I-DEV INTERNATIONAL

“MOBILE MONEY & PAYG INNOVATION TO SCALE AGTECH ADOPTION IN SMALLHOLDER VALUE CHAINS”

MEDA INNOVATE:
I-DEV FINAL LESSONS LEARNED REPORT

NOVEMBER 2019
Section A | Lessons Learned in Designing a Pilot with Smallholder Farmers, New Financial Instruments & AgTech
A Summary: INNOVATE Pilot & Objectives

I-DEV was engaged by MEDA to implement this project, titled “Mobile Money & Pay-As-You-Go (PAYG) Innovation to Scale AgTech Adoption in the Smallholder Value Chain”, in order to test an ambitious model that offered rural, low income farmers in the Northern Andean region of Peru access to consistent and more water to increase tara crop yields and thus household income. The pilot targeted the tara farmers of APTN- Asociacion de Productores de Tara- Norte, located in San Marcos, Cajamarca, Peru.

Our hypothesis was that Smallholder farmers can increase yields, income and opportunity with Pay-As-You-Go (“PAYG”) to make agtech solutions more affordable and feasible by distributing payments in smaller amounts over a longer timeframe, and reducing risks with lost or stolen cash via mobile money ‘cashless’ payments. Specifically, we aimed to:

- Introduce drip irrigation to tara farmers who do not receive consistent access to water for their crops, mostly rely on rainfall in a changing climate, thus reducing total yield potential of tara and making farmers more vulnerable to climate variances
- Introduce best-in-class clean energy e.g. solar irrigation systems to give farmers the best available solutions on the market, so they can see the benefits and reduce negative impacts of their activities, reduce fuel costs and be ahead of innovation trends
- Integration of BIM, the Peruvian mobile money system, would allow APTN – the affiliated farmer cooperative and our anchor partner who will manage a new Irrigation lending facility going forward- to receive loan repayments for irrigation systems in a safe and transparent manner, and in doing so, introduce farmers to the value and benefits of using mobile money vs. cash payments, which can be stolen or lost. Mobile money in Africa has unlocked credit potential, increased income security and created many benefits for low-income communities, yet has been more slowly adopted across Latin America.

Due to various issues and challenges faced that we outline on the next slide, the scope and nature of this pilot was modified to focus on the critical and baseline innovations and agtech introduction to benefit tara smallholder farmers.

- Loans to access traditional drip irrigation systems readily available in the Cajamarca Region 1 solar irrigation pilot)
- 2-5 Smallholders that will pilot and benefit from the irrigation systems
- Design of a more traditional loan mechanism that does not require BIM for payments, but rather mimics familiar features of a Kiva loan
- Design of the financial model and training to APTN management on monitoring and management of a new revolving loan facility that will offer drip irrigation solutions on 13% interesting over an 18-month period to top performing APTN farmers, who are also Kiva borrowers, as an added ‘Secondary Benefit’ or additional reward for engagement with the cooperative and good financial and sales track record
Key Lessons Learned: Macro-Level

- **Leverage Existing Foundations & Ramp Up with Time; Leverage Tools to Save Time on Launch and Scale.** New foundational tools and mechanisms could either add up to or optimize prior successful ones. Aligning new products and services with prior practices, familiar concepts, leading farmers’ projections/goals will support and expedite the rate of adoption of new pilots and solutions.

- **Tech Itself is Not Sexy to Farmers; Results and Potential Are.** Smallholders are very pragmatic when it comes to pricy tech adoption, especially given their low income and thus limited savings as a financial security ‘cushion.’ First, they see it works for their crop, and crop pays it back in the short-term (since season 1), then they adopt it. Complex explanations and theory is not of interest.

- **Start with Local First Movers & Leaders to Prime Others.** Starting with a few leading farmers e.g. 5, with risk-appetite or seeking tech adoption is key (factor in prior experiences/lessons learned of leading farmers). Piloting with a few to demonstrate value/results to other members will ensure a large scale bad initiative does not destroy large scale morale and belief in the possibility of something new and truly beneficial being created. This has happened many times with international development efforts because of a rushed process to analyze local market and demands or engage target users and local anchor partners in effective co-creation that then led to a poorly designed pilot and model targeting a large group (to align with typically unrealistically high impact targets in # of people or beneficiaries early on) that could not be managed well because of scale, loss of focus on core long-term objectives and no room to tweak and perfect the model quickly, which is much easier with a small group.

- **Coops as a Gateway to Innovation.** Building trust and commitment with/among farmers is a long-term process, so well-established coops are key liaisons/partners to make a solid entrance in this segment. They are part of the community, have seen the business and cash flow dynamics, and have usually experienced other projects that have worked or not worked that offer valuable lessons learned.

- **Discussion Leveraging Familiar Concepts & Actors is Key to Unlocking Innovation Adoption.** “Expensive” and “loans” are concepts they prefer not to hear, but “customized, testing, KIVA, APTN” were concepts they were familiar with and wanted to hear more about it. Engineering studies fees were covered by the project which became a key opportunity for farmers to discuss, co-create, prioritize and validate the DOs and DONT’s of adopting irrigation solution.
Key Lessons Learned: Macro-Level

• **Match the Payment Mechanism with Farmers’ Cash Flows and Income Level.** PAYG has limitations when the cost of the systems is too high. Farmers must be able to own their systems after 3 years (vs. 6 to 9 years with imported Lorentz systems we explored, which were too costly). In addition, PAYG as the only mode of payment may not be suitable for tara or other farmers with highly irregular revenues, and only a few major cash flow cycles resulting from only 1-2 key harvest seasons. Thus, understanding better the crop, seasonality and cash flow cycle is key in designing a financial mechanism and agtech solution for farmers.

• **Anticipate Indirect Costs.** The cost of installation and training can represent a large part of the total cost of a new agtech system, with specialized technical knowledge often needed, and few suppliers willing to cover this cost for a pilot without an unclear market demand and lucrative sales opportunity. Collecting detailed topographic, engineering and technical data in the first phase allows to better anticipate these costs and save time during discussions with potential suppliers.

• **In Design, Be Sensitive to Complex Pilot Design with Many ‘New’ Factors; In Some Cases, Too Many New Factors Can Undermine the Objective of the Pilot to Provide Technology that Generates Improved Income and Resilience for Low-Income Farmers.** Introducing a new technology (solar drip irrigation systems) with a new payment mechanism (PAYG) and a new payment mode (mobile money) requires a lot of work to inform, train, generate interest, change habits… This is why we decided it best to focus on answering farmers’ needs by leveraging local solutions at the lowest possible cost point in order to prove baseline success and benefits of irrigation in general, thus priming the farmers and their willingness to consider more expensive, improved solutions when explained the additional upsides; and also to give them an interim solution to increase household income from crop yields, making purchase of a more expensive, premium solution more likely in a 3-5 year timeframe.
Key Challenges Faced

Some of the key factors that posed challenges in completing this pilot on time and as anticipated were:

- **Many New Factors To Introduce in Short Timeframe:** New Pay-As-You-Go Technology; New AgTech (solar or diesel drip irrigation system); New loan product to acquire the tech; New market or geography and client to whom solar irrigation solutions providers had not studied or reached.

- **Unexpectedly High Cost of Solar Technology:** Due to remote location of farmers, limited logistics and transportation and trade routes, and a subset of the market not considered attractive or ‘on-the-radar’ for large solar systems providers.

- **Unexpectedly High Cost of Mobile Money and Pay-As-You-Go Tech Integration:** While BIM is a nationally recognized mobile money platform in Peru, it has been slow to penetrate the BoP and rural segments of the market, meaning target farmers were new to using BIM and would require training and willingness to adopt a new and foreign form of payment when cash is the norm.

- **Lack of Existing & Accurate Demographic Information:** While I-DEV pulled different demographic information from Kiva and other government and regional reports, ultimately, given the new-ness of the product being proposed and the detailed consumer data we wanted to collect (vs. macro-level figures), Human-Centered Design (HCD) field techniques were required to pull useful insights into target beneficiaries.

- **Very Low and Cyclical Income of APTN Farmers:** Farmers’ income is low enough that a loan of several $thousand is burdensome on the family and requires approval and often co-investment from other family members. Meanwhile, many farmers already rely on loans for other essentials that are more clearly tied to household income generation e.g. buying cows for sale of milk and meat, raising cuy to sell to friends and family for food and breeding. Drip irrigation (solar or not) is perceived as a less certain luxury, expensive, and while valuable must fit into the cycles of cash receipt by farmers (e.g. after a large tara harvest, or sale of a cow) and other outstanding loans and payment schedules.

- **Limited Timeframe:** The cyclicity of cash flows of farmers, outstanding loans and ideally, staged lending periods during which more advanced, expensive solutions (e.g. traditional in phase 1, then solar in phase 2) would require a minimum of 3 years to test all features of the original scope of agtech and mobile money interventions we aspired to.

- **Limited Budget to Pilot Costly Innovations:** The overall budget for this project provided limited funding to invest in the full spectrum of initiatives required to test 1) Solar Irrigation, 2) BIM and PAYGO integration, 3) Many plots, 4) The actual increases in yields once systems are up and running through at least 1-2 growing and harvest seasons.

- **I-DEV Setbacks:** I-DEV experienced operational and team set backs that delayed some project steps in early 2019, including a new project lead and staff changes during the project.
How We Tackled Challenges Faced

Some of the key factors that posed challenges in completing this pilot on time and as anticipated were:

<table>
<thead>
<tr>
<th>Many New Factors to Introduce in Short Timeframe</th>
<th>Prioritized 1) Introduction of agtech (but not solar), 2) new financing product or loan facility (vs. mobile money)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unexpectedly High Cost of Solar Technology</td>
<td>Focus on locally-available diesel powered drip irrigation to stay in budget and extrapolate on how solar systems could be introduced; also maintaining 1 solar pilot for a wealthier farmer</td>
</tr>
<tr>
<td>Unexpectedly High Cost of Mobile Money and Pay-As-You-Go Tech Integration</td>
<td>Led to our preferred leading solar irrigation providers falling through. BIM integration was &gt;$30K, and a large buyer market not yet identified to warrant this investment. Farmers were also unfamiliar with it.</td>
</tr>
<tr>
<td>Lack of Existing &amp; Accurate Demographic Information</td>
<td>Required we focus on human-centered design techniques. This is a common issue in rural, low tech areas.</td>
</tr>
<tr>
<td>Very Low and Cyclical Income of APTN Farmers</td>
<td>Mimicked Kiva loan structure for now- since familiar to farmers already, requiring less of a learning curve, avoiding trust issues with APTN and farmers, and focused on back-ended bullet payment at end of lending period and in line with when harvest is complete</td>
</tr>
<tr>
<td>Short Timeframe</td>
<td>The pilot period was short given the various setbacks, and many actors from farmers to APTN management to distributors and vendors to respond, given quotes, do technical site visits and design. Engineering was a bigger process and component of pilot and launch than expected</td>
</tr>
<tr>
<td>Limited Budget to Pilot Costly Innovations</td>
<td>Addressed above with Solar. Also the cost of trainings to farmers on use of BIM, as well as use, maintenance and quality of solar vs. more familiar diesel systems would be costly and require 2-3 years time to realize full benefits</td>
</tr>
<tr>
<td>I-DEV Setbacks</td>
<td>I-DEV Project Lead was lost, and new project lead installed. Team modified slightly to boost implementation, HCD and financial (financial model for revolving loan facility) deliverables for revised scope.</td>
</tr>
</tbody>
</table>
Process & Steps to Navigate Effective Pilot Design

Based on our experiences, we recommend the following process and steps in assessing and then designing an effective pilot that is targeting rural, low income farmers and new tech and/or new financial production solutions.

**Areas of Analysis**

**1. ID Partners & Secondary Data Sources**
- Conduct secondary research (e.g. Review of existing reports) to take lessons learned from other similar engagements.
- Conduct primary research by identifying active banks, MFIs, solar, farming and other groups in region who know the community and agricultural sector better.
- Phone calls and email conversations to understand who might be strong local partners with existing data.
- Request access to data, where possible.

**2. Define V1 Hypothesis & Field Methodology to Validate**
- Based on Step 1 insights, compile a list of 15-20 key assumptions and beliefs about the target market segment to be ‘Beneficiaries’ of the pilot.
- Develop a spreadsheet that outlines hypotheses and assumptions around Avg. Household income; # of revenue streams and key HH income generator e.g., tara sales; Brainstorm on factors that influence revenue and cash flows e.g. # of harvests per year, # of sales and frequency, avg. Sale size, # of income generating individuals in the home; # of decision makers in the home.
- Determine groups you’ll have to access and interview to get these answers.
- Leverage partners to set up HCD workshops.

**3. Complementary Field Research to Develop V2 Hypothesis**
- Design 3-5 HCD workshops.
- Target a minimum of 30 people, representing the broadest spectrum of variants identified in Step 2.
- In advance of workshops, design 2-3 ways you can ask a question to get information on the data point you are seeking, e.g., Farmers will not share their total household income per month and may not know it. You must ask “How many guinea pigs are you growing right now? When will you sell them? How many will you sell then? How much do you sell a guinea pig for?” and then later, “Who sells guinea pigs in your house? How many did you and your family sell last month? How many in December? Which month do you sell the most guinea pigs? Why? How many did you sell then?”

**4. Design Pilot Based on V3 Hypothesis**
- Revise assumptions and features of the pilot based on an analysis of information obtained in Step 3.
- Treat anchor partner (APTN) as a co-creator in the design of pilot features.
- Where possible, go back to sources in previous steps to test specific features of the pilot anticipated, and get their initial reaction, their reaction with some explanation and clarification and once again when final solution is drafted.
Market Assessment Methodology

The following slide outlines some additional lessons learned in the order and process by which to uncover useful and accurate data in places where limited accurate data is readily available.

**Using Primary & Secondary Data Techniques to Uncover Accurate Insights:**

**Step 1: Internet, Government Data & Report Search**
- Consider that many local newspapers and media outlets often get figures and information wrong; look for 2-3 data points that match to triangulate and get an average of those 3 points
- Search for reliable industry reports from reputable international farming, solar or other associations or leading companies operating in this market segment
- Search government databases and reports, keeping in mind that this data is often old and must be extrapolated upon; also it may be inaccurate
- Map relevant value chains and processes that occur among target users, crops, cooperative, etc.- and identify what you still do not understand or are unclear or skeptical of to test in secondary research – interviews, focus groups, etc.

**Step 2: Data from Trusted Partners**
- Once local active regional partners are identified, including who will help you to implement e.g. APTN, the anchor cooperative or association, ask them to share key information on the key drivers or factors identified that will influence your pilot design
- Speak with local actors along the full value chain related to the solution to plan to provide- in this case, 1) farmer, 2) association/cooperative, 3) irrigation manufacturers, 4) irrigation installers or engineer, 5) other related vendors/service providers e.g. for maintenance, 6) local MFIs and commercial lenders to see if they offer any loan to the target demographic and therefore track relevant consumer data.
- Compare or ‘triangulate’ data from Steps 1 and 2 to extrapolate on realistic figures
Example: Improved Pilot Research & Design

**Secondary Research to Create Baseline Assumptions or Pilot Design Drivers**

*Focus:* Understand consumer segment and the opportunity; Map existing landscape, market, actors relevant

- Financing Mechanisms Available or Possible
- Groups working with smallholder farmers who may know about BIM or other mobile money introduction
- Actors in solar or irrigation
- Possible Sources: Kiva, ANDE, GSMA, Devex, IFC, World Bank, IDB, GAGP, IFAD, Root Capital, Center for Financial Inclusion, CSAF, Powermundo

**Primary Research to Validate & Modify Drivers and Anticipated Design**

*Focus:* Understand what is happening today and why what we want to do is not yet there

- Why no BIM yet?
- Why no drip irrigation?
- Why no solar drip irrigation?
- How much do tara farmers earn per year and could they pay for a new agtech solution?

- Hone on shortlist of parties mapped in Kiva, ANDE, GSMA, Devex, IFC, World Bank, IDB, GAGP, IFAD, Root Capital, Center for Financial Inclusion, CSAF, Powermundo

**Field Focus Groups & Interviews**

*Focus:* To confirm our information is current and get feedback, then buy in from those know best

Interactive exercises that again test your drivers to:

- Map a day in the life
- Map user journey-specific to farming, harvest, sale and full value chain
- Uncover monthly spending, costs, needs
- Mobile phone use and interaction; internet use and interaction
- BIM or mobile money familiarity

Questions to Answer:
How do they earn it? When do they earn? If they earn by different means, how many

**Synthesize & Design**

*Focus:* Piece findings together, ideally in an iterative process with co-collaborators e.g. APTN, select farmers and Kiva, to build a viable pilot.

Answer in design:
Does the model factor in an address main pain points mentioned? Does it limit introduction of new features with a steep and slow learning curve (e.g. mobile money adoption + expensive new technology + solar) to a max. of 2 or 3? Does it include seeming or stated ‘deal breakers’ that arose in previous steps?
Checklist of Critical Steps to Check: By Perspective

Secondary Research to Create Baseline Assumptions or Pilot Design Drivers

Focus: Understand consumer segment and the opportunity; Map existing landscape, market, actors relevant

- Clearly defined Problem Statement and proposed Solution - What is perceived as the problem and how the pilot intends to address it
- Min. 10 relevant reports to review - all less than 5 years old
- Longlist of 30-50 actors to research or contact for secondary research and data sets, or to build initial assumptions about market dynamics
- Draft maps of key value chains and flows/processes relevant to hypotheses

Primary Research to Validate & Modify Drivers and Anticipated Design

Focus: Understand what is happening today and why what we want to do is not yet there

- Shortlist of Anchor Partners or Informants to Collaborate with; Honing in to a Min. of 1-2 to continue process with
- Access to primary data sources to add depth to Step 1 research
- Min. of 15-30 interviews with key parties directly tied to key segments of value chain (farmers, coop management, manufacturers of solution (e.g. irrigation system), engineers who install, financiers and lenders.

Field Focus Groups & Interviews

Focus: To confirm our information is current and get feedback, then buy in from those know best

- Template design for each focus group or workshop, outlining Objective & Information to Obtain; Steps and Actions throughout Workshop, Roles of HCD team, Data collection process and template to capture insights
- Min. of 3-5 focus groups and workshops with different groups, or subsets of target users
- Min. 10 follow-on interviews with each relevant market segment or key actor (e.g. APTN management, APTN farmers, financiers like Kiva

Synthesize & Design

Focus: Piece findings together, ideally in an iterative process with co-collaborators e.g. APTN, select farmers and Kiva, to build a viable pilot.

- Min. 3-5 co-collaboration sessions with Anchor partner and other key informants (e.g. APTN, Kiva, engineers)
- All contracts between implementing parties that clearly define role, responsibilities and requirement to realize benefits, unlock tranches of funding, etc.
- Template to track progress and key impact metrics critical to reporting and analyzing success later
- Signed contracts
- (then) Disburse funds - tranches tied to submission of key impact and progress data + visual proof e.g. photos
### Ideal Pilot Timeline

Throughout our process, we uncovered what we believe would be an ideal timeline to realize a pilot that incorporates varying levels of new and costly innovations. This factors in that working with rural farmer groups is also a slow process, that is highly manual as farmers are not active computer, internet or smartphone users for communication. Each interaction must be prompted by a mix of phone call, whatsapp or text message follow up, email and then reminders that emails were sent to be be read. We’ve mapped out a 3-5 year timeframe during which 1) baseline agtech and new financing solution can be introduced, then ramped up to mid-range solutions e.g. improved, foreign and advanced technologies, and then 3) addition of other beneficial features e.g. mobile payments, a full scale evergreen lending facility and more.

#### Market Research & Pilot Design
Research, interviews, ID anchor partners. Macro-level research, micro-level focus groups, interviews, site visits.

#### Solidify Partnerships, Contract & Field Scoping & Build Buy-In
Contracts, planning, engineer visits, build excitement/educate on opportunity; If contracts signed, proceed with purchase of equipment and installation.

#### Year 2: Phase 1 Pilot with Baseline Tech Solution
Launch of Phase 1 Pilot Features, explaining to users that this is a pilot that may not go perfectly. Their active communication, participation and patience is needed. Specific timing of engineering, purchase of equipment and installation plus loan tenor and terms must be matched to findings in previous steps.

#### Interim Reporting & Check-Ins
Data collection from pilot farmers to observe user experience, their observed increase in yields, change in purchasing behavior e.g. did they buy more cuy, new crops, etc; then, Data from cooperative and buyer to confirm actual increase in yield at the end of each major harvest cycle.
- **June**: Farmers Survey & Focus Group
- **October**: Farmers Survey & Focus Group

#### Y1 & Y2
4-6 months

#### Y3, Y4, Y5
(Year 3)

#### Modifications to Phase 1 Pilot
Improve communications, disburse additional tranche of funds if partner has been compliant, improve loan terms and negative clauses if necessary.

#### Advanced Tech Feature 2 (and 3)
Based on early results, begin to design for new upgrades in model including e.g. mobile money, solar. 3-5 workshops and training 6-8 months prior in anticipation of full introduction.

#### Advanced Tech Feature 2 (and 3)
If 2 new features are too much to coordinate in Y4, add in 3rd new feature in Year 5. Important to keep strong trainings, and dialogue with farmers and anchor partner (cooperative) to show how all phases relate and create a net benefit.
Farmer Profiles: A Snapshot of our Target User Dynamics

APTN tara farmers are low income and have limited access to other means of financing. Here is what we learned through focus groups and interviews, as well as Kiva data.

- Average Annual Income of Top APTN Farmers, $7,000 to $11,000
- Tara Sales represent 2% to 29% of annual income
- Other income generators: Cuy (guinea pig) rearing and sale for meat; Other crops e.g. potatoes, tomatoes, onions; Salaries e.g. teacher, etc. (less common and only a few farmers with regular income). Others buy cows for milk sales and meat sales; however, the farmers selected for pilot do not have cows.
- 70% Men; 30% Women
- 112 farmers with Kiva loans; 44% are Women
- Total Kiva Loans to APTN in 2018: $19,300 (9 farmers)
- Less than 30% use irrigation systems for crops

Current Situation:

<table>
<thead>
<tr>
<th>Nº of producers</th>
<th>Average Nº of hectares / farmer</th>
<th>Average Nº of tara trees / farmer</th>
<th>Average Total Production per year (kg.) / farmer</th>
<th>Average production per tree/per year (kg.) / per farmer</th>
</tr>
</thead>
<tbody>
<tr>
<td>78</td>
<td>1.7</td>
<td>554.2</td>
<td>1,086.0</td>
<td>2.0</td>
</tr>
</tbody>
</table>

Upside Potential with Improved Water Access:  
(See next slide for more details)

<table>
<thead>
<tr>
<th>Nº of producers</th>
<th>Average Nº of hectares / farmer</th>
<th>Average Nº of tara trees / farmer</th>
<th>Average Total Production per year (kg.) / farmer</th>
<th>Average production per tree/per year (kg.) / per farmer</th>
</tr>
</thead>
<tbody>
<tr>
<td>6388</td>
<td>11.8</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Farmer Profiles: A Snapshot on Tara Production

Current productivity levels of tara are way below expected ones. Tara production in native forests is measured per tree rather than per hectare since density, spacing and topographic features greatly vary in each plot. Each tree yields between 2 kg. (rain-fed) and up to 16 kg. (irrigated) in a year. The latter one occurs in one selected case, (out of the 78 interviewed) where better land and water management techniques are applied.

According to a previous study (PBD), the actual yield capacity per tree is 92 kg. maximum (2 seasons) in a year. This means that trees at the coop are able to produce only up to 17% of their actual capacity under current production techniques, considering that most plots are rain-fed according the latest data.

In addition to increased yield potentials, improved water access can smooth farmer cash flows by generating a second strong annual harvest. Currently, there is 1 peak harvest season between April/May/June, and other farmers who are lucky or have the benefits of additional water, can harvest a 2nd batch in Aug/Sep/Oct.

About Tara & Harvest Seasons:
Tara is an indigenous tree that grows a peapod, harvested by farmers up to 2 times per year. Tara is indigenous, mostly growing in forests on farmer plots and as such, most trees are not planted but grow naturally. Majority of tara trees are fed by rainwater today. Only about 10-15 years ago were additional benefits of tara and its seed discovered. The seed can be used as a natural, organic binding agent in foods and beverages, replacing harmful chemicals, or as gum or tanning agent in the leather industry.
Unexpected Pilot Costs Uncovered

In the roll out of our market research and pilot design, the following categories were unexpectedly expensive, representing a steep curve and a costly one to achieve broad innovation introduction and adoption.

- **Solar Irrigation is Expensive Due to Limited Supply to Rural Areas.**
  I-DEV looked at several possible solar irrigation systems. Leading international suppliers are not yet in rural areas of the Andean region, nor do they have any information or data on market size and large growth potential to warrant their focus on entering these regions. As a result, the few solar systems available are more costly and lower power capacity in relation to traditional models. Traditional system of equal capacity can be 60% or more in cost of equipment.

- **Engineering & Installation Site Design, Costly Due to Altitude, Uneven Terrain, Uneven Distribution of Trees.**
  Engineering and system design was far more complicated than anticipated. Due to irregular land and each plot being quite different in size, terrain, and crop/tara tree mix, engineers must map out each site and propose a customized solution. Other issues that were unexpected is that because tara trees grew naturally and were not planted with even spaces between then, a customized hose and drip piping must be designed to factor in different distance between points.

- **Unpredictable Rain Cycles & Irregular Government Supplied Water.**
  Another issue that added to cost of engineering design and installation is that each plot is connected to government supplied water connections, yet each has a different schedule to receive the water. Water usually is only available 1-3 times per week vs. daily or continuously. Meanwhile, climate change has caused irregular rain cycles, which not only requires farmers to plan ahead and invest in storage tanks to last between rains, but irregular rains affect planting and harvesting cycles for all crops and cash flows from them.

- **Limited Existing Reach of BIM and Costly Installation.**
  While BIM is a nationally and government recognized mobile money platform, it is still only in its early years and has not seen the rapid adoption or pull-mechanisms from government or otherwise to drive faster uptake. Meanwhile, BIM is expensive to integrate into technologies that want to become Pay-As-You-Go, and equipment vendors would like to see a strong enough case or assistance in funding the cost of installing the PAYGO tech into their equipment. In this case, solar vendors were not ready or convinced to invest in BIM installation into solar irrigation systems for this pilot, and doing so would have set back the time frame for launch by at least 3-6 months regardless. In addition, farmer training and education on the benefits of BIM would add further costs.
About the Drip Irrigation Systems Used

Through our field exercises, I-DEV worked with APTN and the engineer to identify appropriate, locally available irrigation systems and a solution that would be overseen by APTN.

- 6 Farmers shortlisted to receive a drip irrigation solution
- $2500 loan from MEDA per site, with Kiva loan (1-2 family members) or the farmer paying the rest; MEDA loan representing up to 50% of total Installation + Equipment cost
- Avg. Plot Size of 2.7 Hectares
- Range of Plot Size: .83 to 8.96 Hectares
- Irrigation System to cover a maximum of 50% of plots (4.4 Hectares Max.)
- Loans for System: $1,401 to $10,835 required; Avg. Loan Size of $4,126 anticipated in the future (current pilot information and plot needs included on next page)
- Cost of the Loan and Irrigation System is very high in relation to average household income among APTN farmers!
- Loan periods to begin in Nov.2019 and January 2020, when other outstanding Kiva loans paid down, and in advance of next harvest
## Detailed Breakdown of Pilot Site Costs

<table>
<thead>
<tr>
<th>Selected Farmers</th>
<th>Plot Size (HA)</th>
<th>Plot Size for Irrigation System (HA)</th>
<th>Tech Assistance</th>
<th>Pre-Work</th>
<th>Reservoir</th>
<th>Irrigation System</th>
<th>Pump</th>
<th>Transportation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jorge Alberto Honorio</td>
<td>1.61</td>
<td>0.8</td>
<td>965.18</td>
<td>200.00</td>
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<td>0.00</td>
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<tr>
<td>Rodrigo Montoya</td>
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<td>80.00</td>
<td>11,935.13</td>
<td>8,375.19</td>
<td>15,720.50</td>
<td>350.00</td>
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<tr>
<td>Manuel Sanchez</td>
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<td>0.73</td>
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<td>7,744.23</td>
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<td>0.00</td>
<td>300.00</td>
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<tr>
<td>Eufemia Torres Sanchez &amp; son</td>
<td>2.72</td>
<td>1.9</td>
<td>1896.23</td>
<td>120.00</td>
<td>14,742.97</td>
<td>9,495.92</td>
<td>13,165.75</td>
<td>400.00</td>
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<tr>
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<td>8.96</td>
<td>4.48</td>
<td>2862.04</td>
<td>300.00</td>
<td>36,302.05</td>
<td>19,738.70</td>
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<td>900.00</td>
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<tr>
<td>Jose Celso Salas Duran &amp; wife</td>
<td>1.17</td>
<td>0.94</td>
<td>552.93</td>
<td>80.00</td>
<td>0.00</td>
<td>10,628.58</td>
<td>0.00</td>
<td>350.00</td>
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</table>

**Totals**

<p>| | | | | | | | | |</p>
<table>
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<th></th>
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<tr>
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<td>189415.01</td>
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<td>86662.54</td>
<td>24,760.73</td>
<td>10,000.00</td>
<td>8,358.82</td>
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### Breakdown of Installation Costs (Nuevo Soles, 3.5 NS to 1 USD)

<table>
<thead>
<tr>
<th>Selected Farmers</th>
<th>Plot Size (HA)</th>
<th>Plot Size for Irrigation System (HA)</th>
<th>Total Estimate PEN</th>
<th>Farmers Approval</th>
<th>Total Loan Approved PEN</th>
<th>Total Loan Approved in USD</th>
<th>KIVA Loans</th>
<th>MEDA Funds</th>
<th>Self-Funded</th>
<th>Loan Start Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jorge Alberto Honorio</td>
<td>1.61</td>
<td>0.8</td>
<td>19,305.54</td>
<td>YES, total syst</td>
<td>19,305.54</td>
<td>$5,515.87</td>
<td>2,500.00</td>
<td>2,500.00</td>
<td>$515.87</td>
<td>Nov-2019</td>
</tr>
<tr>
<td>Rodrigo Montoya</td>
<td>0.92</td>
<td>0.83</td>
<td>36,460.82</td>
<td>YES, no reservoir</td>
<td>24,525.69</td>
<td>$7,007.34</td>
<td>2,500.00</td>
<td>2,500.00</td>
<td>$2,007.34</td>
<td>Nov-2019</td>
</tr>
<tr>
<td>Manuel Sanchez</td>
<td>0.83</td>
<td>0.73</td>
<td>27,424.68</td>
<td></td>
<td>$-</td>
<td>$-</td>
<td>$-</td>
<td>$-</td>
<td>$-</td>
<td></td>
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<tr>
<td>Eufemia Torres Sanchez &amp; son</td>
<td>2.72</td>
<td>1.9</td>
<td>37,924.64</td>
<td>YES, total syst</td>
<td>37,924.64</td>
<td>$10,835.61</td>
<td>2,500.00</td>
<td>2,500.00</td>
<td>$5,835.61</td>
<td>Jan-2020</td>
</tr>
<tr>
<td>Julio Liñan</td>
<td>8.96</td>
<td>4.48</td>
<td>57,240.75</td>
<td></td>
<td>$-</td>
<td>$-</td>
<td>$-</td>
<td>$-</td>
<td>$-</td>
<td></td>
</tr>
<tr>
<td>Jose Celso Salas Duran &amp; wife</td>
<td>1.17</td>
<td>0.94</td>
<td>11,058.58</td>
<td>YES, partial syst</td>
<td>4,906.67</td>
<td>$1,401.91</td>
<td>2,500.00</td>
<td>2,500.00</td>
<td>$-</td>
<td>Nov-2019</td>
</tr>
</tbody>
</table>

**Totals**

|                      |               |                       | 189415.01       | 0        | 86662.54  | 24,760.73         | 10,000.00 | 8,358.82 |

### Note:

Julio and Jorge Honorio are both teachers with a higher income than others. Jorge has not decided if he wants to take out an additional loan from MEDA, as his primary interest is in repairs and improvements to an irrigation he has that was damaged last year. This is another potential use for the fund that still is in line with target objectives to increase crop yields. Julio is interested to take out a loan for a partial system installation, yet he also indicated that he might prefer to use the money to buy additional land from him family to grow crops on rather than use the money for installation of a drip irrigation system. These are ongoing discussions with the farmers that are indicative of different and order of priorities that will arise. In all cases, funds will not go to farmers directly- APTN will approve funds, and pay for equipment and installation directly to avoid any misuse of funds.
Section B | Lessons Learned in Applying Human Centered Design
Philosophy of Human-Centered Design

Human-Centered Design (HCD) is a fluid process that begins with pulling broad spectrum data, then forming it into useful information, then design. These two frameworks show that one must 1st begin by gaining full spectrum information on possibilities (realistic or not), then begin to sort through them, then re-consider anything missed, then hone again on focus objectives and key elements of the pilot outcomes one hope to achieve, prioritizing those most important and at least temporarily considering letting go of excess ‘features’ that should be tested or incorporated at a later time. Empathy and gaining empathy from the target consumer or user himself is also critical, especially we know the target user lives a very different life from us. (See separate I-DEV Human Centered Design Report in Appendix)
HCD into Market Research & Pilot Design

Most Human-Centered Design (HCD) has been designed for product design and Developed World contexts. It is important when applying HCD to this type of pilot to factor in and sensitize to local contexts. If done well, HCD remains as an effective tool to pull rich insights, especially in places where secondary data can be unreliable, biased and outdated. Here are key take-aways:

- **Start As Early in the Research & Design Process As Possible.** Ultimately, with limited reliable data sets available or accessible, your are best off going to the source of information, e.g. the target users you hope to engage and the anchor organizations who know the users well, have worked with them and have already established baseline trust and relationships.

- **Work Closely with Anchor Partners and Explain Your Process, Methodology and Assumed Drivers.** Chose your partners wisely, and focus on those who have a track record working with target users, an open mind toward innovation and experimentation, and who are willing to be transparent, help coordinate and collect data, and participate in HDC activities then subsequent brainstorming and planning session to design the resulting pilot.

- **Apply Empathy & Identify Your Possible Biases.** We are always biased by our own perspective and cannot know what we’ve not seen. However, here are some common areas where biases are common and should be sensitized at the onset of design.

  - **Income and frequency of weekly, monthly and annual cash flows**
  - **Means and number of ways of generating income** (e.g. APTN farmers have 1-5 ways)
  - **Risk tolerance and Maslow’s Hierarchy of Needs.** Risk tolerance is lower when monthly income is as low as $100 per month, for a family of 4 people. Therefore, preference will be given to more practical, known and obvious solutions than high tech or ‘innovative’ ones.
  - **Basic Services e.g. Water, Electricity & Utilities May Not Be Consistent.** Tara farmers pay for water from the municipality but it is only turned on 1-3 times per week; meanwhile climate change has caused irregular rainy seasons
  - **Use and Appreciation of Tech in Day-To-Day.** Tara farmers in rural areas only use their phones to talk to family and sometimes APTN. Occasionally Whatsapp is used. Email and use of internet is not common. BIM is not used, with mixed familiarity. BIM has only gained ~100,000 users in all of Peru today.
HCD in Market Research & Pilot Design, Cont’d

Additional factors to consider:

- **Cultural Norms and Taboo.**
  - **Hard to Find Income Data.** Farmers and many do not share income data, because they do calculate combined income per year or month, and because it is a sensitive matter. Exercises to walk through monthly means of income and sale value per sale will help reach that figure indirectly.
  - **Loans are Uncommon and Hard to Access.** For APTN farmers, only Kiva is available. Limited access to capital makes farmers cautious and reduces risk tolerance. Yet it also gives a single lender like Kiva a lot of influence, credibility and appreciation.
  - **Strong Family Culture.** Family members live together or on neighboring plots of land. Multiple family members may take out a Kiva loan, and some decide to pool those loans toward shared resources. Understanding family dynamics, decision makers and behavior is important to effective pilot design and buy in.

- **HCD Using Informal, Neutral vs. Leading Questions.**
  - Often we bias our own data collection and pilot design by asking leading vs. neutral questions. Leading questions feel like they are getting an answer quickly, but in fact, biasing user response. Here are some examples. In HCD, use Neutral questions first to uncover the current situation, then hone in with Leading questions to gain buy-in from target users.

  - **Leading Question:** “Would you like to have a drip irrigation system and participate in our pilot?”
  - **Neutral Question:** “How do you plant and harvest tara each year? Has it increased or decreased this year? Why do you think there was a difference? What led to some years being better? Do you water your tara plants? Does that make a difference? Has rain fall changed? What else has affected yields? Fertilizer? Pruning? Water? Then, prompt with more details from there…"
Unexpected HCD Findings

- **Low Value Crop of Tara vs. High Cost of Drip Irrigation Caused Doubts.**
  - Tara grows indigenously on trees in Cajamarca, which means in most cases it was not planted and simply requires some pruning, rainfall and then plucking tara pods. Pods often fall to the ground, making it even lower intensity production and harvest.
  - While tara makes up 30% or more of farmer incomes, it is viewed as a low cost product, compared to cuy, milk, meat and other produce sales.
  - Therefore, the notion of taking out a large loan to pay for drip irrigation to increase tara yields seemed strange and uncomfortable.
  - More appealing to farmers was the possibility of diversifying production of strawberries, tomatoes and other water-intensive and value-added crops, also with more regular yields and sales cycles.

- **Value Creation or Excitement Around Tech is Low and Underdeveloped, and a Bias We Often Have.**
  - Because farmers do not interact with a lot of technology- phones, internet or other tech solutions and many homes do not even have electricity, agtech and mobile money solutions are generally unfamiliar. Their benefits and potential upside are largely unknown and not thought about.
  - Proof in the results of higher yields will be valuable, and APTN’s dissemination of this information once results are in. More powerful in the meantime will be word-of-mouth with the pilot farmers showing healthier yields, diversified crops less subject to climate and rainy season variances etc.
  - Engineer walk through of the site with farmers is extremely helpful to signal confidence and allow farmers to ask questions then visualize future potential and crops to grow, as well as the nuances of their land, water access issues and tara trees.
  - Labor to prune trees and non-tech but known solutions generally take priority in farmers’ minds until the engineer walk through, as they are already known and perceived to increase yield and thus income.

- **High Cost with Unclear Benefit is Daunting and Higher Risk Profile, Only Appealing to 1st Movers and Higher Income Farmers.**
  - For APTN farmers, a drip irrigation system can cost up to 71% of their annual income! Meanwhile, the immediate benefits are less clear than buying a cow, more guinea pigs or planting other crops.
HCD Template: Source & Assumptions

Use this template to iterate on various versions of your hypothesis, and assumed drivers that will influence the success of your pilot.

<table>
<thead>
<tr>
<th>Assumption</th>
<th>Possible Sources of Information</th>
<th>Sources &amp; Data to Support Assumption</th>
<th>Sources &amp; Data to Negate Assumption</th>
<th>Addit. Questions to Answer/Factor into Subsequent Research Activities</th>
<th>Answers to Additional Questions</th>
<th>Suggested Modifications to Assumption</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>

I-DEV | 23
## Example: Source & Assumptions

This outlines how we this would be completed relevant to the work conducted for INNOVATE.

<table>
<thead>
<tr>
<th>Assumption</th>
<th>Possible Sources of Information</th>
<th>Sources &amp; Data to Support Assumption</th>
<th>Sources &amp; Data to Negate Assumption</th>
<th>Addit. Questions to Answer/Factor into Subsequent Research Activities</th>
<th>Answers to Additional Questions</th>
<th>Suggested Modifications to Assumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example: Smallholder tara farmers in Cajamarca are excited by drip irrigation tech and will immediately see the benefits, thus wanting to buy immediately.</td>
<td>• APTN or cooperative management • Kiva, the main lender to APTN • Local banks and MFIs (if others) • Local smallholder farmer focused non profits</td>
<td>• APTN data on tara sales by farmer and Kiva loan repayment was most useful • Farmers do take out loans from Kiva for purchase of cows, guinea pigs- each year</td>
<td>From APTN interviews and farmer focus groups: • Only Kiva offers financing to APTN farmers- limited funding sources • Cows, guinea pigs offer a reliable, understood return; irrigation less clear • Farmers have Kiva loans that must be repaid before cash available for another loan; new loan must be approved by multiple family members</td>
<td>• Who is interested in drip irrigation and why? What appeals to them? Do they understand the benefits? • Who earns income in the household or family (beyond) that might need to be a co-borrower? • When, if ever, do farmers have cash to pay their loans? How much risk in size of loan would a farmer take out?</td>
<td>• APTN says farmers who pay Kiva loans on time are best to lend to, as past pilots failed with less reliable farmers • Farmers interested in irrigation once the talk to the engineer, and realize they can grow multiple crops to diversify income/visualize the benefits • Farmers only have cash after a harvest or big sale- only time loan can be paid in a large payment vs. typical PAYGO model of small daily, weekly or monthly payments • Farm land and loans commonly shared among income earning family members- wife, sister, brother</td>
<td>• Drip irrigation loan an added perk to high performing farmers- an added perk! • Explain and show benefits to farmers in numbers, when available; incorporate engineer • Build loan product to match cash flows of farmers • Leave time to educate family members on benefits, get their buy-in, etc.</td>
</tr>
</tbody>
</table>
Other HCD Techniques Used & Resources

I-DEV teams leveraged several different Human-Centered Design Techniques, the results of which were included in the separate HDC report to MEDA, also attached as an appendix. Below are useful articles and templates that we’d recommend to those trying to replicate a quality HCD process. Sections are focused on some of the HCD techniques we used in our process.

### Clustering.

- IDEO.org Clustering. [https://www.designkit.org/methods/30](https://www.designkit.org/methods/30)

### Reframing.

- UX Planet Longlist of Reframing Techniques. [https://uxplanet.org/a-guide-to-problem-framing-ae58713364ec](https://uxplanet.org/a-guide-to-problem-framing-ae58713364ec)

### How We Might.

IDEO.org How We Might. [https://www.designkit.org/methods/3](https://www.designkit.org/methods/3)

### Other General Tools:

- IDEO.org Design Tool Kit (Full). [https://www.designkit.org/](https://www.designkit.org/)
- Global Alliance for Clean Cookstove HCD Toolkit, Inclusive of Templates. Good model for a similar product-based industry targeting low income populations in emerging markets. [https://www.energy4impact.org/file/1722/download?token=l0tT8BO6](https://www.energy4impact.org/file/1722/download?token=l0tT8BO6)
HCD Template: Journey Mapping Sample Template

The below template outlines a useful framework for mapping a user journey and understanding processes related to income generation, cash flows, and activities and roles of different actors.

EXAMPLE:
“Can you explain the tara planting and harvest process through to sale to APTN?”

1. When tara pods turn color, we begin to collect them in sacks.
2. We deliver sacks to APTN, or APTN picks them up.
3. How many sacks and weight is written down by APTN in a ledger.
4. When it is sold, we come back to receive payment. APTN automatically deducts what we owe for our Kiva loan for the cuy (guinea pigs) we bought.
Section C | Lessons Learned in Designing a New Financing Mechanism
Designing a New Financing Facility at the BoP

APTN is a well-managed cooperative with which I-DEV has had over 10 years relationship. This was obviously helpful in establishing trust and familiarity with the management. Currently, APTN manages Kiva loans and helps farmers repay them directly, by automatically deducting interest and payments from tara sales. This is managed in a hand-written cash ledger. Moving to a digital tracking system or simply a dynamic excel with formulas built-in would create efficiencies and improved tracking, as currently some small amount of funds and management can get lost. What we did to help APTN get on track and prepare to manage the APTN Loan Facility for Drip Irrigation:

- **Financial Model for New Loan Facility**
  - Incorporates funds that APTN will also contribute to the pilot fund
  - Tracks annual interest and principal that will accrue in the facility over a 5 year period
  - Builds in sensitivity analysis e.g. 5%, an assumption on the default rate expected
  - Mimics familiar loan contract terms, repayment schedule and process to Kiva so farmers are familiar, and application and understanding of expectations are minimal in Pilot; Can be reviewed based upon pilot results
  - Includes a tracker that lists each borrower, terms of loan and repayment (all built into formulas vs. hard coded where possible to reduce error from incorrect entry)
  - APTN management trained on how to use the model as a management and financial tracker tool

- **Familiar Terms and Repayment Cycles that Match Ebbs and Flows of Cash**
  - Total avg. loan value of $4167, funded by MEDA funds, Kiva and eventually recycled funds into the APTN loan facility
  - 13% Annual Interest Rate, to mimic Kiva loan terms
  - Monthly “Accumulated Interest” payment that totals $856.45 over 18 months
  - 18 month loan period
  - Principal can be repaid anytime before the 18 month loan ending date, allowing farmers to pay when more cash comes in which is increasingly changing with climate change
  - Funds will be managed by APTN who will purchase equipment, pay for installation, but disburse no cash to borrowers- this is to avoid any misuse of funds or irresponsible purchasing, thus mitigating risk
Key Factors in Designing a New Financing Facility

In general design of a new financing facility, we recommend the following factors be considered and fully analyzed in the design and then pilot process.

- **Trust is Key.** Partnering and leveraging a trusted brand or partner will save significant time, effort and adoption of a new product. Partners can also provide insights into what they struggled with in the past, despite existing trust with target borrowers. In this case, Kiva and APTN were strong partners with whom we could talk through their past lessons learned in failed products and pilots, and then incorporate those and new opportunities into the new product we designed. The existing reputation and trust that APTN and Kiva hold with farmers also means that farmers take the pilot seriously, know people (APTN, etc.) on the ground to whom they can ask questions or inquire on the product and benefits, and time to launch, get farmers to attend design workshops, buy-in to the new opportunity and respond to our requests for information, site visits and more much easier and faster, in a place where things do not move quickly. To do this without local partners could add years of time to create a successful model.

- **Low Income Farmers & Limited Access to Financing.** The average farmer in Cajamarca cannot access a loan, other than from a family member. Even today, other than this new pilot product, Kiva is the only lender that is accessible to the APTN farmers. As such, borrowing and loans for improvements to the ‘home business’ or crop yields is not very common, nor is the tracking of payments and concept of penalties is payments are not on time. Kiva with APTN has begun to change that and prime the local ecosystem of borrowers, which made our role and the learning curve among farmers in our workshops or in the product we designed more manageable.

- **Risk Aversion of Farmers and Cooperatives.** It is important to understand that farmers are low income and therefore relatively risk averse with respect to what they will take a loan out for, terms of repayment and who they must coordinate and seek approval with within the family to get approval on the loan. APTN, while a cooperative with several $M in annual revenues, is also cautious on new programs and initiatives, but is also interested to increase engagement, harvest yields and capacity of the organization. Thus a product and pilot must be created with this sensitization in mind.

- **Past Failed Programs for Lending or Development Grant Bias.** APTN has attempted to partner with development organizations in the past, who offered ‘grants’ for improvements. MEDA funding is also a grant, yet, APTN management emphasized that we not call it a ‘grant’ as this has affected the ability to run a commercial-like pilot, emphasizing to farmers an expectation and obligation for them to repay.

- **Preparing and Engaging the Anchor Partner- the Cooperative.** I-DEV has worked with APTN management over nearly a decade, which was helpful to saving time in establishing a relationship and trust with this anchor partner. However, preparing the partner by explaining the process for data collection, why the data is important to design, engaging the partner in co-creation wherever possible and then providing the customized tools and training (financial model, training on proper use, etc.) is also critical to ensure the pilot results in valuable learnings and potential for scale.
Designing a New Financing Facility at the BoP

Farmers in the pilot are low income. Below are some data points that we compiled on target user demographic. We can see from this snapshot that average monthly and daily income is very low, and makes PAYGO interesting but still limiting to the average farmer. It should also be noted that sales of tara and other crops are not consistent month-to-month, thus why the option to pay a higher or lower amount on monthly interest and principal were created in the loan product.

Snapshot of Pilot Tara Farmer’s Income– By Tara & Other Crops:

<table>
<thead>
<tr>
<th>Farmers</th>
<th>Income from Tara in PEN</th>
<th>Income from other crops in PEN</th>
<th>Income from cuy in PEN</th>
<th>Total Average Annual Income USD</th>
<th>Total Average Monthly Income USD</th>
<th>Total Average Daily Income USD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jose Celso Salas</td>
<td>750.00</td>
<td>15,000.00</td>
<td>20,400.00</td>
<td>8,075.76</td>
<td>672.98</td>
<td>22.13</td>
</tr>
<tr>
<td>Julio Liñan</td>
<td>4,800.00</td>
<td>-</td>
<td>-</td>
<td>7,909.09</td>
<td>659.09</td>
<td>21.67</td>
</tr>
<tr>
<td>Jorge Alberto Honorio</td>
<td>6,600.00</td>
<td>2,100.00</td>
<td>-</td>
<td>4,424.24</td>
<td>368.69</td>
<td>12.12</td>
</tr>
</tbody>
</table>

Other Data Considered- Existing Kiva Track Record with APTN Tara Farmers:

<table>
<thead>
<tr>
<th>Year</th>
<th># KIVA declined</th>
<th># KIVA Loans approved &amp; disbursed</th>
<th>Total KIVA Disbursed USD</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>1</td>
<td>28</td>
<td>45,320</td>
</tr>
<tr>
<td>2016</td>
<td>5</td>
<td>25</td>
<td>38,330</td>
</tr>
<tr>
<td>2017</td>
<td>0</td>
<td>50</td>
<td>88,775</td>
</tr>
<tr>
<td>2018 (up to April)</td>
<td>0</td>
<td>9</td>
<td>19,300</td>
</tr>
<tr>
<td>Total</td>
<td>6</td>
<td>112</td>
<td>191,725</td>
</tr>
</tbody>
</table>
In addition, all farmers were required to complete a form such as this one as further evidence and documentation of household income, requested loans for productive activities and details regarding household, income and activities, such as other items that will need to be purchased throughout the loan period. As you can see, it is sometimes challenging to get small details such as access to basic services available, unless site visits are conducted with each farmer.

The completion of a form makes the loan application process and loan a more formal and ‘real’ opportunity. This contract, requiring signatures, ensures farmers do not confuse this as a grant or other charitable initiative, but a growth and loan opportunity for which accurate information is required in advance.

The example here is of a teacher who also harvests and sells tara.
Identifying & Priming Strong Anchor Partners

A strong anchor partner will make a pilot much easier to implement and increase the odds of success. Here are a few factors to consider in identifying and securing the right partner in introducing a new financial product.

- **Is the party trusted by its constituents and in the community? Does it have a good reputation and seem well organized and managed?** Interviews with farmers, lenders such as Kiva and other will help to hone in on this. Request for data and records and a walk through of operations and data collection process can also be helpful. In this case, I-DEV has worked with APTN for over a decade, and the cooperative has also won awards for its work. It has also operated under the same management for over 10 years.

- **Local Knowledge & Data; Enthusiasm and Commitment.** Do the partners seem well informed and insightful about what has worked, hasn’t worked and what could work? Do they seem excited and engaged in wanting to help design the solution and learn in the process? Will they be collaborative by sharing their data and helping to pull additional data, coordinate focus groups, interview members, allocate staff time toward the pilot? Engage anchor partners as early on in the research and design process as possible, and test their fit as a partner in the early stages before committing. Verify and test quality of their data, data collection and tracking processes, record keeper, cash management.

- **Identify Their Gaps in Knowledge and Resources.** Is there strong on-the-ground staff and management? What are they strong in? What do they understand well vs. not? What have they struggled with in working with target users? Learn how they do things, shadow daily and weekly activities to gain perspective and assess professionalism. With APTN, they were weak on financial skills and thus, we developed a model for them and taught them how to use it as a tracking tool for loans and the money they will ‘keep’ for future loans. We also identified that many APTN members are not as active as they could or should be, and if they were more active, they could improve their tara yields, learn best practices and benefit in increased income. This new lending facility can therefore be designed and branded as an added benefit, a “secondary benefit” or reward to the most engaged farmers in strengthening APTN and selling their tara through APTN. This will allow APTN to grow as a cooperative and business as well.

- **Regular Communication & Explanation.** It is important to have a partner that is responsive and that assigns 1-2 key point persons with whom you will regularly engage in implementation. Furthermore, this counter person (or people) must be regularly informed on next step, updated timeline, intentions of various exercise and activities, and then included in co-creation processes.

- **Financial Management & Reliable Data Tracking Tools.** This is often an area of weakness for local anchor partners, and therefore, supporting them on strengthening this should be assumed in most cases. Design of templates, check in that they make sense to the users, and the training on proper use- ideally in action, shadowing initial use.
I-DEV worked with the APTN management to develop a simple model that allows them to manage and project on funds available for future loans toward irrigation. The model includes summary of year-over-year flows and cash reserves in this revolving loan facility, as well as a monthly tracker for each farmer to track repayment of loans. NOTE: This chart is in USD though farmers may benefit from reviewing forms in their local currency. Farmers are instructed that they only ever need to to update and enter figures into blue highlighted cells. The other cells are formulas.

**Model Tab 1: Assumptions, whereby a base case is assumed**

<table>
<thead>
<tr>
<th>Montos en USD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Supuestos</strong></td>
</tr>
<tr>
<td><strong>Supuestos económicos</strong></td>
</tr>
<tr>
<td>Moneda</td>
</tr>
<tr>
<td>Tasa de inflación anual subyacente</td>
</tr>
<tr>
<td>Tasa de impuesto corporativo</td>
</tr>
<tr>
<td>Número de días calendario en un año.</td>
</tr>
<tr>
<td>Ratio de pago de dividendos</td>
</tr>
<tr>
<td>Descuento por periodo</td>
</tr>
</tbody>
</table>

| **Supuestos de ingreso** | **Dec-19** | **Dec-20** | **Dec-21** | **Dec-22** | **Dec-23** | **Dec-24** | **Dec-25** |
| Tasa de administración (por adelantado) | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| Tasa de interés | 13.0% | 13.0% | 13.0% | 13.0% | 13.0% | 13.0% | 13.0% |

| **Supuestos de gastos como % de los ingresos** | **Dec-19** | **Dec-20** | **Dec-21** | **Dec-22** | **Dec-23** | **Dec-24** | **Dec-25** |
| Gastos de explotación | 0% | 0% | 0% | 0% | 0% | 0% | 0% |

| **Otros gastos** | **Dec-19** | **Dec-20** | **Dec-21** | **Dec-22** | **Dec-23** | **Dec-24** | **Dec-25** |
| Provisión para pérdidas crediticias con % de anticipos de clientes | 5% | 5% | 5% | 5% | 5% | 5% | 5% |
| Recuperaciones de cobro (% de provisión bruta de pérdida de préstamo) | 56% | 56% | 56% | 56% | 56% | 56% | 56% |
| Costo de financiamiento | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
Beyond assumption, the model looks at 3 possible scenarios of performance, 3 ‘Impulsores: High, Base, and Low performance scenarios.

The chart to the right shows some examples of variables that could change and should be planned for in advance e.g. Total revenue to APTN, Total Amount of Loans Disbursed by APTN, # of Kiva-funded Borrowers, # of MEDA-funded borrowers, # of borrowers with other sources of funding for loan, $ value of loan by each of these parties, Interest rate, administration fees of loans, etc. This tab allows APTN to modify the 3 scenarios based on possible futures.

Model Tab 2: Scenarios or Sensitivity Analysis to help farmers project for risk and fluctuation of factors.

### Montos en USD

<table>
<thead>
<tr>
<th>Escenario</th>
<th>Dec-19</th>
<th>Dec-20</th>
<th>Dec-21</th>
<th>Dec-22</th>
<th>Dec-23</th>
<th>Dec-24</th>
</tr>
</thead>
<tbody>
<tr>
<td>Escenario base</td>
<td>2,744</td>
<td>2,980</td>
<td>3,235</td>
<td>3,480</td>
<td>3,735</td>
<td>4,000</td>
</tr>
<tr>
<td>Escenario al alza</td>
<td>10.0%</td>
<td>10.0%</td>
<td>10.0%</td>
<td>10.0%</td>
<td>10.0%</td>
<td>10.0%</td>
</tr>
<tr>
<td>Escenario negativo</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

### Impulsos de ingresos

<table>
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<tr>
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<th>Dec-20</th>
<th>Dec-21</th>
<th>Dec-22</th>
<th>Dec-23</th>
<th>Dec-24</th>
</tr>
</thead>
<tbody>
<tr>
<td>Escenario base</td>
<td>2,744</td>
<td>2,980</td>
<td>3,235</td>
<td>3,480</td>
<td>3,735</td>
<td>4,000</td>
</tr>
<tr>
<td>Escenario al alza</td>
<td>10.0%</td>
<td>10.0%</td>
<td>10.0%</td>
<td>10.0%</td>
<td>10.0%</td>
<td>10.0%</td>
</tr>
<tr>
<td>Escenario negativo</td>
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<td>0.0%</td>
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### Monto del préstamo por productor - KIVA

<table>
<thead>
<tr>
<th>Escenario</th>
<th>Dec-19</th>
<th>Dec-20</th>
<th>Dec-21</th>
<th>Dec-22</th>
<th>Dec-23</th>
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</thead>
<tbody>
<tr>
<td>Escenario base</td>
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<td>4,000</td>
<td>5,000</td>
<td>7,000</td>
<td>9,000</td>
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<td>10.0%</td>
<td>10.0%</td>
<td>10.0%</td>
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<tr>
<td>Escenario negativo</td>
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<td>0.0%</td>
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</table>

### Monto del préstamo por productor - MEDA

<table>
<thead>
<tr>
<th>Escenario</th>
<th>Dec-19</th>
<th>Dec-20</th>
<th>Dec-21</th>
<th>Dec-22</th>
<th>Dec-23</th>
<th>Dec-24</th>
</tr>
</thead>
<tbody>
<tr>
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<td>2,600</td>
<td>2,900</td>
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<td>3,400</td>
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<td>10.0%</td>
<td>10.0%</td>
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### Montas de interés de préstamo

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<th>Dec-22</th>
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<tr>
<td>Escenario negativo</td>
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<td>0.0%</td>
<td>0.0%</td>
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### Tasas de administración

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<tr>
<th>Escenario</th>
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<th>Dec-20</th>
<th>Dec-21</th>
<th>Dec-22</th>
<th>Dec-23</th>
<th>Dec-24</th>
</tr>
</thead>
<tbody>
<tr>
<td>Escenario base</td>
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<td>0.0%</td>
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<td>0.0%</td>
<td>0.0%</td>
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<tr>
<td>Escenario al alza</td>
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<td>0.0%</td>
<td>0.0%</td>
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<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Escenario negativo</td>
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<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
</tbody>
</table>
Snapshot of the Financial Model Created

This tab outlines Profit & Loss Projections, and also includes important financial ratios for APTN to use as indicators of financial health.

Model Tab 3: Financial Model Summary

<table>
<thead>
<tr>
<th>Ingresos brutos por intereses</th>
<th>2,744</th>
<th>3,398</th>
<th>4,225</th>
<th>5,280</th>
<th>6,617</th>
<th>8,343</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gastos por intereses</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Ingreso de interés neto</td>
<td>2,744</td>
<td>3,398</td>
<td>4,225</td>
<td>5,280</td>
<td>6,617</td>
<td>8,343</td>
</tr>
</tbody>
</table>

| Ingresos sin intereses       | -     | -     | -     | -     | -     | -     |
| Ingresos de explotación      | 2,744 | 3,398 | 4,225 | 5,280 | 6,617 | 8,343 |

<table>
<thead>
<tr>
<th>% de crecimiento</th>
<th>N/A</th>
<th>24%</th>
<th>24%</th>
<th>25%</th>
<th>25%</th>
<th>26%</th>
</tr>
</thead>
</table>

| Los gastos de explotación    | (464) | (575) | (715) | (893) | (1,120)| (1,412) |
| Deterioro de préstamos y anticipos | (464) | (575) | (715) | (893) | (1,120) | (1,412) |

| Gastos totales               | (464) | (575) | (715) | (893) | (1,120) | (1,412) |

| Beneficio antes de impuestos | 2,280 | 2,823 | 3,510 | 4,386 | 5,497 | 6,931 |
| Impuesto corporativo         | (673) | (833) | (1,035)| (1,294)| (1,622)| (2,045)|

| Beneficio después de impuestos | 1,607 | 1,990 | 2,475 | 3,092 | 3,875 | 4,886 |
| % margen de beneficio neto    | 59%   | 59%   | 59%   | 59%   | 59%   | 59%   |
Finally, we include a loan tracker per farmer that is better organized than the current APTN system of books. This will allow APTN to manage loans and payments in excel. Below is an example of a loan, in the template we created, so APTN understands how to use it properly. Only blue highlighted sections should be completed and updated and then all else is updated through a connected formula.

Model Tab 4: Loan Tracker

Control de Prestatario

<table>
<thead>
<tr>
<th>Fecha de pago</th>
<th>Monto</th>
<th>Tipo de pago</th>
<th>Mes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-Aug-18</td>
<td>45.14</td>
<td>Interés</td>
<td>Aug-2018</td>
</tr>
<tr>
<td>1-Sep-18</td>
<td>45.14</td>
<td>Interés</td>
<td>Sep-2018</td>
</tr>
<tr>
<td>1-Oct-18</td>
<td>45.14</td>
<td>Interés</td>
<td>Oct-2018</td>
</tr>
<tr>
<td>1-Nov-18</td>
<td>50.00</td>
<td>Interés</td>
<td>Nov-2018</td>
</tr>
<tr>
<td>1-Dec-18</td>
<td>45.14</td>
<td>Interés</td>
<td>Dec-2018</td>
</tr>
<tr>
<td>1-Jan-19</td>
<td>45.14</td>
<td>Interés</td>
<td>Jan-2019</td>
</tr>
<tr>
<td>1-Feb-19</td>
<td>1,389.00</td>
<td>Principal</td>
<td>Feb-2019</td>
</tr>
<tr>
<td>1-Mar-19</td>
<td>30.10</td>
<td>Interés</td>
<td>Mar-2019</td>
</tr>
<tr>
<td>1-Apr-19</td>
<td>30.10</td>
<td>Interés</td>
<td>Apr-2019</td>
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<td>1-May-19</td>
<td>30.10</td>
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<td>May-2019</td>
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<td>1-Jul-19</td>
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<tr>
<td>1-Aug-19</td>
<td>2,200.00</td>
<td>Principal</td>
<td>Aug-2019</td>
</tr>
</tbody>
</table>

Snapshot of the Financial Model Created
Design for Introduction of Advanced AgTech Solutions

While we cannot know exactly how to design a perfect solution for advanced technologies and new features— including solar irrigation and BIM (or other technology that is considered ‘foreign’ by target users and target geography, we can extrapolate on lessons learned through our process. Some key hypotheses we propose are:

• **Educate on benefits of new tech and tangible or quantifiable benefits.** This will save time and adoption rate.

• **Introduce ‘Advanced’ features or version in Phase 2 of the Pilot, e.g. Year 2+ once baseline model is perfected and proven.** Build early trust in the product, allow room to improve and scale a baseline, simplified version of the ‘big picture’ goal, then decide how to add on 1-2 additional ‘new’ features over a staged period of time to avoid confusion and excess complexity, or more expensive ‘failure.’

• **Validate the solution proposed is genuinely a net benefit vs. burden to target consumers.** For example, overly burdening low-income farmers with an expensive loan that requires payments when payments cannot be made does not benefit the tara farmers. Some irrigation systems that require a lot of ongoing maintenance or develop minimal or net negative returns may not be appropriate to introduce, even if we think they are from our world view.
Design for Solar Irrigation

As discussed, solar irrigation was determined to be too complex a solution for the vast majority of APTN farmers or farmers in San Marcos, Cajamarca at this time. The reason was that solar irrigation systems are in limited supply due to limited distribution the region, and that is likely due to limited demand and ability to pay for the solutions. Currently available solar irrigation solutions in the market are more expensive than traditional diesel models on a power/capacity comparison. Yet, APTN is quite interested to explore this, as such, we are piloting with one plot a solar system. This one plot is owned by a teacher who also harvests and sells tara and other crops. His average income is ~$10,000 or 3x what many other tara farmers earn. A salary also means consistent cash flows and income, to complement the more volatile tara sales cycles.

- **Target less low income users.** For example, target users for whom the solution cost is less than 1/3 of annual income. Solar systems in Cajamarca are ~$5K, whereas diesel systems range from $3K to $5K, and offer more power for the price. Engineering and scoping is also somewhat different, and requires an engineer familiar with solar systems. Systems are also harder to repair if few engineers are familiar with the systems, and no local agents are present who are trained in the repair.

- **OR, Build the supply chain for distribution 1st and/or focus on peri-urban areas outside of major trade zones.** This will address many of the costly issues and gaps mentioned in the previous point.

- **Educate on additional benefits and cost savings realized.** Savings realized include no fuel costs, lower maintenance cost (if high quality products with warranty are sourced and offered). In many markets, low quality Chinese products have flooded the market, giving solar a bad name and driving excess skepticism among experimental users.

- **Introduce Solar as a ‘step up’ or follow on upgrade after diesel systems.** Provide an opportunity to take out a loan to upgrade systems to solar once traditional systems have led to increased tara and crop yields, and thus higher household income. In doing so, solar is branded and positioned as an ultra premium ‘secondary benefit’ for only the top and highest performing (financially) farmers.
Design for Mobile Money Introduction

As mentioned, mobile money in Peru is still largely unheard of and cash is king. In rural areas where electricity, consistent water and internet are rare, and even feature phones, mobile money can be adopted but it takes time. Even in Kenya, where mobile money M-Pesa revolutionized the financial sector, and put low income populations on the financial map, it took a lot of money, time and resources to do so. Also, in Kenya, there was low trust for banks, and high trust in Safaricom, the telco that launched M-Pesa. Currently Peru or BIM do not have this dynamic. BIM is yet to be trusted or broadly promoted. Here are ways this might be addressed:

• **Target a group of users tied to a large supply chain or buyer that pays through BIM or mobile money.** In doing so, this reduces the steep learning curve, behavioral change and training component that pilot implementers would otherwise need to absorb. The upsides of this model as well is that if a large company like Green Mountain Coffee or Nestle said they are paying their farmers only through BIM going forward, farmers would adapt quickly to the solution as they must to get paid and keep a valued buyer. The company might also be willing to pay for the cost of training to adopt the new payment system.

• **Look for areas/groups with higher internet and smart phone use.** Smart phone and internet use are good baseline technology priming tools that will reduce the learning curve and behavioral change to paying and being paid through mobile money.

• **Encourage large buyers to integrate mobile money into their supply chain, because of the improved transparency and tracking of suppliers, reduced theft of cash, and financial security to supply chain partners.** Once companies adopt this solution, companies might also be willing to help pay the high cost of BIM integration into improved solutions for their suppliers, as a CSR benefit. For example, helping smallholder farmer suppliers to access clean cookstoves, solar lights, solar irrigation systems and more, and integrated with mobile money would be a very beneficial and interesting CSR initiative.
Who These Report Finding Are Relevant For

The contents of this report are relevant to any and all practitioners interested to develop effective pilots for new technology or financing mechanisms to low income communities. This includes companies seeking to enter new products and reach rural or peri-urban income segments in developing markets. Many features will be similar e.g. low tech adoption, cyclical cash flows, different lifestyles and priorities that make a new product more or less attractive upon first glance.

Parties Seeking to Offer New Financing Products to Smallholder Farmers

As this report has indicated, access to financing is very limited among low income farmers around the world. This continues to be a massive barrier to economic development and a rise out of poverty. Governments, NGOs and DFIs should explore offering new programs that provide alternative financing options than Kiva alone, and yet fortunately, Kiva exists and continues to grow to fill critical market gaps. Because of the nature of these farmers, their low income (most under $10k/ year) and high dependence on variable and very cyclical income, a traditional bank would not find this attractive so others such as Kiva- non-profits or hybrid entities with a social mission- can offer a lot of benefit in boosting these local groups to be commercial viable borrowers to others in the future. Fintech, financial innovators, funders supporting them by funding pilots can all benefit from the findings we’ve included. It is also important for them to consider:

- Sufficient time to research, pilot and implement solutions in phases
- Allocate enough budget to invest in the new innovations or pilot features to prepare it for the highest odds of success. In this case, we might have invested in the integration of BIM into the technology and trialed the model with 2-5 farmers, whereby we also offered rigorous training on proper use of BIM and took repeat rounds of feedback on user experience of farmers- on both the agtech user experience and BIM user experience.
- Understand cash flows, cyclicality and net cash to farmers if they undertake another loan to service

Parties Seeking to Offer New Agtech or Other Tech Solutions to BoP Farmers or Communities

The findings of this report are also very relevant to social enterprise and large tech solutions providers exploring the market potential in a market such as Cajamarca, Peru. HCD activities can pair with secondary research to determine if a market poses future growth potential to warrant a pilot. Ideally, the DFI and international development sector will pair with the tech companies directly to help do the research, design and run a pilot and in doing so, actively facilitate market opening. Kiva and other MFIs should also be key partners, in addition to the cooperatives so all learn from one another and past lessons learned.
APPENDIX 1

I-Dev International

Human Centered Designed Research Methodology & Tools
How the project has been implemented?

Projected Plan:

- **Baseline**
- **Agtech Selection**
- **Business Model & Strategy**
- **Implementation**
- **M & E**

Executed Plan:

- **Baseline**
- **Agtech Corp. Selection**
- **Agtech Solution Selection**
- **Farmers Selection**
- **Business Model & Strategy**
- **Financial Model for Water Availability**

Stakeholders with different priorities, needs, risks, & timelines.

APTN-PAYG solar-BIM integration is beyond scope, budget, timeline and limited resources for geographical issues to test hypothesis.

APTN/IDEV to source locally sourced drip irrigation.

APTN/IDEV to reach out leading farmers become role models to upscale drip-irrigation adoption.

APTN capacity building to receive, manage, & grow Agtech Grant for agtech adoption.

Human Centered Designed Approach
How was HCD applied?

**Human Centered Designed Tools**

<table>
<thead>
<tr>
<th>Defining New Scope</th>
<th>Clustering Insights</th>
<th>Research Plan</th>
<th>Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Re-Framing: • What is the project objective? • What do we want to solve? • What do we want to learn? • How do we get that information? List of Actors Types of Technologies Payment Schemes Testing using Sacrificial Concepts Wild Ideas Insight Tracker</td>
<td>Farmer’s Centered Info: • Behavior &amp; Entrepreneurship • Income &amp; Cash Flows • APTN’s roles • Decision Making • Feasibility Studies • Financial Mechanism</td>
<td>Timeline Matrix: • Phases (x) • Next Step, Questions &amp; Milestones (y) Field visits Interviews</td>
<td>• Work Plan • APTN role re-framed • Irrigation Solutions customized, designed, proposed, and approved. • Farmers’ willingness to adopt drip irrigation reframed • Financial Mechanism Proposal approved by APTN &amp; Farmers</td>
</tr>
</tbody>
</table>
Defining New Scope

The main objective of this activity was to summarize key information and outcomes already achieved, define new scope and identify information gaps. As a result, we framed a new scope and we were able to prepare for fieldwork.

The topics addressed were:
1. Financing capacities are limited
2. Low productivity due to lack of irrigation

Key players for pilot success:
1. APTN
2. Engineer
3. KIVA
4. Farmer leaders

Key milestones for pilot success:
1. APTN’s agtech fund structuring
2. Farmers payments schemes
3. Drip irrigation installation

Key information gaps:
1. Farmers’ cashflows, outstanding loans, willingness to pay/to grow in production.
2. Irrigation viability, financing and APTN-Farmers’ willingness to scale up irrigation systems.
Defining New Scope

In order to collect relevant data from farmers, we used brochures (sacrificial concept). See the example below:

By showing key components of an irrigation system separately, we were able to grasp their technical and empirical knowledge and experiences with irrigation systems and willingness to acquire them.

By showing a payment schemes with both components together, we were able to collect data on cash flows, decision making processes, willingness to pay, ideal budget/price range, and potential payment schemes.
### Beneficiary Profile: behavior & entrepreneurship
- "I want to grow tara yields"
- "I am planting more tara and other products, see my seedlings..."
- "I buy cows, make them grow and sell them when I need money"
- "I have cuys and sell them very often."
- "I live alone and cannot handle all by myself"
- "I capitalize my loan money by lending it or buying animals and pay it back with the profits I make before it overdues (1yr)"
- "I saved about 2,500 soles and bought my motor pump myself"
- "With KIVA, I also lend some money to my relatives and they pay me back with interests before my deadline, I have 12 months to capitalize my loan"

### Income & cash flows
- Income sources are tara, cuy and cow.
- "I devote myself more to take care of my cuys because it provides [money] weekly"
- "I sell my cow and tara to pay my loans"
- "KIVA provides the capital I need to buy my cows, cuys, and pay labor to help me with harvesting"

### APT-N’s role
- APTN is diversifying its income sources. Now they are developing other organic products to export (beans, lentils, cereals)
- Revolving fund to allow APTN lending to other farmers moving forward.
- How do we make sure APTN manage the fund well after the project?
- To rent a pump will be difficult due to transportation and logistics.
- APTN’s general director would like to test a solar pump with one farmer at least.
- APTN never reach the expected tara supply for its exporter because there is a lack of irrigation systems to make water available all year-round.

---

"Tara farmers are entrepreneurs who hack the available financial resources"  
"Tara farmers manage their income volatility from tara with other income sources which provides them financial security.”  
"The main ‘pain point’ for tara farmers is the lack of water availability (efficiency) for irrigation"
## Beneficiary Profile: decision making

- When something stops working, I take it to the technician or mechanic.
- If my plot were bigger (1ha.+), I would invest more money in it, because I produce more money.
- I am on my own, my children do not intervene.
- I make the decisions, but I talk to my children and get their inputs.
- I do not invest, because my children are studying in school.
- I do not invest more, because I need to clean up (manage) my plot.
- I need training to make decisions.
- I asked my neighbor where he bought something, then I go there and ask.

## Feasibility Studies

- How much is a water tank/well?
- How much is the “geomembrana” for the reservoir?
- I heard another farmer have a reservoir.
- How much of power each plot need to use a drip/sprinkler irrigation system?
- I hired a worker to make my irrigation canal. I told him where to do it because I know my plot and how water should be distributed to water my plants.
- I do not want to carry a heavy pump because I cannot.
- I want a water pump with power to distribute water in the higher part of my plot.
- Engineer and farmers need to co-create a customized irrigation system.

## Financial Mechanism

- If I can pay my loan with the output of one season, it will be ideal.
- Paying loans with tara.
- Payments could be twice or once a year or after every season.
- First, I need to see the price and see if I can pay it.
- I would like my production to pay my loans.
- I want to use KIVA to pay my irrigation system.

---

“Confidence, frustrations, information, proceso complejo-no real.

“Los productores necesitan information validada técnicamente para decidir sobre la inversión”

“los productores requieren costear los diversos components del Sistema de riego validado en el studio tecnico”

“necesitamos aprender de las experiencias previas de las soluciones de riego ya implementadas”

“el mecanismo de financiamiento es una conversacion con el productor” (intereses, monto y frecuencia de cuota, forma de pago)
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2.1 Technical Studies</td>
<td>2.2 Economic Studies</td>
<td>2.3 Financing Design</td>
</tr>
<tr>
<td></td>
<td>3.1 Disbursement</td>
<td>3.2 Install in plot</td>
<td>3.3 Payment</td>
</tr>
<tr>
<td>Next Action Steps</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Refine Criteria list</td>
<td>Identify/Define cost for engineering studies.</td>
<td>Final price + 13% TEA</td>
<td>Follow-up with APT &amp; advice it to refine and improve processes</td>
</tr>
<tr>
<td>Revise Criteria list w/ APT and select 10 prod.</td>
<td>Field-Visit timeline.</td>
<td>Financial model (Total amount + installments + payment type)</td>
<td><strong>KPIs:</strong></td>
</tr>
<tr>
<td>Confirm farmers’ participation</td>
<td>Viability report to define investment amount per farmer.</td>
<td>Define Mngmt process + Contract w/APT</td>
<td>- Adoption &amp; use</td>
</tr>
<tr>
<td>APT’s lead</td>
<td>GROUP COSTS DEFINING</td>
<td>• MEETING WITH FARMERS at APT</td>
<td>- Time to convert</td>
</tr>
<tr>
<td></td>
<td>Select vendor</td>
<td></td>
<td>- NPS (1-5) = %</td>
</tr>
<tr>
<td>Qs/Information</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output/min. annual income?</td>
<td>Financing technical studies (MEDA) &gt; check budget</td>
<td>Itemized cost of irrigation system.</td>
<td><strong>Flujo de procesos</strong></td>
</tr>
<tr>
<td>Min water flow?</td>
<td></td>
<td>Confirm 5K APT funds for July</td>
<td><strong>Ficha productor</strong></td>
</tr>
<tr>
<td>Plot size?</td>
<td></td>
<td>Warranties/Contingency plans</td>
<td>(excel measurement + Finan Model)</td>
</tr>
<tr>
<td>Well/Tank/Reservoir costs?</td>
<td></td>
<td>Lessons Lerned from Meeting</td>
<td><strong>Template</strong></td>
</tr>
<tr>
<td>Milestones/Deliverables</td>
<td>&lt;&lt;10 farmers pre-selected&gt;&gt;</td>
<td>&lt;# farmers viable for pilot&gt;</td>
<td>5 farmers selected for pilot</td>
</tr>
<tr>
<td></td>
<td>&lt;&lt;# farmers viable for pilot&gt;</td>
<td>&lt;5 farmers selected for pilot&gt;</td>
<td>5 farmers with installed tech.</td>
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<tr>
<td></td>
<td>&lt;&lt;5 farmers selected for pilot&gt;</td>
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CONTACT FOR MORE INFORMATION:

Patricia Chin-Sweeney, Senior Partner
pcs@idevinternational.com

Arianne Dilts, Associate
Arianne.dilts@idevinternational.com

Elizabeth Pastor, Field Associate
elizabeth.pastor@idevinternational.com

facebook.com/idevinternational/
medium.com/I-DEV-insights
twitter.com/idevnews

e: info@idevinternational.com
w: www.idevinternational.com
APPENDIX 2: General Report Required by APTN to Unlock 2nd Tranche of Funds for New Irrigation Loan Facility for Farmers

I-DEV INTERNATIONAL
UNLOCKING BUSINESS POTENTIAL IN EMERGING MARKETS

Reporte General: Proyecto INNOVATE a I-DEV y MEDA
La Ficha: ____________________
Autor: ____________________
Notas Generales Sobre el Piloto: Prestamos por Sistemas de Riego

Resumen de Observaciones y Progresso

Minimimo de 5 puntos. Notas en puntos sobre que paso relevante del Proyecto...

1. 1
2. 2
3. 3
4. 4
5. 5
Notas Generales Sobre el Piloto: Prestamos por Sistemas de Riego

Que Funciono Bien?

Minimo de 5 puntos. Por ejemplo, “No habia problemas con el ingenierios. Todo pasa en tiempo como planeado,” o “Los otros productores han visto el sistema nuevo y quieren un prestamo tambien,” o “el sistema cuesta menos que anticipada”...

1. 1
2. 2
3. 3
4. 4
5. 5

Que No Funciono Bien y Recomendaciones Por El Futuro

Minimo de 5 puntos. Por ejemplo, “No habia problemas con el ingenierios. Todo pasa en tiempo como planeado,” o “Los otros productores han visto el sistema nuevo y quieren un prestamo tambien,” o “el sistema cuesta menos que anticipada”...

1. 1
2. 2
3. 3
4. 4
5. 5
## Datos Sobre Los Sitios

<table>
<thead>
<tr>
<th>Sitio</th>
<th># de Hectáreas</th>
<th>Nombre de Dueno</th>
<th>No. de Personas Que Viven in La Casa</th>
<th>No. de Mujeres (y Niñas) en La Casa</th>
<th>Fecha de Lanzar de Instalacion</th>
<th>Fecha de Finalizar de Instalacion</th>
<th>Cuesta de Sistema (soles)</th>
<th>Cuesta de Instalacion</th>
<th>Notas Sobre Problemas?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
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<td>4.</td>
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</tbody>
</table>
Notas y Foto del Trabajo Completo del Engenerio

(Pon el foto aqui que incluye la firma del engenerio)
Reporte Fotografico de los Sitos de Instalacion: Sitio 1

(Min. de 5 fotos)
Reporte Fotografico de los Sitos de Instalacion: Sitio 2

(Min. de 5 fotos)
CONTRATO DE COOPERACIÓN PARA PROYECTO PILOTO “ACCESO A TECNOLOGÍAS DE RIEGO CON UN NUEVO MECANISMO DE PAGO” EN MARCO DEL PROGRAMA “INNOVATE”

Fecha: 1 de noviembre de 2019

Entre: I-DEV International
1885 Mission Street
San Francisco, CA 94103
USA

Y

Asociación de Productores de Tara del Norte
Jr. José Gálvez s/n
Pedro Gálvez, San Marcos, Cajamarca
Perú

Conste por el presente documento, el Contrato de Cooperación que suscriben de una parte I-DEV INTERNATIONAL, con domicilio legal 1885 Mission Street, San Francisco, CA 94103, USA, debidamente representada por la Srta. Patricia Chi-Sweeney, gerente general, a quien en adelante se denominará I-DEV y, de otra parte; la ASOCIACIÓN DE PRODUCTORES DE TARA DEL NORTE, con Registro Único de Contribuyente Nº 20495964214, con domicilio legal en la Jr. José Gálvez s/n, distrito de Pedro Gálvez, provincia de San Marcos y departamento de Cajamarca, debidamente representada por el Sr. Victor Quiroz Castañeda, gerente general, identificado con DNI Nº ________________, a quien en adelante se denominará APTN; en los términos y condiciones siguientes:

ANTECEDENTES:

I-DEV es una firma de gestión estratégica y asesoría en inversiones especializada en ayudar a empresas a crecer y expandirse en mercados emergentes incorporando estrategias con mejores prácticas globales y enfoques innovadores. I-DEV ha trabajado con a más de 350 pequeñas y medianas empresas, levantando más de $80M. I-DEV ha trabajado en sectores de tecnología limpia, comercio móvil, agricultura, textiles y retail llevando soluciones de impacto a más de 45 países en África, Latinoamérica y Asia.

APTN es una asociación de productores de tara que viene trabajando desde el año 2002 en la provincia de San Marcos, departamento de Cajamarca. En la actualidad la organización cuenta con 191 asociados en 16 caseríos de tres distritos de la provincia, con una red de 25 centros de acopio, donde se compra aproximadamente el 60% de la producción total de la provincia de San Marcos. Sus asociados cuentan con un comité de base en cada caserío, que les permite desarrollar mejor las actividades relacionadas a la producción de tara, con un principio de producción orgánica de tara; aplicación de control biológico para el manejo de plagas fitosanitarias en los
diferentes estados fenológicos del cultivo en mención; y en la comercialización justa y responsable de la tara.

**INNOVATE** es una iniciativa ejecutado por MEDA- Mennonite Economic Development Associates - financiado por el Centro de Desarrollo Internacional (CDI) que tiene como objetivo evaluar el potencial de los servicios financieros no-tradicionales en permitir la adopción de innovaciones agrícolas a gran escala entre pequeños productores y productoras. En marco de INNOVATE, I-DEV fue seleccionado para pilotear el acceso a tecnologías de riego con un nuevo mecanismo de pago.

**OBJETIVO DEL CONTRATO:**

El presente contrato tiene como objetivo establecer un acuerdo de cooperación entre I-DEV y el APTN en la creación de un fondo destinado al mejoramiento de sistemas de riego y a la implementación de un nuevo mecanismo de pago asequible para los productores de tara socios del APTN, con el fin de dar solución a la falta de disponibilidad de agua y baja producción, mejorando así sus ingresos. Los sistemas de riego serán personalizados según las condiciones geográficas de las parcelas seleccionadas.

**OBLIGACIONES I-DEV:**

I-DEV realizará una contribución al APTN para la creación del fondo otorgando al APTN el importe total de US$12,000. Esta contribución se realizará bajo las condiciones detalladas en el esquema de desembolso y a la cuenta bancaria detallada en forma de pago.

I-DEV desarrollará la estructuración del fondo, modelo financiero, y mecanismo de pago/esquema de pago que permitirá al APTN la creación, gestión y monitoreo del fondo y los préstamos a los productores socios del APTN.

I-DEV solicitará información relevante, realizará visitas de campo, y recolectará información pertinente continuamente si así lo cree necesario y sin previo aviso.

**OBLIGACIONES APTN:**

APTN ejecutará el proyecto y logrará los resultados en conformidad con el siguiente listado.

1. Crear un fondo con el monto total de la contribución que es US$12,000, los cuales serán entregados en dos partes debiéndose cumplir lo especificado en el esquema de desembolso.
2. El fondo creado será destinado solo para la mejorar de los sistemas de riego actuales para solucionar la falta de disponibilidad de agua de los productores de tara socios del APTN.
3. El fondo será usado solo para otorgar préstamos a los productores de tara socios del APTN adicional a KIVA para invertir en soluciones de riego y disponibilidad de agua.
4. Monitorear satisfactoriamente los repagos según el mecanismo de pago implementado.
5. La ganancia generada por los intereses de los préstamos se destinará para el crecimiento del fondo, mejora en la gestión del fondo y disminución de riesgo del fondo.

APTN ejecutará el proyecto según listado de entregables y luego de la conformidad y aprobación por parte de I-DEV, se realizará el desembolso correspondiente.

APTN ejecutará satisfactoriamente el proceso de KIVA para los beneficiarios de este proyecto y dirigirá dicho monto como un fondo adicional para la implementación de los sistemas de riego.

APTN cumplirá con comunicar y reunir a los beneficiarios cuando sea necesario y/o lo solicite I-DEV.

APTN remitirá a I-DEV:

a) La copia debidamente firmada del contrato original, así como copias firmadas (con iniciales) en cada página.

b) Los entregables antes o hasta el último día del mes indicado en el cronograma estipuladas en el esquema de desembolso.

c) Recibos, facturas y otro documento de prueba de los pagos y gastos de la compra, instalación, servicios de ingeniería u otros para la implementación de los sistemas de riego a los beneficiarios seleccionados.

**ESQUEMA DE DESEMBOLSO:**

<table>
<thead>
<tr>
<th>CONCEPTO DE PAGO</th>
<th>IMPORTE (USD)</th>
<th>CRONOGRAMA</th>
<th>ENTREGABLE</th>
</tr>
</thead>
</table>
| Primera parte    | $5,000        | NOV-DIC 2019 | - Compra de materiales y transporte a parcela  
- APT será responsable de la inspección, revisión y bienestar de los materiales.  
- APT deberá supervisar las compras con recibos y/o tickets de compra los cuales deberán ser presentados a IDEV como parte de trámites administrativos.  
- Contratos firmados de 4 seleccionados  
- Reporte fotográfico que incluye 5-10 fotos |
<table>
<thead>
<tr>
<th>Segunda parte</th>
<th>$7,000</th>
<th>DIC-MAR 2020</th>
</tr>
</thead>
</table>

sobre el sitio de instalación en etapas diferentes durante el proceso de installation e.g. 1) Sans instalación pero con materials en sitio, 2) Al medio de instalación, 3) Despues de completar que incluye el dueño del sitio y el ingeniero en los fotos relevantes.

- Informe General de Instalación para los primeras 2 prestatarios que incluye 1) El excel completa sobre los sitios, 2) Una carta firmada del ingeniero que verificar la finalización de instalación de sistema de riego, 3) Una pagina de notas sobre el proceso, que pasa bien, que era difícil, y otros puntos relevantes para I-DEV y MEDA a entender en otros pilotos similares.

- Entrega de Excel-MECANISMO DE PAGO-mensual a I-DEV con la información actualizada de pagos realizados.

- Informe mensual de Comportamiento de Pago de los productores beneficiarios

- Informe mensual de uso, ejecución y aplicación de MECANISMO DE PAGO por el equipo de gerencia del APTN
- Reporte fotográfico que incluye 3-5 fotos de cada sitio para verificar que el sistema de riego esta funciona bien y allí. Si no esta funciona, detalles sobre porque.

- Informe General de Instalación para los primeras 2 prestatarios que incluye 1) El excel completa sobre los sitios, 2) Una carta firmada del ingeniero que verificar la finalización de instalación de sistema de riego, 3) Una pagina de notas sobre el proceso, que pasa bien, que era difícil, y otros puntos relevantes para I-DEV y MEDA a entender en otros pilotos similares.

<table>
<thead>
<tr>
<th>TOTAL DE CONTRIBUCIÓN</th>
<th>USD</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>$12,000</td>
</tr>
</tbody>
</table>

DIVERSOS:

El contrato entrará en vigor el día de su firma por ambas partes.

I-DEV no tiene obligación alguna de efectuar cualquier pago aparte de los mencionados en el presente contrato.

APTN dará publicidad al apoyo financiero de I-DEV con relación al proyecto. APTN esté obligado a mencionar el apoyo de I-DEV y MEDA en la información pública y divulgación en los medios de publicidad con respecto al proyecto.

APTN adquirirá la propiedad de todos los activos obtenidos como parte del proyecto.

APTN será responsable de la entrega final del proyecto en cada parcela garantizando el funcionamiento de los diversos hacia los productores.

TERMINACIÓN:

I-DEV se reserve el derecho de terminar el presente contrato si no se cumplen todas las condiciones administrativas, de informes y de auditorias o cuando los informes presentan (indicaciones de) irregularidades.
APTN tiene el derecho de rescindir este contrato solamente en el caso de incumplimiento material por parte de I-DEV.

La terminación del presente contrato por parte de I-DEV, como quiera que sea, se hará sin perjuicio a los derechos y remedios de I-DEV en relación a dicha terminación.

**BASE LEGAL:**

El presente contrato quedará exclusivamente regulado e interpretado de acuerdo con el derecho del estado de Nueva York, Estados Unidos.

I-DEV se reserva el derecho de postergar o anular cualquier desembolso si no se cumple y prueba que el fondo se use conforme al objetivo indicado. I-DEV se reserva el derecho a solicitar el reembolso de la contribución entregada si no se cumple las obligaciones y entregables establecidos.

Cualquier litigio que se produzca bajo o en relación con el presente contrato será resuelto exclusivamente ante el tribunal del estado de Nueva York, Estados Unidos.
DATOS DE CUENTA:

- Código Swift: BCONPEPL
- Nombre del Banco: BBVA CONTINENTAL
- Dirección del Banco: JIRÓN TARAPACÁ 719 – 721 CAJAMARCA - PERÚ
- Numero de Cuenta del APT: 0011-0277-0100068122
- Nombre Completo del APT: COOPERATIVA AGRARIA PRODUCTORES DE TARA DEL NORTE
- Dirección Fiscal del APT: JIRÓN AMORIN BUENO S/N PEDRO GÁLVEZ - SAN MARCO