Ethiopia Pilot Tools for Stumping Program

FINAL REPORT

MAY 2021

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Ethiopia Pilot Tools for Stumping Program: Final Report

May/2021

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Please cite this report as:

Laterite. (2021). Ethiopia Pilot Tools for Stumping Program: Final Report. Addis Ababa, Ethiopia

Acknowledgements

Laterite would like to thank HereWeGrow for funding this project and especially, Paul Herz, for being a pillar of support throughout.

Laterite would like to sincerely thank TechnoServe for their time, assitance and insights during this project. We appreciate the vision, willingless, and support of the management, including Carole Hemmings, Paul Stewart and Catherine Musangi. TechnoServe's agronomy team – particularly Tamiru Gebre and Desalegne Debele – were vital to implementation of the program on field and providing insights from start to finish.

Finally, we also acknowledge the support of Laterite colleagues Dimitri Stoelinga, Francisco Garcia Jordan and the data team at Laterite – led by Fitsum Dagmawi, Samuel Shumye, Abenezer Yared, Bruk Degie, and Samuel Tesfaye.

This report was delivered by Laterite's team composed of Sachin Gathani, Fitsum Dagmawi and Ravina Pattni.

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List of abbreviations

BA	Business Advisor
BFS	Beans for Stumping
CCT	Conditional Cash Transfer
CFS	Cash for Stumping
DA	Development Agent
ETB	Ethiopian Birr
FF	Focal Farmer
FFG	Focal Farmer Group
FT	Farmer Trainer
KII	Key Informant Interview
NGO	Non-Governmental Organization
SBA	Senior Business Advisor
TFS	Tools for Stumping
USD	United States Dollar

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Executive summary

Executive summary

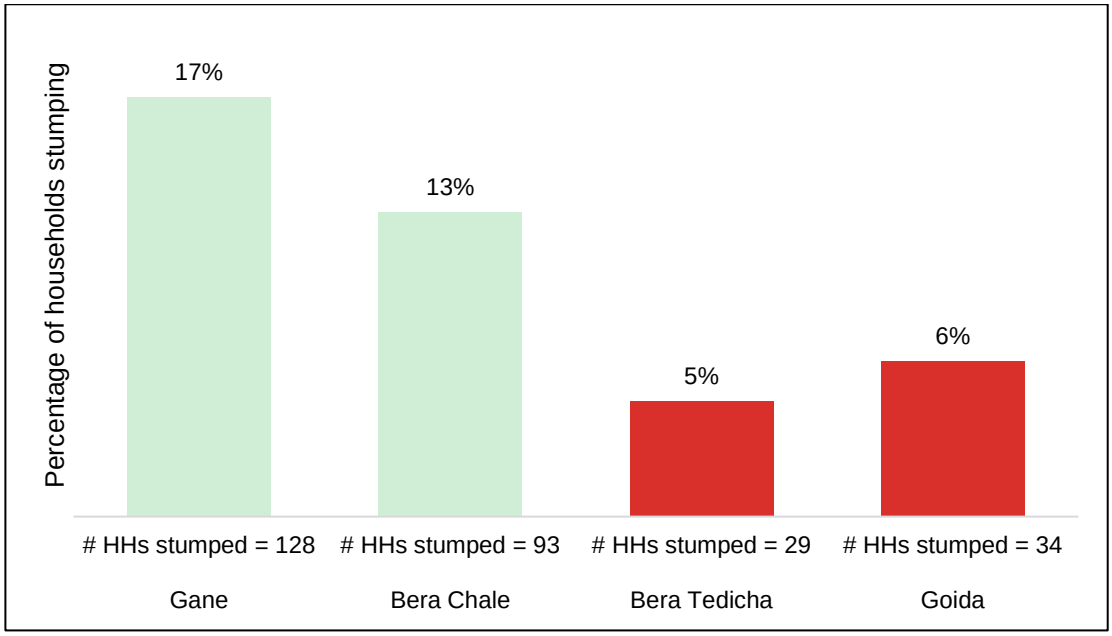
Laterite, in partnership with TechnoServe and HereWeGrow, implemented a pilot Tools for Stumping (TFS) program in Ethiopia to incentivize adoption of stumping practice among coffee farmers. Stumping is a practice of rejuvenating old coffee trees by cutting all their main stems. This results in lower production for two years, but when combined with good agronomic practices, stumping can improve coffee tree production in the long term. In 2019, a similar pilot was implemented under the name of the pilot Conditional Cash Transfer (CCT) program to incentivize farmers in three kebeles to adopt stumping by offering variations of cash or amount of beans per stumped trees.

The pilot TFS program consisted of three variations of packages whereby coffee farmers were offered tools worth a certain amount for the number of trees that they stumped. The incentive was expected to encourage stump their old trees and, in the long-term, lead to behavior change.

During the period November 2019 – October 2020, the pilot program was implemented along with several data collection and research activities. First, a qualitative scoping study and background research informed the design of the pilot and selection of pilot kebeles. In January 2020, TechnoServe reached out to coffee farmers in the pilot areas (1,475 households across two kebeles: Bera Chale and Gane) for a training on stumping practices and an introduction to the pilot TFS program. The training delivered to the farmers in the pilot area was the same as the usual training provided by TechnoServe to all farmers registered into the Coffee Farm College, this was start of Year 2 of the Coffee Farm College for farmers in this cohort. Between February and March 2020, registered households could stump their coffee trees and stumping status was tracked by TechnoServe and Laterite. Next, an independent data collection team visited the households that stumped to count the exact number of stumped trees and determine the final package of tools that the households qualified for. This was followed by the procurement and distribution of the appropriate package of tools by TechnoServe. Note, the verification and counting of stumped trees in the comparison areas was completed later than planned, in October 2020, due to the restrictions on movement as a result of the COVID-19 pandemic.

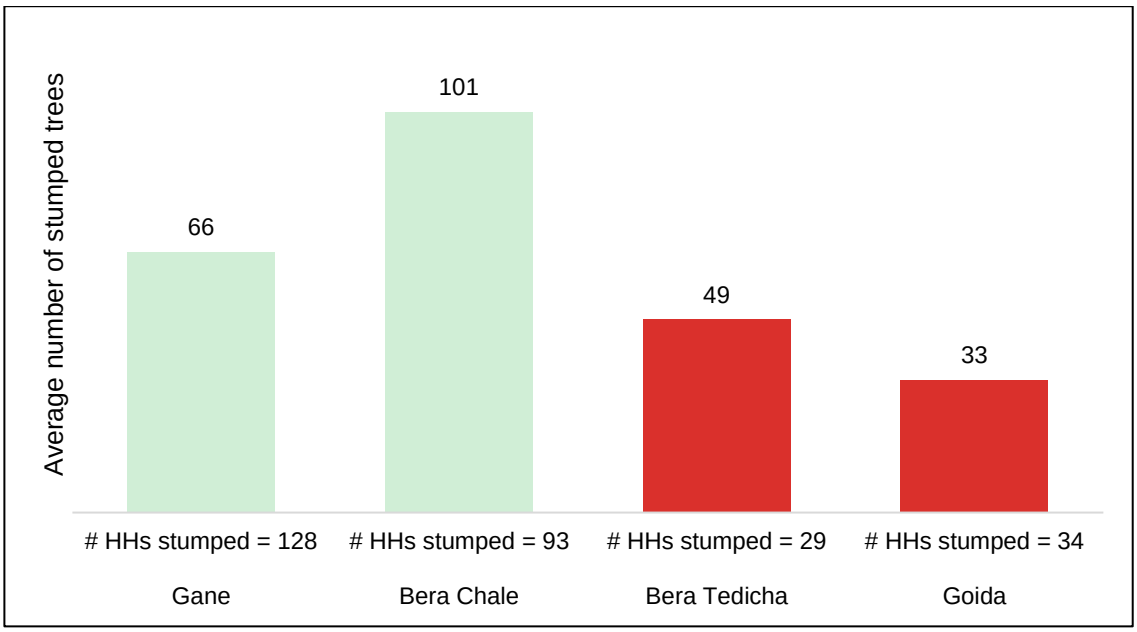
The stumping adoption rate was higher in the pilot kebeles compared to the comparison kebeles. Stumping was conducted by 17% of the registered farmers in Gane, and by 13% of registered farmers in Bera Chale. In two comparison kebeles, the adoption rate was lower, at 5% in Bera Tedicha and 6% in Goida. Note that given the study design, the adoption in the pilot areas cannot be attributed to the pilot TFS program and we cannot make any causal claims.

Figure 1: Adoption of stumping after pilot – by pilot and comparison kebeles for all registered households



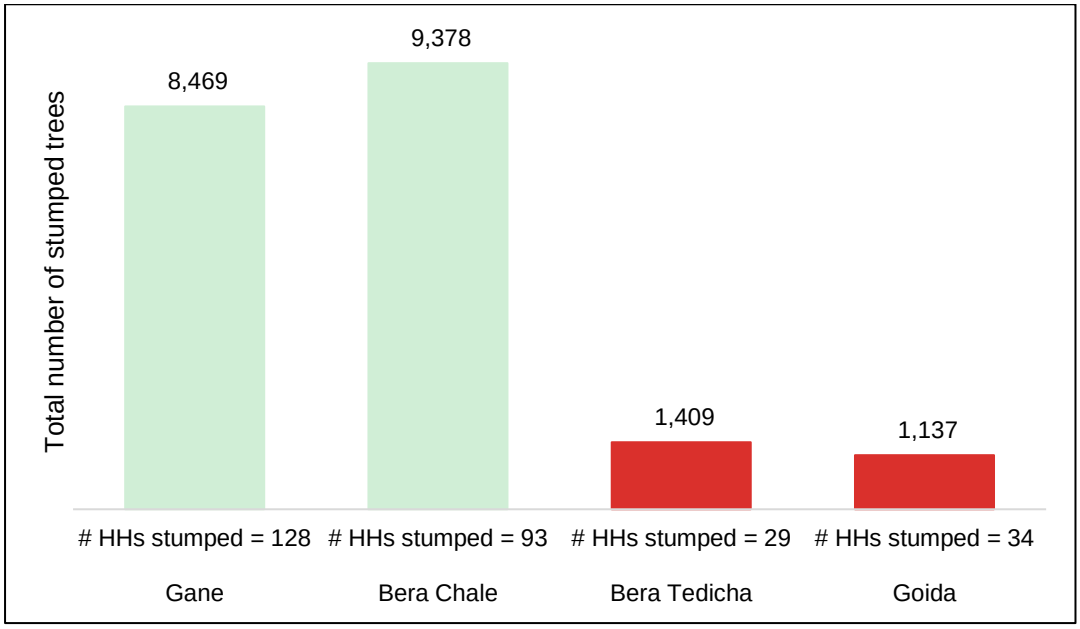
The average number of coffee trees stumped per household was 101 trees in Bera Chale and 66 trees in Gane. Given the total number of trees stumped by each farmer, the majority (42%) of the households qualified for the lowest valued package of tools for stumping between 50 and 99 coffee trees.

Figure 2: Average number of trees stumped after pilot – by pilot and comparison kebeles



The overall results on stumping can be separated into two groups: (i) in the two pilot kebeles, a total of 17,847 coffee trees were stumped – with Bera Chale contributing more of the total, (ii) in the comparison kebeles a total of 2,546 coffee trees were stumped.

Figure 3: Total number of trees stumped after pilot – by pilot and comparison kebeles



For context, the evidence from the endline studies of two different cohorts highlights that the stumping adoption at the end of Coffee Farm College increases to about 17% and 21% from 1% and 5% at baseline. A direct comparison between this study and the usual endline surveys, conducted after two complete years of training (three stumping sessions), cannot be made as stumping rates in the endline are not allocated to specific years.

When asked unprompted, farmers self-reported that their primary motivation for stumping was learning about the benefits of stumping from TechnoServe famer trainers (FTs) and seeing the impact of stumping on the demonstration plot or their own farm. For this unprompted question, while none of the households reported expecting tools for stumping as the main reason for stumping the difference in the stumping adoption rate suggests otherwise. When we asked farmers the main reason they did not stump, the main reason was not having the tools for stumping (e.g., pruning saw), followed by not wanting to reduce coffee production and income.

During this pilot TFS program, Manche, a pilot kebele from the preliminary pilot CCT program was revisited to explore the stumping status among household one year after the pilot program. The stumping adoption rate one year after the pilot CCT program is relatively lower. Stumping was conducted by 12% of the registered households in Manche in 2020 compared to 20% in 2019. In 2020, the average number of coffee trees stumped per household was 55 trees with a total of 2,532 trees stumped, compared to an average of 97 trees stumped, with a total of 5,415 trees stumped in 2019.

The two pilot programs, CCT and TFS, were implemented in consecutive years with the same cohort of farmers but different kebeles which allows us to understand and compare the cost effectiveness the programs. In this cost effectiveness analysis, we only consider the Cash for Stumping (CFS) component of the pilot. Cost effectiveness for this study is defined as an analysis that compares the cost of the incentives in the two pilot programs

relative to the outcomes, which is the average number of trees stumped. For context, the average price that a farmer receives for 1kg of coffee fluctuates between USD 0.4 and USD 0.5 in Ethiopia.

The cost per tree and the average cost per tree is lower for the pilot TFS program than for the pilot CFS program. The highest average cost per tree for the TFS program is USD 0.49 (Package 1) while the highest average cost per tree for the CFS program is USD 0.90 (ETB 25 per stumped tree). However, it should be noted the two programs were implemented at different time points in the Coffee Farm College which may have affected stumping adoption and the number of trees stumped.

Although we cannot conclude on causality, the results of this study indicate higher stumping adoption rates in pilot kebeles consistent with a positive incentive effect. We would recommend further research to experimentally test the effect of incentives. We have identified several areas of improvement of the scale-up of this program – both in implementation and research – that can improve the effectiveness of the intervention. Lastly, we outline a few research studies for a potential scale-up in the future.

Pilot Tools for Stumping

1. Introduction

Stumping coffee trees is known to improve coffee production in Ethiopia. Stumping is the practice of rejuvenating older coffee trees by cutting all their main stems to grow three new main stems – implemented along with good agronomic techniques such as composting, is known to increase coffee tree yields by 2 to 3 times (TechnoServe, 2016;Nestere, 2015).

However, after stumping, coffee tree production is zero for one year and about 70% of unstumped trees[1] in the following year, resulting in loss of revenue for farmers for two years. This loss of revenue from the first two years of adoption makes farmers reluctant to stump despite the long term benefits.

Laterite, in partnership with TechnoServe and HereWeGrow, implemented a small pilot conditional cash transfer (CCT) program in Ethiopia in 2019 within the HereWeGrow 2019 Cohort. The pilot CCT program consisted of a Cash for Stumping (CFS) component and Beans for Stumping (BFS) component. Through this pilot program, coffee farmers in three kebeles[2] were offered a certain amount of cash per tree they stumped or a certain amount of beans for them to plant within the stumped coffee area.[3] The results from this pilot indicated that the additional cash/beans incentive seemed to be associated with higher level of stumped trees per household compared to pure training across all areas. Further, the learnings from the pilot CCT program demonstrated that lack of knowledge and short-term financial loss were the key constraints to stumping.

A second pilot - Tools for Stumping (TFS) - program was implemented in Ethiopia in 2020 for the same HereWeGrow 2019 Cohort. This pilot TFS program differed from the pilots in 2019 as it consisted of three variations of packages of tools such as pruning saws and beans for intercropping, as rewards for farmers that stumped between 50-99 trees, 100-149 trees or more than 150 trees. The key reason for changing the incentive from cash/beans to farming tools and beans was due to lack of government support for the former. The government officials attributed lack of stumping adoption to lack of availability of tools amongst smallholder coffee farmers. Additionally, offering farming tools and beans as part of the program ensures that the incentives can directly be used as inputs into the coffee farm for different tasks, including stumping.

For both the pilot CCT program and TFS program, we assumed that these would be one-time interventions to nudge and encourage farmers to stump their older coffee trees as regular practice.

Given the research design and relatively small geographical coverage of the CCT and TFS programs, the pure impact of the program on adoption of stumping practices in participating

[1] This percentage is from a small sample of TechnoServe farm college demonstration plots assessed between 2017 and 2020
[2] Kebele is the lowest administrative unit of Ethiopia, governing over a cluster of villages
[3] Two kebeles – Dibicha and Manche – were selected by TechnoServe and Laterite for CFS, whereby farmers were offered ETB 25 and ETB 20, respectively. An additional kebele, Wenenata, was selected for BFS, whereby farmers were offered 2 Kg of beans for every 50 trees stumped.

households *cannot* be measured, but our analysis can provide *indicative* patterns regarding the potential effect of the pilot programs.

The TFS pilot was launched within TechnoServe's HereWeGrow 2019 Cohort Farm College program that had already delivered one year of the two-year coffee agronomy training program in Dale woredas[4] of the Sidama region in Ethiopia. Note, the pilot CCT program was implemented within the same cohort, however, 2019 was the first year of the two-year coffee agronomy training program, therefore, in 2020 farmers received a stumping review training. The pilot involved only two kebeles within this training area – Bera Chale and Gane – involving 1,475 coffee-farming households registered in the TechnoServe Coffee Farm College program.

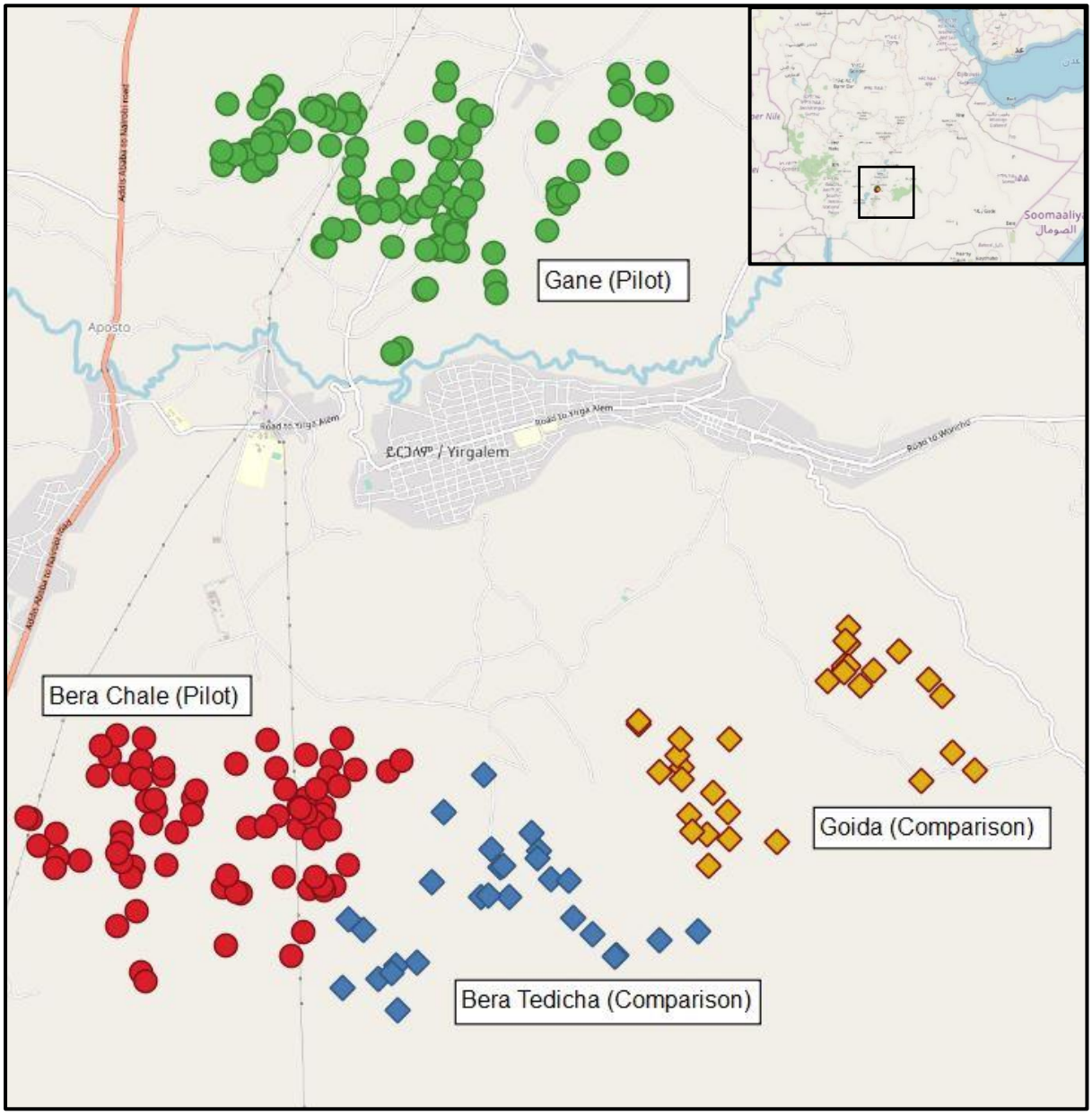
Data was collected from two neighboring training intervention kebeles – Bera Tedicha and Goida – to provide a comparison. These two comparison kebeles were selected based on their geographical proximity to the pilot kebeles. A relatively similar number of households – 1,135 coffee-farming households – are registered in the TechnoServe Coffee Farm College Program in these two comparison kebeles.

Additionally, one CCT pilot kebele that was offered cash for stumping – Manche – was revisited as part of the TFS data collection effort to understand the stumping adoption rate one year after the pilot CCT program. The aim of revisiting Manche one year after the CCT program was to explore the sustainability of stumping adoption amongst farmers.

Figure 4 shows the location of the pilot TFS kebeles on a map. From here, pilot kebeles always refer to the areas where (i) the pilot TFS program was offered and (ii) are part of the TechnoServe Coffee Farm College program; whereas, comparison kebeles refer to the areas that are only part of the TechnoServe Coffee Farm College program.

[4] Woreda is an administrative unit governing a cluster of kebeles

Figure 4: Maps of pilot and comparison TFS kebeles [5]



Our plan for data collection and research was affected by the COVID-19 pandemic. Face-to-face surveys were considered risky, so we prioritized data collection in the two pilot kebeles during April/May, while data collection was still possible, and all other activities were delayed till the end of the year. We also reduced the length of the survey to ensure that the time spent face-to-face with respondents was limited. Our priority was to verify and count the stumped coffee trees in order to distribute tools to farmers in the pilot kebeles. Data collection in comparison kebeles was postponed to October 2020 when the COVID-19 related risks and restrictions were reduced.

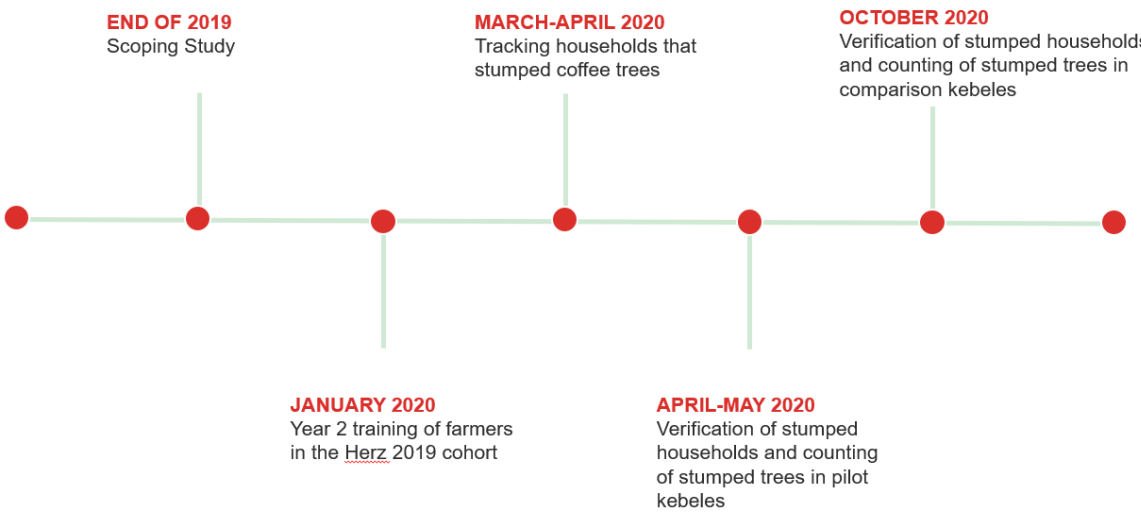
Laterite followed strict COVID-19 rules and protocols at every stage of data collection. Some of these measures included but were not limited to providing the team of independent

[5] Credit: OpenStreeMap contributors, QGIS. The dots represent the location of individual households

enumerators with sufficient personal protective equipment (PPE) for themselves and the farmers, screening them for COVID-19 symptoms and practicing social distancing.

Annex 1 includes details of all activities conducted in the project, but the key activities are described in Figure 5.

Figure 5 - Timeline of key pilot TFS activities



Short description of each activity in the timeline:

Scoping study: background research and interviews with various groups including kebele officials, woreda officials, and TechnoServe senior business advisors (BAs) helped inform the selection of pilot kebeles and the incentive package

Training of farmers: TechnoServe farmer trainers trained coffee farmers on stumping practice, introduced the pilot program and distributed information cards

Tracking of stumped farmers: Tracked stumping status of eligible households through TechnoServe farmer trainers (FTs) and independent enumerators

Verification and stumped tree counting: Independent data collection teams visited the households that stumped to count the exact number of stumped trees to determine the final package of tools in pilot kebeles. This was followed by delivery of tools to the relevant households. Note, data collection was paused in the comparison kebeles due to COVID-19 restrictions on movement in Ethiopia. Data collection in the comparison kebeles and Manche was resumed in October 2020.

This report details the main findings of the pilot Tools for Stumping (TFS) program. We begin with an overview of the practice of stumping coffee trees in Ethiopia. Second, we discuss the design and features of the pilot program. After discussing the research methodology, we present the results related to stumping practice. We also present the results from revisiting a CCT kebele and discuss the cost effectiveness of the two pilot programs, i.e. CFS (part of the CCT pilot incentive) vs TFS. To conclude, we present a summary of lessons learnt and our recommendations for scaling up this program in the future.

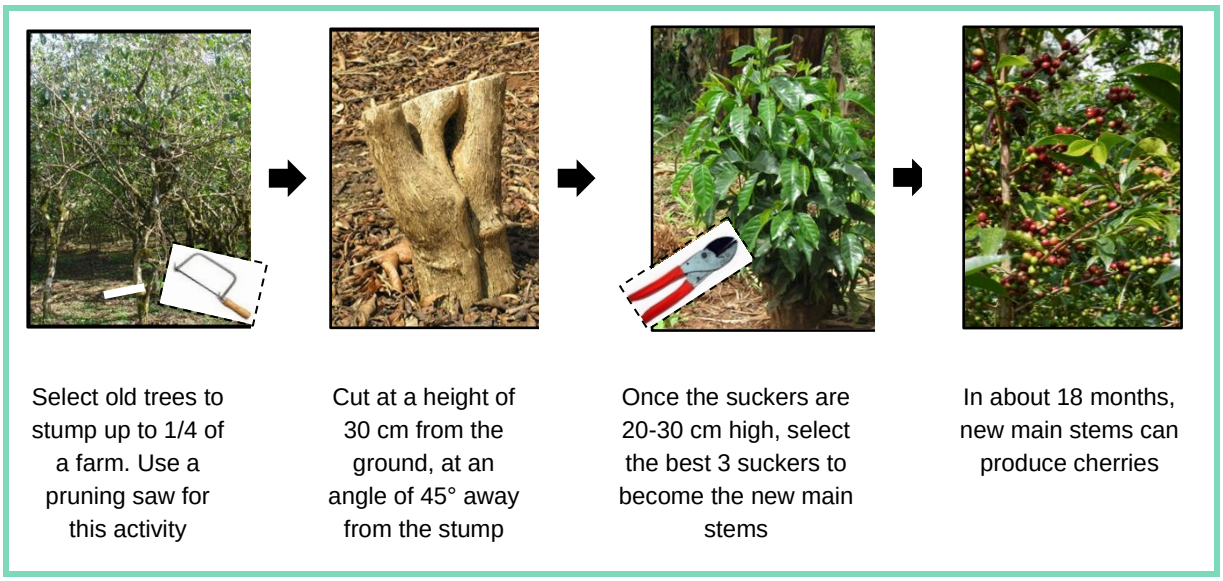
2. Stumping Overview

Ethiopia is well-known for its high-quality coffee, but farmer income remains low due to low farm productivity. According to TechnoServe agronomists, most coffee trees in Ethiopia have never been stumped, and therefore produce coffee on unproductive stems that may be over 30 years old.

Rejuvenation by stumping is an important coffee agronomy practice: TechnoServe demonstration plot measurements and Netsere (2015) suggest it can improve coffee farm yields. An average yield on old stems is likely to be 1 kg cherries per tree compared to yields of over 3 kg cherries per tree on stumped trees, within two to three years after stumping. In Ethiopia, stumping is implemented after harvesting and prior to flowering, giving just one stumping period in a year. This period is usually December – March and can vary slightly depending on timing of rains and the region of interest.

Full adoption of stumping requires a farmer to first stump the entire old coffee tree (8 years or older). TechnoServe trains farmers to stump up to a quarter of their farm using a pruning saw sterilized with a bleach solution to avoid the transfer of the Coffee Wilt Disease[6]. Farmers are advised to cut the stems 30 cm from the ground at a 45-degree angle away from the stump to allow water to run off and prevent rotting. About 3 months after stumping, farmers should select 2 or 3 suckers that are about 20-30cm high to become the new main stems and prune all others to prevent competition for resources. Then, after 18 months, these new main stems produce cherries again. This procedure is described in Figure 6.

Figure 6: Coffee trees stumping procedure as per the TechnoServe training manual



[6] The Coffee Wilt Disease is caused by a fungus that leads to the death of infected coffee trees

Previous quantitative surveys in the region indicate that stumping rates are very low especially prior to Coffee Farm College. We explore the stumping rates in the baseline study prior to the Coffee Farm College program, during Year 1 of training, and in the endline study post-Farm College program:

i. Prior to the TechnoServe Farm College program, Table 1 shows that between only 1% and 5% of the farmers stump their coffee trees. Specifically, the stumping adoption rate in the HereWeGrow 2019 cohort where the pilot TFS program was implemented was 4%.

ii. The pilot CCT program indicated that stumping rates during the first year of Farm College in the three comparison kebeles were relatively low – between 8% and 23% adoption. The highest stumping adoption (23%) was observed in Tesso, one of the comparison kebeles, and was attributed unanimously to the training farmers received from the TechnoServe farmer trainer. Although this data is from three kebeles only, the change indicates a relative increase in stumping during the first year of Farm College program.

iii. After the end of the two-year Farm College program, the stumping adoption rates show an increase. The evidence from the endline studies of two different cohorts highlights that the stumping adoption at the end of Farm College increases to 17% and 21%. Here we measure the increase in adoption of stumping among households that attended at least one training session. The 2015 Cohort Nespresso study only demonstrates a *linkage* between training and adoption of stumping practice. The 2015 Cohort, JDE[7] study was a causal study and so demonstrates *the program effect or causal effect* of the training on stumping practice.
In these studies, we measure the increase in adoption of stumping among households that attended at least one training session.

Table 1: Evidence of stumping adoption from the TechnoServe Farm College programs at baseline and endline. SAR = Stumping Adoption Rate; SS = Sample Size

Cohort	**2019 Cohort HWG** South (Dale and Aleta Chuko woreda)		**2015 Cohort, Nespresso** South (Aleta Wondo woreda)		**2015 Cohort, JDE** Wollega (Lalo Asabi, Nodjo woredas)	
	SAR	**SS**	**SAR**	**SS**	**SAR**	**SS**
Baseline (2015/2019)	4%	952	5%	453	1%	428
Endline (2017)	N/A	N/A	21%	453	17%	418
Change	N/A		**15% points**[8]		**18% points**[9]	

[7] Jacobs Douwe Egberts, the donor for this 2015 cohort
[8] 15% is the percentage point increase, significant at 1% controlling for kebele location and clustering standard errors at the attendance strata level
[9] 18% is the percentage point increase determined using a Pair-Matched Randomized Controlled Trial (PMRCT) design to estimate the pure impact of the program on adoption

Note, all these studies are independent of each other so should not be compared directly. Rather, they provide some context into stumping adoption in other TechnoServe Farm College programs and locations.

Most importantly, the stumping adoption rates from the endline studies cannot be compared to the pilot TFS program because (i) the populations are different, (ii) at endline farmers have received the stumping training thrice compared twice during the pilot TFS program, and (iii) the endline studies report the overall stumping adoption at the end of Farm College while the pilot TFS program is a snapshot in time during the second year of Farm College.

Overall, even highly-structured training programs have struggled to motivate the high levels of stumping required to transform the production of large areas of coffee land in a few years.

Measuring adoption of stumping

Farmers are assessed on the adoption of stumping practice by counting coffee trees that were stumped most recently (i.e., December 2019 - March 2020). The period between December and March is usually the stumping period for coffee farmers but can vary slightly depending on timing of rains, and region of interest. The assessment for adoption of stumping is fully observation-based with the counting done by independent enumerators[10].

Sucker selection was only measured through observation in the comparison kebeles and Manche in October 2020. Selection is implemented once suckers are 20-30 cm tall and it takes about 3 months for the suckers to grow. Due to the timing of the counting survey in the pilot kebeles (April-May 2020), the enumerators were not able to observe the practice of sucker selection.

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[10] Note, in the case of 9 households, counting was completed by the TechnoServe field team in the pilot kebeles due to COVID-19 restrictions that restricted the entry of independent enumerators in the kebele.

3. Program overview

Laterite and TechnoServe designed a pilot program to address the constraints to stumping with the goal of boosting adoption of stumping practice in Ethiopia. The main features of the pilot Tools for Stumping (TFS) program are:

1. **Coffee Farm College** component, designed and delivered by TechnoServe for one year before the start of the pilot TFS program, to overcome the knowledge constraint by providing hands-on training for farmers on correct stumping procedure and follow-up visits; and,
2. **Tools transfer** component to incentivize behavior change by providing a variety of tools as a reward based on the number of trees stumped. Note, unlike the pilot CCT program where farmers had the agency to use the cash from the program for any purpose, the pilot TFS program provided tools that can directly be used as an input in the coffee farm.

The Coffee Farm College component is structured as a two-year training program. The training is conducted by farmer trainers (FTs) who organize the farmers into Focal Farmer Groups (FFGs) of about 20 to 30 coffee-farming households each. Training includes agronomy best practices such as stumping along with composting, coffee nutrition, integrated pest and disease management, mulching, shade management, erosion control, and weeding. The smallholder coffee farmers eligible for the pilot TFS program have received one complete year of the training program and are a part of the TechnoServe's HereWeGrow 2019 Cohort Coffee Farm College program.

In baseline studies, we find that between 1% and 5% of farmers adopt stumping. With this additional tools incentive, we expect to further encourage farmers to adopt stumping practice and ultimately increase their yield and income from coffee.

The following are key features of the pilot TFS program:

- **Eligibility**: any household, in the selected pilot *kebeles,* that was registered in the HereWeGrow 2019 Cohort Coffee Farm College program was eligible for the pilot. This ensured that all households were given equal opportunity to receive tools.
    - During the training, all households were trained on stumping, sucker selection, and had the opportunity to practice it using pruning saws on a demonstration plot. Farmers also received detailed information regarding the pilot TFS program during the training session.
    - Post-training, farmers could borrow pruning saws from the Focal Farmers (FFs) or FTs and stump on their own farms. The FTs were also responsible for visiting the farms of a share of their farmers to further encourage stumping.

- **Package of tools**: Appropriate packages of tools were determined based on the recommendation from the TechnoServe field team. The cost of each package of tools is incremental in value, which aligns with the increasing number of trees that households are required to stump to qualify. Note, the value of the tools is not sufficient

to replace the income lost as a result of stumping old coffee trees, therefore, the tools were offered to test if they are sufficient as an incentive or nudge to promote stumping. The packages of tools were based on the number of trees stumped as described in Table 2.

Table 2: Overview of the package of tools by number of trees stumped

Tools Incentive	Tools	Cost of the package[11]
Package 1 – between 50 and 99 stumped trees	• Pruning shear • 10 kg of bean seeds • Bow saw and blade	~ USD 30
Package 2 – between 100 and 149 stumped trees	• Pruning shear • 10 kg of bean seeds • Bow saw and blade • Zappa • Spade	~ USD 38
Package 3 – more than 150 stumped trees	• Wheelbarrow • Pruning shear • 10 kg of bean seeds	~ USD 83

- **Communication materials:** FTs attended an in-person training and were provided with training materials on how to communicate the features of TFS to farmers. Simple pictorial information cards in local language (Amharic) were given to all households present at the training. The FTs were asked to distribute the information cards to other registered households not present at the training during individual farm visits. Figure 7 depicts the final structure of the pilot TFS program

Figure 7: Structure of the TFS program

Select old trees to stump up to 1/4 of the farm. Use a pruning saw for this activity

Cut at a height of 30 cm from the ground, at an angle of 45° away from the stump

After farmers stump, they inform their FTs and who will visit the farm to check

Next, an independent verification team will count the number of trees stumped and ask the farmer a few questions

Farmers receive a package of farm tools depending on the number of stumped trees. Farmers have to stump at least 50 trees to receive farming tools

[11] The prices are based on the total provided by TechnoServe. TechnoServe assisted with the procurement and distribution of tools

Insights from scoping study

The objectives of the scoping study were: 1) to understand the interest of government authorities with regards to providing incentives for stumping; 2) to explore and select the kebeles for the second pilot. The learnings from the 2019 pilot CCT program demonstrated that lack of knowledge and short-term financial loss were the key constraints to stumping. Therefore, this scoping study allowed for expanding on the learning about key constraints and kebele selection for the pilot TFS program.

1) Role of government

The local government authorities from the woredas are responsible for organizing stumping training for farmers. This is in addition and external to the training provided by TechnoServe. The government training for stumping is provided through development agents (DAs) and agriculture extension workers. The DAs are responsible to mobilize farmers and follow-up on agronomy best practices, including stumping.

During our focus group discussion (FGD) with TechnoServe Senior Business Advisors (SBAs), it became clear that government authorities were not willing to support a cash-based incentive program. The government authorities at the woreda and kebele level were aware of the results of the pilot CCT program, however, they raised the concern that a cash-based incentive was not sustainable in the long-run.

The government authorities and the TechnoServe SBAs suggested that lack of appropriate tools could also be a constraint that leads to low adoption of stumping. As a result, Laterite and TechnoServe decided to shift towards an asset transfer program – "tools for stumping" and the government authorities supported this shift.

The involvement of key government officials was the key to successful planning and design of the pilot program. For the pilot, government buy-in was obtained through high-level interactions between TechnoServe management and officials at the Ethiopia's Coffee and Tea Authority. These interactions included sharing the learnings of the pilot CCT program completed in 2019. Secondly, the key informant interviews (KIIs) with kebele officials allowed for an introduction of the second pilot and sharing the results of the pilot CCT program to obtain their buy-in.

2) Selection of coffee-specialty pilot kebeles

The kebele selection process for the pilot TFS program involved a FDG with two TechnoServe SBAs and key informant interviews (KIIs) with five kebele. The SBAs belong to the woredas where the 2019 Cohort Farm College is located, therefore, they are aware of some key characteristics of all the kebeles.

The pilot kebeles were selected based on several factors including: (i) coffee production in the kebeles, (ii) distance from main highways, (iii) distance from the CCT pilot kebeles, and (iv) absence of large infrastructure or industrial park projects. The selection criteria ensured that coffee was an important crop for the smallholder coffee farmers

in those kebeles, they had not been influenced by the knowledge of the pilot CCT program through information spillover, and the perceived value of their farming land would not be lost due to large infrastructure projects.

Pilot and comparison kebele selection

Laterite and TechnoServe used insights from the scoping study and background research on asset-based transfer programs to design the pilot program and select the two pilot kebeles. Two kebeles – Bera Chale and Gane – were selected for TFS**.** The selection was based on:

- **Optimal size and FT coverage:** kebeles with 24 FFGs (20-30 households each) and two FTs serving all the FFGs were prioritized. Larger kebeles were selected so that the learning from the pilot CCT program could be scaled for further learning; and
- **Recommendations from field team and government authorities:** information from the FGD and KIIs, ensured that the kebeles were far from the pilot CCT program kebeles, were coffee specialty kebeles, and did not have any plans of upcoming large infrastructure or industrial park projects

Two additional kebeles - Bera Tedicha and Goida - **were selected to be surveyed as a rough comparison group.** These are neighboring kebeles that are also a part of the TechnoServe's HereWeGrow 2019 Cohort Farm College program but were **not** offered any incentive. These two kebeles were in the shortlist for pilot kebeles during the scoping phase; however, they did not make it to the final list of pilot kebeles due to budgetary restrictions. Data of farmers that stumped trees in these comparison areas is used to provide some indication of stumping trends in non-intervention areas.

A kebele included in the CCT pilot, Manche, was revisited as a part of the data collection for TFS. The farmers in this kebele were offered ETB 20 per stumped tree in 2019 and on average, they achieved a stumping adoption rate of 20%. We recognize that stumping requires a behavioral change and adoption is expected to increase over time, as more famers observe the benefits among their neighbors and their own coffee farm. Additionally, coffee yield in old coffee trees tend to have biannual bearings – alternative years of high and low yield. Therefore, farmers may be more likely to stump in alternate low years. This was the rationale for revisiting this pilot CCT kebele. We sought to explore the stumping adoption rate one year after the pilot CCT program among farmers that stumped in 2019 and farmers that did not stump in 2019 but decided to stump in 2020.

Comparability of kebeles and households that stumped

The selection of the pilot and comparison kebeles was largely based on the qualitative information from government officials and TechnoServe SBAs. The only quantitative data used to finalize the decision was the relative similarity in the number of households registered in the TechnoServe Farm College program. Table 3 provides the breakdown of the total number of registered households in each kebele

Table 3: Total number of registered households in each kebele

	Kebele	Total number of registered households
Pilot kebeles	Bera Chale	738
	Gane	737
Comparison kebeles	Bera Tedicha	608
	Goida	527

The one socio-economic characteristic that we have access to for all registered farmers in these kebeles is their coffee farm size. This data is self-reported and recorded on attendance sheets by FTs during the training sessions. On average, households in both the pilot and comparison kebeles own 0.6 ha[12] of land. Therefore, the farm sizes of the pilot and comparison kebeles are comparable.

Due to the lack of other quantitative data on all the registered farmers in each kebele, we are unable assess the level of comparability of coffee farming households in the pilot and comparison kebeles.

[12] The 95% confidence interval for the average farm size in the pilot kebeles is between 0.53 and 0.57. While the 95% confidence interval for the average farm size in the comparison kebeles is between 0.52 and 0.65

4. Research Methodology

We use a mix of qualitative and quantitative data collection throughout the study. Given the restrictions on movement due to COVID-19, Laterite was unable to conduct as many qualitative interviews as planned and had to shorten the length of the questionnaire during the quantitative interview in the pilot and comparison kebeles. Note that given the design and sample size, this research aims to capture trends rather than establish causality. Consequently, some caveats should be kept in mind while interpreting the results:

- **Impact:** Given the research design, the pure impact of the program on adoption of stumping practices in participating households *cannot* be measured but our analysis can provide *indicative* patterns regarding the effect of the pilot TFS program.
- **Comparison:** Given the relatively small geographical coverage of the pilot and non-random selection of pilot areas, direct comparisons between separate groups of households (e.g. pilot and comparison kebeles) cannot be made. However, the differences can still *demonstrate patterns* of interest to this pilot.
- **Sample:** Given the size of the pilot program, the sample sizes used are *inadequate* for advanced analysis but are sufficient to demonstrate trends.

Table 4: Summary of data collection components

Activity	Geographical Coverage	Sample size
Scoping Study (Qualitative study)	• Dale woreda • Aleta Wondo woreda	• 5 KIIs with kebele officials • 1 FGS with TechnoServe SBAs
Identification of households that stumped (Quantitative)	• Bera Chale and Gane (2 pilot kebeles)	• 1,475 households (all households registered in Farm College)
	• Bera Tedicha and Goida (2 comparison kebeles)	• 1,135 households (all households registered in Farm College)
	• Manche (1 pilot CCT kebele)	• 383 households (all households registered in Farm College)
Verification Survey (Quantitative)	• Bera Chale and Gane (2 pilot kebeles)	• 221 households that stumped coffee trees
	• Bera Tedicha and Goida (2 comparison kebeles)	• 63 households that stumped coffee trees
	• Manche (1 pilot CCT kebele)	• 46 households that stumped coffee trees
Follow-up study (Quantitative)	• Bera Chale and Gane (2 pilot kebeles) • Bera Tedicha and Goida (2 comparison kebeles) • Manche (1 pilot CCT kebele)	• 1 FGD with TechnoServe Business Advisors (BAs)

5. Results from the TFS Pilot Program

Stumping in the pilot kebeles, was adopted by 13% of the registered farmers in Bera Chale and 17% in Gane. To adopt, household must have stumped at least one coffee tree since the most recent coffee harvest season (i.e. December 2019 to March 2020). These results are highlighted in Table 5. Note, we cannot deduce a lot about the magnitude of this adoption rate because we do not have any previous data to compare or benchmark this stumping adoption rate to. The endline studies for other cohorts and locations are conducted at the end of Coffee Farm College and the stumping adoption is reported for any trees stumped over the course of the two-year Coffee Farm College program as opposed to a snapshot in time.

Table 5: Summary of stumping adoption in pilot kebeles

Kebele name	Registered households	Number (%) of stumped households	Average number of trees stumped	Number of trees stumped
Bera Chale	738	93 (13%)[13]	101[14]	9,378
Gane	737	128 (17%)[15]	66[16]	8,469

The average number of coffee trees stumped per household for pilot kebeles is 83 trees – with the average being 101 trees in Bera Chale and 66 trees in Gane. For this, independent enumerators followed a rigorous methodology to count the number of stumped trees across all coffee plots owned by the household. We rely on the independent enumerators to count the stumped trees instead of self-reported data from farmers because we assume that farmers do not have accurate recall. We found this assumption to be true because a majority (91%) of the households in the pilot kebeles were not able to accurately report the total number of stumped trees. A quarter of the farmers (25%) estimated up to 25% more than the actual number of trees stumped and 30% estimated up to 25% less than the actual number of trees stumped. Therefore, over half (55%) of the households estimated the number of stumped trees within a 25% range of the actual number

Overall, 17,847 coffee trees were stumped in the two pilot kebeles. The total number of trees stumped in Bera Chale was 9,378 – contributing to over half of the total trees stumped. This highlights that while the stumping adoption rate in Gane is higher, more trees

[13] We are 95% confident that the true proportion of stumped households is between 10.3% and 15.2% in Bera Chale
[14] The 95% confidence interval of the average number of stumped trees in Bera Chale is between 84.3 and 117.4
[15] We are 95% confident that the true proportion of stumped households is between 14.7% and 20.3% in Gane
[16] The 95% confidence interval of the average number of stumped trees in Gane is between 56.8 and 75.5

were stumped in Bera Chale. A potential explanation for more trees stumped in Bera Chale is that households in Bera Chale report owning, on average, 0.6 ha of land planted with coffee compared to 0.4 ha in Gane.

Over two-thirds of all the stumped households (74%) qualified for one of the tools packages. The majority of these households (42%) stumped between 50 to 99 trees and therefore qualified for package 1 – see Table 6 for the results. More households in Bera Chale qualified for package 3 than in Gane, as households in Bera Chale, on average, stumped more trees than households in Gane.

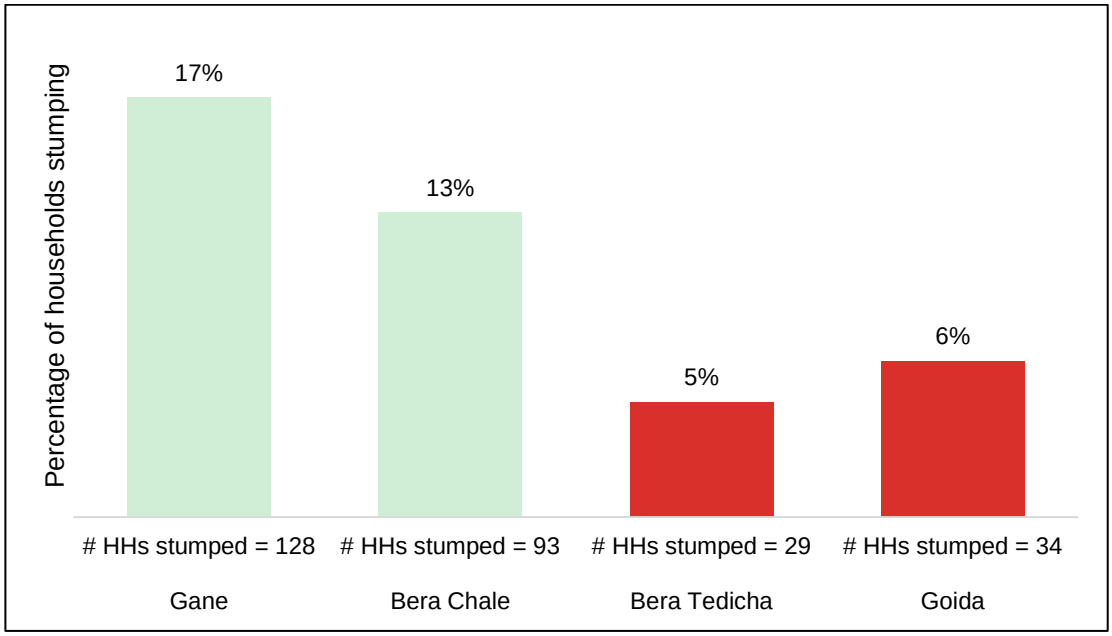
Table 6: Summary of tools packages by number of households in pilot kebeles

Kebele name	Package 1 (50-99 trees)	Package 2 (100-149 trees)	Package 3 (>150 trees)
Bera Chale	36	17	23
Gane	56	15	16

Comparing the stumping adoption rate data to comparison areas, we see a relatively better performance in the TFS intervention areas. In the two comparison kebeles, Bera Tedicha and Goida, the stumping adoption rate was between 5%[17] to 6%[18]. This difference is statistically significant at 5% level after controlling for attendance in the January 2020 stumping training. However, due to the lack of any other quantitative data to compare these kebeles, the difference in proportions are only indicative of a trend. Figure 8 depicts the comparison of adoption rate in the pilot and comparison kebeles.

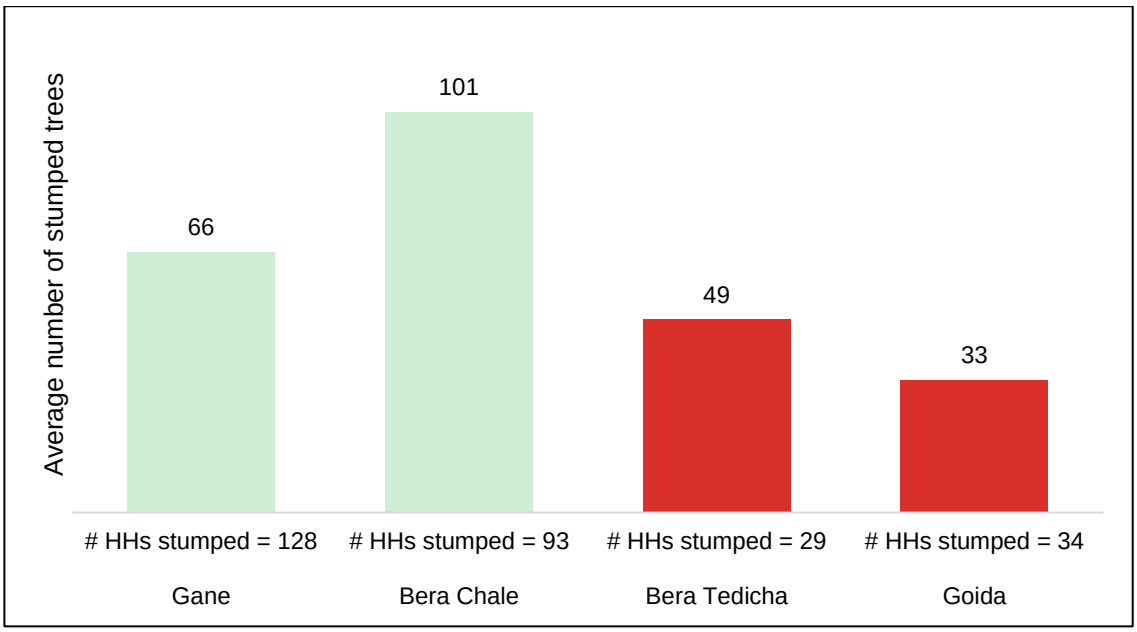
[17] We are 95% confident that the true proportion is between 3.2% and 6.8%
[18] We are 95% confident that the true proportion is between 4.5% and 8.9%

Figure 8: Adoption of stumping after pilot – by pilot and comparison kebeles for all registered households



The average number of coffee trees stumped per household for comparison kebeles is 41 trees – with the average being 49 trees[19] in Bera Tedicha and 33 trees[20] in Goida. The same methodology was used in both pilot and comparison kebeles to count the number of stumped trees. These results are shown in Figure 9.

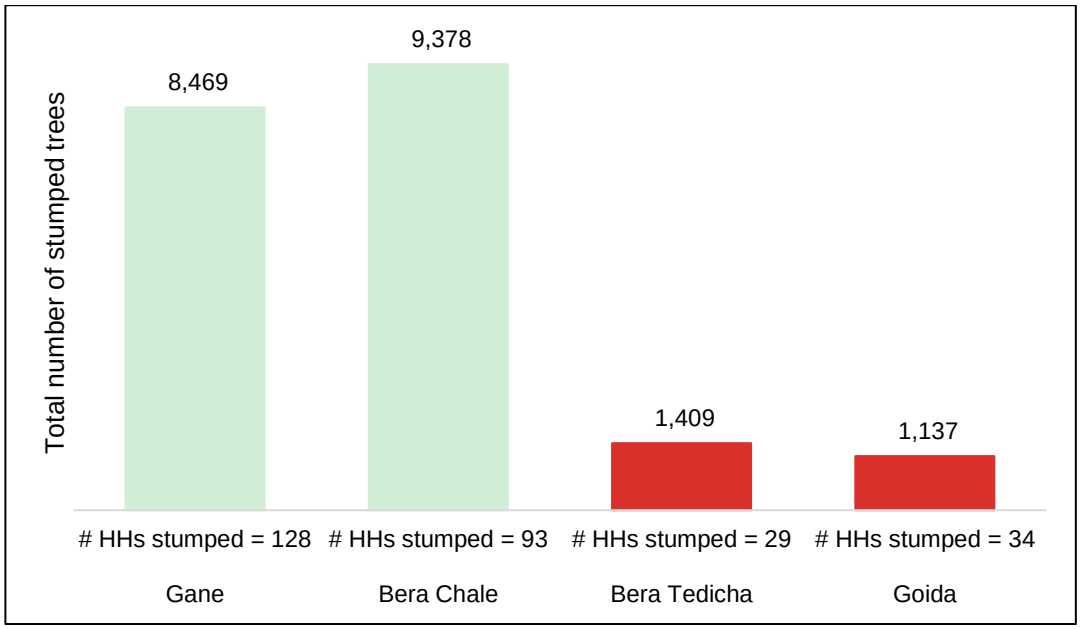
Figure 9: Average number of trees stumped after pilot – by pilot and comparison kebeles



[19] The 95% confidence interval for the average number of stumped trees in Bera Tedicha is between 31.3 and 65.9.
[20] The 95% confidence interval for the average number of stumped trees in Goida is between 22.8 and 44.

Overall, the comparison areas (only offered training) have stumped 2,546 trees – less than one-fifths of the total stumped trees in pilot areas. This comparison of the total number of stumped trees is shown in Figure 10.

Figure 10: Total number of trees stumped after pilot – by pilot and comparison kebeles



Given the research design caveats, stumping adoption cannot be fully attributed to the TFS intervention. However, the results do indicate that the TFS intervention may have positively influenced the adoption of stumping. Note, this is the adoption rate for the entire population of registered households.

While we cannot demonstrate it in the context of this pilot, these trends are consistent with a positive effect of the tools for stumping initiative. To prove that the TFS intervention significantly led to improved adoption and volume of stumping compared to training only, we would need a more rigorous research design and sample to definitively conclude the program impact.

Next, we explore the implications for stumping-related themes.

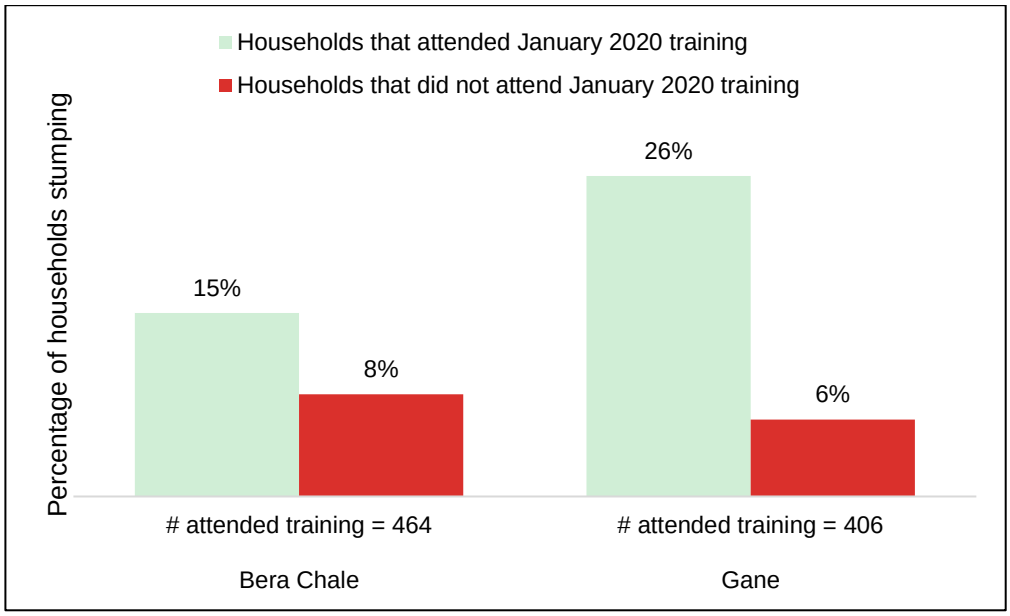
1) Effect of attending the January 2020 stumping training

In both the pilot and comparison kebeles, 80% and 79% of the households that stumped attended the January 2020 stumping training, respectively. The attendance rates among the households that stumped is similar across pilot and comparison kebeles.

We find a higher stumping adoption rate in the pilot kebeles among households that attended the January 2020 stumping training compared to those that did not, and this difference is statistically significant. In Bera Chale, among households that attended the January training (464 households), 15% of the households stumped while only 8% of the

households that did not attend the training stumped. Similarly, in Gane, the adoption rate for households that attended the January training is higher at 26%, with 5% stumping adoption for those that did not attend the training. These results are shown in Figure 11.

Figure 11: Adoption of stumping after pilot – by kebele and January attendance



However, we do not see this large difference in adoption rate in the comparison kebeles when examining attendance in the January training among the households that stumped. The difference in stumping adoption rate between households that attended and did not attend the training is between 2-4 percentage points in the comparison kebeles while it is between 7-20 percentage points in the pilot kebeles. While this difference is statistically significant for the pilot kebeles, it is not significant for the comparison kebeles.

Overall, the association between training and the adoption of stumping is higher in pilot Kebeles. The knowledge and anticipation of receiving tools as a result of attending the January training may have led to more farmers practicing stumping in the pilot kebeles.

2) Motivation for stumping

We expected households to decide to stump due to a range of reasons, therefore, we asked farmers an unprompted question regarding their primary motivation. The independent enumerators were instructed to refrain from reading the options to the farmers and select the option that applied best based on the farmers' response.

The primary motivation for stumping in the pilot kebeles, as reported by farmers, was learning about the benefits of stumping from TechnoServe FTs. This is followed by about one-fifth (20%) reporting seeing the impact of stumping on the demonstration plot or own farm. Lastly, 12% of households reported that they felt their trees were very old and needed to be stumped.

The households in comparison kebeles report similar primary motivations but in different proportions. In the comparison kebeles, relatively more households (52%) report that they felt their trees were old and needed to be stumped. This is followed by 40% reporting learning about the benefits of stumped from their FTs. The primary motivation in the comparison kebeles also indicate the strong role of training and awareness from Coffee Farm College driving stumping.

Interestingly, for the unprompted question on primary motivation, none of the households in the pilot areas reported expecting tools for stumping. Farmers claimed the tools incentive was not an important factor in their decision-making process to conduct stumping, even though the only programmatic difference between pilot and comparison kebeles was the introduction of this element. This finding should be considered with a caveat that the farmers are likely to respond to the question about motivation in relation to what they believe to be an acceptable response instead of agreeing that the tools had an important role to play in incentivizing stumping.

Other than the training from FTs, the households would also receive stumping training from government Development Agents (DAs). TechnoServe FTs were reported to have visited more households than the government Development Agents (DAs) in the period from January to March 2020. When prompted, almost all households (97%) report being visited by their FT but only about 30% of the households report being visited by a DA. The pattern is similar in comparison areas, with all households reporting they were visited by their FT and only 37% reporting they were visited by a DA. Overall, the response on DA visits compared to FT visits corresponds with the unprompted question about primary motivation for stumping whereby farmers report learning from FTs but no mention of DAs.

3) FT performance and stumping adoption

One of the reasons we might observe differences between stumping adoption between pilot and comparison kebeles is FT performance. In both the pilot and comparison kebeles, households mention the role of FTs in motivating stumping. Based on this finding, we conducted an FDG with TechnoServe Business Advisors (BAs) to explore if the difference that we observe in stumping adoption rate can be attributed to the relative FT performance in the pilot and comparison kebeles. The FDG was conducted with BAs because they are responsible for directly managing and training the FTs.

The feedback from the BAs seems to suggest that differences in FT performance are not what is driving the difference in stumping rates. The assessment of FT performance was conducted based on the key performance attributes identified by BAs: (i) knowledge of agriculture best practices, (ii) approachability, (iii) maintenance and quality of demonstration plots, and (iv) frequency of farm visits. In all these categories, the BAs rated each FT on a scale of 1 to 5 (very poor to excellent). Overall, all the FTs received a rating between 3 and 5 in each kebele. Therefore, the BAs perceive all the FTs to be of average or above average quality.

Along with the rating, the BAs were also asked to justify their rating to further explore FTs' performance. The reasons for the ratings for all tasks were similar for the pilot and comparison kebeles, except for:

- Knowledge of agricultural best practices: Interestingly, the BAs perceive that FTs in the comparison kebeles are faster learners and understood coffee farming practices better than in the pilot kebeles.
- Frequency of farm visits: The FTs in the comparison kebeles are reported to conduct regular visits at the farmers' farms but do not always manage to encourage farmers to stump their coffee trees. On the other hand, the FTs in the pilot kebeles are reported to conduct less regular farm visits and similar to the comparison kebeles, the FTs do not manage to encourage many farmers to stump.

The differences for some of the key performance characteristics described by the BAs highlight that while the FTs may seem relatively homogenous from the ratings, the FTs in the comparison kebeles seem to have relatively more knowledge of agronomy best practices and visit their farmers more often. Both of these performance characteristics should influence the uptake of stumping but the addition of the tools incentive seems to have overshadowed the importance of pure FT performance in the pilot kebeles.

4) Understanding households that did not stump

The preliminary identification of farmers that stumped was completed through an interview with the FTs and FFs. The FTs and FFs identified households for each FFG that had stumped according to their best knowledge – we had expected over-reporting of stumping adoption because of a similar experience during the pilot CCT program. This step was followed by physical verification of stumped coffee trees by independent enumerators during the verification/tree counting survey.

A total of 116 households from the pilot and comparison kebeles were wrongly identified by the FTs and FFs as households that had stumped. Despite the incorrect identification, these households were interviewed to understand their reasons for not stumping. Note, due to the small sample size in both pilot and comparison kebeles, the trends are only indicative.

Across all pilot areas, these households indicated that the main reason (44%) for not stumping was not having the tools for stumping (e.g., pruning saw). This is a commonly quoted reason given by farmers to the TechnoServe field team as a reason for not stumping but it is believed that loss of income and yield are the actual reasons for not stumping. This reason also coincides with the constraint explained by the government officials in the scoping phase. The second reason is not having enough coffee trees to stump, which is reported by 17% of the households – this number cannot be sanity checked because we did not ask these farmers about the total number of coffee trees on their farm.

Comparing across the comparison areas (25 wrongly identified households), the most common reasons for not stumping were: not having enough coffee trees to stump and not wanting to reduce coffee production and income (32% of households each). While

households in both the pilot and comparison kebeles refer to not having enough coffee trees to stump, more farmers in the pilot kebeles report access to tools a constraint.

5) Clustering around pilot program threshold for packages of tools

The aim of offering tools as an incentive was to encourage farmers to stump their old coffee trees. The incentive is not meant to motivate farmers to stump only the minimum number of trees that would qualify them for either of the three packages of tools. Clustering around the pilot program thresholds for the packages of tools would signal that farmers made the decision to stump a specific number of trees for the tools.

We do not see households clustering around the thresholds for package 2 and 3 (100 and 150 trees), however there is some clustering around package 1 (50 trees). A quarter of the households stumped in the 50-60 trees range. This means that many households attempted to stump at least as many trees to make them eligible for some tools compared to none. Figure 12 shows a cluster in between 50-60 stumped trees in the pilot kebeles and no such bumps in the comparison kebeles in Figure 13.

Figure 12: Clustering of stumped coffee trees in pilot kebeles

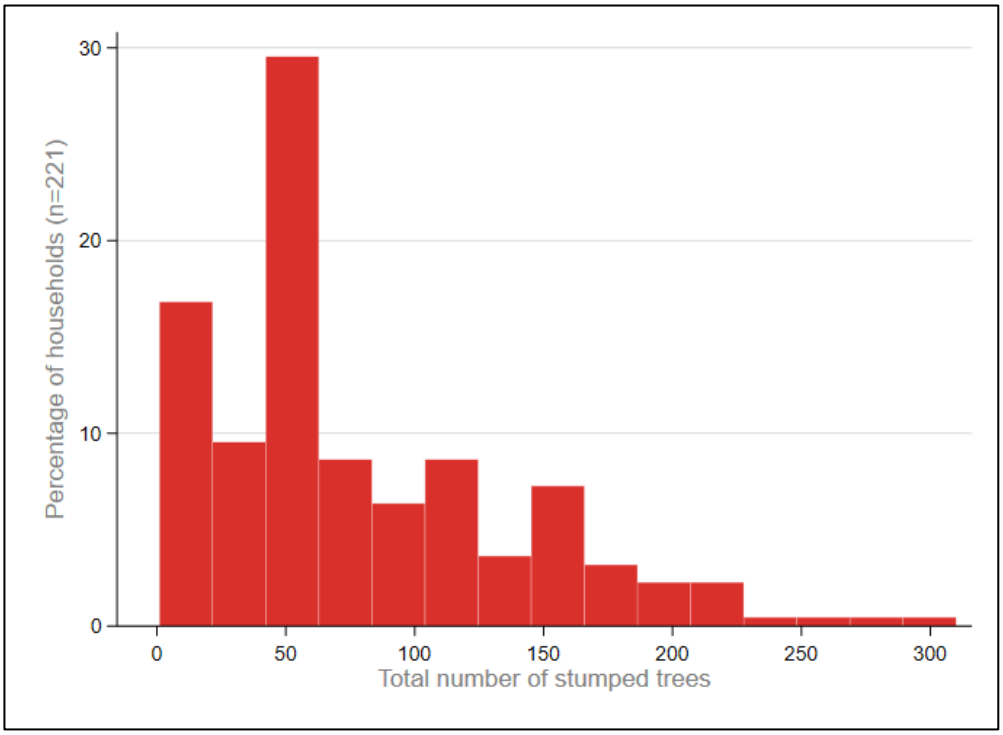
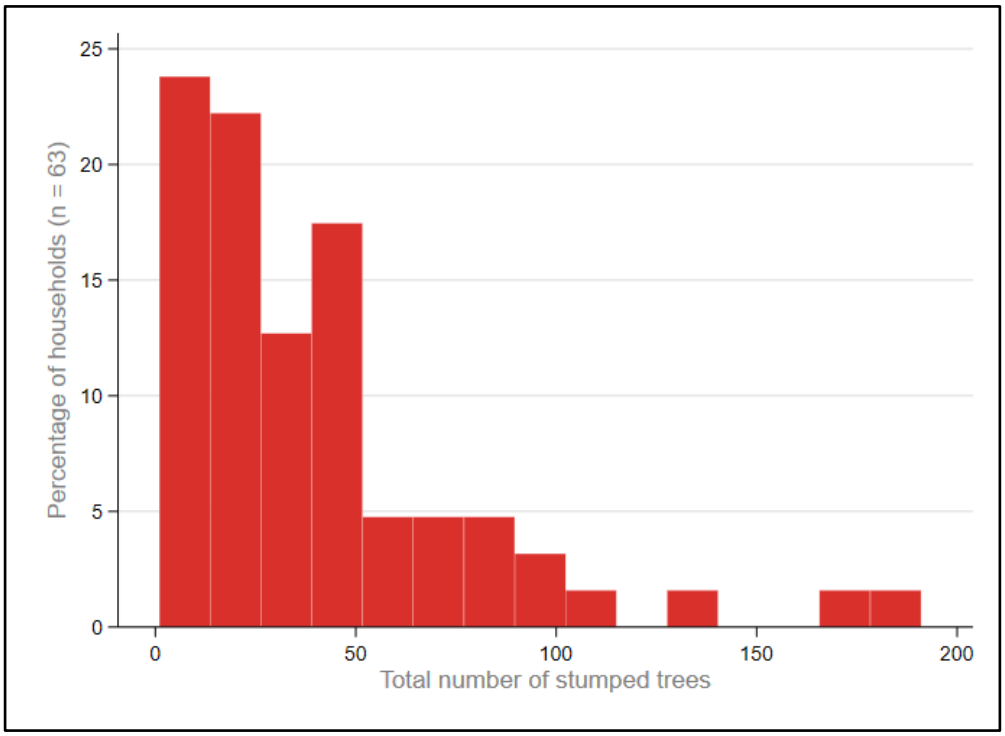


Figure 13: Clustering of stumping coffee trees in non-pilot kebeles



The trends indicate that more households were likely to stump the number of trees that allowed them to qualify for at least package 1 of tools – stumping at least 50 trees. Beyond that, it seems farmers stumped as many trees as they felt was suitable on their coffee farms.

6. Revisiting a Cash for Stumping Kebele

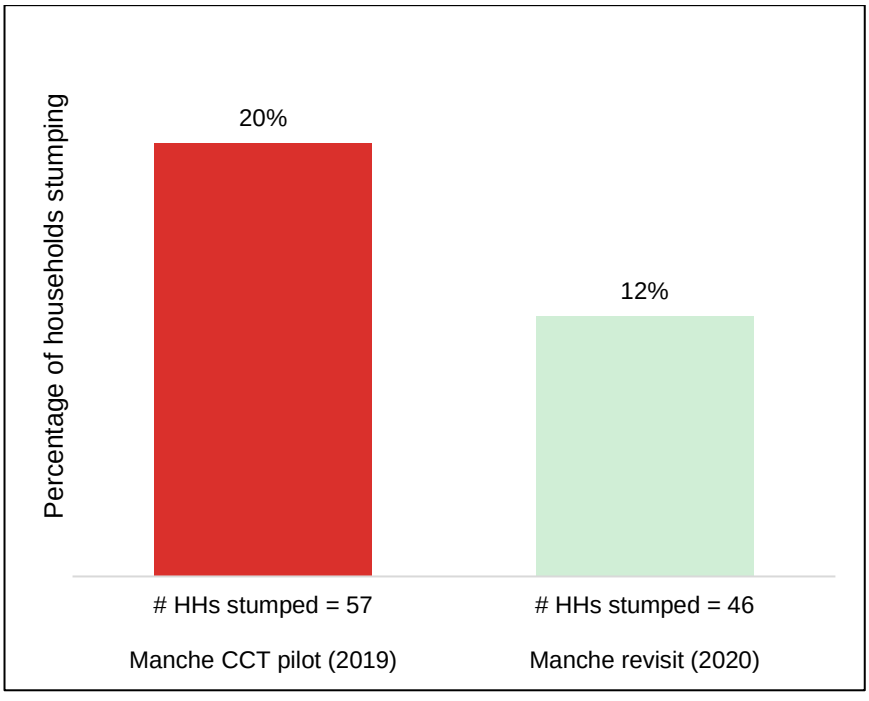
Based on TechnoServe's experience with smallholder farmers, stumping requires behavior change and we expect that stumping adoption will increase over time as farmers observe the benefits. Similar to the TFS pilot kebeles, the CCT pilot kebeles were also in Year 2 of Farm College during the 2020 study. One CCT kebele, Manche, is located in the same woreda, Dale, as the TFS pilot kebeles. The revisit in Manche did not trace the farmers that stumped during CCT but rather served to understand the stumping adoption rate among all registered households in 2020.

Eligible households in Manche received an incentive of ETB 20 per stumped tree during the pilot CCT program in 2019. Only households that attended the first agronomy training in 2019 delivered on the topic of stumping were eligible for the pilot. These households received training on stumping and sucker selection, which is same as the training provided to the TFS pilot kebeles.

Stumping was conducted by 20% of the registered households in Manche during the pilot CCT program. To adopt, households must have stumped at least one coffee tree between January and March 2019. The same protocol for counting trees and establishing stumping adoption was used during the revisit.

During the revisit in 2020, we found that stumping in 2020 was conducted by 12% of the registered household compared to the 20% of households in 2019. These results are shown in Figure 14.

Figure 14: Adoption of stumping – by year



The average number of coffee trees stumped per household was 55 in 2020 and 97 during the CCT pilot. Following a similar trend, in 2020, households in Manche stumped a total of 2,532 coffee trees which is about half of the total number of trees (5,415) stumped during the CCT pilot.

Comparing the data from the two years, we see relatively better performance in Manche after the CCT pilot in 2019 compared to the revisit in 2020, as expected given there was no incentive in 2020. However, the adoption rate of 12% highlights that the gains from CCT pilot are maintained relative to the baseline stumping adoption rate of 4% for this cohort. This performance is evaluated on the basis of stumping adoption rate, the average and total number of stumped trees.

One of the potential reasons to explain why stumping rates are lower in 2020 is that in this year the program welcomed new households that were not a part of the pilot CCT program. The total number of registered households in Manche increased to 383 in January 2020 from 279 households in January 2019.

Next, we explore some survey insights to understand the decision-making of households to stump both in 2019 and 2020, or in 2020 only. Note the numbers in Table 7 only take into account the 46 households that stumped trees in 2020. This number of households that stumped trees in 2020 is quite small so all proportions are only indicative.

Table 7: Insights from revisiting Manche

Themes	Key points
Exploring the experience of households that stumping in 2019 and 2020	• 18 of the 46 households that stumped trees between December-March 2020 has also stumped as part of the pilot CCT program • Most of these households (83%) also correctly recalled the ETB 20 cash amount offered as part of the program • More than half (56%) of the households reported loss of coffee production and income as a result of stumping coffee in 2019. This is in line with the assumptions regarding the income constraints from stumping • Farmers that stumped in 2019 but not in 2020 were not visited as part of the verification exercise
Exploring the experience of households that stumped in 2020 only	• 46% of the households did not stump in 2019 because they reported not knowing how to stump. • This is followed by 29% of the households reporting that they did not want to reduce their production from stumping. Again, this is in line with the key constraints identified from stumping[21]
Knowledge-sharing by households that stumped in 2019 and 2020	• 67% of the households self-report sharing their stumping experience from 2019 with other coffee farmers. This highlights possible positive spillover from the pilot CCT program • The main knowledge-sharing experience was through showing other farmers the stumped coffee trees on their field

[21] One household reported that they stumped coffee trees in 2019 but did not receive an incentive as part of the pilot CCT program. This is because the household did not attend the January 2019 stumping training, therefore was not eligible for the incentive.

Future stumping plans as part of behavioral change	• 54% of the households that stumped in 2020 report that they plan to stump more trees after the end of the 2020 harvest season. The households report that they are motivated to stump again because they know that their trees are old so more trees need to be stumped • Of the households that do not plan to stump trees in 2021, about half report not having enough coffee tree to stump as their primary reason. This is followed by 33% reporting not wanting to reduce their coffee production and income

7. Cost Effectiveness: CCT vs. TFS

An understanding of the cost-effectiveness of the pilot programs can support decision-making for any future scale-up. Cost effectiveness for this study is defined as an analysis that compares the cost of the incentives in the two pilot programs relative to the outcomes, which is the average number of trees stumped. To examine the cost-effectiveness of the pilot CCT program, we only consider the cash component of the program.

Overall, the cost per tree and the average cost per tree is lower for the pilot TFS program than for the pilot CFS program. The lowest average cost per tree was USD 0.33 for farms who received Package 2 for stumping between 100 to 149 trees, while the highest average cost per tree was incurred by farmers receiving USD 0.90 per stumped tree. For context, the average price that a farmer receives for 1kg of coffee fluctuates between USD 0.4 and USD 0.5 in Ethiopia.

Table 8 below further describes the cost per tree range and average cost per tree. Note, the cost per tree column for TFS contains a minimum and maximum range because the actual cost of the packages remained constant regardless of how many trees a qualified farmer decided to stump. For example, package 1 worth about USD 30, was paid for stumping between 50 and 99 trees and the cost per tree is therefore between the range of USD 0.30 and USD 0.60. The same is true for the cost per trees of the other packages.

See Annex 3 for the breakdown of the calculations for the average cost and the cost of each tools in the packages.

Table 8: Cost per tree and average cost per tree, by pilot program

Pilot Program	Cost per tree (minimum – maximum for TFS)	Average cost per tree[22]
Cash for Stumping (ETB 20 or ETB 25 per stumped tree)	USD 0.70 and USD 0.90	Same as cost per tree
Tools for Stumping (Package 1 worth ~USD 30)[23]	USD 0.30 – USD 0.60	USD 0.49
Tools for Stumping (Package 2 worth ~USD 38)[24]	USD 0.26 – USD 0.38	USD 0.33
Tools for Stumping (Package 3 worth ~USD 83)[25]	USD 0.56 or less	USD 0.43

[22] The average cost per tree is calculated by taking the total cost of trees for each package and dividing this by the total number of trees stumped (total cost of trees or package /total trees stumped).
[23] Package 1: stump between 50-99 trees
[24] Package 2: stump between 100-149 trees
[25] Package 3: stump 150 trees or more

We observe that the pilot TFS program is more cost effective (over twice) than the pilot CFS program, however, some caveats must be noted:

- The calculation of the average cost per tree for the pilot TFS program takes into account the total number of trees, which may have been affected by the fact that this is Year 2 of Farm College. It is likely that farmers stump more coffee trees in Year 2 of Farm College compared to Year 1 after seeing the difference in the demonstration plot.
- A robust cost-benefit analysis may be more appropriate to compare the pilot TFS program because cost-effectiveness does not take into account the longevity and depreciation of tools.

8. Pilot feedback and next steps

We have identified areas of improvement for any future scale-up program based on the implementation of the pilot TFS program. It should be noted that the pilot program feedback and recommendations are in the context of the pilot whereby some elements were affected by COVID-19.

Buy-in from government officials:

Approval and buy-in from relevant government officials was critical to the design of the pilot program and incentives package

Observation & Feedback	Recommendations & Comments
• Government officials were opposed to the idea of providing cash as an incentive to encourage stumping • Government officials agreed to provide approval for an asset-based transfer program. In this case, they largely pushed for farming tools	• Share the results of the pilot program with government officials at least a few months before planning the scale-up. This will ensure that government officials are aware of the effect of incentives of stumping • Share the initial program design with government officials during the project planning phase so that the design is not required to be changed at the last minute

Selection of tools:

The tools in all three packages were suggested by TechnoServe field staff instead of the farmers

Observation & Feedback	Recommendations & Comments
• The tools were selected based on what TechnoServe field staff deemed as useful or important for farmers.	• Consider conducting qualitative interviews with farmers to understand the tools that are the most useful to them and/or are not easily accessible in their respective kebeles • Explore packages of tools whereby value of each package increases proportionally to the number of trees stumped

***Tool procurement and distribution strategy**:*

The tools were procured and distributed by TechnoServe

Observation & Feedback	Recommendations & Comments
• TechnoServe procured the tools at the same time as the number of stumped trees were being counted in the pilot kebeles • Farmers were informed about tool distribution and given tools at a location based on their FFG	• To procure tools in advance, consider modelling the stumping status of farmers and the number of trees stumped for timely distribution

***Communication materials**:*

All households that attended the January 2020 training were given an information card depicting features of the pilot TFS program

Observation & Feedback	Recommendations & Comments
• Households that did not attend the January 2020 training were less likely to have all the information regarding the pilot program. • Households that did not attend but were registered in Coffee Farm College could also participate if they heard from neighbors or the FT.	• Consider ways to communicate the program accurately through other means of announcements that can reach all farmers registered in Coffee Farm College.

Mobile-based interventions

High mobile phone ownership among farmers that stumped can be utilized for sending SMS or phone reminders about stumping

Observation & Feedback	Recommendations & Comments
• Among the farmers who stumped, there is a high ownership of mobile phones (84%) compared to 60% in the baseline study for this same cohort	• Consider sending SMS reminders or calling farmers that were not visited by FTs to encourage stumping.

Next Steps

Based on the results of the pilot TFS program and the pilot CCT program, we propose to conduct some small-scale research studies to:

- Explore other in-kind incentives that can nudge stumping among coffee farmers by conducting A/B testing of different incentives
- Explore ways to count stumped trees using satellite or drone imagery in conjunction with machine learning so as limit the reliance on independent team of enumerators

We envision a scaled-up program accompanied by a rigorous impact evaluation to measure the impact and cost-effectiveness of an asset-based transfer intervention. We expect the scaled-up program to cover a much larger population of coffee farming household. The impact evaluation can be quasi-experimental but to truly measure the pure impact of the intervention on adoption of stumping practice, an experimental study like an RCT is required.

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Annexes

Annex 1: Overview of Activities

Here is a brief overview on activities conducted by Laterite during the Ethiopia Pilot Tools for Stumping (TFS) program since October 2020.

Table 9: Overview of activities conducted

Period	Activity	Description
October-November 2019	**Project setup**	• Finalized proposal • Completed contracting and coordination activities with TechnoServe and HereWeGrow • Prepared workplan
	Background research	• Prepared materials for a scoping study to finalize kebeles suitable for implementing the pilot • Prepared qualitative instruments and related materials • Conducted a meeting with Senior Business Advisors (SBAs) of the 2019 Cohort to Identify a list of preliminary kebeles suitable for the scoping study and pilot
December 2019	**Scoping Study**	• Conducted key informant interviews in 5 potential kebeles for the pilot with the objective of finalizing the 2 most suitable kebeles for the pilot • Completed transcription and translation of notes
	Kebele identification	• Identified 3 kebeles suitable for the pilot, 2 kebeles as the comparison kebeles for comparison purposes, and 1 kebele from the Conditional Cash Transfer (CCT) pilot
	Approval from government authorities	• Coordinated with TechnoServe to meet with government authorities to obtain approval for the pilot (initially a Cash for Stumping pilot)
January 2020	**Program design**	• Prepared final structure of a tools for stumping intervention (packages of tools, eligibility criteria, communication, etc.)
	Tools component	• Coordinated with TechnoServe to finalize a list of tools that farmers need • Conducted pricing analysis to finalize 3 packages of tools
	Program Materials	• Prepared materials and Information cards for farmers to explain the Tools for Stumping [TFS] program • Prepared training materials for TechnoServe FTs • Trained 4 TechnoServe FTs on protocol to follow in the training
February 2020	**Enumerator spot check visits**	• Prepared a tablet survey to capture the accuracy of FT communication of the pilot program during the training • Distributed pre-populated information cards to farmers to explain the pilot program and the packages of tools

Period	Activity	Description
March 2020	**Farmer Trainer (FT) Visits**	• Prepared tablet surveys to capture data on FT visits • Trained FTs on field on using tablet surveys • Coordinated with TechnoServe to ensure FTs are capturing data to identify stumped farmers • Monitored data on the server and provided feedback to TechnoServe
	Identification of stumped farmers (pilot kebeles)	• Coordinated with TechnoServe to complete surveys for the 2 pilot kebeles due to COVID-19 related risks • Completed field preparation survey with Farmer Trainers (FTs) and Focal Farmers (FFs) to identify all stumped farmers in 2 pilot kebeles • Prepared final list of farmers to survey
	Data collection preparation (pilot kebeles)	• Completed survey instrument (including translation) • Completed field testing of instrument and counting methodology • Completed all relevant materials and training notes (including translation) • Completed training of enumerators
	Feedback to TechnoServe	• Provided feedback on initial stumping estimates to TechnoServe team to assist with procurement of tools
April 2020	**Mop up survey data collection (pilot kebeles)**	• Completed re-visits for 85 farmers who stumped more trees since the first farm visit in late March • Updated the package of tools for these farmers if required
	Data collection (pilot kebeles)	• Completed data collection and related quality checks for all stumped farmers that were indicated to Laterite by TechnoServe FTs and FFs in 2 pilot kebeles (Bera Chale and Gane)
	Distribution of tools (pilot kebeles)	• Laterite prepared list of farmers and packages of tools to be distributed • Laterite prepared a survey instrument and survey notes for efficient distribution of tools • TechnoServe has taken up logistics of actual distribution of tools
	Analysis (pilot kebeles)	• Analyzing the data and report writing for the pilot kebeles
October 2020	**Identification of stumped farmers (comparison kebeles and Manche)**	• Coordinated with TechnoServe to complete surveys for the 2 comparison kebeles and Manche • Completed field preparation survey over the phone with Farmer Trainers (FTs) and Focal Farmers (FFs) to identify all stumped farmers in 2 comparison kebeles and Manche • Prepared final list of farmers to survey
	Data collection preparation	• Completed survey instrument (including translation)

Period	Activity	Description
	(non- pilot kebeles and Manche)	• Completed all relevant materials and training notes (including translation) • Completed preparing for the COVID-19 protocols such as buying PPE, testing the enumerators for COVID-19 and etc. • Completed training of enumerators
	Data collection (comparison kebeles and Manche)	• Completed data collection and related quality checks for all stumped farmers that were indicated to Laterite by TechnoServe FTs and FFs in 2 comparison kebeles and Manche
November 2020	**Final analysis**	• Analyzing the data and final report writing

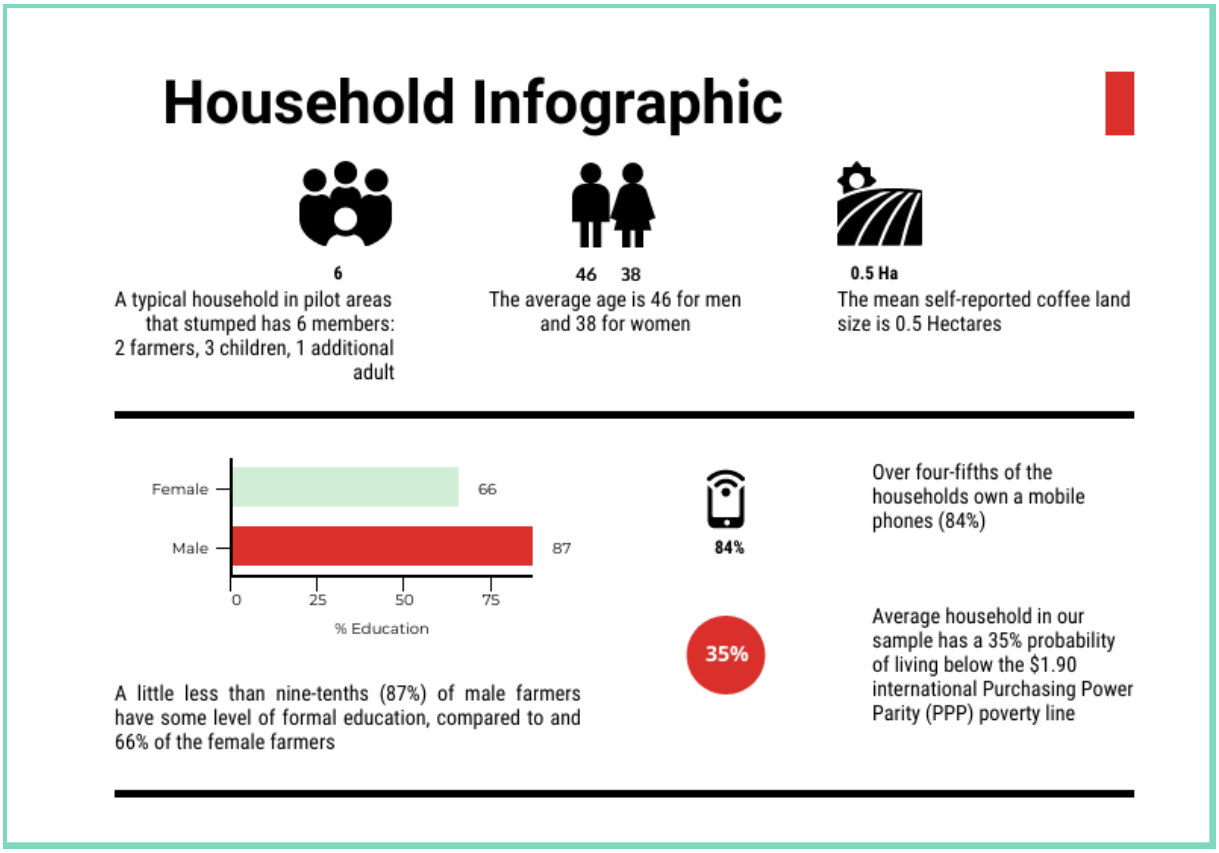
Annex 2: Socio-economic characteristics

This section presents insights on the socio-economic characteristics of farmers from the verification survey conducted in pilot areas. Note, nine households from Gane that stumped trees have not been included in this section because their stumped trees were verified by the TechnoServe field team during tools distribution, therefore, they were not asked questions pertaining to socio-economic characteristics.

Summary of results

Figure 15 depicts a brief overview of the main household characteristics of households that stumped trees in pilot areas

Figure 15: Summary of household characteristics



1. Household characteristics

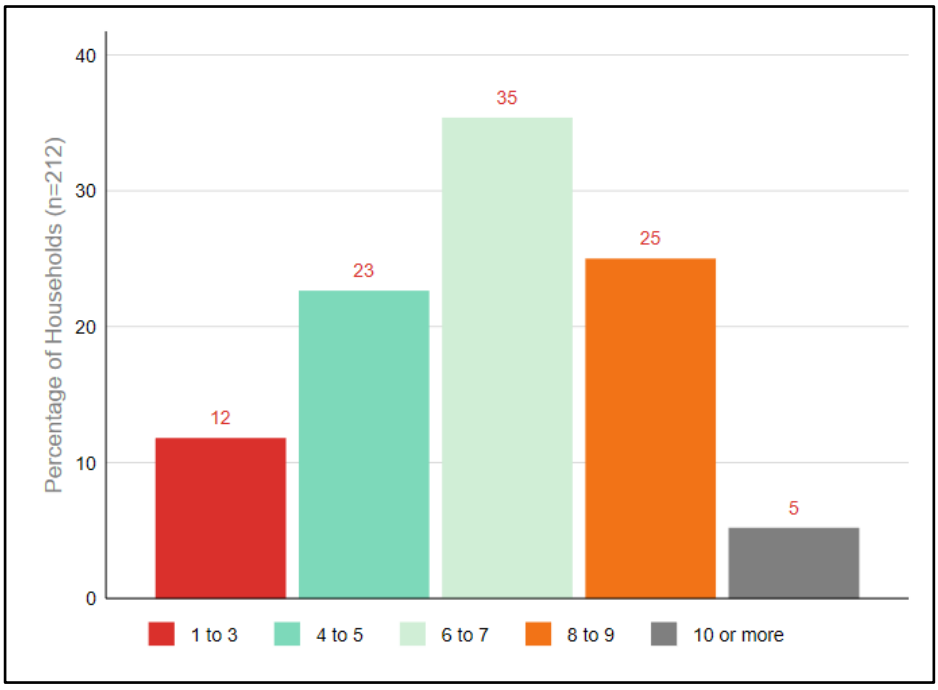
The following section provides a profile of the average household that stumped in the two pilot kebeles covering demographic and socio-economic characteristics. Overall, we find most of the characteristics are quite close to the characteristics of the TechnoServe program farmers as seen in the baseline conducted in 2019. While any large deviations are

mentioned below, it is important to note that the two research designs and samples are completely different – direct comparisons are not applicable.

1.1. Household composition

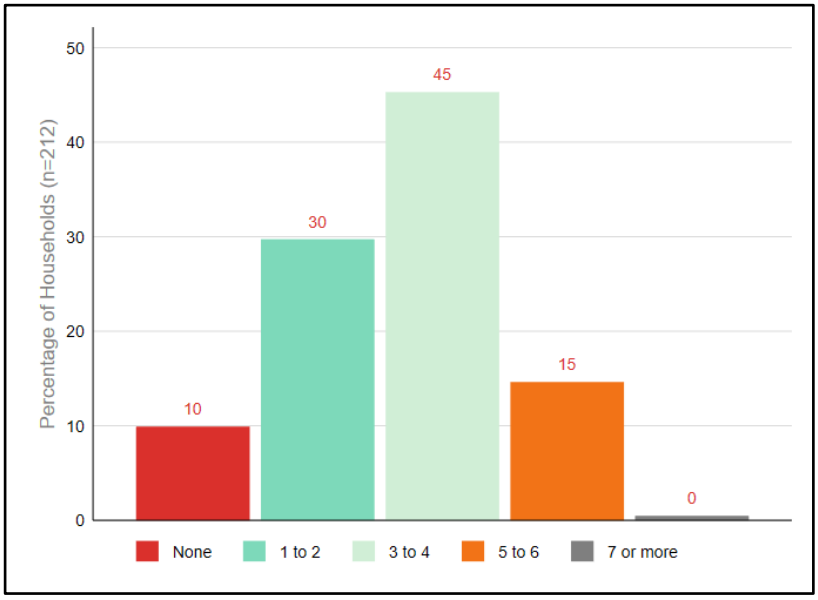
The average household has 6 members, with two farmers, three children and one additional adult residing in the household. About nine out of ten farmers (89%), are married, and the remaining are either widowed (6%), single (4%) or divorced (less than 1%). Figure 16 shows the distribution of household size for pilot kebeles.

Figure 16: Distribution of Household Size



There are three children in an average household, with less than a third (30%) of the households having 1 or 2 children. Figure 17 depicts the distribution of number of children in a household in the pilot areas.

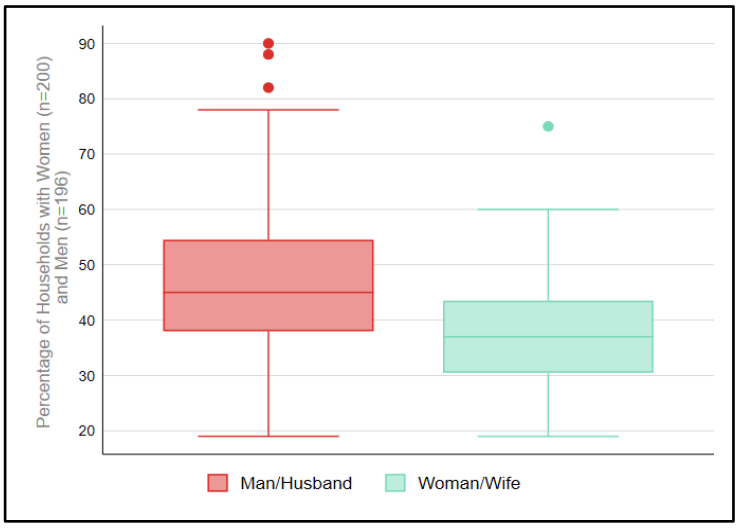
Figure 17: Distribution of Number of Children



1.2. Age

The average age for men is 46 and 38 for women. The distribution of ages is shown in Figure 18. 10% of the male farmers and a quarter (25%) of the female farmers are below 30 years old. At the other end of the spectrum, 17% of male and 2% of female farmers are above the 60 years of age.

Figure 18: Age Distribution by Gender[26]



[26] How to interpret this box plot: The median (or 50th percentile) is represented by the center line inside the boxplot. The top and bottom of the 'box' represent upper and lower quartiles. The T-lines extending from the top and bottom of the boxplot represent the maximum and minimum age. Outliers are represented as dots at either end of the boxplot

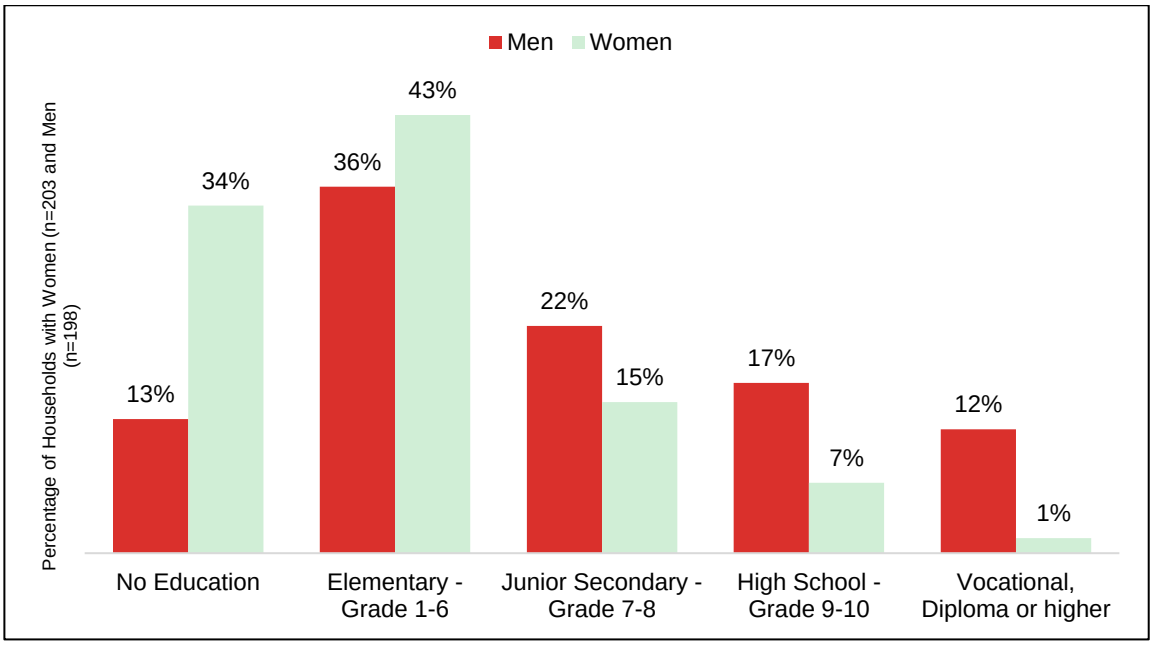
1.3. Education and Literacy

A little less than nine-tenths (87%) of male farmers and seven-tenths (66%) of female farmers have formal education. Nearly two-fifths of the women (43%) have some grade of elementary school completed in seen in Figure 19, but men are more evenly distributed with about 36% completing elementary, junior secondary (22%) and high school (17%) each. Farmers having completed vocational education or higher is highly skewed towards men (12%) compared to women (1.5%).

In terms of literacy, four-fifths of the men (83%) and over half of the women (55%) know how to read and write in at least one language.

The findings on education and literacy are quite similar to the baseline survey, whereby a lower proportion of women (61%) and men (86%) report having formal education and lower proportion of women (55%) and men (79%) report being literate. Thus, there is some indication that farmers who stumped in the pilot areas have about the same level of education as the average coffee farmer participating in the Farm College program.

Figure 19: Distribution of education level of women and men



2. Coffee Land and Asset Ownership

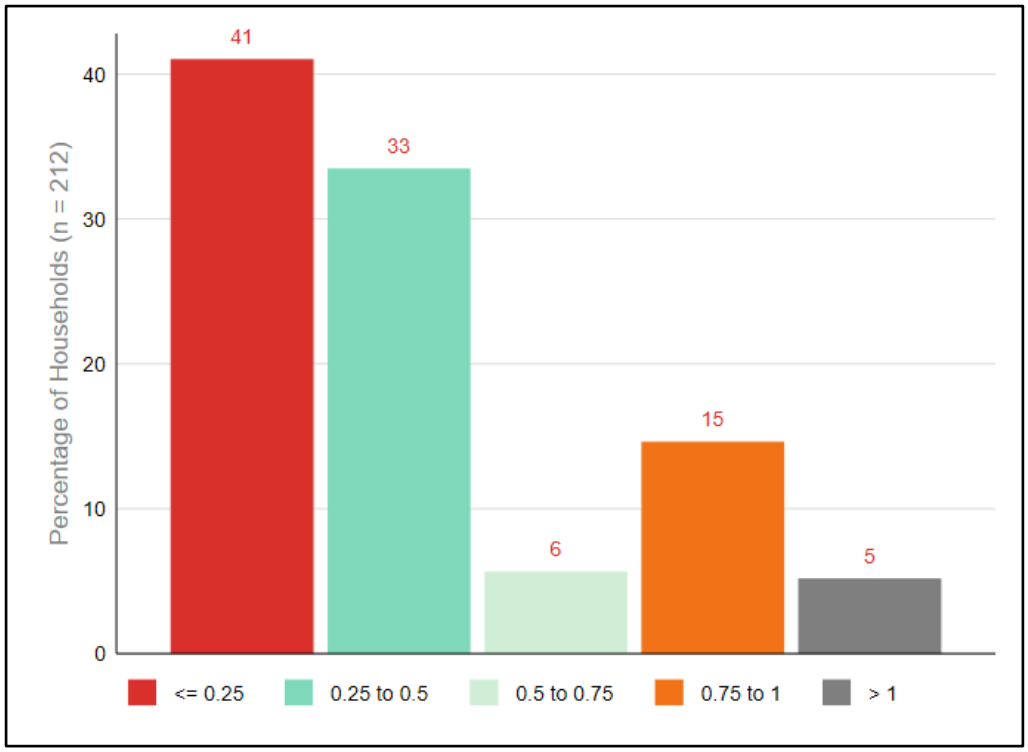
2.1. Land Size

The median household owns around 0.5 hectares of land planted with coffee. On average, farmers own 0.5 ha of coffee, with about 5% of farmers owning over 1 ha. Nearly 15% of the farmers own less than quarter ha of coffee. This distribution is described in Figure 20.

If we use an upper limit number of coffee trees per hectare as 2,500 trees (commonly used by TechnoServe), the median household manages a maximum of 1,250 coffee trees.

In the baseline survey, we find lower average land size planted with coffee (0.33 ha. This indicates that households who stumped in the pilot areas have more coffee than the average coffee farmer participating in the Farm College program.

Figure 20: Land Ownership (in hectares)



2.2. Asset Ownership

All households (100%) use firewood as cooking fuel. Almost all households (97%) own at least one mattress or bed. About three-quarters (72%) of the households own one or more *gabis* (blanket). Just about a tenth (8%) of the households own a plough (either traditional or modern).

While about half (48%) of the households have a radio, over four-fifths of the households (84%) own a mobile phone – with over half (57%) report owning 2 or more phones.

Comparing this to the baseline survey, we see a lower proportion of households owning a radio (33%) and mobile phone (60%). A lower proportion own at least one gabi (62%) and mattress or bed (85%). And, a much higher proportion of households own a plough (97%). Together with the land component, these assets show greater household wealth and overall, this indicates that households who stumped in the pilot areas could be wealthier than the average coffee farmer participating in the Farm College program.

3. Financial profile

3.1. Income Generating Activities

Over half of the households (53%) are highly dependent on coffee with half or more of their total household income in the last 1 year derived from sale of coffee. In fact, 3% of the households report all their income comes from coffee.

Apart from coffee, the most important source of income is the sale of fruits (e.g. avocado, banana, papaya, etc.) for 30% of households. For this, farmers were asked to list their main income generating activities in the past 1 year apart from coffee and only the most important one was captured. The other important sources include quarter (25%) reporting sale of *ensete* (false banana), 20% report selling eucalyptus for timber, 6% reporting working as a government employee (e.g., teacher, police, soldier, etc.) and 5% reporting sale of cereal crops (e.g., maize, wheat, teff, etc.).

3.3. Simple Poverty Scorecard

This section provides a brief overview of the Simple Poverty Scorecard poverty-assessment tool for Ethiopia. The purpose of this tool is to be able to understand the relative poverty profile of the farmers in the pilot areas. Overall, the poverty probability profile of coffee-farming households in this area is in line with that of rural households in the SNNPR region[27] of Ethiopia.

The Simple Poverty Scorecard is a poverty measurement tool similar to the Poverty Probability Index (PPI)[28] comprised of a country specific survey with about 10 simple, easy-to-answer multiple-choice questions. The simple poverty scorecard for Ethiopia uses eight indicators from Ethiopia's 2011 Welfare Monitoring Survey to estimate the likelihood that a household has consumption below a given poverty line. It is primarily used by NGOs, social-enterprises and a few foundations and has been customized for 61 developing countries to data including Ethiopia (Schreiner, 2016).

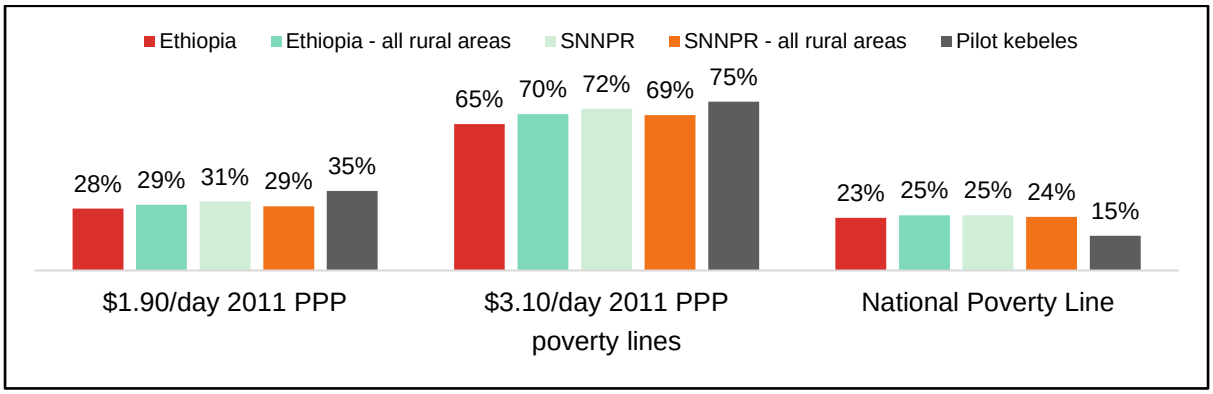
[27] The pilot kebeles are located in Sidama region, previously located in SNNPR. A referendum in 2019 led to the creation of Sidama region, which was the regionalization of Sidama zone. Unfortunately, all regional level poverty-assessment tools have not taken this referendum into account yet. Therefore, we have to use the levels from SNNPR region for comparison purposes.
[28] For more information on the Poverty Probability Index visit (https://www.povertyindex.org/about-ppi)

The Simple Poverty Scorecard (Schreiner, 2016) used to measure the poverty likelihood is based on indicators on the household composition (such as the number of household members), education (such as literacy status of the woman/wife), choice of cooking fuel and ownership of some assets (such as gabi, ploughs, radio). The scorecard uses data from Ethiopia's 2010/11 Household Consumption and Expenditure Survey, a nationally representative survey.

The total score a household can get ranges between 0 (most likely to be below poverty line) to 100 (least likely to be below poverty line). The score can be used to estimate three indicators. First, the *poverty likelihood* of a household, this is the probability that a household has per-adult or equivalent per-capita consumption below a poverty line. Second, the score can estimate the poverty rate of a group of households at a point in time by averaging their scores. Third, it can estimate the changes in the poverty rates of a group of households between two points in time.

Figure 21 shows the results of the simple poverty scorecard analysis. The values for a region represent the percentage of a given population that lives below the poverty line indicated.

Figure 21: Simple Poverty Scorecard based Poverty Rate



Overall, over a quarter (28%) of Ethiopian households are likely to be below the $1.90/day 2011 PPP poverty line[29], and a slightly higher proportion (29%) of rural households of the country are likely to be below the same poverty line. Prior to November 2019, the pilot kebeles were located inside SNNPR, and so we also note that about a third (31%) of the SNNPR households and 29% of the rural SNNPR households live below the $1.90/day 2011 PPP poverty line. Similar trends can be seen in using the national poverty line and $3.10/day 2011 PPP poverty line.

Next comparing these trends to the 3 pilot kebeles, a larger proportion of stumped households in pilot kebeles are living below each of the poverty lines, except for the

[29] In defining the poverty rate such as $1.90/day 2011 PPP, we refer to the 2011 PPP Dollar which is essentially an internationally comparable currency unit. Purchasing power parities (PPP) is the rate of currency conversation that equalize the purchasing power of different currencies by eliminating the differences in price levels between countries.

national poverty line. For example, 35% of the households in pilot kebeles are living below the $1.90/day 2011 PPP poverty line. This is higher than Ethiopia as whole, and even rural SNNPR. A different trend can be observed using the national poverty line, whereby a relatively smaller proportion (15%) of households are living below the national poverty line.

The trend from the national poverty line and comparisons of land and assets earlier, indicates that stumped households are slightly less likely to be poor compared to their peers. This is in line with our expectation that slightly wealthier households are likely to be early adopters of stumping practice. However, this is only an indication since the proportions for the other poverty lines are quite similar to Ethiopia and SNNPR as a whole.

Annex 3: Cost Effectiveness Breakdown

Below is a brief overview of the breakdown used for calculating cos per tree and average cost per tree in the cost effectiveness of the CFS and TFS pilot program.

Table 10 highlights the cost of each package in USD. The exchange rate used to convert the Ethiopian Birr (ETB) amount to USD for the TFS pilot program is 1 USD = 33 ETB because the tools were purchased in April 2020.

Table 10: Cost of packages in the TFS pilot

Package	Number of stumped trees	Tools in each package	Cost of each tool (ETB/USD)	Total package cost (ETB/USD)
Package 1	50-99 trees	1 pruning shear	ETB 425 / USD 12.88	ETB 983.50 / USD 29.80
		10kg beans	ETB 225 / USD 6.28	
		1 bow saw and blade	ETB 33.50 / USD 10.11	
Package 2	100-149 trees	1 pruning shear	ETB 425 / USD 12.88	ETB 1,258.50 / USD 38.14
		10kg beans	ETB 225 / USD 6.28	
		1 bow saw and blade	ETB 33.50 / USD 10.11	
		1 zappa	ETB 160 / USD 4.85	
		1 spade	ETB 115 / USD 3.48	
Package 3	>= 150 trees	1 wheelbarrow	ETB 2,099.90 / USD 63.63	ETB 2,749.90 / USD 83.33
		1 pruning shear	ETB 425 / USD 12.88	
		10kg beans	ETB 225 / USD 6.28	

Table 11 contains the values for the total trees stumped under each package in the TFS pilot program to calculate the cost per tree and the average cost.

Table 11:Total cost, average cost and cost per tree numbers for each package in the TFS pilot

Package	Total number of trees stumped	Number of eligible households for each package	Total cost[30] (USD)	Average cost[31] (USD)	Cost per tree (minimum in USD)	Cost per tree (maximum in USD)
Package 1	5,576	92	2,742	0.49	0.30	0.60
Package 2	3,674	32	1,220	0.33	0.26	0.38
Package 3	7,553	39	3,250	0.43	0.56	N/A

The calculation used to derive the cost per tree for the CFS pilot program is described in Table 12 below. Note, the exchange rate used for the calculations in Table 12 is 1 USD = 28 ETB because the CFS pilot took place in 2019.

Table 12: Total cost and average cost per tree for the CFS pilot

CFS	Total number of trees eligible for payment[32]	Total cost (USD)	Average cost/Cost per tree (USD)
ETB 20 per tree	4,994	3,496	0.70
ETB 25 per tree	3,552	3,197	0.90

[30] Total cost = Number of eligible households for package * cost of package. Note, the cost of each package is provided in Table 10
[31] Average cost = total cost of each package divided by the total number of trees stumped
[32] The total number of trees stumped takes into account the upper limit for this program which was ETB 3,025 for each household

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