



# Responsible Land Governance: Towards an Evidence Based Approach

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## **Assessing the Impact of Second-Level Land Certification in Ethiopia**

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**Abstract**

This paper presents the results of a USAID-funded impact evaluation of the Ethiopia Land Tenure Administration Program (ELTAP) and the Ethiopia Land Administration Program (ELAP). Utilizing panel data collected from 4,319 households in Ethiopia, the evaluation employed a Difference-in-Difference design coupled with matching to examine the impact of second-level certification relative to first-level certification across a range of household-level outcomes. The evaluation found small, positive, and potentially important impacts on household access to credit and on indicators of female empowerment. Little evidence for household impacts of second-level beyond first-level certification was found for indicators related to tenure security, land disputes, land rental activity, or soil and water conservation. The key findings of the evaluation presented in this paper contribute to the knowledge around the impacts of formal land documentation on household level development outcomes. Moreover, the critical analysis of the impacts and limitations of ELTAP and ELAP can contribute to enhanced programming during the Government of Ethiopia's ongoing scale up of second-level land certification. Finally, the evaluation findings may inform the development of a national land use policy.

**Key Words:**

Land certification; second-level; first level; Ethiopia; impact evaluation

## Introduction

Following decades of social, political and economic insecurity marked by conflict, famine, regime change, and land redistribution, in the late 1990's the Government of Ethiopia (GoE) embarked on an ambitious program to document and register lands held by rural households. This “first-level” land certification program was designed to increase tenure security and certify long-term use rights for rural households. The program has been widely viewed by donor institutions, development practitioners and scholars as one of the most successful low-cost land registration programs in Africa or anywhere else in the world (Deininger et al., 2011; Holden et al., 2009; Holden et al., 2011; Holden and Ghebru, 2013).

Despite the well-documented benefits, first-level certification was also perceived to have key limitations that rendered it unlikely to be a viable long-term solution for securing land rights for smallholders. In particular, the process did not map individual plots or provide a sufficient level of spatial detail around boundary documentation to allow for the development of cadastral maps for improved land use management and administration. Moreover, the lack of computerized land registries under first-level certification did not enable effective management and updating of registration records.

With a view towards addressing these limitations, beginning in 2005, the USAID-supported Ethiopia Strengthening Land Tenure Administration Program (ELTAP) worked with *woreda*-level (district) land administration agencies to pilot a second-level land certification process. ELTAP was implemented in Tigray, Amhara, Oromia and Southern Nations, Nationalities, and Peoples' Region (SNNP) from 2005 to 2008. USAID support for second-level certification continued under the Ethiopia Land Administration Program (ELAP), which ran from August 2008 to February 2013.

This paper presents the results of an impact evaluation of the ELTAP/ELAP second-level certification work. The evaluation focuses on the marginal impact of second-level certification relative to first-level certification across a range of household-level outcome families. These include: access to credit; land disputes; land rental activity; soil and water conservation investments; land tenure security; and female empowerment and decision-making over land. Impacts are estimated using a quasi-experimental Difference-in-Difference (DID) approach coupled with entropy balancing from a panel data set of 4,319 households that were surveyed across 284 *kebeles* (village clusters) in Amhara, Oromia, SNNP, and Tigray regions. In addition to average impacts, the study also examines how impacts of second-level certification vary for a set of seven program-relevant characteristics of households or villages that could be important modifiers of program effect: gender of household head; marital status of household head; program round (i.e., ELTAP vs. ELAP); household total landholdings; wealth status; age of household head; and distance to regional capital.

As such, the study contributes original evidence on the role of improved land tenure security in mitigating development challenges and helps build the knowledge base about the longer-term components of a functional land registration process. The results provide insights on the role of land rights clarification and enhanced documentation in meeting broader development objectives.

The paper is structured as follows: Section 1 provides background and context. Section 2 presents the theoretical framing for second-level certification. Section 3 described in detail the data collection and sampling methods used in the impact evaluation, as well as our analysis strategy. Section 4 describes our quantitative results. Section 5 contextualizes our findings within existing work and highlights new contributions. Section 6 discusses program implementation and policy implications that can be drawn from our results. Section 7 summarizes and concludes the paper.

## **Background**

In 1998, the GoE embarked on a rural land registration program to increase the tenure security and certify the long-term use rights of rural households in Tigray followed by Amhara (2002), and Oromia and the SNNP regions (2004). Under first-level certification, land used by households was registered and documented via a participatory process in which neighbors act as witnesses for the demarcation of parcel boundaries. ‘Green books’<sup>1</sup> were issued to households as a record of their land holdings and rights. Parcel details were agreed to by parties participating in the process and recorded on paper forms, together with information on the household head, parcel area, location, quality of land, and the names of individuals to whom adjacent parcels belong (Bezu and Holden, 2014).

The estimated cost of Ethiopia’s first-level certification is reported to be approximately US\$1 per parcel (Alemu, 2006; Deininger, Ali, Holden, and Zevenbergen, 2008; Land Equity International, 2006).<sup>2</sup> In addition to being considered one of the least costly land registration programs in Africa and elsewhere (Deininger et al., 2008), Ethiopia’s first-level land certification program was quickly scaled up and covered a large number of households in a relatively short period of time. By the mid-2000s, approximately 20 million plots were registered from 6 million households (Deininger et al., 2008), with upwards of 12 million households covered by the end of the decade (Hailu and Harris, 2013). The

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1 Green booklets were issued in Oromia and SNNP while in Tigray these were blue (Deininger et al., 2008).

2 By comparison, low-cost estimates for land titling in West Africa are in the range of US\$7-10 per parcel (Lavigne-Delville, 2006). Depending on the scale at which titling is taking place, in Madagascar the costs of issuing titles on an on-demand-basis range from US\$150 to US\$350 per parcel (Jacoby and Minten, 2007; Teyssier, Raharison, and Ravelomanantsoa, 2006), with low-cost estimates under a systematic approach in the range of US\$7-28 per parcel (World Bank, 2006). In Uganda, the cost of issuing customary land certificates is US\$40 per parcel (Deininger et al., 2008). Outside of Africa, the cost of first-time registration ranges widely from of US\$10-13 per parcel (in Moldova and Peru respectively) to over US\$1,000 on the high-end (US\$1,064 for Trinidad and Tobago and US\$1,354 in Latvia) (Burns, 2007).

Ministry of Agriculture's Land Use Directorate estimates that 90% of farming households have first-level land certification (MoA, 2013).

Research to date suggests that first-level certification has had a positive impact on a variety of economic outcomes (Deininger, Ali, and Alemu, 2011; Hagos and Holden, 2013; Holden, Deininger, and Ghebru, 2009, 2011; Holden and Ghebru, 2013; Melesse and Bulte, 2015). Among the key findings are increased investment and land productivity (Holden et al., 2009), increased land rental market activity (Deininger et al., 2011; Holden et al., 2011), as well as increased women's participation in land market activity and even improved child nutrition (Holden and Ghebru, 2013).

Despite being an important step in strengthening the tenure security of rural farmers, first-level certification also had a number of shortcomings that prevented it from being a viable long-term solution (Bezu and Holden, 2014). Chief among the perceived limitations is that the first-level certification process did not map individual plots or provide a sufficient level of spatial detail around boundary documentation to allow for the development of cadastral maps for improved land use management and administration. As such, there was a concern that limited spatial detail compromised the security of the land right, and thus investment. Moreover, the lack of computerized land registries under first-level certification did not enable effective management and updating of registration records.

To address these challenges, USAID began working with the GoE to support "second-level" land certification starting with the Ethiopia Strengthening Land Tenure Administration Program (ELTAP; running from 2005-2008) and continuing under the Ethiopia Land Administration Program (ELAP; running from 2008-2013). Under the auspices of second-level land certification activities, the ELTAP and ELAP programs aimed to address key limitations of the first-level process. In particular, they piloted the use of handheld GPS devices to map and demarcate parcel boundaries, an element of land tenure administration which was not included in first-level certification activities.

### **Theory**

From implementation and programming perspectives, the expectation is that second-level certification will further strengthen household security over landholdings and related impacts, due to technological improvements of the second-level certification process relative to first-level. This included benefits which might accrue because the spatial boundaries of households' land parcels are delineated more exactly and because the computerized process for second-level certification aids in maintaining permanent records and legacies of use rights that were not possible with the paper-based system of the first-level (Bezu and Holden, 2014). In particular, second-level certification is expected to motivate

improvements in livelihoods and development benefits through four primary pathways, including land transactions and access to financing; land disputes and conflict; land management and soil conservation; agricultural investment and productivity outcomes. These pathways are explained in more detail in the paragraphs that follow.

### ***Land transactions and access to financing***

The Ethiopian land policy at the time of first-level land certification allowed rural households to legally rent out their land (Adgo et al., 2014). Empirical research has shown that activity in land rental markets increased as a result of the introduction of first-level certification (Deininger et al., 2011; Holden et al., 2011). Although land leasing was already permitted under the first-level program, the additional information on specific parcel details that is made available through the second-level process, notably the size of the parcel and a map of the boundaries, could potentially reduce information asymmetries between lessor and lessee by verifying key information, thereby allowing the parties to enter into a formal or informal contract that might not otherwise have taken place.

Second-level certification is also expected to increase the incentive for widows and women-headed households to engage in renting and sharecropping activity. Prior to receiving certification, women often limited such activity to relatives out of concern that the renter/sharecropper might claim the land use right as his own after establishing use for several years. Second-level certification is viewed as providing women with additional assurance and documentation of their rights, and thus may increase women's willingness to engage in these types of short-term, temporary transfers of land rights.

Although some land transactions, such as renting/leasing and sharecropping, are allowed, this does not apply to buying, selling, or mortgaging of land, which are still illegal in Ethiopia. Although land cannot be used as collateral to secure a loan, research in other contexts does suggest that informal financial institutions can be an effective alternative in supporting smallholder credit access to promote investment in new technologies. Informal means, such as financing provided collectively by a local group and using norms of social accountability as an enforcement mechanism, is one such model (Knox, Meinzen-Dick, and Hazell, 2002). In Ethiopia, the suggestion is that issuance of second-level certificates could make it easier for small landholders to obtain micro-financing. Rather than being used as collateral in the formal sense—implying that a bank could repossess land used as collateral on an unpaid loan—credit is often accessed through informal mechanisms, where the land certificate may provide a signal that the borrower is attached to a place and likely committed to improving his or her productivity on that land, and perhaps conveying capacity and ability for repayment. In such contexts, often the lender relies on group pressure or other extra-legal means for enforcement of repayment, thus the certificate details may also reassure the

lender on ability to enforce repayment. It is also possible that second-level certificates could facilitate access to credit by reducing the transaction costs associated with obtaining credit, such as by making it easier to verify information such as plot size and related details.

### ***Land disputes and conflict***

In countries like Ethiopia, where livelihoods for most rural residents derive from land, land-related conflicts over ownership and boundary disputes can be particularly harmful and undermine productive activities. Although empirical evidence demonstrating a strong link between strengthened land rights and reduced land conflict is relatively scarce, some studies do indicate that land registration programs can have the ability to reduce boundary disputes and litigation arising from such conflicts. In Ethiopia, there is evidence that first-level land registration and certification reduced the number of conflicts arising from border and inheritance disputes (Giri, 2010; Holden and Tefera, 2008; Holden, Deininger and Ghebru, 2011). A basic premise of stronger and more secure land tenure is that the enforcement of these rights lessens the risk of being forcibly displaced and allows for a level of long-term security and a sense of permanence that encourages land-related investment (Besley, 1995). Increased tenure security is also thought to reduce the need for smallholders to expend resources to defend their land claims, which can be particularly important for women and other vulnerable groups whose rights may not be sufficiently protected under traditional practices (Joireman, 2008).

### ***Land management and soil conservation***

A basic premise of stronger and more secure land tenure is that the clarification of land rights, together with the associated potential to more easily demonstrate claims and enforce rights, lessens the risk to landholders of being forcibly displaced from their land. It also allows for a degree of long-term security and a sense of permanence that is thought to encourage new and different types of land-related investments (Besley, 1995), including those which may require greater labor or resource outlays upfront. Several studies suggest that first-level land certification programs in Ethiopia induced better land management practices (e.g., tree planting, construction of stone terraces) and ultimately improved land productivity (Deininger et al., 2011; Holden et al., 2009). Reduced soil erosion and nutrient loss as a result of these land practices have been indicated as potential mechanisms for productivity enhancements in some areas of Ethiopia (Ghebru and Holden, 2015). It is expected that the additional surety over landholdings that households are expected to obtain under second-level certification relative to first-level certification would likely further reinforce the positive incentives for land decisions that apparently have led to improved land management and productivity under the first-level process. However, whether land certification on its own is enough to induce soil conservation practices directly or whether this is a secondary consideration resulting from some other primary (e.g., economic) objective is not clear. The

finding by Kahsay (2011) that land certification's impact on soil conservation depends on household characteristics, such as off-farm economic opportunities and household labor, further highlights the difficulties of isolating this impact.

### ***Agricultural Investment and Productivity Outcomes***

Although the knowledge base remains unresolved on whether secure land tenure alone is sufficient to induce increased agricultural investment (e.g., use of improved seeds and fertilizers, or adoption of new technologies), it is widely hypothesized to be a necessary condition for individuals to undertake productivity-enhancing investments on their land. Numerous studies have suggested positive impacts of greater land tenure security on agricultural outcomes and investment in rural land (Deininger et al., 2011; Deininger and Chamorro, 2004; Feder, Chalamwong, Onchan, and Hongladarom, 1988; Holden et al., 2009; Jacoby, Li, and Rozelle, 2002; Rozelle and Swinnen, 2004). Nevertheless, there remains great uncertainty around the nature of this relationship, and much empirical work is ultimately indeterminate—particularly in contexts where land markets are fairly nascent, and land cannot be used as collateral (Place, 2009; Arnot et al., 2011; Lawry et al., 2014). In Ethiopia, research to date suggests that first-level land certification increased agricultural investment at individual as well as community levels (Deininger et al., 2008; Holden et al., 2009) and that farms with certified land tended to be more productive than those that were not (Ghebru and Holden, 2008; Ghebru and Holden, 2015). The higher productivity was attributed to the use of better inputs, such as superior cultivars, pesticides, and synthetic fertilizers. Work continues to better elucidate the mechanisms by which first-level certification in Ethiopia may have worked to generate positive investment and agricultural productivity impacts. Yet, the expectation under second-level certification is that the additional security over land holdings, and the formalized and permanent documentation of land rights that is expected to be further strengthened under the second-level process, would further reinforce the incentives for smallholders to make such changes in their land-based decisions.

Nevertheless, while the literature examining impacts of first-level certification is quite extensive, there are currently few published studies of second-level certification impacts that examine whether and how second-level certification had the anticipated effects. The studies which do exist tend to suggest that the marginal impacts of second-level certification relative to first-level certification are currently small from the perspective of household beneficiaries (for example, see Bezu and Holden, 2014). Other recent work has suggested that the demand for, and perceived benefits of, second-level certification are likely to vary substantially, and call for greater targeting of the program to areas or households that may be more likely to benefit from the added-value of the second-level process. This has been suggested to include, for example, peri-urban parts of the country where current disputes over land boundaries tend to be higher, or



in areas with more recent histories of land redistribution where there may be a greater perception of future expropriation risk (Ghebru et al., 2016).

To fill this evidence gap, and to inform future programs and policy formulation, this impact evaluation focuses on measuring the impact of second-level land certification relative to first-level land certification, which has already reached the majority of rural smallholders in the Highland regions of Ethiopia (Amhara, Oromia, Southern Nations Nationalities and Peoples, and Tigray).

### **Methodology**

This study uses a quasi-experimental Difference-in-Difference (DID) approach with entropy balancing to identify the impacts of second-level certification over those of first-level certification across six families of outcomes for household beneficiaries, including access to credit; land disputes; land rental activity; investment in productive assets; soil and water conservation investments; tenure security, and female involvement in land management and decision-making. For each outcome family, a set of indicators were used to measure and track changes at the household level across baseline and endline data collection. The hypotheses and indicators for each outcome family are listed in Table 1.

The analysis utilizes a panel data set of 4,319 households that were surveyed across 284 *kebeles* (village clusters) in Amhara, Oromia, SNNP, and Tigray regions. For ELTAP, treatment and control *kebeles* within districts were selected for sampling at baseline using stratified systematic selection on the basis of distance from the *woreda* capital and access to main roads (EEA, 2013). For ELAP, treatment *kebeles* for sampling were selected on the basis of agricultural and investment potential, while control *kebeles* were selected randomly (EEA, 2013). Under both baselines, households were selected for surveying within each *kebele* from village registries, using stratified random sampling proportionate to the number of male and female-headed households in the *kebele*, to ensure inclusion of a sufficient number of female-headed households in the sample (EEA, 2013).

The baseline survey was designed to sample a certain number of treatment and control *kebeles*, drawing on administrative data provided by regional authorities. Some of this information was found to be outdated during the baseline sampling, such that *kebele* status as treated or control at the time of sampling sometimes differed from anticipated. The baseline survey also encountered *kebeles* where some households had received treatment and others had not. The resulting baseline sample of household and *kebeles* across treatment and control therefore differed somewhat from the initial sample design. Given the panel design, this sample then determined the overall sample for the evaluation. The endline surveys were administered to the households sampled at baseline, per the panel data design.

### *Estimation strategy*

As this evaluation is charged with identifying impacts of second-level certification over first-level certification, the control group for the analysis consists of households which received first-level certification. The general frame of the model is:

$$Y_{it} = \beta_1 \text{Time}_t + \beta_2 \text{Treatment}_{it} + \eta_i + e_{it},$$

where  $Y$  is the outcome of interest at time  $t$  for household  $i$  and  $\eta$  are household-level fixed effects. The constant  $\beta_2$  is the main estimate of interest; it represents the estimate of the treatment effect. Cluster robust standard errors are used, by *kebele*, to account for serial correlation in responses across households within the same *kebele*.<sup>3</sup>

To address the potential for selection bias and improve the accuracy of impact estimates, the study couples the DID approach with an entropy balancing approach. In particular, second-level certification (particularly under ELAP) was targeted towards areas that shared certain characteristics deemed by USAID to facilitate program success. These characteristics were: (1) high agricultural potential, described in terms of higher rainfall, irrigation and cash crops grown; (2) high land transaction activity, in terms of renting and sharecropping land; (3) good infrastructure and access to markets; and (4) the presence of agricultural investors.<sup>4</sup>

This non-random implementation of the program to areas that program implementers considered to be more likely to produce positive outcomes under the program introduces potential ‘selection bias’, whereby areas targeted to receive the program may be more likely to have improved outcomes than areas that did not receive the program. Entropy balancing re-weights household observations in the control group to achieve balance across treatment and control groups on variables which proxy the selection characteristics used for program implementation, as well as other household characteristics that could relate to household interest in, and ability to benefit from, their participation in the second-level certification process. By creating a control group that is similar to the treatment group on these characteristics, this approach generates a stronger counterfactual and better mitigates potential confounding of program impacts that could have been introduced by the non-random implementation of

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3 The DID approach controls for time invariant differences between treatment and control groups; this includes unobserved characteristics and those which have not been taken into account in the entropy balancing. The DID approach also assumes that the change in mean outcomes for control and treatment households would have followed a similar trend in the absence of the treatment. In other words, *kebeles* are assumed to have parallel trends in broader contextual factors that also influence the outcomes expected under land certification.

4 However, program administrators indicated that all *woredas* were deemed to meet this last criteria, thus this criteria was not considered to be a strong source of potential selection bias.

the program to areas with facilitating characteristics. The study thus employs robust econometric methods to mitigate the effects of selection bias to the extent possible.

To examine the robustness of the impact estimates, the study relied on alternative model specifications, particularly across results from the fixed effects DID and the entropy-weighted DID. Additionally, a ‘false discovery rate’ (FDR) adjustment was used, to correct p-values from each test for the fact that multiple tests were run within each outcome family and across subgroups (Benjamini and Hochberg, 2000). Given the number of tests that were run, some portion of the significant results obtained would be expected to be simply due to chance. Results that maintained their significance even after the p-values were adjusted via the FDR correction are considered highly robust.

### ***Heterogeneous treatment effects***

The study also examined heterogeneity in treatment effects to determine how the impacts of second-level certification differ across households, which vary on a set of characteristics that are important for policy and programming considerations. These seven program relevant characteristics<sup>5</sup> include: (1) female-headed versus male-headed households; (2) widows versus other households; (3) ELTAP versus ELAP rounds; (4) total landholding at baseline; (5) household distance to regional capital city; (6) household wealth status; (7) age of household head (impacts on youth-headed households<sup>6</sup> are also captured here). Two approaches were used for this. Firstly, standard subgroups analysis was conducted for three binary categories of interest: gender of household head (male vs. female-headed households); widowed status of household head (widows vs non-widows); and program round (ELTAP households vs. ELAP households). Secondly, the study used Local Regression (LOESS) plots to assess how impacts vary across the distribution range for a set of four continuous factors.

### ***Defining Treatment***

A number of potential treatment and control groups can be constructed from the baseline and endline evaluation data. This possibility arises because there are two sets of baseline data (conducted separately across ELTAP and ELAP), and because some of the households in the panel did not receive the full

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<sup>5</sup> An ex-post disaggregation was also considered to assess Tigray region outcomes separately from the other three regions of ELTAP/ELAP implementation, due to implementation differences in Tigray. This is because implementation of first-level certification in Tigray began several years earlier and was more widely implemented than in the other three regions. In the remaining regions, second-level certification was implemented shortly after or in lieu of first-level certification. Thus, the extent of household exposure to and experience with the first-level process in these regions was likely to be quite different. Moreover, first-level certification in Tigray focused on providing documentation in the name of the household head, while in the other three regions husbands and wives were jointly listed in married households (Deininger et al., 2008). Bezu and Holden (2014) provide additional details regarding the nature of decentralized implementation for first- and second-level certification, and also describe variations across different regions. However, this IE was not designed to identify impacts by individual regions, and unfortunately it does not have a sufficient sample size within each region, hence study power, to conduct a viable sub-group analysis by region. A credible analysis of impacts by region would have required increasing the cluster and household sample size within each region, for both the baseline and the endline data collection efforts.

<sup>6</sup> Youth-headed households are defined as households where the household head was < 35 years in age.

second-level certification process at endline. In this paper, we refer to this as partial second-level certification. For such households, their land was surveyed; however, they did not receive the certificate of possession from government. Thus the dataset includes households which remained uncertified across baseline and endline survey waves; went from no certification to first-level certification; remained at first-level certification throughout; or went from first-level to second-level certification.<sup>7</sup>

Due to the possibilities for examining different treatments that are presented by this situation, impacts were estimated for the four comparison groups described in Table 2,<sup>8</sup> including:

- Treatment Group A—Full or partial second-level certification relative to first-level certification.
- Treatment Group B—Full second-level certification relative to first-level certification.
- Treatment Group C—Partial second-level certification relative to first-level certification.
- Treatment Group D—Full or partial second-level certification relative to no certification or first-level certification.

To bolster confidence in the comparability of treatment and control households used in the analyses, treatment and control groups were examined for similarity of distributions across key household factors and village context variables, at baseline and endline, for each Treatment definition used. There were few substantive differences on household characteristics. Where significant differences were present for key village context covariates in the unweighted sample (for example, on proxies for market access and agricultural potential), they were effectively removed via entropy balancing for nearly all outcome indicators, across the different treatment definitions used. Treatment and control households and *woredas* were also examined for physical geospatial overlap, for each Treatment definition. This provided additional evidence that treatment and control groups were generally similarly distributed across key locational and context characteristics that could also influence outcomes or skew results.

## Results

This section presents the findings on impacts of second-level certification based on the methodology described above.

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<sup>7</sup> Furthermore, within this last category, there are households that completed the land survey process but did not receive certificates of possession, and others which were both surveyed and certified. Excluded from all analyses are 398 households that had already received second-level survey or certification prior to the baseline data collection.

<sup>8</sup> The different treatment vs. control comparisons that the evaluation chose to run stem from the complexity around treatment and control categories that can be constructed from the baseline and endline data. In particular, many surveyed households did not receive a land certificate, and this led to the concern that lumping households too coarsely into treated and control categories could reduce the ability to detect a small treatment effect from second-level certification. The study also wanted to be able to draw on the full set of households for which data has been collected, where advantageous. The group D analysis enables exploitation of the full dataset, and thus gains power due to the larger number of village clusters and overall sample size therein.

### *Average Treatment Effects*

A table of abstracted results—which shows only the direction of impact and level of significance—is presented in Table 3; this table highlights basic patterns of findings across different outcomes and comparison groups. Full details of the Average Treatment Effect on the Treated (ATT) estimates for all indicators across each outcome family are presented in Table 4. As suggested by Tables 3 and 4, the results suggest significant and positive average impacts of second-level certification relative to first-level certification for indicators from two outcome families:

*Credit access:* The study finds a 10% additional increase in the likelihood of households in the treatment group taking out any credit for farming purposes, and a small increase in the average amount of credit obtained. The results indicate a small average magnitude of impact, and are robust to different model specifications. This result is encouraging, but should be viewed with caution and may relate more strongly to household credit activity obtained through an informal lending environment since land certificates cannot be used as collateral in formal lending situations in Ethiopia.

Indeed, the evaluation finds little evidence for a significant impact of second-level certification on whether a household uses a land certificate as collateral to obtain credit. At endline, only 4.9% of households (N = 45; ELAP data only) had used their land certificates to secure credit in the past 24 months, a very small increase from 4.4% of households who had done so at baseline. A strong overall downward trend in the proportion of households who took any credit for farming purposes is also noted among households in the study area. This broader downward trend over time is irrespective of second-level treatment, in which 23% of households reported taking credit out at baseline, while only 7.3% did at endline. Overall, the mean amount of credit taken out was 1.57 logged Birrs at baseline, and 0.50 logged Birrs at endline.

*Tenure security:* The study finds moderate impacts on certain indicators for land tenure security, including an 11% increase in the likelihood of the household believing they have a heritable right to bequeath their land, relative to households with no certification or first-level certification.

In terms of trends in tenure security indicators, 43% of households believed they had a heritable right to bequeath land at baseline, while 96% of held this belief at endline (per the analyses, roughly 11% of this total increase is attributable to the ELTAP/ELAP second-level certification program). The study found no impact of second-level certification on household belief in the likelihood of land redistribution in their *kebele*, which was relatively low across surveyed households regardless of treatment. The study also found no impact on household belief that the land certificate program would positively impact land

investment. This belief was quite strongly held across surveyed households regardless of treatment. Several of the planned indicators for perceived tenure security impacts were already very strongly held at baseline by nearly all households in the study.

*Female empowerment and involvement in land-related decision-making:* The analysis indicates an 11% increase in the likelihood of a wife possessing land in her name, and a 0.32 hectare increase in land held jointly by husband and wife or by female-headed households, as a result of second-level certification. The evaluation also finds a 44% increase in a wife deciding which crops to grow on land in her possession. The magnitude of these impacts are fairly large, and results are moderately robust.

### ***Subgroup results and heterogeneous effects***

In addition to the full sample of respondents, the study also analyzed results for male-headed households (MHH) and female-headed households (FHH) separately, as well as for widow and non-widow households and ELTAP vs. ELAP baseline data rounds. The subgroups' analysis is focused on key policy relevant groups of interest, as well as groups that might be expected to differentially be affected by second-level treatment. For most outcome families, results indicate few differences in the impact of second-level certification for female-headed households over male-headed households or between widows and non-widows.

However, the sub-group results do suggest that second-level certification leads to a significant and substantial improvement for FHH or widow-headed households across some measures of land tenure security and female empowerment. This includes an 11% average increase in the likelihood of female-headed households (and a 12% average increase in the likelihood of widows) feeling more secure about entering into credit-based business transactions when the transactions occur with a holder of a land certificate. Additionally, results indicate a 44% average increase in wives deciding which crops to grow on land in their possession and an average increase of 0.32 hectares of land that is held jointly by husbands and wives or by female-headed households.

Lastly, it is noted that the differences in effect size between female and male-headed households, and widows compared to non-widow households, are statistically significant and large for two of the credit access indicators: obtaining any credit, and the amount of credit taken out for farm improvements. For both of these indicators, there are positive and significant impacts for both male and female-headed households, although comparisons of impacts by subgroups suggest that the second-level certification treatment enables men to take out credit more than it does women. In other words, there is a positive and statistically significant impact of second-level certification on credit access for female-headed

households, however the magnitude of this positive impact from second-level certification is not as large for female-headed households as it is for male-headed households.

The study also examined how impacts of second-level certification relative to first-level certification varied across a set of key policy relevant moderating factors, including age of household head, total landholdings, wealth status, and distance from major regional town. For these continuous factors, results suggest the main sources of heterogeneous effects are distance to the regional capital and the size of total landholding by the household. Results also suggest that on the whole, the household's baseline wealth status and the age of household head are less frequently important moderators of treatment effects. Results suggest that positive second-level certification impacts on certain credit-related, tenure security and female empowerment outcomes tend to be smaller for households located in more isolated *kebeles*, and for households with much larger than average landholdings.

Given the different timings of baseline data collection and variations in program implementation for ELTAP relative to ELAP, disaggregated results were also run by program round to test for significant differences in impacts across the two programs. The trend and significance of results within each program largely supports the overall average effects. However, on average the magnitude of impact for ELAP was found to be significantly greater than for ELTAP-treated households for some outcomes. This was particularly for the amount of credit households obtained for farming investments, and for indicators of tenure security improvements (household belief over rights to bequeath land, perceived land redistribution risk, and security over entering into credit transactions with holders of land certificates). However, due to the different timing of the baseline data collection for these two program rounds, it is also possible that the estimated greater magnitude of impacts under ELAP relative to ELTAP are also at least to some extent affected by different time trends that are captured by the 2007-2015 data collection for ELTAP versus the 2012-2015 data collection for ELAP.

## **Discussion**

These evaluation results seem to be consistent with other recent work that has looked at household-level value issues more specifically as well as in the context of Ethiopia's second-level certification program. For example, Bezu and Holden (2014) examine household willingness to pay for second-level certificates and conclude that households generally do not view second-level certification to provide substantial additional value over that obtained from first-level certification. However, it may be useful to note again here the preceding discussion on the potential for stronger benefits from second-level certification to accrue to households over longer time periods, whether actual or perceived. It is possible that, over time, a greater number of households might be exposed to a type of land challenge for which the stronger

spatial delineation of household landholding and computerized records of the second-level process might make it easier for a household to assert their land claims (relative to what is possible with the paper-based first-level certificate).<sup>9</sup>

In terms of the more direct tenure security indicators assessed, the study found no impact of second-level certification on household belief in the likelihood of land redistribution in their *kebele*, which was generally low across surveyed households regardless of treatment. Or, on household belief that the land certificate program would positively impact land investment, which was quite strongly held across surveyed households regardless of treatment. Thus, there may have been little potential room for the second-level process to further improve on household-level tenure security gains that may have been achieved relative to first-level certification, at least at this stage of program implementation.

The evaluation did not find a significant effect from second-level certification on land rental activity or household investment in soil and water conservation measures, relative to first-level certification. It also did not find a significant impact on land disputes, although the overall very low frequency of land disputes experienced by surveyed households meant that the evaluation was not able to detect small changes in dispute activity if it existed. The evaluation could, however, detect large changes in dispute activity if they existed, and there is no evidence that this occurred as a result of second-level certification. It is noted that the second-level certification is a substantially more expensive process than first-level certification. However, the nature of the documentation would also seem to provide households with expanded legal grounds to defend their land claims, while also facilitating a more permanent and verifiable system for documenting land than was possible under the first-level system. From an administrative perspective, it may be that these enhancements take precedence over cost imbalances, even if current gains relative to first-level certification, from the household perspective, are small.

Key improvements resulting from second-level certification over first-level certification were found for measures of household access to credit, in terms of both the likelihood of a household obtaining credit for farming purposes and the amount of credit obtained, although the magnitude of these increases was small. Many studies suggest that improved ease of credit access can be an early but key step in a chain of processes that can facilitate improved household welfare (Atwood, 1990; Dercon and Krishnan, 1996; Piza and DeMoura, 2015). Therefore, this result is encouraging, but should be viewed with caution since

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<sup>9</sup> Still, it is also possible that these same anticipated strengths of the second-level process could, at least for some households, dampen household security or negatively impact their land-based decisions. This might be particularly if households have uncertainty on the implications of having their land more permanently and precisely recorded, and accessible to a range of potentially unanticipated agencies (Bezu and Holden, 2014).



land certificates cannot be used as collateral in formal lending situations in Ethiopia because land is owned by the state.

Although this evaluation was not designed to test potential mechanisms for impacts, there is some anecdotal support that the credit results could relate to household credit activity obtained through an informal lending environment, in which land certificates could play a variety of informal roles to help ease the process by which rural farmers obtain credit for farming investments. There are several channels for smallholders and others to access credit, including government lending, microfinance institutions, and other less formal or informal lending processes.<sup>10</sup> In particular, anecdotal evidence from the ELAP program suggests that second-level certificates have begun to be used either formally or informally within the context of lending by microfinance institutions. An example is the emergence of group-lending arrangements in which the group decides to require members to have and deposit their land certificate with the group as internal assurance against payment defaults by group members (ELAP, 2012). Such a process could also demonstrate stronger creditworthiness to micro-lending organizations, thus potentially raising the likelihood of loan approval or the amount of credit that is approved. There is also anecdotal evidence that microfinance institutions may be using the parcel maps produced through the second-level process to more efficiently verify the amount of farmer landholdings, which often is tied to the actual amount of credit that the microfinance institution approves (ELAP, 2012). If such changes to microcredit lending practices in conjunction the second-level certification are indeed beginning to occur at scale, in ways which either ease a farmer's ability to obtain credit or contribute to increasing the amount of credit obtained, this may be one possible explanation for the small but significant increase in the likelihood of a household obtaining credit and the amount obtained that were found by this study.

Furthermore, the location of land tenure programming mattered in this case. *Kebeles* that were closer to city centers and markets experienced stronger positive impacts than did more isolated *kebeles*. This is not surprising given that it is easier to access credit, agricultural inputs, and markets the closer one is to cities. The policy implication of this finding might be that land tenure programming should be targeted to those areas that have easier access to towns and markets due to proximity and/or passable roads or other transport. Areas that are more isolated may, as some research suggests, be "secure enough" to create incentives to invest. However, without access to markets and capital, these incentives will be reduced compared with households that have easier access to credit and needed inputs. Thus, from a cost-benefit

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<sup>10</sup> Some of these channels are more limited than others and can impose significant costs on borrowers. In Ethiopia, credit for agricultural inputs can also be obtained through agricultural cooperatives and peasants' associations. These associations receive that funding from lenders such as the Commercial Bank of Ethiopia. Lenders are closely tied to the government, often to the Ministry of Agriculture (Tadesse, 2014), as the government guarantees the loans. Individuals who borrow are required to repay the loan plus accumulated interest right after harvest. Failure to pay results in loss of other property (livestock, other moveable assets) or a jail term.

perspective, there may be more benefit per dollar invested in certification in places close to cities than in isolated areas, and more economic growth.

Finally, this evaluation was also somewhat uniquely positioned to examine whether and how tenure security and livelihoods impacts differ for households which completed full versus partial land certification. While the evaluation results suggest few material differences in impacts across these two sets of households, it is not concluded from the analyses that surveying alone is sufficient to generate positive tenure security or household economic impacts. Such households intended to receive the full second-level process and formal documentation. Thus, the evaluation cannot determine whether their impacts as measured reflected decisions and beliefs made only on the basis of having had their land surveyed, or whether their decisions and beliefs also incorporated the household's expectation to eventually receive formal documentation of their land rights. It is possible that over time, if these households continue to operate in this ambiguous area between first- and second-level certification, their behaviors will change and their perception of tenure security will erode. Such a shift may emerge only over longer time frames.

### **Policy recommendations**

Overall, the impact evaluation findings provide a basis for the following four policy recommendations:

1. While second-level certification does seem to increase access to credit, particularly for male-headed households, very few surveyed households obtained any credit for farming purposes. This is not surprising given that: a) land may not formally be used as collateral for lending in Ethiopia (though leasehold rights may be used as collateral for lending); and b) commercial lending to small enterprises in Ethiopia is extremely limited. In order to address concerns related to improving access to credit in an environment where land certificates may not be used for secured lending, **policy makers may wish to include a land tenure activity in agribusiness support and market development projects.** Tying land tenure programming more directly to agribusiness and market development projects may have a mutually reinforcing positive impact, given that such projects often aim to increase credit access and land investment, and establish farmer cooperatives and women's involvement in them. Linked land tenure programming could include efforts to strengthen knowledge on land rights, women's rights to land, and the different ways that land certificates might informally aid cooperative groups or individuals in obtaining credit. For example, donors may particularly wish to support women Farmers' Cooperative Unions in Ethiopia and support efforts to train women on best practices related to leasing agricultural lands while also building capacity to access and effectively manage credit.

2. The evaluation found no evidence of an increase in land rental activity as a result of second-level certification. This may not be surprising given current provisions which limit the amount of land, and time length, of land rental contracts. In order to promote “thicker” land rental markets in rural Ethiopia, **policy makers may wish to support efforts to review the legal framework at the state level for land rentals, and then to support revisions to this framework to allow, for example, longer-term leasing and for leasing of larger percentages of a household’s land.** Recognizing there are historical sensitivities related to land accumulation, it may nonetheless be desirable to extend leasehold terms and expand the permissible leasehold areas to strengthen investment incentives and allow those who lease out land to extend benefits from this activity. It may be useful to consider a radio campaign to educate rural Ethiopians about land values and the legal requirements of land leases as part of such an effort.
3. Given the evidence suggesting an impact of second-level certification on indicators of female empowerment, **policy makers may wish to continue to expand emphasis on joint titling and the issuance of land documentation in the name of both the husband and wife, for example, to areas where joint titling may still be at the discretion of local officials.**
4. The evaluation found that a fairly large percentage of parcels and households involved in the program did not receive land certifications from the government. The evaluation thus draws attention to the extent to which second-level certification rests on activities beyond the program’s manageable interests, as actual issuance of the certificates falls under the government’s purview. Given the additional cost to implement second-level certification to completion, and the small magnitude of impacts apparent at this stage, it may be relevant to briefly highlight considerations around program costs relative to household beneficiary impacts, and the sustainability of second-level certification impacts.

Although additional benefits to households from second-level certification over first-level certification appear to be fairly small at this stage, relative to a fairly large increase in implementation costs over the first-level intervention, this does not necessarily suggest that program costs are unwarranted. Even if some of the anticipated benefits of second-level certification are potentially less salient to households over the shorter term (as this evaluation may suggest), over the long term digitizing land records and enhanced longevity and access to land records through the second-level process is likely to support transparent land markets and the spread of credit to rural landholders.

In light of this, **policymakers may wish to consider efforts to identify programming gaps and opportunities, for example around capacity, financing, or process for certificate provisioning, as well as enhanced donor coordination around land programming.** Where

gaps are identified, policymakers may wish to consider coordinated donor efforts to ensure that new land programming involves such identified components, with a view towards maintaining sustainability of program impacts.

## **Conclusion**

Compared to the change from no certification to first-level certification, second-level certification can be thought of as a more incremental treatment. The effects at the household level may be more nuanced to detect over a shorter time frame. Still, the evaluation results do suggest some small but important additional impacts of the second-level process on households for some development outcomes. Small but significant increases due to second-level certification were found for: credit access, tenure security, and increased involvement of women in land-related decision-making and land possession. The evaluation results also suggest that positive second-level certification impacts on certain credit-related, tenure security and female empowerment outcomes tend to be smaller for households located in more isolated *kebeles*, and for households with much larger than average landholdings.

The study employed robust econometric methods to mitigate the potential confounding effects of selection bias to the extent possible. However, as with all quasi-experimental DID designs, there is a possibility that unmeasured confounders may have been present and affected the treatment and comparison groups differently over the time frame of the evaluation. Although the evaluation team has no indication of the presence of such potential confounding factors, if present they could result in biased estimates of program impacts.

The approach for this impact analysis was guided by a focus on more immediate impacts at the household level, across key development outcomes that might be expected from second-level certification relative to first-level certification at the time of endline sampling. From implementation and programming perspectives, the expectation was that second-level certification would further strengthen household security over their landholdings and related impacts, due to technological improvements of the second-level certification process. This included benefits which might accrue because the spatial boundaries of household land parcels are delineated more exactly, and because the computerized second-level process facilitates maintaining permanent records and legacies of ownership that were not possible with the paper-based system of the first-level process (Bezu and Holden, 2014).

However, and given the results of this evaluation, it is also possible that from the household perspective, these additional benefits of second-level certification may become apparent only after a longer time period, or perhaps have strong impacts only for particular kinds of households. For example, households

in a particular risk category for land expropriation, or who are faced with a particular situation for which the added value of these second-level benefits are more directly relevant. Possibilities might include inheritance challenges, or issues related to land transfers, such as in cases of divorce or the death of a household head or spouse. In terms of the potential for negative impacts to arise from second-level certification, it is noted that some researchers have suggested households could become concerned that land registration might increase their tax burden, and related concerns stemming from the amount of information on the process and purpose of certification that a household received (Bezu and Holden, 2014).

Lastly, the ELTAP and ELAP programs were designed to provide land administration benefits that extend beyond the household level, for example in terms of support to the land registration and record-keeping process that contributes to the overall long-term sustainability of Ethiopia's land administration system. However, this evaluation was designed to consider only the household-level impacts of the program, relative to first-level certification. Therefore, it is important to highlight that this evaluation should not be viewed as a comprehensive evaluation of all aspects of the second-level certification process. Even if the evaluation did not find large additional impacts to households from second-level relative to first-level certification across some of the anticipated household-level benefits, second-level certification may be required to maintain identified benefits of first-level certification. And, there are likely to be broader potential benefits from the program that extend beyond the scope and issues focused on by this evaluation.

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## Tables

**Table 1. Evaluation Hypotheses and Indicators**

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**H-1: Second-level land certification increases household access to credit (i.e., micro-finance)**

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**Indicators:**

- A. Total amount of credit obtained in Birr, in past 24 months
  - B. Total amount of credit households took for farming purposes in past 24 months
  - C. Whether households/ proportion of households used any form of land certificate to secure credit in past 24 months
- 

**H-2: Second-level land certification reduces the number of land-related disputes and dispute resolution time**

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**Indicators:**

- D. Number of land-related disputes
  - E. Mean severity of disputes experienced by the household (endline only)
  - F. Average time taken to resolve disputes experienced by the household
- 

**H-3: Second-level certification increases the likelihood that households engage in land rental and sharecropping activities**

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**Indicators:**

- G. Number of parcels rented out by households
  - H. Amount of land (ha) rented out by households
  - I. Whether / proportion of households renting land out to non-relatives or friends
  - J. Amount of land that households rent out to non-relatives or friends
  - K. Monetary payment received in Birr/ha for land rented out in last 12 months
  - L. Monetary payment in Birr/ha for the largest parcel of land rented out
- 

**H-4: Second-level land certification encourages households to invest more in soil and water conservation (swc)**

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**Indicators:**

- M. Average length of hedges, bunds, and ditches constructed
  - N. Average length of soil bunds stabilized with vegetation
  - O. Average number of water retention structures constructed
- 

**H-5: Second-level certification results in stronger perceived tenure security for women and men**

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**Indicators:**

- P. Household belief it has right to bequeath land under its possession
  - Q. Household belief that the land certificate program will have a positive impact on:
    - a. tenure security
    - b. land investment
    - c. land renting
    - d. security of entering into business transactions
  - R. Household belief that land currently under its possession will remain under their control
  - S. Household belief that land redistribution within the *kebele* is unlikely over the next 5 years
- 

**H-6: Second-level certification increases women's involvement in land management and decision-making activities**

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**Indicators:**

- T. Hectares of land (proportion of household's total landholding), and number of parcels within the household:
    - a. That are possessed by husband and wife jointly, or wife only
    - b. Which have a certificate held by husband and wife jointly, or wife only
    - c. For which decisions on which crops to grow is made by husband and wife jointly, or wife only
    - d. For which decisions on land transfers to others are made by husband and wife jointly, or wife only
- 

Source: ELTAP/ELAP Impact Evaluation design

**Table 2. Treatment and Control Definitions and Household Sample Sizes Used in the Impact Analyses**

<b>Comparison group and description</b>	<b>Treatment group</b>	<b>Control group</b>
A: Full or partial second-level certification relative to first-level certification.	(Household N = 884) Households with full or partial second-level certification	(Household N = 1,017) Households that have first-level certification only
B: Full second-level certification relative to first-level certification.	(Household N = 345) Households with full second-level certification	(Household N = 1,017) Households that have first-level certification only
C: Partial second-level certification relative to first-level certification.	(Household N = 539) Households with partial second-level certification	(Household N = 1,017) Households that have first-level certification only
D: Full or partial second-level certification relative to no or first-level certification.	(Household N = 1,844) Households with full or partial second-level certification	(Household N = 1,959) Households with no certification or first-level certification

**TABLE 3. Overview of Significant ATT Results (symbols indicate sign of effect and significance of result)**

Outcome family	Label	Treatment A	Treatment B	Treatment C	Treatment D
		Full or partial 2nd level certification	Full 2nd level (survey & certificate only)	Partial 2nd level (survey only)	Full or Partial 2nd vs no or 1st level
		WFE	WFE	WFE	WFE
Access to credit	Amount of credit taken for farming purposes in past year in Birr	+	+	+	+
	Household took any credit for farming purposes in past year (Yes/No)	+	+	+	+
	HH formally or informally used land as collateral to obtain credit	+		-	-
Land disputes	Average time to resolve a land dispute in months*	-	-	+	-
	HH experienced conflicting land claim related to boundaries or encroachment	+	+	+	+
Land rental activity	Total area of land the HH rented out, in hectares	+	+	-	-
	Total number of plots the HH rented out on a monetary basis	-	+	-	-
Soil & water investments	HH invested in any soil or water conservation measures (Yes / No)	+	-	-	+
Land tenure security	HH believes it has heritable right to bequeath land (Yes/No)	-	-	+	+
	HH believes land redistribution in kebele is likely (Yes/No)		-	-	+
	HH feels more secure in credit-based business transactions w/ land certificate holder (4 point likeart)		+	-	+
	HH believes land certificate program will have positive impact on land investment	+	+	-	-

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*CONTINUED—Table 3. Overview of Significant ATT Results (symbols indicate sign of effect and significance of result)*

Outcome family	Label	Treatment A	Treatment B	Treatment C	Treatment D
		Full or partial 2nd level certification	Full 2nd level (survey & certificate only)	Partial 2nd level (survey only)	Full or Partial 2nd vs no or 1st level
		WFE	WFE	WFE	WFE
Female empowerment & decision-making over land	Wife possesses land in her name (Yes / No)	-	-	+	+
	Wife has certificate of title for land in her possession	-	-	+	+
	Wife decides what crops to grow on land in her possession	+	+	-	-
	Wife can rent out land in her possession at her discretion	+	+	+	+
	Number of parcels possessed by wife only, or husband and wife jointly	-	+	-	-
	Number of parcels possessed by wife only	-	+	-	-
	Area of land in hectares possessed by wife only, or husband and wife jointly	+	+	+	+
	Area of land in hectares possessed by wife only	+	+	-	-

\*Note that for this variable, a negative effect sign (-) means the time to resolve land disputes was reduced (this is a positive program impact).

Significance reported as: +/- :  $\alpha < 0.10$ ; +/− :  $\alpha < 0.05$ ; and **+/-** :  $\alpha < 0.01$

FE = Fixed effects difference-in-difference; WFE = entropy-weighted fixed effects difference-in-difference

**+** Results considered highly robust; retains significance even after adjusting p-values for multiple hypothesis testing via a FDR approach.

**Table 4. ATT Estimates for All Indicators Across Each Outcome Family**

		Treatment A	Treatment B	Treatment C	Treatment D
Outcome family	Label	Full or partial 2nd level certification	Full 2nd level (survey & certificate only)	Partial 2nd level (survey only)	Full or Partial 2nd vs no or 1st level
Access to credit	Amount of credit taken for farming purposes in past year in Birr	0.72** (0.338)	NS	0.92** (0.408)	<b>0.89***</b> <b>(0.238)</b>
	Household took any credit for farming purposes in past year (Yes/No)	0.10** (0.047)	NS	0.13** (0.057)	<b>0.13***</b> <b>(0.036)</b>
	HH formally or informally used land as collateral to obtain credit	<b>-0.13***</b> <b>(0.048)</b>	NS	-0.19** (0.091)	-0.06* (0.0345)
Land disputes	Average time to resolve a land dispute in months <sup>a</sup>	NS	NS	NS	NS
	HH experienced conflicting land claim related to boundaries or encroachment	NS	NS	NS	NS
Land rental activity	Total area of land the HH rented out, in hectares	NS	NS	NS	NS
	Total number of plots the HH rented out on a monetary basis	NS	NS	NS	NS
Soil & water investments	HH invested in any soil or water conservation measures (Yes/No)	NS	NS	NS	NS
Land tenure security	HH believes it has heritable right to bequeath land (Yes/No)	NS	NS	NS	0.11** (0.049)
	HH believes land redistribution in kebele is likely (Yes/No)	NS	NS	NS	NS
	HH feels more secure in credit- based business transactions w/ land certificate holder (Yes/No)	NS	0.10* (0.056)	NS	0.07** (0.031)
	HH believes land certificate program will have positive impact on land investment	NS	NS	NS	<b>-0.13***</b> <b>(0.050)</b>

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*CONTINUED—Table 4. ATT Estimates for All Indicators Across Each Outcome Family*

		Treatment A	Treatment B	Treatment C	Treatment D
Outcome family	Label	Full or partial 2nd level certification	Full 2nd level (survey & certificate only)	Partial 2nd level (survey only)	Full or Partial 2nd vs no or 1st level
Female empowerment & decision- making over land	Wife possesses land in her name (Yes/No)	NS	NS	NS	0.11** (0.054)
	Wife has certificate of title for land in her possession	<b>-0.21***</b> <b>(0.063)</b>	-0.20*** (0.076)	NS	NS
	Wife decides what crops to grow on land in her possession	<b>0.44**</b> <b>(0.108)</b>	<b>0.48***</b> <b>(0.146)</b>	-0.34* (0.193)	NS
	Wife can rent out land in her possession at her discretion	NS	NS	NS	NS
	Number of parcels possessed by wife only, or husband and wife jointly	NS	NS	NS	NS
	Number of parcels possessed by wife only	NS	0.02* (0.131)	NS	NS
	Area of land in hectares possessed by wife only, or husband and wife jointly	NS	0.32* (0.194)	NS	NS
	Area of land in hectares possessed by wife only	NS	NS	NS	NS

<sup>a</sup> Note that for this variable, a negative effect sign (-) means the time to resolve land disputes was reduced (this is a positive program impact).

Reported results are based on impact estimates obtained via an entropy-weighted fixed effects difference-in-difference model.

Significance reported as: \*  $\alpha < 0.10$ ; \*\*  $\alpha < 0.05$ ; and \*\*\*  $\alpha < 0.01$

**BOLD** results retain their significance even after using a conservative false discovery rate approach to correct p-values for multiple hypothesis testing.

NS = Not statistically significant; impact estimate not shown.