Exploring constraints to Forest Garden Success

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Our team ran three types of focus groups in five villages spread across two regions of the Peanut Basin, Fatick and Kaffrine. We spoke with Forest Garden adopters, with their wives, and with non-adopters. Our goal was to investigate the primary barriers to successful Forest Gardening, with an emphasis on access to water and the opportunity cost of male and female labor. We found that, despite differences in regional characteristics and the period of TREES programming, participants from both regions struggled most with finding adequate materials for fencing. They also struggled to provide the labor and time necessary to irrigate Forest Gardens, and relied heavily on labor from their wives and children as well as, occasionally, hired labor. The wives of male participants were generally tasked with watering Forest Gardens in Fatick, and in both Fatick and Kaffrine women often gave up both leisure time and income-generating activities to provide labor to the Forest Garden. Yet women also appreciated the additional food and income generated by Forest Gardens and were eager to adopt their own Forest Gardens – particularly in Fatick where female participation rates in TREES programming is low. Families with successful Forest Gardens stated that they sell Forest Garden products at market, generally after prioritizing home consumption. Yet when too many vendors are selling the same product, prices may drop dramatically, impacting profitability. Income is not the sole benefit of Forest Gardens, however. Participants appreciated the availability of new seeds and tools, learning new skills, new foods or improved availability of foods, animal forage, and the reduced expenditures at market that came from producing one's own horticulture and/or legumes during dry season rather than purchasing these products. Participants stressed that they believed in the Forest Garden approach but needed help with fencing and ideally water to fulfill its potential.

Objectives and Methods

Our team worked in 5 villages in the Peanut Basin: Keur Birmane Ndoupi, Ndiomdy, and Payoma in the region of **Fatick**, and Keur Malick Ndiaye and Médinatou Salame 2 in the region of **Kaffrine**. The village locations are pictured in Figure A1 of Appendix A.

We ran three types of focus groups in each village, to have separate discussions with:

1. **Adopters**: farmers who had or were participating in the TREES program
2. **Women in the family**: adopter's wives and/or female adopters
3. **Non-adopters**: farmers who were not participating in the TREES program

Our primary objective was to learn the following, with key sub-questions listed below our primary research questions:

1. What are the primary barriers to successful Forest Gardening?
    - What are the primary barriers to accessing irrigation water in particular?
    - How much water is being used by farmers during the dry season?
    - What solutions do farmers propose/prefer, for improving access to water?
2. Why do dis-adopters choose to leave the TREES program?
    - Do constraints in access to water and/or labor drive dis-adoption?
    - Does the opportunity cost of dry season labor, e.g., seasonal migration labor, drive dis-adoption?
3. Who provides labor towards Forest Gardens?
    - How are various tasks (e.g., watering, weeding, planting, harvesting, building structures) divided between male participants, women, children, and hired labor?
4. Does the adoption of Forest Gardens change a family's livelihood strategies?
    - What other livelihood / income-generating strategies do men and women pursue in this region to begin with, during dry season and wet season?
    - Does adoption change a family's propensity to engage in dry season migration, in non-agricultural work, or in other forms of agricultural work?
5. How are women impacted by their husbands adopting a Forest Garden?
    - How is their time use impacted?
    - Is their ability to generate independent income impacted?
    - Do they see up-sides or down-sides to Forest Gardens that are not named by men?
6. What do farmers value most about their Forest Gardens?

Recruitment Strategy: We recruited participants for our focus groups in two distinct efforts. First, a TREES technician would visit the project's head farmer and the village chief prior to our first scheduled day in the village, and request mobilization of all farmers in the village who had ever participated in TREES programming. These farmers were told to attend a meeting at 9am or 10am on our first day in the village. Because these adopters and dis-adopters were mobilized by the time we arrived, we would run the adopter's focus group on that first day, in the morning.

Second, while in the village we would ask the project's head farmer, the village chief, TREES participants, and anyone else in attendance to help us recruit women and non-adopters for the second two focus groups. In some cases, either women or non-adopters could be mobilized by afternoon and so we would conduct a second focus group that day. In other cases, we would return to run focus groups with both women and non-adopters the following day. In Payoma it

was not possible to mobilize non-adopters and so only the adopters' and women's focus groups were run. In two instances, focus groups coincided with a village event (a vaccination day and a burial), but these events reduced attendance only slightly.

It is worth saying a bit more about who we attempted to recruit for each focus group, and who participated.

- **Current Adopters:** Farmers who were currently participating in the TREES program were asked to join the first focus group. The TREES' technician had no trouble mobilizing current adopters, likely because they attend frequent TREES trainings.
- **Dis-Adopters:** We hoped to include dis-adopters in the adopter's focus group – farmers who had initially signed the MOU with TREES but had subsequently left the program. However, TREES technicians struggled to mobilize dis-adopters. We dealt with this by sending out a follow-up message once we arrived in the village, encouraging dis-adopters to join for the first focus group, or even to join the non-adopters focus group. Despite this, we only spoke with 0, 2, 1, 5, and 0 dis-adopters in Keur Birmane Ndoupi, Ndiomdy, Payoma, Keur Malick Ndiaye and Médinatou Salame 2 respectively.
- **Female Adopters:** Women registered as TREES program participants could participate in either the first or second focus group or in both. Two women were registered as TREES participants in the three **Fatick** villages (3% of the village participants), and one of those two attended an adopter's focus group. (We did not meet the other.) In the two **Kaffrine** villages, 21 women were registered TREE participants (22% of the village participants), and 17 attended our focus groups.
- **Wives of Male Adopters:** Wives of male adopters were invited to join the women's focus group, and they made up the bulk of that focus group in each village. We had no problem recruiting these women – if anything they were more eager than adopters to share their thoughts, possibly because they had not previously been engaged by TREES.
- **Non-Adopters:** While we had hoped to engage farmers who had initially considered joining the TREES program but decided against it, it was impossible to mobilize this group.[a] Instead, villagers who attended the non-adopters focus group tended to be men who were not registered TREES participants, but who wished to join the program.

The individuals we spoke with are enumerated by village and by focus group in Table A1 of Appendix A. The average (median) focus group had 11 (8.5) participants, with 4 at minimum and 30 at maximum. For comparison, the full list of registered TREES participants in each of the five villages is provided in Appendix B. Based on this list, it appears that around 48 percent of TREES participants in each village attended the adopter's focus group, and a roughly similar proportion of these participants had at least one wife attended the women's focus groups.

Running the Focus Groups: The focus groups were generally ~1.5 hours long; our longest discussion was 2 hours long. We followed focus group prompts (in Appendix C) written in advance and discussed with and edited by both TREES staff and collaborator Dr. Katim Touré at

[a] We had hoped to mobilize farmers who attended the earliest meetings with TREES, but while TREES does record the names of those initial attendees during mobilization, they do not keep these lists in the long run.

École Nationale Supérieure d'Agriculture, Université de Thies. As with all focus groups, we also added questions in response to details shared by participants, or sometimes dropped questions that were irrelevant in the context.

We ran focus groups in the following manner. Our focus group facilitator and translator, Aissatou Mbaye, asked each question in Wolof, and then translated the answers for us in English. The other team members (Dr. Leah Bevis, Karan Shakya, Bineta Fall, and Amanda Davy) took detailed notes on responses. One team member (first Leah in **Fatick** and later Karan in **Kaffrine**) additionally managed the flow of the conversation – clarifying answers, spearheading additional questions, prompting Aissatou if she got lost, and deciding which questions to skip, if any, as the discussion progressed. Other team members added questions as they saw fit.

Figure 1: The 'Non-Adopters' focus group session in Ndiomdy.

Synthesizing Findings: After the focus groups were finished in each village, the team leader (Leah in **Fatick** and Karan in **Kaffrine**) prepared a document summarizing key findings and a variety of supporting details. The team met to discuss and fact-check these findings and details, and to discuss what each member saw as the take-aways from the village. The team leader then finalized a document summarizing village-specific findings. After all focus groups were finished, the team reviewed both the written notes and the audio recordings to identify key themes and relevant quotes. These quotes were transcribed in Wolof and then translated into English.

Key Findings

1. Lack of fences is a serious problem.

"Because of the lack of fence, our produce is not enough.
So, if we want to produce more, we need the fence"[1]
- A farmer from Ndiomdy

In the villages we visited, farmers' inability to construct dead fences was the primary barrier to the successful growth of Forest Gardens. Dead fences critically prevent animals such as goats, sheep, or donkeys from eating vegetables and saplings, in the years before a live fence is grown. In Keur Birmane Ndoupi, 11 of 12 participants had never built a dead fence around their Forest Gardens, and so all but 2 plots were lying fallow in June. The participants agreed that labor towards their Forest Gardens was basically futile without a fence; one farmer said, "if we make our tree nursery, the goats will eat it all…even if we do our best job, when we transplant, the goats will [also] eat it".[2] This point was made again and again by farmers in **Fatick**. In Médinatou Salame 2 in **Kaffrine**, where most participants were in their 4th year of the program, farmers also emphasized the need for proper dead fences. Here, farmers pointed out that 3 out of 10 Forest Gardens failed, on average, because of a lack of fences.

The importance of fences derives from the seasonality of local grazing practices. In every village we visited, farmers grew millet and peanut during the rainy season and harvested these crops at the end of the year (as early as late October, possibly through December). To ensure successful growth and harvest, farmers in **Fatick**, explained that they tie up their animals from June through January. Animals roam freely during the rest of the year and therefore enter any lands that are not well-fenced. In the two villages we visited in **Kaffrine**, households raised greater numbers of livestock and commonly hire herders to graze their animals outside the village during the day in nearby pasture lands. These animals were tied once they returned home. However, villagers still reported that animals from outside their village – owned by nomadic pastoralists or people in nearby villages – would often venture into their lands and damage unprotected crops and plants.

Figure 2: Animals wondering in a Ndiomdy Forest Garden. Without fencing, animals would enter the field to eat any plants, including the growing live fence.

Farmers reported being constrained from using local resources to build their dead fences. A farmer from Keur Birmane Ndoupi said, "the real problem with the fence is that when farmers go in the forest to get wood, the forest agents sanction them."[3] This point was made by farmers from all sample villages: the local forest authorities prevent farmers from cutting down local trees and shrubs, making it impossible to build the dead fence themselves. In fact, a scarcity of wood made wooden posts a valuable commodity and farmers in Keur Birmane Ndoupi explained that wooden posts were sometimes stolen at night if one did procure them. In Ndiomdy, farmers also pointed out that even if there were available wooden posts, termites would eventually destroy them. This made it infeasible to use wooden fences long-term, they explained.[b]

Some farmers used alternate materials for dead fences, but these came with risk and costs. A number of farmers reported using thatch to fence not only Forest Gardens but also small vegetable gardens by homes or by water sources. However, in every village farmer agreed that thatch fences were not strong enough to deter animals and required someone to be physically present to guard the fence. In Ndiomdy adopters pointed to an 'expert gardener' who had used thatch to produce yields from his 1-hectare Forest Garden. But the young man (who had been gardening prior to the Forest Garden program) expressed that he needed to stay constantly close to his Forest Garden. He even slept in his Forest Garden – a commitment that most other farmers could not make, they said laughingly. In Keur Malick Ndiaye and Médinatou Salame 2 a few farmers had also used thatch fences when they started the program. They explained that thatch required the presence of women and children, to ensure that animals did not jump the fence.

Additionally, farmers in Payoma jointly invested in fishing nets for fencing material, bought by the bag in Thies. These farmers explained that the nets were a calculated risk – they didn't know if the nets would hold up to animals, but hoped they would. But within weeks, the nets had been damaged by animals, and at the time of interview most fishing nets were stringy rags, unable to keep any animals out (Figure 3).

Figure 3: Nets initially used as fencing for Forest Gardens in Payoma, destroyed by animals by June 2022.

[b] We realize that dead fences are meant to be temporary solution prior to the growth of the live fence. However, even farmers with 3-year-old live fences in Kaffrine reported that, at their stage of growth at least, the live fences alone were not enough to keep out animals.

In a few cases farmers had procured a metal fence (sometimes from a non-profit), but these are extremely costly. In Ndiomdy, focus group farmers initially expressed uncertainly about the cost of a metal fence and where one might buy one. The (Peace Corps trained) "master gardener" speculated that with 120,000 CFA one might fence a full hectare of land. Other disagreed, saying prices had risen since his fence was put in. Eventually a focus group participant called a seller in Kaolack: the seller said he sold metal fencing for 37,000 CFA per 25 meters. At this price, it would take 418,603 CFA, or over $600, to fence only *half* a hectare (5000 sq. m) of land.[c] While this may not be the lowest price one could find for metal fencing in Kaolack, even a lesser sum would be unaffordable for most farmers in the region. Additionally, the discussion emphasizes farmer' uncertainty regarding the source and price of metal fencing. Transportation is still another barrier.

Figure 4: Wife of a Payoma adopter whose Forest Garden was destroyed when animals broke her fence.

While innovation around fencing may seem laudable, it is also risky, and may harm participants. In 4 of the 5 villages we visited, very few farmers attempted to build an animal-resistant fence. If/when animals eventually destroyed some or all of these non-fenced Forest Gardens, time and effort on planting and watering went to waste, but no serious monetary investment was lost. This contrasts with the experience of participants in Payoma who jointly invested in a creative fencing solution, fishing nets, which cost about 100,000 CFA per Forest Garden, then broke within months. When animals destroyed these fences, participants lost not only time and effort but also this direct cash investment. Payoma participants were notably upset about the loss. One woman participant in Payoma (Figure 4), who worked on a Forest Garden with her husband divulged, "I am kind of desperate, because I invested a lot in my Forest Garden. I watered, planted, and even tried to make the fence, but the animals destroyed everything. I did cry about it."[4]

Furthermore, weak fencing can create an economic burden by tying up labor that could be used for other productive tasks. Several **Fatick** farmers mentioned the need to constantly guard Forest Gardens with thatch fencing themselves or via family labor. Even in the two villages in **Kaffrine** where participants have been in the program for 3 or 4 years and live fences were fairly well-established, farmers continued to emphasize the need for quality dead fencing. One farmer in Médinatou Salame 2 noted, "Since we have given some hectares for TREES, we have stopped

[c] Half a hectare of land has a perimeter of ~282.84 m, if square. A colleague at U of Theis calculated a similar price.

migrating. When the fences are not good, we can't travel because we need to protect our garden."[5] For farmers with smaller families, the labor demand of ongoingly "guarding" Forest Gardens may harm other economic activities and thus incentivize dis-adoption.

Even mature Forest Gardens do best with dead fences. In **Kaffrine**, and particularly in Keur Malick Ndiaye, farmers expressed that it was possible – though not easy – to grow a live fence from saplings even without a dead fence around it. (Again, this was because animals were grazed outside of villages during the day.) However, farmers with large live fences still emphasized that using thorny bushes was not enough, as livestock could pass through them. Even once these thorny bushes were big, they need to be supported with portions of wires, wooden posts, or even thatches, according to focus group participants. It was also visually clear that the most prosperous Forest Gardens in **Kaffrine**, were ones where the live fences were supported by dead fences, in keeping with the TREES' Forest Garden protocol.

The critical necessity for dead fencing, combined with its high cost, means that Forest Gardens may inadvertently exacerbate pre-existing village inequality – wealthier farmers can afford dead fences, while poorer farmers cannot. This was noted in each focus group village in **Fatick**. For instance, the most successful farmer in Payoma had replaced his ruined fishing net fence with a particularly strong thatch fence (Figure 5), had eventually built a well on his land and purchased a solar pump, hired labor for a variety of tasks, and produced so many vegetables that vendors came by his Forest Garden on a regular schedule to buy. He almost certainly had the ability to invest in this large thatch fence – and the subsequent well and solar pump – because he owned a car and had worked as a driver prior to beginning (and likely concurrently with) the TREES program. In other **Fatick** villages we similarly noted that the village chief, and/or farmers who had previously held lucrative jobs outside the village, made the largest up-front financial investments in their Forest Gardens in terms of fencing, wells, or pumps, and therefore experienced the greatest success.

Figure 5: The most successful farmer in Payoma had replaced his ruined fishing net fence with a particularly strong thatch fence. However, this fence still required the constant presence of his wife or children to guard it against animals.

2. Barriers to water access vary by village – and they are important.

"Irrigation takes a lot of time, and we don't have water in the well all the time. So, if we don't have water in the well, we cannot work."[6]
- Wife of a participant in Keur Birmane Ndoupi

Difficulty in accessing irrigation water is also a serious barrier to Forest Gardening, and the impediment to water access varied across the five villages we visited. In Keur Birmane Ndoupi most agricultural land parcels were located far outside the village, and as a result Forest Gardens were anywhere from 0.5 to 2km away from the village center where the two community wells were located (Figure 6). Farmers in Keur Birmane Ndoupi drew irrigation water for their tree nurseries from both the village water tower and the central village wells, but neither source of water was reliably available year-round. The burdensome transportation and sporadic lack of water, combined with the fact that fences had never been put up, forced all but 1 farmer to abandon efforts in their Forest Gardens during the dry season. A woman from Keur Birmane Ndoupi shared, "We take three hours for irrigation. One hour to put water in the cans, one hour for transporting the water using donkey carts, and one hour for irrigation. In one day, we will use twenty 20-liter cans".[7]

Figure 6: One of two community wells in Keur Birmane Ndoupi. Each haul brings up half a jerry-can of water (since the jerry-can is cut out in the middle for pouring), necessitating at least 40 haul to fill 20 jerry-cans of water for a single irrigation session.

In Ndiomdy and Payoma, land parcels were closer to the village center and therefore Forest Gardens were also closer to the village well – always within 1 km in both villages and often within 40-60 m in Ndiomdy. Yet participants still emphasized the time-consuming nature of watering their Forest Gardens. Two focus group participants in each of these two villages had a well within their Forest Garden, and these farmers were notably more successful that the rest. Focus group participants in all **Fatick** villages emphasized the need for fencing first – in order to succeed with the Forest Garden approach – but they secondarily stressed the need for more and closer water sources. Because water is 24, 8, and 15m below the surface in Keur Birmane Ndoupi, Ndiomdy, and Payoma, respectively, farmers explained that drilling new wells was technically feasible but unaffordable for most of them.

In Keur Malick Ndiaye and Médinatou Salame 2, the water tower was the only source of water for farmers. This is because the **Kaffrine** region has a low water table – farmers reported it was 45 to 50 m deep, which makes drilling wells infeasible. Given the necessity of irrigating from the water tower, the lead farmer in Keur Malick Ndiaye explained that TREES had provided them with 30 m of tubes to help connect fields to existing water tower pipes. Yet, despite this, both men and women emphasized the time it took to irrigate a Forest Garden, given the very slow flow of water through the tubes between tower and garden. Men also emphasized that the pipes were difficult and costly to maintain (Figure 7).

Figure 7: Participants in Medinatou Salame 2 shows the wear and tear in the irrigation pipes.

Hauling and transporting water from a well to a Forest Garden is very time consuming, for almost all families. In **Fatick**, it was women's responsibility to water the Forest Gardens, and most women agreed that they distributed water from twenty 20-liter jerry cans in their Forest Garden each day, or sometimes every other day. (Men, who have less detailed knowledge of the process, generally reported the same.) As illustrated in the quote of Keur Birmane Ndoupi above, there are 3 parts to the labor of watering: hauling the water up by rope (generally multiple hauls are needed to fill 1 jerry can), transporting the water by head or donkey-cart, and then actually watering the garden. In Keur Birmane Ndoupi women reported that this took a total of 3 hours, since their Forest Gardens were up to 2 km away. However, women in Payoma also reported that watering took a total of 2 to 3 hours, even though their Forest Gardens were no more than 1km away. This illustrates the fact that much of the labor is not in transportation, but rather in initially hauling and later distributing the water. Women in Ndiomdy, where Forest Gardens were often ~50 m from a well reported that the watering process took about one hour.

Overall, women agreed that the time spent watering Forest Gardens was significant and unprecedented. Additionally, they emphasized how tiring the process was, particularly the manual hauling up of water from the well. Hauling water was more difficult than average for the sole female participant from Keur Birmane Ndoupi, due to her advanced age. She relied only on the water tower to irrigate her Forest Garden but explained, "I irrigate twice a day – in the morning and after dinner. For me, it takes 30 minutes to irrigate my Forest Garden. 30 minutes in the morning, and 30 minutes again in the night… But, if there is no water on the taps, I don't go to the well, because I cannot physically do it".[8]

The viability of transporting well water for long distances in **Fatick** depended partly on the availability of donkey carts. For instance, a woman from Keur Birmane Ndoupi explained "Some

of us have donkey carts, and some of us don't. I have a donkey, but not a cart. I will need to ask for help when I need to borrow a cart… but, if the person is using the cart, then I will have to wait for him to finish first."[9] Transporting water via donkey cart seemed to be less common in Payoma and Ndiomdy, where Forest Gardens were closer to village center. There may also be a gender dimension to access within the family: in Payoma roughly half of the men in our adopter's group said they owned a donkey cart, but only 2 of 8 women in the women's group said they used a donkey cart for transporting irrigation water.[d] While the use of donkey carts shortened the time need for and the physical stress of transporting water, participants emphasized that the donkeys walked slowly – not much faster than a person – when carrying heavy loads like water. In addition, multiple trips are still needed with a donkey cart if a participant does not own 20 jerry-cans. Thus, donkey carts don't cut the transportation time as dramatically as one might hope, but they do reduce the physical stress of transporting water by head.

Even in Keur Malick Ndiaye and Médinatou Salame 2, where water taps were available at every Forest Garden, farmers also shared that the watering process was time-consuming. Women explained that sometimes watering their Forest Garden took almost 4 hours. Farmers in **Kaffrine** reported that, on average, they used around 1,000 liters of water to irrigate their Forest Gardens. This daily water use is greater than the average water-use in **Fatick**, where farmers were using around 400 liters of water a day (twenty 20-liter jerry cans). (This greater water may be attributed to the fact that irrigating was less physically demanding in **Kaffrine.** Or it might be that the older Forest Gardens in **Kaffrine** simply needed more water than those **Fatick**.) Water from the water tower was pumped using solar pumps, and these pumps were strongest at noon when the sun's intensity was greatest. With good water pressure, filling 1 jerry can takes around 2 minutes, according to farmers, but when the water pressure is low, filling one jerry can take 5-10 minutes. Farmers watered once in the morning and once in the evening to reduce heat stress and evaporation. However, both these times are when water pressure is low.

Figure 8: Water meters in Keur Malick Ndiaye. These meters are inside every Forest Garden and measured participants' monthly water use.

For those who relied on the water tower in **Kaffrine**, the water fees could also be prohibitively expensive. In Médinatou Salame 2, one farmer said, "Many of us have a tap (in our Forest Garden). But some farmers have left the project because the water fee for 1,000 liters is 200 CFA"[10]. Depending on the amount of water used and the size

[d] These 8 women represented 7 families, as 2 were co-wives. These two co-wives were not using a donkey cart as their husband, the chief of the village, had a well inside his Forest Garden.

of Forest Gardens, total water payment ranged from 6,000 to 10,000 CFA per month. Three of the 5 dis-adopters in Keur Malick Ndiaye shared that they had dropped out of the TREES program because they could not afford the water fees.

Each village had its own preferred solution for addressing water access issues. In Keur Birmane Ndoupi, a few farmers said that the water tower was not a reliable source of water (since the strength of the water flow varied as in **Kaffrine**, and sometimes halted completely), but suggested that wells built out near the Forest Gardens would be helpful. These farmers estimated that the average cost of wells was around 500,000 CFA. In Ndiomdy and Payoma, where wells were closer to Forest Gardens, farmers wanted irrigation pipes, solar pumps to extract water, and water storing technologies in their Forest Gardens to make irrigation easier. Farmers shared that they knew about two water pumps available in the market. The cheaper gas pump was around 70,000 CFA, while the more expensive diesel pump cost around 250,000 CFA.

In Keur Malick Ndiaye and Médinatou Salame 2, farmers ideally wanted the water fee to be lower (or subsidized). They also wanted better pipes and irrigation tubes. Farmers shared that there were two types of pipes commonly available in the market: a 90cm pipe that costs 8,500 CFA (6m in length), and a smaller 60cm pipe that costs 6,000 CFA (6m in length). Despite the known availability of pipes in the market, farmers were hesitant to invest in additional pipes, highlighting that the maintenance of such pipes is expensive. In Médinatou Salame 2 few wells had been constructed by the government using heavy machinery but were too deep to manually draw up the water. Villagers, here, additionally wanted solar pumps to help collect water from those wells. Last, while focus group participants in **Kaffrine** took the sluggish water flow from water towers as given, they would surely appreciate an improved solar pump that smoothed energy availability across the day, increasing the speed of water flow in the mornings and evenings when they tend to draw water.

3. Forest Gardens rely on labor from women, children, and hired workers.

"I have 6 ha and I want to give all of them for the project. But when, the project asked me to do a garden, I gave up because I didn't have time to take care of the garden because I am alone. My children go to school."[11]
- A dis-adopter from Ndiomdy

Women and children do most of the watering and much of the weeding for Forest Gardens in **Fatick**. For instance, in Payoma women reported that they spend 1 hour watering nurseries per day (prior to out-planting), 2 to 3 hours watering the Forest Gardens per day (during dry season), 2 hours a week weeding (when crops are growing), and 30 minutes to 1 hour a week harvesting (during harvest period). (Most farmers in Payoma were not growing and producing year-round due to lack of fencing, and so these time inputs varied across year and across families.) Similar times were provided in Ndiomdy, where men reported that women and children were primarily responsible for tending to the tree nurseries and watering the Forst Gardens. The women's focus group here also reported that they were responsible for watering and weeding – tasks that men and children occasionally helped with.

In **Kaffrine** women also spent a great deal of time contributing to watering, weeding, and generally tending to the Forest Gardens. However, labor was divided more equally within tasks. Participants in both Keur Malick Ndiaye and Médinatou Salame 2 emphasized the cultural importance of men and women working equally. When asked for male and female labor inputs by specific tasks, both men and women stressed that they worked equally on each aspect of the Forest Garden, and that this norm is a societal characteristic of the Saloum region (north of Gambia).

Figure 9: A young girl in Ndiomdy shows Karan how to haul up water. Women and children made multiple trips to and from this well, carrying containers on their heads to their Forest Gardens.

Generally, households with more family members reported being more successful with their Forest Gardens. A few women also indicated that tasks like watering and harvesting became easier when a household had multiple wives, as tasks could be shared. A dis-adopter in Ndiomdy (quote above) and another in Médinatou Salame 2 shared that they could not continue with the program since they were living alone and did not have the labor required for Forest Gardens.

Unfortunately, we did not probe men's time use in the Forest Garden as carefully as we did women's time use. But based on how the women's group in **Fatick** emphasized their responsibility in the watering and managing the Forest Gardens, it appeared that in the villages in **Fatick**, women spend more time in Forest Gardens than their participant husbands, on average. However, there was also clear heterogeneity within each village, with some men working alone, and some women stressing they and their husbands shared labor equally. Ultimately, the precise labor practices of each family are a family choice, influenced by societal normal as well as by family preferences, power dynamics and constraints.

Since wives provide the bulk of the non-participant labor to Forest Gardens, women in all sample villages reported that Forest Gardens put serious constraints on their leisure time. In Keur Malick Ndiaye one woman said, "We don't have time to rest; we spend all of our time taking care of our Forest Gardens."[12] This same sentiment was expressed by adopters' wives in each sample village. In Keur Birmane Ndoupi, women agreed that they had less time to spend with their husbands and their children since adopting the Forest Garden. In Payoma, women stated that they had less time to hang out with friends after adopting a Forest Garden.

In all sample villages, women reported earning income that is separate from their husbands'. In **Fatick**, women earned income from individual or group-organized commerce (making and

selling soaps, processing and selling peanut and millet as peanut butter and flour, drying and selling meat, and re-selling market-purchased vegetables), from growing and selling peanuts (on plots given to them by their husbands), from growing and selling garden produce (during the dry season), and by rearing their own animals. Many women engaged in at least two of these activities. Additionally, women in **Kaffrine** made money by raising and selling livestock. Male and female focus group participants both explained that men are required by (culturally-defined) Islamic law to provide for all family needs. Thus, a man cannot coopt his wife's income for family needs, nor dictate how it is spent. However, women contribute at least part of their income towards public goods – for instance, women in both **Fatick** and **Kaffrine** reported pooling their incomes to fund religious ceremonies and village ceremonies.

In many sample villages, wives of TREES participants said that since their family began a Forest Garden they had less time for such income-generating activities, and in particular less time for commerce. In Keur Birmane Ndoupi, women reported that they may not have time to engage in buying and re-selling vegetables from market when they are busy with the Forest Garden. Women in Ndiomdy (Figure 10) agreed that they have less time for commerce when spending many hours on watering the Forest Garden. They also noted that they have less time for going to market to buy food. In Keur Malick Ndiaye, the women's group reported that they raised, vaccinated, and traded goats for income, but working in the Forest Gardens left them with less time for these activities.

Figure 10: Women's focus group in Ndiomdy.

Reports were mixed regarding the impact of Forest Gardens on women's labor to husband-managed peanut and millet production. In Payoma, women reported that they spent no less time in their husband's agricultural fields after beginning the Forest Garden. It was necessary to contribute to the family production project, they explained, and so instead, they spent less time resting or socializing with friends. Yet in Médinatou Salame 2, women reported that they had less time to work on their husband's peanut and millet fields after adoption of Forest Gardens.

This suggests that farms in Médinatou Salame 2 experience a "sum zero" trade-off between labor allocation to different crops/plots, which is common in labor-scarce settings. Possibly the same will be experienced in **Fatick** when Forest Gardens are larger.

Many farmers also hired Forest Garden laborers, especially when they didn't have large families. For instance, the lead farmer in Keur Birmane Ndoupi, paid someone 30,000 CFA per month to help with weeding and watering. A young, successful farmer from Ndiomdy had a more structured contract for hiring labor. He said, "I have 4 workers and I have a contract for them for the duration of the campaign. It may be 4 or 5 months. And when we have money after selling products, we split it among ourselves after we account for the costs like gas or fertilizers."[13] He also explained that he hired additional laborers to dig compost pits and fix the thatch fences around his Forest Garden (Figure 11).

Figure 11: A successful participant in Ndiomdy showing his Forest Garden. This participant hired labor for various tasks such as digging compost pits or mending thatch fences.

A variety of labor contract types exist in the Peanut Basin. Participants in Keur Malick Ndiaye mentioned that one could hire somebody to help in their Forest Garden for just one afternoon at a rate of 700-1,000 CFA. Additionally, they mentioned that neighbors frequently helped one another, sometimes planning out tasks like transplanting and watering in groups to make sure everyone had enough labor at the right time. In Médinatou Salame 2, labor contracts can vary by the age of the hired worker: Hiring an 18-year-old for 6 months would cost ~250,000 CFA, farmers explained, whereas hiring a 25-year-old for 6 months would cost ~300,000 CFA.

In general, farmers agreed that hiring labor to work in Forest Gardens was less common than hiring labor to work on millet or groundnut fields, but that it wasn't rare. As with all agricultural hiring, farmers with fewer family members were more likely to hire laborers. For instance, of the 3 participants in Keur Birmane Ndoupi who reported hiring workers, 2 of them lived alone. Similarly, participants in Payoma agreed that it is harder to grow a Forest Garden if one doesn't have a large family – such a person would need to hire outside help.

4. Women rarely own their own Forest Gardens – and they want to.

"Are TREES willing to accept women into their program?"[14]
- Women's group leader and wife of a participant in Ndiomdy

Few women in **Fatick** owned Forest Gardens. According to the roster provide by TREES, there were 2 participants in Keur Birmane Ndoupi and none in Ndiomdy or Payoma. Only 3% of listed participants in **Fatick** are female, according to the same roster, whereas 22% of participants in **Kaffrine** are female. In Keur Birmane Ndoupi, one of the two listed female participants attended our women's focus group, a 74-year-old woman who had inherited her Forest Garden from her husband after he died. She told us, "Women are normally not participating in the TREEs project. Here, the only woman who is a participant is me. Maybe, they will participate next year."[15]

In Payoma we met one other woman who had recently inherited a Forest Garden from her husband, also after he died. These two encounters suggested that female participants in Fatick may often inherited their participant status with the death of a husband or father, rather than being enrolled directly. However, with such a small sample size (two women) we cannot be sure.

Despite their lack of current engagement with the TREES program, a number of women in **Fatick** mentioned that they wanted to own their own Forest Gardens. This message came out particularly strong in Ndiomdy, where a women's commerce group was well established and had previously run a community garden before their well water went saline. When we mentioned that TREES requires ownership of land for Forest Gardens, a woman from Ndiomdy volunteered "Some women have their own land after their husband passes away. But we also have a community garden that we can use for Forest Gardens."[16] We asked whether the women's group would be capable of providing enough labor to a "community Forest Garden," and the group members expressed that it would, and that, if necessary, they could hire labor to help.

Figure 12: Women's focus group in Keur Malick Ndiaye.

Women's participation in the TREES program was less constrained in **Kaffrine**, and the female participants we spoke to were generally allocated land for their Forest Garden by either their father or their husband. We are not sure why such allocation was more common in **Kaffrine** than in **Fatick**. However, the TREES Monitoring, Evaluation and Learning Coordinator for Senegal, Samba Ndaiye, shared that

rain-fed gardening for marketing purposes is popular among women in **Kaffrine**. The profitability of this activity is well understood and may that encourage households in **Kaffrine** to allocate lands to women for Forest Gardens. This contrast with **Fatick**, where Mr. Ndaiye thought that female participants were often given less fertile lands at the edge of the valley, and/or given land that were liable to be later re-claimed by their husband.[e] Further, due to high soil salinity, the region close to Ndiomdy had scarce arable lands, which Mr. Ndaiye thought men prioritized for field crops.

5. Too many sellers for any one product lowers prices at local markets.

"Yes [it is hard to sell our products in the market] because we all sell the same product, and we have a lot of these products." [18]
- Wife of a participant in Keur Birane Ndoupi

In the 3 villages in **Fatick**, focus group participants explained that when too many people sell one thing at market, it is hard to sell one's product and/or one is forced to accept a low price. For instance, in Keur Birmane Ndoupi, a women explained by way of example that if too many people are selling mint, she is less likely to find a buyer for her mint. Other women and men who were observing the women's focus group voiced their agreement. In Payoma, men in the adopters focus group also reported that prices drop when too many people are selling one good at market. Explaining further, a young farmer noted, "Yes, because once you have a product, you have to sell it. If there is too much of that product [at market], you might have to lower the price by half. For instance, if price is 5,000 CFA. then sometimes we have to sell at 2,500 CFA to prevent it from rotting."[18] He followed up by explaining that his willingness to drop prices depends on the product. Large tomatoes are hard to store, for instance, because they are "watery". Small ones are more storable. Thus, if too many tomatoes are being sold at market, he might take the small tomatoes home to sell at another market later, but he would be forced to take a price cut for the larger tomatoes, which cannot be stored.

Implicit in this price effect is that most focus group participants reported selling products at weekly local markets, where prices are impacted by variable demand and supply. Yet not all farmers prioritized selling at local markets. For instance, the women's group in Ndiomdy told us that before selling at the market, they would sell within their village. Only after satisfying demand within the village would they go the market to sell produce. This village felt that there was a dearth of vegetables being produced in the village, so supply could increase quite a bit before it met within-village demand. It seems likely that this dearth/need will be most common in the least-connected villages. Alternatively, we met a Forest Garden adopter in Ndiomdy who specialized in producing and selling bissap (Figure 13). Merchants from Kaolack would come to his farm twice a month to buy 7 baskets of bissap at the rate of 2,500 CFA per basket. This is an

[e] We cannot verify these possibilities, as we spoke to only 1 female participant in **Fatick**, who inherited her husband's plot when he died.

example of how a TREES participant might contract with merchants from bigger cities for a more secure source of income.

In **Kaffrine** farmers also raised concerns about low prices when supply of similar products are high. The lead-farmer in Keur Malick Ndiaye explained how prices fluctuate depending on village-wide production, and if more farmers sold a certain produce, the price would go down. In Keur Malick Ndiaye, all 13 participants sold some produce from their Forest Garden. Most participants sold cashew, mango, guava, moringa, and lemon, which sold for higher prices than commonly grown crops of peanut, millet, and corn. This was the same in Médinatou Salame 2 where most adopters agreed that they prioritized selling these produces at market.

Figure 13: Forest Garden participant in Ndiomdy who specializes in growing bissap. Merchants from Kaolack would come to his Forest Garden to buy bissap.

6. People value Forest Gardens; they believe the benefits outweigh the costs.

"We have a lot of benefits: we have money for ourselves and we can sell and eat the products"[19]
- Participant in Médinatoul Salam

In all 5 villages, participants value the contribution of Forest Gardens on family diet. In **Fatick**, despite the struggles of maintaining a fence or the large time-investment required to irrigate Forest Gardens, adopters emphasized how Forest Garden provided households with more food, which helped save income that would otherwise be spent on buying food from the market. A woman in Ndiomdy, whose husband lacked adequate fencing on his Forest Garden, shared how she could see successful participants save money by growing vegetables rather than buying them. Likewise, in **Kaffrine**, both the adopters and women's group highlighted how Forest Garden supplemented household diets. Participants with smaller Forest Garden's (area less than 0.5 ha) would often use Forest Garden products for household consumption, and any remaining items would then be sold in the market. This emphasis on reduced expenditure (rather than, or alongside, increased family income) came up time and time again.

Many farmers emphasized the economic benefits of Forest Gardens. In Ndiomdy, farmers in the non-participant group explained that Forest Gardens were more profitable than peanut and millet farming, which is why they wanted to enroll in the program in future. One non-participant said, "Forest Gardens have more value than a crop field. For example, one Kg of okra costs 700F

CFA, and peanuts cost 200F CFA. From the Forest Garden, one kg of Pepper costs 3000 FCFA."[20] Additionally, in Keur Malick Ndiaye we asked non-adopters if they observed economic benefits (higher income or greater harvest) accruing to fellow adopters, and said they yes, they could usually observe benefits within a year.

Figure 14: A Forest Garden participant in Fatick shows us the biodegradable bags that TREES provided him for growing saplings.

Farmers also value the seeds provided by TREES, many of which are not available to purchase at local markets. Farmers in Ndiomdy explained that while cashew and mango seeds were cheaply available, other vegetable seeds were expensive or unavailable. This constraint in buying seeds was a barrier even for farmers wanting to expand their current vegetables gardens. This was the same in **Kaffrine** where farmers from Keur Malick Ndiaye and Médinatou Salame 2 highlighted how the seeds provided by TREES were not available at their local markets, and having access to these seeds free of charge put them at an advantage. Farmers also appreciated the supplies that TREES provided, such as bags for saplings (Figure 14), watering cans, and wheelbarrows.

Farmers appreciated the new skills taught by the TREES program. A farmer in Keur Malick Ndiaye said "We have many vegetables, and they are accessible for people. We have many new trees. People in the project have a good relationship and they help each other. The project improves their skills."[21] In Ndiomdy, a participant noted that growing tree nurseries would have been impossible before TREES taught them how to do this. He added that techniques for growing vegetable nurseries were also valuable. This was also reflected in Médinatoul Salame where a farmer shared, "We gain a lot of technical skills because of the TREES training. They also give us seeds that are not accessible to us. But the problem is always the fence." [22] This last point stresses once again how the benefits of the TREES program are only fully achieved once the monetary and labor investments towards the Forest Gardens are protected by a fence.

While the vast majority of TREES participants are older men who have passed the age of temporary migration, a few younger participants did note that they stopped migrating during the dry season after beginning a Forest Garden. For instance, in Payoma, the son of the chief of the village said that he used to work outside the village as a tailor, but this year he did not, because he was working at his father's Forest Garden. In Keur Birmane Ndoupi, the lead-farmer was a young man who used to migrate during the dry season but had now invested heavily in his Forest Garden instead. He told us, "I stopped migrating when I discovered the potential of my village. I want to explore that now." [23]

Figure 15: Peppers being grown in a Forest Garden in Payoma. Successful Forest Gardens in this village also had aubergine, okra, tomato, and mango.

Participants also mentioned the benefit of employment during the dry season. Particularly, in Ndiomdy, one man noted that after the millet and groundnut season, they had very little to do. But since enrolling in the TREES program, they could work in the Forest Garden. A non-participant from the same village noted that if one only works during the rainy season, one cannot make enough money to support one's family. According to these farmers, Forest Gardens provide an opportunity for year-round income and/or food.

In Keur Malick Ndiaye and Médinatoul Salam 2, Forest Garden products were used to provide food for livestock. Generally, each household in these villages raised 5 to 6 sheep (often among other livestock), which the women managed by vaccinating and feeding them. These livestock would ultimately be sold during the Tabaski festival – the Senegalese name for Eid al-Adha. The women group from Médinatoul Salam 2 shared that a benefit of the Forest Garden was that they could feed their livestock residues from plants like the cowpea.

Ultimately, villagers seemed to believe in the Forest Garden approach. Even in the three villages in **Fatick**, where almost no live fences had been established and where the vast majority of Forest Gardens were empty during dry season, farmers believed that they could succeed if they only had adequate fencing. One farmer in Keur Birmane Ndoupi continued to grow vegetables during the dry season by basically living in his Forest Garden. In all five sample villages, non-adopters were eager to find opportunities to enroll in the program and were confident about the program even though they appreciated the time-consuming and potential risky nature of Forest Gardens. One farmer summarized this sentiment by saying, simply, "we have a lot of hope in the project TREES." [24]

Figure 16: Successful Forest Garden in Keur Malick Ndiaye. The land was protected using a combination of thatch, live fence, and branches.

Recommendations

1. We recommends that TREES provides farmers with fences, for at least 1/8 of a hectare.

Participants from all villages stressed the importance of dead fences as a requirement for successful Forest Gardens. In Fatick, a lack of fences prevented the vast majority of participants from growing anything in their Forest Garden during dry season, as animals would enter and eat everything. In contrast, successful participants in Kaffrine had dead fences alongside live fences, and stressed that even with live fences, dead fences were necessary to keep the animals out.

We recommend that TREES begins by giving every farmer a fence large enough to fence between 1/8 and 1/4 of a hectare. This area should provide farmers with a start for their Forest Gardens, since we noted in Fatick that even farmers who had theoretically allocated a hectare of lands toward their Forest Garden began by planting ~1/8 of a hectare. Protecting this initial parcel of land would help farmers produce something from their Forest Gardens right away.

From this "starting Forest Garden," farmers would have two options to expand. They could transplant their dead fence to surround an adjacent plot of land, if subsequent live fencing was enough to keep the animals away. They could also use the proceeds from the starting Forest Garden to finance fencing for an adjacent plot of land. We saw this second solution employed by a successful farmer in Fatick, who explained to us that he would buy his next section of fencing whenever he had a chunk of profits saved up.

2. We recommend a flexible approach to addressing water access in each village or region, one that depends on the context.

In conversations, TREES staff have expressed that they are hesitant to provide different resources in different villages, for fear of seeming unfair, or of raising and then disappointing village expectations. Yet the extreme reverse, providing every village with precisely the same resources regardless of circumstance, may also be "unfair," as it may inadvertently set up some farmers to succeed and some to fail, based on village circumstances only. The village of Keur Birmane Ndoupi exemplifies this risk; because agricultural plots were generally 0.5-2 km away from the central village water source, participants were far less likely to grow successful Forest Gardens from the start. Indeed, this was the least successful village we visited.

We know that TREES is aware of this risk, and further that TREES has historically made efforts to address unique water situations with, for instance, the tubing that was observed in Kaffrine, or with the LOCO water pumps that have been offered in other villages. We recommend that TREES expands on these efforts, to make village-specific or at least region-specific efforts to address water access in a way that makes the most sense for the projects you are working in.

For instance, because Keur Birmane Ndoupi had a water tower, this village could have been provided with tubes to connect the water tower to their Forest Gardens. Another option, which the farmers themselves suggested, would be to partner with an outside group to build a new water tower closer to their agricultural land. This latter solution would likely be best for the farmers, since the distance from the village to the Forest Gardens might render piped water from the village impossibly slow.

While TREES cannot alleviate the primary concern of the focus group farmers in **Kaffrine** – costly water fees – it might work to address secondary constraints in **Kaffrine** such as water pipe maintenance and the exceedingly slow flow of water during the mornings and evenings, when solar power is weak. For instance, TREES might provide farmers with 50 m rather than 30 m of pipe for the purpose of maintenance, or might indirectly help farmers to invest in their own pipe by transporting new pipe purchases to the village for buyers. TREES might also work with an outside agency to replace the water tower solar pumps with new solar pumps that store energy, smoothing the water flow speed across the day. This would drastically reduce the time use associated with watering Forest Gardens in Keur Malick Ndiaye and Médinatou Salame 2 2.

3. We recommend a micro-loan program for famers who wish to invest further in their fences, their water sources, or their garden more generally.

We spoke with several farmers who invested in wells or even in solar pumps for their Forest Gardens, and we believe that more would do so if they had fencing to secure their garden from the start. Investing in a Forest Garden without a fence poses a risk to farmers; their efforts might result in failure and lost resources. But based on our focus group conversations, we expect that if farmers began with a protected parcel of land, more of them would successfully grow and sell vegetables and legumes within the first 1 or 2 years. Some of them might then wish to expand and intensify operations by investing in a well inside their Forest Garden, by purchasing a pump if they had a well already, by building concrete cistern such as observed in a few Forest Gardens (Figure 17), or by simply buying more fencing to expand their Forest Garden.

To ensure that all farmers have the opportunity make such investments, we recommend that TREES offers small, 1- or 2-year loans to farmers who are looking to make capital investments. The loans might cover something like half or two-thirds of the total investment cost – requiring that farmers also save money from their first harvests to put towards the goal. The loans could be repaid after the first and/or second harvest that benefitted from the investment. Because some farmers might wish to make this investment after their 4 program years are over (and because some of the "pay it forward" farmers might also wish to invest in resources for their Forest Garden), we recommend that if possible, TREES separate this loan program slightly from the 4-year training program.

Figure 17: The village chief in Payoma invested in cisterns for his Forest Garden. But not all farmers can afford to make such a costly investment.

We understand that a micro-finance program would be mission drift for TREES, and therefore we recommend that TREES consider a partnership with an existing micro-finance organization to provide these loans. Another option would be to partner with an organization that offers a savings mechanism only, such as MyAgro.[f] We suspect a savings mechanism would be effective and slightly safer for farmers, though might slow capital investments relative to what is possible when micro-loans are available. Either way, it would be best to pilot a loan and/or savings program prior to rolling it out large-scale, to learn as best as possible about associated difficulties, impacts, etc.

4. Improve female participation in Fatick.

We are not sure why female participation in the TREES program was so much lower in **Fatick** than in **Kaffrine**. Women in our focus groups in **Fatick** seemed to be under the impression that TREES did not allow, or at least did not encourage, women to join the Forest Garden program. This is odd since we, the project team, know that in fact TREES leadership is strongly committed to inclusion of female farmers. We therefore suppose that: (1) gender roles around land management prevented **Fatick** women from joining, (2) slightly smaller farm sizes in **Fatick** (vis-à-vis **Kaffrine**) constrains the quantity of land that men are willing to lend to their wives, (3) TREES technicians in **Fatick** did not encourage women to join the TREES program. Of course, the answer may be a combination of these three factors, or may be none of these.

Regardless of the underlying problem, TREES needs to improve recruitment of female farmers in the **Fatick** region. If the problem stems from gender roles, we recommend that TREES addresses those gender roles directly in early mobilization meetings. If the problem stems from technician beliefs and practices, we recommend that TREES addresses those beliefs and practices in technician trainings and meetings, perhaps encouraging technician from areas with excellent female participation rates to share their experiences with other technicians.

Two other creative tweaks to the training program might improve female participation in **Fatick** even in the face of difficult-to-alter gender roles and/or land constraints. First, we suggest that TREES considers permitting two participants to register per Forest Garden, to allow a husband and a wife to be trained together. This seems advantageous for agricultural production (as well as for female empowerment and family power dynamics) because women are providing much of the labor to male-owned Forest Gardens anyway, and they might do so better if they were attending the TREES trainings. Second, we recommend that TREES considers allowing women's groups that own agricultural land to participate in the Forest Garden program, with 1 or 2 women attending the TREES programs at primary participants.

5. Train farmers to seek out further markets and/or product differentiate when the local markets are over-supplied.

Based on focus group conversations, we gathered that most farmers sell their Forest Garden products at local markets (if they sell at all), while a few sell to traders. Farmers and their wives further informed us that the supply of any given product at that local market strongly informs

[f] MyAgro offers a phone-based savings account for farmers to save incrementally towards either seasonal or one-time agricultural investments. Their services are widely available in many areas of Senegal.

one's ability to sell, and/or the price that one must accept for the product. This suggest that two factors are important to the profitability of Forest Gardens: (1) the rarity of the product being sold, (2) the location and size of the selling market.

We know that TREES provides training on marketing. We suggest that if it is not already covered, trainings on product differentiation and/or processing be included. In an ideal world, farmers would seek to grow (or post-process) 1 or 2 products that are rare at local markets and are therefore less threatened by over-supply. Examples might be rare peppers, rare citrus fruits, rare legumes, or dried rather than fresh fruit. In addition, TREES might consider supplying interested farmers with seeds for crops that are less common at local markets, in order to place market-oriented Forest Garden farmers in a "niche" vis-à-vis other local producers. These efforts would not only boost profitability for TREES participants, they would also improve product diversity at local markets, in theory benefitting all households in the market catchment area.

We also suggest that TREES encourages farmers to collaboratively identify and sell to further-off markets if the local market is over-supplied with their products. Because transportation costs to further-off markets are high, selling to these markets is often not profitable for a single farmer. If groups of farmers bundle products however, the transportation cost will be reduced for each farmer, and may make the effort worth it. TREES might encourage such collaboration in ways that are a simple as providing an hour or two during training for farmers to explicitly discuss the various markets that they know of and/or sell to, to discuss product transportation methods and costs, and to identify groups of farmers who all grow the same product, in order to know who might be interested in working cooperatively in the future.

Quotes

1: “ligniy produire dou barri, ndax ligniy produire do baarri. Souniou amer ndiak bi dinagn produire loubarri” (*Ndiomdy: Focus Group 3*)

2: Person 1 – “dagay defar niak bii ba pareh, beuy yii niokay lekk”. Person 2 – “so defarer pépinière comme nign ko waxeh soko yobbo thi tool yi, beuy yi niokay lekk bamou diekh takk” (*Keur Birane Ndoupi: Focus Group 2*)

3: “diaffé diaffé ndiag bii moyy, soy wout bant thi hall bi , wa eaux et forets meun nagnu leuh diap” (*Keur Birane Ndoupi Focus Group 1*)

4: “sunu lem bi, diour gui nioko yak. Dagay liguey ba sonn, niou nieuw yak ko , dioy na ba soon” (*Payoma: Focus Group 2*)

5: “dioxer hectare trees batay demougn fen. Yenn tool yi baxoul ndax diang bi mo baxoul. Te do meun demm kon di bayi tool bi” (*Médinatoul Salame: Focus Group 1*)

6: “rosser bi day dieul temps, té ndox du am tout le temps. Sou amoul do liguey” (*Keur Birane Ndoupi: Focus Group 2*)

7: “sool ndox bi dina mat waxtou. Ten bi liko manquer 30m beuriwoul. Tool yi tollo woul, motax yon bi dou gaw ndax mbam yi mom tamit dina dieul ben waxtou. Soo aksiwé thi tool bi meun na dieul tamit ben waxtou. Mouyy 3 waxtou thi arrosage bi. 20*20L bouteilles yi pour ben fan leuh” (*Keur Birane Ndoupi: Focus Group 2*)

8: “thi keur gui digua rosser souba ak gon… rosser gui souba ak guon bouthie nek 30mn lay dieul… sou ndox amoul douma rosser ndax amuma Katan wut ndox me” (*Keur Birane Ndoupi: Focus Group 2*)

9: Person 1: “amna niou am mbam, amna niou amoul. Man mbam la am, amuma charette, damay am souma soxla”. Person 2: “so amoul dagay abb, so nitt ki di liguey dagay xarr” (*Keur Birane Ndoupi: Focus Group 2*)

10: “gnu amone nagnu robinet, facture bi da cher motax gnu bari reculer, 1m3 bi 200 F CFA laay diar” (*Médinatoul Salame: Focus Group 1*)

11: “Ousmane DIOUF; dis-adopters , amna 6ha beugon dioxé leup, mais bagnou waxeh maraichage la délou guinaw ndax atanoumako. Awma kouma diapaleh samay dom dagniy diang” (*Ndiomdy: Focus Group 1*)

12: “daniouy meun di demm founiou neex, heure bou neek niogui thi tool yi” (*Keur Malick Ndiaye: Focus Group 2*)

13: “par campagne lagniy liguey ak niom meun na dieul 4 ba 5 mois. Man amna 4 surgas, Souniou diayé ba guéner dieugou gasoil, wala engrais bi… Lithi dess niou seddo ko” (*Ndiomdy: Focus Group 1*)

14: “dagny len di lathie; ndax pareguen djiguen yi doug thi programme wala pare woulen” (*Ndiomdy: Focus Group 2*)

15: “Diguen yi bokk thi projet Tree bi beuriwoul, Man rekk la xam kouthie bokk. Kheuyna reen niou bokk thi.” (*Keur Birane Ndoupi: Focus Group 2*)

16: “sou nieuwé meun nagnu waxtane ak suniouy borom keur mu may niou souf. Amagnu Jardin, pour sunu boop” (*Ndiomdy: Focus Group 2*)

17: STILL SEARCHING

18: “legui gua bay ba pareh, dem marché bu beurre feuh. Dagay moudié danou. Sothie yakaron 5000 F CFA, 2500 guakay moudié diayer sinon dafay yakou sa lokho” (*Payoma: Focus Group 1*)

19: “digua thi am benefice, dagay am xaliss , digua diay , digua lekk ak sa ndiabot” (*Médinatoul Salame Focus group 1*)

20: “Marraichage mo eup ndieurign, eup xaliss bayoum nawet bi… kilo Kandia 700F CFA lay diar té budé guerté leuh 200F CFA lay diar…kilo kani eup na 3000F CFA.” (*Ndiomdy: Focus Group 3*)

21: “legui legumes bi yomb naafi, avant daf féé diafer wone. Legui am nagnu ay garap you bess. Niit yii dagniy liguey sen birr. Project bi dalay défal renforcement de capacité” (*Keur Malick Ndiaye: Focus Group 3*)

22: “amna ndieurign. Thi walou formation, thi walou xam-xam garap amnagnu Ko thi. Digua meun greffer ay garab saxal ko fii. Souniou dioxé ay dji yu bess meun nagn ko andi fi saxal ko fi. Niak bi daal moy probleme bii” (*Médinatoul Salame Focus Group 1*)

23: “dama ka dan deff mais bima découvrirer que sama deuk amna potentiels thi la tokk” (*Keur Birane Ndoupi: Focus Group 1*)

24: “Am nagnu yakar thi yokouté liguey bi ak tree” (*Keur Birane Ndoupi: Focus Group 2*)

Appendix A: Focus Group Specifics

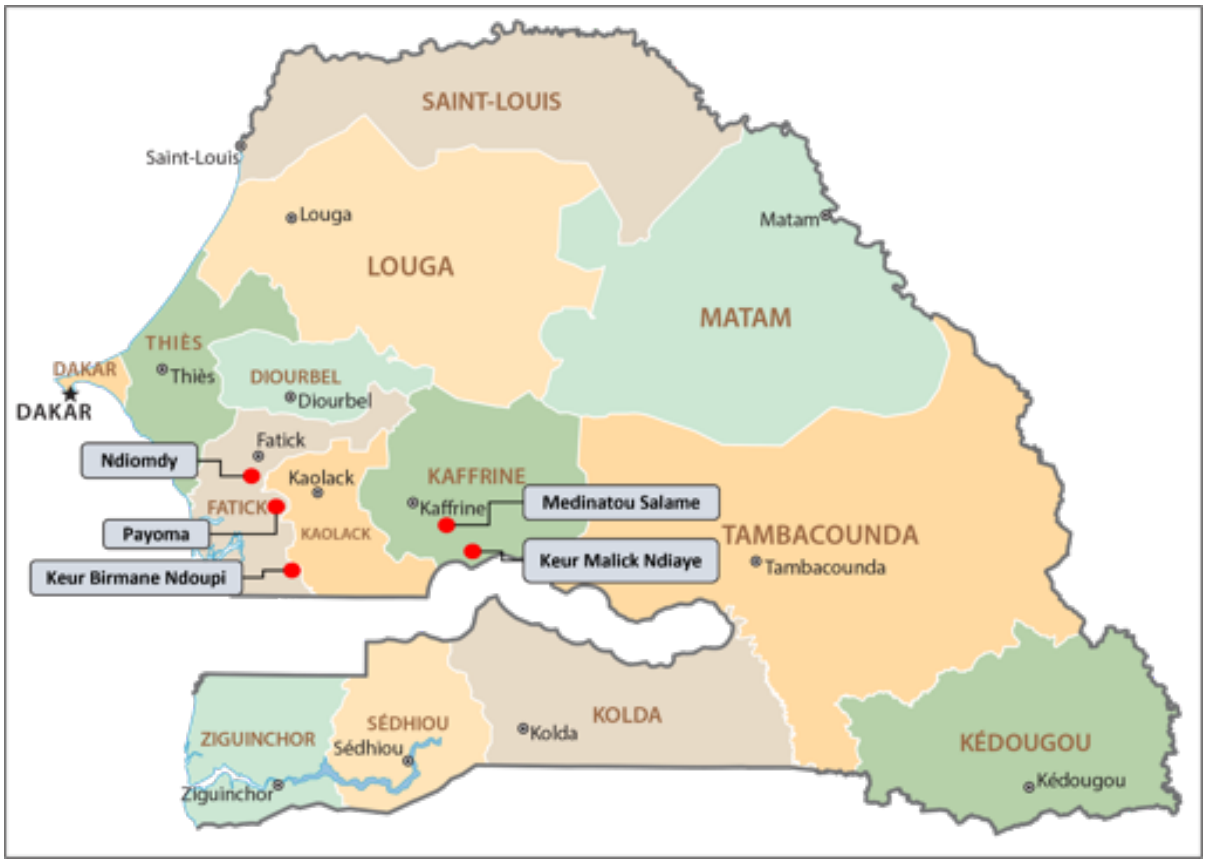

Figure A1: Sample village Locations. Base map is from *https://gisgeography.com/senegal-map/#RegionsMap*

	Adopters	Women	Non-Adopters
Keur Birane	10	4	4
Ndiomdy	7	8	9
Payoma	10	18	-
Keur Malick	18	13	7
Médinatoul Salam	30	8	6

Table A1: Number of Participants in Each Focus Group, by Village

Appendix B: Registered TREES Participants in Each Village

Forest Garden Name	Gender	Age	Village	District	Project Unit	Local Group Name
Abdoulaye Keita	Mâle	28	Keur Birmane Ndoupi	Wack ngouna	Fatick 10	Bok guis guis
Abdoulaye thiame	Mâle	51	Keur Birmane Ndoupi	Wack ngouna	Fatick 10	Bok guis guis
Aliou diagne	Mâle	60	Keur Birmane Ndoupi	Wack ngouna	Fatick 10	Bok guis guis
Amath biteye	Mâle	50	Keur Birmane Ndoupi	Wack ngouna	Fatick 10	Bok guis guis
Balla camara	Mâle	50	Keur Birmane Ndoupi	Wack ngouna	Fatick 11	Bok guis guis
Ibrahima Touré	Mâle	60	Keur Birmane Ndoupi	Wack ngouna	Fatick 12	Bok guis guis
Keba ndiaye	Mâle	55	Keur Birmane Ndoupi	Wack ngouna	Fatick 13	Bok guis guis
Malick touré	Mâle	79	Keur Birmane Ndoupi	Wack ngouna	Fatick 14	Bok guis guis
Mamou Camara	Femelle	74	Keur Birmane Ndoupi	Wack ngouna	Fatick 15	Bok guis guis
Mariama Camara	Femelle	50	Keur Birmane Ndoupi	Wack ngouna	Fatick 16	Bok guis guis
Mass Diagne	Mâle	53	Keur Birmane Ndoupi	Wack ngouna	Fatick 17	Bok guis guis
Mbaye Sarr	Mâle	25	Keur Birmane Ndoupi	Wack ngouna	Fatick 18	Bok guis guis
Modiba Camara	Mâle	67	Keur Birmane Ndoupi	Wack ngouna	Fatick 19	Bok guis guis
Modou Camara	Mâle	55	Keur Birmane Ndoupi	Wack ngouna	Fatick 20	Bok guis guis
Modou sene	Mâle	47	Keur Birmane Ndoupi	Wack ngouna	Fatick 21	Bok guis guis
Mouhamed biteye	Mâle	32	Keur Birmane Ndoupi	Wack ngouna	Fatick 22	Bok guis guis
Mouhamed Keïta	Mâle	25	Keur Birmane Ndoupi	Wack ngouna	Fatick 23	Bok guis guis
Moussa fall	Mâle	50	Keur Birmane Ndoupi	Wack ngouna	Fatick 24	Bok guis guis
Moustache biteye	Mâle	45	Keur Birmane Ndoupi	Wack ngouna	Fatick 25	Bok guis guis
Pape Diagne	Mâle	51	Keur Birmane Ndoupi	Wack ngouna	Fatick 26	Bok guis guis
Pape lô	Mâle	60	Keur Birmane Ndoupi	Wack ngouna	Fatick 27	Bok guis guis
Seydou Keita	Mâle	45	Keur Birmane Ndoupi	Wack ngouna	Fatick 28	Bok guis guis
Sidy Keita	Mâle	50	Keur Birmane Ndoupi	Wack ngouna	Fatick 29	Bok guis guis
Silma camara	Mâle	52	Keur Birmane Ndoupi	Wack ngouna	Fatick 30	Bok guis guis
Souleymane Keita	Mâle	40	Keur Birmane Ndoupi	Wack ngouna	Fatick 31	Bok guis guis
Amadou Ndiaye	Mâle	41	Ndiomdy	Djilor	Fatick 3	ÑOOW DIAM F3
El Hadji Malick Ndao	Mâle		Ndiomdy	Djilor	Fatick 3	ÑOOW DIAM F3
Gorgui Ba	Mâle	60	Ndiomdy	Djilor	Fatick 3	ÑOOW DIAM F3
Guéladio Diallo	Mâle	60	Ndiomdy	Djilor	Fatick 3	ÑOOW DIAM F3
Ibou Sarr	Mâle	61	Ndiomdy	Djilor	Fatick 3	ÑOOW DIAM F3
Lamine Diouf	Mâle		Ndiomdy	Djilor	Fatick 3	ÑOOW DIAM F3
Malick Ba	Mâle	58	Ndiomdy	Djilor	Fatick 3	ÑOOW DIAM F3
Modou Dione	Mâle	62	Ndiomdy	Djilor	Fatick 3	ÑOOW DIAM F3
Moussa Diouf	Mâle		Ndiomdy	Djilor	Fatick 3	ÑOOW DIAM F3
Ousmane Ndiaye	Mâle		Ndiomdy	Djilor	Fatick 3	ÑOOW DIAM F3
Sambou Diouf	Mâle	61	Ndiomdy	Djilor	Fatick 3	ÑOOW DIAM F3
Sémou Diouf	Mâle	29	Ndiomdy	Djilor	Fatick 3	ÑOOW DIAM F3
Abdou Touré	Mâle	30	Payoma	Toubacouta	Fatick 5	And liguey soukhaly Jiguinly
Abdoulaye Touré	Mâle	60	Payoma	Toubacouta	Fatick 5	And liguey soukhaly Jiguinly
Aliou Touré	Mâle	50	Payoma	Toubacouta	Fatick 5	And liguey soukhaly Jiguinly
Babacar Diouf	Mâle	40	Payoma	Toubacouta	Fatick 5	And liguey soukhaly Jiguinly
Babacar Touré	Mâle	59	Payoma	Toubacouta	Fatick 5	And liguey soukhaly Jiguinly
Babou mbaye Sow	Mâle	60	Payoma	Toubacouta	Fatick 5	And liguey soukhaly Jiguinly
Cheikh Tidiane Ka	Mâle	55	Payoma	Toubacouta	Fatick 5	And liguey soukhaly Jiguinly
Cheikhou Diba	Mâle	40	Payoma	Toubacouta	Fatick 5	And liguey soukhaly Jiguinly
Cheikhou Niane	Mâle	50	Payoma	Toubacouta	Fatick 5	And liguey soukhaly Jiguinly
El adji Omar Toure	Mâle	65	Payoma	Toubacouta	Fatick 5	And liguey soukhaly Jiguinly
Madiabou Toure	Mâle	50	Payoma	Toubacouta	Fatick 5	And liguey soukhaly Jiguinly
Mamadou Diallo	Mâle	46	Payoma	Toubacouta	Fatick 5	And liguey soukhaly Jiguinly
Mamadou lamine Ndiaye	Mâle	53	Payoma	Toubacouta	Fatick 5	And liguey soukhaly Jiguinly
Mamadou Leye	Mâle	70	Payoma	Toubacouta	Fatick 5	And liguey soukhaly Jiguinly
Mamath Niane	Mâle	55	Payoma	Toubacouta	Fatick 5	And liguey soukhaly Jiguinly
Massamba Bousso	Mâle	35	Payoma	Toubacouta	Fatick 5	And liguey soukhaly Jiguinly
Modou lamine Touré	Mâle	46	Payoma	Toubacouta	Fatick 5	And liguey soukhaly Jiguinly
Modou Ndiaye	Mâle	55	Payoma	Toubacouta	Fatick 5	And liguey soukhaly Jiguinly
Momath sow	Mâle	45	Payoma	Toubacouta	Fatick 5	And liguey soukhaly Jiguinly
Mouhamed Touré	Mâle	25	Payoma	Toubacouta	Fatick 5	And liguey soukhaly Jiguinly

Moutapha ndiaye	Mâle	45	Payoma	Toubacouta	Fatick 5	And liguey soukhaly Jiguinly
Omar Touré	Mâle	40	Payoma	Toubacouta	Fatick 5	And liguey soukhaly Jiguinly
Ousmane Toure	Mâle	35	Payoma	Toubacouta	Fatick 5	And liguey soukhaly Jiguinly
Pape serigne Toure	Mâle	60	Payoma	Toubacouta	Fatick 5	And liguey soukhaly Jiguinly
Thierno Diallo	Mâle	52	Payoma	Toubacouta	Fatick 5	And liguey soukhaly Jiguinly
Youssoupha Gaye	Mâle	42	Payoma	Toubacouta	Fatick 5	And liguey soukhaly Jiguinly
Abdoulaye Dia	Mâle	50	Keur Malick Ndiaye	Katakel	Kaffrine 7	Diapo Keur Malick Ndiaye
Adji arame Willane	Mâle	35	Keur Malick Ndiaye	Katakel	Kaffrine 7	Diapo Keur Malick Ndiaye
Adji Fatou Vilane	Mâle	50	Keur Malick Ndiaye	Katakel	Kaffrine 7	Diapo Keur Malick Ndiaye
Babou Diane	Mâle	45	Keur Malick Ndiaye	Katakel	Kaffrine 7	Diapo Keur Malick Ndiaye
Dame Diané	Mâle	62	Keur Malick Ndiaye	Katakel	Kaffrine 7	Diapo Keur Malick Ndiaye
Diané Cissé	Mâle	45	Keur Malick Ndiaye	Katakel	Kaffrine 7	Diapo Keur Malick Ndiaye
Djibel Cssé	Mâle	50	Keur Malick Ndiaye	Katakel	Kaffrine 7	Diapo Keur Malick Ndiaye
Elhadji wilane	Mâle	47	Keur Malick Ndiaye	Katakel	Kaffrine 7	Diapo Keur Malick Ndiaye
Ibra Khady Willane	Mâle	45	Keur Malick Ndiaye	Katakel	Kaffrine 7	Diapo Keur Malick Ndiaye
Ibrahima Ndiol Vilane	Mâle	55	Keur Malick Ndiaye	Katakel	Kaffrine 7	Diapo Keur Malick Ndiaye
Khady Ndao	Femelle	60	Keur Malick Ndiaye	Katakel	Kaffrine 7	Diapo Keur Malick Ndiaye
Malick mbakhé Willane	Mâle	55	Keur Malick Ndiaye	Katakel	Kaffrine 7	Diapo Keur Malick Ndiaye
Malick Ndao	Mâle	49	Keur Malick Ndiaye	Katakel	Kaffrine 7	Diapo Keur Malick Ndiaye
Malick Sokhna vilane	Mâle	46	Keur Malick Ndiaye	Katakel	Kaffrine 7	Diapo Keur Malick Ndiaye
Math Vilane	Mâle	40	Keur Malick Ndiaye	Katakel	Kaffrine 7	Diapo Keur Malick Ndiaye
Mbaya Willane	Femelle	34	Keur Malick Ndiaye	Katakel	Kaffrine 7	Diapo Keur Malick Ndiaye
Moth sény Diané	Mâle	20	Keur Malick Ndiaye	Katakel	Kaffrine 7	Diapo Keur Malick Ndiaye
Moussa Mbakhé Vilane	Mâle	45	Keur Malick Ndiaye	Katakel	Kaffrine 7	Diapo Keur Malick Ndiaye
Omar Fady wilane	Mâle	67	Keur Malick Ndiaye	Katakel	Kaffrine 7	Diapo Keur Malick Ndiaye
Ousmane oumy Willane	Mâle	40	Keur Malick Ndiaye	Katakel	Kaffrine 7	Diapo Keur Malick Ndiaye
Saloume Rokhe Diagne	Mâle	55	Keur Malick Ndiaye	Katakel	Kaffrine 7	Diapo Keur Malick Ndiaye
Sokhna Willane	Femelle	35	Keur Malick Ndiaye	Katakel	Kaffrine 7	Diapo Keur Malick Ndiaye
Abdou Karine seck	Mâle	32	Médinatou Salame 2 2	Katakel	Kaffrine 3	Doundal Garab
Abdou Seck	Mâle	32	Médinatou Salame 2 2	Katakel	Kaffrine 3	Doundal Garab
Aly Mbaye	Mâle	30	Médinatou Salame 2 2	Katakel	Kaffrine 3	Soukhaly sounou ngokh
Arame Seck	Mâle	60	Médinatou Salame 2 2	Katakel	Kaffrine 3	Doundal Garab
Assane Cheikh Seck	Mâle	50	Médinatou Salame 2 2	Katakel	Kaffrine 3	Soukhaly sounou ngokh
Assane Cissé	Mâle	57	Médinatou Salame 2 2	Katakel	Kaffrine 3	Soukhaly sounou ngokh
Awa Boussac Seck	Femelle	30	Médinatou Salame 2 2	Katakel	Kaffrine 3	Doundal Garab
Awa Seck	Mâle	40	Médinatou Salame 2 2	Katakel	Kaffrine 3	Doundal Garab
Bassirou Cissé	Mâle	40	Médinatou Salame 2 2	Katakel	Kaffrine 3	Doundal Garab
Bassirou Seck	Mâle	52	Médinatou Salame 2 2	Katakel	Kaffrine 3	Doundal Garab
Bataur Seck	Femelle	50	Médinatou Salame 2 2	Katakel	Kaffrine 3	Soukhaly sounou ngokh
Birane Cissé	Mâle	52	Médinatou Salame 2 2	Katakel	Kaffrine 3	Doundal Garab
Cheikh Bamba Seck	Mâle	62	Médinatou Salame 2 2	Katakel	Kaffrine 3	Soukhaly sounou ngokh
Cheikh Yacine Seck	Mâle	35	Médinatou Salame 2 2	Katakel	Kaffrine 3	Soukhaly sounou ngokh
Demba Mbaye	Mâle	40	Médinatou Salame 2 2	Katakel	Kaffrine 3	Soukhaly sounou ngokh
Elhadji Abdoulaye Cissé	Mâle	60	Médinatou Salame 2 2	Katakel	Kaffrine 3	Doundal Garab
Fatou Mbaye	Femelle	45	Médinatou Salame 2 2	Katakel	Kaffrine 3	Soukhaly sounou ngokh

Guéye Cissz	Mâle	40	Médinatou Salame 2 2	Katakel	Kaffrine 3	Doundal Garab
Ibou Ndiaye	Mâle	46	Médinatou Salame 2 2	Katakel	Kaffrine 3	Soukhaly sounou ngokh
Ibrahima Seçk	Mâle	40	Médinatou Salame 2 2	Katakel	Kaffrine 3	Soukhaly sounou ngokh
Khady Cissé	Femelle	40	Médinatou Salame 2 2	Katakel	Kaffrine 3	Soukhaly sounou ngokh
KHODIA SECK	Femelle	44	Médinatou Salame 2 2	Katakel	Kaffrine 3	Doundal Garab
Mâle Diarra Seck	Femelle	33	Médinatou Salame 2 2	Katakel	Kaffrine 3	Soukhaly sounou ngokh
Mâle souna Seck	Femelle	45	Médinatou Salame 2 2	Katakel	Kaffrine 3	Soukhaly sounou ngokh
Matar Loum	Mâle	45	Médinatou Salame 2 2	Katakel	Kaffrine 3	Doundal Garab
MBATHIO DIENG	Femelle	50	Médinatou Salame 2 2	Katakel	Kaffrine 3	Doundal Garab
Mbaye Loum	Mâle	50	Médinatou Salame 2 2	Katakel	Kaffrine 3	Doundal Garab
Modou Diarra Seck	Mâle	60	Médinatou Salame 2 2	Katakel	Kaffrine 3	Doundal Garab
Modou Seck	Mâle	55	Médinatou Salame 2 2	Katakel	Kaffrine 3	Doundal Garab
Modou Thiaré Mbaye	Mâle	32	Médinatou Salame 2 2	Katakel	Kaffrine 3	Soukhaly sounou ngokh
Môth Awa Mba6e	Mâle	42	Médinatou Salame 2 2	Katakel	Kaffrine 3	Soukhaly sounou ngokh
Motu Seck	Mâle	40	Médinatou Salame 2 2	Katakel	Kaffrine 3	Soukhaly sounou ngokh
Moussa Amina Cissé	Mâle	60	Médinatou Salame 2 2	Katakel	Kaffrine 3	Soukhaly sounou ngokh
Moussa Mbaye	Mâle	40	Médinatou Salame 2 2	Katakel	Kaffrine 3	Soukhaly sounou ngokh
Ndéye Mbaye	Femelle	33	Médinatou Salame 2 2	Katakel	Kaffrine 3	Soukhaly sounou ngokh
Ndiaga seck	Mâle	60	Médinatou Salame 2 2	Katakel	Kaffrine 3	Doundal Garab
Ndiaga taula Seck	Mâle	34	Médinatou Salame 2 2	Katakel	Kaffrine 3	Doundal Garab
Ndiamatou Cissé	Mâle	35	Médinatou Salame 2 2	Katakel	Kaffrine 3	Doundal Garab
NdioumbaBSeck	Femelle	55	Médinatou Salame 2 2	Katakel	Kaffrine 3	Soukhaly sounou ngokh
Ramata Seck	Femelle	50	Médinatou Salame 2 2	Katakel	Kaffrine 3	Soukhaly sounou ngokh
Rame Cissé	Mâle	45	Médinatou Salame 2 2	Katakel	Kaffrine 3	Soukhaly sounou ngokh
Rokhy Cissé	Mâle	35	Médinatou Salame 2 2	Katakel	Kaffrine 3	Doundal Garab
Saliou Seck	Mâle	45	Médinatou Salame 2 2	Katakel	Kaffrine 3	Doundal Garab
Sellé Baba Mbaye	Mâle	63	Médinatou Salame 2 2	Katakel	Kaffrine 3	Soukhaly sounou ngokh
Sette Cissé	Mâle	73	Médinatou Salame 2 2	Katakel	Kaffrine 3	Doundal Garab
Seune Cissé	Mâle	40	Médinatou Salame 2 2	Katakel	Kaffrine 3	Doundal Garab
Seydou mboji Diop	Mâle	60	Médinatou Salame 2 2	Katakel	Kaffrine 3	Doundal Garab
Seynabou Seck	Femelle	50	Médinatou Salame 2 2	Katakel	Kaffrine 3	Soukhaly sounou ngokh
Taula Seck	Femelle	60	Médinatou Salame 2 2	Katakel	Kaffrine 3	Doundal Garab

Thiérno Cîsse	Mâle	65	Médinatou Salame 2 2	Katakel	Kaffrine 3	Doundal Garab
Thioumbé Dieng	Femelle	50	Médinatou Salame 2 2	Katakel	Kaffrine 3	Soukhaly sounou ngokh
Yacine Dieng	Femelle	30	Médinatou Salame 2 2	Katakel	Kaffrine 3	Doundal Garab
Yacine Seck	Femelle	50	Médinatou Salame 2 2	Katakel	Kaffrine 3	Soukhaly sounou ngokh
Alassane Mbaye	Mâle	45	Médinatou Salame 2 2	Katakel	Kaffrine 3	Ande dieuf
Aliou Nokho	Mâle	48	Médinatou Salame 2 2	Katakel	Kaffrine 3	Ande dieuf
Babacar Seck	Mâle	55	Médinatou Salame 2 2	Katakel	Kaffrine 3	Ande dieuf
Barro Diop	Mâle	60	Médinatou Salame 2 2	Katakel	Kaffrine 3	Ande dieuf
Dame Diop	Mâle	32	Médinatou Salame 2 2	Katakel	Kaffrine 3	Ande dieuf
Kéba Nokho	Mâle	66	Médinatou Salame 2 2	Katakel	Kaffrine 3	Ande dieuf
Lahine Ndeye Nokho	Mâle	31	Médinatou Salame 2 2	Katakel	Kaffrine 3	Ande dieuf
Lahine Nokho	Mâle	45	Médinatou Salame 2 2	Katakel	Kaffrine 3	Ande dieuf
Mady Diop	Mâle	35	Médinatou Salame 2 2	Katakel	Kaffrine 3	Ande dieuf
Mady Seck	Mâle	38	Médinatou Salame 2 2	Katakel	Kaffrine 3	Ande dieuf
Malick Touré	Mâle	61	Médinatou Salame 2 2	Katakel	Kaffrine 3	Ande dieuf
Mame Aly Seck	Mâle	35	Médinatou Salame 2 2	Katakel	Kaffrine 3	Ande dieuf
Mamour Maye	Mâle	35	Médinatou Salame 2 2	Katakel	Kaffrine 3	Ande dieuf
Mariama Cisse	Femelle	45	Médinatou Salame 2 2	Katakel	Kaffrine 3	Ande dieuf
Modou Nokho	Mâle	44	Médinatou Salame 2 2	Katakel	Kaffrine 3	Ande dieuf
Moth Seck	Mâle	63	Médinatou Salame 2 2	Katakel	Kaffrine 3	Ande dieuf
Rokhy Sall	Femelle	36	Médinatou Salame 2 2	Katakel	Kaffrine 3	Ande dieuf
Seck Cissé	Mâle	48	Médinatou Salame 2 2	Katakel	Kaffrine 3	Ande dieuf
Thiendou Cissé	Mâle	50	Médinatou Salame 2 2	Katakel	Kaffrine 3	Ande dieuf

Appendix C: Focus Group Prompts (English)

Focus Group 1: Adopters (And Dis-adopters)

Pre-amble: Thank you so much for being willing to talk with us today! We really appreciate your time.

We are interested in learning about your experience growing Forest Gardens. In particular, we want to learn about the primary difficulties you encountered while growing your Forest Gardens, and how you attempted to overcome those difficulties. And for those of you who dropped out of the Forest Garden program, we are wondering what caused you to do so.

We are not working for TREES. We are researchers from two universities: one in America called Ohio State University, and the Université de Thiès in Thies. We are conducting these focus groups to learn about Forest Gardens. In the future, we might work with TREES on related projects. But right now, we have no projects ourselves. We are just listening and learning.

We are going to record this conversation if that's ok with you, and we will keep that recording at our university. But we will never share that recording with anyone else. Also, we will not share your name or other information about you with anyone else. We also will not write your names in any sort of report or document. We might quote you in a report, but the quotes would be completely anonymous – nobody would be able to tell who said it.

We also ask that everyone here keeps this discussion confidential – that is, please do not share remarks to anyone outside of this group. We hope that confidentiality will make everyone feel like they can be honest with their opinions. But of course, it is always possible that somebody may repeat a comment anyway. That is, we cannot guarantee perfect confidentiality.

Last, your participation in this focus group is *completely* voluntary – you may leave at any point, including right now! But we hope you will stay, as we are excited to hear your thoughts. :)

(1) First, let us all introduce ourselves. Please tell us tell us how much agricultural land you work, the size of your Forest Garden, what was growing on the Forest Garden before, and what sort of crops you grow in it now.

- Prompt at the end: Do any of you RENT land? If so, for what part of the year?
    - *Action: This should all be noted down for each participant.*

(2) Aside from the Forest Garden, **what agriculture or non-agriculture activities does your family do,** across all the seasons?

- Prompt: Do you grow millet/groundnut, or any other sort of crops?
- Prompt: Do you have any tree farm?
- Prompt: Do you fish?
- Prompt: Do you grow any vegetables in another garden, separate from the Forest Garden? If so, during wet or dry season?
- Prompt: What non-agricultural activities do you do?
- Prompt**:** In what season is each of these happening?
- Prompt**:** Do women help with ALL of these, or is there some activity that is ONLY men?

(3) Are you currently growing a Forest Garden? That is, are you actually growing something in the Forest Garden plot during dry season right now?

- Prompt: If not, how and where did you use the vegetable seeds from TREES?
- Prompt: During what months did you grow those vegetables?
- Prompt: When are animals untied in this village?

(4) What were the **primary difficulties or constraints** you faced while growing your Forest Garden**,** and what did you do to address them?

- Prompt: For instance, was building the dead fence difficult? Did you have trouble gathering enough water for irrigation? Did you have trouble accessing people for labor? Was there any problem with your soil? Was your plot too large?
- Prompt: How did you address these problems? Did you have any support from outside sources (NGOs, family, friends)?
- Prompt: Did the challenges change over time? For instance, did years 3-4 need less water, or less time?

(5) Now, **for those who ended up leaving the Forest Garden program – when and why did you leave?**

- Prompt: At what point did you leave – after how many months/years?
- Prompt: Did you leave because it was too time-consuming, because you couldn't access enough water, because you lost access to the land, because you needed to travel, because it just didn't seem worthwhile…?

(6) How close is your Forest Garden to the well that you use for drawing irrigation water?

- Prompt: Is it inside the Forest Garden itself? If not inside, how far away is it (km or walking minutes)?
- Prompt: If you draw from multiple wells, how far is each one?

(7) We want to learn more about this **water source**, **how you transport the water** into your Forest Garden (and how long it takes), and **how you irrigate** (and how long it takes). Can you each explain this process to us?

- Prompt on water source: What sort of well/pump do you use, or do you gather surface water? Do you share access with other families? Can you access this water source year-round? Do you pay water user fees? Any other access problems?
- Prompt on transportation: What do you use to carry the water (e.g., jerry can, donkey cart, bike)? How much time does it take to walk to the source, gather the water, and bring it to the Forest Garden?
- Prompt on irrigation: If you water by hand, what sort of bucket do you use? Otherwise, how do you irrigate? How much time does it take each day in the dry season? In the wet season, if you water then?

(8) Who gathers and transports the water, for those of you without an on-site well?

- Prompt: Do you do it, or your kids, or your wife, or somebody else?
- Prompt: Do you ever pay somebody to do it?
- *Note: Skip this question if everyone mentioned the answer when discussing (6).*

(9) How much water to do you use to irrigate your Forest Garden during the nursery phase, in the wet season, and after out-planting during the dry season?

- Prompt: This can be per day or per week, however you count it. You can also give the quantity in any unit.

(10) Is it **feasible to dig a well** in or near to your Forest Garden? What are the **primary constraints to drilling a new well?**
- Prompt: Did anybody do this? What labor, cost, and parts were involved?
- Prompt: Did anybody consider this, and decide not to? Why did you decide not to?
- Prompt: What makes drilling a well hard – getting the materials, getting the laborers, or the price of the materials/labor?

(11) Is it **feasible to irrigate your Forest Garden with a pipe or tubes**, to avoid manual watering? What are the **primary constraints to this sort of irrigation?**
- Prompt: Does anybody do this? What labor, cost, and parts were involved?
- Prompt: Did anybody consider this, and decide not to? Why did you decide not to?
- Prompt: Do you think piped water would reduce the burden of watering?

(12) Besides you, who works in your Forest Garden, and in what season? And who works on your farm more generally?
- Prompt: Do you ever hire labor to work on your land, for any crops?
- **Mandatory Prompt:** Do you ever hire labor to work in the Forest Garden? If yes, *how much were they paid*?
- **Mandatory Prompt:** Which family members work in the Forest Garden, and *how are they compensated*?
- Prompt: Is there any difference between the work you do yourself, vs. what other people can do?

(13a) Older participants: when you were younger, **did you temporarily migrate** during the dry season, or **did you live and work outside the village?**
- Prompt: Where did you use to work permanently / during off season?
- Prompt: How important was that income to the family? For instance, did it help pay for food? Did it pay for school fees?
- Prompt: Since adopting, have any of the younger men stayed at home to help you during dry season, rather than migrating to a nearby area for work?

(13b) Younger participants: Does having a Forest Garden **change your ability to migrate for work** during the dry season? Is it worth it?
- Prompt: Before the Forest Garden, did you migrate for wages? Where did you go?
- Prompt: If **no** income was lost, why not? If income **was** lost, how did you compensate?
- Prompt: Which option do you prefer – migration or agricultural labor during the dry season?

(14) Let's say an outside program was offering help with water for Forest Gardens. **What would be the most helpful investment in water access and/or irrigation?**
- Prompt: Partial financial help with drilling individual wells?
- Prompt: Solar or diesel pumps?
- Prompt: Pipes or tubes for irrigation?

(15) Now let's change topic for the last question… **how has the Forest Garden changed your family's life?** This might be in good ways or in bad ways, we want to hear about both!

- Prompt: For instance, do you have more work to do during the agricultural season?
- Prompt: Or do you have more vegetables during some part of the year?
- Prompt: Does it change the way that you can feed your animals, or the way you graze them?
- Prompt: Has it changed your family's diet in any way? If so, in what season is the change biggest?
- Prompt: Has it brought in extra money, or perhaps caused a loss of money? If a loss, why?

(16) Is there **anything else you'd like to share with us** about your experience with the Forest Garden?

Focus Group 2: Wives of Adopters

Pre-amble: Similar to that of Focus Group 1, but with an emphasis on women's experiences.

(1) First, let us all introduce ourselves. When you introduce yourself, perhaps you can say how long your family has been growing a Forest Garden, how big it is, and what sort of crops and products you primarily grow. Also, tell us your relationship to the TREES participant who owns the Forest Garden.

- Introductions by family members and by focus group team (Amanda, Leah, Karan, Master's student, facilitator).
    - *Action: This should all be noted down for each participant.*

(2) Aside from the Forest Garden, **what agriculture or non-agriculture activities does your family do,** across all the seasons?

- Prompt: Do you grow millet/groundnut, or any other sort of crops?
- Prompt: Do you have any tree farm?
- Prompt: Do you fish?
- Prompt: Do you grow any vegetables in another garden, separate from the Forest Garden? If so, during wet or dry season?
- Prompt: What non-agricultural activities do you do?
- Prompt**:** In what season is each of these happening?
- Prompt**:** Do women help with ALL of these, or is there some activity that is ONLY men?

(3) Are you currently growing a Forest Garden? That is, are you actually growing something in the Forest Garden plot during dry season right now?

- Prompt: If not, how and where did you use the vegetable seeds from TREES?
- Prompt: During what months did you grow those vegetables?
- Prompt: When are animals untied in this village?

(4) From which of those activities **do you make your own income**, separate from your husband or family?

- **Mandatory Prompt:** Do you keep any money/crops from the Forest Gardens?
- Prompt: Do you keep money from selling crops from your own plots
- Prompt: Do you own and sell your own animals?
- Prompt: Do you ever work for payment on other farms?
- Prompt: Do you engage in any sort of commerce, or non-ag wage labor?

(5) Now, **what sort of work do you do** in the Forest Garden, and in **which seasons?**

- Prompt: Do you gather water, transport water, or help irrigate?

- Prompt: Do you weed, help with preparing the soil or planting, help with fertilizing or applying compost, help harvest?
- Prompt: Are you equally likely to be working there during the wet season and the dry season? Why or why not?
- Prompt: Do you tend to be working alongside your husband or other family members? Or alone?

(6) **How many hours of work per day** (or per week) do you put into the Forest Garden, in **each phase (nurseries, transplanting, then after transplanting)?**

- Prompt: During the rainy season? During the hot dry season? During the cool dry season?
- Prompt: If your work time varies quite a bit across different seasons, why is this?

(7) If you are spending part of the day in the Forest Garden, **is there some activity that you have less time for?**

- Prompt: For instance, do you spend less time working on other plots? And if so, does that effect your income?
- Prompt: Or do you spend less time with your kids, or relaxing?

(8) **What benefits does your family see, or do you personally see**, from the Forest Garden?

- Prompt: For instance, does it bring new food, or does it change food availability during specific seasons?
- Prompt: Or does it bring a new source of agricultural income?
- Prompt: Has it changed the way you rear animals, or changed the number of animals you keep?
- Prompt: Has it changed anything about wood availability, or gathering wood?

(9) **How big is your compound, and who eats the food** produced in the Forest Garden (if producing)?

- Prompt: How many people are part of your household?
- Prompt: How do you end up sharing the food produced by the Forest Garden?

(10) **How many animals does your household have, and which ones eat the forage** produced by the Forest Garden (if producing forage)?

- Prompt: How many animals do you guys have, and how do you feed them?
- Prompt: Is ownership joint or by sub-family?
- Prompt: Who uses the forage, and for which type of animal?

(11) Does the Forest Garden have any **negative effects, for you personally or for your family**?

- Prompt: For instance, does it necessitate anyone spending more time gathering water for irrigation? Who is impacted?
- Prompt: Does it take up a lot of your time? How does this impact your ability to do you own work and earn income?
- Prompt: Does it impact the time you spend on chores, on cooking, with your friends, with your children, etc.?
- Prompt: Does it reduce the ability of family members to work for wages in the dry season?
- Prompt: Does it change family dynamics in any way?

(12) If there are **negative effects** of the Forest Garden (for you personally or the family), **how could those be mitigated?**

- Prompt: For instance, if the negative effect is about gathering water, what might reduce that time?
- Prompt: Or if the negative effect is about labor during certain seasons, is it possible to hire labor during those seasons?

(13) Is there **anything else you'd like to share with us** about your or your family's experience with the Forest Garden?

Focus Group 3: Non-Adopting Farmers

Pre-amble: Similar to that of Focus Group 1.

(1) First, let us all introduce ourselves. Please tell us tell us how much agricultural land you work, the tenure of that land, what crops you grow.
- Introductions by farmers and by focus group team.
    - *Action: This should be noted down for each participant.*

(2) What **made you initially interested** in adopting a Forest Garden?
- Prompt: Why did you attend the early mobilization meetings? What aspects of Forest Gardens did you think might be useful?
- Prompt: Or for those who did not attend those meetings, why did you not?

(3) Why did you **not end up enrolling in the TREES program?**
- Prompt: For instance, were there TREES requirements for participation that were infeasible or impractical for you?
- Prompt: Or did you yourself decide that it was infeasible or undesirable for some other reason?
    - For instance, was water or labor access an issue?
    - Or did you not own enough land with secure tenure?
    - Or did you know that you'd have trouble making all of the TREES trainings?
    - Or did you simply think it was not desirable – perhaps you were skeptical about the idea of agroforestry?

(4) Has anything changed in the village, because of the Forest Gardens?
- Prompt: For instance, do the Forest Gardens impact the labor market, or the crop market in any way?
- Prompt: Do the farmers with Forest Gardens sell or give away new foods in the village?
- Prompt: Or do you think there's more interest in growing trees/shrubs/vegetables, after watching the Forest Gardens?

(5) Do you own a land parcel close to a well, or with a well on it? How close is the well?
- Prompt: Is the well inside the parcel itself?
- Prompt: If no parcel has its own well, how far away is the parcel with the CLOSEST well (km or walking minutes)?
    - *Action: This should be noted down for each participant.*

(6) Do you own a primary garden? If so, how big is it, and do you ever irrigate it? Why or why not?
- Prompt: what sort of crops do you grow in the garden?

- Prompt: In what season or seasons do you grow this garden, and in what season do you irrigate?

(7) If you irrigate at all, tell us about the **water source** you use, **how you transport the water** to your plots, and **how you irrigate**.

- Prompt on water source: What sort of well/pump do you use, or do you gather surface water? Do you share access with other families? Can you access this water source year-round? Do you pay water user fees? Any other access problems?
- Prompt on transportation: What do you use to carry the water (e.g., jerry can, donkey cart, bike)? How much time does it take to walk to the source, gather the water, and bring it to the Forest Garden?
- Prompt on irrigation: If you water by hand, what sort of bucket do you use? Otherwise, how do you irrigate? How much time does it take each day in the dry season? In the wet season, if you water then?

(8) Is it feasible to drill a new well on your land, if you wanted one? What are the **primary constraints to drilling a new well?**

- Prompt: What labor, cost, and parts are involved in drilling a well?
- Prompt: What makes drilling a well hard – getting the materials, getting the laborers, or the price of the materials/labor?

(9) Besides you, who works on your farm in each season?

- Prompt: How do family members generally share work for your *other agricultural plots*?
- Prompt: Do you generally hire laborers for *other agricultural plots*? Or trade labor with friends/neighbors?
- Prompt: Is there any difference between the work you do yourself, vs. what other people can do?

(10) Forest Gardens require a fair amount of labor during certain times of the year, when transplanting trees or irrigating, for instance**. Do you think you would have enough time and labor for growing a Forest Garden**, in addition to your other crops?

- Prompt: If the time commitment is too much, why? The time for growing the young trees? The dry season irrigation?

(11) Do **you or any other member of your family generally migrate for work/wages** during the dry season? If so, do they send back money?

- Prompt: If so, where do they go? What sort of work do they do?
- Prompt: Is this income important for the family? For instance, what do you tend to use it for?

(12) Let's say an outside program was offering help with water for irrigated agriculture (horticulture or whatever else). **What would be the most helpful investment in water access and/or irrigation?**

- Prompt: Partial financial help with drilling individual wells?
- Prompt: Solar or diesel pumps?
- Prompt: Pipes or tubes for irrigation?

(13) Are there **any other thoughts you'd like to share with us** about Forest Gardens?

Appendix D: Extra Pictures of Fencing and Team

Figure: Live fences were commonly supported by a dead fence in Medinatou Salame 2. These fences were sufficient in preventing animals enter Forest Gardens.

Figure: Participants attempting to fence their Forest Gardens using nets in Payoma. These nets were ineffective in preventing animals entering the lands.

Figure: Farmers in Payoma shows how animals easily destroyed the nets.

Figure: A participant in Fatick supplement his growing live fences using branches and sticks.

Figure: Wife of a participant whose Forest Garden is empty after animals ate the saplings she planted for her live fence.

Figure: Participant using sticks and twigs to make a dead fence around his Forest Garden.

Figure: Forest Garden in Ndiomdy that used thatch as a fence.

Figure: A firm, black netting being used as fence.

Figure: Participants in Medinatou Salame 2 riding with the team to visit nearby Forest Gardens.

Figure: The research team, including our driver Malik on the left.