Creating Value and Sustainability in Agricultural Supply Chains
Models for Delivery of Crop Improvement Services to Smallholder Farmers In Africa

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Executive Summary

Smallholder farmers around the world face many constraints, including access to financing, inputs, and technologies that prevent them from upgrading production. In Africa in particular, farming techniques developed during the green revolution, such as the use of fertilizer and higher yielding crop varieties, have low adoption. As a result, a vicious cycle of low yields keeps farmers in poverty, leading to under-investment in agriculture and further deterioration of yields.

The cocoa sector faces many of these same challenges: remote farms with limited access to services, low application of fertilizer, scant knowledge of grafting, and poorly implemented post-harvest, quality and grading systems. The resulting low yields and minimal payback do not provide incentives for farmers to invest in or to replant their cocoa trees. Increased abandonment of cocoa farms combined with decreasing yields is projected to lead to a shortage of cocoa supply by 2020.

In light of these developments, Mars is re-thinking the way cocoa has traditionally been farmed and looking to incorporate best practices and new innovations into its supply chain. To help inform this process, this report surveys best practices in comparable tree crop supply chains including shea, palm oil, and cashew. The report also reviews new technologies and financial instruments that can be applied to cocoa. Drawing upon this research, key findings and recommendations are incorporated into a “blue sky” model that presents an ideal version of how Mars could address current challenges in the cocoa sector.

Methodology

Value chains were selected for in-depth analysis based on the following criteria:

1) Smallholder crop
2) Tree crop
3) Sourced in fairly remote areas where services are scarce

The selected value chains were examined using Mars’ suggested framework:

- Funding mechanisms: What types of funding mechanisms were used during the initial project and what was the transition plan for after project end? How successful was this transition?
- Delivery Model: Which types of service delivery models have been used? What are their relative strengths and weaknesses?
- Performance Metrics: What kinds of metrics are other projects tracking? What are the data collection techniques used to track progress?

This report is based on desk research and interviews conducted in shea, palm oil, cashew and other supply chains. A list of our interviews can be found in Appendix 2.

Key Recommendations

Interviews with diverse organizations involved in smallholder farmer intervention programs and a review of projects and case studies within this space revealed common themes and issues to be addressed when upgrading small farmer supply chains:

Hire a Third Party to Manage Program: Projects with high uptake, long-term participation, and demonstrated yield or quality improvements had a strong local presence. These projects had hands-
on field officers that regularly communicated and interacted with local communities to effectively transfer best practices and knowledge about crop cultivation and handling.

**Have Project Managers Maintain a Continuous Local Presence:** The most sustainable projects hired field agents from local communities. These agents spent significant time and resources building local capacity. This continuous local presence promoted transparency in operations, built trust with local communities, and helped identify promising talent.

**Separate Buying and Yield Improvement Activities:** The projects that were the most successful were those that built trust with the local community through continuous interaction and separating buying from technical assistance. Keeping interventions with farmers separate from the business allows farmers to choose their buyer. In projects where farmers have not had this choice, there are problems with side selling or farmers, rightly or not, resent the buyer.

**Provide a Bundled Package of Input, Technical, and Financial Services at True Cost:** Paying the true cost of inputs helps farmers to correctly budget their production costs. In addition, farmers tend to undervalue free inputs, so charging a price will encourage farmers to value these goods appropriately. There are costs, such as technical assistance, for which farmers are usually unwilling to pay. These costs should be bundled into prices for physical inputs. Projects that were most successful at cost recovery have service costs bundled into the price of inputs. Financial services can also be bundled: for example insurance can be incorporated into agricultural loan agreements.

**Supporting Other Local Actors Encourages Investment:** In other value chains, projects have not only focused on producers, but also local processors and other actors. If these actors are supported in the effort to become financially viable, it is often in their interest to encourage farm upgrading. For example, in Mozambique, strengthening the cashew-processing sector led local processors to begin investing in farmers to upgrade their production. In shea, a global alliance including industry actors led to increased investment in improving farmer production.

**Demonstration Must Be Local:** When training farmers and showing new techniques through demonstration plots, it’s important that conditions mirror those that farmers actually face. Farmers are not convinced that increased effort will increase output and income when they see crop production under ideal conditions. Demonstrations that mirror their constraints, however, can be powerful tools to incentivize change.

**Interactive, farmer-centered trainings promote learning.** Creating dialogue with and between farmers in training and outreach programs is an important first step for creating trust between field officers, fostering supportive communities, promoting formation of farmer action groups, and addressing key challenges farmers face every day. By designing training to be interactive and farmer-centered, Mars and its partners will be better able to reach and understand smallholders. Listening to farmers will help field officers diagnose constraints on yield or quality improvement. Giving farmers a voice within a dialogue about agricultural improvement empowers them and fosters independence.
Value Chain Analysis of Smallholder Tree Crops
The following section focuses on three different value chains, shea, palm oil, and cashew, which have many similarities to cocoa. This section provides in-depth background on each crops’ background, value chain challenges, solutions used in a selected case study, and key takeaways that can be applied to the cocoa value chain.

Shea Value Chain
Shea has many similarities to cocoa. It grows in the same region and is characterized by under-investment and poor post-harvest handling. This section reveals best practices currently used in shea that can be applied to upgrade the cocoa supply chain.

Shea Background
The shea tree grows wild along a narrow swath of land that encompasses 20 countries, from Senegal in the west to Sudan and Uganda in the east (see Figure 1). This semi-arid strip, known as the shea belt, is said to contain over 500 million trees.¹

The shea fruit has a variety of uses ranging from fruit pulp, edible nuts, cooking oil, and cosmetic butter. In West Africa, shea butter is primarily exported as a substitute for cocoa butter and used in the making of chocolate and various confections. A second export market—much smaller in volume but not in dollar value—is for cosmetic shea butter.¹

The shea tree takes between 8 to 15 years to start bearing fruit, and reaches maturity at 20 to 30 years. The tree can continue to produce for up to 200 years. A tree can typically yield 15 to 20 kg of fresh fruit (3 to 4 kg of dry kernels), with optimum yields up to 45 kg. Raw shea nuts are predominantly harvested and dried by rural women. The labor intensive post-harvest process involves: de-pulping and boiling the fruit, sun-drying the nuts, cracking the shells to remove the kernel, sun-drying the kernels, and storing the kernels for sale and further processing. If nuts are stored properly, they can last for more than a year.²

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Many physical factors influence shea tree yield, including weather, bush fires, pests, and pruning. A major concern for the sustainability of the value chain is the age of the shea tree population, which is above the optimal production stage.³

**Shea Value Chain Challenges**

Key challenges in the Shea value chain include:

**Labor Shortages Lead to Under Production:** A very small portion of total West African shea nut production is actually collected and moved to market. The shea fruit ripens during the rainy season, when agricultural labor requirements are at their peak. Women gather fallen fruits and leave them piled beneath the shea trees on their way to various fields, collecting them in the evening on their way home. The nuts are then stored until the planting schedule allows for proper drying and preparation. Shea trees are widely scattered, and labor shortages have forced many women to abandon their more distant fields, only cultivating those that are closer to their home compound.²

**Poor Storage Leads to Low Quality:** Improper storage causes nuts to form mildew and rot before they can be processed. In order for West African producers to export high-quality shea butter, storage techniques must be improved.⁴

**Sub-optimal Postharvest Processing:** Quality of shea nuts and butter depends heavily on postharvest handling and processing, such as parboiling and drying seeds, which prevents them from germinating. However, currently low quality techniques, such as smoking nuts over a fire, contaminating them with hydrocarbons, are used.⁴

**Lack of Access to Financing:** Shea butter producers have little access to production and marketing capital. Women who harvest shea lack cash flow during the spring months, which causes them to sell early, before the nuts are properly dried. Since drying significantly increases the quality of the nut, these women must sell at a much lower price, reducing their potential earning power.

**Low Adoption of Grafting:** A grafted shea tree will be able to produce fruit approximately 10 years sooner and at higher yields. However, grafting is still rarely used in shea cultivation. As explained by

the West Africa Trade Hub project’s employee, Peter Lovett, “some people believe shea trees just grow in the wild, but in reality they are in parklands that people have managed for millennia. Empowering local stakeholders with grafting skills will not only add value but also protect and promote the entire shea industry.”

Figure 3: Major Constraints in Shea Value Chain

<table>
<thead>
<tr>
<th>Production</th>
<th>Processing</th>
<th>Consolidation</th>
<th>Exporter</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Shea trees grow in remote areas, making collection difficult</td>
<td>- Rudimentary techniques reduce quality</td>
<td>- Absence of effective controls and sorting processes degrades quality</td>
<td>- Low awareness among international buyers reduces feedback mechanisms that could improve value chain quality</td>
</tr>
<tr>
<td>- Low prevalence of grafting reduces yields</td>
<td>- Limited access to finance reduces overall output quality</td>
<td>- Commonly used packaging practices reduce nut quality</td>
<td></td>
</tr>
<tr>
<td>- Labor shortages reduce production volumes</td>
<td></td>
<td>- Remoteness of production creates several layers of intermediaries that raise prices without adding value</td>
<td></td>
</tr>
</tbody>
</table>

Proposed Solutions: West Africa Trade Hub (WATH) Project

The USAID West Africa Trade Hub uses a market-driven approach to increase exports from the region, with the goal of increasing the region’s competitiveness in world markets. The Trade Hub provides direct assistance to hundreds of companies in six value chains, including shea, and couples this assistance with focus on supporting industries, such as transport, telecommunications, and finance.

Figure 4: Outline of West Africa Trade Hub Project

<table>
<thead>
<tr>
<th>Countries in Africa</th>
<th>Dates</th>
<th>Most Relevant Parts of Project</th>
<th>Implementer</th>
</tr>
</thead>
</table>

Assessment of WATH’s Interventions

More than 4 million African women are involved in shea production, the basis of a surging industry in shea butter as a food additive and cosmetic moisturizer. The West Africa Trade Hub’s industry

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6 All information can be found at www.watradehub.com unless otherwise noted.
analyses found that buyers’ quality requirements were not reaching women at the village level. Thus the project focused on increasing the quality of village-based harvesting and processing.

**Training Improves Quality:** Since 2005, WATH has organized shea quality trainings in rural Benin, Burkina Faso, Chad, Ghana, Nigeria and Mali. These village trainings demonstrate how initial processing (for instance, sun drying vs. boiling) can affect the final price paid to women. Often these trainings were institutionalized in the local community through working with Peace Corps Volunteers, who provided training and guidance on a daily basis.

→ Experience across the region has shown that even rural farmers with very limited equipment can produce high-quality shea nuts and butter.

**Building Capacity Along the Value Chain Strengthens Production:** WATH also built outreach, production and training capacity of female West African buyers and consolidators so they could better instruct village processors and connect directly with Western buyers. WATH designed trainings to increase buyers’ knowledge of and links with upstream suppliers and certifiers.

→ More reliable sources of higher volume and better-quality shea butter at competitive prices have raised confidence in the market, allowing direct sourcing from producers. Traders’ agents have made more efforts to deal directly with rural women pickers, assisting them with obtaining supplies, financing, and establishing assistance programs.

**Association Building Promotes Dissemination of Best Practices:** The Trade Hub focused on improving business competitiveness in West Africa through fostering industry alliances led by private sector companies and supported by regional facilitators. Such alliances help members share information and increase their influence in public policy debates, as well as their ability to negotiate collectively. Through WATH’s association-building efforts, the **Global Shea Alliance** is taking a lead role in establishing industry standards for quality and sustainable sourcing, and facilitating information exchange.

→ The Global Shea Alliance is strengthening linkages throughout the shea value chain, allowing for knowledge-sharing on emerging innovations in processing technology, standards and certification, and supply chain logistics.

**Promoting Information Dissemination Increases Value Chain Professionalism:** The Trade Hub’s shea value chain analysis was the first public domain document on the industry. Now, the Global Shea Alliance disseminates quarterly newsletters and holds an annual conference that helps spread best practices to multiple actors in the value chain.

→ Increased information and awareness through trainings and dissemination of reports has contributed to the shea industry’s expansion; many more stakeholders, from producers to traders to major suppliers, are now technically proficient, which improves overall quality of output and relationships between supply chain actors.
Funding Mechanisms

Donor Funding: The West Africa Trade Hub is funded through the United States Agency for International Development (USAID), with funding from November 2002 to September 2011 totaling ~$50M. The project aimed to create a sustainable structure through creating the Global Shea Alliance, which comprises more than 50 shea industry stakeholders and is now an international, non-profit association. The alliance’s mission is to represent and further the shared interests of the shea sector.

→ This project, though funded by outside donors, was able to create a sustainable structure through bringing together different industry stakeholders into a freestanding organization that represents overall value chain interests.

Delivery Model

Cross Sector Focus on a Region: The West Africa Trade Hub worked with select export-ready firms, mostly small and medium enterprises (SMEs). Working across multiple sectors allowed WATH to address major crosscutting supply chain constraints, such as access to finance, transportation, telecommunications and business environment.

→ Working across several different sectors at a high level can create a large coalition that can promote change.

Performance Metrics

WATH tracks performance by country and component for all of its activities. Typical performance indicators include:

- Value of exports facilitated
- Number of jobs added
- Number of people trained
- Number of companies receiving technical assistance
- Value of intraregional trade facilitated
- SPS Studies

For example, WATH/Accra’s intervention in the shea sector from 2004-2007 facilitated $2,179,000 in export sales, $473,083 in intraregional trade, $982,400 in investment, and 83 new jobs.  

Case Study: The Shea Value Chain Reinforcement Initiative in Ghana’s Delivery Model

Implemented by SAP, PlaNet Finance, Grameen Ghana and Maata-N-Tudu

- Women have been organized into an association called the Star Shea Network (SSN) www.starshea.com, which gives them more negotiating power and buyers access to larger quantities of products;
- The project provides training on processing quality, allowing women to earn premium prices;
- The Rural Market Connection (RMC), an order management and fulfillment software package created by SAP, provides buyers with transparency on historical product quality data and product traceability;
- Women have greater access to information through price updates via SMS text messages to mobile phones;
- Microfinance officers at MTA and GG use Microloan Management (MLM) to track their loan portfolios more efficiently, decreasing the costs involved with giving out small loans to producers.


Key Takeaways for the Cocoa Sector

Analysis of the shea sector, particularly when looking at WATH’s downstream interventions, has several implications for the cocoa value chain:

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7 For more information, see www.globalshea.com
Supporting Downstream Local Actors can Improve Value Chain Quality: In addition to enabling collaboration between industry leaders on initiatives such as joint marketing campaigns, alliances provide a platform for engaging with policymakers on value chain upgrades. As often challenges like transportation, are not faced by only one sector, these platforms allow a value chain like shea to collaborate with other industries to push changes, such as access to financial services and improving transport logistics. In addition, wider information dissemination can improve upstream activities. For example, shea processors, in need of high quality inputs, now work more closely with producers to ensure proper quality techniques are implemented.

Incorporating Private Sector Actors promotes clarity of Market Requirements: Working from the market backward to identify how West African firms and producers can improve their products is critical to strengthening value chains. Incorporating public, private, and nonprofit actors into a consortium can expedite the transmission and adoption of standard grading systems. Clear sets of quality standards downstream, tied to increased prices, are crucial to incentivizing farmers to improve production techniques upstream.

Local Networks can have Deep Impact: WATH’s collaboration with the U.S. Peace Corps to deliver farmer trainings shows that leveraging local resources can help institutionalize change. Having someone located in the community who could provide ongoing support was critical to ensuring that best practices to improve quality were adopted locally.
Palm Oil

Like shea and cocoa farmers, palm oil smallholder farmers suffer from limited access to finance and poor quality production. Palm has one critical difference from cocoa: processing is required to take place almost immediately after harvest, leading processing facilities to be located close to the source of production. The following section will highlight similarities as well as key differences between palm oil, shea and cocoa.

Palm Oil Background

Unlike cocoa, the palm oil tree is mostly grown in Malaysia and Indonesia, which are responsible for 80% of palm oil production. The remaining large exporters of palm oil include: Nigeria, Thailand, Colombia, Ecuador, Papua New Guinea, Ivory Coast and Brazil.\(^9\)

Palm oil net processing volume is projected to double by 2020\(^10\). Much of the increased demand is driven by the use of palm oil in biofuels. In addition to bio fuels, palm oil is also used in food products and produces ten times more oil than soy, sunflowers, or other comparable crops.\(^11\)

Perhaps the greatest difference between palm oil and other value chains stems from the crop’s processing requirements. Unlike cocoa, where crops can be processed on individual farms using low cost, small-scale technologies, the palm oil fruit bunches must be processed within 24 hours of harvesting, which requires larger scale infrastructure. This key characteristic of palm oil processing explains why the most typical palm oil farming scheme involves a nucleus-processing mill surrounded by smallholder farmers, who require immediate access to the mills post-harvest.\(^12\)

While the nucleus-farming scheme is most widely used, there are three other types used for palm oil farms: smallholder, collective landholder, and plantations. For smallholder farmers, there are independent farmers and supported farmers (supported by companies, government subsidies, or a combination of both). The majority of palm oil production in Africa is composed of supported smallholder farming structures. In Nigeria, 80% of palm oil production comes from smallholder farmers (compared to 50% in Papua New Guinea and 33% in Indonesia).\(^12\) The diagram below visually represents the two major types of palm oil farming, and provides example schemes for each farming structure type.

The palm oil tree must be grown in a nursery until the age of 12 months before being planted in a field. It then takes an additional 1-3 years before the plants begin to produce fruit. Production lasts for a period of 25 years.\textsuperscript{12}

Figure 6: Palm Tree Lifecycle

Harvesting palm oil involves cutting fresh fruit bunches (FFB) from the tree. As previously mentioned, to preserve the quality and freshness of palm oil, extraction must take place within 24 hours. After extraction, crude oil is sent to the refinery to be odorized and liquefied.\textsuperscript{13}

\textsuperscript{13} Round Table on Sustainable Palm Oil, "Palm Oil Fact Sheet," available at: http://www.rspo.org/files/pdf/Factsheet-RSP-O-AboutPalmOil.pdf
Figure 7: Palm Oil Processing Flow Diagram

Palm Oil Value Chain Challenges
The 24-hour processing requirement is a key difference when comparing palm oil to cocoa. The challenges in the palm oil value chain will be discussed in the next section.

Land Dispute Issues Impede Farm Development: Land tenure issues plague the palm oil farming community across regions and farming schemes. The users of the land are not always the owners in reality, and in smaller communities, it’s unclear who sets land ownership laws as there are often no clear ways to issue or transfer land titles. Disagreements around land ownerships prevent community building and trust issues, making it difficult for smallholder palm oil farmers to cooperate.14

Low productivity and quality from smallholder farmers: Farmers lack access to improved seedling and fertilization to maximize fruit yield. Even if farmers have resources provided to them, many are unwilling to forgo short-term gains for longer-term gains by investing in inputs. Low productivity is also a result of lack of access to processing mills. For farmers that face poor infrastructure, there is little incentive to increase production if it will not make it to the processing facility in time.12

Low access to reliable information: Many of the smallholders buy into contractual agreements with processing mills and they don’t have the proper market information or training to help them negotiate. There is a lack of transparent pricing mechanisms, a theme that is consistent for many types of smallholder tree crop farmers.14

Trade-offs between food and cash crop production: Palm oil farmers have to make a decision about how much cash crop their land utilizes vs. food crops. Often farmers don’t know how to

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allocate land to produce both crops and harvesting cycles make it difficult to successfully produce both.\(^{12}\)

**Access to Financing:** Smallholder farmers need capital to invest in quality inputs, expansion programs and plant revitalization. However, administration of loans to many small farmers with limited credit history can be expensive. As a result, interest rates on loans are often high, making it hard for farmers to repay. \(^{12}\)

**Figure 8: Palm Oil Value Chain Challenges**

<table>
<thead>
<tr>
<th>Production on Farm</th>
<th>Processing</th>
<th>Consolidation</th>
<th>Exporter</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Low productivity and quality from smallholder farmers</td>
<td>- Lack of access to processing mills</td>
<td>- High transaction costs when dealing with a large number of smallholder farmers</td>
<td>- Environmental issues</td>
</tr>
<tr>
<td>- Land dispute issues</td>
<td>- Low bargaining in relation to mills/plantations</td>
<td>- Loan defaults due to difficult repayment terms</td>
<td>- Certification adherence (RSPO)</td>
</tr>
<tr>
<td>- Tradeoff between cash crop and food crop</td>
<td>- Low access to reliable market information</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Large variability in fruit production</td>
<td>- Lack of capital</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


The previous sections have discussed the general overview of palm oil, its uses, the cultivation process and finally challenges within the smallholder palm oil value chain. The following section will assess a project designed to strengthen the palm oil value chain.

**Proposed Solutions: Oro Smallholder Oil Palm Development Project**

This next section will explore a case study from Papua New Guinea, which was selected because it represents an initiative to combat some of the largest value chain challenges for smallholder palm oil farmers. This project was chosen because Papua New Guinea has a mature market for smallholder farmers (50% of all palm oil is derived from smallholder farmers), World Bank experts recommended this project, and there was a significant amount of data for evaluating the case. There are other examples of other current smallholder farming initiatives in West Africa, however, most are nascent and do not have sufficient information to make a case analysis fruitful.
Figure 9: Outline of Oro Smallholder Oil Palm Development Project

<table>
<thead>
<tr>
<th>Country</th>
<th>Date</th>
<th>Most Relevant Parts of the Project</th>
<th>Applicable Project Goals</th>
<th>Main Implementer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Papua New Guinea</td>
<td>1990-2001</td>
<td>- Project aimed to improve the productivity and livelihood of smallholder oil palm farmers through financial support, access to processing, and technical support (farming best practices and inputs) - “Mama Lus Frut” program increased women’s earning potential</td>
<td>- Create 3,500 ha of new smallholder palm oil blocks (2 ha per recipient) - Re-plant 3,000 ha of palm oil (2 ha per recipient) - Strengthen services to smallholders - Construct access roads to permit fruit collection - Build social infrastructure (healthcare, school, etc.)</td>
<td>- The World Bank - The Government of Papua New Guinea - Higaturu Oil Palms - Oil Palm Industry Corporation (OPIC)</td>
</tr>
</tbody>
</table>


Assessment of Oro Project Interventions
This section will evaluate the project’s interventions and its results.

Technical Assistance and Targeted Aid increased Production Quantity: The project was designed to increase output and profitability of smallholder palm oil farmers. The World Bank partnered with a third party organization, The Oil Palm Industry Corporation (OPIC), to manage on the ground implementation of project goals. OPIC was designed to “promote, organize and supervise” the smallholder farmers by providing inputs, crop pick-up delivery and technical advice.17

OPIC was able to penetrate 72% of the smallholder farmers and provide inputs, training and fruit delivery. As a result, the number of participating farmers exceeded initial targets by 48% and the number of hectares planted exceeded targets by 135%. In addition to increasing farmer participation, OPIC started a program to support women in palm oil production: the Mama Lus Frut Program. The program was designed to provide financial incentives for women to collect ripe fresh fruit bunches through guaranteed direct payments.14

→ Designing a program to support both women and men can have positive social and economic spill-over effects and increase production quantities. The Mama Lus Frut program not only increased crop output, it increased women’s economic standing.

Improved Production Techniques can be Hindered by Infrastructure Challenges: Crop variability was high, due to unequal use of fertilizer. To combat this challenge, the project offered fertilizer and

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15 Note: In an interview with World Bank palm oil expert Oliver Braedt, we were advised to focus on the time period before 2002 because there would be enough data and the World Bank has recently no longer focused on funding tree crop projects as lending requirements have shifted.


17The World Bank, 2002, p. 18
palm maintenance support; however, only 50% of eligible farmers adopted these techniques because poor access roads still hindered their ability to get their goods to market.\textsuperscript{18} 
\textit{Revitalization programs can only be effective if there is an effective ecosystem (infrastructure, market) that ensures that products can be sold.}

\textbf{Delivery Model}

\textbf{Using International Donor Knowledge to Build Local Actors’ Capacity:} This project was a collaboration between the World Bank, Papua New Guinea government, and private sector actors. The project followed a traditional donor program, with primary oversight by the Bank, which collaborated with local public and private sector partners. This structure worked for less complicated tasks. For example, the project was able to work with OPIC to ensure that it had both the resources and know-how to provide assistance to small farmers. However, in more complex projects, such as the building of roads, coordination was more difficult. Firstly, local companies did not have the capacity to accurately budget and manage road building, causing cost over-runs and leading them to break their contracts. As a result, the Bank had to access emergency funds to finance construction.\textsuperscript{19} 
\textit{When working with local partners, it’s important to gauge their capacity relative to the complexity of the task. In this case, coordination of input delivery and technical assistance was successful because the Bank only worked with one partner and the task was relatively simple. However, when the World Bank worked with several construction companies on building roads, a much more complex task, it should have worked more closely to build local companies capacity to correctly budget for and manage projects. If the Bank had worked more closely with these companies, cost over-runs could have been minimized.}

\textbf{Funding Mechanisms}

\textbf{Public and Private Sector Partnerships Facilitated Local Knowledge Transfer:} The project was funded by the World Bank, the Papua New Guinea government, the private sector and by farmer contributions. The project was initially funded at $27M for 20 years but this amount ended up being spread over 27 years. As part of the sustainability plan, the World Bank built the Oil Palm Industry Corporation’s (OPIC) capacity to provide technical and financial support after project close.\textsuperscript{20} 
\textit{Local and international public sector actors, combined with local private sector actors ensured the sustainability of the program, through effectively transferring knowledge within farmer communities.}

\textbf{Public Sector Involvement Can Encourage Private Sector Lending and Facilitate Re-Negotiation when Adverse Shocks cause Prices to Decline:} To facilitate private sector lending, the public sector backed loans issued by OPIC. Smallholder farmers were provided individual loan packages, which bundled service costs, to improve project cost recovery. One of the largest hurdles was selecting the credit agency that would provide credit to the smallholder farmers, as well as deciding on an appropriate interest rate.\textsuperscript{21} Prices for palm oil fell and the interest rate was renegotiated. The price sharing formula between growers and mills also had to be renegotiated by OPIC when palm oil prices plummeted. The financial rate of return was estimated to be 24.5% for the new planting and 15.1% for the old planting.\textsuperscript{22}

\textsuperscript{18} The World Bank, 2002, p. 8
\textsuperscript{19} The World Bank, 2002, p. 11
\textsuperscript{20} The World Bank, 2002, p. 34
\textsuperscript{21} The World Bank, 2002, p. 19
\textsuperscript{22} The World Bank, 2002, p. 15
The involvement of the government facilitated loans to farmers and also the renegotiation of terms when prices dropped substantially. The public sector has a role in buffering farmers when industry conditions change significantly.

Performance Metrics
The project measured its impact according to three different main areas: income improvement, increased access to finance, and project returns.

Figure 10: Oro Smallholder Oil Palm Development Project Performance Metrics


Key Takeaways for the Cocoa Sector

Partner with a third party who is familiar with the local environment: Much of the project’s success can be attributed to the Bank’s ability to leverage OPIC as the project implementer. OPIC as a third party had existing relationships with the government, and also understood the local climate. This enabled them to effectively support farmers while also working on larger infrastructure related projects.

Consider all parties in the value chain: One of the most successful outcomes in the project was the Mama Lus Frut program, which OPIC implemented to help women gain financial independence as well as increase palm output. By thinking about the role of women in the value chain, they were able to create additional social and economic value.

Loans are most effective when bundled, and need to be backed by a third party: In this case, the government stepped in to back the loans. To incentivize banks to take on increased risk, backing loans at the beginning provides the buffer banks need to enter into lending to more risky clients.
Cashew

As a tree crop, cashew shares many of the same characteristics as palm oil, taking several years to reach commercial viability. However, cashew, much like cocoa, is easier for small farmers to grow because it does not require immediate processing. The below section describes cashew production, assesses value chain challenges, and evaluates the methods that the African Cashew project uses to address these issues.

Cashew Background

The cashew value chain has many similarities to the cocoa supply chain. Cashew grows in the same region, primarily in Cote d’Ivoire, Ghana, Burkina Faso, and Mozambique, albeit in areas that are slightly higher temperature than cocoa. Africa’s share of production has slowly declined over the years due to underinvestment and misgovernance. Mozambique, which used to be the largest global supplier of cashew, now has lower production than Vietnam and India.23 Today, nearly 1.5M farmers in Africa produce 40% of the world’s cashew supply.24

During the harvest season, fruits ideally should be collected from the tree. However, in West Africa, fruits are often collected from the ground several times a week. Cashews are attached to the fruit, called an apple, and must be separated with a knife and then dried in the sun for several days. Because this causes the nuts to lose weight, reducing farmers’ prices, often farmers will sell nuts at higher moisture content than is optimal. This practice, combined with the use of plastic bags instead of jute bags, can often lead nuts to rot before processing.25

Cashew Value Chain Challenges

The following issues characterize cashew in Africa:

Low Yields: African cashew producers are significantly less productive than their counterparts in India, Vietnam, and Indonesia. It’s estimated that Cote d’Ivoire, one of the world’s largest producers, has yields that are 4 to 8x under that of Vietnam’s. While there is still room for growth, countries such as Ghana, where cashew projects are receiving assistance from the more developed cocoa sector, are improving. Ghana more than doubled yields to 450kg/ha from 2000 to 2006. The main reasons for poor yields include:

- Degraded soil quality
- Poor disease control
- Underinvestment in inputs (fertilizer, herbicides)
- Low maintenance of agricultural land (weeding)
- Low productivity tree stock

25 Ibid.
• Lack of producer organization to build capacity

**Low Quality:** Nut quality is directly impacted by the age of trees. Because West Africa’s crop is fairly old, it produces small sized nuts of lower quality. Low use of fertilizers, pest sprays, and proper tree maintenance techniques, combined with poor post-harvest handling techniques result in lower quality nuts. Because there is limited labor for fruit picking, often farmers take short cuts or use harvesting techniques that harm the nut. Few sanitary standards are followed, with nuts pulled from the fruit, leaving pulp still attached, which can cause mold. Because most farmers are unaware of grading requirements, they do not realize that these choices also have an impact on their income.

**Low Economic Returns to Producers:** In addition, efforts must be made for cashew to become a more profitable crop for small farmers, as a good farm under 2ha produces about $500/year in income. Intercropping is possible during the first three years, when the tree is not producing, which allows farmers to diversify their income and plant staple crops. Though cashew provides low economic returns, it is often the only cash crop that many farmers grow and is harvested during the dry season, providing families with critical income to buy food when their crops are not producing.

**Poor Processing Techniques:** Cashews must be shelled, processed, and vacuum packed for roasting/flavoring in end markets. Of the few processors that currently exist, many still can have difficulty meeting international standards. The majority of nuts are exported whole, to be processed in end markets.

![Figure 11: Issues in Cashew Supply Chain](image)

<table>
<thead>
<tr>
<th>Value Chain Step</th>
<th>Production on Farm</th>
<th>Middle Men or on Farm</th>
<th>Middle Men or Exporter</th>
<th>Exporter</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Current Value Chain Deficiency</strong></td>
<td>Poor seed/tree stock</td>
<td>Poor post harvest handling and separation of fruit from nut</td>
<td>Shell split following sanitary standards</td>
<td>Majority of raw nuts are exported as processing is limited in West Africa</td>
</tr>
</tbody>
</table>


African Cashew Initiative (ACI) Project

To address challenges in the current cashew value chain and increase production and processing in Africa, the African Cashew Initiative was started with funding from the Gates Foundation and German development agency, private companies including Planters, Olam and Itremare, and socially oriented entities, including Technoserve and FairMatchSupport. The project is working in five countries and works along the entire supply chain, from farm production through exports. ACI often uses a “pilot” strategy where it pursues a certain activity in one country before adopting it in others.27

The project is still very new but has developed some interesting techniques that appear to address many of the current challenges in the cocoa supply chain, including grafting, improved farmer training, and increased market information.

Figure 12: Outline of African Cashew Initiative27,29

<table>
<thead>
<tr>
<th>Countries in Africa</th>
<th>Dates</th>
<th>Most Relevant parts of Project</th>
<th>Project Goals</th>
<th>Implementer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benin, Burkina Faso, Cote d'Ivoire, Ghana, Mozambique</td>
<td>2009-2019</td>
<td>• Working all along the value chain, from farm to processing/export • Supporting nurseries and grafting techniques • Supporting fair trade certification • Beekeeping project to increase tree pollination and create women's employment • Creating training for radio broadcast</td>
<td>• Phase 1 (current phase): reach 150K farmers increase income by at least $100 in 4 yrs. • Create 5.5K jobs in processing • Increasing processing in West Africa by 10% • Work with 7 new processors a year to upgrade their facilities</td>
<td>GIZ in consortium with: • African Cashew Alliance (ACA) • FairMatchSupport (a certification company) • Technoserve (processing) • Sustainable Trade Initiative (IDH) • Kraft foods • Olam (supply chain manager) • Itremare • FAO (using their technologies and practices for small agricultural producers)</td>
</tr>
</tbody>
</table>

Assessment of ACI’s Interventions

Through its design and activities, the ACI project appears to be fairly well positioned to improve the cashew sector. It is currently addressing the major constraints of low yields, adoption of new techniques, and limited technical and market information. In addition, a Technoserve project was able to incentivize local investment, a major barrier in the sector.

Improving Currently Poor Yields: The ACI project is focusing on improving the stock of current cashew trees through developing nurseries and grafting techniques. While Good Agricultural Practices (GAPs) can only increase production by 20%, new planting materials increase productivity by 300-400%.30 ACI is collaborating with the Ministry of Food and Agriculture and the Cocoa Research Initiative in Ghana to start a grafting program. They are working with 23 nurseries located across cashew growing districts that will sell new and grafted seedlings. A sole nursery can produce around 3,400 grafted seedlings a year. ACI will also create farmer based clonal gardens located near farmers to give them greater access to grafting material. Nurseries in Ghana are

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receiving requests from neighbors for their seedlings and grafting materials. Trees were given away during the first year and are currently sold at a subsidized price.31

→ **It is not clear that this is sustainable, as prices are currently subsidized, causing farmers not to account for the true cost of planting materials when evaluating their production costs. In addition, new farmer-based organizations are starting grafting gardens, which will also provide farmers with planting materials and appear to be competing with private nurseries. It is not clear how this competition between nurseries and farmer organizations will play out.**

The project is also training 10 members of farmer-based organizations in each district on grafting, pest control, and trimming. The idea is that these members will provide **grafting services** for a fee.31

→ **One weakness with this model is that other organizations, such as One Acre Fund, have found that farmers are not used to paying for technical assistance and often are unwilling to do so. It might be better to bundle these services up in products, such as fertilizer, for which farmers are more likely to pay.**

**Improving Quality through Increasing Farmers’ Knowledge of Cashew Farming:** ACI uses **interactive training techniques** to teach farmers on demonstration plots. Training methodologies force farmers to interact with the trainer and test their knowledge, such as asking farmers questions or encouraging them to participate and demonstrate their knowledge to others in the group.27 Training materials are sourced from FAO, technologies and practices for small agricultural producers program ([http://teca.fao.org/](http://teca.fao.org/)).

→ **These techniques appear to be quite effective in increasing farmer understanding and retention, as they test their knowledge on the spot and encourage them to learn the techniques well enough to explain them to the group.** ACI also works with radio stations to produce daily **20-minute radio shows** with ACI training content. Short trailers with essential information will be played throughout the day to remind people of the core message of each show. Roundtable discussions are also organized amongst radio, ACI staff, and other experts.32

→ **Radio is an extremely effective way of disseminating information, especially in rural areas, as it is one of the only methods of mass communication that is widely available.**

**Improving Access to Market Information:** ACI is doing a mobile phone pilot to record movement of cashews along the supply chain, tracking them from farm to buyer. They include the weight of the cashew bags, bar coding, and managing the entire supply chain using SAP’s software.33 ACI is also disseminating agricultural practices, weather information, SMS receipts and market information through phones. They want to expand the system to other crops, one of which could be cocoa (though cocoa does not appear to be big amongst their farmers).

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32 African Cashew Initiative. “104.7 FM – Cashew farmers: Listen up!!! ACI radio programs for cashew farmers in West Africa.” (Radio factsheet)

Case Study: Increasing Other Actors’ Role in Supporting the Value Chain in Mozambique

In Mozambique, which has made significant progress towards improving the sector, it is local processors that have led the upgrading of cashews. Historically, Mozambique had a fairly strong processing sector which was destroyed through a series of trade liberalizations and restrictions. In 2001, USAID and TechnoServe worked with a local entrepreneur to refurbish a cashew processing plant so that it could begin production. The plant bought raw cashews from several sources, one of which was direct from small farmer associations and growers. The plant worked with these growers to improve their yields, increasing their income by an average of 20% through cutting out middle men.

This entrepreneur then provided support for other cashew processing plants, growing the sector from one to five plants in three years. These plants continue to provide support to farmers through supplying them with seedlings, teaching them quality control measures, and improving yields. In 2004, processors realized that farmers still needed a significant amount of assistance to improve quality and yields. To provide these services alone would be too costly for any individual firm, so they collaborated and each put in equal investments into a firm that provided technical assistance to farmers at a small fee.* This endeavor has benefitted the processors and industry as a whole through:

- Improved quality, which results in fewer delivery rejections;
- A central body that can lobby the government for exemptions that reduce duties on inputs and allow them to be provided in a more timely fashion;
- The entity coordinates and tracks shipments of both cashews and inputs; this allow the companies to track cash flows and provides financial data that assists with obtaining bank loans.

These local processors are able to work together, strengthening horizontal linkages, which allows them to share the costs of upgrading upstream producers, as no one processor could bear the cost alone.

*This was the only project that was successful in charging farmers for technical assistance. We did not receive a response to our inquiries to discuss this project and were unable to find out more about how the fee and services were structured.


→ Similar market information systems have worked in other countries and other value chains, given farmers more information both about how their product will be evaluated and current market prices.
Funding Mechanisms
There is currently a lack of both private and public investment in the cashew sector. While development agencies can fund value chain upgrading, leveraging both local and private sector expertise and funding can significantly increase impact.

Donor and Private Sector Funding: The project is funded through the Gates Foundation and German development agency and has many “contributing partners” including SAP, Bank of Africa, Intersnack and other businesses that contribute funds, technical expertise, or products to the project. In terms of longer-term sustainability, ACA the local cashew trade association is expected to take over most of the marketing and local actors, such as processors, will take over other parts of the value chain. In terms of farmers, most of the services and input provisions (such as grafting assistance, seedlings, etc.) are expected to be fee-for-service going forward27,34.

→ Based on discussions with other organizations, like One Acre Fund, farmers are less willing to pay for services than goods (i.e. fertilizer, etc.). Thus the prices of technical assistance should be bundled with the price of goods for financial sustainability. Otherwise, it appears that ACI is effectively leveraging the important actors in the supply chain and developing a plan to ensure its interventions are sustainable in the long term.

Funding Mechanisms within the project: The project is helping to arrange credit guarantees to banks to incentivize loans29. It is not clear that this is sustainable, once the guarantees are gone, banks will have to find another mechanism to protect themselves from risky agriculture investments. Bundling loans with insurance would be a better mechanism to try to increase access to finance, as it would build up the insurance sector, an important industry to mitigating both farmer and bank risk.

Delivery Model
The ACI model addresses issues around knowledge sharing and learning, through running different initiatives in different countries and then sharing these experiences with other offices.

Sharing Lessons Across Countries: There are local ACI offices in each country that coordinate all interventions and studies in that particular country. Pilots are conducted in some countries with the expectation that they will then be scaled and replicated in all countries in the future. The project aims to empower local organizations to operate independently and has invested significant time and resources in building the capacity of the African Cashew Alliance, a business association including international and local companies along the cashew supply chain. ACA will be taking over some ACI tasks, such as marketing, in the future. Other actors such as processors, government extension services, research institutions, consulting and development partners, and farmer-based organizations are projected to take over other ACI activities. During phase II (starting in year 5), it’s projected that ACA will become one of the main implementer27.

Performance Metrics
The project is tracking three main “forces” that are focused primarily on increasing farming and processing capability, and strengthening the overall supply chain. More details on the indicators that are being tracked can be found in Appendix 1.

The project is using the following methodologies to collect data on their impact:

- Quantitative Baseline Surveys in each country: 400+ households per survey to assess whether GAP is being implemented and income changes
- Focus Group Discussions (FGD) in every country: 6-8 villages and 20-30 farmers per focus group
- Harvest Surveys in Ghana and Mozambique
- FGD/mini-survey to assess ACI impacts in Benin: 1 control and 6 treatment groups with 20 people per FGD; additional quantitative interviews with each farmer
- Large qualitative survey of farmers to measure economic output increases/decreases year on year

Major indicators were measured as follows:

- Yield/ha increases also estimated through national data from government or own-surveys
- Transactions through farmer based organizations (FBO) were tracked through the number of contracts they had with outside parties
- ROI: tracked project expenditures against the net income generated along the supply chain

Key Takeaways for the Cocoa Sector

Analysis of the cashew sector has several implications for the cocoa value chain:

**Participatory Teaching Techniques Foster Learning:** Using techniques that include participants in the teaching process fosters learning. It tests their knowledge through forcing them to re-explain

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processes to others in the group, ensuring that they can teach these same concepts to neighbors once they leave the training.

Supporting Other Local Actors Encourages Investment: Technoserve’s support of a processor was the critical step to encouraging investment and upgrade of the entire sector. Through Technoserve’s support, the processors banded together to share resources that impacted processors’ and farmers’ profitability significantly.

Leverage consortiums of private and public entities with differing skill sets: ACI is able to access resources and expertise from its consortium that allows it to address a wider range of problems more easily and inexpensively.

Sharing Lessons Across Countries: ACI’s structure allows it to share learnings and innovations across countries. Being able to pilot different techniques in different places and then rapidly communicate to other countries allows most producers to upgrade simultaneously.

Creating Farmer-Based Clonal Gardens: Creating clonal gardens at the farmer organization level is an effective way of ensuring that farmers have easy access to high quality planting materials.
Review of Other Projects and Studies

Introduction
In addition to studying improvement initiatives in shea, palm oil and cashew, we also reviewed academic studies and conducted interviews on agricultural value chains and improvement initiatives outside of these three crops. Case studies were based on their relevance to cocoa and covered value chains including sugar, fruit, soybean, and dairy. Challenges that were also found in these new value chains included:

- Underinvestment in inputs
- Low maintenance of agricultural land
- Low productivity
- Inconsistent application of technology
- Absence of effective quality controls
- Lack of producer organizations to build capacity
- Lack of access to reliable markets
- Lack of access to financing

Interviews with One Acre Fund and Komaza, two groups working on agricultural improvement with African smallholders in maize and eucalyptus respectively, provided key insights on how to effectively build and manage an organization that can reach smallholders and provide incentives, inputs, and technical knowledge necessary for yield increase. This review uncovered the following findings:

1) community is an important driver in creating market power
2) community can create the right kind of incentives for quality and yield improvement
3) lead farmers can be an effective model for encouraging farmers to adopt new technologies

More information on each of the above can be found in the following section.

Case Study: Building a Local Presence – One Acre Fund’s Work in Staple Crops\(^{36}\)

*Innovative scalable and sustainable delivery model for high-density, rain-fed agriculture*

Since its founding in 2006, One Acre Fund (OAF) has grown to serve 75,000 farm families in 19 districts across Kenya, Rwanda and Burundi. OAF’s core service package for farmers includes: group formation, education, seed and fertilizer delivery, flexible payments (credit or sales), and market access. Results include a four-fold increase in crop yields and a 98% repayment rate from farmers [Cost ~$120/family].

OAF program areas generally rotate between 2 crop growing seasons to avoid the problems that monoculture causes, supporting maize in the "long rains" season and a rotation of beans in the "short rains" season.

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\(^{36}\) All information from: Hanson, S. (2012, May 1). One Acre Fun. (D. Kaboli, & M. Graham, Interviewers) unless otherwise noted.
OAF finds and mobilizes existing self-help groups within communities, typically women farmers. Every farmer needs to join as part of a group (6-15 members) and live within a 5-minute walk of everyone in the group. As part of joining OAF, the group commits to repaying a loan within a few weeks after harvest, attending all OAF training sessions, and doing farm work in their group. OAF makes a concerted effort to keep the group dynamic very autonomous from their own operations, interacting with the group leader instead of individual farmers.

Each farmer group is provided with a **market bundle** including inputs, credit, training, market access tools, and crop insurance. Loans are individual, but guaranteed by the group – the group leader holds the collateral form.

OAF learned that farmers are not willing to pay for advisory services, only for products such as seed and fertilizer. OAF can only offer extension services and training because it **bundles** those costs with the loan. In addition, farmers need to pay market price for products from the beginning in order to set correct expectations. In Rwanda, OAF is working with the government to phase out fertilizer distribution subsidies, which is challenging since farmers are used to paying below market price.

### Field Extension Model
OAF has a 3-tiered **field extension model**, with a field unit at the village level, district operating unit, and overarching country organization.

**Field Unit:** OAF consolidates 150 - 200 farmers into a farm producer group. Each farm producer group has a **field officer**, who administers OAF’s services: group formation, contract signing for credit, local farm input distribution, education services, and receiving of repayment. Field officers are typically recruited from the communities in which they work, and are chosen for being down-to-earth, hard-working staff who have strong teaching ability and leadership potential within their own communities.

**District Operating Unit:** OAF consolidates 50-80 field units into one district operating unit (DOU). At full size, these district operating units serving 8,000-15,000 farm families. In addition to the core field officer staff, DOU’s include 6-12 field managers, one bookkeeper, and two director-level staff.

**Whole Organization:** OAF is composed of 12 district operating units of varying tenure.
Distribution
Delivery models in Kenya and Rwanda are slightly different due to varying needs in farmer packages. In Kenya, where OAF primarily supports maize, farmers order a standard set of inputs based on plot size. Input delivery is arranged in a series of one-day drops around different communities (~300 locations). OAF sends trucks to a warehouse to load up with seed and fertilizer, dropping off at a pick-up location that is typically central to all farmers (schoolyard, church etc.), but the organization does not have a permanent structure.

In contrast, farmers in Rwanda take loans on an a-la-carte basis (OAF offers 2 different bean seeds, different fertilizers, and more recently, coffee). To satisfy this wider range of orders, OAF rents or buys a small storage facility at the community level to store seed and fertilizer before input delivery (quantities are based on projections from prior season), and input delivery is ongoing over the course of about 2 weeks. The distance to pick-up is ~2km in both countries.

Purchasing Contracts
At the start of the program, OAF asked for loan repayment in maize, and experienced the worst repayment season in its history. OAF learned that there were cultural practices surrounding food production that inhibited farmers from wanting to re-pay with their output. Because they were producing staple crops and there was often was not enough food in the community, farmers were loath to repay in crops that might be sold outside the community. Since then, OAF has stuck to cash repayment of loans.

OAF does not buy from farmers. The organization originally tried various farmer buyback schemes, but the uptake was extremely low in Kenya and Rwanda. Instead, OAF is doing market facilitation work in both countries, beginning with training in good storage practices.

Performance Management
One Acre Fund monitors the quality of all operations using weekly "key performance indicators" (KPIs). Every week, at least five different KPIs are used to monitor the quality of individual field officers, higher-level field managers, or entire district operating units. An example KPI is farmer repayments, which is a good indicator of customer satisfaction levels. Sites that have good customer service tend to attract a high volume of voluntary early repayments – sites with poor customer service have low volume of early repayments. OAF tracks figures like this throughout the year and quickly replaces any poor-performing staff. These KPIs are supplemented with a regular and intense schedule of in-person field visits from managers who monitor overall program quality.

Financial Sustainability
OAF is currently at 82% cost-recovery across the organization, and on track to reach 85% by the end of 2012. It primarily generates funds through interest on loans. Kenya and Rwanda should break even in the next 3 years.
OAF is also thinking of rolling out a franchise model as part of a long-term vision to rapidly disseminate its operating model. Public discussions are beginning to attract interested organizations in planning a pilot with OAF.

Case Study: Adapting to Low Population Density Areas – Komaza’s Work in Microforestry

Similar model to OAF, Komaza is working at the local level. However this model has significant differences in approach and scale because it is operating in low population density area.

Komaza operates in Eastern Kenya’s drylands where unreliable rainfall and frequent drought often cause traditional crops to fail. Komaza bundles high-value trees with financing, training, and marketing services, allowing farmers to triple their baseline income in a decade. Founded in 2006, the organization scaled to serve almost 3,000 farmers in its first 3 years of operations.

Farmers pay an upfront fee of ~$2.50 for the farmer bundle, which includes training, planting inputs (tree seedlings, seeds for short-term crops, water-retaining polymers, and fertilizers), maintenance support, harvest & sales support [cost ~$200 per farm]. Komaza signs a MoU with each farmer and village chief to retain a portion of each farm’s revenues at harvest to cover its costs and invest in new families.

Komaza functions through self-contained operation units called Rural Cells, which at scale, will each have a central office and tree processing facilities that serve roughly 9,000 farmers. This centralization will streamline production and minimize costs of overhead, transport and processing equipment.

Komaza’s decentralized Field Extension Network employs locally-based field staff that follows a step-by-step manual to support farmers through every stage of production, from planting to selling final products. The four layers are necessary due to the low population density and remoteness of farms (see figure).

Komaza currently has 3 experimental farms with more than 180 research plots across 25 acres to refine its grafting practices and test new crops. The organization is currently funded through grants from foundations, but looking at transforming into a for-profit model.

37 All information from an interview with John Gillis, KOMAZA Crop Production unless otherwise noted.
Summary of Findings from Other Value Chains
Komaza and OAF leverage community ties and farmer groups as part of their model for improvement in maize and eucalyptus. Action in local communities, bundling of services, prepayment programs, and market access work are also central to the success of these two organizations.36,37 The below studies of value chains as disparate as tomato and dairy revealed similar themes. More detailed summaries of each case discussed below can be found in Appendix 4.

Risk Sources and Risk Reduction Programs
A survey of farmers’ views on risk sources and management strategies revealed similar findings as those in other value chains. Farmers cited market failure (54.4%) and price fluctuations (46.1%) as their greatest sources of risk, followed by environmental and weather conditions. Management strategies available to farmers included access to subsidized fertilizer (41.2%), mixing crops (79.3%), extension services (67.3%), borrowing money (73%) and off-farm work (69.7%). Only 1.2% of farmers used insurance as a risk reduction strategy. The high prevalence of borrowing and off-farm work to increase incomes suggests that farmers’ coping strategies can increase the likelihood of poor performance in the following seasons, as these activities divert income and labor investment in farm activities.38 Across four different surveys (Nigerian survey, a Rural Income Assessment Survey in Zambia,39 a study of improved variety adoption in cassava,40 and an Enabling Rural Innovation (ERI) project promoting organic agriculture in Uganda41) farmers with access to education programs and extension services were more secure and likely to pursue land and crop improvement than those without. These findings suggest that intervention services can be effective and are key to reducing farmer risk and increasing incomes.

Insurance can also be an effective risk management strategy. Rainfall index insurance can be structured with relatively low overhead costs and little requirements on farmers aside initial enrollment. An insurance program run by the Abdul Latif Jameel Poverty Action Lab (JPAL) bundled rainfall index insurance with agricultural loans, a practice that is favored by banks in Gujarat, India, because it decreases default risk.42 OXFAM is currently scaling up a program in Ethiopia where farmers can access rainfall index insurance either through a government safety net program or through direct payment. This allows access to the poorest farmers who cannot afford insurance otherwise. While uptake rates are promising, the OXFAM program has not yet been in place long enough for effects on farm yields and investment to be accurately measured.43 It is important to note, however, that rainfall insurance requires extreme accuracy in measurement and could require substantial up-front investment in rainfall measurement devices.

Vouchers and Bundling of Goods and Services
In conjunction with poor access to risk mitigation strategies, farmers often have few devices to help them save money to invest in next year’s harvest.38,43,44 Vouchers are a mechanisms that allows farmers to pay for inputs in advance. Normally vouchers are available at

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harvest, allowing farmers to purchase inputs for the subsequent while they still have money. Komaza, OAF, Land O’Lakes, and JPAL have all explored pre-payment for inputs such as fertilizer with some success. In addition, Komaza and OAF bundle technical assistance with the price of physical inputs. Farmers are less willing to pay for services than goods, so this technique increases the cost recovery for their service programs without creating a disincentive for farmers to seek out technical assistance. JPAL and OXFAM both offer rainfall insurance bundled with loans to increase uptake.

The Importance of Community: Market Power and Access

Farmers often lack market and price information that could be helpful for decision making. In studies in soybean production and bananas, it was found that farmers regularly underinvested in production when they had low market power, since additional quality or output would not garner them a higher price. Organizing farmers increases their market power and allows them to command higher prices. Organization of farmers into action groups in Uganda, combined with education on market information, allowed them to successfully transition to certified organic production, increasing overall income. Platforms such as SMS text messaging and radio can be used to disseminate market information, but local intervention and financial training is necessary to help farmers form action groups and/or access cooperatives to increase their market power.

The Importance of Community: Farmer Organization and Incentive Alignment

Working with existing community structures, such as cooperatives, is a key driver in successful agricultural intervention programs. Land O’Lakes found that poor self-policing at the local level led to quality issues in African milk because farmers had no incentive to keep neighbors from mixing spoiled or low quality products into batch deliveries. Cooperatives or other organized groups at the local level with the capacity to measure and reward quality, increasing overall production standards. Other organizations have also recognized that a community organization can serve as an enforcement mechanism for value chain upgrading. Komaza leverages community group structure by interacting with both individual farmers and with village leaders, and OAF mobilizes existing self-help groups within communities and incentivizes farmers to form smaller working groups. OAF and Komaza align incentives within these existing groups to ensure that they are supporting quality and standards.

The exact structure and politics of existing communities and cooperatives can often be a big determinant in the effectiveness of quality and yield improvement measures. In a study of a Ghanaian tomato project, village councils were utilized to help incentivize uptake and improvement. However, these councils were too large and diffuse to be effective. Organizing farmers into smaller action groups was recommended to increase land investment. Studies of cooperatives active in sugar and juice production also show that politics and personalities within cooperatives and connections between farmers, cooperatives, and other value chain players affect technology adoption and quality improvement amongst participating farmers.

Lead Farmers and Interactive Training

In addition to building upon existing social structures, leveraging the skills and social power of locals can increase rates of technology adoption. Most studies found that working with lead farmers

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to build demonstration plots was effective in increasing uptake rates. Studies of cassava showed that farmers with diverse revenue sources and financial security are more likely to try new technologies. In general, the use of locally recruited lead farmers or agents fosters trust of new methods because smallholders can see that increased quality and yields come from interventions as opposed to differences in soil, weather, or other factors out of their control.

Key Takeaways For the Cocoa Sector

Analysis of One Acre Fund, Komaza, and other projects showed the following implications for the cocoa value chain:

**Decentralized Organizations with Vetted Local Agents Are Effective at Reaching Farmers:** Leveraging a network of local field agents to work directly with farmers in their communities allows agents to develop relationships with farmers and guide them throughout the entire process of training and crop improvement. Komaza’s step-by-step manual approach ensures that field agents will implement their programs correctly. OAF’s intensive interview process selects field officers from the community who have the teaching skills necessary for the role. OAF then invests in training them on the technical material.

**Farmers view market access and price fluctuations as some of their greatest sources of risk:** Responding to farmers’ need for information on and access to markets can incentivize investment in yield improvement, as they will feel more empowered and secure in seeking a buyer for their products.

**Bundling Goods, Services, and Financing Increases Farmer Participation:** Both OAF and Komaza bundle physical inputs with training and services. For example, OAF bundles the cost of services into the price for fertilizer. This increases cost recovery, as farmers are more willing to pay for physical goods than for intangibles or services. Similarly, insurance can be bundled into loan payments or government safety net programs.

**Vouchers and Prepayment Programs Increase Investment in Inputs:** Farmers are most likely to buy inputs if offered vouchers that allow them to pay the cost at the time of harvest, when cash reserves are high. If farmers must save these funds to buy fertilizer at the time of planting, uptake will likely be lower, as farmers are less likely to have cash on hand after living on these funds for months.

**Crop and Rainfall Insurance Incentivizes Lending and Provides Income Security for Smallholder Farmers:** When bundled into loans, insurance can be structured to cover loan payments in times of low yields, providing security to banks and farmers. The balance of payments then go to the farmer.

**Incorporating Community Support and Organization Into Working Groups Supports Success:** Close-knit, supportive communities of farmers tend to fare better than those in more diffuse social settings. Farmers in these settings have more market power and can therefore obtain better prices. Such communities can also enforce quality standards through social pressure and monitoring. Cooperatives are one way to bring farmers together, but effectiveness depends on leadership and interactions with other value chain stakeholders.

**Lead Farmer Models and Experimental Plots Promote Technology Adoption:** Successful farmers are often respected in their communities and have enough financial security to try new technologies.
on their land. Other farmers are more likely to be convinced to adopt new methods by seeing a local’s success, as they both trust this person and see that they are operating under similar constraints.

Major Findings from Value Chain Assessments

After studying shea nut, palm oil, and cashew value chains in depth as well as exploring a number of studies on agricultural value chains, findings were distilled into four high level recommendations. Despite the differences in growing and processing techniques, supply chain structure, geographic location, and end use of products, the drivers of low yields and quality within these disparate value chains were very similar, as was the structure of successful programs. The below section details the structure of the program that, based on survey findings, will be most effective in increasing farmer yields.

Recommendations Incorporated into Model

Hire a Third Party to Manage Program: The projects that had the most success had hands-on management that regularly communicated and worked with project staff and local communities. There are already organizations, such as One Acre Fund, that have developed considerable expertise in designing a model that provides effective interventions at the local level. Mars capability resides primarily with its knowledge of cocoa (i.e., production, handling, and grading techniques), but not necessarily with its ability to effectively engage and manage projects at the local level. Thus Mars could both save costs and time by working with a third party to implement the program.

Have Project Managers Maintain a Continuous Local Presence: The projects that were the most sustainable spent significant time and resources building local capacity. Continuous local presence promoted transparency in operations, built trust with local communities, and helped identify promising talent. It also ensures that the program dynamically responds to local differences; while the model should be scalable, it is important that it be revised and tweaked to respond to operating conditions in different areas. There are three key areas where local presence appears to be extremely important:

a) Recruitment: Finding and retaining strong project staff, especially field officers that interact directly with farmers, is extremely important. One Acre Fund (OAF) has a very vigorous recruitment process that has contributed to the substantial success of their model. It also allows them to identify and recruit talent within their communities.

b) Reduction in Costs and Learning Time: OAF already possesses a model and capabilities to support small farmers and has already shown that they can replicate this model in a new country (Rwanda). Utilizing an experience third party provider has the potential to actually reduce costs and time to performance. For example, to start a family on the program only costs AOF ~$120 and within 3 years the costs go down significantly per family since local capacity is built. As a result, in later years OAF only provides inputs.

c) Trust: In multiple contexts, farmers trusted demonstrations on the local level and information from others in their community more than information that came only from extension agents.

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**Separate Buying and Yield Improvement Activities:** The most successful projects had strong levels of trust with the local community\(^48\). Multinationals, have historically had difficulty maintaining and managing these relationships, especially since their position as buyers can make local communities and governments nervous about motivations\(^47\). Thus, keeping interventions with farmers separate from the business side can help local actors and communities feel comfortable collaborating with the project\(^49\).

**Provide a Bundled Package of Input, Technical, and Financial Services at True Cost:** Farmers tend to value only what they pay for. In addition, subsidizing inputs leads farmers to underestimate their production costs. As a result, it is difficult to remove subsidies once they’re in place, as they create dependence. Projects should strive to create independent farmers who can survive without outside assistance. Mars and partner organizations should work with farmers to help them value their inputs and materials at true cost and incorporate this cost structure into the prices it pays for cocoa. Group-guaranteed microloans and vouchers are two ways to finance farmers so that they can access inputs at their true costs.

Several projects have had difficulty making farmers pay for technical assistance from field officers – Farmers are willing to pay for products, not services. Those that have been successful at covering these costs have bundled field officer salaries into the cost of inputs, such as fertilizers. Bundling also makes sense when offering financial services. In Gujarat India\(^42\), insurance is not a choice, but is packaged with loans, with the cost incorporated into the interest rate. Bundling encourages farmers to adopt services they otherwise would not and also allows providers to recover their associated costs.

From the starting point of these four key recommendations, we built out a model for service delivery to increase yields in West African cocoa farmers.

**Blue Sky Model**

A model for service delivery and yield improvement is presented below. This model shares many characteristics with Mars’ current strategies. The specifics of the model are taken from the supply chains and agricultural products we researched that showed the most impact and promise for the cocoa supply chain. For example, it includes aspects of the delivery model from One Acre Fund and Komaza and insurance options in line with the Oxfam/UN HARITA project.

**Roles and Players in Cocoa Intervention**

Our research suggested that direct intervention by end buyers was less effective and harder to manage than service models that involved relatively independent third party organizations focused solely on crop improvement. Based on this, we utilize four levels of management and intervention in our model. Firstly, Mars acts in general oversight, project goal setting, dissemination of technical knowledge, and performance measurement. In addition, Mars, perhaps in conjunction with NGOs or governments provides funding and support through the early implementation process, eventually pulling back as the project reaches higher cost recovery levels. For implementation, Mars works with an on-the-ground third party organized according to either a non-profit or social entrepreneurship model. This third party organization has management set up at the country level to create training materials, work with banks and insurance providers, hire staff and coordinate with Mars. At the regional level, Cocoa Centers run by this third party organization handle sale and

delivery of inputs such as fertilizer, run grafting nurseries, and provide field officers with the technical and financial training necessary for them to be effective. Lastly, field officers sourced from local communities, thoroughly vetted and trained by the third party organization, work directly with farmers to do technical training, aid in purchase of inputs, and grade cocoa.
Figure 13: Detailed Needs and Responsibilities of Players in Blue Sky Model

Mars: Funder and Technical Expertise in Cocoa

3rd Party Organization

**Requirements:**
- Experience working on local level with small farmers
- Independent entity
- Experience working with stakeholders and subcontractors
- Strong management, training, and M&E capabilities

**Tasks:**
- Staff management
- Resource and program management:
  - Salaries
  - Farmer supplies
  - Training design
- Administer and design loans and insurance
- Monitoring and evaluation
- Market information system

Cocoa Centers

**Requirements:**
- Administrative/Management of field operations
- Training “hub”
- Input Distribution
- Grafting Nurseries
- Metrics to be measured

**Tasks:**
- Implement field officer training
- Oversee field officers and manage weekly reporting meetings
- Coordinate input distribution on regional level
- Develop nurseries and grafting materials

Field Officer

**Requirements:**
- Has experience in the community
- Good communicator and teacher
- Teaches technical skills of planting to farming
- Shows potential to learn new skills (such as basic accounting)

**Tasks:**
- COCOA MANAGEMENT:
  - Work with farmer groups
  - Take input orders; serve as local loan administrator collecting payments
  - Provide farmer trainings and continuous support
  - Support local demonstrative plots
- POST HARVEST HANDLING:
  - Educates farmers on grading/quality standards
  - Organizes pick-up/grading for a fee

Farmers

**Requirements:**
- Organize in self-selected groups
- Groups must be close enough to interact frequently

**Tasks:**
- Receive training and technical assistance:
  - Grafting
  - Fertilizer
  - Pest Control
  - Financial literacy
  - Transport and grading (optional)

Detailed Roles and Responsibilities

**Mars (International Level)**

Mars provides two key inputs to the entire model: 1) The funding for the third party organization who manages the overall program; 2) Technical expertise to advice third party organization in designing input packages and trainings on different processes related to cocoa. Because most of the successful models we reviewed required significant and regular interaction on the local level\cite{36,37,47}, we are encouraging that Mars hire a third party that already has expertise in this area. Mars will compliment this partner with its strong R&D and technical knowledge in cultivating cocoa, providing much of the guidance on content and specific technical activities that the third party implementer then develops and implements. Based on the OAF and other models, we do not think Mars should become a guaranteed purchaser of inputs. Establishing contracts with farmers often creates resentment and leads farmers to become dependent on the buyer. Allowing farmers choose the party to whom they sell increases their independence and makes them more sustainable in the long run.

**Third Party Management Organization (Country Level)**

There are four tasks that should be organized at the country level:
Program Management & Controls
The third party organization (TPO) needs to provide the overall management and control systems for the program to ensure smooth and effective operations and provide controls against misuse of funds.

Staff Management: Staff management is critical to the program success. Perhaps the most important staff are the local field officers (description of role can be found below). In programs where there has been successful knowledge transfer at the local level, there has been very close monitoring of field staff (weekly meeting and reports) as well as intensive recruiting processes to ensure that the right skills and talent is found (see text box on OAF’s recruitment process). It’s important to recognize that field officers will spend the majority of their time training and teaching others, thus the skill sets that should be emphasized should be communication/teaching, which does not necessarily require farming experience. All staff associated with the project should be paid, including field officers. This aligns incentives, makes the model better quality, and ensures more effective transfer of local knowledge.

Oversight and Coordination of Supplies to Farmers:
The office should work with Mars to identify which inputs should be offered to farmers. Requests for inputs at the local level should be aggregated so that purchase can take place at the national level, allowing the Third Party Organization (TPO) to negotiate better rates. Establishing a strong purchasing and tracking system will ensure that supplies are delivered when needed on farms and reduce waste/corruption.

Training: The office should work with Mars to develop technical side of training materials. The national office would develop and establish trainings that would be given at the national level to train CC employees, at the regional level to train field officers, and at the local level to train farmers.

Loan Management and Disbursement
The TPO should organize and give loans, as interest will be used to recover costs. This model allowed OAF to recover 85% of their costs after 8 years of operation. However, it is important to note that OAF is able to achieve these cost recovery rates because they are working in high population density areas, so costs will be higher for work in West Africa.

Group Guarantee: Loans should be given on an individual basis, however they can be guarantee by farmer groups. Farmer group guarantees have allowed OAF to achieve 98% repayment rates. This also allows the TPO to develop financial information on each farmer, which will build their credit history so that they can apply for loans outside of the Mars project in the future.

Vouchers: In the first year it is likely that most farmers will need loans. However vouchers can be offered in subsequent years. A voucher allows the farmer to pre-pay for inputs around the time when he receives cash from selling his crop, alleviating the burden of saving money for the next harvest. (For more information on vouchers, see Appendix 4).
Repayment: Payments should be structured according to farmers’ yearly cash flows (i.e., if they receive most their income in one payment a year, then repayment should be structured to take place soon after harvest.)

Insurance: Insurance should be provided by a third party and bundled with each loan to mitigate risk. Rainfall insurance is superior to crop insurance, as it more accurately protects farmers against the largest agricultural risk, however it may be difficult to implement if there are not already providers offering this kind of insurance. (See Appendix 4 for more information on insurance).

Monitoring and Evaluation
If necessary, monitoring and evaluation can be managed by a subcontractor engaged by the TPO. Tasks include:

- Work with Mars to develop metrics that will accurately measure project activities and their impact on local communities, cocoa production, and supply chain sustainability. As a guideline, OAF has three high-level metrics: scale, quality of impact and financial sustainability.
- Identify which local metrics are easiest to measure given goals of project.
- Conduct intensive surveys and data analysis.

Market Information
The project should provide national level data to farmers that helps them assess market dynamics and bring transparency into the supply chain. This information system should be given to farmers for a small fee. The kinds of information provided can include:

- Market data on prices: This kind of information system is already operating in Ghana and can be extended to other countries.
- Supply Chain Management: order management and fulfillment software that allows farmers to report yields.

Cocoa Centers (Regional Level)
The Cocoa Centers will serve as a regional hub that supports local field officers through administration, training, input distribution.

Administration/Management of Field Operations: OAF organizes their field operations into districts which include 50-80 field units of ~200 farmers. Each district represents 8,000-15,000 farm families. Realistically because population density is much lower in West Africa, these numbers will be lower for each CC. Following OAF’s model, each CC should have 6-12 field managers, 1 bookkeeper, and 2 director-level staff.

Training “Hub”: Field officers will go to the CCS to receive regular trainings. Demonstration plots will be available, though they will be targeted more at field officer training than farmers. It’s important the field officers learn to adapt demonstration plots to the areas in which they are working, as terrain and other variables change. The TPO national office will design trainings in conjunction with Mars.

Input Distribution: CCSs will aggregate input orders from field officers, which will then be aggregated at the national level. CCSs will help coordinate the immediate distribution of inputs to farmers,

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50) JPAL offers SMS text message information services in Gujarat, India, for example. (Talbott, 2012)
51) Similar services are offered by the Shea value chain reinforcement initiative and ACI projects
alleviating the need for storage and warehousing facilities. As transport is a huge barrier to farmers, CC transport of inputs is critical to ensuring farmers receive and use inputs at the right times.\footnote{As seen in OAF, Palm Oil, and JPAL projects}

**Grafting Nurseries:** CC will raise seedling and grafting materials that will be provided to field officers. Field officers can lead the planting of local grafting projects as needed.

**Other Services:** The CC will infrastructure will be expensive to maintain. Renting space to or co-locating with other parties such as microfinance institutions or health services could help defray costs and may also provide benefits for the model, as individuals visiting other institutions will be exposed to the CC as well.

**Field Officers (Local Community Level)**
We propose that field officers fall directly under the CC although there is another layer of staff that manages the field officers in the OAF model. The number of layers in the model needs to take into account the remoteness and number of farmers served by each field officer. Each field officer at OAF works with 150-200 farmers organized into groups of 6 to 15. These numbers will most likely be lower in West Africa due to lower population density.

**Management and Cost Recovery of FOs**
Management: FOs should have regular meetings at the CC level for reporting and management purposes. The regularity of meetings will depend upon feasibility, given transport. Local field officers (FOs) may need to be provided with bicycles or motorbikes in order to serve farms and attend regular CC meetings. FOs should be evaluated based on metrics, such as farmer outputs. OAF has a talent retention program that gives bonus to staff for meeting certain time-based criteria. Performance based bonuses could be another method for incentivizing FOs, however it could: 1) penalize staff who do not achieve results due to circumstances outside their control (weather), 2) lead to cheating or over-reporting of results by FOs, and 3) could be incompatible with cultural norms.

Salary Recovery: FOs will provide communities with the technical assistance needed to improve farmer output. They should be salaried to align incentives, but their salaries should not come from a fee for service. OAF and several other organizations have found that people are very hesitant to pay for technical assistance, as it is not within cultural norms. They found that bundling FOs salaries in with the price of inputs, such as fertilizers, is effective at recovering FO salaries.

**Technical Assistance on Cocoa Farming**
Input Coordination: The FOs should take and organize input orders from farmers, the aggregate them and forwarding them on to the CC level. When inputs are delivered by the CC, the FO will manage the pick-up process.

Loan Officer: The FO will serve as a local loan officer, providing much of the administrative services for the loan (collecting payments and monitoring performance). It’s important to note that CC or partner bank staff should be granting/approving the loans to minimize potential for corruption or favoritism by the FO.

Outreach: FOs will provide outreach services and try to recruit more farmers to the program. FOs can reach out directly or leverage participating local farmers and their networks in their recruitment efforts.
Trainings and Support: The FO will be a part of the community and will regularly visit with and work with farmers to train them on different techniques. They will work with strong candidates to help their farmland to become local demonstration plots that can be used to train other farmers within the community. It is important that new production techniques be adopted in phases. The ACI project found that experimentation allowed farmers to learn these new techniques without jeopardizing their whole crop. Farmers who used experimentation and gradual change were more successful at using these new techniques. Services that can be offered to farmers include: grafting/propagation, fertilizer application and pest control, transportation of inputs, and financial literacy training. National level staff will provide financial literacy training. FOs will provide all other training sessions.

Market Linkages: Trainings on farm-level fermentation, grading, and post-harvest handling will be offered by FOs to inform farmers on property quality assurance techniques. FOs can also grade cocoa and arrange for farmers’ produce to be collected and delivered to market for a fee.

Farmers (Local Level)
To facilitate management, farmers should be organized in groups. These groups should be self-organized so that members trust and can work with each other. OAF uses groups of 6-15 members that must all be within a five-minute walking distance from each other. Farmers would likely be more spread out in West Africa, so group size and distance requirements will need to be adjusted.

Conclusion

Examining other tree crops and innovations in agriculture elucidated methods that can be directly applied to cocoa. In the majority of cases, a local approach was key to ensuring proper knowledge transfer to small farmers. Technical assistance on grafting, fertilizer, and post-harvest handling was most likely to be adopted when there was a long-term continuous training resource in the local community. As a result, in our Blue Sky model, we believe the most critical key to success is focusing on building the skills and resources of field officers to work in local communities. It is noteworthy that even highly successful projects, such as OAF, have spent significant time (eight years to date) working in local communities to ensure that yields and quality increased. For Mars to make a sustainable impact on cocoa communities in West Africa, it must commit to a long time horizon and make significant time and resources commitments. This investment, however, will greatly improve the sustainability of Mars’ supply chain and the well-being of cocoa farmers.
## Appendices

### Appendix 1: Performance Metrics for ACI Project

<table>
<thead>
<tr>
<th>Force I: Sustainable Growth in Production and Farming Income</th>
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<tbody>
<tr>
<td><strong>Production Income</strong></td>
</tr>
<tr>
<td>Price (cashew related income per farmer)</td>
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<tr>
<td>Quality</td>
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<tr>
<td>Specialty Certifications</td>
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<td>Better outturn (average outturn)</td>
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<td>Bargaining Position (farmgate price as % of FOB price)</td>
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<tr>
<td>Effectiveness of farmer organizations (Number of transactions through farmer based orgs)</td>
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<tr>
<td>Access to better market information</td>
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<tr>
<td><strong>Volume</strong></td>
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<tr>
<td>Productivity (number of new jobs created)</td>
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<td>Nurseries</td>
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<td>Better agricultural practices (number of farmers trained)</td>
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<tr>
<td>Better/more productive varieties (Average Yield per hectare)</td>
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<tr>
<td><strong>Small-scale Processing Income</strong> (see Force II)</td>
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<table>
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<tr>
<th>Force II: Sustainable Success in local processing</th>
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<tbody>
<tr>
<td><strong>Volume of Local Processing</strong></td>
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<tr>
<td>Productivity (processing capacity of ACI supported processors; total processed volume)</td>
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<tr>
<td>Less labor turnover</td>
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<tr>
<td>Skills for processing workers/management</td>
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<tr>
<td>Capacity Utilization</td>
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<tr>
<td><strong>Processing Scale</strong></td>
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<tr>
<td>Number of processors</td>
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<tr>
<td>Scale of existing processors</td>
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<tr>
<td><strong>Quality of Local Processing</strong></td>
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<tr>
<td>Reliable basic quality (number of processors passing basic quality standards)</td>
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<tr>
<td>Training/skills</td>
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<tr>
<td>International Standards</td>
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<tr>
<td>Training/skills</td>
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<td>International social training</td>
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<tr>
<td>International food standards</td>
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<tr>
<td><strong>Sustainable Processing</strong></td>
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### Market for by-products
- Fruit/apple
- Shells

### Financial Viability
#### Access to finance
- Investment funds to support processors
- Financial Services

### Force III: Develop a Sustainable Supply Chain
- Sustainable supply chain relationships/loyalty packages
  - Development of farmer based organizations
  - Sustainability standards and certification
    - Traceability
    - Verification/certification
- Enabling Environment
  - Institutional landscape (number of linkages between farmer orgs and processors)
    - ACA Institutional capacity
  - Trade/investment policy (volume shipped via consolidators)
### Appendix 2: Interview List

Desk research was combined with the following interviews to complete supply chain analysis:

<table>
<thead>
<tr>
<th>Name</th>
<th>Organization</th>
<th>Position</th>
<th>Notes</th>
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<tbody>
<tr>
<td>Mansi Anand</td>
<td>OXFAM</td>
<td>Microinsurance Program Associate</td>
<td></td>
</tr>
<tr>
<td>Christina Ingersoll and</td>
<td>MIT Sloan</td>
<td>Researchers in Cocoa and Sustainable Supply Chains</td>
<td>Walked through major challenges in Cocoa supply chain</td>
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<tr>
<td>Maja Tampe</td>
<td></td>
<td></td>
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<tr>
<td>Oliver Braedt</td>
<td>World Bank</td>
<td>Tree Crop Specialist based in Liberia</td>
<td>Specialized knowledge in Palm Oil</td>
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<tr>
<td>Sona Ebai</td>
<td>World Cocoa Foundation</td>
<td>Policy Advisor for the African Cocoa Initiative</td>
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<tr>
<td>Peter van Grinsven</td>
<td>MARS, Inc.</td>
<td>Cocoa Sustainability Director - Origins and Operations</td>
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<tr>
<td>Peter Keller</td>
<td>GIZ / African Cashew Initiative</td>
<td>Director of Development Operations</td>
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<td>Tom Larsen</td>
<td>Suterra</td>
<td>Director of Product Development</td>
<td>Private company providing bio-rational products for crop protection and commercial pest control</td>
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<tr>
<td>Arathi Rao</td>
<td>Harvard Kennedy School of Government</td>
<td>Researcher on rainfall index insurance in India</td>
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<tr>
<td>Gustavo Setrini</td>
<td>MIT</td>
<td>Graduate student</td>
<td>Focused on effectiveness of agricultural cooperatives</td>
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<tr>
<td>Tavneet Suri</td>
<td>MIT</td>
<td>Assistant Professor of Applied Economics</td>
<td>Regional focus in Sub-Saharan Africa</td>
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<tr>
<td>Todd Thompson</td>
<td>Land O'Lakes</td>
<td>Former Chief of Party/Country Manager, Zambia &amp; Uganda</td>
<td>Dairy and agriculture expert in Africa</td>
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<tr>
<td>William Talbot</td>
<td>MIT and Harvard Kennedy School of Government</td>
<td>Researcher on rainfall index insurance in India</td>
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<tr>
<td>Sonja Vermuelen</td>
<td>University of Copenhagen's Department of Plant and</td>
<td>Director of Research, Climate Change, Agriculture and Food Security Program</td>
<td>Provided palm oil research guidance</td>
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<tr>
<td></td>
<td>Environmental Sciences</td>
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<tr>
<td>Stephanie Hanson</td>
<td>One Acre Fund</td>
<td>Director of Policy and Outreach</td>
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<tr>
<td>John Gillis</td>
<td>Komaza</td>
<td>Crop Production</td>
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Appendix 3: One Acre Fund Financials

The below table shows One Acre Funds costs recovery during its first 8 years of operation as well as how this breaks down according to number of farmers served.

<table>
<thead>
<tr>
<th>Year</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2011</td>
<td>2012</td>
</tr>
<tr>
<td>Cost Recovery through Operations</td>
<td>10%</td>
<td>15%</td>
<td>30%</td>
<td>50%</td>
<td>60%</td>
<td>80%*</td>
<td>85%*</td>
<td>90%*</td>
</tr>
<tr>
<td>Cost Of Operations</td>
<td>$67,703</td>
<td>$556,439</td>
<td>$1,171,995</td>
<td>$2,136,869</td>
<td>$4,708,888</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Total unrecovered costs</td>
<td>$6,770</td>
<td>$83,466</td>
<td>$351,599</td>
<td>$1,068,435</td>
<td>$2,825,333</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Number of Farmers served</td>
<td>120</td>
<td>600</td>
<td>3,500</td>
<td>12,000</td>
<td>30,000</td>
<td>5000*</td>
<td>8500*</td>
<td>12000*</td>
</tr>
<tr>
<td>Unrecovered cost per farmer</td>
<td>$56</td>
<td>$139</td>
<td>$100</td>
<td>$89</td>
<td>$94</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

* projected

* *Cost recovery is going to be lower because population density is lower in W Africa and because services required for cocoa require CDC and other infrastructure not needed for OAF’s staple crops.
Appendix 4: Details from Other Value Chains

Growing Sustainable Business: Aligning Incentives

The Growing Sustainable Business (GSB) initiative spearheaded by the UN attempts to foster public-private partnerships. However, lack of bottom-up participation is hindering the effort. The GSB’s efforts are globally managed with country-level delivery mechanism and coordination groups. Of 48 projects under the umbrella, 20 were focused on food supply chains. In Kenya, the main intended beneficiaries of one project were smallholder producers of mangoes and nuts. While partnerships were brokered, they were mainly between private companies and a few local groups with long-standing interests in and relationships with market-building organizations. Participation of government officials was inconsistent. There was resistance within the UN group as well as other partners to including farmers’ voices in the planning stages of the project.

Macadamia Nuts

Macadamia Nuts were identified as a good crop for export, specifically to niche organic markets. However, processing issues and quality problems hampered development of this export crop. An extension agent was also brought in to oversee growing and grafting through processing. No input from the smallholders themselves was taken in throughout the planning and application process for this effort to become a GSB supported project. There was a lack of interest amongst farmers for increasing nut yields either through increased investment in existing trees or an increase in land dedicated to nut production. The project folded after two years due to these issues.

Mangoes

Another project focused on Mangos and was undertaken after the Gatsby Trust and other groups had already begun implantation of training and extension services on pest management and quality improvement for mango farmers. Originally, these Del Monte and a large supermarket chain were contacted to uptake the mangoes; however, both of these deals fell through. The GSB then aimed to provide these farmers with links to a juice manufacturer to secure the market. However, lack of understanding of the economics of the process, poor access to transportation, and the inability of farmers to meet the quality metrics necessary led to project failure.

Land O’Lakes Dairy In Africa: Community and Quality Improvement

For dairy, quality is the major issue. Handling and temperature control are extremely important, but the cold chain for transport and storage can be unreliable. This is an especially hard challenge in countries such as Zambia with low population densities, where some farmers are up to 18km away from collection centers. At the point of pick up from farmers, there is poor self-policing, in part because of lack if incentives for high quality products and sympathy for neighbors who have produced low quality milk. Mixing any bad batch can ruin an entire tank, so quality checks are necessary at the collection centers.

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Training
In order to address quality issues, Land O’Lakes has undertaken a farmer-training program to address drivers of low quality. They teach milking methods, how to grow and provide cows with the correct feed, and how to properly water the cows. Even with training, however, farmers often do not adopt the best practices, either because of lack of capital or lack of understanding. Another factor in the difficulty of training farmers in best practices is that demonstrations are not clear; it is hard to show increased quality unless there are incentives in place and a group such as a cooperative present to measure and reward for high quality.

Adoption and Funding
In Zambia, the early adopters have been illiterate smallholders, mostly those with nothing to lose. In order to promote use of fertilizer, functional coops that can distribute the fertilizer and inputs amongst farmers without cash transactions tend to be the most effective. This model can also be applied through giving lead farmers vouchers and putting them in charge of input purchase. The most workable plans tend to involve layers of oversight and peer pressure with high incentives for participation and improvement.

Zambia Rural Income Assessment: Organization and Access to Markets
A vast majority of rural households in Zambia depend on agriculture for income. Regional disparities exist, and lower crop production is linked to delayed delivery and high cost of fertilizer, lack of credit, inadequate road access, and weather conditions. Smallholders were marginalized further by lack of storage. Education, farming a mix of crops aligned with market needs, and access to roads were all positively correlated with increased returns when comparing two otherwise similar communities. In addition, farmers seemed to favor including animal or fish farming as a way to increase income rather than expanding the number of plant crops they grew. Farmers with access to well-developed cooperative societies or clubs also fared better than those in a less closely knit community. The authors hypothesize that the groups could be leveraged in development of local produce markets.

Smallholder Banana Farmers: Economic Efficiency and Farmer Organization
Surveys of farmers found that production was on average 60% of optimum levels due to technical inefficiencies. Much of this inefficiency may result from the fact that banana farming is often a secondary activity for women with other responsibilities, such as dairy farming. Also, farmers were cultivating a native variety of banana with a two-year maturity time, smaller fruits, and lower yield. Upgrades to higher yield tissue culture bananas were rare because of the high price of good planting materials. Farmers lacked sufficient access to credit to obtain these materials even if they were interested in improving their stock. Lack of financial knowledge and organization amongst farmers was also found to have an effect on yield and price. Middlemen generally buy bananas from farmers, and lack of infrastructure and transportation limits the ability of farmers to access markets on their own. Organizing farmers into groups to maximize market power could help them realize higher prices for their current, native varieties of bananas, and financial and technical training could help to foster the switch to tissue culture bananas.

Constraints in Soybean: Prices and Farmer Organization

Soybean production has been promoted by the Ministry of Food and Agriculture in Ghana with the aim of increasing incomes and food security. However, adoption rates have been low. This survey based study of smallholder farmers found that lack of technical knowledge, and low investment in the crop led to low yields. Prices tended to be low because of lack of organization amongst traders and processors, thereby exacerbating the problem. Traders often exploited farmers, as farmers were not sure of access to any other point of sale. Promotion of organization and standardization in post-harvest handling and processing would be necessary to increase adoption of soybean cultivation. Higher prices could help to incentivize not only increased land use for soybean production but also increased investment in high quality inputs and seeds as well as adoption of best practices for cultivation, such as row planting.

Ghanaian Tomatoes: Low Capital Investment and Distrust of Best Practices

Recent reduced levels of capital investment were observed amongst smallholder farmers, so a Participatory Rural Appraisal (PRA) was conducted to find out why. Root causes of this lack of investment were reported to be (1) incorrect production techniques utilized by farmers and (2) absence of nearby processing facilities.

Land management systems organized use into two categories: individual land for farming and communal family land for housing and/or farming. Village Land Management Committees allocate land rentals. Those who do not plan to farm negotiate with another user, then informs the VLMC. If a user does not use the land for farming, their fields are forfeit. Given this land allocation strategy, there were many opportunities for farmers to band together to access funds in a group or share resources. However, the study found that farmers had in almost all cases failed to do so. Facilitating formation of decision-making groups that are tighter and smaller than the VLMCs was recommended.

In addition, survey results showed that farmers were aware of best practices for fertilization, seeding, etc. but were not following those practices. Poor record keeping on incomes and expenditures likely exacerbated the problem. Farmers were skeptical of best practices taught by extension. Farmers reported distrust of the best practices because the experimental plots were so far removed from their experience that they did not think they would be able to create similar outcomes on their own land. Therefore, experimental learning may be a better tactic than demonstration alone.

Adoption of Different Cassava Varieties: Access Through Lead Farmers

In this study of cassava cultivation and adoption of improved varieties, it was found that higher income farmers with more diversified sources of income were more likely to both cultivate cassava, a hardy staple crop, and to adopt new varieties of the plant. Farmers with access to extension services were about twice as likely to adopt new cultivars. This suggests that reaching high-income farmers and those with existing relationships with extension agents is a natural first step in introduction of new plants and growing methods. The skills

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and experience of these farmers can be leveraged to reach other, lower income farmers in the same communities.

**Interactive Training: Enabling Rural Innovation in Uganda**

Over the last 10 years in Uganda, there has been an expansion from a few hundred to over 200,000 organic farms. Much of this growth came through contract farming, in which traders identify buyers and provide support services, certification, etc. to farmers. Using traders as the critical mover in these systems can be positive because traders can shoulder more financial risk than the individual farmers and because having traders as the access point for management of the product allows farmers to focus on production rather than securing funds or finding a market for their goods. On the other hand, this system does not foster farmer autonomy and empowerment, limiting increases in farmer competitiveness. Knowledge transfer is recipe-based, and farmers often do not understand the underlying principles of the proscribed methods they carry out. Enabling Rural Innovation (ERI) is meant to address this.

The ERI program is designed to allow farmers to make decisions and identify new production and marketing opportunities for themselves. The five steps of the process are outlined in the figure below.

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Figure 11: ERI Approach for Transition to Organic Farming: Tactics at the Farmer Level

<table>
<thead>
<tr>
<th>ERI Phase</th>
<th>Purpose</th>
<th>Activities</th>
</tr>
</thead>
</table>
| Participatory diagnosis (PD)       | identify new opportunities and livelihood strategies, based on available human, social and natural resources and broader community visions; establish a feasible action plan | • community visioning and diagnosis workshops (using tools such as visioning maps, market chain analysis, wealth ranking)  
• group dynamics workshops (analysing group structures and behaviour using institutional calendars, resource mapping, daily activity calendars)  
• community action planning workshops (agreeing on an action plan within the group; selecting PMR, FPR and PME committees) |
| Participatory market research (PMR)| develop market research skills, explore organic markets (direct buyers, traders) and prioritise most profitable enterprise options at group level | • market research trainings (learning how to design data collection tools, develop market research questions, identify markets to visit)  
• market visits by PMR committee (data collection on market demand, requirements and logistics, data analysis)  
• community feedback meetings (presentation of market data by PMR committee, selection of enterprise options by the whole group) |
| Farmer participatory research (FPR)| develop on-farm experimentation skills, test the agronomic and economic performance of selected enterprise options through farmer-managed on-farm test trials | • crop experiment trainings (learning how to select and prioritize technology options, plan experiments, and develop research protocols)  
• on-farm experimentation by FPR committee (testing, monitoring and evaluating different agronomic practices)  
• community feedback meetings (presentation of experimentation data by FPR committee, selection of technology options by the whole group) |
| Enterprise development (ED)        | establish a business plan based on information gained from PMR and FPR, and scale-out the production of tested organic enterprises and adapted agronomic practices | • enterprise development trainings (learning how to run production, marketing and profitability analyses)  
• enterprise selection (running cost-benefit analyses, negotiating contracts with traders)  
• business coaching services and backstopping by facilitators |
| Participatory monitoring and evaluation (PME) | monitor transition process to organic agriculture and provide feedback to the community, based on visions, goals and indicators developed during PD | • participatory monitoring trainings (learning how to monitor and evaluate progress using matrices along pre-defined indicators)  
• monitoring and evaluation by PME committee (re-prioritising long-term goals, identifying factors for success and failure)  
• community feedback meetings (presentation of PME data by PME committee, deciding on corrective measures) |

In the study, a group of farmers, almost all of which had no contact with extension services and did not use external farm inputs, were recruited to go through the ERI program. Market
knowledge and orientation among farmers was low. Through ERI, farmers made group
decisions to experiment with organic production of different crops and to experiment with
production methods for crops they had not previously grown. They became more market
knowledgeable and oriented and were better able to share information with each other.
Despite this, access to financing slowed crop improvement measures, and the farmers relied
on a trader to hold and maintain their organic certification. Also, some of the groups
reported a discouraging influence from surrounding farmers who were not participating in
the project.

**Risk Sources and Management: Perceptions of Smallholders in Nigeria**

Survey data was collected from 165 farmers in Osun State in Nigeria to assess exposure to
risk factors and access to risk mitigation strategies. Farmers were asked to report on risk
factors they had experienced in the past years and which risk management strategies, if any,
they had participated in. Results are below.

**Sources of Risk**
1. Market Failure (54.5%)
2. Price fluctuation (46.1%)
3. Drought (32.7%)
4. Pests/Disease (33.9%)
5. Rainfall (39.4%)

**Management Strategies**
1. Access the fertilizer (41.2%)
2. Mixed crops (79.3%)
3. Extension services (67.3%)
4. Borrowing money (73.0%)
5. Off-farm work (69.7%)

While majority of farmers had access to some extension services, only 23% had access to
training and education from government or NGOs. While less than half had access to
subsidized fertilizer, it is unclear how many more farmers may have had access to
purchasing unsubsidized products. Only 1.2% used insurance. The majority of households
used borrowing and off-farm work to cope with adverse situations, which could exacerbate
their sensitivity to the non-individual risk sources listed above in the next season.

**Input Vouchers: JPAL**

Because most farmers only receive their entire year’s income in a large lump sum at harvest
time, new methods to help farmers “save” or commit their funds to next year’s production
have helped increase productivity. In Kenya, JPAL ran an experiment where they used
vouchers to have farmers commit to buying fertilizer for the next season. The theory is that
in between when farmers receive their yearly income and when they need to spend it on
inputs for the following year, most farmers spend their money on health emergencies, lend
it to family, or allocate it towards household expenses. This behavior means they then do
not have the money when they need it to purchase fertilizer. A voucher is presented to
farmers around harvest time, which allows farmers to pre-pay for fertilizer. This voucher

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**References**


then guarantees that they will have fertilizer delivered to them when needed later in the year. Delivery was partly subsidized in this specific instance, but distribution costs could be folded into the price farmers pay for inputs. This JPAL project was very successful and significantly increased uptake of fertilizer.

Rainfall Index Insurance: HARITA and JPAL
Rainfall insurance is structured as a replacement for traditional crop insurance. In traditional crop insurance, farmers that experience catastrophic losses file a claim, then have an agent come out to assess damages and ensure that the damages are covered under the farmer's policy. This requires transportation, communication, and administrative resources that are not always present in developing countries.

Rainfall index insurance is structured such that payout size is correlated with seasonal rainfall conditions. Therefore, farmers can receive support during years with poor yields without having to go through the process of filing a claim. As payouts are based on an easily measurable metric rather than individual outcomes, farmers need to have less detailed knowledge of policies in order to reap the benefits. Rainfall insurance requires less administrative work and less oversight than traditional crop insurance, which keeps overhead low. The low cost of administering these policies makes it possible to offer access to risk reduction through insurance to farmers who might otherwise not be able to afford it.

R4 Rural Resilience Initiative: Horn of Africa Risk Transfer Initiative (HARITA)\textsuperscript{63}
OXFAM, in cooperation with a number of other NGOs and governments, is implementing an insurance program in Ethiopia. There, insurance is offered to the poorest farmers through a government sponsored food and cash for work program. Farmers can elect to spend, in most cases, two extra days doing environmental improvement and risk reduction work (soil recovery, erosion control, etc.) in exchange for a year of insurance. As cash is not required, uptake rates are promising: HARITA enrolled over 13,195 farmers from January through September 2011, exceeding their goal for the year and increasing from 1,308 farmers in 2010\textsuperscript{64}. Farmers are also granted access to microcredit either in concert with or separate from insurance, and those who do not participate in the government work programs may elect to buy insurance as well. The program is still ramping up, so the effect of insurance on farm investment and yields has yet to be seen.

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\textsuperscript{63} Anand, M. (2012, May 3). HARITA Project. (D. Kaboli, & M. Sridharan, Interviewers)

For a J-PAL project in Northern India, rainfall index insurance was tacked onto loans given to farmers by banks. The attitudes we encountered toward rainfall insurance were mixed. In the area, crop insurance is a required measure for any farmer taking a loan, so while farmers may not fully understand the insurance model, they are used to the idea of taking it out. Despite this, uptake and education have been slow over the first two years of the project. Methods of education are being adapted to address some of these issues. In addition, researchers on the project feel that a poor rainfall year, in which farmers will receive a large payout, may help increase uptake because farmers will be able to see that insurance is worthwhile.

One difficulty that cannot easily be addressed in either of these projects is the differences between rainfall and other weather conditions as measured at a weather station and that which farmers experience. The HARITA project is looking into more accurate and local measurement of weather using satellites. However, this will likely continue to be a challenge for weather index insurance relative to crop failure insurance.

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Abdul Latif Jameel Poverty Action Lab: Weather Index Insurance

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