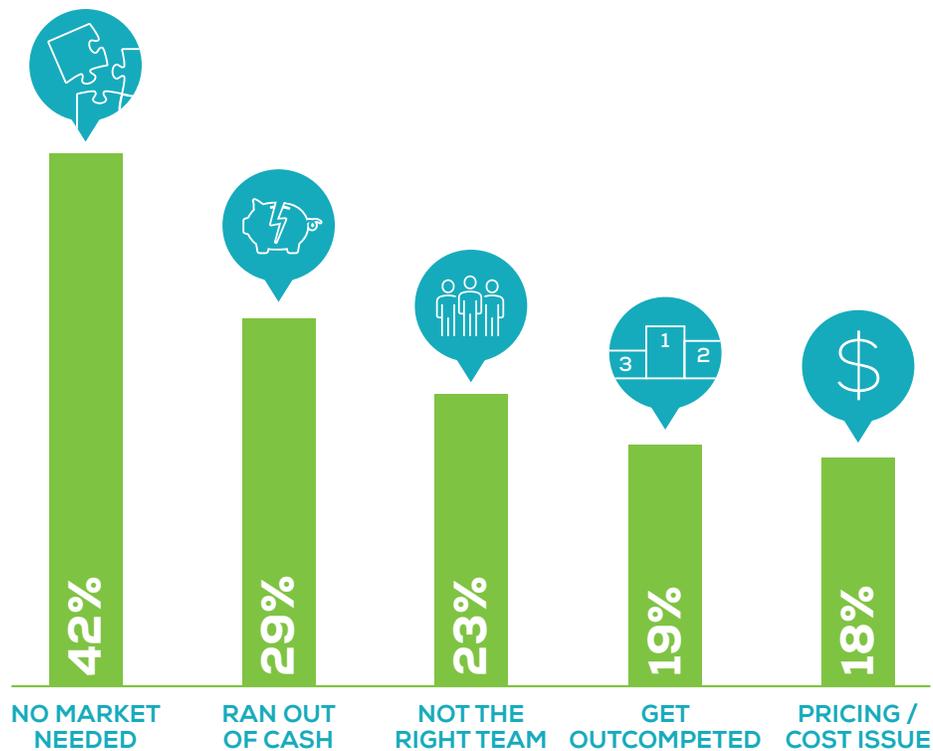
14 Casado Caneque, Fernando, and Stuart L. Hart. *Base of the Pyramid 3.0*. 2017. Greenleaf Publishing.

15 "Mobisol GmbH To Secure A Sustainable Position Through Restructuring Process." *Innovative Off-Grid Solar Solutions*. 18 Apr 2019. Web. 14 June 2019.

16 "Mobisol: A Cautionary Tale For Impact Investors." *Financial Times*. 2019. Web. 14 June 2019.



TOP FIVE REASONS WHY STARTUPS FAIL¹⁷



¹⁷ "The Top 20 Reasons Startups Fail." CB Insights Research. 2 Feb 2018. Web. 14 June 2019.



UNCOVERING PATHWAYS PAST BUSINESS MODEL CHALLENGES

All innovators face unique sets of challenges based on the context in which they operate. While there are no cookie-cutter business models that will help innovators solve all of their problems, entrepreneurs working to sell solutions to the BOP in WE4F sectors face common challenges. This section highlights six common challenges—ability to pay and end-user financing, individual customer acquisition, time-sensitive service, regular maintenance required, easily mimicked, and cutting out the middlemen—and how they can be overcome by drawing from features in other business models in WE4F sectors.

While we highlight different business models below, most BOP-focused business models will need hybrid strategies to address the needs of both their customers and business operations. This just scratches the surface, so we encourage you to explore these solutions in greater detail through additional research and reaching out to the companies cited (complete list provided in Appendix D).

Problem #1: Ability to Pay and End-User Financing

Ability to pay is the most common problem for innovators selling products or services to the BOP. This challenge is one of the fundamental considerations that makes BOP-focused business models unique and there have been many innovations to help overcome the challenge, including business models that integrate pay-as-you-go, rent-to-own, leasing, cross-subsidization, government subsidies features. If you find that your BOP customers cannot afford high up-front costs for products that have a proven, positive return on investment (ROI), here are six different models you can consider that support end-user financing using:

- **Pay-as-you-go (PAYGo)** solutions replace a high-cost product with the service provided by the product. While PAYGo is known mostly from its successful application in solar home system business models, it can be applied to any productive capital inputs such as tractors, water pumps, and irrigation systems. By reconceiving a product, such as a solar home system, as the service it provides, such as electricity and light, customers no longer have to pay the high up-front cost of the product. Instead, they only pay for the service it provides (i.e., access to electricity from a solar home system) and the business receives a regular income stream. From the business's perspective, the risks are that this model requires significant upfront investment, repossessing the product can be expensive and challenging, and assets and demand must be carefully balanced to avoid retaining ownership of the products.

Claro Energy is an example of a PAYGo model offering affordable, on-demand irrigation services from a portable solar pump at no upfront capital cost.

- **Rent-to-own** models are creative consumer financing models. They are similar to PAYGo in that they replace the full upfront cost with smaller regular payments, but the difference is that the customer eventually pays off the system and ownership is transferred to the customer. The financing can be funded by either the company—or more likely—a third-party financial institution like a bank. The value of the model is that customers receive a product without having to provide the cash upfront. Companies receive regular flows of revenue while avoiding the cost of depreciation and maintenance. The risk companies need to consider is bearing the upfront costs and/or locating a third party to provide the consumer financing.

Gham Power uses a rent-to-own model for their solar water pumps in Nepal. Gham Power applies a proprietary algorithm to calculate a bankability score to determine a farmer's ability to pay and then connects credit-worthy farmers to investors who pay for the system upfront, allowing farmers to enjoy increased yield and income while being paid back their investment plus monthly interest over a three-year period.

- **Leasing** models provide customers with a product in exchange for a regular fee. The company maintains ownership of the asset. The model can be applied to high-end, portable, durable products like tractors and irrigation pumps. Similarly to the rent-to-own and PAYGo models, this model allows the company to receive a regular stream of income while the customers are able to access capital intensive, durable assets without having to pay the full upfront cost of the asset. Since the assets are owned by the company, the risk with this model is that the company is liable for theft, damage, and depreciation of the assets.

MimosaTEK provides precision irrigation solutions for many crops in Vietnam. While some of their customers are able to afford the system upfront, not all are able to afford this expense. MimosaTEK also offers the ability to lease the system, allowing them to expand their base of potential customers.

- **Cross-subsidization**, whereby there is a tiered pricing model with some customers paying more for a service or product than others, is useful when the solution is valued by both BOP and non-BOP customers. Cross-subsidized models work best when the practical element of a solution is the same across price-points, but additional value, such as a nice aesthetic, can be layered onto the basic solution and sold with a higher margin. "Within development, Aravind Eye Hospitalis perhaps the most widely recognized example of a cross-subsidy model that offers the same product—in this case, eye surgery and eye health services—to all customers, with payment based on income."¹⁸

In this solution, there needs to be enough differentiation so that the higher-end customers do not feel they are being overcharged, but how that differentiation is delivered will depend on what markets are being pursued. In South Africa, Reel Gardening cross-subsidizes its innovative biodegradable seed tape that provides optimal planting conditions for garden vegetables while using only 20 percent of the water of a traditionally-planted seed. Using a buy one - give one model, they work with community partners to provide one Reel Gardening product to a person in need for every product they sell commercially. They even share stories of the families who benefit from the donations on their social media channels to help connect their customers to the impact they are enabling.

18 Jahani, Mirza and Elizabeth West. "Investing in Cross-Subsidy for Greater Impact." Stanford Social Innovation Review. May 2015.



- **Government subsidy** models decouple the user of a product or service from the payer. In these models, the company works with the government to distribute its products—and to a lesser extent services—at a price point that is affordable for the customers with the government covering the difference. The government support helps to catalyze demand and enables customers to access products that they would otherwise not be able to afford. Models that rely on government funding are always vulnerable to changes in policy, and the government can move too slow for the market and/or company. As such, these models tend to work best where the use of the product or service is clearly tied to increased economic output and therefore potential for revenue collection by the government.

Aybar Engineering created a plow specifically for a common soil type in Ethiopia and sold them through the government with great success and fanfare. However, a change in government led to no follow-on purchase orders from the government, and they had to pivot to a market-driven model to survive.

Problem #2: Time-Sensitive Service

If your service contains time-sensitive information—such as weather forecasts—then a low-cost, technology-enabled subscription model may work well.

- **SMS delivery** of an information-driven service allows customers to receive the information in a timely manner so they can act on the information. By using technology that has quickly become widespread in the BOP, SMS-based subscriptions deliver time-sensitive information, such as an approaching storm or a drier than normal season, into the hands of the farmers so they can act on the information. The challenge with this model is that the subscription must be priced so that customers understand the value of continued use.

Ignitia delivers hyperlocal 48-hour weather forecasts to smallholder farmers in West Africa via SMS. The service is paid for by linking into the customer's existing phone credits, which they pay less than four cents per day to receive. This price point is less expensive than the cost to forward an SMS, so there is greater value in receiving the texts instead of sharing them with other neighboring farmers.

Problem #3: Individual Customer Acquisition

If you find that it is too expensive to make sales to individual customers, you may consider selling to an aggregated unit, such as a farmers' association/co-op, or linking to a business that is already serving the BOP.

- **Selling to an aggregated unit**, particularly if you are selling a product/service to smallholder farmers, is a way to gain access to multiple customers who may value your solutions. By focusing on selling to a collection of farmers, such as farmers in a co-op or in a farmers' association, a company can take advantage of the collective buying power of the group who could not afford the product/service individually, while reducing the time and energy needed to travel to individual farms. While getting the sale may take longer, the value-per-user of the contracts should be significantly higher. This model works particularly well for information services where the information is valuable to many farmers and the additional cost per farmer accessing the information is small.

After struggling to make sales of their drone-captured spatial water stress information to individual farmers, Third Eye pivoted to sell to farmers' associations with common irrigation chains. The farmers are aligned as the service allows for water savings across the water table, and the information is more efficiently captured across multiple farms at once.



The one risk to this approach is limiting the number of customers. If the business relationship with the aggregator declines or deteriorates, the company may face serious customer and/or revenue losses.

Problem #4: Regular Maintenance Required

If you find that your product requires regular servicing that is too complex for customers to conduct themselves, a subscription or share-based model may help keep the product operational over its expected lifespan.

- A **subscription or share-based model** can help when an innovation brings significant value to customers, but they do not have the technical expertise to maintain the innovation. This allows the company to receive a regular income stream, and for the customers to gain value from the innovation without having to complete technical training to be able to use it. As this model requires the company to maintain asset ownership, potential demand should be well understood before investment.

SkyFox's integrated aquaculture and crop production system helps to bring nutritious food to communities. While the crop production can be handled by farmers in the community, the aquaculture ponds require specialized skills not already found in communities. As such, SkyFox runs the aquaculture ponds themselves and uses a share-based system, where customers buy shares of fish (10 kg of fish/share) before production starts and receive the fish at harvest time. This model, similar to the Community Supported Agriculture (CSA) model popular in the United States, allows customers to access food they are unable to produce themselves, and reduces risks such as disease, disrepair, and malfunction.

Problem #5: Easily Mimicked

If you find that your innovation is easily copied or hard to protect with intellectual property, then you may consider bundling your product as a marketing add-on to existing products. If there are cut-rate alternatives you are competing with, this strategy can also help overcome the competition as the bundled products provide enough value to outweigh the additional cost.

- **Product bundling** can occur within your company, or more likely, by working with another company that is already serving your target customer group. If an innovation has high value in complementing an existing solution, then selling the innovation to the existing solution provider can make sense. The existing provider already has a distribution network in place and can bundle the solutions together to bring new value to their customers. Meanwhile, you get an impactful innovation into the hands of the customer without having to allocate resources to customer acquisition and distribution networks. The risk with this strategy is that the addition does not provide differentiated value. If the partnering company decides that the cost of your innovation is unnecessary, they may discontinue offering it to their customer base.

Shreenager, the largest aquaculture feed company in Nepal, introduced a simple bucket- and-straw technology to feed fish in 2017 that can easily be copied with a little ingenuity. Instead of focusing on sales of the feeder, they marketed their low-cost feeders to increase purchases of their feed—their main revenue source. As a result, feed sales increased by an astonishing 30 percent within one year and the government is now partnering with them to further scale the bucket-and-straw feeder solution.

Problem #6: Cutting Out the Middlemen

If you find that middlemen are hurting both producers and buyers in your targeted supply chain, then you may consider contract farming or other methods that will allow you to shorten the supply chain and work toward a more equitable distribution of value.

- **Contract farming** provides smallholder farmers with improved inputs and technical assistance in exchange for a contract to sell to a buyer at a predetermined price. Through this model, farmers can see an increase in yield from the inputs and assistance, while the company takes on less risk and receives higher quality and/or quantity of crops. In order for contract farming to work well, building trust with the farmers is paramount and the company must accurately be able to forecast future demand and crop prices. Where available, using risk mechanisms such as crop insurance can be helpful and should be explored.

In Cambodia, [Project Alba](#) offers partnerships to farmers and provides technical support, inputs, and tools at no upfront cost. They agree to buy a predetermined amount of the crop at harvest time. This quota system aligns incentives by allowing the farmers to sell any additional quantity of crop above the quota amount into local markets at current market prices.

- **Digital transactions** are a powerful tool to increase the transparency of supply chains that can help overcome socio-cultural barriers reducing opportunities and choices for BOP market segments. Mobile money platforms enable farmers to be paid directly for their crops, which increases trust and transparency. Digital financial services also make it easier for low-income households to budget, which can help take care of poverty barriers like school fees and access to health clinics. In fact in Kenya, [M-PESA](#) helped 185,000 individuals transition from subsistence farming and part-time incomes into business or retail sales.

Digital transaction platforms help poor farmers build up the data history needed to generate credit scores, such as created by [Tala](#), that can open access to finance opportunities. Blockchain applications are another method for building the transparency and trust of transactions. These can be powerful, but only when they are the simplest solution to the problem at hand.¹⁹

[BanQu](#) is an innovative blockchain-as-a-service software company focused on empowering the BOP through economic identity. In Zambia, they have partnered with Anheuser-Busch InBev in a pilot to connect 2,000 smallholder farmers to the platform. This improves Anheuser-Busch's supply chain management while creating economic opportunity for the farmers and enabling them to move from the ranks of the unbanked to the banked. [AgUnity](#), [Kiu Global](#), and [Amar Desh Amar Gram](#) are other examples of digital transaction firms that cut out the middleman in agriculture value chains in developing countries.

19 Higginson, Matt, Nadeau, Marie-Claude, and Kausik, Rajgopal. "Blockchain's Occam Problem." *McKinsey & Company Financial Services*. Jan 2019. Web. 18 June 2019.



BUSINESS MODEL STRATEGIES FOR THE BOP IN WE4F

	PAYGo	Rent-to-own	Lease	Cross Subsidization	Government Subsidy	Aggregated Unit Sales	SMS Delivery	Subscription	Product Bundling	Contract Farming
Ability to Pay	•	•	•	•	•	•	•	•	•	•
Individual Customer Acquisition					•	•	•	•		•
Time-sensitive Service	•						•	•		•
Regular Maintenance Required	•	•	•							•
Easily Mimicked				•	•				•	
Middlemen				•	•	•				•



TOOLS AND TACTICS FOR PIONEERING INNOVATORS

Businesses exist in complex economic and natural ecosystems. To succeed in BOP markets, companies need to account for the contexts in which they operate. This includes the skill level of the workforce, the state of logistics networks, and the levels of social trust, to name just a few contexts. Innovators need to think about making the product available and accessible, as well as affordable. In developing a market-creating solution for the BOP, companies often must build the infrastructure, distribution, logistics, sales, and other components of the business model as well.²⁰ This requires a broad array of tools and tactics, many of which are offered in this section..

IDE-India is one example of a firm that has carefully researched their context and integrated ecosystem awareness into their operating model. Before rolling out a new innovation, they mapped the value chain and developed a pricing strategy that allowed each stakeholder in the value chain to prosper.²¹

WE4F entrepreneurs should understand that trendy business tools and tactics do not always translate well at the BOP. While mentioned before that Eric Ries' Lean Startup is an excellent guide for software companies, this methodology does not directly align for innovators who must consider the science, the time required to grow crops, and most importantly, the survival of smallholder farmers whose livelihoods are on the line.

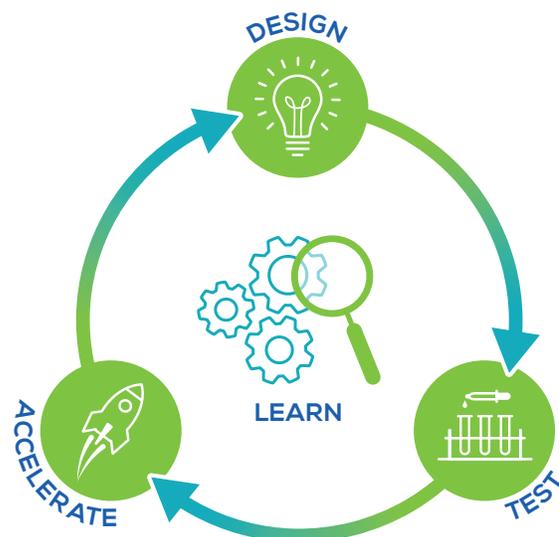
The following tools and tactics are not step-by-step instructions, but overviews of strategies and resources that may help innovators scale their solutions to the BOP in WE4F sectors. These tools and tactics are presented under the following phases:

- I. **Design:** Recommended approaches to designing a new feature to an existing solution or to creating an entirely new product or service for low-income market segments in WE4F.
- II. **Test:** Recommended approaches to validating your ideas, learning, and improving to support growth after gaining first customers.
- III. **Accelerate:** Recommended approaches to help guide business growth and expansion into new markets and customer segments.

20 Christensen, Clayton M., Ojomo, Efosa, and Dillon, Karen. *The Prosperity Paradox: How Innovation Can Lift Nations Out of Poverty*. HarperCollins Publishers. 15 Jan 2019.

21 "Paul Polak: Achieving Success at the BoP." *Business Fights Poverty*. 28 Dec. 2012. Web. 18 June 2019.

Through all three phases, it is important to bring an unbiased and growth-oriented mindset to capturing and applying the learning in your business models.



I. Design

When starting to design a new solution or add features to an existing one, customer research and outreach are critical. However, engaging BOP customers can be quite challenging due to physical barriers, such as lack of roads or communications infrastructure, and socio-cultural challenges, such as language, customs, and other social norms. Innovators often have to create the market. This means they must incorporate the different behaviors, attitudes, and interests into their rollout strategy to attract the first customers to purchase a new product or service. From the beginning, innovators must design customer retention and distribution strategies to ensure that they are positioning themselves for long-term growth. Below are key tools and tactics that may help you design new features, products, or services.

Understand the Needs of Target Customers

We learned from successful innovators, including those working with SWFF, that understanding your targeted customers' values, needs, and pain points at the design phase is critical to success. Many of these innovators have used creative approaches to get to know their customers in BOP communities, such as anthropological observation techniques, finding community brokers to collect customer research, and partnering with local NGOs. Here are some tools and tactics to help you understand your customers and their needs:

Human-Centered Design (HCD) is a process that starts with understanding the people you are designing for, and ends with the new solutions that are tailor-made to suit their needs. In the WE4F context, an HCD approach can help entrepreneurs quickly learn the realities of BOP communities and see their customers' issues and capabilities, including understanding their socio-cultural and economic challenges to accessing resources, productive employment, and social services that will help them find their way out of poverty.

After problems are identified, entrepreneurs using an HCD process imagine new solutions and new ways to implement them. They then rapidly prototype these solutions on the ground to learn and adapt to the customer needs. When there a new market needs to be created in BOP communities, this approach may be useful because the customers co-create the solution, which may help ensure an eventual market demand.

For example in eastern Congo in 2014, the American Refugee Council (ARC), with support from USAID and IDEO, used HCD methods to launch a new social services enterprise called [Asili](#), which provides health, agricultural support, potable water production, and other services at their facilities.²² At the onset of the design phase, ARC conducted extensive research into community needs and organized a number of co-creation workshops with community members to design Asili's service offering. Asili ultimately developed a "strip mall model" that enabled community members to access a subscription to Asili facilities and services at reduced prices. In 2017, Asili expanded to several communities in the Democratic Republic of Congo and had achieved its first profitable month.²³ The Asili solution continues to make an impact and was covered by an op-ed by Ben Affleck and Adam Houschild in the *Los Angeles Times* in June 2019.²⁴

If HCD may help design your solution, remember to consider the business viability of any co-created solution, as this sometimes goes overlooked.



Resources

- IDEO pioneered the use of HCD in the 1980s and has many useful tools, webinars, and classes on its website, including 57 simple design methods and case studies on HCD in action in the social sector in [IDEO's *The Field Guide to Human-Centered Design*](#).
- Deep Dialogue is an approach that entails interviewing individuals in your target market to gain obtain deep insight into their knowledge, needs, and experiences, that you can use to inform your product or service design. Deep Dialogue will help you better understand customer needs and pain points, pointing the way toward building a market for your firm. Read more about Deep Dialogue and other hands-on activities to obtain market information in the [Market Creation Toolbox](#).
- Learn how HCD can benefit farming communities in low-income countries by reading about the approach IDEO and Proximity Designs used to address a key pain point for farmers in Myanmar in this deep-dive into their [Betel Meter, a low-cost sensor project](#).
- [Why Design Thinking Works](#). This Harvard Business Review article presents research demonstrating that HCD, often referred to as "design thinking," is not a one-time tool, but a way to work and a process to innovate.

22 "Asili." *DesignKit* by IDEO. Web. 18 June 2019.

23 Adele Peters. "This Community-Run Business Creates A Sustainable Stream of Food, Water, and Health." *Fast Company*, 25 Apr 2017.

24 Affleck, Ben and Adam Houschild. "In the Democratic Republic of Congo, Foreign Aid Matters." *The Los Angeles Times*. 19 June 2019.



Map like-minded and aligned partners to help you to access and gain insights on potential customers. Consider governments, corporate representatives, NGOs, donors, global development firms, and others that may have aligned interests with your company or targeted market segment. In South Africa, [Meat Naturally](#) partnered with conservation NGOs to better understand the needs of livestock smallholder farmers. Partners like these can help unlock doors within communities, and provide credibility to conduct potential customer interviews.



Resources

- Consider conducting a stakeholder analysis to uncover the most promising partner leads. There are many available, such as [this one](#) from [Mercy Corps](#) that is designed for working in emerging markets.
- Are you considering partnering with the government to help scale your solution? [Leveraging Government Partnerships for Scaled Impact](#) by the [Innovation Investment Alliance](#) is a must-read.
- For a step-by-step guide on how to map these partners, the [Social Entrepreneurship Playbook](#) has an excellent tool on how to identify stakeholders on page 150.

Identify and engage the early adopters in BOP communities to inform your first sales and marketing efforts. Interview ideally 500 or more people in BOP communities to develop customer profiles that depict their demographics, backgrounds, needs, and interests. While each context may be different, many ventures working with BOP customers in rural communities have had success in targeting the working poor versus the unemployed very poor. These individuals are generally more affluent and have higher levels of education, which may mean they are more open to taking risks on new products or services.

While you may have some ideas of their profiles, identifying early adopters (generally 12 percent of your total market) can be difficult. In Vietnam, [MimosoTEK](#) would comb through the local newspapers to find stories about farmers testing new systems that might be interested in their internet of things-based precision agriculture solution. In Nepal, [Sunfarmer](#) engaged the head of farmer associations to identify which smallholder farmers might be open to its rent-to-own, solar-powered irrigation pump service.



Resources

- How many people should you interview? [The Sample Size Calculator](#) by Qualtrics helps you determine your ideal sample size in seconds.
- For aggregating customer survey data, many resources may fit your needs, including [Google Forms](#), [Survey Monkey](#), [Pipedrive](#), and [Salesforce](#).
- [This pipeline article](#) is a useful starting point to help you make customer profiles.

Create the Market

As you design your business model, think about the people you want to reach, how they will feel about what you're selling, and what doubts or concerns they may have. Beyond their ability to pay for the product, consider the socio-cultural barriers that may hold back adoption. For instance, do your customers have decision-making power in their household? Are there any human security barriers, such as violent crime or political turmoil that may prevent adoption? Then, figure out how you can design your offering to maximize the value they perceive and receive. A true innovation may fill a market gap, but that does not mean that a ready-made market exists? In all but the rarest cases, your customers have been living without your offering and could continue doing so.

In addition, BOP customers think long and hard before making investments in new products or services because these investments are directly correlated to their family welfare. As you think through the design and local market context, is your value proposition aligned to the needs of your customers? How do you plan on convincing these customers that the solution will increase their incomes and improve their lives? The following tools and tactics are helpful in designing solutions that take into account your customers' needs and ability to pay.

Develop a pricing strategy. As you design your product or service, can you make it affordable to the BOP or businesses serving this low-income market segment? If the price is set intelligently, there is an opportunity to generate sustainable sales and profits. Set it too high or too low, and you risk losing both customers and revenue. For the BOP, innovators may also need to consider creative end-user financing such as the aforementioned pay-as-you-go, rent-to-own, subscription, or other financing models to attract demand for a new product or solution in WE4F.

[ICU - Peru](#) recognized that smallholder farmers need water monitoring technology that is similar to what is required for larger farms, but the cost was astronomical to them at \$300,000. Working with the Massachusetts Institute of Technology (MIT), they designed a lower-cost alternative that sells for just \$3,000. It has limited features, but still addresses the core needs of the farmers. Similarly, the [Water Governance Institute](#) (WGI) developed a payment plan for its poorer farmers in which they paid 50 percent upfront and the balance after their first harvest.



Resources

- If you are looking to set the right price for the BOP market, check out the [Pricing Strategy Matrix](#) by MindTools.
- Here are [five easy steps](#) to develop price points for your business.
- For more methods and tools to monetize innovation, consider reading [Monetizing Innovation: How Smart Companies Design the Product Around the Price](#).

Map indirect competition. Even if you are a first mover to a new market, innovators may still be competing with existing alternatives or companies in other industries. For customers in the BOP, you may be competing with a new motorbike purchase, humanitarian aid, or even a new television. In making every purchase decision, buyers implicitly weigh substitutes, often unconsciously. The BOP is no exception.

In Kenya, Mozambique, and South Africa, [ITIKI](#) provides SMS weather forecasting to farmers in BOP communities. ITIKI's founder—who comes from a farming community in Kenya—knows that many farmers have generations of indigenous knowledge on weather forecasts. Instead of competing against this knowledge, she coupled it with high-tech meteorological technology and hired people from within the community on commission to build trust and uptake of the solution.



Resources

- This [Harvard Business Review article](#) walks you through different dynamics you must consider when creating a new market.
- Mapping all of these different areas of competition is also a useful exercise to further identify your comparative advantage within the marketplace. In a blog article, Steve Blank shows how to map your competition using this [visual tool](#).
- *The Social Entrepreneurship Playbook* digs into this context within the BOP in Chapter Five, which analyzes the most competitive alternative. A free copy of the book can be [found here](#).

Identify Channels to BOP Customers/End-Users

So you have identified your customer profiles and designed a product or service that is affordable and in demand. How do you get that product or service to the people it is designed for? Most companies do not sell their products directly to end-users, but use a chain, businesses, and/or intermediaries to reach the final buyer or end-user. Distribution in the BOP is a particular challenge because users are frequently based in inaccessible locations, and each actor in the distribution will add to the overall cost of the product or service. The following tools and tactics may be helpful in overcoming marketing and sales channel challenges in BOP markets:

Hub and spokes distribution sets up control distribution sites from which micro-entrepreneurs take the product to remote markets. This model gives you increased control over your supply chain but creates inventory management challenges. In rural areas in emerging markets, it may help to develop a “market map” to identify your target market and the largest town around which the surrounding area’s economy is based (e.g., the market town). This can serve as the hub, while trained microentrepreneurs can sell to farmers in the surrounding communities.

For example, [Meat Naturally](#) conducts its meat sale auctions at a central point where livestock farmers come from the surrounding area to sell their livestock to traders and buyers. Everything is provided in a central location including the scales, livestock experts, and transportation. This event has the added benefit of providing transparency on each sale while also providing additional services and products while everyone is gathered, such as training and the sale of young heifers to return with the villagers after they make a sale.



Resources

- [The Marketing Creating Toolbox: Your Guide for Entering Developing Markets](#) has a number of helpful tools and tactics including how to manage a hub and spoke distribution system.
- Undecided about switching from a traditional distribution model to hub and spoke? This [article](#) from Flex Space help you consider the pros and cons.
- The distribution power of multinational corporations may seem like a threat to local and small enterprises, but apply the lessons from this [Harvard Business Review article](#) to draw out your comparative advantage.



Location-based distribution: Consumers behave differently when purchasing expensive, durable products versus cheap consumables. Figure out where your consumers buy similar products and focus your channel development appropriately. Based on your product's anticipated cost and frequency of purchase, try to identify comparable products and determine where the product comes from. In some cases, farmers are willing to travel far to acquire a product if they believe it will improve their livelihoods. Conversely, women farmers in some countries may not be able to travel, so adjusting your distribution strategy to the socio-cultural needs of your target customers is also important.²⁵

For example, in India, durable consumer goods are typically purchased in cities by rural consumers because they consider the cost savings worth the long trip. However, fast-moving consumer goods are typically sourced locally because convenience trumps any cost savings.



Resources

- For a comprehensive and deeper understanding, check out the [Marketing Channel Strategy in Rural Markets](#) by Benjamin Neuwirth, Kellogg School of Management.
- [Activity mapping](#) is a very useful tool to identify distribution channels convenient to the daily routines of targeted BOP customers.
- For a refresher in the [different distribution strategies](#) your firm may consider, [fourweeksMBA.com](#) has you covered.

Socio-Cultural and Mobility Barriers Affect Channels to Customers: Even if the price for the solution is affordable, the mobility of BOP end-users may impact their ability to access a product or service. For example in India, a report by Bain & Company and Acumen discovered that most male farmers are willing and able to travel over longer distances to purchase a product or service. By contrast, many women farmers in Kenya are women who do not have motorized transportation and must travel on foot, which suggests that agricultural innovations need to be located nearby for them to access.²⁶

Door-to-door sales may sound expensive in the 21st century, but they have proven to be effective in targeting rural households in emerging markets. This sales model takes a high-touch approach to customer engagement and brings your product face-to-face with the community, which helps with product development, customer acquisition, and retention. In the early days of [Airbnb](#), for example, the founders went door-to-door in New York City to ask people to list their apartments and to help existing users update their listings.²⁷ If this model may work for you, consider partnering with local kiosk agents on a commission basis, hiring youth from the communities as sales agents, or aligning with influencers in the targeted BOP communities.

25 Neuwirth, Benjamin. "Marketing Channel Strategies in Rural Emerging Markets: Unlocking Business Potential." *Kellogg School of Management*. 2011. Web. 18 June 2019.

26 "Growing Prosperity: Developing Repeatable Models to Scale the Adoption of Agricultural Innovations." *Bain & Company, Inc. and Acumen*. 2014. Web. 14 June 2019.

27 "The Smart Entrepreneur's Guide to Nailing your MVP." *Zibtek*. May 2016. Web. 18 June 2019.



For example, in Kenya and with support from SWFF, [Hydroponics Africa](#) saw its sales numbers increase dramatically after it hired women from the targeted BOP communities as sales agents/lead farmers. With local knowledge of these communities, these women go door-to-door in low-income neighborhoods to speak with women about purchasing the company's hydroponic solution, which grows leafy greens at high yields with less water and space than traditional farming methods.



Resources

- If you are wondering if this tactic is for you, the [BOP Innovation Center](#) offers best practices to determine if your model is compatible with door-to-door sales.
- Door-to-door sales are also a great way to get to know your customers. Remember to [review these tips](#) before knocking on doors in your community.
- While a strong sales pitch is a necessary tool for any entrepreneur, [this guide](#) will help you or your sales agent perfect the door-to-door pitch.

II. Test

As you launch a new company, product, or service, success will depend on your ability to identify mistakes and misunderstandings and take corrective action. This phase encapsulates the process to validate your hypotheses, measure results, and identify gaps in your model, offering, or organization. When rolling out a new business or offering, use the Test phase to engage with your first customers in BOP communities. Making your product available to a small, receptive segment of the population can also help you spread awareness about the unrecognized need that your product or service can solve. For example, [Ecofiltro](#) provides ceramic water filters to schools in Guatemala. Students like the taste of the water and encourage their parents to buy these filters instead of boiling their water.

Take the time to get to know these individuals and use their insights and feedback to improve your solution and marketing strategy. Introduce yourself to local sales agents and advocates who can help promote your solution within the market. Find other aligned partners who can help fast track your growth and credibility with customers, such as NGOs, universities, and public organizations. Finally, make sure the information you gather is applied across your company. Build processes into your operation so that new information is regularly absorbed and used to improve your offering, adapt your strategy, and grow your organization. Tools and tactics that innovators have used in the Test phase of the lean startup cycle are presented below.

Marketing and Early Customer Acquisition

How you go about marketing will vary widely depending on your business model. If you sell a crop monitoring system to large agricultural cooperatives, for instance, you may not focus on a mass marketing campaign. If you sell to a mass market through local channels, you'll want your marketing strategy to complement that of your channels. The tools and tactics below focus primarily on enterprises whose offerings are ultimately used by individuals.

Understand your innovation diffusion strategy: The diffusion of innovations model categorizes the different kinds of consumers and may be useful for developing your strategy for customer acquisition. Because many BOP consumers are averse to risk, you can sell inputs like improved seeds to higher income farmers who have a greater risk tolerance. When they see the positive results, lower income farmers will be more likely to purchase the same product. In Vietnam, [Mimosatek](#) found its first paying customers by networking with the Israeli embassy and reading local newspapers to find progressive farmers interested in their precision-agriculture solution.

The table below illustrates the five types of consumers in the order of which they are likely to try your product. The bottom line is that innovators should focus early customer acquisition efforts on "high value customers" who are seen as community leaders and will encourage others to buy the same product or service.

5 TYPES OF CONSUMERS

Market Segments	Possible Marketing Strategies for the BOP
Innovators: Interested in trying new things; risk-tolerant.	High-touch marketing: Innovators may not be limited to customers, but include innovation hubs and institutions whose use of the product will educate and inspire others to adopt the innovation. They provide valuable feedback to improve the product. Universities, village chiefs, donors, and NGOs are examples of innovators.
Early adopters: Risk tolerant, but prefer proven solutions; are likely to see new innovations as a marker of prestige.	Marketing should emphasize the newness of the product while communicating the value. These customers are likely to have more financial resources. Examples include community leaders who can serve as role models for the rest of the community. In BOP communities, these tend to be individuals that are generally more affluent than their neighbors, have high social standing, and have a higher level of education.
Early majority: Not afraid of new solutions, if the product's viability is proven.	Marketing should focus primarily on the value the product offers and its reliability. The early majority may be wealthier, high-status individuals, but not necessarily community leaders.
Late majority: Conservative; willing to switch over only after the innovation has become widespread.	The late majority look for "cheap and easy" solutions. Marketing should emphasize cost competitiveness and ease of use.
Laggards: Very conservative; will resist changing unless competing options are no longer viable or are rendered obsolete.	Because laggards typically only adopt new technology once it becomes the only or easiest option, significant resources should not be committed to pursuing this market.



Resources

- Looking for a template to uncover the forces behind your customer's decisions? Check out this [two-page canvas tool](#) from [leanstack.com](#).
- This [article](#) explains how to use social media to find early adopters. In the BOP context, look for the local social media influencers that are often sharing information about agtech, life in rural communities, and other relevant topics.
- Author and startup mentor, Sean Wise, also has this [helpful tool](#) for understanding how to identify and connect with your early adopters.

Community-based marketing entails holding events that attract a broad cross-section of the community. Your company can create or leverage an existing event or location to engage directly with consumers and demonstrate your product's value. Farm demos, community fairs, and other events are all excellent marketing strategies to attract additional customers. In Ethiopia, [Aybar Engineering](#) (which provides an innovative hand plow solution) held a community plowing competition. After the fun-filled event, participants lined up to purchase the plow from Aybar. In Uganda, [Water Governance Institute](#) has an open water farm to convince people that farming fish is better and easier than fishing in the nearby overfished lake.



Resources

- The book, [Bright Lights, No City](#) is the story of a battery swapping firm in Ghana that illustrates their use of community-based marketing to scale their business.
- Check out the [International Rice Research Institute's \(IRRI\) step-by-step guidelines](#) on how to conduct impactful farm demonstrations.

Integrated Feedback Loops and Decision Points

No entrepreneur has ever started a business and done everything correctly from the beginning. Successful entrepreneurs go into business assuming they are doing something wrong and look for the chance to identify and change their mistake. As you grow, try to develop feedback loops that allow you to collect information from staff, customers, and partners. Where possible, integrate these feedback loops into your standard operations. By incorporating feedback proactively and often, you will make the process of gathering and responding to data easier and more natural.

In-depth customer research is a great way to develop a deep understanding of BOP customer needs. For example, how urgent is this need or benefit for customers? Is this something they can postpone? Is their age, caste, class, religion, ethnicity, or sexual identity influencing their adoption? Are there other factors, such as crime or political conflict that may influence adoption?

In Uganda, [Water Governance Institute](#) learned from its customers that its integrated aquaponics system, which consisted of a pond covered by a garden, was very difficult to clean due to the weight of the garden on top of the tank. In addition, people were stealing fish from the ponds. WGI quickly adjusted by placing the gardens to the side of the tank and built a greenhouse around both the tank and garden to keep pests and robbers out. After testing 12 different models, they standardized three different size offerings designed to suit the needs of a different customer demographic.



Resources

- For interview scripts and guides, check out the [Mozilla Open Innovation Toolkit](#).
- Another great resource is the “[Five Whys](#)” technique to determine the root causes of problems.
- For a scientific approach to customer discovery, [this tool](#) from Steve Blank helps you evaluate the impact of your solution on the problems faced by your customers.
- The Swedish International Development Cooperation Agency's (Sida) conceptual framework, [Dimensions of Poverty](#), can help you consider the complex factors impacting poverty in BOP communities.



Find community insiders to observe customers: If you are not from your targeted community, it may be hard to collect honest feedback from customers. Consider other approaches to observe and collect data on how end-users are using your solution by partnering with community brokers, anthropologists, and others from within the community.

For example, West Africa-based [Ignitia](#) hired local anthropologists to go “undercover” and observe how end-users interact with products and to answer their questions about its SMS weather forecasting service. From this research, Ignitia learned that villages would report the weather forecast at a local community gathering each morning when the SMS came in. At first, this finding may sound worrisome because it may mean people chose to attend the gathering rather than subscribe. However, anthropologists also observed that people did not like the inconvenience of traveling to the meeting every day and started subscribing to the service themselves. This tactic is one reason why Ignitia is close to reaching one million customers in West Africa.



Resources

- In many cases, integrating feedback is all about tracking experiments. This [leanstack.com experiment report](#) can help with that process.
- [The Lean Startup](#) has a robust plan on how to integrate feedback loops into business operations. The goal of its build-measure-learn framework is to minimize the time between taking an action, identifying mistakes, and correcting for them.
- The [Lean Data Field Guide](#) leverages the power of low-cost technology and lean experimentation principles to collect high-quality data at a fraction of the time and cost of other methods.
- The [Social Enterprise Toolbelt](#) is an excellent resource for checking out various methods to collect data.

Building your impact KPIs around U.N. Sustainable Development Goals (SDGs) can help you attract greater recognition, inform your brand, and attract support from the social sector. In some emerging markets, it may be difficult to register a venture as a social enterprise due to bureaucratic paperwork. If this happens to be your enterprise, aligning your KPIs with the SDGs will still be important for your brand, investors, and business partners. The SDGs are comprised of 17 goals, each with a set of targets, most of which can be applied to the WE4F nexus. By demonstrating your enterprise’s contribution to the SDGs, it may be easier to integrate your solution into corporate supply chains that are struggling to overcome social and environmental challenges. Similarly, showcasing your positive impact on social and environmental issues may strengthen your appeal to customers, investors, and donors.

For example, [Aduna](#) is aligned to SDG Goal 8: “Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.” Aduna is a health food business on a mission to make African “superfruits” famous, which creates demand for underused natural products and provides sustainable incomes for smallholder farmers.²⁸

28 Ward, Ellie. “[Social Entrepreneurs step up to tackle the SDGs.](#)” *British Council*. 2019. Web. 18 June 2019.



Resources

- An overview of the SDGs can be found [here](#).
- There are many indicators that you could use to support your commitment to the SDGs, but we recommend starting with the [Global Reporting Initiative \(GRI\)](#). A few other notable sources include the [Impact Reporting and Investment Standards \(IRIS\)](#), the [Portfolio Risk, Impact, and Sustainability Measurement \(PRISM\)](#), and the [UN Global Compact–Oxfam Poverty Footprint](#).

III. Accelerate

As your company integrates lessons learned from the previous Test phase, you may find yourself positioned to scale up (or accelerate) your offering to the broader BOP market in your country or abroad. Acceleration is a complex challenge, especially in the BOP context. Very few companies with solutions in WE4F have been able to enter into multiple markets at scale. Many firms struggle because they believe they can keep doing more of the same that helped with their early success in reaching the BOP. They replicate their operations in multiple geographies, but then struggle as their organizational structure becomes overburdened, overhead expenses grow, and unexpected variables arise in new markets.

WE4F entrepreneurs in the acceleration phase should consider how their business model should change and adapt to accommodate proactively rapid growth. Finding the right types of finance and investment to fund that growth will be crucial to sustaining your upward trajectory while avoiding financial emergencies later on. Finally, expanding your mechanisms for gathering and responding to new information will allow you to respond to variations and successfully find your place in reaching the BOP in new markets.

Building Business Models to Scale

Scaling a successful business model does not usually mean making the same business model bigger. As they grow, most social enterprises reach a point where the enterprise needs to be thoroughly reconceived as your operations outgrow your channels, marketing strategy, and organizational structure. Many companies only discover this after suffering setbacks caused by an inadequate overly centralized management structure or financing models. As ventures take off, finding the right distributors, manufacturers, and retailers to support your growth may change as you receive larger orders or enter into new markets. At the same time, keeping a low inventory is critical for generating additional revenue that will fuel exponential growth.

By taking a proactive approach to scaling, however, you can anticipate what challenges your model will face and make the required adjustments before you hit the obstacles they might cause. Here are a few tools and tactics that may help:

Determine staffing needs that align with your growth strategy. As you reach more farmers and communities, consider how you can grow your staff to help your sales, production, and distribution teams cope with the increased demand. If a fixed salary is not possible, consider creative remuneration approaches such as company equity, commission, part-time labor, or incentives. Having the right people on staff at the right time is critical for business growth. The challenge is to adopt staffing strategies that



not only meet current staffing needs, but also keep the pipeline full.²⁹ Most innovators rely on professional networks, but LinkedIn and recruitment agencies can also be helpful depending on your needs.



Resources

- This [Self-Assessment Manual for Social Entrepreneurs](#) includes a staffing assessment.
- Need a job description template to hire more innovators? Innovation Leader has you covered [with these templates](#).
- Considering how human resources can add value to your company? Some useful tactics can be found [here](#).
- How do you keep your employees motivated, growing and focused? Be sure to prioritize education and training. Entrepreneur.com has some useful tips and tricks for small and growing businesses [here](#).

Develop internal systems, including a system to track important business metrics, such as margins, return on investment, internal return on investment, customer acquisition, and retention costs, that will make it easier to attract investors and make decisions about organizational headcount.

For example, [Lal Teer Seed](#), a seed company in Bangladesh, needed to rethink its systems to continue its growth. In fact, it uncovered a counterfeit problem in which people were packing seeds as Lal Teer when in fact they were of a much poorer quality, leading to government inquiries and many unhappy farmers. Lal Teer solved this challenge by manufacturing a high-end packaging material for its seeds and providing strict guidance to distributors to only work with a set list of trusted retailers in the market.

29 Lohrey, Jackie. "Staffing Strategies for Growing Companies." *Small Businesses - Chron*. Web. 18 June 2019.



Gham Power in Nepal was growing, but did not have the capacity to mobilize an entire sales team. The company identified various types of sales agents already working in targeted communities—kiosk owners, micro-finance institution representatives, and mobile money agents—and recruited them on a commission-based payment scheme. Creatively expanding their sales capacity led to increased in purchases from its existing customer base and new customer growth.



Resources

- **Systems thinking** takes a holistic perspective to problem solving in that it considers a variety of interrelated and interdependent factors underpinning an issue. Peter Senge's *The Fifth Discipline* provides innovators with practical advice on how to integrate system thinking into a ventures' strategy to foster continuous learning and unlock new solutions to complex problems.
- Visual maps of organizational structure can be very helpful in thinking through gaps and opportunities for development. For a list of organization chart solutions, [click here](#).

Adjust supply chain to market demand: As greater demand is generated, innovators should reevaluate if their distributors, manufacturers, and retailers align with their growth strategy. With a larger operation, predictability within the supply chain is necessary to support customer growth and retention.

In Cambodia, Project Alba bought crops solely from its contract farmers. As the company grew, this sourcing model became too unpredictable to meet the demands of the market. Now they use a quota system in which they only buy crops from contracted farmers to meet the minimum demand in the marketplace to sustain their business operations. This adjustment has reduced the number of suppliers, allowing Project Alba to focus and concentrate its efforts on only high-performing farms.



Resources

- For more information on supply chain management in emerging markets, check out this [in-depth report](#) from Accenture.
- [JDA Demand Planning](#) is an integrated retail and supply chain management platform that helps you manage costs, revenue, and production time so you can deliver your customer promises.
- [SAP Integrated Business Planning](#) is a cloud-based solution that combines capabilities for sales and operations; demand, response, supply planning, and inventory optimization.

Develop adjacent products or services to sell in the same market. Once you have developed a functional model for your innovation, consider offering products and services that relate to your core offering. This can increase your profit margin and bring in new customers attracted by your variety of offerings. A company selling a product like stress-resistant seeds might consider introducing a line of fertilizer; a company offering irrigation equipment might launch an irrigation as a service offering for customers who cannot afford the upfront investment in a system.

In Nepal, [Sunfarmer](#) started off with a rent-to-own irrigation pump for its BOP customers, but after additional customer research, learned that its solution would never scale unless they provided more holistic services to this market segment. Based on extensive research with community leaders and farmers, Sunfarmer developed adjacent products and service, including farm production, logistics, and crop storage that produced district revenue streams. The company's long-term growth plan is now based on farmers adopting many of its services. This shift to incorporate services that address more needs of smallholder farmers has supported its exponential growth of customers from just a few hundred in 2017 to 2,500 today.



Resources

- Clay Christensen's [Prosperity Paradox](#) chronicles how entrepreneurs have successfully overcome challenges in emerging markets by diversifying their products and services to better meet the needs of the BOP.
- Are you struggling to decide if you should diversify your offerings or not? Check out this [helpful article](#) from *Harvard Business Review*.
- Need inspiration to spur creative adjacencies to your current model? The [Ten Types of Innovation](#) cards can help.

Finding Finance

It is difficult to achieve dramatic scale when relying solely on existing revenue streams. When your organization is ready to scale, you will have to navigate a diverse range of potential sources of investment to meet your needs, including social impact investments, loans, and grants. All sources have their respective advantages, costs, and risks. **Before selecting a funding source, it is important to identify the motivation of the funder and understand how their investment will require your organization to change, what they expect in return, your ability to meet those expectations, and the consequences of failing to meet those expectations. While you should not avoid outside investment, limiting yourself to investment that aligns with your vision, timeline, and capabilities will allow you to focus your energy on managing the business rather than struggling to meet investor needs.**

Find financing that aligns with your needs and timeline. BOP enterprises can take longer to find their working business model than other types of enterprises, such as tech startups in established markets. It is important to find investors who are comfortable providing “patient” or long-term capital with no expectation of turning a quick profit, as opposed to those who seek an exit within three to five years. Patient capital investors have a high tolerance for risk, long payback horizons (beyond five years), and are flexible enough to meet the needs of entrepreneurs. These types of investors also often provide valuable management and advisory support that can help your enterprise scale.

For example, the [Acumen Fund](#) provides patient capital in early-stage enterprises servicing BOP consumers, with investments ranging from \$300,000 to \$2.5 million and payback or exit in roughly seven to 10 years.

These relationships with patient capital investors may take a long time to develop, but are potentially more valuable in the long run. Both [Adaptive Symbiotic Technologies](#) and [Ignitia](#) eventually received investment after building relationships with patient capital investors for multiple years. This provided both sides time to develop trust and understanding before entering into a long-term business deal.



Resources

- Need to assess your readiness for investment? [Abaca](#) by Village Capital provides a self-assessment tool that can help.
- Accelerators can be springboards into greater levels of financing. ImpactSpace’s [Accelerator Selection Tool](#) helps you find the right impact-oriented accelerator.
- More information on why mission-aligned investors are critical for ventures in impact investing can be found [here](#).

Find investors who understand the nuances of working within your sector and the BOP. When scaling your business, you should look for investors that can add value beyond the money they invest. Ensuring that your investors understand the BOP market and your sector will reduce the chances of being pressured into making choices that are harmful to your company’s goals. The right investors can provide valuable input on an area of your business model, such as distribution, marketing, sales, etc. as well as connections to new partners and additional investors. Pay attention to investors who have built a company before, have sector experience, can make introductions to potential customers or partners, or help you raise more money in the long-term.

For example, [Aqua-Spark](#) is an investment fund with a focus on sustainable aquaculture businesses around the world, including in Africa and Southeast Asia. Aqua-Spark believes that committing to a long-term vision is the way to realize effective and lasting impact results. This includes fostering peer-to-peer learning and joint ventures between firms within its portfolio. When it comes to investments, their model is not built around quick exits; instead, they look for entrepreneurs who want to build and scale, and who see their businesses as major economic opportunities that can also help solve looming environmental and food security challenges. Aqua-Spark is an example of an investment fund that understands the complex challenges of operating in agriculture and in emerging markets.



Resources

- Searching databases designed to help investors find deals can be equally as useful for entrepreneurs looking to connect to those investors. The Global Impact Investing Network's (GIIN) [ImpactBase](#) is the global directory of impact investment vehicles.
- [Abaca](#) helps makes benchmarking your company's progress easier and gives you a common language to use with investors, mentors, and your team as you seek capital and resources.
- Who are the best impact investors working in different sectors in different regions? [ImpactAssets' Annual IA50](#) highlights these investors.

Develop and execute a fundraising strategy and pitch to fit your company and market. Raising outside investment is difficult. Expect that you are going to fail a lot. Raising investment is like sales: it is all about building relationships, and it will take time and persistence. The investor pitch and presentation is a major deal as very few companies get to this stage. Here are some tips for preparing an investor presentation include:

- Bring more than one person.
- Show there is a team.
- Have hard copies ready.
- Specify the amount of money requested and what will you do with it.
- Use samples and present current results.
- Rehearse and then rehearse some more.
- Learn from the presentation experience and get feedback.



Many aspects of the BOP entrepreneur's path will look similar to one funded by a traditional venture model, but the investment models for companies targeting the BOP remain highly experimental and expected to evolve as investors learn from different approaches. You may need to consider alternatives to traditional venture funding initially, for example [Husk Power Systems](#) in India won a series of grants from organizations—including the Shell Foundation—that were willing to fund their initial market-exploration work. They then raised capital from impact investors like the Acumen Fund, who were interested in both the financial and social impact potential of the company.³⁰ USAID and other donor organizations may also have programs that facilitate customized technical assistance along with funding to help address critical needs and support your growth.



Resources

- Need to create a powerful presentation on the fly? Check out the [10/20/30 Rule of PowerPoint](#) from serial angel investor Guy Kawasaki.
- Learn 10 quick ways to make a better presentation from [Lessons from Storytellers](#).
- What are the key questions investors consider in evaluating pitches? Check out [this tool](#).
- Research USAID and other donor-funded opportunities in your country on their websites, social media, looking at job ads on [Devex.com](#) and LinkedIn, and by networking at events.

30 Kundra, Raj and Katz, Robert. "Clean Energy for the Base of the Pyramid in India: A Market on the Brink." *Kauffman Fellows*. 22 Mar 2012. Web. 18 June 2019.



Leverage open innovation challenges to attract seed funding and investors. USAID and other donors regularly hold global, regional, and national open innovation prize competitions and challenges to identify market-based solutions to complex development and humanitarian problems. Before deciding to apply to one of these competitions, innovators should conduct a cost-benefit analysis to ensure that the return will outweigh the time to apply and manage a possible award.

Many emerging market-based innovators have benefited greatly from prize money and in-kind support. One of the most notable examples is Go-Jek from Indonesia, which is an on-demand motorbike ride sharing/delivery service. In 2011, when it was first starting out, [GoJek](#) won a \$10,000 prize from the U.S. Department of State. Today, GoJek has turned into the leading ride-hailing, food delivery, and mobile payments platform in Southeast Asia. It now has over 2.5 million employees and is one of the few unicorns to emerge from the region.

The visibility and connections entrepreneurs and innovators make when they participate in challenge and prize competitions is an added benefit. After winning USAID's SWFF Grand Challenge for example, [Adaptive Symbiotic Technologies](#) reported that the additional media visibility helped accelerate discussions with investors. Similarly, AgUnity advanced several discussions with investors following [press coverage](#) of its victory in the USAID Feed the Future Tech4Farmers Asia Challenge. Meanwhile, [EnerGaia](#) met its eventual investor, Aqua-Spark, on the sidelines of [Fish 2.0](#).



Resources

- Learn more about the [Water and Energy for Food \(WE4F\) Grand Challenge](#), which is designed to scale innovations to increase the sustainability of agricultural food value chains and address climate change in developing countries and emerging markets with a particular focus on the poor and women.
- USAID's [Development Innovation Ventures \(DIV\)](#) program is an open opportunity with a rolling application process. DIV tests and scales creative solutions to any global development challenge.
- For more active open innovation competitions, [XPrize.org](#) maintains a list of challenges in the public and private sectors.

Navigating New Market Variations

Scaling typically relies on replicating an existing model. However, the diversity of the BOP—especially in rural environments—makes it difficult to effectively replicate a model. An enterprise operating in rural West Bengal, India, for instance, will face radically different conditions than a similar enterprise in rural Rajasthan, India. The different conditions between countries and regions is often even much greater. With most successful enterprises deeply embedded in the context of their market, the need to frequently adapt to the market inhibits growth.

As you scale to new markets, you may hope to replicate your operation with only a few variations to suit the local context. Keep in mind that conditions vary from one market to the next, often in ways that are difficult to anticipate. Use integrated feedback loops referred to earlier to catch and respond to challenges stemming from market variations. When developing a rollout timeline, remember to build in time to adjust and recover when the unexpected hits.

Plan and resource for uncertainty when targeting new BOP markets. It is exciting to enter into new markets, but remember to plan and devote resources for the unexpected. While it is always a good idea to anticipate the different variables in a new market, there will be some that are difficult to predict, such as a different species of pest, a more open or closed business-enabling environment, political instability, and a more diverse set of customer attitudes, behaviors, and needs.

For example, Indonesia's [eFishery](#) partnered with USAID and Kasetsart University in 2017 to test its product application in ponds in Bangladesh. They were surprised to learn that the hotter temperatures, different types of pests, and varying voltage greatly impacted the effectiveness of a product designed for the Indonesian market. eFishery analyzed these findings and adapted its smart automatic feeder to respond to the variations. eFishery continues to grow and in 2018, raised over \$4 million in funding from investors.³¹



Resources

- Table 14.1 on from the *Social Entrepreneur Playbook* illustrates different scale up strategies and challenges. This site offers a [free copy of the book](#).
- Acumen walks you through the different challenges of working in agriculture in emerging markets in this in-depth report, [Growing Prosperity: Developing Repeatable Models to Scale the Adoption of Agricultural Innovations](#).

Franchising or partnering to customize offerings to the BOP market may help overcome regional variations in new markets related to the local enabling environment, manufacturing, distribution, or customer outreach. For example, [Ignitia](#) overcame telecom policies for its SMS weather forecasting service by partnering with different organizations based in each country of operation in West Africa. Similarly, [SI Technologies](#) entered into a joint venture with a chemical manufacturer in India to produce its highly scientific silicon-based plant protection.



Resources

- Having a hard time deciding if franchising would help your business model? The questions in [this tool](#) may help.
- Here is [another tool](#) to help you decide if franchising is right for you from entrepreneur.com.
- And finally, an [in-depth analysis](#) on the pros and cons of franchising.

Continue learning and iterating: It is critical to continue the learning process as your company scales to keep growing and remain competitive. As your venture expands, the needs of the customers in the early and late majority market segments may differ. With greater market share, new partnerships and investors will present themselves, while internal management will become an even greater challenge. There has yet to be any innovations that have reached over 25 percent (one billion people) of the BOP market, which is a reminder that this is still a raw and new space for entrepreneurship. If you cannot find other peers to learn from in agriculture-related industries, consider looking to the health sector because like agriculture, it must incorporate hard biological science and ethics into its operations.

31 Ellis, Jack. "In Brief: Indonesian Aquaculture Startup eFishery Nets \$4m Funding." Tech Crunch. November 12, 2018.



Resources

- Need inspiration or ideas from similar pioneering innovators in emerging markets? Hystra chronicles the trials and tribulations of 16 entrepreneurs in [this report](#).
- [Innovation Leader](#) has collected a large number of resources from multinational corporations. As you grow, its tools on how to design an innovation culture, organization, and team to support the continuous learning process may be helpful.
- Are you investing in incremental, adjacent, and transformative innovations at the same time? How much should you invest in each horizon? KPMG has some answers that may help in the [Benchmarking Innovation Impact](#) report.
- While it would need to be adapted to the BOP and smallholder farming context, consider aligning your iteration process to the [build-measure-learn cycle](#) outlined in the [Lean Startup](#).



APPENDIX A - COUNTRY PROFILES IN AGRICULTURE AND INNOVATION

Bangladesh



With 159 million people living in one of the world's most densely populated countries, Bangladesh's strong economic growth can mostly be attributed to the services sector. Even though political instability causes unrest and economic slows, the current GDP of \$262.5 billion has grown annually at six percent each year.³²

Since gaining independence from Pakistan in 1971, Bangladesh has made major strides in reducing poverty. Nearly half of the population is employed in the agriculture sector and even more of those people attribute their annual income to agriculture. Rice is the most important agricultural product and the backbone of the agricultural sector in the country.³³

Agriculture by the Numbers:

- 16 percent of GDP
- 42.7 percent of workforce
- 70 percent of land used for agriculture
- 87 percent of people attribute annual income to agriculture

Harvest Trends:

- Harvest production: rice, vegetables, jute, tea, wheat, sugarcane, potatoes, tobacco, pulses, oilseeds, spices, fruit
- Livestock production: beef and poultry
- Dairy farming

Challenges Facing BOP:

- Rapid population growth and dwindling land resources
- Climate change making weather patterns unpredictable
- Degradation of natural resources

Supply Chain Challenges:³⁴

- Unreliable transportation
- Poor and underdeveloped infrastructure
- Limited modernization in all levels of supply chain
- Inadequate credit support to farmers with loss of profit as crops change hands
- Links to markets are limited

32 "[South Asia: Bangladesh](#)." *The World Factbook: Central Intelligence Agency*. 2019. Web. 12 June 2019.

33 "[South Asia: Bangladesh](#)." *The World Factbook: Central Intelligence Agency*. 2019. Web. 12 June 2019.

34 "[The World Bank in Bangladesh](#)." *The World Bank*. 2019. Web. 12 June 2019.

Barriers to Innovation:³⁵

- Insufficient power supplies
- Slow implementation of economic reforms
- Governmental corruption
- Limited availability of serviced land
- Complex business regulations that are uncertain

Innovation Spotlight:^{36,37}

Farmer Query System est. 2012	Rice Knowledge Bank est. 2011	Mrittika est. 2008
Smartphone application allows farmers to connect with agro experts in call center	Online initiative by Bangladesh Rice Research Institute to provide fact sheets on rice cultivation	Mobile phone application that links soil data information to appropriate fertilizer dosage
IMPACT: 30,000 inputs of agro information have been tapped into by BoP farmers	IMPACT: Cultivation techniques on rice farming provided with quick access online to optimize growth and revenue	IMPACT: Provides farmers with exact fertilizer information for respective land to preserve soil nutrients

Enablers to Innovation:³⁸

- Partnerships with the World Bank's International Development Association that is committed to lending \$30 billion in grants to the development of the country
- Public-private partnerships that aim to reduce poverty and improve developmental challenges
- Young and growing population with more people interested in learning about and using technology
- Majority of the population has access to mobile phones, and almost 50 percent use the internet
- Accelerator programs for startups and innovation tech conferences happening on annual basis
- Large yield gap between the amount of crops produced and the potential for production³⁹

35 "South Asia: Bangladesh." *The World Factbook: Central Intelligence Agency*. 2019. Web. 12 June 2019.

36 "E-Agriculture in Action." *Food and Agriculture Organization of the United Nations*. 2017. Web. 12 June 2019.

37 Sadek, Sadman. "eAgriculture Innovation in Bangladesh: A Brief History." *LinkedIn Publications*. 16 Oct 2016. Web. 12 June 2019.

38 "The World Bank in Bangladesh." *The World Bank*. 2019. Web. 12 June 2019.

39 "Pairing Agriculture with Technology in Bangladesh." *The World Bank*. 23 June 2014. Web. 12 June 2019.



Cambodia has seen recent rapid growth in their GDP, averaging an annual growth rate of seven percent in the last decade and much of this growth can be attributed to the agriculture sector. Other industries contributing to economic growth include tourism, construction and real estate, but the country still remains one of the poorest in Asia with a GDP of \$22 billion.⁴⁰ The country has an extremely low unemployment rate, ranked second worldwide, but the problem lies in the underemployed Cambodians, keeping 16 percent of the population below the poverty line.⁴¹

Agriculture plays a significant role in pulling people out of poverty and the Cambodian government recognizes the opportunity to improve the agriculture sector and grow the economy. Diversification is a key focus in this endeavor and is also recognized by the FAO. The FAO focuses on three key areas of development in Cambodia: increased productivity through diversification, sustainable management of natural resources, improved resilience to shocks at all levels (national, community, and household).⁴²

Agriculture by the Numbers:

- 25 percent of GDP
- 48.7 percent of workforce
- 32 percent of land used for agriculture

Harvest Trends:

- Main crop in production: rice
- Major commercial crop in production: rubber
- Other harvested crops include: corn, vegetables, cashews, cassava (manioc, tapioca), silk
- Livestock: water buffalo, oxen, fisheries

Challenges Facing BOP:⁴³

- Climate change making rainfall unpredictable is a growing issue for a country whose main crop, rice, depends on two-season cultivation based off rainy and non-rainy seasons
- Zero to limited access to potable water
- Increased competition of rice producers leading to falling global rice prices
- Inability to diversity crop production to gain profit
- Lack of food security

40 ["East Asia/Southeast Asia: Cambodia."](#) *The World Factbook: Central Intelligence Agency*. 2019. Web. 12 June 2019.

41 ["East Asia/Southeast Asia: Cambodia."](#) *The World Factbook: Central Intelligence Agency*. 2019. Web. 12 June 2019.

42 ["FAO in Cambodia."](#) *Food and Agriculture Organization of the United Nations*. 2019. Web. 12 June 2019.

43 ["Cambodian Agriculture in Transition: Opportunities and Risks."](#) *The World Bank*. 2014. Web. 12 June 2019.

Supply Chain Challenges:⁴⁴

- Rural countryside lacking basic infrastructure
- Limited access to markets and market information
- Lack of drying and storing facilities
- Little communication among supply chain players
- Consistent reliance on traditional supply chain practices

Barriers to Innovation:⁴⁵

- Population of BOP farmers lack education and skills
- Farmers lack access to credit
- 60 percent of rice farmers farm for subsistence needs only
- Limited access to technology in rural areas

Innovation Spotlight:^{46,47,48}

Project Alba est. 2015	eKutir est. 2009	Agribuddy est. 2015
Provides technical support to farmers through a cooperative network	Decentralized network of microentrepreneurs and kiosks to convert fragmented agriculture system into connected soil-to-sale model	App technology that connects all the stakeholders within agriculture by training local entrepreneurs who serve as buddies to farmers
IMPACT: Doubled the income of hundreds of farmers. Helps to provide healthy vegetables to 10,000 customers daily	IMPACT: Farmers cut costs by 50%. Incomes increased 2x more than non-participating farmers	IMPACT: 6,000 farmers increased productivity and income. Acts as guarantor for loans

Enablers to Innovation:

- Cooperation among government, nongovernmental organizations, and the private sector, all working together to create an environment ripe for innovative products and investment
- The Green Shoots Foundation Agri-Tech Centre in Northwest Cambodia is working toward repackaging agriculture so that it is more appealing and exciting as a profession for young people
- The agribusiness acceleration program Mekong Agritech Challenge MATCH enables startups to enter the industry by winning their challenge but also encourages innovation in agriculture techniques

44 Try, P. and McSweeney, P. "An Analysis of Paddy Supply Chain Management in Cambodia." *International Society for Horticultural Science*. 2013. Web. 12 June 2019.

45 "FAO in Cambodia." *Food and Agriculture Organization of the United Nations*. 2019. Web. 12 June 2019.

46 "Project Alba: The Partner for Farmers." *Project Alba*. 2018. Web. 12 June 2019.

47 "Reaching Deep in Low-income Markets: Enterprises Achieving Impact, Sustainability, and Scale at the Base of the Pyramid." *Monitor Deloitte*. June 2017. Web. 12 June 2019.

48 "Agribuddy: Connecting the Next Billion." *Agribuddy.com*. 2019. Web. 12 June 2019.



Originally a French colony, Côte d'Ivoire gained its independence in the 1960s and quickly became a nation characterized by governmental stability and open to immigration. Since then, the nation has experienced religious unrest and economic struggle, but the agricultural outputs have always been a mainstay for the economy.⁴⁹

The agricultural sector of Côte d'Ivoire is a main contributor to the country's economic growth, which has been among the highest in the world at 7.8 percent in 2017 and 8.3 percent in 2016.⁵⁰ The country's current GDP stands at \$40.47 billion. As the world's largest exporter of cocoa beans and a significant producer of coffee, Côte d'Ivoire's economy can be impacted by fluctuations in these product's international prices. Additionally, the labor-intensive farming required to produce these crops have made the younger and larger population (approximately 60 percent are under the age of 25) less interested in pursuing agricultural work.

Agriculture by the Numbers:

- 20.1 percent of GDP
- 68 percent of workforce
- 64.8 percent of land used for agriculture
- 9.1 percent of agricultural land is arable

Harvest Trends:⁵¹

- Harvested crops: coffee, cocoa beans, bananas, palm kernels, corn, rice, cassava (manioc, tapioca), sweet potatoes, sugar, cotton, rubber
- World's largest exporter of cocoa beans
- West Africa's largest exporter of fruits and vegetables
- Once had the largest forest in Africa, but due to overlogging, deforestation has become a major environmental issue

Challenges Facing BOP:⁵²

- Water pollution from sewers, mining and other industrial works
- Lack of access to basic potable water
- Climate change risks with inconsistent rainfall and rising sea levels causing flooding
- Dry soil with reduced fertility
- Insecurity around land ownership

49 ["Africa: Côte d'Ivoire." The World Factbook: Central Intelligence Agency, 2019. Web. 12 June 2019.](#)

50 ["Africa: Côte d'Ivoire." The World Factbook: Central Intelligence Agency, 2019. Web. 12 June 2019.](#)

51 ["Africa: Côte d'Ivoire." The World Factbook: Central Intelligence Agency, 2019. Web. 12 June 2019.](#)

52 ["Understanding Côte d'Ivoire's Sustainable Development Issues in Five Charts." The World Bank. July 2018. Web. 12 June 2019.](#)

Supply Chain Challenges:⁵³

- Lack of proper infrastructure
- Payments between BOP supplier and consumer made in cash and thus theft and fraud have become common
- Poor governance and leadership within co-ops that farmers cannot depend on payments being on time

Barriers to Innovation:⁵⁴

- Demand for technology among BOP users in agriculture is not apparent
- Aging farmer population with the young generation uninterested in farming as a livelihood
- Farmers do not have access to financial services

Innovation Spotlight:^{55,56,57}

ICT4Dev	WeFly Agri	GRACI est. 2018
Online platform that integrates ICT solutions with management tools to answer farmers' questions	Uses drone technologies to give farmers the ability to monitor their crops remotely to reduce costs and maximize productivity	Program that offers production, certification and dissemination of improved seeds for rice
IMPACT: Improves small scale farmers knowledge of the market and farming	SERVICES: Interactive plantation map, crop progress tracking, remote monitoring for farmers, GIS	IMPACT: Improves profitability in rice sector by solving issue of poor seed quality

Enablers to Innovation:⁵⁸

- Growing demands of consumer class for crops such as vegetables, fruits, rice, and nuts
- Public-private partnerships aimed at bringing innovative technology
- The World Bank's debt relief program in 2012 spurred additional foreign investment

53 Lonie, Susie, Martinez, Meritxell, Oualai Rita, and Tullis, Christopher. "Opportunities for Digital Financial Services in the Cocoa Value Chain: Côte d'Ivoire." *International Finance Corporation: World Bank Group*. Web. 12 June 2019.

54 Lonie, Susie, Martinez, Meritxell, Oualai Rita, and Tullis, Christopher. "Opportunities for Digital Financial Services in the Cocoa Value Chain: Côte d'Ivoire." *International Finance Corporation: World Bank Group*. Web. 12 June 2019.

55 "ICT4DEV." *ICT4DEV*. 2019. Web. 12 June 2019.

56 "Opportunities in agricultural value chain digitisation: Learnings from Côte d'Ivoire." *GSMA*. Oct 2017. Web. 12 June 2019.

57 "WeFly Agri: Regain Control Over your Land." *WeFlyAgri*. 2019. Web. 12 June 2019.

58 "Opportunities in Agricultural Value Chain Digitisation: Learnings from Côte d'Ivoire." *GSMA*. Oct 2017. Web. 12 June 2019.



Ethiopia is the second most populous country in Africa and, until 2016, was one of the fastest growing economies in the world, growing their GDP at a rate at around 11 percent annually.⁵⁹ This rapid growth did not translate to prosperity for the nation with a GDP of \$80.87 billion, is still considered one of the world's poorest countries. Almost 30 percent of Ethiopians live below the poverty line, but the country is on par with Scandinavian countries with some of the lowest levels of income-inequality.⁶⁰

Frequently described as a predominantly an agricultural country, Ethiopia is growing rapidly and this is placing a strain on its land resources. More than 80 percent of the 108 million people in Ethiopia live in rural areas and depend on agriculture for their livelihood.⁶¹ Services have surpassed agriculture as the main source of GDP, but the agricultural sector of the economy is being engaged by both the state, foreign states, and private investors that show potential for growth and development in the near future.

Agriculture by the Numbers:

- 34.8 percent of GDP
- 72.7 percent of workforce
- 36.3 percent of land used for agriculture

Harvest Trends:

- Harvested crops: cereals, coffee, oilseed, cotton, sugarcane, vegetables, khat, cut flowers
- Livestock: hides, cattle, sheep, goats
- Believed to be the origin of three major crops: coffee, grain sorghum, and castor bean

Challenges Facing BOP:⁶²

- Food shortages
- Environmental degradation
- Rapid population growth putting pressing on its land resources
- Climate change causing uncertain rainfall and drought
- Soil erosion
- Water shortages due to poor farming techniques that are water intensive
- Pollution to air, water, and soil from industrial areas and improper pesticide usage

Supply Chain Challenges:

- Inadequate infrastructure that is still under development
- Transport systems deficient
- Little to no access to market information
- Fragmented farms and landholders

59 ["Africa: Ethiopia." The World Factbook: Central Intelligence Agency. 2019. Web. 12 June 2019.](#)

60 ["Africa: Ethiopia." The World Factbook: Central Intelligence Agency. 2019. Web. 12 June 2019.](#)

61 ["Africa: Ethiopia." The World Factbook: Central Intelligence Agency. 2019. Web. 12 June 2019.](#)

62 ["Africa: Ethiopia." The World Factbook: Central Intelligence Agency. 2019. Web. 12 June 2019.](#)

Barriers to Innovation:⁶³

- Forced governmental resettlement and political repression
- Social unrest, such as conflict among ethnic groups
- Constraining bureaucracy that limits innovators unless they have government buy-in or partnership
- Underdeveloped private sector that limits trade competitiveness and opportunity

Innovation Spotlight:^{64,65,66,67}

Pula est. 2017	GreenPath Food est. 2018	Aybor Engineering est. 2012
Uses technology to restructure agricultural insurance and insuring smallholder farms in both Africa and Asia	Teaches and trains smallholder farmers how to make farms more sustainable and partner BoP with larger farmers for tech	Broad Bed and Furrow Maker used at planting time to drain excess water from plants and conserve moisture
IMPACT: Allows farmers to insure their crops using their mobile phones	IMPACT: Creates community of farmers (large and small) to share innovations, best practices and support growth	IMPACT: Reduces water logging caused by poor drainage in order to reduce crop yields and failures

Enablers to Innovation:⁶⁸

- High levels of government involvement in agricultural sector, especially in infrastructure development
- \$8.5 billion in foreign direct investment mostly from China, Turkey, and India to develop infrastructure, agricultural processing, and additional sectors⁶⁹
- Agritech expos to draw innovators to Ethiopia and help fund startups in the agricultural sector
- External aid and donor capital is abundant in Ethiopia coming from international partners

63 "The World Bank in Ethiopia." *The World Bank*. 2019. Web. 12 June 2019.

64 "Kibogo Innovate Consultants: Food Manufacturing Supply in Thika." *Kibogo Innovate*. 2019. Web. 12 June 2019.

65 "M-Farm." *M-Farm*. 2019. Web. 12 June 2019.

66 "Greenpath: Premium Organic Food." *Greenpath*. 2019. Web. 12 June 2019.

67 "Aybar Engineering." *Aybar*. 2019. Web. 12 June 2019.

68 Goedde, Lutz, Ooko-Ombaka Amandla, and Pais, Gillian. "Winning in Africa's Agricultural Market." Feb 2019. Web. 12 June 2019.

69 "Africa: Ethiopia." *The World Factbook: Central Intelligence Agency*. 2019. Web. 12 June 2019.



After gaining independence from Britain in 1957, Ghana was a country of immigrants who came from neighboring countries to harvest cocoa and mine minerals. Economic downturn and drought in the 1970s caused many Ghanaians to leave and the country became the opposite, a nation of declining population and high emigration rates. Since then, the population is on the rise, with 57 percent of the people under 25 years and urbanization is a major trend.⁷⁰

Agriculture still plays a key role in the economy, employing nearly half the Ghana workforce. Ghana also produces the second most cocoa in the world. The FAO in Ghana is focused on food and nutrition security, sustainable natural resource management, rural development, and resilient livelihoods.⁷¹ Growing the agricultural sector could help decrease the poverty and unemployment rate, while improving the health of BOP farmers and other rural people.

Agriculture by the Numbers:

- 18.3 percent of GDP
- 44.7 percent of workforce
- 69.1 percent of land used for agriculture

Harvest Trends:

- Harvested crops: cocoa, rice, cassava (manioc, tapioca), peanuts, corn, shea nuts, bananas, timber

Challenges Facing BOP:⁷²

- Soil erosion
- Overgrazing due to poor farming practices
- Climate change causing recurrent drought
- Water pollution and inadequate supplies of potable water
- Wildlife destruction of farms

Supply Chain Challenges:⁷³

- Lack of mechanization available to BOP farmers
- Inefficient transportation for distribution, limiting access to distribution channels
- Minimal data and analysis available in country
- Inadequate and outdated infrastructure

70 "Africa: Ghana." *The World Factbook: Central Intelligence Agency*. 2019. Web. 12 June 2019.

71 "Country Profile: Ghana." *Food and Agriculture Organization of the United Nations*. 2019. Web. 12 June 2019.

72 "Africa: Ghana." *The World Factbook: Central Intelligence Agency*. 2019. Web. 12 June 2019.

73 "Ghana Agriculture Sector Policy Note: Transforming Agriculture for Economic Growth, Job Creation and Food Security." *The World Bank: Open Knowledge Repository*. 2017. Web. 12 June 2019.

Barriers to Innovation:⁷⁴

- Mismanagement by government of budget coordination in agriculture
- Little government acceptance and involvement in promoting new technology usage in industry practices
- Regulatory system with government of Ghana that does not aid private sector engagement or investment in agriculture
- Historical trade policies have adopted protectionist measures and restrict or heavily taxed imports⁷⁵

Innovation Spotlight:^{76,77,78}

TROTRO Tractor est. 2017	Farmerline est. 2013	Esoko est. 2004
App that connects BOP farmers to local tractor operators to request machinery help	Using an online platform, it links BOP farmers to market information, finance and equipment services	Provides useful information to smallholder farmers via SMS including weather forecasts, price information and links to buyers
IMPACT: Provides mechanization to smallholders in Ghana	IMPACT: Empowers small-scale farmers to become financially prosperous and more entrepreneurial	IMPACT: Started in Ghana and expanded to 15 African countries

Enablers to Innovation:⁷⁹

- Medium Term Agriculture Sector Investment Plan enacted numerous government programs to increase agricultural sector and improve BOP farmers profitability
 - Fertilizer Subsidy Program in 2008
 - Agriculture Mechanization Services Enterprises Centers (AMSECs) program in 2007
 - National Food Buffer Stock Company (NAFCO) in 2010
- Competitive business environment that is attractive to innovative Agritech firms

74 "Agriculture: Ghana's Engine of Growth for Jobs Creation." *The World Bank*. 5 Mar 2018. Web. 12 June 2019.

75 "Country Fact Sheet on Food and Agriculture Policy Trends." *Food and Agriculture Organization of the United Nations*. March 2015. Web. 12 June 2019.

76 "Trotro Tractor." *Trotro Tractor Limited*. 2019. Web. 12 June 2019.

77 "Farmerline: Market-driven Solutions Empowering the Entire Agric Value Chain." *Farmerline*. 2019. Web. 12 June 2019.

78 "Esoko: Empowering Organizations with innovative Digital Solutions and Services." *Esoko*. 2019. Web. 12 June 2019.

79 "Country Fact Sheet on Food and Agriculture Policy Trends." *Food and Agriculture Organization of the United Nations*. March 2015. Web. 12 June 2019.



Agriculture

With over 1.25 billion people living on 3.29 million square kilometers, India claims the second largest population within the seventh largest country in the world.⁸⁰ This large population and landmass yield significant cultural, geographical, and economic diversity. Using 60 percent of its land, India produces the second highest farm output in the world, which is focused on dairy, rice, wheat, and sugarcane.⁸¹ Although agriculture and its allied sectors account for half the nation's workforce, its contribution to overall GDP is declining. Economic growth in diversified sectors, including IT and software services, have helped grow the country's GDP to \$2.6 trillion, third highest in the world, but the country's per capita income remains below the world average.⁸² The poverty rate in these rural communities is 25 percent, 5 percent higher than the national average, with over 82 percent of rural landowners also affected by poverty.

Agriculture by the Numbers:

- 18 percent of GDP
- 50 percent of workforce
- 70 percent of rural households primarily dependent on agriculture for food
- 60 percent of land used for agriculture

Harvest Trends:

- Largest producer of milk, pulses and jute
- Second largest producer of rice, wheat, sugarcane, groundnut, vegetables, fruit, and cotton
- One of the leading producers of spices, fish, poultry, livestock, and plantation crops

Challenges Facing BOP:⁸³

- Small and fragmented land holdings
- A growing population with decreasing land for agriculture use
- Decreasing groundwater levels
- Poor quality of seeds
- Lack of mechanization and intensity of labor
- A dependence on the middleman

Supply Chain Challenges:⁸⁴

- Absence of an organized marketing structure
- Malpractices in the unorganized agricultural markets
- Insufficient facilities for transportation and storage
- Lack of credit or capital

80 "[Country Profile: India.](#)" *Food and Agriculture Organization of the United Nations.* 2019. Web. 12 June 2019.

81 "[The World Bank in India.](#)" *The World Bank.* 2019. Web. 12 June 2019.

82 "[South Asia: India.](#)" *The World Factbook: Central Intelligence Agency.* 2019. Web. 12 June 2019.

83 "[South Asia: India.](#)" *The World Factbook: Central Intelligence Agency.* 2019. Web. 12 June 2019.

84 "[South Asia: India.](#)" *The World Factbook: Central Intelligence Agency.* 2019. Web. 12 June 2019.

Barriers to Innovation:

- Growing rates of food imports
- Large corporations growing with the funding to invest in new innovations taking market share from the SMEs and BOP end-users
- Limited access to technology for information and communication in rural areas

Innovation Spotlight:^{85,86,87,88}

eKutir est. 2009	Stellapps est. 2011	Ninjacart est. 2015
Decentralized network of microentrepreneurs and kiosks to convert fragmented agriculture system into connected soil-to-sale model	Uses technology, IoT and data analytics, to collect data to monitor quantity and quality of milk, storage facilities and wearables for tracking cattle	Connects fruit and vegetable farmers directly to end users, such as grocery stores and restaurants, using a marketing and delivery platform
IMPACT: Farmers cut costs by 50% and incomes increased 2x more than non-participating farmers	IMPACT: Allowed for dairy farmers to create dynamic pricing, increasing profits and decrease waste and reduce loss of product	IMPACT: Eliminates middleman and bottleneck of supply chain. Reduces loss of produce by increasing delivery time to seller

Enablers to Innovation:

- Government policy changes such as increasing minimum support price and crop insurance support
- Demand-side drivers such as increased income leading to increased consumption and growing population
- Maturation of platforms that engage BOP farmers, corporations, investors and mentors
- Potential partnerships between AgriTech entrepreneurs and Farmer Produce Organizations

85 ["Reaching Deep in Low-income Markets: Enterprises Achieving Impact, Sustainability, and Scale at the Base of the Pyramid." Monitor Deloitte.](#) June 2017. Web. 12 June 2019.

86 ["eKutir: India's First Certified B Corp."](#) eKutir. 2019. Web. 12 June 2019.

87 ["Stellapps: Digitization of Your Dairy Supply Chain via IoT."](#) Stellapps. 2019. Web. 12 June 2019.

88 ["Ninjacart."](#) NinjaCart. 2019. Web. 12 June 2019.



As the economic and transportation hub of East Africa, Kenya is both geologically and ecologically diverse. The country has also undergone a GDP growth rate at about 5 percent annually, totaling \$79 billion and consistent poverty reduction rates with 36 percent of the population now living below the poverty line.⁸⁹ Kenya's rapidly growing population of approximately 49 million, is ethnically diverse and consists of many refugees from neighboring countries. This young and growing population is urbanized and densely located in the west on the shores of Lake Victoria and in Nairobi.⁹⁰

Although tourism continues to grow as an important industry, agriculture is the backbone of the Kenyan economy with 75 percent of agricultural outputs coming from small-scale, rain-fed farmers. The FAO in Kenya is focused on creating a more competitive and productive agricultural sector in the country as well as increasing food security.⁹¹

Agriculture by the Numbers:

- 34.5 percent of GDP
- 61 percent of workforce
- 48 percent of land used for agriculture

Harvest Trends:

- Harvest crops: tea, coffee, corn, wheat, sugarcane, fruits, vegetables; dairy products, beef, fish, pork, poultry, eggs
- Livestock: cattle, pork, poultry, fish

Challenges Facing BOP:⁹²

- Water pollution from urban and industrial wastes
- Water shortage and degraded water quality from increased use of pesticides and fertilizers
- Inconsistent flooding and soil erosion
- Climate change impacts the highly susceptible and vulnerable traditional rain-fed crops
- Small to no increases in productivity overtime due to lack of quality data
- Administrative and land ownership issues
- Deterioration of soil nutrients due to increasing population and re-using the same small land units

Supply Chain Challenges:

- Inadequate infrastructure
- Limited market information and knowledge of selling opportunities for farmers
- Poor communication and transport services
- Little work completed in research and development that would cause changes and impact

89 "Africa: Kenya." *The World Factbook: Central Intelligence Agency*. 2019. Web. 12 June 2019.

90 "Africa: Kenya." *The World Factbook: Central Intelligence Agency*. 2019. Web. 12 June 2019.

91 "Country Profile: Kenya." *Food and Agriculture Organization of the United Nations*. 2019. Web. 12 June 2019.

92 "Africa: Kenya." *The World Factbook: Central Intelligence Agency*. 2019. Web. 12 June 2019.

Barriers to Innovation:

- Weak governance and political turmoil
- Lack of access to agriculture finance and credit for small and medium sized farms
- The average farmer's age is 60 years old and the youth population not interested in working in agriculture

Innovation Spotlight:^{93,94,95}

Kibogo Innovate est. 2018	M-Farm Limited est. 2016	Taimba est. 2017
Produces organic fertilizers using locally sourced materials specifically targeting small-scale farmers	Online market information platform that enables farmers to understand what their crops are worth	Business to business online platform that connected BoP farmers directly to retailers
IMPACT: Lowers input costs for small-scale farmers but also increases soil nutrition	IMPACT: Helps both buyers and farmers get the best prices and create transparency in the marketplace	IMPACT: Creates price transparency, cuts waste and increases revenue for farmers

Enablers to Innovation:^{96,97}

- Highly skilled workforce
- Growing and youthful population that embraces innovative new technology
- Dynamic and innovative private sector
- Challenges to promote and encourage innovators including the Disruptive Agricultural Technology Innovation Knowledge and Challenge Conference

93 "[The World Bank in Kenya](#)," *The World Bank*. 2019. Web. 12 June 2019.

94 "[M-Farm](#)," *M-Farm*. 2019. Web. 12 June 2019.

95 "[Taimba: Simplifying Food Chains](#)," *Taimba*. 2019. Web. 12 June 2019.

96 "[The World Bank in Kenya](#)," *The World Bank*. 2019. Web. 12 June 2019.

97 "[Disruptive Agricultural Technology Challenge and Conference](#)," *The World Bank*. 5 Apr 2019. Web. 12 June 2019.



Landlocked in southeastern Africa, Malawi is one of the world's least developed and poorest countries. With a stable and peaceful government in place, Malawi is implementing policies and programs to aid progress both economically and socially.

The agricultural sector in Malawi is an economic staple, accounting for a third of the country's GDP and almost 80 percent of their export revenues. Additionally, more than 80 percent of the 19.84 million population lives in rural areas and this population is rapidly growing.⁹⁸ The strain on natural resources is apparent due to population increase and the country will need to address the lack of diversification in their crops moving forward.

Agriculture by the Numbers:

- 28.6 percent of GDP
- 76.9 percent of workforce
- 59.2 percent of land used for agriculture

Harvest Trends:

- Harvested crops: tobacco, sugarcane, tea, corn, potatoes, sweet potatoes, cassava (manioc, tapioca), sorghum, pulses, cotton, groundnuts, macadamia nuts, coffee
- Tobacco accounts for 50 percent of exports
- Livestock: cattle and goats

Challenges Facing BOP:

- Flooding and droughts at unpredictable times
- Negative effects of climate change including extreme high temperatures and changing precipitation patterns
- Reliance on one crop—tobacco—for income
- Poor soil nutrients
- Low annual crop yields due to inability to afford expensive treatment of crops

Supply Chain Challenges:⁹⁹

- Poor infrastructure, especially irrigation
- Undereducated labor force
- Energy shortages are commonplace—only 11 percent of the population has access to electricity
- No manufacturing base in the country
- Logistic issues with produce and crops changing hands from BOP farmers to consumers
- Barriers to Innovation¹⁰⁰
- New technology adoption is low

98 "[Africa: Malawi](#)," *The World Factbook: Central Intelligence Agency*, 2019. Web. 12 June 2019.

99 "[The World Bank in Malawi](#)," *The World Bank*, 2019. Web. 12 June 2019.

100 "[The World Bank in Malawi](#)," *The World Bank*, 2019. Web. 12 June 2019.

- High levels of corruption
- BOP farmers have little to no access to technology
- Most farmers do not have banking access and many of their transactions rely on cash

Innovation Spotlight:^{101,102}

Noble Agri-Tech est. 2017	The Basket Malawi est. 2018	Khusa App est. 2012
Uses agriculture technologies to test soil, design irrigation systems and plan out farms	Basket of fresh produce delivered to homes via mobile app, connecting farmers straight to consumers	Loan savings mobile tech app that allows farmers (and others) to minimize risk of trading with cash
<p>IMPACT: Automated systems for horticultural farmers, installs greenhouses and designs irrigation systems</p>	<p>IMPACT: Deals with logistic challenges in supply chain, getting crops directly to customers</p>	<p>IMPACT: Targets 80% of the Malawi population that does not have access to banking or credit</p>

Enablers to Innovation:¹⁰³

- Partnership with the World Bank supporting the Third Malawi Growth and Development Strategy focusing on five key areas, including agriculture and climate change
- International Finance Corporation focused on growing agribusiness in Malawi and provides advisory services to SMEs hoping to increase investment in the country
- Public-private partnerships involved in water and agriculture sectors looking to implement reforms and make change
- Investment opportunities are plentiful and Malawi people and government open to new businesses and technology

101 "Country Profile: Malawi." *Food and Agriculture Organization of the United Nations*. 2019. Web. 12 June 2019.

102 Fries, Lorin. "A Farmer-Centered Approach to Agritech." *Forbes*. 9 Sep 2018. Web. 12 June 2019.

103 "The World Bank in Malawi." *The World Bank*. 2019. Web. 12 June 2019.



After gaining independence in 1975, Mozambique was one of the world's poorest countries. This was followed by decades of civil war and economic mismanagement kept the country from growing economically. Since then, political stability coupled with donor assistance, has allowed GDP growth from \$4 billion in 1993 to about \$37 billion in 2017.¹⁰⁴ Although the economy has significantly improved, the 46 percent and 27.3 million population lay below the poverty line and 24.5 percent are unemployed.¹⁰⁵

Characterized by mainly smallholder farmers, Mozambique's agricultural sector plays a key role in the economy and everyday lives of the people. Providing livelihood to around 80 percent of the population, agriculture has the potential to do even more. The available arable land leaves great potential to increase food production, improving food security within Mozambique and export potential to increase trade.¹⁰⁶

Agriculture by the Numbers:

- 23.9 percent of GDP
- 74.4 percent of workforce
- 56.3 percent of land used for agriculture
- Second largest formal food producer in South Africa region

Harvest Trends:

- Harvest crops: cotton, cashew nuts, sugarcane, tea, cassava, corn, coconuts, sisal, citrus and tropical fruits, potatoes, sunflowers
- Livestock: cattle, poultry
- Majority of farmers are small producers cultivating less than 10 hectares of land

Challenges Facing BOP:¹⁰⁷

- Soil erosion
- Increased levels of water pollution due to artisanal mining
- Climate change and lack of resilience to changes in climate
- Irrigation and access to electricity, especially in rural areas, is low
- Low diversity of production and single-crop reliance
- Afraid to risk using costly seeds and fertilizers so settle for no fertilizer and low-quality seeds

104 "Africa: Mozambique." *The World Factbook: Central Intelligence Agency*. 2019. Web. 12 June 2019.

105 "Africa: Mozambique." *The World Factbook: Central Intelligence Agency*. 2019. Web. 12 June 2019.

106 "Country Profile: Malawi." *Food and Agriculture Organization of the United Nations*. 2019. Web. 12 June 2019.

107 "Africa: Mozambique." *The World Factbook: Central Intelligence Agency*. 2019. Web. 12 June 2019.

Supply Chain Challenges:¹⁰⁸

- Increased migration of the population to urban and coastal areas with adverse environmental consequences
- Little to no mechanization
- Inadequate infrastructure causing issues with transportation
- Lack of functional markets and market information systems

Barriers to Innovation:¹⁰⁹

- Government tax and fee administration does not make it easy for start up businesses to impact agriculture (or other industries)
- Farmers have little to no access to credit
- Reliance of traditional farming practices with no interest in changing technique shown

Innovation Spotlight:^{110,111,112}

YA Agri-Tech est. 2014	Third Eye est. 2009	TECA est. 2009
Center that offers agricultural courses to youth to educate them on job market and teach skills to start own business	Sensors that fly over land and provide information to the farmers about agricultural inputs	Global web-based programs for sharing information on agricultural practices and technologies
IMPACT: Expanded to various South African locations. Provides entrepreneurship courses to train future agritech innovators	IMPACT: Detects crop stress, thus saving crops, up to two weeks before standard detection	IMPACT: Improves knowledge of small scale farmers utilizing demand-driven information

Enablers to Innovation:

- Recent government implemented reforms encouraging foreign investors and partnerships
- Innovation challenges in neighboring countries open to Mozambique innovators
- Only 16 percent of arable land is farmed in Mozambique, creating an opportunity for mass expansion and future production as well as shaping that future
- Donor assistance and innovative agro funded by private and public sector is very abundant in Mozambique

108 "Country Profile: Malawi." *Food and Agriculture Organization of the United Nations*. 2019. Web. 12 June 2019.

109 "Mozambican Agriculture Needs a Rethink to Break the Cycle of Poverty." *Financial Times*. 2017. Web. 12 June 2019.

110 "Mozambican Agriculture Needs a Rethink to Break the Cycle of Poverty." *Financial Times*. 2017. Web. 12 June 2019.

111 "Country Profile: Malawi." *Food and Agriculture Organization of the United Nations*. 2019. Web. 12 June 2019.

112 "FAO's Work on Agricultural Innovation: Sowing the Seeds to Transformation to Achieve the SDG's." *Food and Agriculture Organization of the United Nations*. Web. 12 June 2019.



At the foot of the Himalayas and landlocked between China and India, Nepal has historically been considered one of the world's poorest countries. Political unrest and natural disasters have made it increasingly difficult for the country to grow, but trade and investment deals with India and China show potential for growth.

A quarter of Nepal's 29.7 million people live below the poverty line, but agriculture is the mainstay of the economy with 80 percent of the population involved. Two-thirds of the population depend on agriculture for their livelihood, but that accounts for less than one-third of the country's overall GDP, which sits at about \$25 billion.¹¹³ Although most of Nepal's farmers are subsistence farmers, there are four major priorities of focused assistance: food and nutrition security and safety, institutional and policy support, market orientation and competitiveness, natural resource conservation and use.¹¹⁴

Agriculture by the Numbers:

- 27 percent of GDP
- 69 percent of workforce
- 66 percent of population dependent on agriculture for livelihood
- 34 percent of land resources used for agriculture

Harvest Trends:

- Harvest production: pulses, rice, corn, wheat, sugarcane, jute, root crops, milk
- Livestock production: water buffalo meat
- Main industrial activity involves the processing of agricultural products

Challenges Facing BOP:¹¹⁵

- Natural disasters (i.e., 2015 earthquake)
- Growing population
- Rapid urbanization converting quality agriculture land to infrastructure development (housing, industries, etc.)
- Small and fragmented land holdings
- Limited access to improved seeds

Supply Chain Challenges:

- Shortage of distribution and marketing channels or opportunities
- Lack of adequate infrastructure and investment like storage facilities, roads and irrigation networks
- Decreases in the variety of crops and livestock being produced or cultivated
- Unreliable mechanisms to ensure proper delivery of seeds and fertilizers to BOP subsistence farmers

113 "[South Asia: Nepal](#)," *The World Factbook: Central Intelligence Agency*, 2019. Web. 12 June 2019.

114 "[Country Profile: Nepal](#)," *Food and Agriculture Organization of the United Nations*, 2019. Web. 12 June 2019.

115 "[Agriculture and Food Security](#)," *USAID*, 15 Oct 2018. Web. 12 June 2019.

Barriers to Innovation:

- Lack of access to information services and obsolete technology in rural areas
- Policy level constraints
- Reliance on subsistence farming or turning a small profit
- Landlocked geographic location

Innovation Spotlight:^{116,117,118}

Smart Maka est. 2016	Airlift est. 2018	Smart Krishi est. 2018
Portable, solar soil testing device that links to a smart phone application to analyze the quality of soil and plant nutrition	Drone technology that helps farmers track the health of their crops via online platform on their smartphones	Smartphone App that provides information about agriculture, everything from weather to daily market price, to farmers
IMPACT: Immediate suggestions of fertilizer dosage	IMPACT: Addresses the challenge of spraying pesticide aimlessly at a 95% accuracy rate.	IMPACT: 24/7 support to app users and over 125K app downloads in Nepal

Enablers to Innovation:

- A focus on infrastructure development by both the private and public sectors in order to reduce poverty
- Poverty levels rapidly increasing
- The United States and Nepal signed a \$500 million Millennium Challenge Corporation Compact in September 2017 which will expand Nepal's electricity infrastructure and help maintain transportation infrastructure.

116 "[SmartMaka](#)," *SmartMaka*. 2019. Web. 12 June 2019.

117 "[Nepal Innovation Challenge - AgriTECH Announces The Top 10 Finalists](#)," *UNCDF*. 27 May 2019. Web. 12 June 2019.

118 "[Smart Krishi](#)," *Smartkrishi.org*. 2019. Web. 14 June 2019.



Boasting a population of 203.5 million that is only projected to grow faster in the next 30 years, Nigeria is Africa's most populous country. Nigeria also holds the title of Africa's largest economy with a GDP of \$376.4 billion, mainly relying on oil exports.¹¹⁹ This strong growth economically has not translated to the BOP with 70 percent of the population living below the poverty line and 16.5 percent unemployed.¹²⁰

After the global financial crisis in 2009, Nigeria's agricultural sector has driven its economic growth and increased interest from private investments.¹²¹ The country consists of vast arable land, a young and large workforce, and two of Africa's largest rivers—all key factors that could drive the growth of agriculture and agriculture innovation in the years to come.

Agriculture by the Numbers:

- 21.1 percent of GDP
- 70 percent of workforce
- 78 percent of land used for agriculture

Harvest Trends:

Harvested crops: cocoa, peanuts, cotton, palm oil, corn, rice, sorghum, millet, cassava (manioc, tapioca), yams, rubber

- Livestock: cattle, sheep, goats, pigs
- Other areas of agriculture output: timber and fish

Challenges Facing BOP:¹²²

- Climate change affecting rainfall with periodic droughts and flooding
- Rapid urbanization leading to environmental problems
- Pollution from oil extraction including water, air, and soil suffering major damage
- Dependence on middlemen and intermediaries
- Poor seed quality

Supply Chain Challenges:¹²³

- Unreliable power supply to the entire country
- Inadequate infrastructure
- Poor property registration system
- Fragmented supply chain with inputs changing hands frequently between BOP farmers and regional distributors¹²⁴
- Unorganized distribution channels

119 "[Africa: Nigeria.](#)" *The World Factbook: Central Intelligence Agency*. 2019. Web. 12 June 2019.

120 "[Africa: Nigeria.](#)" *The World Factbook: Central Intelligence Agency*. 2019. Web. 12 June 2019.

121 "[The World Bank in Nigeria.](#)" *The World Bank*. 2019. Web. 12 June 2019.

122 "[Africa: Nigeria.](#)" *The World Factbook: Central Intelligence Agency*. 2019. Web. 12 June 2019.

123 "[Africa: Nigeria.](#)" *The World Factbook: Central Intelligence Agency*. 2019. Web. 12 June 2019.

124 Goedde, Lutz, Ooko-Ombaka Amandla, and Pais, Gillian. "[Winning in Africa's Agricultural Market.](#)" Feb 2019. Web. 12 June 2019.

Barriers to Innovation:¹²⁵

- Restrictive trade policies
- Slow and delayed legislative reforms
- Volatile economic growth that relies too heavily on oil and oil prices
- Limited existing links between farmers and entrepreneurs

Innovation Spotlight:

Kitovu est. 2011	Farmcrowdy est. 2009	Verdant est. 2016
Provides data on soil and market demand through an online and mobile phone platform	Mobile app that addresses issues of food security, production and circulation by connecting farmers to sponsors	Utilizes AI technology to crowdsource information and connect small-scale farmers to that information
IMPACT: Reduces high rates of post-harvest losses by informing farmers on what is in-demand	IMPACT: Over 11,000 farmers in network. Over 42,000 farms sponsored	IMPACT: 1.4 million farmers and processing 1 million questions and answers monthly

Enablers to Innovation:¹²⁶

- Government engagement and programs in extension services to train workers in the agricultural sector
- First country in Africa to use mobile phones in order to reach farmers with subsidized farm inputs
- Programs to encourage youth engagement in agriculture [i.e., YEAP (Youth Employment in Agriculture Program)]
- Interest from the private sector with investments in agriculture totaling \$5 billion in recent years¹²⁷

¹²⁵ "The World Bank in Nigeria." *The World Bank*. 2019. Web. 12 June 2019.

¹²⁶ Goedde, Lutz, Ooko-Ombaka Amandla, and Pais, Gillian. "Winning in Africa's Agricultural Market." Feb 2019. Web. 12 June 2019.

¹²⁷ Goedde, Lutz, Ooko-Ombaka Amandla, and Pais, Gillian. "Winning in Africa's Agricultural Market." Feb 2019. Web. 12 June 2019.



Senegal, located in West Africa, is one of the continent's most stable countries. Although its government has changed hands somewhat frequently, all political transitions have been peaceful.¹²⁸ The country has a young and growing population with more than 60 percent of the 15 million people being under the age of 25. High rates of poverty, unemployment and illiteracy are just some of the major social issues facing Senegalese people and preventing successful development of human capital.¹²⁹

Economic growth in Senegal has been strong as of late, specifically in 2017 it grew at a rate of 7 percent, mostly in part to the agricultural sector. Comprising of 16.9 percent of GDP, agriculture and fish processing are the country's biggest industries. Despite erratic weather and rainfall on rain-fed crops, Senegal's ability to produce high-yielding crops, especially dry cereals, is both promising for the future of agriculture and economically beneficial for the current country.¹³⁰

Agriculture by the Numbers:

- 16.9 percent of GDP
- 77.5 percent of workforce
- 46.8 percent of land used for agriculture

Harvest Trends:

- Harvested crops: peanuts, millet, corn, sorghum, rice, cotton, tomatoes, green vegetables
- Livestock: cattle, poultry, pigs, fisheries
- Groundnuts are the main industrial crop

Challenges Facing BOP:¹³¹

- Climate change causes seasonal flooding and period droughts
- Overgrazing of pasture land
- Soil erosion
- Poor traditional farming practices
- Limited access to high quality seeds
- Inadequate water availability to pursue non rain-fed agriculture

Supply Chain Challenges:¹³²

- Inadequate irrigation systems and additional infrastructure
- Lack of mechanization for transport of crops
- Inability to access market information
- Transportation links nonexistent or outdated

128 "The World Bank in Senegal," *The World Bank*. 2019. Web. 12 June 2019.

129 "Africa: Senegal," *The World Factbook: Central Intelligence Agency*. 2019. Web. 12 June 2019.

130 "Times are Hard and Uncertain: Senegal Adopts Climate Smart Agriculture to Mitigate the Effects of Climate Change," *The World Bank*. 3 Dec 2015.

131 "Africa: Senegal," *The World Factbook: Central Intelligence Agency*. 2019. Web. 12 June 2019.

132 "Country Profile: Senegal," *New Agriculturist*. 2019. Web. 12 June 2019.

Barriers to Innovation:¹³³

- Challenging business environment
- Bureaucratic bottlenecks
- Lack of available electricity in rural areas and some of the highest electricity costs in the world
- Inability of BOP farmers to access credit
- Lack of transparency in real estate and other business environments

Innovation Spotlight:¹³⁴

Jappandil est. 2018	Tool Bi est. 2018	GIE Senbioagro Corporation est. 2018
Online platform that connect BOP farmers to agricultural experts	Innovation that facilitates irrigation utilizing electronic innovation to improve agricultural yields	Providing food waste solutions through innovative means
IMPACT: Provides farmers with necessary information on improving practice and latest innovations	IMPACT: Gives BOP farmers access to improved irrigation and information about latest technology and innovations	IMPACT: Creating employment opportunities and utilizing excess yields

Enablers to Innovation:¹³⁵

- Government investments in improving production of main crops in order to boost the economic growth of the country
- Privately run programs such as the Senegal Startup Accelerator, which supports local entrepreneurs translate their ideas into practice in the agriculture sector

133 "The World Bank in Senegal." *The World Bank*. 2019. Web. 12 June 2019.

134 Mulligan, Gabriella. "5 Agri-tech Startups Join Senegal Startup Accelerator." *Disrupt Africa*. 7 Jan 2019. Web. 12 June 2019.

135 "Country Profile: Senegal." *New Agriculturist*. 2019. Web. 12 June 2019.



With a population of 55.3 million people in the southernmost tip of Africa, South Africa links the east side of the continent to the west and is emerging as a middle-income country despite its political and social challenges. South Africa experienced great economic growth in the past due to its abundance of natural resources and was able to develop strong financial, legal, energy and transport sectors, growing its GDP to \$349.3 billion.¹³⁶ In recent years, with unemployment high at 27.5 percent and 16.6 percent of the population below the poverty line, economic growth has slowed and wealth inequality is at an all time high.¹³⁷

Agriculture makes up just 2.2 percent of the country's GDP that is mostly fueled by industry and services, particularly mining and manufacturing. Although, considering the entire value chain of agriculture, the sector's contribution to the GDP reaches closer to 12 percent.¹³⁸

Agriculture by the Numbers:

- 2.2 percent of GDP
- 4.6 percent of workforce
- 79.4 percent of land used for agriculture
- 10 percent of agricultural land is arable

Harvest Trends:

- Harvested crops: corn, wheat, sugarcane, fruits, vegetables, dairy products, wool
- Maize production is the most important crop for in country use (food and animal feed) and exportation
- Livestock: cattle, sheep, poultry

Challenges Facing BOP:¹³⁹

- Soil erosion
- Pollution of rivers due to agricultural use and urbanization
- Land degradation
- Unpredictable and severe droughts due to climate change
- Government policies around land reform and reallocating land ownership

Supply Chain Challenges:

- Unstable electricity supplies throughout the country
- Limited access to financing or financial support
- Concerns about violent attacks on farms, including murder

136 "Africa: South Africa," *The World Factbook: Central Intelligence Agency*. 2019. Web. 12 June 2019.

137 "The World Bank in South Africa," *The World Bank*. 2019. Web. 12 June 2019.

138 "The Untapped Market for Agricultural Innovations in Emerging Economies," *Securing Water for Food: A Grand Challenge for Development*. USAID. Aug 2017. Web. 12 June 2019.

139 "Country Profile: South Africa," *Food and Agriculture Organization of the United Nations*. 2019. Web. 12 June 2019.

Barriers to Innovation:¹⁴⁰

- Regular work stoppages due to strikes
- International credit ratings dropping due to debt
- Aging farmers with less of the youthful population entering the industry
- Scarce resources and limited agriculture potential

Innovation Spotlight:^{141,142,143,144}

Agri Apps est. 2014	Agri-Hub Farming est. 2014	Meat Naturally est. 2015
IoT and Big Data company that provides an online software and hardware to improve farmers' profitability	Farming app to provide information and advice on when to harvest crops and acts as communication tool	The implementation of communal grazing systems based on training herders and supporting market access
IMPACT: Helps farmers to make better decisions	IMPACT: Improves profitability for farmers and makes their actions more effective	IMPACT: Improves fertilization and crop planning to make food systems more resilient

Enablers to Innovation:¹⁴⁵

- Geographic position instrumental in being a vital exporter to either or both East and West Africa
- Farmers interested in and willing to diversify products based on demand in the market
- Well developed transportation sector, communications and infrastructure to aid implementation of new technology¹⁴⁶

140 "Agriculture in Africa: Transformation and Outlook." NEPAD: Transforming Africa. Web. 12 June 2019.

141 "The Untapped Market for Agricultural Innovations in Emerging Economies." Securing Water for Food: A Grand Challenge for Development. USAID. Aug 2017. Web. 12 June 2019.

142 "Agri-hub." Agri-hub. 2019. Web. 12 June 2019.

143 "Have you Herd?" Meat Naturally Brings Sustainable Profits to South African Cattle Farmers." Securing Water for Food: A Grand Challenge for Development. USAID. 29 June 2018. Web. 12 June 2019.

144 "Award-winning Farming App Boosts South Africa's Small-Scale Farmers." TRTWorld. 12 Nov 2018. Web. 12 June 2019.

145 "Africa: South Africa." The World Factbook: Central Intelligence Agency, 2019. Web. 12 June 2019.

146 "The World Bank in South Africa." The World Bank. 2019. Web. 12 June 2019.



Tanzania's youthful and quickly growing population of 55.45 million is going through vast internal migration. Urbanizing at a rate of 33.8 percent annually, people are moving from rural farm land to cities such as Dar es Salaam in search of work in telecommunications, tourism and banking.¹⁴⁷ Economic growth has also aided in the decline of the poverty rate even though the number of poor citizens remains stagnant due to the increasing population with 22.8 percent of people living below the poverty line.¹⁴⁸

Although tourism has recently helped to grow the Tanzanian economy, the country depends on agriculture for economic prosperity. Agricultural processing is also a profitable industry, producing sugar, beer, and cigarettes.¹⁴⁹ Small scale farmers are still the main producers of both food and cash crops for exportation, but all the agricultural land in the country is owned by the government and leased to farmers.¹⁵⁰

Agriculture by the Numbers:

- 23.4 percent of GDP
- 66.9 percent of workforce
- 43.7 percent of land used for agriculture

Harvest Trends:

- Harvested crops: coffee, sisal, tea, cotton, pyrethrum (insecticide made from chrysanthemums), cashew nuts, tobacco, cloves, corn, wheat, cassava (manioc, tapioca), bananas, fruits, vegetables
- Livestock: cattle, sheep, goats

Challenges Facing BOP:

- Land degradation
- Water pollution
- Negative effects of climate change causing unpredictable flooding and droughts
- Rapid urbanization reducing the land area for agriculture

Supply Chain Challenges:¹⁵¹

- Outdated infrastructure and transportation facilities especially railroads and ports
- Weak infrastructure
- Poor transportation
- Inadequate storage and packing technology
- Market information and systems disjointed and unreliable

147 ["Africa: Tanzania."](#) *The World Factbook: Central Intelligence Agency*, 2019. Web. 12 June 2019.

148 ["The World Bank in Tanzania."](#) *The World Bank*, 2019. Web. 12 June 2019.

149 ["Africa: Tanzania."](#) *The World Factbook: Central Intelligence Agency*, 2019. Web. 12 June 2019.

150 ["Land for Agriculture in Tanzania: Challenges and Opportunities."](#) *Sokoine University of Agriculture*, Dec 2014. Web. 12 June 2019.

151 ["Agriculture and Food Security."](#) *USAID*, 7 June 2019. Web. 12 June 2019.

Barriers to Innovation:¹⁵²

- All land is owned by the government and can be leased out to people for 99 years
- BOP farmers have limited access to financial resources
- Poor government policies that reduce incentives to further develop agricultural sector

Innovation Spotlight:^{153,154, 155}

Wakati est. 2017	AgriTechs est. 2018	eWaterPay est. 2016
Technology that preserves fruits and vegetables without using cooling, but using one liter of water and a solar panel	Hydroponics system designed for BoP in urban settings	Prepaid smart water taps that track revenue to keep both governments and private companies accountable for system maintenance
IMPACT: Smallholder farmers can store produce on farm with only one liter of water a week	IMPACT: Reduces household expenditures on food.	IMPACT: In the last year, sold 85m liters of water, built 250 water dispenser systems. Utilized by 62,000 people

Enablers to Innovation:¹⁵⁶

- Government plans to incorporate private sector engagement with a public-private partnership focused on increasing agricultural business investments called Southern Agricultural Growth Corridor of Tanzania (SAGCOT)
- Vast arable land suitable for agriculture that is still uncultivated
- Tanzanian government's plan to reduce poverty is three-fold, with one entire cluster dedicated to increasing agricultural productivity and improving infrastructure to support that growth¹⁵⁷

152 "Land for Agriculture in Tanzania: Challenges and Opportunities." *Sokoine University of Agriculture*. Dec 2014. Web. 12 June 2019.

153 "Wakati-Co: Low-cost Food Preservation." *Wakati.co*. 2019. Web. 12 June 2019.

154 "AgriTechs: Defining the Future of Farming." *AgriTechs*. 2019. Web. 12 June 2019.

155 "eWaterPay: Affordable, Smart wWater for Everyone, Everywhere." *eWaterPay*. 2019. Web. 12 June 2019.

156 "Agriculture and Food Security." *USAID*. 7 June 2019. Web. 12 June 2019.

157 Wolter, Denise. "Tanzania: The Challenge of Moving from Subsistence to Profit." *OECD*. Web. 12 June 2019.



Standing alone as the only Southeast Asian country never colonized by a European power, Thailand enjoys relatively well-developed infrastructure and a free-enterprise economy that is highly dependent on international trade and exports.¹⁵⁸ The population of Thailand is 68.6 million people in a comparatively homogeneous society with over 90 percent of the population comprised of Thai ethnic groups who speak Thai and practice Buddhism.¹⁵⁹

The agricultural sector, comprised mostly of small-scale farms, contributes only 10 percent of GDP but employs about one-third of the labor force. Manufacturing surpassed agriculture as the country's leading industry back in the 1980s and although there has been governmental support to sustain farmers, it is not expected to revive agriculture as a major economic booster.

Agriculture by the Numbers:¹⁶⁰

- 10 percent of GDP
- 32 percent of workforce
- 41 percent of land used for agricultural purposes

Harvest Trends:

- Harvest production: rice, cassava, rubber, corn, sugarcane, coconuts, palm oil, pineapples, livestock, fish products
- World's top exporter of the world's top exporter of rice, rubber, sugar and cassava and also large livestock and fish product producer

Challenges Facing BOP:¹⁶¹

- Agriculture production declining due to the departure of young people and changing the face of the industry and also leading to potential unsafe migrant worker challenges.
- Scarcity of water and increasing competition for water usage resulting in conflict between farmers
- Environmental degradation changing the face of the land used for agriculture

Supply Chain Challenges:¹⁶²

- Ineffective communication channels between farmers and end-users and lack of information sharing due to little technology investment
- Fierce competition and collusion at all levels of supply chain
- Inadequate infrastructure in the central logistics within the supply chain
- High percentage crops lost during transportation, especially fruit farmers yielding 15-20 percent loss during transport annually

158 "[East Asia/Southeast Asia](#)." *The World Factbook: Central Intelligence Agency*. 2019. Web. 12 June 2019.

159 "[East Asia/Southeast Asia](#)." *The World Factbook: Central Intelligence Agency*. 2019. Web. 12 June 2019.

160 "[Country Profile: Thailand](#)." *Food and Agriculture Organization of the United Nations*. 2019. Web. 12 June 2019.

161 "[Country Profile: Thailand](#)." *Food and Agriculture Organization of the United Nations*. 2019. Web. 12 June 2019.

162 "[The World Bank in Thailand](#)." *The World Bank*. 2019. Web. 12 June 2019.

Barriers to Innovation:

- Political uncertainty and increasing household debt levels
- An aging population that is more adverse to technology and innovative change
- Sources of capital and credit are scarce for BOP farmers

Innovation Spotlight:^{163,164, 165}

Eden Agritech est. 2015	EnerGaia est. 2009	Ricult est. 2016
Enable Thai fruit farmers and exporters to reduce waste during transport where high percentage of crops are lost	Developed technology on algae production to enable consumers to grow spirulina and use it on their farms	Uses satellite imagery to observe farmland and give insights on when to water, irrigate or harvest
IMPACT: Sprayed solution onto fruit extends shelf life by 15 days	IMPACT: Focused on providing a clean, healthy and sustainable food source to improve sustainable farming	IMPACT: Access to 250,000 farmers and increased profitability of farm by 50%

Enablers to Innovation:

- Thai government that have adopted a wide range of institutions and policies that look to improve and revive the agriculture sector
- Farmers consistently shown interest and willingness to experiment with new seeds, machinery and methods¹⁶⁶
- Thailand Board of Investment (BOI) received \$1.9 billion in agricultural related projects or products in 2017, showing the private sector interest in investing and growing the industry
- BOI also established tax exemptions and non-tax incentives such as work permits and visas to drive innovation and encourage investment

163 Lee, Pearl. "Thailand's Plan to Become an Agritech Powerhouse." *Techinasia*. 26 July 2017. Web. 12 June 2019.

164 "EnerGaia." *EnerGaia*. 2019. Web. 12 June 2019.

165 "How Thailand is Bringing Technology to the Table." *CNBC*. 2019. Web. 12 June 2019.

166 "How Thailand is Bringing Technology to the Table." *CNBC*. 2019. Web. 12 June 2019.



The East-Central African nation of Uganda yields one of the youngest and fastest-growing populations in the world, rapidly increasing their current population of 40.8 million. Their GDP is growing on average at five percent annually but due to recent political conflict with South Sudan, it has slowed down and sits at \$26.6 billion.¹⁶⁷ Foreign investors have realized the importance of Uganda's natural resources, including oil, and there will be significant investment in production facilities.¹⁶⁸

Agriculture is the most important industry to Uganda's economic health and to its people, employing 71 percent of the workforce. Although, subsistence farming is the major form of agricultural use, the country relies on agriculture as a major source of its GDP and almost half of its exports.¹⁶⁹ Agriculture has also proven to be a huge factor of pulling people out of poverty in Uganda, accounting for 79 percent of the poverty reduction in recent years with hopes to reduce the rate of poverty even more, which currently is at 21 percent.¹⁷⁰

Agriculture by the Numbers:

- 25.4 percent of GDP
- 71 percent of workforce
- 72 percent of land used for agriculture
- 50 percent of exports

Harvest Trends:

- Harvest: coffee, tea, cotton, tobacco, cassava, potatoes, corn, millet, pulses, cut flowers, milk, fish
- Livestock: cattle, sheep, goats, pigs

Challenges Facing BOP:¹⁷¹

- Climatic disasters due to the changing climate
- Explosive population growth
- Pest and weed infestation
- Common livestock diseases
- Insecurity over land ownership

Supply Chain Challenges:¹⁷²

- Insufficient infrastructure and transport network
- Lack of modern technology
- Poor agriculture practices
- Limited sources for market information
- Lack of quality agriculture machinery

167 "Africa: Uganda." *The World Factbook: Central Intelligence Agency*. 2019. Web. 12 June 2019.

168 "Africa: Uganda." *The World Factbook: Central Intelligence Agency*. 2019. Web. 12 June 2019.

169 "Country Profile: Uganda." *Food and Agriculture Organization of the United Nations*. 2019. Web. 12 June 2019.

170 "Africa: Uganda." *The World Factbook: Central Intelligence Agency*. 2019. Web. 12 June 2019.

171 "Making Farming More Productive and Profitable for Ugandan Farmers." *The World Bank*. 19 June 2018. Web. 12 June 2019.

172 "Making Farming More Productive and Profitable for Ugandan Farmers." *The World Bank*. 19 June 2018. Web. 12 June 2019.

Barriers to Innovation:¹⁷³

- Limited access to resources, such as electricity, with only 10 percent of people in rural areas having access
- Lack of availability to finance and credit
- Traditional farming techniques with resistance to new ideas and innovation

Innovation Spotlight:^{174,175,176}

Agro Supply Uganda est. 2017	Bringo Fresh Deliveries est. 2009	Wefarm est. 2016
Uses microsavings financing to supply smallholder farmers with inputs, markets and services	Digital logistics platform that provides an organized market for farmers to sell produce in packaged boxes to consumers	Utilizes AI technology to crowdsource information and connect small-scale farmers to that information
IMPACT: 18,000 farmers reached. Increased farmers income by \$250 annually. 50-100% increase in harvest yield per hectare	IMPACT: Uplifting the agriculture sector in Uganda and supporting smallholder farmers	IMPACT: 1.4 million farmers and processing 1 million questions and answers each month

Enablers to Innovation:¹⁷⁷

- Partnership between the International Fund for Agriculture Development (IFAD) and the Ministry of Agriculture to support smallholder farming
- The World Bank sponsored Agriculture Cluster Development Project with the goal to increase productivity on the farm and the number of products that get sent to the market
- Civil works in progress on a road linking DRC and Uganda, increasing trade between the nations and improving the transportation facilities

173 "Africa: Uganda." *The World Factbook: Central Intelligence Agency*. 2019. Web. 12 June 2019.

174 "Agro Supply Uganda Ltd." *Agro Supply Uganda*. 2019. Web. 12 June 2019.

175 "Bringo Fresh: Get Fresh Produce From the Farm Direct to your Doorstep." *BringoFresh*. 2019. Web. 12 June 2019.

176 "WeFarm: The World's Largest Farmer-to-Farmer Digital Network." *WeFarm*. 2019. Web. 12 June 2019.

177 "The World Bank in Uganda." *The World Bank*. 2019. Web. 12 June 2019.



Vietnam has been transitioning from the rigidity of a centrally-planned to a more industrial, market-based economy since 1986. The country has had much success in this transition due to its stable political system, young population, stable currency and commitment to sustainable growth.¹⁷⁸ Vietnam has been able to grow its GDP at a rate of 6.79 percent annually, although agriculture's share of this rate has actually decreased in this time frame.¹⁷⁹

Similar to its neighboring countries in Southeast Asia, Vietnam is a densely populated country with a heavy dependence on agriculture. Out of the nation's 90 million people, 70 percent live in rural areas and two-thirds depend on agriculture for their livelihood. Emerging as a world leader in exports of agro-food commodities, Vietnam's agriculture sector has made great progress in recent years with lots of future growth potential.

Agriculture by the Numbers:

- 15.3 percent of GDP
- 40 percent of workforce
- 34.8 percent of land used for agriculture
- 66 percent of population depends on agriculture sector for livelihood and employment

Harvest Trends:

- Major crops in production: rice, coffee, rubber, tea, pepper, soybeans, cashews, sugar cane, peanuts, bananas
- Livestock production: poultry and seafood

Challenges Facing BOP:^{180,181}

- Climate change causing increase risk to crops due to droughts, floods, etc.
- Rapid urbanization and industrialization converting agricultural land for industry or housing use
- Traditional farming practices are not the best use of resources and harsh on the land used for farming (e.g., using too much water during irrigation)
- Reliance on a single crop—rice—productivity for future employment and stable income

Supply Chain Challenges:

- Lack of professional organizations or co-operatives in agriculture that lead to low bargaining power for farmers
- Poor logistical operations in getting the harvested crops to consumers quickly leading to an average loss ratio of 25-30 percent¹⁸²
- Low level of mechanization available in agriculture production to transport crops and very little capacity for the transportation of frozen foods

Barriers to Innovation:

178 "East Asia/Southeast Asia: Vietnam." *The World Factbook: Central Intelligence Agency*. 2019. Web. 12 June 2019.

179 "The World Bank in Vietnam." *The World Bank*. 2019. Web. 12 June 2019.

180 "Country Profile: Vietnam." *Food and Agriculture Organization of the United Nations*. 2019. Web. 12 June 2019.

181 "Country Profile: Vietnam." *Food and Agriculture Organization of the United Nations*. 2019. Web. 12 June 2019.

182 "The World Bank in Vietnam." *The World Bank*. 2019. Web. 12 June 2019.

- Associated high costs for farmers to invest in new digital technology
- Inferior trade activities on agriculture and crops when compared with neighboring countries
- Market challenges faced by the country including lack of transparency and uniformity within the government policies and high levels of corruption

Innovation Spotlight: ^{183,184,185}

AgrHub est. 2016	Spark est. 2011	MimosaTEK est. 2014
Supply chain management platform that uses technology to link farmers to consumers	Cold storage technology to bring potato seeds from Germany and The Netherlands	A technology platform helping farmers transfer to more effective practices driven by data
<p>SERVICES: Products seek to improve quality of life for farmers and rural communities</p>	<p>STRATEGY: Utilized BIOVAC method for processing waste and cut down on agriculture waste</p>	<p>IMPACT: Saving farming resources, including water, fertilizer, labor while optimizing crop yield and integrating farmers more directly in the supply chain.</p>

Enablers to Innovation:

- Government agri-programs working toward sustainable and modern commodity production on a large scale by applying technology to increase productivity and quality
- IDA (International Development Association) program to enable partnerships between farmer organizations and agri-based companies
- Recent investments in research and development for agriculture by private corporations and governments alike
- The agribusiness acceleration program Mekong Agritech Challenge MATCh that enables startups to enter the industry by winning their challenge but also encourages innovation in agriculture techniques

183 "Agrhub: Transform the Agricultural Technology." *Agrhub*. 2019. Web. 12 June 2019.

184 "Spark: Center for Social Entrepreneurship Development." *Spark*. 2019. Web. 12 June 2019.

185 "MimosaTEK." *MimosaTEK.com*. 2019. Web. 14 June 2019.



Zambia's reliance on copper exports proved successful in growing the country's economy extremely quickly at a rate of 6.7 percent annually. When copper prices fell, this growth dropped to 3.4 percent and Zambia's lack of economic diversification was clear.¹⁸⁶ With a current GDP of \$25.7 billion, extreme rural poverty (54.5 percent of the population below the poverty line) and high unemployment rate (15 percent) characterize Zambia's current economy.¹⁸⁷

This landlocked country in southern Africa has a mostly urban population of 16.5 million, but the opportunities in the rural areas for further agricultural development are present. Most farmers in Zambia are small scale, subsistence farmers with few medium-scale farmers producing maize as a cash crop and even fewer diversifying crops for various markets. The country has access to millions of hectares of uncultivated agricultural land and 40 percent of sub-Saharan Africa's water resources, meaning great potential for agricultural expansion.¹⁸⁸

Agriculture by the Numbers:

- 7.5 percent of GDP
- 54.8 percent of workforce
- 31.7 percent of land used for agriculture

Harvest Trends:

- Harvested crops: corn, sorghum, rice, peanuts, sunflower seeds, vegetables, flowers, tobacco, cotton, sugarcane, cassava (manioc, tapioca), coffee
- Livestock: cattle, goats, pigs, poultry, milk, eggs, hides

Challenges Facing BOP:¹⁸⁹

- Climate change causing period droughts and tropical storms more frequently
- Lack of adequate water treatment
- Chemical runoff into water sources
- Rapid urbanization, one of the highest levels in Africa, meaning less land for agricultural use
- Dependence on rain-fed agriculture

Supply Chain Challenges:¹⁹⁰

- Lack of mechanization
- Inadequate rural infrastructure including roads, railroads, and telecommunication
- BOP farmers have little to no access to market information
- Obsolete technology used in irrigation systems

186 "Africa: Zambia." *The World Factbook: Central Intelligence Agency*. 2019. Web. 12 June 2019.

187 "Africa: Zambia." *The World Factbook: Central Intelligence Agency*. 2019. Web. 12 June 2019.

188 "The World Bank in Zambia." *The World Bank*. 2019. Web. 12 June 2019.

189 "Africa: Zambia." *The World Factbook: Central Intelligence Agency*. 2019. Web. 12 June 2019.

190 "Opportunities and Challenges in Enhancing Agricultural Development in Zambia." *IAPRI*. 12 Oct 2016. Web. 12 June 2019.

Barriers to Innovation:¹⁹¹

- High levels of government debt
- Commercial banks involvement in small scale, and even medium scale agriculture production is non-existent
- BOP farmers do not have consistent access to credit or capital
- Little to no investment in research and development in the agricultural sector by government or private-sector

Innovation Spotlight: ^{192,193,194}

Zazu est. 2015	Agripredict est. 2016	Lima Links est. 2016
Online platform to connect BoP farmers directly to new markets, particularly those with extra produce	Web and mobile-phone platform for risk management sending farmers information on pest infestations and weather conditions	Using a tech platform to connect smallholder farmers directly with consumer markets
IMPACT: 9,000 farmers interacting with SMS on the platform and increasing their profits	IMPACT: Reduces the amount of agricultural products lost due to poor treatment or undiagnosed diseases	IMPACT: Helps BOP farmers increase incomes and connect to markets

Enablers to Innovation:¹⁹⁵

- Zambia's government raising money from international investors, both private sector and other countries
- Working with other governments, specifically China, to help finance infrastructure projects aimed at improving live for rural people
- Government promoting agriculture in order to diversify the economy and eliminate their reliance on copper

191 "Opportunities and Challenges in Enhancing Agricultural Development in Zambia." *IAPRI*. 12 Oct 2016. Web. 12 June 2019.

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APPENDIX B - RESEARCH METHODOLOGY

This Innovator Guidebook was developed using primary and secondary research, including over 30 in-person interviews with a wide range of entrepreneurs working in the WE4F sector and literature on the bottom of the pyramid, agriculture, and social entrepreneurship. Secondary research in academic and mass market interviews, articles, and books focused on entrepreneurs' challenges, mitigation strategies, and business models in targeting markets at the bottom of the pyramid. A complete list of these resources can be found in the bibliography in Appendix C. Finally, we explored a number of resources designed to assist entrepreneurs, including the *Social Entrepreneur's Handbook*, the *Social Enterprise Toolbelt*, and the Lean Startup and Lean Data methodologies.

Primary research was conducted by telephone and in-person during the 2019 Global Entrepreneurship Summit in The Hague, Netherlands. The authors of this guidebook met with a wide range of entrepreneurs in the WE4F sector, including graduates of the Securing Water For Food and Powering Agriculture Grand Challenges. The findings, recommendations, and case studies presented in this guidebook are all informed by these in-depth discussions and interviews with these dedicated entrepreneurs.





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APPENDIX D - CITED BUSINESSES AND INVESTORS PIONEERING WE4F SOLUTIONS FOR THE BOP

Company	Location	Description
<u>Acumen Fund</u>	USA	Philanthropic organization that invests philanthropy funds into companies making change on a global level, hoping to provide people around the world with access to basic goods and services.
<u>Adaptive Symbiotic Technologies</u>	USA	Biotechnology organization that develops microbial seed and plant treatments to aid agricultural efforts and make crop harvests more resilient to climate stresses.
<u>Aduna</u>	Senegal	Leveraged the untapped potential of the baobab fruit to produce a global, natural product that would benefit consumers but bring revenue to the BOP farmers that cultivate the fruit.
<u>Agri Apps</u>	South Africa	A big data and internet of things organization that provides an online software and supplemental hardware that enables agricultural innovators to engage with BOP farmers immediately and deploy solutions without having to solve technology problems.
<u>Agri-hub farming app</u>	South Africa	Agri-hub has developed a farming app that provides information and advice directly to farmers' mobile phones about when to harvest crops. The app works as a communication tool that enhances the farmer's profitability.
<u>Agri Hub</u>	Vietnam	A supply chain management platform that uses technology to link farmers to consumers in order to eliminate the middleman and produce products that seek to improve the quality of life for BOP farmers.
<u>Agribuddy</u>	Cambodia	Agribuddy trains local entrepreneurs in Cambodia to mentor farmers via an app that connects all the stakeholders within the agricultural sector and serves as a guarantor for farmers to obtain loans.
<u>Agripredict</u>	Zambia	A web and mobile phone platform that helps farms manage risk by sharing information about pest infestations and weather conditions so that farmers can prepare their harvest to optimize results.
<u>AgriTechs</u>	Tanzania	AgriTechs uses a hydroponic system to automate irrigation and monitor water level and temperature that is available to BOP farmers in mostly urban farming environments.
<u>Agro Supply Uganda</u>	Uganda	Fintech and agritech organization that uses microsavings financing to supply smallholder farmers with inputs, market information, and additional services to increase farmers harvest yields and income.
<u>AgUnity</u>	Kenya	Using a smartphone app, this company creates a network of trusted farmers and cooperatives and permanently records all transactions using an incorruptible blockchain ledger to reduce the loss of crop value from harvest to point of sale.

Company	Location	Description
<u>Airlift</u>	Nepal	Airlift uses drone technology to help farmers track the health of their crops, connecting the drone information directly to the farmers smartphones so that they know when and where to spray pesticides.
<u>Amar Desh Amar Gram</u>	Bangladesh	An ICT-based network that connects the rural life of BOP farmers to city life and works on cutting out the middleman during transactions between the two.
<u>Aqua-Spark</u>	Netherlands	A global investment fund working with sustainable aquaculture SMEs that create positive social and environmental impacts while also generating returns on investment.
<u>Asili</u>	DRC	A business startup co-created by ARC, USAID, IDEO and other partners, this organization works to develop supply and demand services such as health clinics, clean water distribution, and agricultural cooperatives.
<u>Aybar Engineering</u>	Ethiopia	Aybar Engineering uses a broad bed and furrow maker to drain excess water from plants in order to conserve moisture and mitigate water logging problems caused by poor drainage to reduce crop failures.
<u>BanQu</u>	USA	A blockchain-as-a-service software company that aims to alleviate poverty by connecting the BOP to businesses, organizations, and governments using their platform, which helps the unbanked develop economic identities.
<u>Bringo Fresh Deliveries</u>	Uganda	Connecting farmers directly to their end-users, Bringo Fresh provides a digital platform for an organized market so that farmers can sell their packaged produce to customers.
<u>Burro</u>	Ghana	Focused on developing “tools for a better life,” Burro started with selling rechargeable batteries and now sells a variety of products including irrigations pumps, solar energy systems, and food processing equipment.
<u>Claro Energy</u>	India	A pay-as-you-go irrigation service that uses a portable and affordable solar pump to meet the needs of BOP farmers without pumps of their own or upfront capital.
<u>CleanStar Mozambique</u>	Mozambique	A cookstove and biofuel supplier in Mozambique that uses farmer-based cassava instead of charcoal to increase food and energy security and help fight climate change.
<u>Ecofiltro</u>	Guatemala	Manufactures and installs ceramic water purification filters for BOP farmers for better quality and less energy than boiling water and less money than bottled water.
<u>Eden Agritech</u>	Thailand	Provides an innovative solution to the loss of revenue post harvest during the transportation of fruit by creating a spray that extends the shelf life of fruit by 15 days.
<u>eKutir</u>	Cambodia	A decentralized network of microentrepreneurs and kiosks that converts a fragmented agriculture system into a connected soil-to-sale model.
<u>EnerGaia</u>	Thailand	EnerGaia leverages the value of spirulina to develop and sell their bioreactor systems and new technology that helps BOP farmers grow and manage their spirulina, an algae that grows rapidly and converts greenhouse gases into nutrition, protein, and oxygen.

Company	Location	Description
<u>eWaterPay</u>	Tanzania	A prepayment water dispenser that gives BOP farmers access to clean water at all hours through a mobile money and cloud-based data analytics system. The company creates transparency and accountability at all levels of stakeholder engagement through its innovative and sustainable water platform.
<u>Esoko</u>	Ghana	Enables smallholder farmers to access information such as weather forecasts, pricing changes, and links to buyers via SMS. The service is available in more than 15 African countries.
<u>Farm Tech</u>	Myanmar	A startup that distributes environmentally-sustainable solar dryers to BOP farmers.
<u>Farmcrowdy</u>	Nigeria	Farmcrowdy is a mobile phone app that addresses the issues of food security, production, and circulation in Nigeria by connecting farmers directly to sponsors, which creates an online network of BOP farmers.
<u>Farmer Query System</u>	Bangladesh	A smartphone technology—created through a USAID-funded project—that allows farmers to connect with agricultural experts in a call center.
<u>Farmerline</u>	Ghana	Farmerline is an online platform that links BOP farmers to market information, finance, and equipment services, empowering small-scale farmers to become financially prosperous and more entrepreneurial.
<u>Gham Power</u>	Nepal	A solar water pumping systems producer that makes their products available to farmers online and then sells and implements the systems as a reliable means of irrigation, regardless of weather and rainfall. The systems also track key water data to ensure profitability of land and protect harvests.
<u>GIE Senbioagro Corporation</u>	Senegal	Developed a new innovation tool that reduces food waste by transforming excess harvest yields into products ready to be sold at market, which creates additional employment opportunities for the BOP.
<u>GRACI</u>	Côte d'Ivoire	Attempting to tackle the problem of poor seed quality in Côte d'Ivoire, this program offers production, certification, and dissemination of improved seeds to rice cultivation.
<u>GreenPath</u>	Ethiopia	GreenPath Food teaches and trains smallholder farmers how to make farms more sustainable. The organization partners BOP farmers with larger farmers to provide tech support, share innovations, and create best practices to support industry growth.
<u>ICT4DEV</u>	Côte d'Ivoire	Using an online platform, this startup innovator integrates ICT solutions with management tools to quickly answer farmers' questions, providing the BOP with knowledge of the market through SMS or mobile internet.
<u>ICU - Peru</u>	ICU - Peru	An irrigation scheduling system that links weather station and soil moisture sensor technologies to a smartphone platform that relays real-time information to BOP farmers.
<u>IDE-India</u>	India	Reaching multiple agricultural segments, including climate-smart and sustainable, IDE-India targets poverty reduction and rural development with a focus on enabling access to clean water for all.
<u>Ignitia</u>	Sweden	A tropical weather forecasting company that predicts weather patterns and delivers information straight to farmers' mobile devices so that they can adapt their farming techniques to increase harvest production.

Company	Location	Description
<u>Husk Power Systems</u>	India	Using off-grid utilities, Husk provides reliable power from renewable energy sources to rural communities, BOP farmers, and small businesses.
<u>Hydroponics Africa</u>	Kenya	Hydroponic farming technology using mineral nutrient solutions in the water to grow crops, which reduces the need for excess soil.
<u>ITIKI</u>	South Africa	ITIKI generates a forecasting tool to provide BOP farmers with drought information directly on their mobile phones by tapping into a network of sensors that monitors weather conditions.
<u>Jappandil</u>	Senegal	Aiming to improve farming practices and BOP access to new innovations, Jappandil developed a platform that connects farmers to agricultural experts, service providers, and materials to source.
<u>Khusa App</u>	Malawi	A fintech and loan savings mobile app that allows farmers and other consumers to minimize their risk by reducing the need to trade in cash. Transactions can happen over the app even for customers who don't have access to banking or credit.
<u>Kibogo Innovate</u>	Kenya	Targeted toward small-scale farmers, this innovator produces organic fertilizers using locally-sourced materials to lower the input costs for farmers and improve the soil nutrients.
<u>Kitovu</u>	Nigeria	Kitovu is an online and mobile platform that provides farmers in Nigeria with access to data on soil and market demand that aims to reduce the high rates of post-harvest losses by helping farmers understand when they can sell at the best prices.
<u>Kiu Global</u>	USA	A fintech company that uses an online platform with a built-in AI credit scoring engine that provides easier access to loans and businesses.
<u>Lal Teer Seed</u>	Bangladesh	A research-based seed company that develops and produces high-yielding seeds and yields.
<u>Lima Links</u>	Zambia	Lima Links in Zambia uses a technology platform to connect smallholder farmers directly with consumer makers, eliminating the need for a middleman and mitigating BOP farmers' profit loss through supply chain handovers.
<u>M-Farm Limited</u>	Kenya	M-Farm developed an online market information platform that enables farmers and buyers to understand the worth of the crops and create transparency in the marketplace.
<u>Meat Naturally</u>	South Africa	The organization partners with NGOs to provide formal training to BOP farmers on grazing techniques and rangeland restoration practices to help them sustainably produce meat.
<u>MicroEnsure</u>	USA	Insurance organization that looks to create innovative solutions to provide insurance policies in emerging markets.
<u>MimosaTEK</u>	Vietnam	An internet of things platform that uses sensors to collect and analyze farm data, which addresses excess water use in traditional Vietnamese farming practices to improve sustainability.
<u>Mobisol</u>	Germany	Provided solar systems as an alternative energy source to households and micro-enterprises with the overall goal to alleviate poverty and implement sustainable and affordable energy solutions.
<u>Mrittika</u>	Bangladesh	A mobile phone app linking soil data to fertilizer dosage that farmers can tap into for their specific land in order to preserve soil nutrients and increase crop production.

Company	Location	Description
<u>Naireeta Services</u>	India	The company behind the product Bhungroo and the service Women Climate Leaders (WCL) improves agricultural outputs in India with Bhungroo filters, which inject and store stormwater subsoil to avoid overflowing crops while WCL trains women smallholder farmers to provide fee-based services to other BOP farmers.
<u>Ninjacart</u>	India	Ninjacart connects fruit and vegetable BOP farmers directly to end-users and customers using an online marketing and delivery service that eliminates the need for a middleman.
<u>Noble Agri-Tech</u>	Malawi	This agricultural innovator developed a new technology to test soil for proper nutrients, design irrigation systems, and plan out farms to improve the farming industry in Malawi.
<u>Project Alba</u>	Cambodia	Project Alba created a cooperative network with an online platform that provides on demand technical solutions and support to farmers..
<u>Pula</u>	Ethiopia	Now stretching into Asia and Africa, Pula uses technology to restructure agricultural insurance, allowing BOP farmers to insure their crops using their mobile devices.
<u>Reel Gardening</u>	South Africa	An innovative startup based in South Africa that produces simple biodegradable seed planting tools for subsistence gardening.
<u>Rice Knowledge Bank</u>	Bangladesh	In order to optimize growth and revenue for BOP farmers, the Rice Knowledge Bank provides fact sheets online about rice cultivation techniques and best practices.
<u>Ricult</u>	Thailand	Ricult is a Thailand based startup that uses satellite imagery to observe farmland and provide BOP farmers with insights on when to water, irrigate, and harvest crops, improving their production and revenue.
<u>Shreenager</u>	Nepal	An integrated agribusiness, Shreenager offers its services through an online platform that is a one-stop-shop for smallholder farmers to get all their farming needs including seeds, technical assistance, insurance, and market linkages.
<u>SI Technologies</u>	India	Connecting BOP and others to products and services that use innovative solutions to problems and develops a platform of networks to help organizations grow.
<u>Smart Krishi</u>	Nepal	An SMS and mobile app that provides immediate information about necessary agriculture needs, including weather updates and daily market prices, to BOP farmers.
<u>Smart Maka</u>	Nepal	Analyzes the quality of soil and plant nutrition using a portable, solar soil testing device that links to a smart phone application. The app then provides farmers with immediate suggestions of fertilizer dosage to maintain soil quality and improve harvests.
<u>Spark</u>	Vietnam	Spark uses the BIOVAC method for processing and reducing agricultural waste and improves cold storage technology to bring potato seeds from Europe to Vietnam for planting.
<u>Stellapps</u>	India	An internet of things company that uses data analytics and technology to monitor quantity and quality of milk and storage facilities to reduce loss of product and decrease waste.
<u>Sunfarmer</u>	Nepal	A solar energy company focused on providing electricity and power to rural communities in Nepal. The organization provides technical, financial and strategic information to farmers in addition to implementing the solar power systems.

Company	Location	Description
<u>SkyFox</u>	Ghana	Operating in the water and sanitation space, SkyFox limited provides a variety of products and services to BOP farmers including a mobile commerce platform to conduct business transactions and a water monitoring system.
<u>Taimba</u>	Kenya	Taimba is a business-to-business online platform that connects BOP farmers directly to retailers, which cuts out the middleman and creates price transparency while increasing revenue for the farmers.
<u>Tala</u>		Fintech organization that provides loans to anyone with an Android smartphone, specifically geared toward emerging markets for people that do not have the opportunity to gain credit easily.
<u>TECA</u>	Mozambique	TECA is a global web-based program for sharing information on agricultural practices and technologies to improve the knowledge of small scale farmers.
The Basket Malawi	Malwai	A business-to-business provider that delivers fresh produce to homes using a mobile app that connects farmers directly to the customers and handles the logistics of the delivery.
<u>Third Eye</u>	Mozambique	Third Eye produces and deploys sensors that fly over farms collecting data and provides the data to farmers via an online platform. BOP farmers have the information they need to detect crop stress in advance and adjust agricultural inputs to save their harvests and protect their incomes.
Tool Bi	Senegal	Tool Bi markets new electronic irrigation technologies to BOP farmers to help them improve their agricultural yields.
<u>TROTRO Tractor</u>	Ghana	This app connects BOP farmers who lack consistent access to mechanization tools to local tractor operators to access machinery and tractor services.
<u>Verdant</u>	Nigeria	Using AI technology, Verdant crowdsources information about agricultural techniques and practices and connects small-scale farmers directly to that information.
<u>Wakati</u>	Tanzania	Wakati developed technology to preserve fruits and vegetables using only one liter of water and a solar panel, making the process more affordable and sustainable for BOP farmers.
<u>Water Resource Institute</u>	Uganda	A center that bridges the gap between theory and practice by providing technology training, skills development, and outreach support in water resources management.
<u>Wefarm</u>	Uganda	Crowdsources agricultural best practices information using AI technology and connects small-scale farmers directly to that information.
<u>WeFly Agri</u>	Côte d'Ivoire	Giving farmers an "eye in the sky," WeFly Agri uses drone technologies to remotely monitor farmers' fields and crop progress, sending updates directly to their mobile phones, to enable better crop management and maximize productivity.
<u>YA Agri-Tech</u>	Mozambique	A local Mozambican center that provides agricultural training to youth to prepare them for the job market and help them develop skills to start their own agritech businesses.
<u>Zazu</u>	Zambia	A fintech organization that aids BOP farmers, among other customers, manage their finances using a mobile application. This reduces the risk of supply chain transfers that mostly depend on cash transactions and increases money security.



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The Water and Energy for Food (WE4F) Grand Challenge was established to expand the scale of innovations that impact the food and water sectors, food and energy sectors, or all three sectors of the nexus (food, water, energy) to increase the sustainability of agricultural food value chains and address climate change in developing countries and emerging markets – with a particular focus on the poor and women.