Land Governance in an Interconnected World
Annual World Bank Conference on Land and Poverty
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IMPACTS OF CUSTOMARY LAND USE RIGHTS FORMALIZATION ON SMALLHOLDER TENURE SECURITY AND ECONOMIC OUTCOMES: MIDLINE RESULTS FROM A RCT IMPACT EVALUATION OF USAID'S LAND TENURE ASSISTANCE ACTIVITY IN TANZANIA

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Abstract

We report on baseline and midline findings from a USAID-supported randomized controlled trial impact evaluation of the effects of Certificate of Customary Right of Occupancy provisioning on a set of household outcomes hypothesized to improve with formalization of smallholder customary land use rights: tenure security, land disputes, land investment, empowerment, and smallholder economic outcomes. Results are based on baseline and midline findings from the evaluation of USAID's Land Tenure Assistance Activity (LTA) in Tanzania, after two rounds of household survey data collection. In addition, we use contextual spatial data to examine village-level variation for a sub-set of covariates and outcomes. Results indicate that achievement of some anticipated intermediate outcomes appears to be underway for LTA, including an increase in the likelihood of treatment group households having formalized land documentation and a decline in land use decision-making solely by the male household head.

Key Words: Customary land use; impact evaluation; land formalization; tenure securit

I. Introduction

This paper reports on midline impacts findings from a USAID-supported randomized controlled trial impact evaluation of the effects of Certificate of Customary Right of Occupancy provisioning on a set of household outcomes hypothesized to improve with formalization of smallholder customary land use rights: tenure security, land disputes, land investment, empowerment, and smallholder economic outcomes. Results are based on two rounds of household survey data, collected at baseline and midline, for an impact evaluation of USAID's Land Tenure Assistance Activity in Tanzania. In addition, we use contextual spatial data to examine variation in key covariates and outcomes on the basis of village characteristics. Results of this impact evaluation are aimed to contribute to the body of evaluation evidence to inform donor, implementer and government interests to find low-cost, scalable and sustainable approaches to achieve land formalization goals and broader development objectives.

Smallholder tenure security, customary land formalization and economic outcomes

Land tenure insecurity has long been conceptualized in development economic theory as a key barrier to agricultural investment, productivity, and follow-on economic growth for poor agricultural smallholder households. Secure property rights are broadly theorized to contribute to economic development primarily through three potential mechanisms, although the evidence base for each varies: (1) reduced risk of encroachment and expropriation, which in turn lowers a smallholder's cost to protect property and enables increased productive investment; (2) facilitating market transactions through land transfers to more efficient users; and (3) allowing land to be used as collateral in financial markets (Feder 1988).

In many countries, where there are constraints on individual's rights to land ownership, sale, and use as collateral, empirical studies of the effects of tenure strengthening interventions or policy reforms tend to focus on the first mechanism above. However, to date there is no clear consensus on whether and how stronger land tenure security may, as a whole, incentivize farmer decision-making and pursuit of different land investment strategies on their farms, and in turn lead to improved household economic wellbeing (Lawry et al. 2014; Place, 2009). While early tenure interventions often focused primarily on converting customary land systems to statutory titling, current tenure strengthening interventions take a number of forms, including the legal recognition and codification of land users' customary use rights to land through individual parcel mapping, documentation, registration, and certification (Lawry et al. 2016).

Meta-analyses of land tenure interventions highlight the complexity of the overarching causal chain from tenure strengthening to classic development outcomes, the varied and often unsuccessful efforts to establish causal links between such interventions and anticipated outcomes, and call attention to diverse moderating factors and alternative pathways to outcomes on the basis of land holder characteristics and context. In sub-Saharan Africa, recent syntheses note the relevancy and potential for extreme poverty, but also already strong tenure security within customary systems, to alter hypothesized trajectories of outcomes, while the generally small evidence base and dearth of rigorous studies also contributes to a lack of certainty to better inform development programming approaches (Lawry et al. 2016). However, at least some recent examples from sub-Saharan Africa do point to the role of land titles as a means to strengthen smallholder perceptions over security of tenure and subsequent changes to land use decision-making and land investments (Holden et al 2009; Deininger, Ali, & Alemu, 2011; Lawry et al. 2014).

Tanzanian land context

The Tanzanian land rights system is based on public ownership of land, wherein all land in the country is owned by the state and held in trust by the president. Roughly 70% of land in Tanzania is designated as

Village Land, which is governed by the 1999 Village Land Act, while an estimated 75% of the Tanzanian population lives on village land (Massay 2016). The 1999 Act introduced sweeping reforms and protections for customary land use rights in Tanzania, including recognition of the rights of villages to hold and administer land according to customary law. Individuals who use or occupy Village Land have the right to obtain formal documentation of their use rights via a Certificate of Customary Right of Occupancy (CCRO), which is issued by local government.[1]

In practice, however, implementation of customary land use protections under Tanzania's Village Land Act has been slow. Most Tanzanian villagers do not have CCROs for their plots and lack formal documentation of their land rights (Pederson 2010). In many villages, the land use demarcation and mapping that are required to issue the documents has not yet been completed. Moreover, the district land offices (DLOs) responsible for issuing CCROs frequently lack the capacity to do so, and rural land users are often unaware of their land rights under the law.

These legal reforms and implementation challenges within the land sector are juxtaposed against a pattern of increasing land pressures in the country, particularly in the regions which comprise the Southern Agricultural Growth Corridor of Tanzania (SAGCOT) where the LTA activity is implemented, which stem from a combination of factors. For example, the impacts of a changing climate, population growth, and the regular migration of pastoralist communities to the region causes tensions over land and give rise to many types of disputes at various levels (Mwamfupe 2015). In addition, large-scale agricultural investments are also increasing in the area, leading to insecurity on the part of smallholders due to weak land rights protection and limited bargaining power (Deininger 2011). There is growing recognition by Government of Tanzania (GOT) and the donor community that improving the security of land rights is essential to protect the rights of smallholders, reduce land disputes and tensions, and maximize the economic potential of the region.

LTA activity background and implementation status

USAID/Tanzania's Land Tenure Assistance activity (LTA) is a four-year, $6 million activity that began in December 2015, and aims to clarify and document land ownership, support local land use planning efforts, and increase local understanding of land use and land rights in Tanzania. The LTA activity assists villages and the local DLO in Iringa and Mbeya districts in completing the land use planning process and delivering CCROs in select villages. It also includes education on land laws, CCROs, and land management. The LTA activity is using the Mobile Application to Secure Tenure (MAST), an app that facilitates the mapping and CCRO process.

The LTA activity is currently implemented in 36 villages in Iringa District, Tanzania. The interventions under the LTA activity aim to increase land tenure security and lay the groundwork for sustainable agricultural investment for both smallholder farmers and commercial investors. The LTA activity works within the current land management bureaucracy, and helps facilitate formal land certification and education through the following activities:

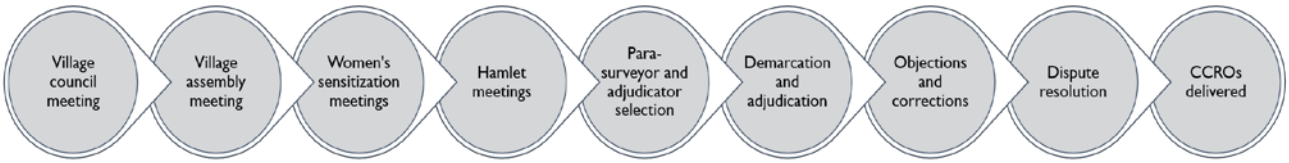
1. Assist villages and district administrations in completing the land use planning process and delivering CCROs in select villages within two districts (Iringa and Mbeya).
2. Educate and develop the capacity of village land governance institutions and individual villagers to complete the land use planning and CCRO process; effectively manage land resources; respect the land rights of women, youth, and pastoralists; and build agriculture- related business skills.

[1] For more on Tanzania's land tenure system, see USAID Country Profile, "Land Tenure and Property Rights: Tanzania," at https://www.land-links.org/wp-content/uploads/2016/09/USAID_Land_Tenure_Tanzania_Country_Profile.pdf.

3. Educate and develop the capacity of district-level land governance institutions in the Mbeya Region to complete the land use planning and CCRO process; effectively manage land resources; respect the land rights of women, youth, and pastoralists; and build agriculture- related business skills.
4. Develop capacity to use the Mobile Application to Secure Tenure (MAST) application throughout the SAGCOT and nationally to assist with tenure certification.

Figure 1 shows the general process flow for LTA implementation. By December 2017, the LTA activity had performed demarcation and adjudication, objection and correction, printing and registration, and CCRO registration across 12 of 15 treatment group villages (the Phase I implementation period). According to the project's monitoring and evaluation data, an average of 85 percent of parcels received CCRO registration in nine of the Phase I villages where registration took place, and a total of 10,535 CCROs were registered through November 2017. Of the CCROs registered, 92% (n = 9,257) had been claimed by the parcel holders. LTA M&E data indicates an average of 82 days between demarcation and adjudication starting and the issuance of CCROs in the nine villages where these activities had taken place by the start of midline data collection for the LTA impact evaluation.

Figure 1. Illustrative village implementation process for the LTA activity.



Development Hypothesis

USAID envisions that if the LTA activity provides clarification and documentation of land ownership, supports land use planning efforts, and increases local understanding of land use and land rights, then this will lead to increased agricultural investment, reduced land tenure risk, and more empowered people and local institutions. The LTA activity components work in tandem to promote inclusive agricultural development, food security and investment, and institutional capacity.

USAID envisions that by contributing to the issuance of CCROs to land users, as well as education on land laws and capacity-building components, the LTA activity will contribute to improved tenure security and reduced incidence of land disputes for land users. These outcomes will, in turn, spur increased investment in agriculture as land users change their behavior in response to stronger incentives brought about by improved security. A greater sense of empowerment for women, youth, and pastoralists is expected to result for individuals from these groups who receive a CCRO. Empowerment should also result more broadly from LTA outreach and education on the land laws, which protect the rights of women, youth, and pastoralists. Development of Village Land Use Plans (VLUPs), together with trainings for village and district officials, is expected to improve the capacity of village and government institutions to manage land resources, including to identify and maintain protected areas, establish or strengthen the management of communal forest areas or woodlots, limit excessive expansion of areas under cultivation, and implement other environmental management practices or sustainable land uses

within villages. Finally, activities under LTA to raise awareness about MAST and build capacity to use it within the GOT and donor community is anticipated to result in greater uptake of the MAST technology in future land mapping and registration projects, leading to more transparent, participatory, and efficient processes to issue CCROs in the country.

II. Impact Evaluation Background and Approach

Experimental Design: LTA Impact Evaluation Background

The LTA impact evaluation uses a two-phase randomized controlled trial design to rigorously test how mobile mapping and facilitation of land tenure certification affect income, women's empowerment, dispute prevalence, and other factors related to land use and tenure security in Iringa District, Tanzania. The purpose of this IE is to provide USAID with evidence on the impacts of its investment in the LTA activity and to contribute to research on the impacts of land mapping, registration, and formalization in rural customary land tenure settings in Tanzania.

The LTA IE is designed to measure LTA's impacts on activity beneficiaries in 30 randomly selected villages[2] in Iringa District. Implementation of LTA was planned to occur in 30 randomly selected villages in Iringa District in two phases: an initial set of 15 randomly chosen villages beginning in 2017, then a second set of 15 randomly chosen villages beginning in mid-2018. This two-phase cluster randomized design was developed in response to concerns raised by the implementing partner that the context of the LTA activity may change over time as village administrative and geographic boundaries shift, an increasingly common occurrence as a village's population grows. Table 1 shows the phase in approach, noting that project implementers moved the start of Phase II implementation forward by six months (from a planned timing of April 2018, to actual implementation start in October 2017), necessitating the IE data collection for Phase II to shift timing accordingly.

Table 1. LTA IE phase-in design and data collection timing.

Phase	LTA Implementation Start	Control Villages (do not receive LTA)	Treatment Villages (receive LTA)	IE Data Collection Activity	IE Data Collection Timing
Phase I	April 2017	15 randomly selected villages	15 randomly selected villages	Phase I baseline	March 2017
Phase II	October 2017	15 randomly selected villages	15 randomly selected villages	Phase II baseline, Phase I midline	Nov 2018

The approach to village selection was discussed in detail and agreed between the program implementer, USAID, GoT, and the evaluation team. As the initial step, the Iringa District Land Office prepared a master list of 75 villages suggested for potential LTA activity implementation according to its own

[2] The number of villages in the study is determined by the size of the activity. In 2016, LTA begin implementing in a preliminary set of non-randomly selected villages in Iringa, and is also implemented in a set of five test villages in Mbeya. These villages are not included in the IE and were not selected from the list of potential IE villages. The selected 30 villages were chosen randomly after accounting for key factors such as whether the village planned on subdividing, accessibility during the rainy season, and the presence of villagers capable of running the MAST application.

priorities. From this list, the evaluation team randomly selected 37 candidate villages to allow for 15 Phase 1 treatment villages, 15 Phase 1 control villages, and up to 7 villages to be eliminated for implementation reasons prior to randomized assignment.[3] Field reconnaissance was conducted in September 2016 to assess the suitability of each of the 37 candidate villages for implementation. From the remaining Phase 1 candidate villages, the evaluation team randomly assigned 15 villages to the Phase 1 treatment, and 15 to the Phase 1 control group. Two of the remaining villages were designated as "reserve" villages and candidates for implementation if for some reason implementation cannot take place in the originally designated treatment villages. Phase II villages were selected using a similar process, after updating the list of remaining villages to correct for inaccuracies with respect to village characteristics.

It is noted that midline data collection took place six months after baseline rather than at the planned 12 months interval, and during the dry season rather than during the rainy season. Seasonal differences can affect the outcomes of interest, for example due to changes in migration patterns and resource use, which may lead to changes in dispute prevalence. In addition, the change in the IE data collection timeline also has implications for the likelihood of impacts to be achieved by midline, particularly for questions related to land investments and longer term outcomes.

Evaluation Questions, Outcomes and Data

The underlying theory of change for the LTA impact evaluation is that LTA, by facilitating the CCRO process for land users, as well as through the provision of education on the land laws and capacity-building for the DLO, will improve tenure security and reduce the incidence of land disputes in Iringa District. Theory suggests that improved tenure security will also lead to increased investment as land users change their behavior in response to stronger incentives brought about by improved security. The IE also seeks to test whether empowerment outcomes, such as decision making, change for women as a result of LTA's outreach on the land laws, including the rights of women and youth under those laws.

Data collection at baseline and midline was obtained through administration of two household surveys: a head of household survey, and a wives survey administered to the primary spouse/partner of the household hold (in non-female-headed households). The target respondent sample was 25 households per village, with up to two respondents surveyed per households, depending on availability (household head and primary spouse). Within each village, systematic random selection was used to select respondent households using a skipping interval based on the percentage of target households for the village to the total village population, with a minimum skipping interval of 10. All surveys were geo-coded for additional quality assurance and to facilitate follow-up data collection rounds. The midline survey used an amended baseline survey instrument to re-survey respondents from the Phase I baseline sample.

[3] To improve balance, the initial 37 villages were selected by stratifying by constituency and blocking on whether the village had a VLUP, geographic location (constituency and ward), and the number of parcels in the village.

Table 2. LTA IE thematic areas of investigation and evaluation questions.

Thematic Area	Evaluation Questions
1. **Tenure security and land management**	1. In what ways and to what extent do landholders who have received formal land documentation through the assistance of LTA perceive their land rights to be more secure?
2. **Land disputes**	2. To what extent are landholders who have received formal land documentation through the assistance of LTA less likely to experience land disputes? 2.1 What kinds of disputes (if any) are affected and what are the mechanisms by which LTA affects them?
3. **Investment and land use**	3. To what extent do landholders who have received formal land documentation through the assistance of LTA change their investment and land use decisions in a manner that reflects strengthened incentives resulting from increased tenure security? 3.1 What (if any) are the specific decisions that are affected and how does LTA influence them?
4. **Empowerment**	4. To what extent do the LTA outreach and communication activities, as well as mapping, verification, and the formal registration of land, lead to a greater sense of empowerment on the part of women, youth, and pastoralists? 4.1 What (if any) are the specific aspects of empowerment that are affected and how does LTA influence them?
5. **Economic and environmental outcomes**[4]	5. To what extent do the LTA interventions to strengthen land tenure lead to increased agricultural productivity, household income, and wealth, as well as more environmentally sustainable land-use practices and associated environmental benefits? 5.1 Which (if any) of these outcomes are affected and how does LTA influence them?

III. Data and Econometric Approach

The analysis of outcomes at midline aims to provide updated information on implementation process and a preliminary understanding of potential change in impacts at this early stage of activity implementation. At midline, we focus on assessing a select sub-set of outcomes for which it is reasonable to anticipate potential change at this stage of implementation. The midline analyses focuses on select outcomes for four of the five outcome families / thematic areas on which the evaluation questions are focused: Tenure security and land management; Land disputes; Investment and land use; and Empowerment.

The advancement of the midline data collection in the project timeline, such that midline values were obtained only 6 months after the start of implementation, lowers the likelihood that investment and other economic outcomes will have accrued at scale at this early stage in the project. However, we retain at midline some key outcomes under this theme to provide a benchmark understanding of change prior to endline. We do not include food security variables at midline due to the seasonal difference in data collection between baseline and midline. Midline analyses of impacts was conducted for the following 10 outcomes listed in Table 3.

[4] The economic and environmental outcomes covered in Evaluation Question 5 are expected to unfold over a longer period, and the full impact of LTA on these outcomes may not be observable over the timeframe of the evaluation. Thus, the endline analysis will provide a preliminary indication of these impacts, while a more comprehensive assessment would require an additional round of data collection.

Table 3. LTA IE midline outcome variables by outcome category.

Outcome Category	Outcome Variable
Tenure security and land management	1. Familiarity with land laws 2. Household possesses land-related documentation 3. Expropriation risk 4. Fallowing risk
Land disputes	5. Incidence of land disputes in past year 6. Duration of land disputes (in months)
Investment and land use	7. Total land holding by household (in ha) 8. Credit access by household[5] (over past six months) 9. Incidence of tree planting on farms (fruit and non-fruit trees)
Empowerment	10. Land-related decision-making power exclusively by male household head

We use the below fixed effects difference-in-difference (DID) panel regression specification to test for the impact of the LTA activity on each of the above outcomes. The model includes a set of pre-treatment covariates to control for potential differences in the treatment and control groups and village-level fixed effects that control for time-invariant unobserved factors. The treatment effect is estimated by a regression coefficient on a dummy variable that interacts time and treatment. For continuous outcome variables at the household level, the panel regression models take the following form:[6]

$$Y_{it} = \gamma_0 + \gamma_1 X_{it} + \gamma_3 \delta_t + \beta(\delta_t * T_i) + \gamma_i + \varepsilon_{it} \qquad (1)$$

Where:
Y_{it} is the outcome of interest for household i at time t,
X_{it} is a vector of covariates,
δ_t is a dummy variable equal to 1 at the midline,
T is a dummy variable equal to 1 for members of the treatment group,
γ_i is a vector of village-level fixed effects
ε_{it} is a random error term,
and γ and β are parameters to be estimated.

We use robust standard errors clustered at the village level. The estimate of LTA impact is given by β, which reflects the Average Treatment Effect. Under standard assumptions, β provides an unbiased estimate of the causal impact of the LTA activity on the outcome Y. We also include a set of individual, household or village level control variables as measured at baseline, to further improve the precision of the outcome estimates. These are: Gender of household head; Household head age; Head education level; and Village distance to Iringa Town (driving distance, in kilometers).

For robustness, we additionally run the below alternative specification.

$$Y_{ij} = \beta_0 + \beta_1 T_{ij} + \beta_2 X_{ij} + Y_{ij}^{o} + \gamma_i + \varepsilon_{it} \qquad (2)$$

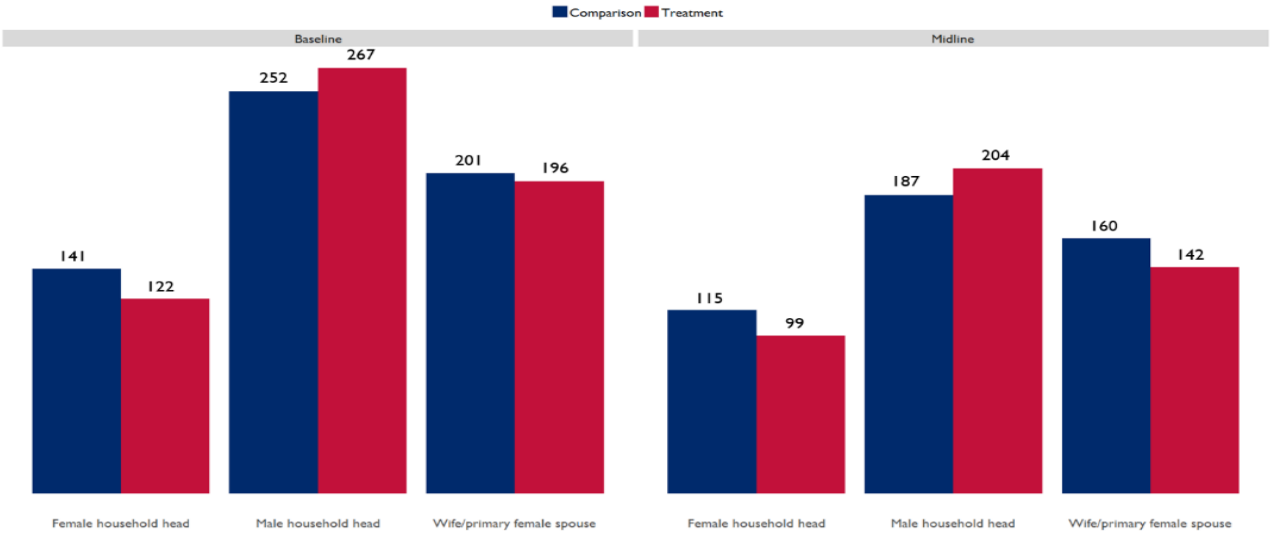
[5] This excludes informal lending by friends, neighbors or families, but includes all formal sources of credit such as from banks and micro-finance institutions, as well as informal lending from community savings and loans groups.
[6] Logit models are used for binary outcomes.

Where Y_{ij} is the outcome measured for household *i* in village *j* measured at midline. T_{ij} is a dummy which indicates treatment status; X_{ij} is a vector of co-variates as listed above; Y_{ij}^{o} j is the value of the outcome as measured at baseline; γ_i is household fixed effects; and ε_{it} is the error term. Robust standard errors clustered at the village level are also used. Under this analysis of co-variance (ANCOVA) approach, the main control variable is the baseline value of the outcome variable.

Descriptive Statistics for Key Outcomes

The Phase I midline data included 610 households and a total of 907 respondents. This sample includes about 81 percent of the Phase I baseline sample, n = 755 households (and 1,179 respondents). The evaluation team was unable to re-survey in one of the Phase I villages due to ongoing and contentious land disputes in the village[7].

Figure 2. Baseline and midline sample by assignment group.



The overall household attrition rate between baseline and midline was 17 percent. In about 60 percent of attrited cases, the respondents from the Phase I baseline were not able to be re-interviewed due to travelling or absence from the village during the survey team's visits. Another 20 percent of attrited cases were related to inability to locate the respondent. Other sources of attrition included death, illness and refusal to be re-interviewed.

The overall sample between Phase I baseline and midline shows some change within the treatment group relative to the comparison group for tenure security and land rights measures. Sixteen percent (n = 40) of treatment group households surveyed at baseline said they possessed land-related documentation, and this rose 43 percent (n=125) at midline ($p<0.001$). In contrast, there was no change in the percentage of comparison group households reporting land documentation between baseline and midline (11 percent and 12 percent at baseline and midline, respectively).

[7] There were 23 households dropped from this village in the midline sample.

Table 2. Descriptive statistics, treatment group outcomes.

Treatment Group											
Variable	**Baseline**					**Midline**					**Mean Diff.**
	n	**Mean**	**SD**	**Min**	**Max**	**n**	**Mean**	**SD**	**Min**	**Max**	
Tenure Security and Land Management											
Do you have familiarity with land laws (1=Y, 0=N)	585	0.04	0.19	0	1	445	0.05	0.22	0	1	0.01
Household possesses land-related documentation (1=Y, 0=N)	378	0.16	0.37	0	1	291	0.43	0.5	0	1	0.27***
In general, how many people in your community are worried that someone might try to take their land against their will? (1=Y, 0=N)	389	0.16	0.37	0	1	303	0.09	0.29	0	1	-0.07**
Is there a risk that someone will take over one of your plots if you leave it fallow? (1=Y, 0=N)	389	0.44	0.5	0	1	303	0.44	0.5	0	1	0
Disputes											
Experienced a dispute in the past year (1=Yes, 0 = No)	389	0.08	0.27	0	1	303	0.08	0.27	0	1	0
How long did the dispute last? (in months)	389	0.61	2.44	0	12	303	1.53	11.32	0	148	0.92
Number of disputes in the past 12 months	30	1.03	0.18	1	2	23	1.09	0.29	1	2	0.06
Investment and land use											
Parcel size (in hectares for all parcels owned)	389	2.57	5.37	0	86.6	303	3.84	6.72	0	55.41	1.27***
Borrowed money in the past six months (1=Yes, 0=No)	389	0.11	0.32	0	1	303	0.12	0.32	0	1	0.01
Fruit trees planted (1=Y, 0=N)	389	0.44	0.5	0	1	303	0.39	0.49	0	1	-0.05
Non-fruit trees planted (1=Y, 0=N)	389	0.24	0.43	0	1	303	0.16	0.37	0	1	-0.08**
Empowerment and Decision Making											
Decision-making exclusively by male household head	196	0.55	0.50	0	1	140	0.29	0.45	0	1	-0.27***

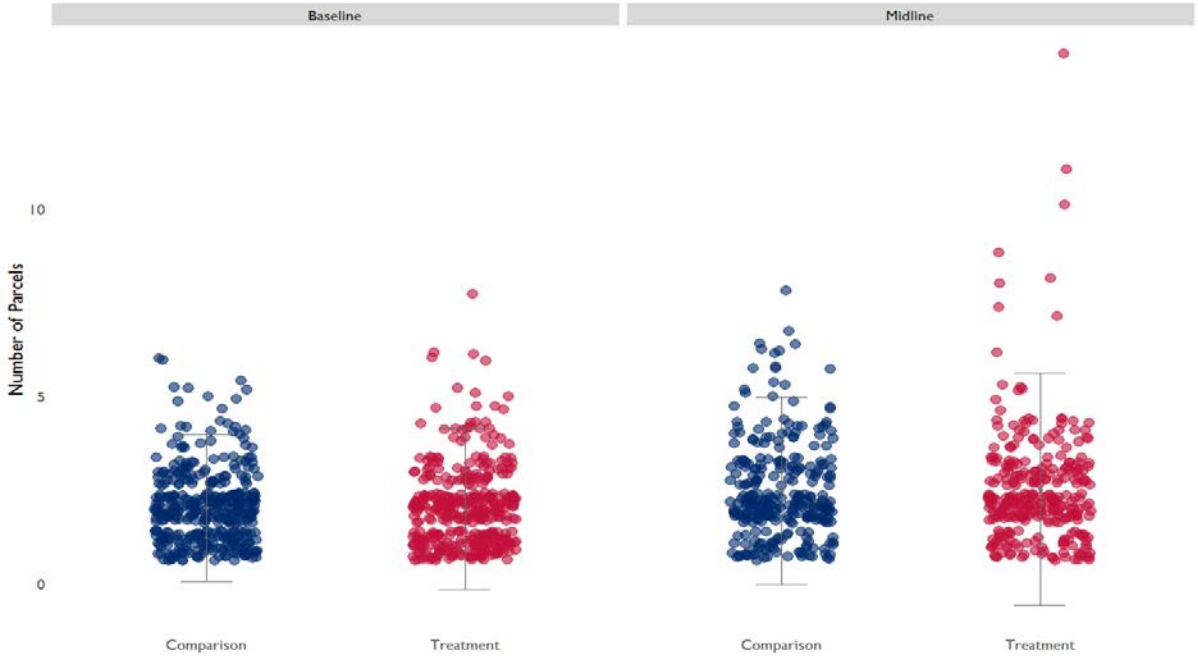
Statistical significance denoted by: *** p<0.01, ** p<0.05, * p<0.1

Table 3. Descriptive statistics, comparison group outcomes.

Comparison Group											
Variable	Baseline					Midline					Mean Diff.
	n	Mean	SD	Min	Max	n	Mean	SD	Min	Max	
Tenure Security and Land Management											
Do you have familiarity with land laws (1=Y, 0=N)	594	0.03	0.18	0	1	462	0.03	0.17	0	1	0.00
Household possesses land-related documentation (1=Y, 0=N)	387	0.11	0.32	0	1	292	0.12	0.33	0	1	0.01
In general, how many people in your community are worried that someone might try to take their land against their will? (1=Y, 0=N)	393	0.15	0.36	0	1	302	0.09	0.29	0	1	-0.06**
Is there a risk that someone will take over one of your plots if you leave it fallow? (1=Y, 0=N)	393	0.46	0.5	0	1	302	0.5	0.5	0	1	0.04
Disputes											
Experienced a dispute in the past year (1=Yes, 0 = No)	393	0.1	0.3	0	1	302	0.06	0.23	0	1	-0.04*
How long did the dispute last? (in months)	393	0.54	2.07	0	12	302	1.95	16.5	0	204	1.41*
Number of disputes in the past 12 months	38	1.13	0.34	1	2	17	1.06	0.24	1	2	-0.07
Investment and Land Use											
Parcel size (in hectares for all parcels owned)	393	2.3	3.3	0.1	36.8	302	2.8	3.5	0.1	24.3	0.48*
Borrowed money in the past six months (1=Yes, 0=No)	393	0.12	0.33	0	1	302	0.08	0.27	0	1	-0.04**
Fruit trees planted (1=Y, 0=N)	393	0.51	0.5	0	1	302	0.43	0.5	0	1	-0.08**
Non-fruit trees planted (1=Y, 0=N)	393	0.25	0.43	0	1	302	0.12	0.32	0	1	-0.13***
Empowerment and Decision Making											
Decision-making exclusively by male household head	201	0.45	0.49	0	1	161	0.32	0.47	0	1	-0.13***

Statistical significance denoted by: *** p<0.01, ** p<0.05, * p<0.1

Figure 3. Household total parcel holdings by assignment group and survey round.



Given the short 6-month time interval between baseline and midline, major changes are not expected in land holdings and investment behavior beyond those that may be driven by seasonal differences across the two survey rounds. Both assignment groups reported an increase in the number of parcels owned and the mean parcel size between survey rounds. Seasonal differences in data collection may also explain the change in tree planting activity across both assignment groups between baseline and endline, with both the treatment and control groups reporting a decline in tree planting between survey rounds. Finally, wives surveyed in both treatment and control groups reported that the percentage of land-related decisions made exclusively by the male household head declined. The evaluation team found that this decrease to be largely explained by increased joint-decision making across both assignment groups.

Balance and Power

Baseline data provide an understanding of the pre-intervention context and were also used to test evaluation design assumptions and ensure that randomization occurred as intended. First, balance tests are used to assess and confirm the comparability of the treatment and control groups. Secondly, the power calculations presented in the evaluation design proposal are revisited using updated parameters from the baseline data to assess statistical power, given the actual sample size and other sample parameters. Balance on key variables was assessed using the normalized difference in means (Austin 2009), and results indicated no major imbalances (Table 7).

Table 4. Normalized difference in means for selected household characteristics and baseline outcomes.

Variable	Treatment					Comparison					Normalized Difference
	n	Mean	SD	Min	Max	n	Mean	SD	Min	Max	
Age	585	46.5	15.3	18	93	594	48.0	16.8	18	101	0.01
Cooperative membership (Y/N)	389	0.17	0.38	0	1	393	0.23	0.42	0	1	0.00
Education Level	585	0.87	0.51	0	4	594	0.88	0.5	0	3	-0.15
Distance to Iringa Town (mi)	502	32.4	10.9	12.9	57.2	525	32.3	10.82	12.9	57.0	0.04
Number of HH Members	389	4.0	1.9	1	10	393	3.9	2.0	1	12	0.11
Tenure Security and Land Management											
Do you have familiarity with land laws (1=Y, 0=N)	585	0.04	0.19	0	1	594	0.03	0.18	0	1	-0.05
Household possesses land-related documentation (1=Y, 0=N)	378	0.16	0.37	0	1	387	0.11	0.32	0	1	0.09
In general, how many people in your community are worried that someone might try to take their land against their will? (1=Y, 0=N)	389	0.16	0.37	0	1	393	0.15	0.36	0	1	0.02
Is there a risk that someone will take over one of your plots if you leave it fallow? (1=Y, 0=N)	389	0.44	0.5	0	1	393	0.46	0.5	0	1	-0.17
Disputes											
Experienced a dispute in the past year (1=Yes, 0 = No)	389	0.08	0.27	0	1	393	0.1	0.3	0	1	0.01
How long did the dispute last? (in months)	389	0.61	2.44	0	12	393	0.54	2.07	0	12	0.00
Number of disputes in the past 12 months	30	1.03	0.18	1	2	38	1.13	0.34	1	2	0.23
Investment and land use											
Parcel size (in hectares, all parcels owned)	389	2.6	5.4	0	86.6	393	2.3	3.3	0.1	36.8	0.00
Borrowed money in the past six months (1=Yes, 0=No)	389	0.11	0.32	0	1	393	0.12	0.33	0	1	0.05
Fruit trees planted (1=Y, 0=N)	389	0.44	0.5	0	1	393	0.51	0.5	0	1	0.07
Non-fruit trees planted (1=Y, 0=N)	389	0.24	0.43	0	1	393	0.25	0.43	0	1	0.07
Empowerment and Decision Making											
Decision-making exclusively by male household head	196	0.55	0.50	0	1	201	0.45	0.49	0	1	-0.12

The baseline data were also used to revisit power assumptions made during the evaluation design, noting that the sample size for the LTA IE is constrained because LTA implementation is limited to 30 villages. The Minimum Detectable Effect Size (MDES) was calculated for 14 outcome variables drawing on the intra-cluster correlation coefficient (ICC) and other sample parameters for each variable. As indicated by the MDES values in Table 8, the study is sufficiently powered to detect policy-relevant magnitudes of effects for most of the outcomes. The study has lower power to detect true impacts on the number of land disputes experienced in the year prior to survey, due to the very lower frequency of dispute events experienced by respondents.

Table 5. Power calculations for selected outcomes.

Variable	N	Treatment Mean/SD	Comparison Mean/SD	ICC	MDES	Lower-Upper 95% CI
Tenure Security and Land Management						
Do you have familiarity with land laws (1=Y, 0=N)	1,179	0.04	0.03	0.00	0.05	0.02 0.09
Household possesses land-related documentation (1=Y, 0=N)	765	0.16	0.11	0.11	0.35	0.10 0.59
In general, how many people in your community are worried that someone might try to take their land against their will? (1=Y, 0=N)	765	0.93	0.10	0.02	0.16	0.05 0.26
Is there a risk that someone will take over one of your plots if you leave it fallow? (1=Y, 0=N)	765	0.44	0.47	0.05	0.24	0.07 0.40
Disputes						
Experienced a dispute in the past year (1=Yes, 0 = No)	765	0.07	0.10	0.06	0.25	0.08 0.44
How long did the dispute last? (in months)	765	0.40	0.36	0.1	0.12	0.03 0.20
Number of disputes in the past 12 months	66	1.04	1.13	0.26	0.56	0.16 0.93
Investment and land use						
Parcel size (in hectares for all parcels owned)	765	4.29	3.86	0.02	0.15	0.04 0.25
Borrowed money in the past six months (1=Yes, 0=No)	765	0.13	0.11	0.06	0.26	0.08 0.44
Fruit trees planted (1=Y, 0=N)	765	0.29	0.33	0.09	0.33	0.10 0.56
Non-fruit trees planted (1=Y, 0=N)	765	0.15	0.17	0.04	0.22	0.06 0.37

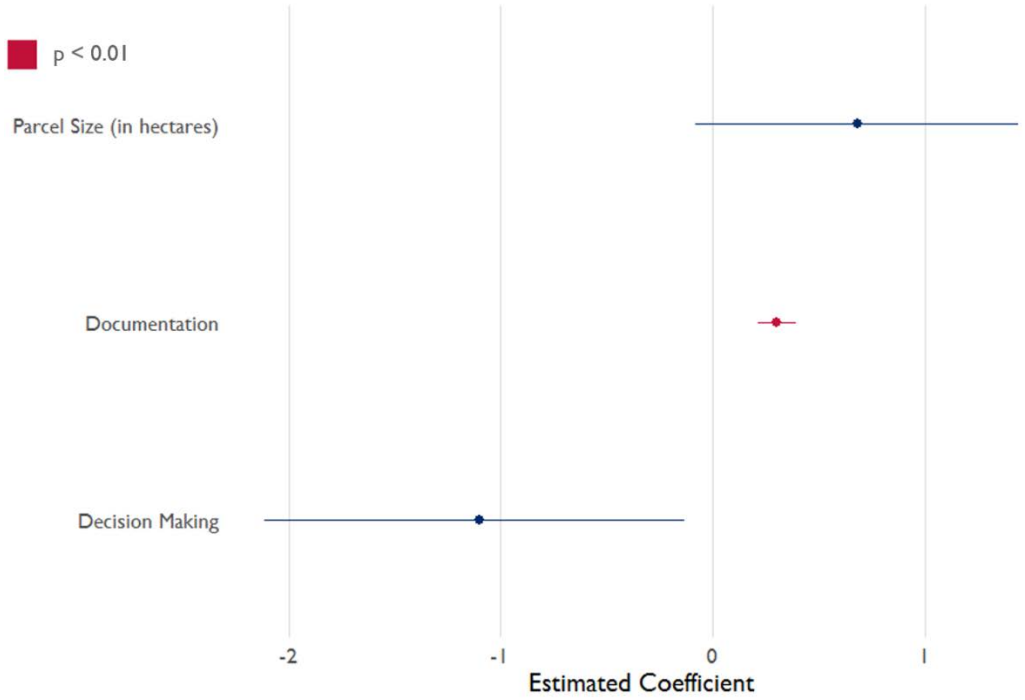
Note: All power calculations assume alpha = 0.05 and power=0.80.

IV. Midline Results and Discussion

This section provides a summary of key findings from the Phase I midline analysis of LTA impacts on select tenure security, land disputes, land use and investment, and empowerment outcomes. Table 9 presents impact estimates for each of the ten outcomes measured at midline, while figure 4 indicates the magnitude and statistical significance of each outcome assessed. The results suggest statistically significant and positive impacts for the following three indicators[8]:

[8] Midline analyses also found a statistically significant increase in the incidence of tree-planting on farms, however this indicator is considered highly sensitive to the difference in seasonality across baseline and midline data collection and the result is therefore not included in the discussion.

Figure 4. Point estimates and 95% CIs for significant outcomes at midline.



Household possession of land-related documentation: Results suggest that holding household head gender, age, education level and village distance to Iringa constant, there is, on average, a 29.8 percent increase in the likelihood of a household having land document at midline, for households in the treatment group relative to those in the comparison group. The magnitude of impact is relatively large, and the statistical significance is robust to alternative model specifications. This finding is not necessarily surprising, since LTA has been actively working to issue CCROs to households in activity villages and LTA M&E data also confirms that the activity has been fairly successful in achieving wide scale issuance of CCROs to households. The results provide useful confirmation that the project has been successful in increasing land documentation amongst project beneficiaries, a key intermediate outcome in the causal chain to improved tenure security impacts.

Household total land-holdings: Results suggest that, on average, total land-holdings by treatment group households has increased by 0.67 ha relative to comparison group households, at midline. However, the magnitude of impact is fairly small and the results are only marginally significant ($p<.10$). The statistical significant of the landholding results are variable under alternative model specifications, while there is currently little supporting evidence in the midline data to explain if or why households in LTA villages are using their increased familiarity with land laws and possession of CCROs to expand their landholdings. Therefore, this intermediate finding should be interpreted with caution and will be investigated further at endline.

Land-related decision-making power exclusively by the male household head: Results suggest that holding the same household and village factors constant as above, there has been an 11.4 percent decrease in the likelihood of a land-related decisions solely by the male household head, for treatment group

households. This is interpreted as a positive finding for surveyed women in the sample, as it suggests an increase in joint or other types of decision-making on land use (such as solely by the woman land user). The magnitude of impact is smaller across alternative model specifications, but the significance of the effect remains. This finding suggests that LTA activities aimed to inform women on land rights and encourage women's management and decision-making over land they use appear to have begun to take hold.

Table 6. Summary of impact estimates at midline.

Variable	Estimate	95% CI	Total N	Treatment N	Comparison N
Familiarity with land laws	0.63	-0.37 1.66	1,807	882	925
Household possesses land-related documentation	0.29***	0.21 0.39	1,198	588	610
Expropriation risk	-0.94	-1.96 0.08	1,198	588	610
Fallowing risk	0.00	-0.48 0.49	1,807	882	925
Incidence of land disputes in past year	0.14	-0.18 0.47	95	46	49
Duration of land disputes (in months)†	-0.03	-1.56 1.48	95	46	49
Total land holding by household (in ha)†	0.67*	-0.02 1.30	1,198	588	610
Credit access by household (over past six months)	0.91	0.11 1.74	1,198	588	610
Incidence of tree planting on farms (fruit and non-fruit trees)	0.80**	0.15 1.45	1,545	758	787
Land-related decision-making power exclusively by male household head‡	-1.10**	-2.15 0.03	610	294	316

Statistical significance denoted as: * p< 0.10, ** p< 0.05, *** p<0.01.
† Denotes a continuous outcome. Remaining point estimates are expressed as log odds.
‡ A negative value for this outcome indicates a positive improvement.

Supplemental Spatial Analyses

In addition to conducting tests for program impact at midline, supplemental spatial analyses were also conducted to examine spatial patterns in outcomes on the basis of village characteristics. The spatial analyses provided an opportunity to examine relationships among variables, such as distance to the nearest market, and also aimed to identify statistically significant clusters of villages on the basis of key covariates or outcomes of interest. These results may be used to identify issues for targeted qualitative probing during endline data collection, and/or additional follow-up analyses to help interpret results. For example, three villages were identified as statistically significant "hot spots" of larger than average parcel size at midline (Figure 5, while two of the three villages were also identified as such as baseline. Patterns in household-level land holdings could be further investigated at endline, to help determine reasons for household land acquisition and change in total parcel area since project inception, and the extent to which the LTA intervention may have contributed to those changes.

Spatial analyses also provided additional information for understanding variation in different kinds of expropriation risk across villages in the sample. Although the overall findings at midline suggest that risk of outright land expropriation is generally perceived as low among villagers in the sample, spatial mapping of responses by village indicates respondents who expressed a medium to high risk of land taken

over the next five years were more concentrated in villages located south of Iringa town and in close proximity to the Ruaha river. Targeted data collection and analyses at endline could be used to better understand drivers of this variation. In contrast, the risk of losing land under fallow was mentioned by respondents in nearly all of the surveyed villages, with little spatial variation (Figure 6). This suggests a more widespread fear of losing access to land that is left fallow, and potential pressures on farmers to keep land under production.

Figure 5. Geographic distribution of villages with larger than average parcel size, at midline.

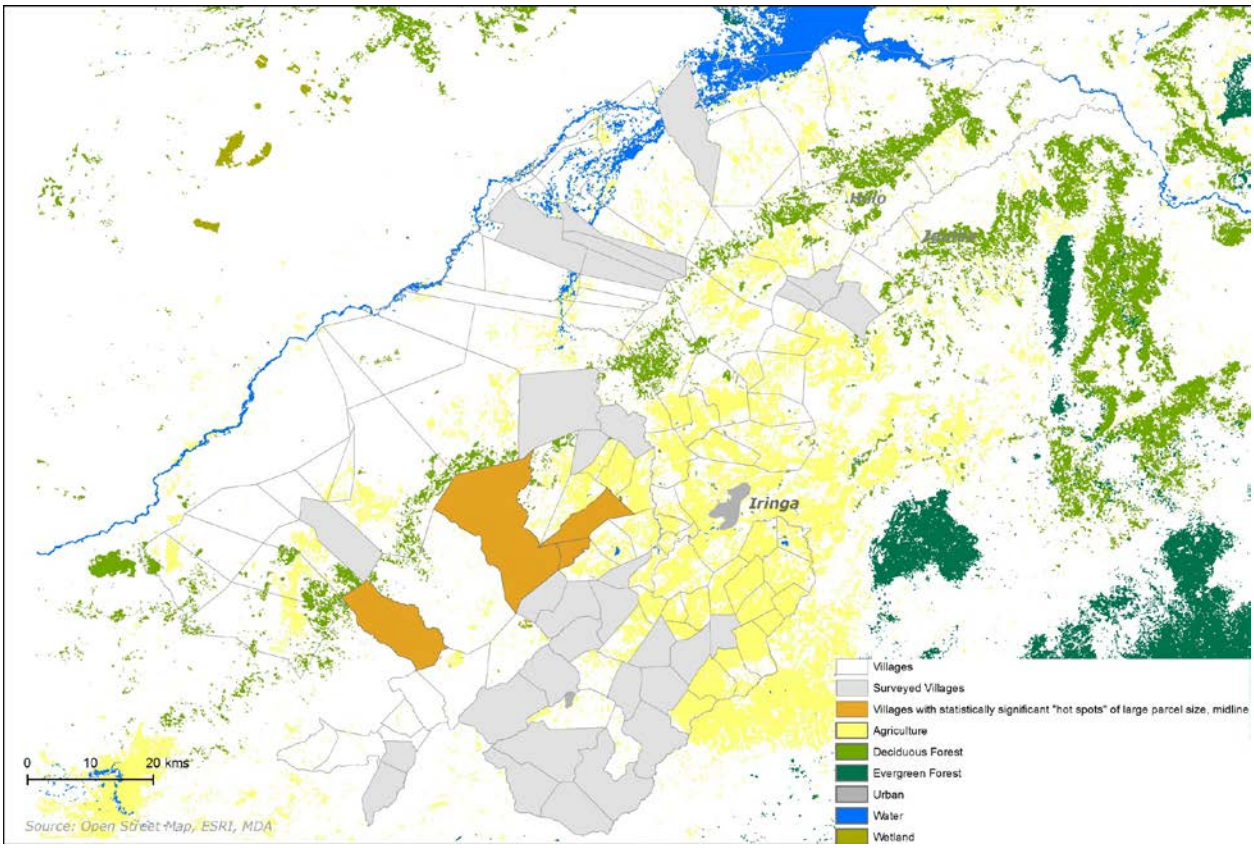
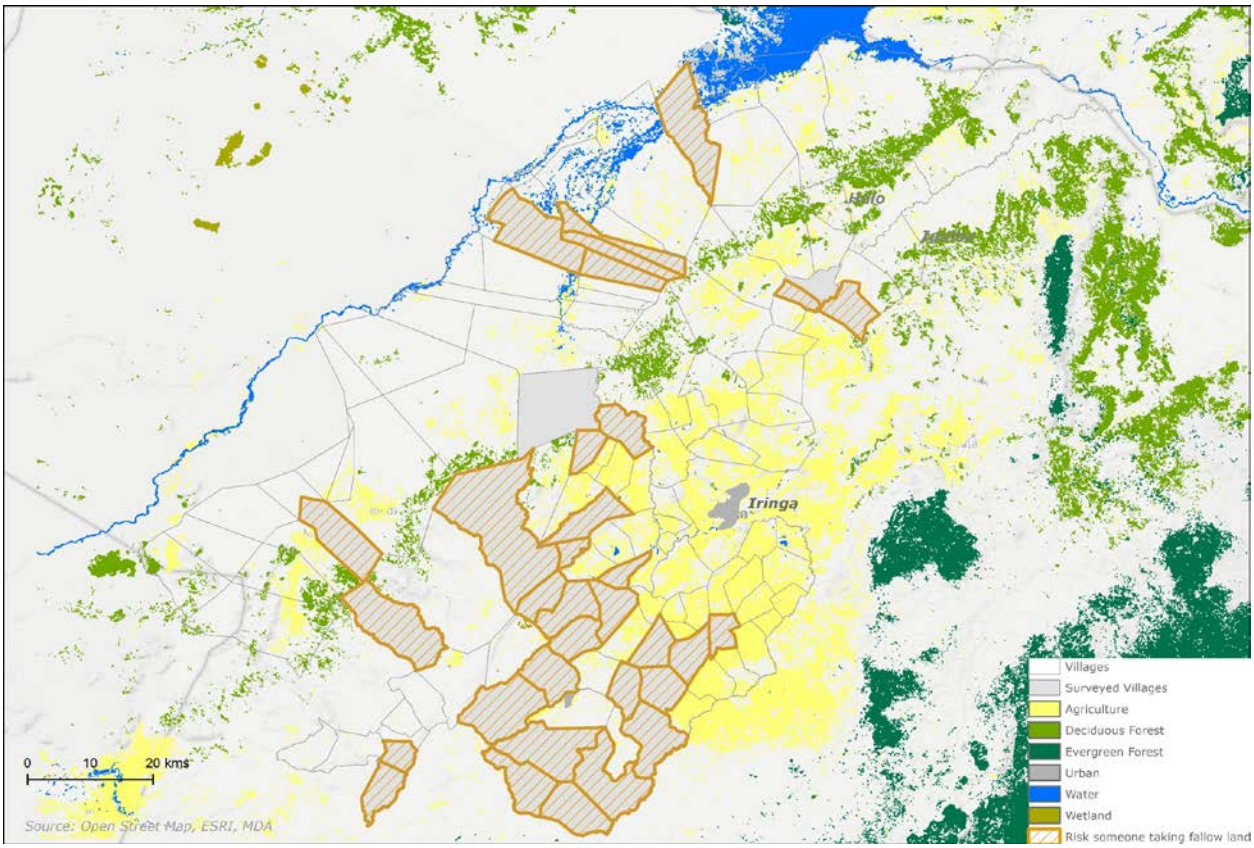


Figure 6. Geographic distribution of villages with at least one respondent expressing medium to high risk of land loss due to fallowing, at midline.



V. Conclusion and Program Implications

The findings indicate that LTA implementation may be leading to positive impacts on some of the key intermediate outcomes across three of the four outcome categories assessed at this early stage of the evaluation. Under the LTA theory of change, continuation of such impacts over the activity lifetime is also expected to lead to significant improvements in longer terms outcomes, such as increased agricultural productivity and household income. The midline analysis did not find statistically significant impacts for the remaining outcomes assessed at this stage. However, this may not be surprising given that the analyses measures impacts for activities that have only been underway for six months. The generally low proportion and lack of change on household familiarity with land laws for the treatment group may indicate that project messaging on this has not yet taken hold. In addition, households who only recently obtained their CCROs and are in process of understanding the potential benefits of securing their landholdings may not yet perceive a lower expropriation risk or changed their land investment behavior accordingly. Overall, the midline results indicate that achievement of some of the anticipated LTA impacts appears to be underway, confirm the validity of the IE design and sample power, highlight the role that endline qualitative data collection is likely to bring to help explain impacts at endline, and re-confirm the utility of measuring longer term outcomes as planned at endline.

It is also important to highlight two important limitations to these analyses, on timing of midline data collection and the overall small size which stems from the relatively small number of villages where LTA is implemented (the activity was restricted to 30 villages). Due to a shift in the implementer's timeline, the midline data collection for Phase I village took place some 5 months earlier than initially planned by the evaluation team, and approximately 6 months after the start of implementation in those villages.[9] Given that many of the outcomes of interest for this evaluation rest on substantive behavioral change within households, villages, and the local DLO, each of which are expected to take some time to accrue, it may be unlikely to see improvements on several of these outcomes at this early stage of the evaluation.

The collection of the midline data only 6 months after the start of implementation is thus likely to result in smaller observable impacts and fewer significant outcomes at this stage in the evaluation. In addition, the change in seasonal timing of the midline data collection could have some implications for reliability of measurements for some indicators across the two survey rounds. However, the indicators focused on for the midline analyses are not considered by the evaluation team to be highly susceptible to this seasonal difference, with the exception of the incidence of tree planting on farms. The seasonal timing of the baseline sample will be replicated at endline, currently planned for 2020.

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[9] The evaluation design planned for a phase-in approach that included data collection at 12-month intervals, and the Phase I baseline took place in March and April of 2017, during the rainy season.

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