

FarmGrow: Farm Investment Plans for Smallholder Cocoa Farmers in Ghana

Midline Assessment

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Abstract: FarmGrow is an individualized agricultural service platform designed to assist smallholder cocoa farmers in Ghana to increase cocoa yields from 400 kg / hectare to 1500 kg / hectare over an 8- to 10-year period by leveraging long-term individual business plans and coaching techniques based on insights from behavioral economics. A midline quantitative analytics assessment using FarmGrow data and qualitative interviews conducted in November 2019 found improved adoption of some good agricultural practices, particularly in pest, disease and sanitation and weeding practices as well as limited change in yields, as was to be expected. Qualitative data indicates that more farmers are considering replanting despite the emotional and financial toll this takes. Very little intra-household collaboration and communication between spouses regarding the business plans was detected which could have negative consequences for the households, particularly among women. Farmers reported satisfaction with the process and some reported improved yields. This will be important momentum upon which to build.

Executive Summary

Satellite for Farming, or Sat4Farming, is a consortium of the Rainforest Alliance (lead institution), Touton, Grameen Foundation, University of Ghana, WaterWatch Projects, and Satelligence and is funded by the Geodata for Agriculture and Water (G4AW) program of the Netherlands Space Office (NSO). The Sat4Farming project is designed to assist smallholder cocoa farmers in Ghana to increase cocoa yields from 400 kg / hectare to 1500 kg / hectare (over 300%) over an 8- to 10-year period by developing a geo-data enabled individualized agricultural service platform that leverages long-term individual business plans and coaching techniques based on insights from behavioral economics. Agronomists use FarmGrow with participating cocoa farmers to provide them with individualized support in adopting good agricultural practices (GAPs) and increasing on-farm investments to improve cocoa yields and cocoa income.

This report covers a series of qualitative interviews conducted in November 2019 with FarmGrow farmers supported by Touton, Touton and ECOM agronomists, and a simple analysis of GAP adoption data collected by the FarmGrow application and facilitated through analytic dashboards used to monitor farmer progress.

As of the end of December 2019, 17,906 farmers from three cocoa buyers were sensitized (on-boarded) onto the FarmGrow system (basic farmer profile pre-loaded into the system), 2,778 farmers (farms) managing 5,144 plots had completed a baseline plot diagnostic of their plots and 1,861 had completed a monitoring visit. As a proportion of the total, approximately 30 percent of farming households had female primary farmers and 20 percent of the primary farmers were under the age of 35. In 2018, there were 778.8 hectares covered by the farms profiled (based on an estimate of 3.3 hectares per farmer); in 2019, there were 8,920 hectares profiled (based on actual hectares covered by the 5,144 plots profiled). Outreach targets were not met for year two for farmers profiled (actual: 2,778 against target of 4,000) and those monitored (actual: 1,861 against target of 2,000); however, given each farmer profiled had on average two plots assessed, the outreach targets were exceeded.

For Touton alone, for which the rest of the report will focus, by the end of December 2019, 2,353 farmers managing 4,566 plots had completed a baseline diagnostic of their plots; 1,835 farmers managing 3,458 plots had completed a monitoring visit. Female primary farmers made up 30 percent of the total number of farmers at both the diagnostic and monitoring phase. Out of the total number of farmers who had a baseline diagnostic, more than half of the plots were classified with the recommendation to "Replant + Extra Soil Management" followed by "Grafting + Extra Soil Management", "Extra Soil Management" and "Thinning Out + Extra Soil Management." It is important to note that Extra Soil Management was part of all the top recommendations.

To assess change over time (comparing initial diagnostic values to the monitoring visit), only 453 farmers managing 858 plots who had been evaluated by an agronomist (versus 1,324 that had receiving a coaching visit) were included. This comparison was chosen due to agronomist visits being considered as the official evaluation visits.

The basic diagnostics reveal that among the fourteen (14) adoption observations (AOs) promoted for cocoa farming¹, pest, disease and sanitation and weeding practices were the AOs that experienced the largest gains

¹ The 14 AOs for cocoa include 1. Planting Material - Genetic Potential, 2. Tree age, 3. Tree density, 4. Tree health, 5. Debilitating Disease, 6. Pruning, 7. Pest and Disease and Sanitation, 8. Weeding, 9. Harvesting, 10. Shade Management, 11. Soil Condition (pH separately), 12. Organic Matter, 13. Fertilizer Formulation, 14. Fertilizer Application. Descriptions of these are provided in the Annex.

at the monitoring visit (approximately one year later) among Touton farmers. Fertilizer formulation and pruning both experienced at least a 25% decrease between the diagnostic and monitoring visits. Female farmers experienced greater gains than men in pest, disease, and sanitation; however, the decreases experienced were also driven primarily by women. The barriers to adopting the practices were led by financing challenges, followed by "not feeling competent".

At the time of the monitoring visit, 93 percent of Touton farmers that had received an official plot assessment (n=872 plots) from the agronomist had received a "Fail" on their plot assessment, which means they did not succeed in making critical improvements related to their investment plan. For example, if the farmer did not replant as recommended, this can delay improved productivity by a full year. Seven percent received a non-critical fail, which means the monitoring visit happened at a time prior to when critical improvements were expected to be made and so while the farmer failed, they were not yet expected to have completed the prioritized activities.

Touton yields slightly decreased on average for all farmers between 2018 and 2019; for the 458 farmers that had monitoring data from an agronomist, yield varied between 465 and 460 kg/ha, respectively. It is important to note that some of the lack of change is due to farmers repeating the same yield from the prior harvest as their monitoring visit may have occurred prior to harvest, which would explain the little to no change.

The qualitative research, which consisted of interviews with thirty (30) cocoa farmers, consisting of 10 couples, and 4 agronomists found that farmers may or may not understand the difference between their specific farm investment plan—what has been identified as their specific set of priorities—or the broad application of GAPs. This may or may not have had influence, in addition to the financing constraints, on the failures in achieving progress on their plan during the monitoring visit. These findings suggest the FarmGrow team needs to decide how important it is that farmers can articulate their specific plan priorities.

Lack of financing is a well-documented challenge for farmers. The interviews also revealed that the availability of spraying equipment and labor support was often mentioned by the farmers as significant challenges to achieving their plan. Access to credit is gained primarily through the Purchasing Clerks; however, the credit appeared to be most used for non-cocoa related expenses such as for health, funeral, or education expenses. If farmers did not access credit through the Purchasing Clerk, they mentioned interest rates were too high or that they did not like the idea of taking credit generally. Farmers also acknowledged that their poor credit repayment histories have also limited their current access to credit. Mobile money is being used by farming households to help make person-to-person payments due to security concerns as well as the need to send money to caretakers for education and household expenses.

The quantitative baseline revealed that some farmers are likely earning more money from other incomegenerating activities or income sources than cocoa, particularly if they rely on remittances, non-cocoa farming, and general trade/small businesses. However, less than half of the farmers appeared to mention income sources other than cocoa. During the midline, the concept of income diversification was explored further and discussions revealed that most households appear to have diversified their income, but uncovering these sources took time. This has important implications for FarmGrow data collection, particularly as FarmGrow explores how it can support income diversification as a strategy for offsetting lost income when farmers are replanting. Also, despite the encouragement that male and female heads of household should participate in the development of the plan, very few women participated in the data collection or the decisions regarding the agreement to the plan (most were unaware that a plan existed except when she was the head of household and was directly involved). While it is challenging to ensure both key decision-makers are involved, this is an area that deserves extra attention if the goal of improved women's engagement and empowerment is to be achieved.

Given the length and importance of the data collection process for providing farmers with accurate recommendations, farmers were asked about their satisfaction with the data collection process and any difficulty they experienced sharing information with the agronomist collecting the data. Most farmers mentioned some concern regarding their sharing of their income and expense data as they were not sure why it was being requested and they felt in some cases it might altogether be inaccurate due to their lack of recordkeeping. They also shared that the length of time to complete the interviewing process was too long. FarmGrow should explore ways to reduce the amount of time the data collection process takes, even though it has already significantly reduced data collection time through digitizing the process and the recommendations for the farmers.

An important part of the midline assessment was to understand farmers' degree of satisfaction with their experiences with FarmGrow and their satisfaction with their agronomists or other relevant staff. Overall, there appears to be a high degree of satisfaction and trust of Touton and its agronomists and farmers reported their intent to sell all or most of their beans to Touton. When there was mention that not all of their beans were to be sold to Touton, they noted dissatisfaction with the Purchasing Clerks or dissatisfaction that some promised support came late, such as late access to pesticide sprayers, or not at all.

While only some of the farmers had completed a monitoring visit, which signifies the amount of time the agronomist and farmer feel is the right time to check the progress in their FarmGrow plan, all were asked about their perception of any changes they have experienced in their experience with FarmGrow. Most reported seeing some improvements in yield (ex. Growing from 6 bags last year to 14 bags this year). Some farmers felt the most significant change that has happened in their community is that some farmers have agreed to cut down some of their trees and replant.

FarmGrow is designed to be a sustainable, front-line support service that results in personalized farm investment plans for cocoa farming households. The midline assessment has pointed to areas of concern and improvement, particularly regarding engagement of women and improving efficiency further for the agronomists and the farmers. While outreach to youth was not fully explored in this report, the data show approximately 20 percent of the farmers are classified as youth. Without specific actions designed to better target women and youth, it is unlikely that significant changes in outreach to these groups will improve.

The results show that farmers are satisfied with the individualized support for their farming activities but they also want to see results given the many data collection activities and perceived limited value received from prior projects promising results. Some appear to already see improvements in their yields despite the short time period that has passed. This will be important momentum upon which to build.

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Introduction

Sat4Farming

Satellite for Farming, or Sat4Farming, is a consortium of the Rainforest Alliance (lead institution), Touton, Grameen Foundation, University of Ghana, WaterWatch Projects, and Satelligence and is funded by the Geodata for Agriculture and Water (G4AW) program of the Netherlands Space Office (NSO). The Sat4Farming project is designed to assist smallholder cocoa farmers in Ghana to increase cocoa yields from 400 kg / hectare to 1500 kg / hectare (over 300%) over an 8- to 10-year period by developing a geo-data enabled individualized agricultural service platform that leverages long-term individual business plans and coaching techniques based on insights from behavioral economics.

FarmGrow

The major vehicle through which the overarching goal will be achieved is the deployment of a digital agriculture advisory tool, known as FarmGrow, that agronomists use with participating cocoa farmers to assist them in adopting good agricultural practices (GAPs) and increasing on-farm investments to improve cocoa yields and cocoa income. Farmers are initially engaged through a profiling exercise that covers basic household demographics, farm data such as farm size and number of cocoa trees, and the adoption observations (AOs) aligned with GAPS for cocoa farming, plant material genetics, and farm conditions which include tree age, density, health and the presence of diseases. The standard GAPS include pruning; pest, disease and sanitation practices; weeding; harvesting conditions; shade management; soil fertility management which includes soil condition and health, fertilizer formulation and application. What constitutes satisfactory behavior related to these GAPS is covered in the Annex.

In addition, farmers are asked about their recordkeeping behaviors, the yield and the associated income and expenditures for cocoa as well as other household income sources and expenditures to assist in calculating a set of plot-specific recommendations and an investment plan for the farmer. The investment plan lays out an 8- to 10-year picture for the farmer of the potential yield and resulting income they could receive through their farm improvements, based on the recommendations they are provided. There are six primary categories of recommendations provided to farmers. These recommendations include:

- Replant (cut down old trees or diseased trees and replant with new planting material)
- Extra Soil Management (increase use of organic matter, proper application and formulation of fertilizer)
- Grafting (graft old trees with new planting material)
- Maintenance GAPs (follow basic GAPs)
- Thinning Out (remove some trees to meet recommended distance among trees)
- Filling In (plant new trees to maximize plot space and meet the recommended distances among tress)
- No Farm Development Plan (FDP; tree health and soil condition are both bad and it is not ideal for a farmer to plant cacao on the plot).

Any farmer can receive a combination of these recommendations, usually resulting in no more than two recommendations per plot. Extra Soil Management is the only recommendation that is coupled with other recommendations. Once recommendations are made and farmers agree upon a plan with the agronomist, they are then monitored at agreed-upon intervals with the agronomist. During a monitoring visit, farmers are assessed on the GAPs as well as their achievement of their targets per the recommendations provided by FarmGrow.

This report covers a series of qualitative interviews with FarmGrow farmers supported by Touton, Touton and ECOM agronomists, and a simple analysis of GAP adoption data collected by the FarmGrow application.

Baseline Summary

A baseline assessmentⁱ conducted between October and December 2018 found that there was much room for improvement in farm conditions and adoption of GAPs to ensure that the current yields of 307 kg per hectare reach the desired 1.5 metric tons per hectare goal set by the Sat4Farming project. There was a low use of fertilizers (less than 30 percent) but relatively high use of pesticides (about 95 percent) and fungicides (about 70 percent); however, qualitative data indicated that farmers primarily faced a challenge with respect to the timing of the application of pesticides and fungicides. When households did not own their own equipment and had to rely on someone else to spray their farm, spraying was often done late, reducing its effectiveness.

Almost all farmers reported pruning in the last year, with most reporting either pruning twice or more than 10 times. Approximately 85 percent of farmers reported maintaining shade trees on their cocoa farms; for those who maintain shade trees, their estimated yields are much higher than those who do not have shade trees (311 kg/hectare compared to 289 kg/hectare among those without shade trees). Most farmers (77 percent) rely on slash-and-burn to prepare their land for both cocoa farming and cash crops. Between 32 and 47 percent of farmers reported establishing a new farm in the last five years, which raises a concern about deforestation. Instead of intensifying efforts on existing cocoa farms, farmers may be using new lands to achieve the yields they need for income purposes. Fifty percent of farmers reported using soil and water conservation techniques; intercropping followed by planting of shade trees were the most reported techniques used.

Results showed there was very little use of credit among these farmers, either due to low access to credit or aversion to taking credit given real or perceived high interest rates. When credit was noted, it was often coming from informal lenders such as the local cocoa purchasing clerk and often requested for non-cocoa related expenses, such as education fees, funeral expenses, and health costs.

Farmers also indicated that due to the seasonality of cocoa farming and their significant household expenditure, it was always difficult to save which affects their ability to attract credit. Figure 1 below depicts a seasonality calendar that was crafted from qualitative interviews with the farmers to better understand the relationship between various agricultural activities, income and expenses.



Figure 1: Cocoa Farming Seasonal Calendar

Spraying									Spr	ay Pesticic	le	
Holidays		Monthly	celebratio	ns that require	e financial	input (fun	erals, villa	age chief-	dictated exper	nses)		Christmas
Funerals												
Maize		Clear land		Plant seeds		Harvest						
Rice		Clear land		Plant seeds		Harvest						
School	PTA dues								School fees			
Most inco	me											
Most inter	nse expenses	5										

Most of the communities visited had no organized saving groups despite farmer interest in being part of such savings mechanisms. Farmers also felt that crop diversification and intercropping could help them have regular access to funds and facilitate their ability to save and access credit. Given women's important roles in income diversification and intercropping, this could have important implications for how Sat4Farming should engage spouses of male farmers in key farming decisions if they are not already a primary decision-maker on the cocoa farm.

Methods

Quantitative

In addition to the qualitative analysis, Grameen Foundation leveraged the FarmGrow platform to conduct a very simple analysis in order to understand the progress among Touton farmers who had participated in a monitoring visit and were assessed by an agronomist (n=458) to capture changes in the adoption of GAPS. The tables of data and the bar charts are part of the diagnostic analyses provided by FarmGrow and the data dashboards are designed to reflect real-time status of events and progress. At the time of writing this report, these dashboard diagnostic capabilities were still being developed by Grameen Foundation in collaboration with Touton and other cocoa buyers.

Qualitative

November 6-9, 2020, the members of the Sat4Farming team collaborated in a series of qualitative in-depth interviews with primary and secondary farmers located in Kasapin and Sunyani districts in the Brong Ahafo Region. Ten husband and wife pairs (or male and female farming teams) and 10 individual farmers were interviewed. Thirty farmers in total were interviewed (16 women and 14 men). Two agronomists from ECOM and two from Touton were also interviewed for this study.

Farmers were interviewed with two different questionnaires depending on whether they had only participated in the meeting with the agronomist regarding their investment plan ("investment plan group") or whether they had received a monitoring visit to follow-up with the farmer on their implementation of that investment plan ("monitoring visit group").

The key questions of the investment plan group explored:

- Household's primary income sources, in addition to cocoa, and the degree to which they actively sought to diversify their income,
- How the household expected to achieve the steps in the plan and the challenges they expected,
- Whether there was coordination between spouses in decisions related to the cocoa farm and the FarmGrow investment plan,

- Men's and women's degree of satisfaction with FarmGrow, and
- The support received from Touton and their satisfaction with those services as well as the degree to which women feel supported by Touton.

The key questions of the monitoring group explored all questions above, plus:

• The actions the household had already taken towards achievement of the investment plan and any challenges they faced in implementing the plan.

Inductive analysisⁱⁱ was used to summarize the findings and identify key themes from the 30 stories. Dashboards were developed with use of Microsoft BI (Business Intelligence) and key data points were determined based on the theory of change articulated by the project. This theory of change is summarized below in Figure 2. Given the short time period between the baseline and midline, key points of interest included change in yield (disaggregated by gender), types of investment plan recommendations, changes in adoption of GAPS, and reasons for non-adoption.

Figure 2: Sat4Farming theory of change



- Farmers and aggregators are engaged early in the project and see the value of SAT4Farming services to increase cocoa yields and sustainability in Ghana
- + Future business owner / model is identified early in the project and involved in developing the services
- The benefits of using geo-data is realized and integrated seamlessly into FarmGrow technology platform
- Key supply chain actors such as MARS and Touton support and promote the use of SAT4Farming

Results

Quantitative

As of the end of December 2019, 17,906 farmers from three cocoa buyer companies were sensitized (onboarded) onto the FarmGrow system (basic farmer profile pre-loaded into the system), 2,778 farmers (farms) managing 5,144 plots had completed a baseline plot diagnostic of their plots and 1,861 had completed a monitoring visit. As a proportion of the total, approximately 30 percent of farming households had female primary farmers and 20 percent of the primary farmers were under the age of 35. In 2018, there were 778.8 hectares covered by the farms profiled (based on an estimate of 3.3 hectares per farmer); in 2019, there were 8,920 hectares profiled (based on actual hectares covered by the 5,144 plots profiled). Outreach targets were not met for year two for farmers profiled (actual: 2,778 against target of 4,000) and those monitored (actual: 1,861 against target of 2,000); however, given each farmer profiled had on average two plots assessed, the outreach targets were exceeded.



Figure 3: FarmGrow Outreach among Primary Farmers

For Touton alone, for which the rest of the report will focus, by the end of December 2019, 2,353 farmers managing 4,566 plots had completed a baseline diagnostic of their plots; 1,835 farmers managing 3,458 plots had completed a monitoring visit. Female primary farmers made up 30 percent of the total number of farmers at both the diagnostic and monitoring phase. To assess change over time (comparing initial diagnostic values to the monitoring visit), only 453 farmers managing 858 plots who had been evaluated by an agronomist (versus 1,324 that had receiving a coaching visit) were included. This comparison was chosen due to agronomist visits being considered as the official evaluation visits and deemed to be the most accurate assessment.

Among the agronomist-assessed farmers, the basic diagnostics reveal that among the fourteen (14) adoption observations (AOs) promoted for cocoa farming², pest, disease and sanitation and weeding practices were the

² The 14 AOs for cocoa include 1. Planting Material - Genetic Potential, 2. Tree age, 3. Tree density, 4. Tree health, 5. Debilitating Disease, 6. Pruning, 7. Pest and Disease and Sanitation, 8. Weeding, 9. Harvesting, 10. Shade Management, 11. Soil Condition (pH separately), 12. Organic Matter, 13. Fertilizer Formulation, 14. Fertilizer Application. Descriptions of these are provided in the Annex.

AOs that experienced the largest gains at the monitoring visit (approximately one year later) among Touton farmers. Both fertilizer formulation and pruning experienced at least a 25-percent decrease between the diagnostic and monitoring visits. Female farmers experienced greater gains than men in pest, disease, and sanitation; however, the decreases experienced were also driven primarily by women. The barriers to adopting the practices were led by financing challenges, followed by "not feeling competent" (Table 1, Figure 4, Figure 5).

Figure 6 demonstrates that more than half of the cocoa farmers were given the recommendation to "Replant + Extra Soil Management" followed by "Grafting + Extra Soil Management", "Extra Soil Management" and "Thinning Out + Extra Soil Management." It is important to note that Extra Soil Management was part of all the top recommendations.

At the time of the monitoring visit, 93 percent of the plots assessed by an agronomist (n=872) had received a "Fail" on their plot assessment, which means the farmers did not succeed in making critical improvements related to their investment plan. For example, if the farmer did not replant as recommended, this can delay improved productivity by a full year. Seven percent received a non-critical fail, which means the monitoring visit happened at a time prior to when critical improvements were expected to be made and so while the farmer failed, they were not yet expected to have completed the prioritized activities.

Figure 7 demonstrates that Touton yields slightly decreased on average for all farmers between 2018 and 2019; for the 453 farmers that had monitoring data from an agronomist, yield varied between 465.38 and 460.26 kg/ha, respectively. There was very little difference between male and female-led farms, though women's farms experienced a smaller decrease between 2018 and 2019 than men's. Table 2 demonstrates that for each individual Recommendation Cohort, changes were very slight as well. It is important to note that some of the lack of change is due to farmers repeating the same yield from the prior harvest as their monitoring visit may have occurred prior to harvest, which would explain the little to no change.

Table 1: Baseline and Midline GAP Adoption

Adoption Observations		Diagnos	stic			Monito	ring Visit 1		%-point Change in ''Good''
	n=	Good (%)	Medium (%)	Bad (%)	n=	Good (%)	Medium (%)	Bad (%)	
Planting Material	867	19.84	8.77	71.40	884	17.99	8.14	73.87	-1.85
Free of Debilitating Disease	867	88.24		11.76	884	92.31		7.69	4.07
Tree Age	867	59.63		40.37	884	60.75		39.25	1.12
Tree Density	867	59.40		40.60	884	59.95		40.05	0.55
Tree Health	867	71.63		28.37	884	78.17		21.83	6.54
Harvesting	867	92.04		7.96	884	98.87		1.13	6.83
Pruning	867	2.19	5.19	92.62	884	1.58	3.28	95.14	-0.61
Pest, Disease & Sanitation	867	20.18	18.92	60.90	884	32.81	21.04	46.14	12.63
Weeding	867	61.13		38.87	884	92.99		7.01	31.86
Shade Management	867	35.64		64.36	884	37.78		62.22	2.14
Organic Matter	867	97.46		2.54	884	99.55		0.45	2.09
Physical Condition of Soil	867	96.31		3.69	884	98.87		1.13	2.56
Fertilizer Application	867	1.73	6.34	91.93	884	1.81	5.66	92.53	0.08
Fertilizer Formulation	867	1.96	8.88	89.16	884	1.47	5.66	92.53	-0.49

Figure 4: Percent-change in Adoption Observations 2018-2019



■ Men ■ Women ■ ALL

Figure 5: Reasons for Failure to Adopt GAPs



Figure 6: FarmGrow Recommendations by Plot







Table 2: Yields by Recommendation Cohort

Recommendation Name	# of farms	# of plots	Average Yield at Diagnostic	Average Yield at Monitoring	% change in yield
Extra Soil Management	90	116	605.66	587.41	-3.01%
Filling in + Extra Soil	2	3	707.77	707.77	0.00%
Grafting	1	2	466.19	466.19	0.00%
Grafting + Extra Soil	146	235	493.48	491.41	-0.42%
Maintenance (GAPs)	1	1	409.84	409.84	0.00%
Replant	6	8	512.20	512.20	0.00%
Replant + Extra Soil	266	469	406.45	405.93	-0.13%
Thinning out	1	1	1536.89	1536.89	0.00%
Thinning out + Extra Soil	20	23	580.28	518.71	-10.61%
Total	453	858	465.38	460.26	-1.10%

Qualitative

Thirty (30) cocoa farmers were interviewed, with 20 of them being part of a couple. As mentioned in the Methods section, the purpose of the qualitative assessment was to understand progress (or lack thereof) in farmers meeting targets in the investment plan, concerns or excitement they had about their plan, and their satisfaction with Touton's support. Key themes regarding FarmGrow experiences are summarized below and short case studies from the individual interviews are provided to highlight those findings.

Farm Investment Plans

Every farmer that engages with FarmGrow receives a personalized farm investment plan that provides a recommendation for each plot and the costs associated with implementing the plan. When farmers were asked about their plans, the obstacles they faced in implementing the plan as well as what they were most excited about, the following experiences were captured:

• It was not clear if farmers understand the difference between their specific farm investment plan—what has been identified as their specific set of priorities—or the broad application of good agricultural practices. There are 14 AOs that are promoted in FarmGrow and these are

Importance of the FarmGrow Plan

"Without a plan, you don't know if you will make a profit or not." Saara, a cocoa farmer, decided to commit to the plan because he "thought it would help me plan and help with troubles. Now I can buy fertilizer before the season." He cannot read the plan but his children help him read it. "Sometimes they read it 3-4 times a week. I see it as my office." consistent across the board for all farmers. Each farm investment plan prioritizes a set of AOs for a farmer. The AOs and the timing of application of those AOs are documented in the paper-based workbook provided to each farmer. A calendar of month-by-month activities is provided in the

workbook. The investment plan is a separate paper-based calendar that is left with the farmer that outlines the costs associated with the prioritized recommendations. The agronomist walks through the plan with the farmer, an agreement is made and documented in FarmGrow and the paper plan is then left with the farmer as a reminder of the plan. Farmers often tuck this paper within the workbook. When all but one of the farmers was ask about his/her plan, farmers tended to list priorities other than the ones associated with the plan documented in FarmGrow. Following are a few examples to illustrate this point:

Example 1: Comfort has two plots, both with recommendations to Replant + Extra Soil Management. When asked about her plan, she references recommendations to prune, weed, and apply fertilizer and insecticides. She decided to prioritize weeding and then insecticide. She notes lack of credit is an issue for achieving her plan. When her nephew Eric, who assists her on the farm, was asked about the plan, he too noted their recommendations were to apply chemicals (insecticide) and conduct maintenance pruning. He shared that they did the spraying since the cocoa leaves were shrinking and the agent recommended a chemical for them to apply. He appreciated the booklet and it has been helpful with planning for future implementations and practices on the farm.

Example 2: John has two plots, one with a recommendation to Graft and the other Extra Soil Management. When asked about his plan, he shares that he is focusing on pruning and fertilizer application.

Example 3: Isaac has one plot with a recommendation to Replant and for Extra Soil Management. When asked about his FarmGrow plant, he shared that he was recommended to weed, fertilize, and apply fertilizer in a timely fashion. He shared that he was also encouraged to record his activities and expenditures. He decided to prioritize financial management (he needs to prioritize and allocate money for interventions on his farm), pruning and mistletoe removal.

- Some recommendations for farmers did not appear to match their financial situation or did not make sense in the order they were given. For example, some of the agronomists shared, "Why would you prioritize pesticides before prioritizing weeding? I will give other advice over and above what the app tells me in these cases." and "Farmers shouldn't be expected to replant without taking some baby-steps first."
- Farmers are trying hard to adhere to the recommendations, but **financing is a significant constraint**. One farmer shared, *"it has been a financial drain on me.*" Rebecca, another farmer, shared that she was recommended to thin out her trees and at first she felt the loss. *"This mean losing money in my mind,"* she shared. But after following the advice, she has seen how the other trees have become strong and she's no longer worried.

One of the agronomist also shared that farmers do not like the idea of replanting, "they feel your whole world comes to an end". However, some also express that while the overall cost implications of following the recommendations can be overwhelming, they recognize the costs do not come all at once. For example, one woman farmer shared that after several farmers participated in FarmGrow, they got together to discuss what they each learned. They all reflected that at first, they wondered how in the world they could come up with all the money. "The money is not just sitting around. But after thinking about it, not all the expenses have to happen at once. You just need to plan for when they will occur." She also shared, "At first we didn't have money for fertilizer. We started learning how to create fertilizer on our own. We got leaves, ashes and we applied water. We also started leaving the broken pods on the ground around the trees. This is what we did before. I now have money to purchase fertilizer, using my savings and my other income. I plan for it and make sure I have the money." She's most excited about the increase in yield she's expecting this year. She doesn't dislike anything from her experience with FarmGrow, but she does admit that she has felt sad when she realized she didn't have the money to do everything they recommended. "I was crying in my room wondering where will I also get money for my children?" Does she think that the recommendations she's received match her financial reality? "Yes. I've learned I need to plan for the farm. I now know every month what I need to do." Therefore, replanting is both a financial and psychological shift for farmers. One farmer also shared that there was a backlash from other households when they decided to replant. Another shared that the decision to cut down infected trees "was painful."

- While financing (covered more below) was identified as key constraint for not adhering or achieving milestones of the plan, availability of spraying equipment and labor support was often mentioned by the farmers as an equal challenge. Availability of labor to do the spraying and labor to assist with harvesting or other activities often come too late to be effective. During the baseline qualitative, the quality of labor services were particularly noted by women. Women farmers shared that they would pay for a full day of labor and their hired hands would often complain they were tired and not complete an expected full day of labor activities.
- Farmers do see value in having a plan. They like understanding when activities should be conducted and understanding their associated costs. As Saara shared, *"Without a plan, you don't know if you will make a profit or not."* Saara, a cocoa farmer, decided to commit to the plan because he *"thought it"*

would help me plan and help with troubles. Now I can buy fertilizer before the season." He cannot read the plan but his children help him read it. "Sometimes they read it 3-4 times a week. I see it as my office." Some of the agronomists also mentioned that it would be helpful if the farmers had reminders sent out to them, such as through the use of SMS messages that match the calendar a farmer is given. "Farmers will easily forget."

• Slash-and-burn is a common technique for land clearing—for cocoa and for annual crops. At baseline, many farmers noted using slash-and-burn as a method for preparing land for planting (for cocoa and cash crops). This raised a concern about deforestation as farmers may be expanding their farms into virgin forests instead of intensifying productivity; therefore, during the midline, the study aimed to gain greater insight into whether slash-and-burn was being used for cocoa or whether it was a technique used for land clearing for annual crops (i.e. burning weeds to prepare land for planting maize). At the midline all but two of the farmers noted using slash-and-burn for land clearing. One farmer shared, *"We do it every year. It helps us clear the land and we can plant earlier than we can if we use other methods to clear the land."* Some mentioned its benefits as reducing the need for chemicals (weedicides). One of the farmers who did not use slash-and- burn considers herself a crusader against the technique and feels that slash-and-burn depletes the fertility of the soil overtime. She felt they should instead, "spread what is weeded as much for food crops."

Financing

Lack of financing is a well-documented challenge for farmers. During the midline, the team explored how households manage their finances.

- While purchasing clerks (PC) are often used for credit (as was noted in the baseline), this is not accessible by all farmers. Some farmers noted that the interest rate charged by the PC was too high so they did not take credit from him. One farmer noted, "When we are cash strapped, we go to the PC but he charges 50% interest and you can pay with or without cocoa. You get 1,000 and you pay back 1,500."
- When PCs provide credit, they are mainly providing credit for education, funerals, health expenses, etc. Some of the farmers indicated they get "soft loans" from the PC which means they are interest free or basically just purchasing something on credit that they pay back once they sell their harvest. PCs earn commission on the beans they purchase on behalf of traders which provides an incentive for PCs to lend to farmers, as farmers sell their beans to the PC to cover the costs of their prior debts.
- Credit and/or financing are not available at the right time. For example, one farmer shared when asked about what extra support she needed as a farmer from Touton that "*There are some seasons during the year when it is harder. If we could get loans or inputs and we can pay back when we harvest our beans. That would be helpful. February and March are tough months of the year since that is the season when we need to plant our food crops for the year."*

On Financing

"There are some seasons during the year when it is harder. If we could get loans or inputs and we can pay back when we harvest our beans. That would be helpful. February and March are tough months of the year since that is the season when we need to plant our food crops for the year." – Touton Farmer

- **Request for credit may be more associated with non-cocoa expenses than for cocoa.** As with the described use of PCs for credit for assistance meeting education, health or funeral expenses, when asked about credit needs, some also mentioned needing credit for purchasing polytanks and pvc pipes for irrigating vegetable farms, purchasing carts to carry the cocoa pods and other produce to and from their farms.
- Agronomists also feel frustrated when they provide recommendations that they know farmers cannot complete without access to credit. "I give recommendations to farmers but I see they are unable to act upon those recommendations due to lack of funds to do so." The agronomists also recognize that farmers don't like this either. "Being told to invest in fertilizer. They feel there is no capacity to do it. If we could help them save for it, I think they can do it, especially if they save up for it and they can get a discount. If farmers think the recommendations are too expensive, they

Promise of Credit

"I believe cocoa is wealth and every financial institution will provide loans when I need it."- Elizabeth

won't do it."

• Willingness to pay is a recognized issue, even among farmers. During the baseline assessments, qualitative interviews

with PCs highlighted the issue that farmers do not have a strong willingness to pay and that there are not huge incentives to repay. Farmers can easily switch to selling their cocoa to another PC without repaying the loans of another, given the competition in the market. One farmer, Saara, shared that farmers recognize their own poor repayment history, "Almost all the farmers here have difficulty accessing credit. It is due to our own behavior and non-repayment." However, there are a few cocoa farmers that are optimistic about accessing credit. Elizabeth shared, "I believe cocoa is wealth and

every financial institution will provide loans when I need it."

• There is active use of susu (savings) groups and mobile money among the farmers. One farmer, Joyce, shared that she used mobile money to protect

Communication of Income

"Where there is money involved, there are always issues. For this reason, women will not be truthful and will not share accurate information." – Comfort, Touton farmer

herself from theft as she traveled on the road between home and town to pick up goods for her petty trading business. Adjoa shared that she uses her mobile wallet to send money to her children. She also shared that once, one of her children had a leg injury. Her husband sent her money via the mobile wallet to pay the hospital. She also sends money to her children's guardian when she's away from them. Some of the people that purchase fish from her on credit will also eventually pay her via mobile money. It must be noted that as the research team travelled to the various villages to meet the farmers, there was a mobile money agent in each village. One gentleman shared that he felt the introduction of village savings and loan association (VSLA) groups were making a good contribution to his community but he feels men have been excluded.

Income Diversification

The quantitative baseline revealed that some farmers are likely earning more money from other incomegenerating activities or income sources than cocoa, particularly if they rely on remittances, non-cocoa farming, and general trade/small businesses. However, less than half of the farmers mentioned income sources other than cocoa. During the midline, the concept of income diversification was explored further to understand how likely most farmers are to have more than cocoa as their income source.

- All farmers mentioned more than cocoa as an income source, even if cocoa was their primary income source. This also depended on who you asked. Isaac, the primary farmer shared that his income was "100% cocoa." When his wife was asked, she revealed her petty trading business of selling fish, cocoyam and whatever vegetables they grow on their land.
- When farmers were asked about income diversification, it took them a while to reveal all income sources, with some income sources being revealed throughout the interview while discussing other topics. This suggests that quantitative questions asking about income sources should rely on a probable list of income sources and ask a farmer if he/she relies on the income source or not (closed versus open question).
- A wide variety of income sources are relied upon, even if the income source is the difference between what they consume and what they have left to sell. Livestock is most often used for income and not for consumption. See the income sources mentioned below in Table 2.

Livestock	GoatsPigs	SheepGuinea Fowl	• Chicken
Vegetables/Fruit	OkraChiliesCowpeasYam	TomatoesWaterlilyCabbagePlantain	Green peppersBeansGarden EggOranges
Grains/Tubers	• Cassava	• Cocoyam	• Rice
Nuts/Oil	• Cashew	• Oil palm	• Groundnut
Business/Employment	 Preacher Fish trader	Taxi driverLiquor store owner	 Petty trade Pastry/ provision shop

Table 2: Income sources

Women and Gender Roles

While FarmGrow was not originally designed with a special or different process for women, gender roles are being explored to inform future improvements. For this reason, the primary farmer (often the man) and the secondary farmer (often the wife of the primary farmer) were both interviewed to understand how much collaboration occurs between the two in how they make decisions, share responsibilities on the farm, as well as others in the household who have or manage other income generating activities.

- While FarmGrow assumes that households engage both husband and wife in the interview and datasharing process, there appeared to be little communication between spouses regarding farm development plan. Out of the nine couples interviewed, only two couples appeared to collaborate. It was most often the male farmers noting that they had spoken to their wives about their FarmGrow plan and the wives indicating that very little to nothing had been shared with them. Wives of the primary farmer generally targeted by the agronomists indicated that they rarely engage with the agronomist. However, when the agronomists are able to meet with the couple together, they see the advantage of having "a conversation where women can have an opinion. Women are ready to support their men. She's more aware of where the money is going. The women are also coming on board as they know where the money is going. When she understands the expenses from the FarmGrow plan, when he says they need to spend money on pesticides, she understands where the money is going and why. It takes trust. Men are happy when women can support them. Sometimes women even know more than the men!"
 - Example 1: Mafel shared that when the Touton agronomist visits her home, he speaks only to her husband. On the farm she cooks for the laborers and she grows plantains under the cocoa trees. She travels to Kumasi a lot and so she was not around when the agronomist last visited. She feels she contributes to decisions on the farm and that her husband listens to her. However, she'd like it if her husband kept the farm more tidy (like keeping the weeds

picked) so that when the laborers are there, they can focus on what they need to do. She also contributes to helping pay laborers and for fertilizer. She feels the business is a joint business.

• Example 2: Adjoa is married to Isaac. He's a lead farmer for the community. Isaac, when asked about whether he

One Women's Participation

"Women are ready to support their men. She's more aware of where the money is going. The women are also coming on board as they know where the money is going. When she understands the expenses from the FarmGrow plan, when he says they need to spend money on pesticides, she understands where the money is going and why. It takes trust. Men are happy when the women can support. Sometimes women even know more than the men!" – Ecom agronomist

shared anything regarding their farm development plan with Adjoa, he shared, "*I didn't share anything with my wife.*" When asked about their farm development plan, she shares she doesn't really know anything about it. She fetches water and waters the seedlings that Touton gave her household to take care of. However, she feels her husband listens to her opinion about the farm. While her husband has attended all Touton trainings, she's never been to one. Her husband is a trainer of trainers, but "*he doesn't train me.*" If she were invited to a training, she'd "*be excited*". However, if there were training, she'd like the group to not be only women. "*I'd prefer them to be mixed gender. Women's intelligence is low. I'd prefer a mixture of men and women so men can support the women.*"

- Example 3: Atta has not shared anything about FarmGrow with his wife because of his initial lack of trust given he has gone through many programs which have yielded no positive results for him. Isaac shared that he involved his wife, Linda, from the beginning of the plan and that he has her full agreement. "*No critical issues were raised. We both agreed to the plan.*" When Linda was asked about her knowledge of the plan, she shared, "*There has been no discussion about the farm development plan. I don't know much about it.*"
- Example 4: Maxwell and Agatha are a couple that has shared about their farm development plans since they both have their own farms. *"We discussed the plan together since my wife is*

also implementing the plan. We make decisions together. "Agatha thought they also had 100 percent agreement with each other.

- Households do not always agree on how decisions should be made. Clement shares that he often disagrees with his wife about how to use the money that comes from selling their beans. "I have a preference to pay for school fees of our children, but my wife wants a quick turn-around of the money in trading before the settlement of fees is made." Mercy shared that she and her husband Peter sometimes disagree on the number of times a particular GAP needs to happen in a cropping season. They resolve this disagreement by referring to the FarmGrow manual.
- The FarmGrow data collection process also assumes primary and secondary farmers (most often husbands and wives) will participate in estimating their household income to result in as accurate of an estimate as possible so that recommendations provided to the farmers do not over or underestimate a farmer's financial capability. Given few women noted their engagement in the FarmGrow process, this means **household estimates may or may not accurately incorporate a woman's income**. On the other hand, one agronomist and one farmer shared that husbands could get mad if they discovered that their wives shared household income figures with another person. Comfort shared, therefore, women may also not provide accurate figures, particularly if she is being interviewed and not the husband.
- In regards to roles that women play on the cocoa farm, **women often noted the task of carrying heavy loads** to and from the farm on their heads and the time, often 30-60 minutes, of walking this requires. Adjoa, the wife of a primary farmer shared, "we carry them [the cocoa beans] here. Traders are the only people with the tricycles (motorized motorcycle/wagon vehicles). I carry them on my head here. It takes 45 minutes to walk from the farm to the house. The next day, your neck can really hurt."
- Women farmers, particularly female-headed household heads, rely more on labor than men and labor is not always reliable and is expensive. This point was partially made above; however, it is an important barrier to recognize as this indicates that women will have more expenses than men given their potential need to hire labor for simple tasks such as weeding, especially if she is disabled or elderly.
- Despite challenges that women face, such as very long days, they recognize their lives are better than their mother's generation. For example, Adjoa, a secondary farmer shared when asked about work-life balance, her typical day looks like the following: She starts by sweeping the house and fetching water. She takes care of the children and gets them off to school. She cooks, eats, and then goes to the farm. She supports with the weeding and weeds the other crops where they grow vegetables. She goes back to the house and cooks the evening meal. Takes a bath. On the days when she has fish to sell, she'll sell fish after she drops the children off at school (between 8 and 9). Around 10, she'll go to the farm. How does she see her life as a woman differing from her mother's life? "Schooling is the biggest change. When my mother was little, her family focused on the farm. But now males and females both go to school. Women are also diversifying their income sources now. The cost of living has gone up and families need more income. I also don't have to ask my husband for everything."
- Many women grow up on cocoa-growing households. Rebecca shared that her parents were also cocoa farmers and this is where she learned to become a cocoa farmer.

Data Collection

Given the length and importance of the data collection process for providing farmers with accurate recommendations, farmers were asked about their satisfaction with the data collection process and any difficulty they experienced sharing information with the agronomist collecting the data.

- Farmer's expressed some data collection fatigue. Some indicated that there were a lot of data collection efforts by many different organizations. One farmer expressed that "many people come to my farm with papers, asking me a lot of questions, but rarely give me anything in exchange or anything new." Another farmer shared, "We don't get any incentive devoting our time to various surveys."
- The **baseline data revealed very few farmers reported diversifying their incomes** (it appeared less than half). The **qualitative interviews suggest substantial diversification efforts**; however, getting to the number of income-generating activities required significant probing. During the interviews, when farmers were asked about diversification, they might have mentioned one or two activities but through the interview, they revealed other activities.
- Some farmers felt uncomfortable sharing their income/expense data and did not understand why it was being requested. One farmer noted the anxiety he felt sharing his income because "we don't know why this information is being requested". Another farmer shared that he felt others could

collect data from farmers without making them feel anxious by asking financial-related data such as household size, how they cater to their household, other people they cater to, and number of children in school.

Satisfaction with Touton

"Touton field officers are patient and accommodating of my needs and concerns. In fact, I trust them because I believe they have the knowledge to help me improve my farm."- Mercy, Touton farmer

• Many farmers felt the data they shared on their income and expenses was inaccurate because they did not keep records and could not remember the figures. Some noted that if they had been warned, they might have thought about their expenses and income sources prior to the interview and going forward, would try to document them.

Satisfaction with Touton

Proof of Impact

Future output will determine my future continuity of the plan. If good, then I continue. – Touton farmer

An important part of the midline assessment was to understand farmers' degree of satisfaction with their experiences with FarmGrow and their satisfaction with their agronomists or other relevant staff.

- Overall, there appears to be a high degree of satisfaction and trust of Touton and agronomists. Mercy shared, "Touton field officers are patient and accommodating of my needs and concerns. In fact, I trust them because I believe they have the knowledge to help me improve my farm."
- **Trust matters to the farmers.** Agronomists recognize this as well. *"You have to gain their trust. They have to see it as a conversation."*

- Most report their intent to sell all or most of their beans to Touton. Isaac shared, "*I'm 100* percent satisfied with Touton but the timing in carrying out some of the activities are really delayed. I trust Touton because their method works. I will sell exclusively to Touton because of the teaching they provide."
- Some support services come too late. Some farmers reported that trees can be sprayed too late. One farmer mentioned that he was dissatisfied with a particular brand of fertilizer since "*I've yet to see any benefit from it.*" Another farmer indicated he trusted 90 percent of Touton's recommendations and will sell them some, but not all of his beans because "*they refused to come by and cut down my old trees and re-graft them. They recommended that and I waited for them and they never came by. Future output will determine my future continuity of the plan. If good, then I continue. Touton should be transparent and honest with us.*"
- Female farmers generally feel Touton understands their particular needs and does not discriminate against them. Comfort shared, "*There is no discrimination between men and women*"; however, she does not feel like she can do the spraying and pruning herself, as recommended. Joyce feels that "women are [Touton's] priority. They really encourage us to find a savings group or to save our money in a savings account." Rebecca wishes Touton would help her more on labor, such as weeding the farm and inputs. She also appreciates that they have trained her on some new recipes. She plans to sell her beans to Touton since she's already seen promising improvements: "I'm happy when I enter the farm." Another female farmer shared that she felt Touton supports women who grow vegetables with agrochemicals and she hopes this support continues. She would like more help transporting her beans from the farm to the house to dry. Bismarck, one of Touton's agronomists, shared that while male and female farmers are often the same, female farmers need more time between sharing the recommendations and when they can make a decision.
- When asked if they would like to be grouped with other farmers with similar plans, **most liked the idea of sharing lessons and challenges with farmers facing the same recommendations**. Many of them already discuss their plans with other farmers in their community, but liked the idea of learning from peer farmers.
- **Farmers appreciate the training and education that Touton provides.** "*I will sell to Touton because of the training they provide.*"
- For some, **the relationship with the PC seems critical to them selling their beans to Touton.** One farmer shared he only sells 50 percent of his cocoa due to his relationship with the PC, "*He is not so good.*" He would like to see the PC work on more unity among the farmers in the area. His wife agreed. Her advice was for Touton to "*be sincere with its farmers and fulfill their promises.*"

Most Significant Change

While only some of the farmers had completed a monitoring visit which signifies the amount of time the agronomist and farmer feel is the right time to check the progress in their FarmGrow plan, all were asked about their perception of any changes they have experienced in their experience with FarmGrow.

- Most reported seeing some improvements in yield and improvements on the farm due to adhering to Touton's recommendations. For example, Joyce only brought in 4 bags when she first starting working with Touton and now produces 12 bags. Rebecca has gone from 6 bags last year and she expects 15 this year. She has already pulled in seven bags so far. Mercy projects selling 12 bags of cocoa compared to 4 bags sold in the minor crop season in May of 2019.
- Some farmers felt the most significant change that has happened in their community is that **some farmers have agreed to cut down some of their trees.**

Discussion and Recommendations

The midline assessment set out to explore farmer satisfaction as well as progress made with their engagement with Touton and agronomist input from both Ecom and Touton regarding their experiences in engaging cocoa farmers with FarmGrow.

The assessment found that the majority of Touton farmers were recommended to replant and conduct extra soil management activities. Extra soil management was also part of almost all farmers' plans in conjunction with some other core recommendation. When the core AOs were assessed, pest disease and sanitation and weeding were the AOs that experienced the largest gains at the monitoring visit while there were substantial decreases in fertilizer formulation and pruning.

There was very little change in yields an expected decrease in yields for all farmers between 2018 and 2019. Yields decreased for both male and female farmers, though slightly less so for the female farmers.

Among the same farmers that had completed a monitoring visit, 93 percent received a "Fail" on their plot assessment, and seven percent received a "Non-critical Fail." This means most farmers had not made the changes that they agreed to make by the time they met with the agronomist for their monitoring visit. Most

farmers noted financing challenges as the key reason for non-adoption of the good agricultural practices.

In addition to the financing and skill/confidence challenges, the qualitative interviews suggest that the reason for poor

Most Significant Change

"It's the seedlings. The farms in this area are aging. Some farmers have agreed to cut down their trees and replant." – Touton Farmer

adoption of the recommended practices may have to do with how farmers see their plan: instead of being able to state their specific priorities, they tend to reference other "easier" agricultural practices as being their priorities, such as weeding. There are pros and cons to this potential finding. The recommendations provided by FarmGrow are those that match the land potential to the farmer capacity. This means some farmers received recommendations that are both financially (replanting results in foregone income while trees mature) and mentally difficult (replanting is "like death") to pursue, but that will result in the greatest benefit in the long-run. Therefore, while the recommendation to replant is the most strategic, farmers may choose smaller, easier wins to gain some momentum to putting their plan into action. In essence, both approaches are a type of business "plan". You can either focus on an individualized recommendation, i.e. Replant + Extra Soil Management, or focus on the broader recommendations, i.e. follow the 14 AOs, which all are assumed to be equally important (and therefore, no AO is necessarily prioritized over another).

Research on farmer field schools, which provide broad recommendations applicable to all farmers, such as the 14 AOs for cocoa, shows that generalized agriculture training has large positive impacts. On average farmer field schools result in a 13 percent increase in yields and 19 percent increase in profits per unit of land.ⁱⁱⁱ Other research has also shown that the impact of extension services is significantly stronger for smallholder farmers with access to formal credit.^{iv} Research on business planning suggests that having a business plan positively impacts business revenues and profit.^v In Mexico, business mentoring (individualized recommendations) was found to improve business productivity (in terms of sales).^{vi} In Peru^{vii}, when business training and mentoring were compared, business mentoring achieved improvements in productivity in the short-term, but the benefits of business training were equal to business mentoring in the long run. The characteristics of the mentor also appear to matter.^{viii} This research on non-agriculture focused business practices and revenues.

• Recommendations:

- These findings suggest the FarmGrow team needs to decide how important it is that farmers can articulate their specific plan. This will have influence on how farmers mentally and financially align themselves to an agreed plan that is being used to monitor progress over time.
- Engagement with the agronomists to understand how the plan is communicated to the farmer should be studied further. How farmers understand their specific priorities comes through the engagement with the agronomist. Given farmers are relying heavily on the pictorial calendar in the farmer field book, the articulation of the FarmGrow plan may need to reconsider how to ensure this responds to low literacy rates among the farmers.
- FarmGrow may need to consider how SMS messaging or IVR messaging can support reminding farmers about their specific plans given the motivation farmers may need to stay aligned with their plan.
- While financing has continually been explored by the FarmGrow team, it will be critical that financing sources are identified that are aligned with the specific investments farmers need to make, even if the financing is aligned with non-cocoa agricultural activities. For farmers that are replanting, alternative income sources will be critical to fill the income gap.

The finding that both primary and secondary farmers (often a husband and wife pair) are not engaging together with the agronomist and are not discussing the FarmGrow plan with their spouse or other decision makers is somewhat concerning, given the impact the plan could have on household finances. Farmers that choose to replant could be seeking alternative ways to generate income while trees are not producing cocoa. This could have important impacts on the other income generating activities that are managed by the farmer or other household members. Given women are more likely to have non-cocoa income sources, this could have the most negative impact on her income sources. Research has shown that joint agricultural decision-making between men and women in the same household improves conditions for the household as a whole, when compared to decision-making only by the man.^{ix} Joint agricultural decision-making has shown to result in improved soil fertility practices^x, improved tree management practices, ^{xi} and increased use of improved seeds and sustainable land management practices^{xii}. However, studies related to money management demonstrates the complexities of joint decision-making. Research in Uganda found that among couples, when a husband hid his money from his wife, this had negative consequences for the household; however, when women hid money from her husband, they had better economic outcomes.^{xiii} Given women tend to

have little decision-making power and control over income, hiding money is one way to maintain control. Other research has found similar dynamics as those discovered among cocoa growing households^{xiv}: while men tend to report discussing the FarmGrow plan with their spouses and obtained their agreement with the plan, most women contradicted this and in fact many shared they had no information on the plan. This same study posits that if only one spouse is interviewed regarding decision-making and control over household decisions, this can lead to erroneous conclusions.

• Recommendations:

- These findings suggest that FarmGrow and/or the cocoa buyer partners need to consider how women can be directly or indirectly engaged in the FarmGrow plan. Given women are supporting cocoa production, either through weeding, harvesting, drying of beans, overseeing the farm overall in female-headed households, or eventually inheriting land at the passing of her husband or through parents,^{xv} women could benefit from training related to cocoa even if it's not provided through direct agricultural extension.
- Creative mechanisms should be explored to support collaborative household decisionmaking. This could take the form of community dialogues that discuss the roles that women play on the cocoa farm, either directly through support or indirectly through providing other income sources for the household, creative uses of technology that could assist farming households in considering the impact of different decisions on the farmer as well as the household income. Various game-based technologies have been shown to help farmers improve their knowledge and understand the impact their decisions can have in a risk-free environment.^{xvi}

A final key finding from this assessment is the risk of data quality in the FarmGrow system. Farmers identified that providing income and expense data was difficult and that they realized after the fact, they may have missed some income or expenses sources. Also, given one household member was likely interviewed (instead of all decision-makers and income earners), this likely resulted in inaccurate estimates of household total income and expenditures. Finally, farmers voiced the length of the interviews was long, resulting in interview fatigue and perceived limited short-term value. FarmGrow has taken a several day process and reduced it to a several hour process, efficiencies have already been gained through digitizing the process and automating some of the recommendations to the farmers based on their own data. There remains room for improvement. A growing body of literature suggests survey fatigue can result in measurement and misclassification errors.^{xvii} Given the importance of this information for developing individualized recommendations, measurement and misclassification errors could result in over or underestimating a farmer and farm's potential and resulting in negative consequences for the farmer. Moreover, there are either data collection errors or adaptations that may need to be explored further. Several data cleaning efforts resulted in the need to split up agronomist and "coaching" visits. Coaching visits are often completed by those trained to complete the assessments but who do not have the extensive agronomy background. While data was not shown in this report, there were noticeable differences in scoring of farmers and yield estimates between agronomist and coach visits. Also, monitoring visits do not ask for the farmer's perception or satisfaction with the process or the changes they are seeing on their farms, limiting FarmGrow's interpretation of changes experienced at the monitoring visit.

• Recommendations:

• FarmGrow should address the survey length as well as the criticality of some measures and their accuracy for the individualized farm investment plans. For example, the category of

"other" that is being used for explaining reasons for not adoption needs to be expanded to include more specific reasons for non-adoption. Also, the capture of income sources used by the household should be a list of probable income sources that serve as prompts that households can reply "yes" or "no" to.

- Given the infrastructure from FarmGrow was developed in Indonesia with cocoa farmers and additional questions were added for the Ghanaian adaptation, the team should consider which questions are critical for the plan and consider removing the nice-to-have data points or validate their utility for other information needs.
- Additional interviews should be conducted with the agronomists to gather their input on how they might explain the negative change in planting material.
- Cocoa buyers who integrate FarmGrow should consider identifying where they can streamline duplicative data collection activities. For example, there are often separate systems for certification that require similar data as those required for FarmGrow. FarmGrow potentially could be leveraged for certifications and other data collection needs.
- Soft skills training may be necessary for agronomists and coaches to reduce farmer anxiety and ensure farmers fully understand the reason behind the data collection of income and expenditure. Alternatively, FarmGrow can consider researching proxy measures for income and expenditure that may result in similar recommendations and reduce the survey length.
- Data collection and entry errors have resulted in months of data cleaning and deserve attention, particularly during the training and supervision of agronomists and coaches. These data errors can significantly change the interpretation and use of the data for decisionmaking.

Conclusion

In 2018, the Global Forum for Rural Advisory Services (GFRAS) published a working paper on the approaches that work in rural advisory services.^{xviii} Through consultations with researchers, experts and organizations, good extension and rural advisory services can be described as those that:

- Directly contribute to use of agricultural innovations to improve livelihoods and skills,
- Improve effectiveness and efficiency of extension functions and that increase access to agricultural innovations,
- Successfully engage men and women and are inclusive (engage marginalized groups such as women, youth, and the poor),
- Are adapted to the local context and conditions and fit local sociocultural, ecological, economic and political conditions,
- Embrace "pluralism"—which recognizes the provision of advisory services being provided by different entities in the same location,
- Increase accountability to rural clients,
- Develop human resource capacity, and
- Are sustainable.

FarmGrow is designed to be a sustainable, front-line support service that results in personalized farm investment plans for cocoa farming households. In many ways it responds to description of ideal advisory services above. However, there is room for improvement, particularly regarding engagement of women and improving efficiency further for the agronomists and the farmers. While outreach to youth was not fully

explored in this report, the data show approximately 20 percent of the farmers are classified as youth. Without specific actions designed to better target women and youth, it is unlikely that significant changes in outreach to these groups will improve.

The results show that farmers are satisfied with the individualized support for their farming activities but they also want to see results given the many data collection activities and perceived limited value received from prior projects promising results. Some appear to already see improvements in their yields despite the short time period that has passed. This will be important momentum upon which to build.

Annexes

Adoption Observations and Rationale

A	doption Observations	Mechanism to monitor	Rationale
Plant	1. Planting Material - Genetic	Interview and	Plant material determines maximum vield - it must
Material	Potential	Observation	produce 1.5 MT/ha or more
	2. Tree Age	Interview and Observation	Trees over 25 yrs. old must be replaced as they are or will soon be in decline
Farm Condition	3. Tree Density	Observation	We need maximum production per ha and need between 800 - 1350 trees/ha
	4. Tree Health	Observation	If many trees are in poor health, it is better to replace
	5. Debilitating Disease	Observation	If there is a disease such as CSSV, trees must be replaced
	6. Pruning	Observation	Only good pruning will ensure both energy and nutrient sequestration to pods
	7. Pest and Disease (P&D) and Sanitation	Observation	Only good P&D management will protect high pod load
GAP	8. Weeding	Observation	Good weeding allows fertilizer uptake by trees
	9. Harvesting	Observation	Good harvesting (leave nothing on the tree) to reach highest production
	10. Shade Management	Observation	Light shade is wanted to allow enough sunlight, but also some stress protection
	11. Soil Condition (pH separately)	Observation	Only good soil condition (not too argillic, sandy, rocky etc.) allows high yield
	12. Organic Matter	Observation	Organic matter supports high microbial activity
Soil	13. Fertilizer Formulation	Interview	We need all nutrients, and in the right ratios, whilst we avoid Urea and Ammonia
	14. Fertilizer Application	Interview	We need enough fertilizer, in the right place at the right time to support 1.5 MT/ha

Adoption Observations and Assessment Summary

Rating	Criteria
A. Plant	Material Genetics
Plant Ma	terial: What is the yield potential of planting material used at the farm?
Good	Interview: • >80% of Plant Material sourced after 1990 from research station, extension service, accredited plant material distributor OR • if historical known Yield reached 1500kg/ha Field observation: • Identification of clone or hybrid OR • If in peak season: yield on tree

Medium	Interview:
	• >80% of Plant Material sourced before 1990 from research station, extension service, accredited
	plant material distributor <u>OR</u>
	• if historical known Yield was between 900-1500kg/Ha
	Field observation:
	• If in peak season: yield on tree
Bad	Interview:
	 Plant Material source not known or taken from farms with unknown parentage OR
	• if historical known Yield never reached 900 kg/Ha
	Field observation:
	• If in peak season: yield on tree OR
	• other indicators of low yield potential i.e. 70/30 yield distribution
B. Farm	Condition
B1: Tree	age: Are the trees above or below the theoretical maximum production threshold?
Good	Interview:
	• <26 years
	Observation:
	• best judgement
Bad	Interview:
	 26 years and older (age 25 - 30 graft or replant, > 30 only replant)
	Observation :
	best judgement
B2. Tree	density: Does the density of trees support targeted production per hectare? (i.e. spacing
between	trees as proxy to number of trees and average density)
Good	Observation:
0000	• Farm has adequate density (800 – 1320 trees per ha)
Bad	Observation:
Dau	• Earm has near density (<800 trees per ha or more than 1320 tree/ha)
P2 Troo	• Fail has pool density (<800 trees per ha of hore than 1520 tree/ha)
bs. free	nearth. Are the trees on a farm hearthy enough to support targeted yield?
Good	Observation:
	 >80% trees are healthy and without physical damage
Bad	Observation:
	 >20% of trees look unhealthy with irreparable problems (i.e. cannot be fixed by GAP or soil
	management) <u>OR</u>
	•20% of trees with physical damage
B4. Debil	itating disease: Is the farm free of any signs of major diseases that may imperil the farm?
Good	Observation:
	No observable CSSV on the farm
Bad	Observation:
	Evidence of CSSV on the farm

C. Good Agricultural Practices

C1. Pruning

Good	Observation:
	Hybrid Trees, >90% of trees must have:
	• Max height of the tree: < 4.5 m <u>AND</u>
	• 3-5 main branches <u>AND</u>
	• All main branches visible <u>AND</u>
	 >50% of leaves capture direct light <u>AND</u>
	 Good aeration under and in the tree canopy <u>AND</u>
	• chupons on <10% of trees
	Other criteria to support positive judgement
	• Height of Jorquette: <1.5m <u>AND</u>
	Branches exhibit vertical growth habit <u>AND</u>
	 Canopies of trees do not touch (CSSVD prevention) <u>AND</u>
	Mostly single stem trees
	Clonal Trees, major criteria of all trees:
	Observation:
	• Height of tree < 3.5 m <u>AND</u>
	• 2-3 main branches, in balance, clearly visible <u>AND</u>
	 >75% of leaves capture direct or a lot of indirect light <u>AND</u>
	 good aeration in the whole farm <u>AND</u>
	• chupons on <10% of trees
	Other criteria (to support positive judgement)
	• Branches exhibit vertical growth habit AND
	Connection of the end to end to the other (CCC)/D represention

• Canopies of trees do not touch each other (CSSVD prevention)

Medium	Observations:
	Hybrid Trees, >90% of trees must have:
	 Max height of the tree: < 5 m AND
	• 2-5 main branches, in balance <u>AND</u>
	• all main branches are visible AND
	 50% of leaves likely to capture direct and indirect light <u>AND</u>
	• good aeration <u>AND</u>
	• Chupons on <25% of trees
	Other criteria to support positive judgement
	Height of Jorquette: 1.5-2m <u>AND</u>
	 Branches exhibit at least some vertical growth habit <u>AND</u>
	• <25% - 50% of canopies of trees touch each other <u>AND</u>
	Mostly single stem trees
	Observations
	Clonal Trees. >90% must have:
	• Height of tree < 4.5 m AND
	• Max 4 main branches, in balance, clearly visible AND
	• 50-75% of leaves likely to capture light AND
	Good aeration
	Other criteria to support positive judgement
	Branches exhibit mostly vertical growth habit <u>AND</u>
	• Some (<25%) canopies of trees touch each other AND
	• Chupons on <10% of trees
Bad	Observations:
	Hybrid Trees, most trees on the farm have
	• Height of the tree: > 5m OR
	 Only one stem until crown or >5 main branches, poor balance, some or most main branches not
	visible <u>OR</u>
	• Most leaves are not likely to capture light and trees are not aerated well under or within the canopy
	• >25% chupons on the trees
	Other criteria (to support pogative judgement)
	• Height of lorguette: >2m OP
	Most branches have berizontal growth babit. OP
	• Nost branches have horizontal growth habit <u>OK</u>
	• $r_{23\%}$ of catopies of trees touch each other OK
	Observations:
	Clonal trees, most trees have
	• Height tree > 4.5 m <u>OR</u>
	• >3 main branches, poor balance, most branches not visible <u>OR</u>
	• <50% of leaves do not capture enough light <u>OR</u>
	• poor aeration under or within canopy <u>OR</u>

	Other criteria (to support negative judgement)
	 Branches exhibit mostly horizontal growth habit <u>OR</u>
	 >50% of canopies of trees touch each other <u>OR</u>
	• >25% cupons on the trees
C2. Pest,	Disease and Sanitation: What is the Pest and Disease (P&D) and Sanitation condition for
supporti	ng or limiting the yield potential of the planting material?
Good	Observation:
	P&D
	• Spread of pest disease is low measured by few pods and branches affected on < 10% of the trees OR
	only in a few pockets on <10% of farm area) <u>AND</u>
	the P&D presence causes little loss
	Sanitation
	• trees are nearly free of diseased damaged wilted dead or mummified pods eninbytes or ant nests
	and tunnels AND
	 no diseased plant material on the ground near the tree
Medium	Observation:
	P&D
	• < 25% of trees have significant presence of non-debilitating diseases on pods, stems and branches
	leading to loss of <15%
	Sanitation
	• < 25% have diseased, damaged, wilted, dead or mummified pods, epiphytes, dead branches, or ant
	nests and tunnels <u>AND</u>
	• <25% of land have some diseased plant material on the ground near the tree
Bad	Observation:
	• > 25%) have significant presence of non-debilitating diseases on pade, stoms and branches leading to
	significant loss of >20% OR
	• The spread of diseases to many trees all over the farm
	Sanitation
	 > 25% of trees have diseased, damaged, wilted, dead or mummified pods, epiphytes, dead branches,
	or ant nests and tunnels <u>OR</u>
	 >25% of land has diseased plant material on the ground near the tree
C3. Wee	ding: What is the weeding condition for supporting or limiting the yield potential of the
planting	material?
Good	Observation:
	• The ground under the canopy of trees is kept clean of undesired undergrowth and very little weed is
	visible
Bad	Observation:
	• Undesired undergrowth or weeds up to knee height on >10%) of the farm and outside canopy of
	cocoa trees <u>UK</u>
CA Harri	• >10% of area under canopy of cocoa trees has weeds
C4. Harv	esting: what is the narvest condition for supporting or limiting the yield potential of the
planting	material?

Good	Observation:
	 Few over-ripe pods on maximum 10% of the trees <u>AND</u>
	 <10% under-ripe pods harvested (if this can be observed)
Bad	Observation:
	 >10% of trees have over-ripe pods <u>OR</u>
	 >10% of harvested pods are under-ripe (if this can be observed)
C5. Shad	e: What is the shade level for supporting or limiting the yield potential of the planting
material	?
Good	Observation
	• Good shade is light shade which can be measured by 70 - 80% of sunlight reaching the canopy of most
	cocoa trees <u>OR</u> presence of 12 to 18 large shade trees of >20 m tall per ha <u>AND</u>
	 >75% cocoa trees receive shade during part of the day <u>AND</u>
	• Shade trees are compatible with cocoa i.e. no host of disease, no competition for root or canopy
	space, no breaking branches
Bad	Observation:
	Bad shade is insufficient shade or too much shade which is measured by $<70\%$ or more than 80% of
	sunlight reaching the canopies of most cocoa trees <u>OR</u> < 12 or > 18 large shade trees of > 20m tall per ha
	OR
	• <75% receive shade during part of the day OR
	• Shade trees that are not compatible with cocoa i.e. host of disease, competition for root or canopy
	space, no breaking branches
D. Soil F	ertility Management
D1. Phys	ical condition of farm land (soil condition): What is the physical condition of the land and its
limiting	factors for cocoa cultivation?
Good	Observation:
	• No signs of erosion, no roots visible on the surface <u>AND</u>
	• few rocks or gravel on farm surface or in the ground as measured by 3 holes of 30 cm deep per plot
	AND
	• soil is neither too sandy or argillic as measured by touch/roll test on soil from 3 holes of 30 cm deep
	per plot <u>AND</u>
	 well drained either naturally or through drainage canals <u>AND</u>
	• slope < 15%
Bad	Observation:
	 signs of erosion, roots visible on the surface <u>OR</u>
	 many rocks or gravel on farm surface or in the ground as measured by 3 holes of 30 cm deep per plot
	<u>OR</u>
	 soil is too sandy or too argillic measured by touch/roll test on soil from 3 holes of 30 cm deep per plot)
	• poorly drained (waterlogged) <u>UK</u>
D2 C	
D2. Orga	nic Matter (Soil Health): What is the volume and level of decomposition of organic matter on
and in th	e soil and what are other indicators of soil health i.e. worm, insect activity and microbial life

for supporting or limiting the yield potential of the planting material?

Good	Observation:	
	• Clear signs of microbial activity everywhere on the farm with multiple layers of decaying organic	
	material covering the soil under the cocoa canopies of all trees, worms, worm castings, insect activity,	
	soil pores <u>AND</u>	
	• Organic material left in the farm and/or extra organic material (compost, manure) around cocoa trees	
	or in 'mulching rows or trenches' evenly spread through the farm (note: pod husk left in the farm is a	
	strong positive indicator)	
Bad	Observation:	
	 >10% of soil under the cocoa tree canopies is exposed without at least one layer of decaying organic 	
	material <u>OR</u>	
	• Little or no signs of organic material in the farm or microbial activity in the soli	
D3. Fertilizer Formulation: What kind (formulation) of fertilizer is used at the farm i.e. nutrient		
content, nutrient balance and non-acidifying and does it support or limit the yield potential of the		
planting material?		
Good	Interview:	
	• Use of well-balanced NPK + Secondary + Micro nutrients fertilizer with N in CaNitrate AND	
	No use of Urea <u>AND</u>	
	• If pH <5.7 apply mechanism to add Ca to soil i.e. use relevant dose of lime, higher doses of Nitrabor,	
NA - 1 ¹	more organic material etc.	
iviedium	Interview	
	• Ose of Ammonium based NPK + Secondary + Micro nucleurs fertilizers with reasonable nucleur	
	No use of Lirea AND	
	 If nH <5.8 apply mechanism to add Ca to soil i.e. use relevant dose of lime higher doses of Nitrabor 	
	more organic material etc.	
Bad	Interview	
	Use of poorly balanced fertilizer <u>OR</u>	
	• Use of Ammonium based N without additional lime, Kieserite or Dolomite OR	
	• Use of Urea	
D4. Fertilizer application: How is fertilizer used i.e. dosage, timing and application technique, and does		
it support or limit the yield potential of the planting material?		
Good	Interview	
	For details see manual	
	For Mature trees and to sustain 1.5 mt/ha <u>AND</u>	
	 > 700 kg/ha of all fertilizer combined excluding lime/dolomite <u>AND</u> 	
	• applied under the leaf litter or in the soil at the root system of the trees <u>AND</u>	
	applied at least once per year	
Medium	Interview For data is a manual	
	For details see manual	
	For instaure trees and to sustain 1.5 mt/na AND ~ 100 and ~ 100 kg/pa of all fortilizor combined evoluting line/dalamite AND	
	• applied mostly under the leaf litter or in the soil at the root system of the trees AND	
	applied mostly under the lear filler of in the son at the root system of the trees <u>AND</u> applied at least once her year	
	• applied at least once per year	

Bad	Interview
	For details see manual
	For Mature trees and to sustain 1.5 mt/ha OR
	 < 400 kg/ha of all fertilizer combined excluding lime/dolomite <u>OR</u>
	 mostly applied close to trunk or far from tree root system, applied on leaf litter <u>OR</u>
	 applied <1 time per year

Farmer Stories

Comfort

Recommendations: Replant + Extra Soil Management, has completed a monitoring visit



Comfort was born in 1963 and is 56 years old. She is divorced. She has 6 children: 2 girls and 4 boys. She's had her farm for longer than her daughter is old, so about 30 years. She inherited her farm from her mother and father. She used to live in another town but when her parents died, she came home to take over the farm. Prior to that, she was really suffering trying to take care of her children. "It was a very difficult life," she says. When she first came to live in her village, there was no shelter for her to live in. Her children had to eat at other people's homes.

Comfort has two different farms. Her sister's son, Eric, helps her on the farm. Her daughter sometimes also supports her, but her daughter primarily takes care of her trading business where she sells eggs, food (banku) and other items. Her daughter recently finished school so she is helping more now. Petty trade and the sale of other crops are the only other income sources her family has outside of cocoa.

She also grows cassava, plantain, and cocoyam. Cocoa is her primary income source, followed by petty trade and then by other crops. She also raises goats. She saves about 5 cedis every day—Monday through Friday—with the susu. She also saves with a VSLA and has about 283 cedis in savings. IN that group, she saves about 10 cedis each time.

She doesn't think cocoa has changed much. It will continue to be her primary income source unless the farm were to burn down. Rainfall patterns, however, have been irregular.

Most farmers in this area, she says, don't rely just on cocoa. It would not be enough, so they do other crops as well, like vegetables (onions, tomatoes). Most also raise goats, pigs, or sheep. Some also do palm oil. But cocoa is still the most. With this year's harvest, she hopes to have about 30 bags compared to last year's 28 (it takes 1000 pods to make a bag of cocoa beans). One farm is older than the other, it is about 5 acres. The younger farm has lots of weeds. To clear land for both cocoa and for planting her other crops, she uses slash and burn. She first plants maize. She raises livestock for both consumption and for money. She doesn't purchase more livestock because as they reproduce, she will sell them. Comfort joined Touton in 2012 and joined the FDP in 2018 (August of last year).

The recommendations she received were pruning, weeding, fertilizer application and applying insecticides. She will prioritize weeding first (if not, this weakens the foundation for the cocoa) then pruning (she wants sunlight to flow in) and then insecticide (if you don't prune, the insecticide won't be as effective).

When asked about her farm development book provided by Touton, she shared that she likes the visuals in it. The calendar with the pictures matters most to her. She didn't have a copy of her FarmGrow plan. Eric, her nephew, is the main person she discusses the farm with but also her daughter. Eric and Comfort go together to sell her beans. There hasn't been a major disagreement between them. She's very receptive to suggestions from her nephew.

Right now on her farm, she's primarily spending time weeding. They've suspended pruning and focused more on harvesting. They'll prune in January.

She doesn't feel it's hard to adhere to the plan. But for both weeding and pruning, they'll pay laborers to help. They pay about 5 cedis per day (about 25 cedis per week) for labor...and these people help with pulling weeds, gathering beans, helping transport them. It takes about 65-90 cedis per treatment of insecticide. They will do this on credit with the purchasing clerk. Once she sells her beans, she pays off the clerk.

Recently, her key challenges have been having black spots on the pods—this results in rotten pods. She says this is caused by a lack of insecticide. The challenge is regularly applying the insecticides.

Comfort is most excited about the progress unfolding before her eyes. *"When we started working on the recommendations, we can already see the benefits. My farm is doing well. It's starting to work."* She's really liked the process so far. She likes receiving personalized coaching, on how to do things like pruning. Bismarck is her field agent. He shows her the proper way of breaking the pods.

She was comfortable sharing her income data for the investment plan because she could see it would be beneficial. She had an opportunity to also ask questions during the interview. She can call Bismarck when she has questions and she also frequently visits the Rural Service Center. She had a hard time recalling her exact income and expenditure.

When asked how she thought other women and men would feel about sharing their income, she shared the men won't be honest. They will be angry if they know their wife is sharing this information. *"Where there is money involved, there are always issues."* For this reason, women won't be truthful. They won't share accurate information.

When she gets her harvest income, she divides it in three: she pays for education with a third, puts a third back into the farm, and saves for emergencies. Every Wednesday, her daughter participates in a VSLA/susu

group on her behalf. There are 5 boxes and she puts 6 cedis in each box, each week (in addition the susu who comes around where she deposits money daily as well). They aren't sure why there are 5 different boxes. With her savings group, if she needs credit, she can take some from the group but she also borrows from the purchasing clerk. It's a soft loan without interest...she pays the purchasing clerk back when she sells the beans.

All the farmers with similar land size will work on each other's farms so that it's a fair amount of shared labor. This is a type of "group capital". There are rules to the group. If you come late to start labor, you pay 20 cedis. This is money that they use at the end of the year to purchase something for the group. They work together to break pods, dry, transport, etc. There are many groups like these that help each other.

What she'd like from Touton? They have given her free boots, sometimes free insecticides. Other projects also give things out for free, like Cocoalife (Mondelez). What she'd like is a spraying machine, the insecticide and the protective spraying gear, and something to help with the transport of the beans from the farm to the home where she dries them.

How does she decide who to sell her beans to? Mondelez is getting their own license to be a Licensed Buying Company (LBC). They may start buying soon but she would still sell to Touton. She has a good relationship with the agronomist. She doesn't doubt him. She reaps the benefits of his advice. Sometimes Bismarck visits. She'll give him plantain to say thanks. Every week she sees him as he passes by her home on his way to other homes. He checks on her.

Her parents also sold to Touton. Now she works with them. She's not worried about someone else giving her a better price. She values the long-term relationship she's had with Touton.

How does she feel about the idea of belonging to a group of farmers who have a similar plan? She likes the idea. They could help support each other.

Most significant change: Her livelihood has improved. She can now take care of her children, some children are in a training college, some have graduated from college (she's really talking more about her time with support from Touton).

Change on community level? Touton has facilitated community sharing. They bring the community together and they can share with their peers.

Her opinion about how they treat women? No discrimination between men and women. She doesn't feel like she can do spraying or pruning.

Eric

Eric is 43 and single and is the nephew of Comfort. He's been a cocoa farmer for about 5 years. He became a cocoa farmer because it is a family business and a source of income. They have one farm. His "sister" (aunt) helps him run the farm. They also grow plantain and cassava on the farm. Cocoa is their primary income source and he thinks this has changed over time and more and more farmers are relying on other

income sources. They also grow maize. He thinks raising animals generates the second most significant income. They use slash and burn to clear their lands and this is used most on other crops than cocoa to prepare the land for planting.

The recommendations they received were to apply chemicals and maintenance pruning. Spraying chemicals (insecticide). They did the spraying since the cocoa leaves were shrinking and the agent recommended a chemical for them to apply. He appreciates the booklet and it has been helpful with planning for future implementations and practices on the farm.

They've already completed the spraying on the farm (as part of the plan). They still need to do the maintenance pruning. It's been easy to adhere to the plan because most activities involve personal labor without a lot of cost. He's most excited about the idea they might bring in an increase in yield. As part of the FDP, he liked the data collection experience, liked the number of times the agronomist visits, and was ok with sharing his income and ok with the recommendations they received.

He doesn't feel any anxiety because he feels the agronomist deserves to know my farming information (in regards to sharing his income/expense information). He also didn't feel concerns sharing his information with his sister (aunt). He didn't feel the information he shared was that accurate because he hasn't kept records and had to recall most figures from memory.

They've made no financial investments on their farm. He is concerned about his lack of access to credit because he'd like to make additional investments on the farm. He feels confident that if he received credit, he'd use it to buy chemicals for spraying. Credit is most needed at the beginning of the season. From Touton, they've provided pruning equipment and coaching on pruning. He'd really like Touton to provide the spraying equipment. He's satisfied with the relationship with Touton and has a lot of trust in the advice they get from Touton because of the progress they see when the advice is applied. He indicates there are not yet any other LBCs in the community.

He decided to commit to the FDP because of the sensitization that Touton did. He was made to understand its advantages. He's hoping to gain more knowledge and yield from the plan. He'd like to be part of a group of farmers who have a similar plan. He'd like to share his experiences with others. He has no feedback for Touton.

At this stage the most significant change they've experienced is an increase in yield from 4 bags to 6 bags within a short time of implementing the plan. He thinks others in the community have also increased this yield.

Agatha

Recommendation: Plots 1-4 =Extra soil management

Agatha is 64 years old and is married to Maxwell. She has been a passionate cocoa farmer for 40 years. Since inheriting the land from her parents, she has managed 31 acres, of which are 2 cocoa farms. Agatha is assisted in tending to the management of the cocoa trees by her husband Maxwell. Approximately 90 percent of her income is derived from producing cocoa, and the remaining 10% of her income extends from growing a diversity of other crops such as; cassava, coco, yam, pepper, plantains and running a provisions shop. She and her household rely almost solely on the income that is generated from cocoa, which also helps her invest in her family's provisions shop. Agatha views their cocoa product as their primary and most productive source of income and does not foresee this changing in the future.

Around Agatha's community, she has noticed that more cocoa farmers and families are investing in diversifying their income such as growing cassava, peppers, and plantains to be sold in local markets. However, given that most cocoa farmers are diversifying their incomes with different products and businesses, most families agree that cocoa still generates the most income.

When it comes to land clearing for new cocoa plots, one of the most popular methods is slash and burning, which Agatha and her family practice often. Some of the benefits that she sees with slash and burn is that it kills all the pesticides which destroys nutrients of the soil.

Very few farmers in the community use livestock for additional income; however, households do invest in animal production. Agatha's household primarily raises animals for their personal consumption and some will also be sold. She does see that some households are raising more animals for income generation.

In the Farm Grow/ FDP plan, practicing shade management and replanting old cocoa trees was recommended for her plots. Agatha views that shade management will take priority in her plan and since providing shade will give strength to the trees. Going forward with her FDP plan, she has no immediate concerns; however, is expecting that financial assistance in replanting new cocoa trees will be challenging.

While creating the FDP plan, Agatha and her husband, Maxwell, were in a 100% agreement with each other, which elevated any concerns from the household moving forward with FarmGrow. Given that Agatha is the primary farmer of the cocoa farm, she typically makes most or all the decisions on her farm. Agatha is confident that if she focuses on her prescribed FDP plan that her income from cocoa will increase which has given her household excitement about the prospect of growth in the cocoa farming business.

As for the FDP experience, Agatha liked the aspects: of data collection, visits from the agronomist, the information that was shared, and appreciated the recommendations that were shared.

While sharing income and expense information for the development of the plan, Agatha did experience some anxiety, especially since her children wanted to know how else they could her. While answering these questions she did find it difficult to find some answers since she does not practice record keeping. In the future, she has no preference how she would share this type of information in the future. While making financial investments on her farm, she plans to use banking and financial management her cocoa business.

Some farmers have noted the difficulty of gaining access to credit or other financial services to assist them in investing their farmers. Agatha has experienced the difficult process for her and her household to access credit to loans. If offered credit, Agatha and her household would take it to invest more into her provisions store as well as the cocoa farm.

To date, Agatha has not received any support from Touton to help her make the recommended steps from her recommended business plan. Agatha is 100% satisfied with her Touton agronomist and trusts the advice that has been given to her. She trusts the recommendations by her agronomist and believes that it will help her farming business. For now Agatha is hopeful that Touton will help in the long term.

When it comes time to sell her cocoa, Agatha will be selling her harvest exclusively to Touton because she believes in the teachings and assistance they provide. Given the recent change of Touton becoming a licensed buying company, it will not change her decision to sell exclusively to Touton.

Agatha believes that it would be useful to belong to a group of farmers who are also developing these similar plans in order to share and learn new ideas, and would be willing to share her experience with other farmers.

In the future, Agatha would love to see Touton provide the farmers with small loans to expand their current business. At this stage in the FDP process, the most significant change that this has brought is seeing a brighter future for her farm and holds the promise of an income that will last. With the help of Touton, she believes that her family will continue to save more money through an increase of income.

As a woman, Agatha felt that Touton supported female farmers just as much as they supported the men. She believes that Touton understands the needs of female farmers as well. How could Touton improve? By providing tools and loans to farmers.

Maxwell

Recommendation: Plots 1-4 =Extra soil management

Maxwell is the 68 year old husband of Agatha. He's been a cocoa farmer for 23 years. He has 6 farms: 1 farm of 14 acres, one of 22 acres, 1 of 7 acres, 1 farm of 5, 3, and 4 acres each. He indicates he was in agricultural extension and then decided to stop to focus on cocoa farming to have a better income compared to secular work.

He relies on laborers as well as his children who have completed school to help him on his farm. His household also relies on a beer bar, a store/shop, they rear sheep, goats, pigs, chickens. They also have bees (have 30 hives), run a taxi, grow yam, plantains. Cocoa provides about 60% of household income, bees 20%, sheep/goats 10%, and the beer bar about 10%. Cocoa provides most income for his household and for his community. "When some trees die, we replant and can depend on it."

They often use slash and burn to clear their land as it reduces the additional work on the farm. Lots of households rear animals like cattle, pigs, sheep, goats, and chickens. In the absence of cocoa income, these animals provide a means of income, especially for emergencies. They don't invest more due to land availability constraints.

For his recommendations for his farm plan, he was recommended to:

• prune

- mistletoe removal
- weed about 3 times per year
- apply fertilizer
- apply Touton recommended agrochemicals
- remove/dispose of chemical bottles
- provide a warning sign that the farm has recently been sprayed with chemicals
- wear protective clothing.

He decided to prioritize:

- 1. weeding
- 2. pruning
- 3. remove mistletoe
- 4. spray against insects.

This is the best order to make work easier. The documents/plans they provided helped give the timing to undertake the appropriate activities. So far he hasn't faced difficulty in adhering to his plan. He shared his ideas about this plan with his wife, his children, with his laborers and his colleague farmers. "My wife fully agreed to the plan and even reminds my laborers to implement the plan. We discussed the plan together since my wife is also implementing the plan. We make decisions together." He also doesn't feel that the decisions his wife makes about the farm affects his income generating activities. "The document/book given to us has pictures and this helps a lot in telling us what to do each time. I like all the recommendations."

When asked about his experience with the interview about income and expenses, *"it has helped me since I now became aware/conscious of the extent of my expenditure."* He felt, however, that the information he provided was quite accurate and that it was a good average since sometimes you can under or over-estimate.

He feels they can achieve their plan through his own funds and some money he has in the bank. *"Future output will determine my future continuity of the plan. If good->continue."* He does agree, however, that credit is difficult to access. He'd take credit if the interest rate is good and to support his laborers to weed, apply fertilizer and adopt GAPs.

From Touton he notes that his family received a bonus in March, gave our children textbooks and learning materials. Touton also promised to give/pay for laborers to weed 2 acres of one of their farms and provide seedlings. He'd like to see Touton also provide teachers' quarters for their community. *"This will alert us to sell our beans to Touton."*

He's overall satisfied with Touton. He trusts about 90% of their recommendations. He likes Touton more than PBC since Touton gives a bonus. He will sell some of his beans to Touton but not all. *"They refused to come by and cut down my old trees and re-graft them. They recommended that and I waited for them and they never came."*

Maxwell shared that he also belongs to a group facilitated by Cocobod and they also teach GAPs to combat insects. He'd like to share with Touton that they should *"be transparent and honest with us."*

So far, he's experienced already increased cocoa output. So far, the biggest change is that Touton has provided our children with educational materials.

Benedicta – Agronomist

Benedicta is a 29-year-old female agronomist with Touton. She's worked for Touton for three years now. She was with Solidaridad for 1 year and Cocobod for 2 years. She was a teacher before that. There are 6 other female agronomists with Touton but she's never met any of them. When she first joined Touton, she was a mapper...she developed the polygons for the farmers. She's had some interesting experiences. For example, she told a story of being on one man's farm where she was very tired after a long day. While he was gone mapping his farm, two alligators entered the farm and she panicked. She watched them slide into a pond on the farm. When he got back, she told him about the alligators, and he said, *"oh yes, they come every day here to sleep in the pond."*

Benedicta is based out of Sunyani and she travels around the region. She currently meets with about 60 farmers. She met with about 104 farmers before moving back to Sunyani where her family lives. Like the other agronomists, Benedicta drives a motorcycle to access the rural communities. Some of these drives can take up to two hours to reach. During one of the drives we shared with her, we'd already driven about 1.5 hours before we realized we wouldn't reach that community before it got dark. It was an extremely rough road with deep grooves and drop-offs. The ride was jolting. She said this is not altogether unlike the roads she takes. Touton trained her how to drive a motorcycle. She often has to leave her home by 5:30 or 6 a.m. in the morning to reach the communities before the farmers go to their farms. When asked how she felt about driving the motorcycle, *"yes, it can be scary."*

On our first ride with Benedicta, we went to Mongoase. The road was paved and fairly easy. Most farmers walk to their farms, which can take between 30 minutes to one hour to reach, if not more. What she most likes about this job is her contact with the farmers. It gives her more morale to do the work. She admits it is very difficult work: very long days and some days risky, between the dangers of driving a motorcycle on the road to the wild creatures. She's seen her share of pythons and other snakes. What she finds most challenging about this job is the long distance driving. Also, she finds it frustrating when she gives advice to farmers and they don't follow it. It makes her feel like she's not doing her job well. In reality, most women don't do field work like this. *"But I feel like I give farmers hope as I spend more time with them. I am also learning with them."*

When asked how she'd describe FarmGrow? "Well, it's a farm development plan. It requires a farmer to combine the farm and their money together." To prepare for using FarmGrow, Benedicta participated in a training with Solidaridad in 2017. She learned a lot. "It took me to a whole new level. FarmGrow is not just a data collection tool." What she finds most challenging about FarmGrow is that there doesn't seem to be enough support to help the farmer to get from the investment plan to an actual "investment plan." "Their first reaction is they 'don't have enough money.'" She shares that she doesn't think it's fair to expect a farmer to make the leap to "replant" without some baby steps so that they build confidence. They worry

about that fact they still need to put food on the table. Benedicta shares that another challenge she's seen with FarmGrow is that the GPS is not always accurate. Given she has experience using Touton's "metadata" program, she uses that to get the GPS coordinates of the farm alongside FarmGrow. She has more confidence that this is accurate.

Overall, Benedicta feels like FarmGrow helps make her work easier, especially for someone who doesn't have an agriculture background, *"it allows you to learn with the farmer."* She also likes that the system allows her to edit a farmer's profile when you realize you've captured something incorrectly or to simply make something more accurate. She feels like farmers most like the tool because you can tell them the size of their land. They're often surprised, *"Wow, how did you get 5 hectares?"* They don't think she's able to "guess" the size of their land and then they realize she's correct after the mapping. They also like to see the good picture of their family. But they dislike the amount of time the process takes. They also don't like the advice of replanting, *"they feel your whole world comes to an end."*

Women, she feels, face particular challenges. They often access bad inputs. Women often can't afford the inputs and they don't seem to budget for them like men. While she likes to have both men and women farmers present when she's there, it doesn't often happen. It's expensive for women to be there too because they often have other income generating activities they are in charge of. When asked about whether she thinks husbands or wives hide money, she says *"yes, men tend to hide their income from their wives."* To really benefit women, she feels more women need access to savings groups as there don't seem to be many in the area.

When asked how much she thinks the farmers trust the recommendations, she indicates that she tends to spend more time with farmers, because she wants the farmer to be able to speak his or her mind. *"You have to gain their trust. They have to see it as a conversation."* She doesn't always trust the recommendations herself, though. She shared that there was one farmer that had a 12-year-old farm whose recommendation was to replant. *"How do you tell this farmer to replant?"* So she decided to give some additional advice prior to the idea of replanting, even though Touton advised her to just follow the recommendation for the moment. She'd like to see this addressed, but it's not something that happens all the time.

She feels that the most significant change she's seen is the simple fact that farmers are adopting good agricultural practices.

Bismarck – Agronomist

Bismarck is a 26 year old male agronomist that serves the Kasapin area. He's worked for Touton for exactly 1 year and 1 month. He was hired to be a FarmGrow coach but he has also helped with Touton's other sustainability programs, such as Touton's livelihood programs. He indicates that Touton encourages farmers to take up other livelihoods in addition to cocoa, such as growing vegetables. They give recommendations and supply inputs and fertilizer free of charge but they no longer give free seeds away. In school he studied natural resource management, which is related to cocoa. He is naturally drawn to nature. During his studies, he received a project related to cocoa and learned during those studies that Touton might be a place he could match his appreciation for nature with a job.

What Bismarck most likes about his job is the simple act of touching base with the farmers. He enjoys helping to build their capacity. He feels that they trust his recommendations, despite his youth, because farmers know that Touton shares recommendations that are tested. Despite his love for capacity building, he acknowledges it's a tough job and it takes a lot of effort to visit the more than 500 farmers (he mentioned 560 farmers) that he helps oversee.

In his own words, FarmGrow (still known best as the Farm Development Plan (FDP) by Touton farmers and agronomists) provides farmers with recommendations that help them improve their yield. To prepare to help farmers develop their investment plan, he was trained on adoption observations and how to assess and understand them. This was a 2-week training in Sunyani followed by 1 week in the Ashanti region. Then another week with Solidaridad. What he most liked about the training was the hands-on experience it gave them. They practiced what they were taught in the field.

When he's in the field, the one thing that has frustrated him most with the FDP is that it crashes and it's often hard to resolve the crashing in the field, which means you might have to go back and visit the farmer at another time. It takes time for things to resolve themselves. But overall he's satisfied with FarmGrow because he's seeing it result in changes at the farm level, even within one year of a farmer's effort. He feels the farmers are already seeing it, too. The FDP is different from the support they provided before because they go to individual farms and give specific advice instead of providing group-level training. The farmers really like the cost-benefit information they get because it helps them understand the costs they'll incur at specific times of the year. Despite these positive attributes, he admits that the participation in the interviews and the visits take a lot of the farmers' time. This can be a restraint (some farmers can be visited multiple times for various reasons by other organizations...and that little is offered to the farmers for their time).

What he dislikes about FarmGrow is that there is no financial support to the farmers. He feels the program should help with that. He gives recommendations to farmers but sees they are unable to act upon those recommendations due to lack of funds to do so.

When asked about female farmers, Bismarck noted that while most things are similar with male farmers, female farmers need a little bit more time between the sharing of the recommendations and when they can make a decision. Women need to go home and discuss with others before they are ready to make a decision. He simply gives more time to those women farmers to do this so they feel comfortable committing to the plan.

When he visits farms, often wives will join their husbands (who are often considered the primary farmers) for a few times, but they rarely make it to all the visits. He indicates he asks them to join the visits, but often women are not around when he is there or simply do not join. One reason, he feels, is that the visit is time consuming and women often have other things they are doing. Ultimately, he feels both husbands and wives are making decisions together. He strongly believes that women should be part of the financial discussion, especially.

When farmers share their income and expenditures, he doesn't feel that there are any issues since he feels like the trust is there. He feels like it might be likely that farmers overestimate their income when they try to recall their income source. When he compares what he knows about how much a farmer sold in bags with what they reported in income, the numbers don't match up. But he admits that he's not sure if that means farmers are selling to other Licensed Buying Companies (LBCs).

Overall, Bismarck feels farmers trust the recommendations they receive. But he trusts them about 95% of the time. He says sometimes the logic provided doesn't make a lot of sense. For example, why would you suggest pesticides before suggesting that they weed? He will give other advice over and above what the app tells him in those cases.

When asked what he thinks is the most significant change he's seen among the farmers, he notes their increased yield and when farmers understand how they must plan for certain expenses. He feels once farmers see changes on their farm, they may be even more willing to replant.

What he recommends to the FarmGrow team is to help resolve the issue of the program crashing. He's also worried about the number of farmers he must serve.

Anderson and Ebenezer – Agronomists

Ebenezer is 33 and has been with ECOM for 2 years. Ebenezer has been interested in agriculture for a long time, since he was in high school. He studied agricultural science with a minor in crop specialization, since *"Food is our daily need."* What he most likes about his job is being in the field on a daily basis. *"I can impact farmers. I train and coach them and engage with their livelihoods."* What he finds most challenging about his job is the fact that farmers face an ongoing capital constraint. Farmers need inputs like fertilizer and *"they want to take the easy way"* but this is the modern way to make investments in one's farm.

If Ebenezer were asked about how to describe FarmGrow, he'd say, "it's a plan to help farmers invest in their farm and to aim higher to obtain their profits. It helps them to pay attention to their daily expenses. If he wants to improve his yield he needs to purchase chemicals. The tool helps them understand their expenses better. If I do this, this year, I'll get this, next year." They learn, "If I spend more on farming, I get more (money)."

Anderson is 28 and has been with ECOM for one year. Anderson became an agronomist after playing the role of a mapper. Anderson's family also consists of farmers so he went to an agriculture college. He'd really like farmers to see their farm as a business. *"Farmers are poor. I want to help them alleviate this mindset. I want to see them alleviate their poverty."*

What Anderson most likes about FarmGrow is that he sees women sharing their points of view. *"I feel happy for the women at the society level."* What he finds challenging is that farmers always want something. *"How will the company give them fertilizer? If you give them nothing, then that is a challenge."* When they were both asked about the FarmGrow training, they both indicated it was a good experience. Solidaridad gave them the training. They both really appreciated the practical side of the training, getting to practice what they were learning in the field. This helped them a lot. They would, however, like some repetition of this training. *"The FDP is a different ball game altogether."* When asked about what they

meant regarding more training (especially given it's a lengthy training), they'd like periodic refreshers (maybe the first and third quarter), particularly if there are updates to the FDP. They'd also like a certificate from Grameen that indicates they've been trained on the FDP. When asked about the support they've been given regarding the app specifically, they noted their appreciation for the Whatsapp group and they get a good response when they submit support questions. They shared that earlier, they were having difficulty with the app where they were entering a new household and then they'd swipe and the household would disappear. So they panicked, but were told that others in the system could see the data there.

The other challenges they've faced with the FDP is that it's lengthy. *"You don't want to waste a farmer's time."* ECOM also has a system called the SMSI and ECOM's field agents ask many of the same questions. The household questions in particular are the same. *"Could we just solicit these from the SMSI to avoid asking the same questions?"* Then there is a bigger challenge when you ask the same questions and you get different answers (Note: This was also noted during the field visits. Some of the FDP data says a person is 26 but in the field, they'll say they are 36). Then, *"what do you go with?"*

Generally, Anderson and Ebenezer are both very satisfied with FarmGrow. *"We do like it, it helps us engage with farmers. We're able to get an idea of what is happening in the field."* Ebenezer, adds, however, *"What will we do with the other farmers? There is a willingness to join, particularly if we had an input scheme for those FDP farmers."* What they most like about FarmGrow, *"before the FDP, farmers didn't keep records, now they keep records. They are starting to put all their records together."* They also like that the app gives specific timing for actions, such as pruning. Farmers are generally afraid to prune because the *"cocoa will be lost."* They worry about the financial impact.

What is challenging about FarmGrow is the time. *"You have to go to the village and sleep. It's really involving."* Before, ECOM would just bring all the farmers together and train them together. Now everyone is on board...one-by-one. But they note they like this personal interaction. *"You show them the investment plan and then you see them spend more money on the farm than the household, compared to before."* What they think farmers dislike? *"Being told to invest in fertilizer. They feel there is no capacity to do it. If we could help them save up for it, I think they can do it, especially if they save up for it and they can get a discount."* They ask, *"Could the app capture this? Capture their account? We could capture their savings and see about them paying ½ of the cost before the seasons, and the remaining ½ after the season."* Basically, *"if farmers think the recommendations are too expensive, they won't do it."*

Anderson and Ebenezer feel like women and men farmers face different constraints. Women tend to work with sharecroppers. The caretakers are not always honest. They will not give women the right profit. Women also have difficulty in getting laborers when they own their farm. *"Women are not supposed to spray. They face strain."* But on the flip side, women who manage their farms, *"are superwomen. Nothing worries them."* When they make visits to the farm, most of the time, you'll meet the husband and wife together. The FDP ``becomes a conversation where they can have an opinion." If both are not around, he'll have a husband who maybe doesn't know what his wife is earning. *"One partner might not know what the other is doing."* They believe women can be more engaged in farm decisions. *"Women are ready to support their men. She's more aware of where the money is going. The women are also coming on board where the money is going. When she understands the expenses from the FDP, when he says he needs to spend money*

on pesticide, she understands where the money is going and why." They don't think conducting the investment plan (capturing income and expenses) is an issue. "If we take out time and explain what we are doing, then they are sensitized." "It takes trust. Men are happy when women can support them. Sometimes women even know more than men!"

Overall, they share, these farmers are trained a lot. *"Those who are interested, become FDP-ready."* ECOM simply invites farmers and those who step forward can become an FDP farmer. So far, no one has opted out. But it depends on how you introduce the FDP. You can create a mess. Farmers like ECOM, but the FDP is not free. It costs money for the farmers to adhere to the recommendations. Farmers at ECOM have a Farmer Field Book. This also shows the farmers when they should do certain things. Every farmer receives the Farmer Field Book.

For ways to improve the FDP? Ebenezer and Anderson noted it would be great if they could send reminders to the farmers, like through SMS, which matches the calendar. *"Farmers will easily forget."* Also, the app has a tendency to freeze. Especially since the tablet might have too many apps on it. There is not enough memory.

The most significant change they've seen in farmers? They think it's the individualized approach of the FDP. Farmers are able to share their challenges. The agronomist can prescribe actions.

Endnotes

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