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COST AND TIME EFFECTIVENESS STUDY OF THE MOBILE APPLICATION TO SECURE TENURE PILOT IN TANZANIA

Lauren Persha[1], Benjamin Linkow[1], Sebastian Monroy-Taborda[1] and Gwynne Zodrow[2]
[1]NORC at the University of Chicago, USA
[2]Management Systems International

Presenting Author: persha-lauren@norc.org

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Abstract

Technical and financial requirements for land formalization programs are substantial, prompting donor and government interest to find low-cost approaches to customary land documentation and registration. Such programs must be feasible to implement at scale, with manageable time, personnel and technical requirements, but also provide sufficiently high-quality service delivery to meet development objectives and ensure sustainability of the process beyond initial donor support. Currently there is no standard approach in the land sector for determining per-parcel costs or cost-effectiveness of such programs. Such analyses could, however, help clarify resource needs and potential efficiencies, identify how differences across approaches may contribute to overall quality and sustainability, and facilitate selection from a range of options. We draw on cost-effectiveness analyses and qualitative data collection with district land staff and program beneficiaries to estimate the cost-per-parcel and associated quality dimensions of USAID's Mobile Application to Secure Tenure (MAST) pilot approach to map land and facilitate formal documentation of customary use rights in Tanzania. While cost data present several uncertainties, results suggest evidence of a trade-off between per-unit cost and quality, and identify advantages of the MAST system that appear to benefit overall quality, CCRO delivery time, and beneficiary trust in the process.

Key Words: Land formalization, MAST, Tanzania

Introduction

As different low-cost options for mapping and documenting land use rights at scale continue to be developped, and as more countries adopt fit for purpose land administration techniques, the focus on cost per-parcel, time per-parcel, and related quality of different approaches has gained salience. While studies often highlight the relatively low or high formalization cost per-parcel under different efforts to achieve land titling or customary land documentation (Deininger et al 2008; Deininger and Feder 2009), in general where such figures have been cited it has been difficult to understand the full range of costs that may have been included, or how costs may have been distributed across different steps in the land documentation process. Such information may be useful, however, for helping to identify opportunities for further efficiencies in the process as it is taken to scale, as a well as to simply better understand the scope of different costs involved and requirements for achieving sustainable land formalization efforts in different program and country contexts.

This study aims to provide practical information on cost, time, and quality dimensions of USAID's MAST technology, as piloted in Tanzania, that may be useful for further refining and scaling of the approach, and contextualizing the MAST process relative to comparable efforts to map property and secure land tenure under Tanzania's procedures for issuing CCROs.Given the lack of existing precedents for such analyses, a secondary aim is to describe the approach and outline cost and effectiveness measure challenges and considerations, that may contribute to more systematic comparisons in future work.

The Cost and Time Effectiveness (CTE) study is the second part of a two-part performance evaluation of the Mobile Application to Secure Tenure (MAST) pilot in Tanzania. The Office of Land and Urban in the United States Agency for International Development's Bureau for Economic Growth, Education, and Environment (USAID/E3/LU) commissioned the CTE study, and the E3 Analytics and Evaluation Project designed and implemented it.[1] The CTE study examined the MAST approach relative to previous and ongoing alternatives in Tanzania for gathering property boundary data and securing land tenure through the delivery of Certificates of Customary Right of Occupancy (CCROs).

The CTE study consisted of a quantitative component to estimate and compare the cost-per-parcel of CCRO delivery across MAST and a set of comparison project approaches in Tanzania, and a qualitative component to assess quality dimensions of customary land mapping and CCRO delivery via the MAST

[1] Team lead Management Systems International (MSI) implements the E3 Analytics and Evaluation Project in partnership with Development and Training Services (dTS) and NORC at the University of Chicago.

process relative to comparison processes. The qualitative component drew on information collected from district and village officials and village beneficiaries in two MAST pilot sites, and from a set of comparison project villages across selected districts.

MAST Pilot Description

USAID/E3/LU funded and oversaw the MAST pilot through its Evaluation, Research, and Communication (ERC) Task Order under the Strengthening Tenure and Resource Rights (STARR) Indefinite Quantity Contract. The Cloudburst Group is the implementing partner for the MAST pilot in Tanzania. MAST developed and implemented a new "crowd-sourcing" methodology using mobile phone technology to facilitate the process of land mapping and documentation, as well as a new approach that employed village youth as "trusted intermediaries" responsible for mapping land in their village. USAID chose to carry out the pilot tests in Tanzania to ground-truth the technology, information transfer, and community education/advocacy components of the MAST approach. The MAST pilot supported the Government of Tanzania (GoT) in trying to improve land governance and lower the cost of land certification programs, with the aim of providing an alternative to more traditional, and potentially costlier, land administration interventions.

The Cloudburst Group implemented MAST in three villages in Iringa District, Tanzania between 2014 and 2016, where the pilot mapped and prepared CCROs for nearly 4,000 parcels across the three villages. The pilot's original goal was to be a "proof of concept" that mobile technologies could be provided to community members, along with training on land laws and rights, to efficiently and effectively capture land rights information. The pilot quickly transformed into a collaborative experiment with the GoT to work with rural villagers and the District Land Office (DLO) for Iringa Rural District to formally document land rights, by providing CCROs in accordance with Tanzania's Land and Village Land Acts.

Given interest among governments and donors in finding low-cost, high-quality solutions for mapping and documenting land use rights at scale, the CTE study aims to provide practical information on cost, time, and quality dimensions of the MAST technology and approach that may be useful for further refining and scaling the approach. It also aims to contextualize this approach relative to comparable efforts to map property and secure land tenure under Tanzania's procedures for issuing CCROs. The incorporation of a quality dimension for the study reflects donor interests in finding low-cost solutions that are also socially responsible and sustainable.

Research Questions

The study aimed to understand if and how the MAST methodology as implemented in the second and third pilot sites is a cost-effective, time-efficient, and appropriate approach to registering land in Tanzania relative to previous or alternative ongoing approaches. Research sub-questions for the study were:

1. *Cost-per-parcel:* How does the cost-per-parcel of carrying out mapping, verification, and transmission of the information needed to issue CCROs using the MAST methodology compare to alternative approaches?
2. *Quality dimensions:* Are there differences between the MAST methodology and alternative approaches in terms of:
    i. Transparency and inclusiveness of the mapping and verification process;
    ii. Quality of the data collection and transmission platform in terms of accuracy, functionality, ease of use, and accessibility;
    iii. Requirements for implementation in terms of time and personnel.

Question 1 was assessed via a quantitative Cost-Effectiveness Analysis (CEA) of project costs across MAST and comparable land mapping and CCRO delivery efforts in Tanzania. Question 2 was assessed via qualitative data collection across village beneficiaries and non-beneficiaries, and village and district officials. The team collected qualitative data in the second and third MAST pilot villages, and in four villages from four of the comparison projects used for the CEA.

STUDY METHODOLOGY

The CTE study identified four previous land formalization projects in Tanzania that are broadly similar to the MAST pilot, to form the basis for the comparative assessment. The study team identified the comparison projects during a scoping mission in Tanzania, and requested project implementation details and budget information from the implementing institutions. The team subsequently reviewed this information to identify projects that had conducted broadly similar CCRO delivery efforts, and for which sufficiently detailed budget information was available. For the MAST and comparison project approaches, the study team calculated the estimated cost-per-parcel of completing the sensitization, mapping, verification, and CCRO preparation process using CEA. The team carried out the CEA using project budget data, with adjustments made for differences between MAST and the comparison project processes in terms of content, scope, or other aspects that affect costs.

Although many sectors increasingly highlight the need for CEAs of development interventions, there is currently no standard CEA methodology in the land sector, and a lack of comparable existing work in this area. Therefore, the study team based its methods for the CTE study on work done in the health and education sectors, which have a more extensive history of CEA for development interventions and good agreement on the elements of a standard approach to conducting such studies (McEwan 2012; Dhaliwal et al. 2012). In that sense, the CEA approach employed for this study is somewhat exploratory in nature and is based in two main assumptions: (1) the projects being compared via the CEA have very similar goals, and (2) the projects have similar measures of effectiveness that are available to draw on (Levin and McEwan 2001). A CEA is targeted to estimate the dollar (or local currency) amount needed to achieve a certain outcome. Such an analysis enables project decision-makers to select the project alternative that has the lowest cost-per-unit of effectiveness.

Differences in non-cost dimensions were also considered in addition to the CEA, such as transparency and inclusiveness of the mapping and verification process, quality and accessibility of the land information compiled, and overall time and personnel resources required. These were assessed through group discussions (GDs) and key informant interviews (KIIs) with the respective DLO staff and in selected villages where the MAST and comparison project processes were implemented. The study team used the qualitative data to classify the land mapping and CCRO delivery process used by each project according to a set of non-cost dimensions, so that these elements could be considered in parallel with information on costs. To facilitate more systematic comparison across cases, the team also assigned the qualitative classifications developed for each case a numeric rating, which corresponded to specified criteria.

Comparison Project Identification and Selection

The study team identified four similar customary land rights mapping and CCRO delivery projects, obtained preliminary cost and other information from the implementing institutions. Comparison projects were implemented by MLHHSD, the Property and Business Formalisation Progamme (MKURABITA), Haki Ardhi, and the World Bank Private Sector Competitiveness Program (WB PSCP) across 14 districts (Table 1). Each project-district combination is considered as a separate project effort, since the nature and timing of activities was generally conducted separately by district for each of the projects.

Determination of Project Similarity

To ensure that the selected comparison projects were broadly similar to MAST (i.e., that they were customary land rights mapping projects with aims of recording parcel boundary and land user information

for CCRO preparation and delivery), the study team obtained detailed information from project points of contact on each of the main activities or tasks undertaken, and the different steps in the project work plan starting from sensitization activities in districts or villages, through to CCRO delivery to households. This understanding of the main activities and work flow undertaken across each project was essential to ensure that the different projects are broadly comparable, to identify where project activities may have differed from the MAST process, and to be able to make informed decisions to justify the inclusion or exclusion of specific cost information for each project in the final CEA, where necessary. Drawing on project information from MAST and the identified comparison projects, Table 2 provides an overview of the typical steps that are involved in a participatory land use mapping and CCRO delivery effort in Tanzania, and highlights the steps covered by MAST and each of the candidate comparison projects.

The projects are broadly similar in terms of process (Table 2). Key differences were that all of the identified comparison projects included village land use planning in their process, while MAST was designed to engage in individual land rights mapping after a Village Land Use Plan (VLUP) and village by-laws had already been prepared and approved. Also, the WB PSCP used satellite imagery to assist with the village and parcel mapping, while the other projects did not. These are notable differences with separable costs that were adjusted for in the cost-per-parcel comparison and results interpretation. The nature of sensitization and awareness activities also differs somewhat across the projects. For example, the village-level training for MAST devoted additional effort to villager training on land laws, and to the selection and training of trusted intermediaries to implement MAST's participatory mapping process. Keeping in mind that such differences may have cost and/or quality implications, the study team considered them in both the CEA and qualitative analysis and interpretation.

Cost-Effectiveness and Time Analyses of Per-Parcel CCRO Delivery Approach

The CEA aimed to quantify the cost-per-unit of project effect (McEwan 2012) to determine the incremental cost to conduct participatory land rights mapping and prepare each additional CCRO document. This enables a standardized comparison across MAST and comparable processes. CEA studies rely on obtaining accurate and comparable cost information across different projects, which is also the primary challenge of such studies. Cost information can be reported in several ways, and different projects do not necessarily use the same cost recording or reporting conventions. Thus, an important step in the CEA is to systematically determine project costs and organize the cost information that is obtained across different projects. To do so, the study team followed the "ingredient" method for undertaking a CEA (Levin and McEwan 2001), in which all of the ingredients (resources) that are required to carry out

the project are identified, and a value is assigned to each based on project cost data (or, where not explicitly captured, as estimated from secondary data).

The cost of an intervention is defined as "the value of all the resources that it utilizes; had they been assigned to their most valuable alternative use" (Levin and McEwan, 2001, p.44). This refers to the opportunity costs involved in spending a dollar on the given intervention instead of using it for other activities. In using this definition, the study team aimed to capture costs that may go beyond those reported in budget reports, keeping in mind that it is possible that not all of the incurred costs will be included in standard budget reports (e.g., if the project made use of volunteers for certain activities and did not compensate for their time). To ensure that all relevant costs are captured, the study team drew on multiple information sources to obtain an in-depth understanding of the different resources that may have been involved in project implementation. This included drawing on project work plans or descriptions of project activities and personnel involved that were provided to the study team, and having follow-up communications with project points of contact to clarify uncertainties.

Following Levin and McEwan (2001), the study team included five standard cost categories in the analysis: (1) personnel, (2) facilities, (3) equipment and materials, (4) other project inputs, and (5) required client inputs. Then, to account for the specific land rights mapping and CCRO delivery project context, the study team additionally include administration, travel, training, workshops, and service delivery cost categories. Each category is described below:

1. *Personnel:* Costs pertaining to salaries and fringe benefits for human resources (i.e., staff, consultants, or volunteers) involved in the project's functioning.
2. *Facilities:* Costs related to the acquisition, renovation, or renting of office or storage space for the use by the project.
3. *Administration:* Costs involved in the functioning of the project on a day-to-day basis.
4. *Equipment and Materials*: Costs related to the furnishing of the office space, and purchase of any necessary materials and equipment to allow the project's functioning.
5. *Travel:* Costs related to travel expenses for project implementation, including per diems.
6. *Training:* Costs related to training in activities that pertain to project functioning and/or service delivery.
7. *Workshops:* Costs related to the sensitization and socialization of project activities.
8. *Service Delivery:* Costs pertaining to the direct delivery of the service or activity by the project. In the context of land rights mapping and CCRO delivery projects, this may include specific costs

for: parcel surveying and adjudication; installation of a CCRO administration system; mapping data downloads and plotting; CCRO printing; and CCRO verification, registration, and issuance.

9. *Required client inputs:* Costs that users of the service are required to contribute to access the service.[2]

Since different projects under comparison were implemented over slightly different time periods, the study team transformed all costs in local currency to constant 2010 U.S. dollars[3] using the Consumer Price Index (CPI) and exchange rates for Tanzania.[4]

Effectiveness Measures

The second key element in the CEA is the effectiveness measure. Levin and McEwan (2001) suggest that a measure of effectiveness should be a reflection of the main objective of the project, and also should be comparable across the different intervention alternatives. Given the focus of the MAST pilot, the total number of CCROs prepared was used as the effectiveness measure for this study.[5] This information was consistently reported by MAST and each of the comparison projects, and is distinguished from the number of CCROs that were actually delivered back to individual villagers by the conclusion of the project. The difference in the total number of CCROs delivered back to households, relative to the total number of parcels mapped and information collected for CCRO issuance, rests to some extent on steps in the process that are outside of the implementer's control.[6]

The study team considered using two alternative effectiveness measures: (1) the number of parcels mapped by the project, and (2) the number of CCROs delivered to project beneficiaries in villages. But, qualitative fieldwork indicated few differences between the number of parcels mapped and CCROs

[2] In the context of a land rights mapping and CCRO delivery project, this could include any fees that individuals or households must pay to complete the process or obtain the CCRO.
[3] This is the baseline year currently used to benchmark the CPI.
[4] As obtained from the WB's World Development Indicators database: http://data.worldbank.org/data-catalog/world-development-indicators
[5] The study team distinguishes between CCROs that had been prepared by the DLO and recorded at the district office, and those that had also been delivered to individual villagers. The number of CCROs prepared includes those where the district has received all of the necessary parcel and recipient information to prepare and issue a CCRO. For all of the projects, there was a substantial difference between the number of CCROs that had been prepared for a given village, and those that had actually been delivered back to the village and received by individual households or land users. Reasons were either due to additional costs to districts for CCRO document printing, which had not been covered by project funds, or villages not having the funds or completed construction of the required village registry to store the CCRO documents.
[6] But, this is not entirely out of implementer control in the sense that projects may choose to allocate additional resources to ensure that final steps conducted by government, CCRO document signing and delivery back to villages, are conducted.

prepared across the projects.[7] Moreover, information on the number of parcels mapped versus the number of CCROs prepared was only available for some of the comparison projects. For any given project, there will be some targeted beneficiaries who will drop out of the process prior to its conclusion. The extent of dropouts could also be viewed as an indicator of the quality and effectiveness of the effort, since the reasons often appear to relate to issues that project service delivery purports to address, such as conflict resolution support, or the availability of surveyors to map land when villagers are present. The study team viewed the number of CCROs ultimately prepared, regardless of how many parcels were mapped, to be the stronger measure of overall effectiveness. Lastly, the number of CCROs delivered to project beneficiaries was not available as an effectiveness measure for this study,[8] since this number could not be reliably obtained. Qualitative data collection across the MAST and selected comparison project villages indicated that project documentation on reported number of CCROs referred to the number prepared and entered into the District's database, rather than the number that had been delivered to villagers (which was often much lower), for all of the projects.

To assess the time dimension of MAST relative to other approaches, the study considered several aspects. These included the average time required to map individual parcels and the overall time required to accomplish key steps in the process (e.g., the average time to map parcels using the MAST and comparison project processes, and the time to process and prepare CCROs). Since none of the projects collected such measures related to time, the study team triangulated this information across the interviews with DLO staff and village leaders and beneficiaries. The study team found that ultimately it was not feasible to undertake a rigorous quantitative assessment of the time-effectiveness of MAST and the comparison approaches. This aspect of the study is therefore addressed in the qualitative results. In addition, since some villages were still waiting to receive their CCROs, this was not used as the ultimate measure of timeliness. It was factored into the quality analysis, however, since delivery of the CCROs to individuals is a key objective of the process and a crucial element of the overall theory of change for improved household tenure security and economic wellbeing through customary land formalization programs.

[7] On the other hand, there appeared to be a greater difference in the number of villagers who were interested in having their land mapped and receiving a CCRO, but could not proceed to the mapping stage because they were unable to resolve boundary disputes or internal family disputes on land allocation, across all of the projects. This is important, but reliable measures were not available for this study.

[8] Such differences appeared to relate to the extent to which projects facilitated final CCRO delivery activities in villages.

Cost Data Collection

The team conducted initial desk review of available MAST documentation and the identified candidate comparison interventions to determine broad project comparability and drop any projects for which it was not relevant or feasible to conduct a more in-depth analysis. The study team then contacted different project coordinators or points of contact to establish communication, explain the nature of the study, and request project cost and effectiveness information, and follow-up with clarifying questions as needed. The study team sought the following information across each candidate project to inform the decision on project inclusion for this study:

- Detailed understanding of project objectives, a disaggregated list of key project steps or activities undertaken, and the nature of work flow for the project.
- Detailed understanding of any key factors related to project targeting of particular districts, villages, or types of households.
- A description of the type of technology and process used to conduct land mapping, and the information storage and transmission platform used.
- Disaggregated cost information according to the basic ingredients categories, in as disaggregated a form as the project is able to provide.
- Total number of CCROs prepared per project village, as well as any additional interim or outcome information available that indicate project effects against intended objectives.
- Timeframe of project implementation and village and district names that were included.
- Total number of villages, households, and hectares per village that were covered by the project.
- Role of village officials and village households or CCRO beneficiaries in the CCRO service delivery process.

Cost Analysis

The CEA analysis organized the cost information it collected from the different projects into a cost matrix of the identified ingredients categories, based on the budget line descriptions provided by the projects. Where categorization was unclear, the study team communicated with project contacts to obtain clarity and ensure that line items across different projects were consistently allocated. In some cases, the study team made pre-comparison calculations to bring data from the various projects to the point where direct comparisons could be made. The cost-effectiveness ratio was obtained as the Net Cost / Program Effect, which yields for this study the incremental dollar cost to sensitize project beneficiaries, map each additional parcel, document user rights, and prepare the CCRO document. This measure was used to

inform how MAST compares, from a cost-effectiveness standpoint, with alternative project approaches to achieve customary land rights documentation and CCRO delivery to households.

Since the CEA exercise involved making certain assumptions on both the cost and the effectiveness measures, particularly due to the level of disaggregation (or lack thereof) of some project activities and varying levels of certainty for some of the cost elements that were available from comparison projects. In addition to making such assumptions explicit in the analysis, values for some estimated inputs were varied in order to understand the extent to which results may be sensitive to assumptions made (e.g., estimating travel or personnel costs where such information was incomplete), and to generate a reasonable range of estimates on the cost per CCRO prepared.

Given the lack of precedent for detailed analyses of per-parcel costs and associated quality of customary land formalization efforts, the study team aimed to describe the cost comparisons as systematically as possible, and also note the challenges encountered with the adopted approach. While there is certainly scope for improvement, this initial exploration of a cost-effectiveness accounting coupled with quality considerations may serve as useful entry point for future efforts.

Qualitative Approach to Assess Quality Dimensions

Cost is a crucial consideration to inform scaling up possibilities for the MAST pilot, however a meaningful comparison to alternative approaches must also extend to other dimensions of the process. Different approaches to formalizing land rights may vary in terms of "quality" aspects, such that lower costs may imply a less thorough approach that ultimately provides less value. To explore the quality of customary land mapping and CCRO delivery via the MAST process relative to comparable efforts in Tanzania, the study team undertook a companion qualitative data collection effort. While the CEA may indicate the most parsimonious approach required to prepare each additional CCRO, the qualitative component provides a means to understand in greater detail the quality of service delivery under the MAST approach relative to others, how this may relate to resource allocation or cost differences, and identify where there may be opportunity to efficiently maintain or strengthen this process under more widespread implementation.

The goal of this qualitative effort was therefore to learn about each project's approach to issues of transparency, inclusiveness, data collection and transmission quality, and required time and personnel dimensions, with respect to customary land mapping, verification, and CCRO preparation and delivery. And, to understand if and how any such differences might relate to resource allocation or cost differences.

The incorporation of this quality dimension for the study, and its integration with the cost-per-parcel analysis, also reflects donor interests in finding low-cost solutions that are also socially responsible and sustainable. The study team developed developped classification criteria across transparency, inclusiveness, quality, time, and personnel dimensions (see Table 3), and conducted qualitative data collection through GDs and KIIs, in the second and third MAST pilot villages and in four comparison project villages. Group discussions were conducted with project beneficiaries, non-beneficiaries, and village officials. Qualitative content analysis of KII and GD data was then integrated with the per-parcel cost results.

District and Village Selection

After excluding 95 MLHHSD villages and 18 WB PSCP villages due to CCRO delivery not yet conducted, or logisitical difficulties conducting fieldwork due to remote locations, the study team drew on the resulting pool of districts and villages to select four districts for the quality dimensions data collection, identify alternates, and generate a list of candidate comparison villages in each of these districts. The team prioritized districts and villages for qualitative data collection on the basis of their similarity to the MAST pilot village, project, and district context (see Table 4).

Qualitative data was collected in four districts: Kilolo, Mvomero, and Rufiji– which covered four of the comparison project approaches – and Iringa Rural District, where MAST was implemented. Across these districts, the team collected qualitative data in six villages (two MAST villages and four comparison project villages). The team conducted 1 GD and 1 village KII in each of the two MAST villages, and in one village per selected comparison project. Because the four selected comparison projects were located in three different districts, the team conducted KIIs with a total of four DLOs. KII and GD respondent categories are summarized in Table 5.

To select a representative village for each project, the team prioritized up to four candidate villages per selected district and comparison project prior to the fieldwork, based on context similarities with the MAST pilot, and finalized selection during the KII with DLO staff. Interviews were conducted in Swahili with a native Swahili-speaking moderator and a Swahili/English-speaking notetaker. GDs aimed for 10 to 15 respondents, and for gender and age balance. When possible, a small number of villagers in technical or non-technical project roles were included, including MAST intermediaries or Village Land Use Management Committee (VILUM) members. KIIs at the district level included district land officers and/or their subordinates. Vllage KIIs were conducted with village *mwenyekiti* and *mtendaji*, and hamlet leaders (*kitongoji*).

Qualitative Data Analysis

The study team assessed each comparison case according to the classification criteria in Table 3, triangulated from information obtained from each KII and GD conducted for that case, and the KII with the DLO from the respective district, and supplemented by descriptive anecdotes. Individual criteria listed in Table 3 were also assigned a 1-5 rating that corresponds to a Low to High spectrum, and an overall rating for each case. This was done to facilitate systematic comparison across cases, and integration of the qualitative and quantitative data. The team analyzed data from the GDs and KIIs using content analysis methods, coding text according to key themes across the KII and GD participants. The cost-per-parcel results and cost matrix are presented along with the quality classification for the MAST pilot and comparison cases, to provide an integrated assessment of the cost effectiveness of the MAST approach. The summary analysis discusses the advantages and disadvantages of the MAST process relative to other approaches, from both cost and outcome quality perspectives, and comments on the overall implications for the potential adoption of the MAST approach for formalizing land rights in Tanzania on a wider scale.

Study Limitations and Risks

The study team obtained sufficiently detailed cost information to conduct a credible cost-per-parcel comparison. However, it had to make some assumptions to proceed with the CEA due to differences in how comparison projects aggregated and reported costs, and it was not always possible to disaggregate costs to the extent desired. Given the lack of precedent for detailed analyses of per-parcel costs and associated quality of customary land formalization efforts, the study team aimed to describe the cost comparisons as systematically as possible, note the challenges encountered, state assumptions and key sources of uncertainty, and focus on estimated cost ranges rather than point estimates. Response and recall bias is a potential limitation for the qualitative component of the study, given that the interviews relied on self-reported data. Also, the findings from this study are based on a small number of comparison cases and thus their generalizability is somewhat limited. To address this, the study team aimed to select comparison cases that were typical for the comparison project approach and had context similarity with the MAST process.

OVERVIEW OF COMPARISON PROJECTS

Comaprison projects are briefly described below. Table 6 describes key context and project approach similarities and differences across the MAST and selected comparison project villages.

Tanzania Property and Business Formalization Programme

MKURABITA is a land use formalization program that operated from 2008 through 2012 in at least 51 districts in Tanzania, with a phased roll-out across a different set of districts each project year. It typically implemented CCRO delivery in 3 to 10 villages per district, with more extensive coverage in up to 25 villages in some southern corridor districts such as Mufindi, Njombe, and Rungwe. As of May 2016, MKURABITA had prepared VLUPs in at least 108 villages, and conducted parcel surveying on 106,629 plots. According to project records, it had prepared at least 63,273 CCROs by May 2016. In terms of the technology to map parcels, the project used handheld GPS together with topomaps. Teams of three district land surveyors conducted parcel mapping in villages, accompanied by two to three Village Land Use Committee members. Each land user's supporting information for the CCRO document was collected separately and entered into an Excel database. According to KIIs with DLO staff, MKURABITA aimed to work in villages with farmer-herder land conflicts in Mvomero and Rufiji Districts, since clarification of customary land rights and boundaries via the CCRO process was anticipated to help reduce such conflicts. The comparison cases for this study were drawn from project villages in Rufiji and Mvomero, two of the districts completed during the first year of MKURABITA implementation in 2008-09, and where the scope of the MKURABITA effort was similar to that of the MAST villages.

Haki Ardhi

The Haki Ardhi-supported village land use planning and CCRO delivery project was implemented in three districts (Kilolo, Mufindi, and Mkinga), covering a total of 18 villages. In Kilolo District, the project worked in 10 villages. The project aimed to sustainably protect villager land, guarantee access and land ownership rights, secure land investment interests, and address problems with land conflict, deforestation, and unsustainable cultivation. The project aimed to provide CCROs for 50 to 350 parcels in each village, with the number determined by the project budget. Haki Ardhi differs from the other comparison projects in this study, in that it did not aim for village-wide CCRO coverage or to map land for all interested villagers. Villages had flexibility to decide which parcels would be surveyed, while the project provided selection guidance that aimed for broad inclusion of parcels owned by men and women, distribution across different hamlets in the village, and consideration of vulnerable groups. According to KIIs with Kilolo DLO staff, village selection criteria for Haki Ardhi in Kilolo District was based primarily on three issues: (1) no unresolved boundary conflicts with other villages; (2) presence of outside pressures to invest in or acquire land; and (3) internal interest from villagers to obtain a CCRO.

MLHHSD

The MLHHSD-supported land formalization project in 2006 to 2013 followed a similar process as MKURABITA, in terms of the technology and overall approach. It used handheld GPS to map villager land parcels, together with topomaps in a GIS to produce parcel maps for CCROs. It also drew on satellite imagery in some districts. The project collected information from land users separately, and entered this into an Excel database. According to KIIs with Mvomero DLO staff, the project aimed to work in villages with farmer-herder land conflicts.

QUANTITATIVE RESULTS: COST-PER-PARCEL ANALYSIS

Adjusted and Unadjusted Cost Estimates

Two cost estimatesare reported: (1) the unadjusted cost-per-parcel for CCRO preparation, which draws on all of the budget data provided by MAST and each comparison project; and (2) the adjusted cost estimate that results from conservative assumptions to include missing information or exclude costs of non-comparable activities. Overall, the quantitative cost-per-parcel analyses suggest fairly wide variation in the estimated cost per CCRO prepared across the different projects and districts. Some of this variation likely relates to missing cost information from some projects, or economies of scale realized from implementation in multiple districts, even when the number of villages per district was small. Across the 15 different comparison cases, the unadjusted estimated cost per parcel ranged from $14.80 to $47.70 per CCRO prepared (reported in 2010 dollars). The unadjusted unit cost per CCRO prepared was $47.70 across the two MAST pilot villages, while the adjusted estimated cost for MAST was $32.70. After considering differences in the MAST structure, excluding village land use planning and registry renovation costs, and varying assumptions on personnel and other elements of the comparison projects via a sensitivity analysis, the adjusted cost-per-parcel range was $9.00 to $35.70 per CCRO prepared. Within that range, the estimates for half of the cases were under $20 per CCRO prepared, and the remaining half ranged from $20 to $36 per CCRO prepared.

While the estimated cost of MAST is on the higher end of the comparison, the pilot's approach appears to have provided CCROs to village land users substantially more quickly. For MAST, the per unit *time to initial CCRO delivery in the village* was estimated at 0.1 to 0.2 days per CCRO prepared, while it ranged from 0.5 to more than 8.4 days per CCRO prepared across the comparison projects (table 6). The MAST approach also scored higher on key quality criteria, with potential efficiency benefits and villagers more knowledgeable and trusting in the land formalization process.

Project and village context factors likely affected these results. The nature and implementation structure of the MAST pilot involved some costs that may be redundant under a more DLO-embedded implementation. MAST also worked through multiple partners in Tanzania, which involved additional layers of project management and oversight. The comparison projects worked more directly through district and MLHHSD staff. In addition, efforts that are smaller in scope, with fewer villages covered per district, are likely to be costlier on a per CCRO basis. Factors related to project context may contribute to variability in the unit cost of CCRO preparation across the comparison cases and can significantly affect cost when the overall project scope is small, including. Two such factors the study team identified during qualitative data collection are village topography and the presence of protracted disputes.

The study team also examined patterns in resource allocation across the comparison cases, which could relate to overall quality and sustainability of CCRO service delivery. While some of the observed differences likely stem from the different ways that projects aggregated costs[9], the proportion of resources devoted to trainings and workshops appears to have been higher for MAST (and one of the comparison approaches). The study team linked this to the overall quality of the approach, suggesting that the depth and content of sensitization efforts, and time window provided for parcel mapping in a village, had positive implications for the levels of knowledge and trust that villagers have in the process and the ability for potential beneficiaries to have their land mapped. Also, all comparison cases allocated a fairly large share of resources to personnel, which may simply be a reality of customary land formalization efforts, or offer scope for additional efficiencies by future efforts.

The qualitative data collection provided some opportunity to examine links to overall quality and the potential longer-term sustainability of anticipated outcomes, and suggested for example that the depth of sensitization efforts, and the time window made available for parcel mapping in a village, appeared to have quality implications. Thus, the extent to which MAST was able to allocate resources to conduct sensitization and training for trusted intermediaries, and fund a longer time period for teams to conduct mapping, adjudication, and verification work in villages, could be one reason why that approach appeared to fare well from a quality standpoint, despite the somewhat higher cost per CCRO prepared during the pilot stage. In other words, it may be that this somewhat higher cost could have knock-on effects for

[9] In particular, the MLHHSD and MKURABITA projects appeared to pull some of the per diem costs into personnel and/or service delivery costs. WB PSCP folded personnel costs into each service delivery activity, which is why the relative allocation to service delivery appears so high for that project.

higher quality and overall project sustainability to meet intended household social and economic objectives beyond CCRO provisioning itself.

Cost Assumptions and Sensitivity Analysis

Overall, the exploratory nature of this work highlighted some key challenges and contributors to uncertainty in trying to systematically compare per-parcel costs of land formalization efforts across different cases. There is also a lack of precedent for existing work that clearly states how per-parcel costs of land mapping and customary land certification were obtained. This initial effort may serve as a useful entry point for additional work to understand per-parcel costs of customary land formalization projects, and how such costs may relate to the overall quality and sustainability of the approach. Keeping such limitations in mind, this analysis aimed to state assumptions that were made and key sources of uncertainty, and to focus on estimated cost ranges rather than point estimates.

To improve on the accuracy of cost estimates, future efforts would likely benefit from tracking costs during project implementation with this explicit goal in mind, and perhaps also tracking effort and staff-days across each of the different steps in service delivery more explicitly to understand where greater time efficiencies might be gained. This would also include, for example, considerations of volunteer or unpaid personnel or labor contributions to activities, including that of villagers who may not always be paid allowances for their inputs, and accounting for materials and equipment used by the project that was not directly paid for with project funds.

Across all of the projects, the study team placed lower confidence in budget information related to four categories: Personnel, Facilities, Materials and Equipment, and Travel. For example under Materials and Equipment, it is unlikely that all projects reported on at least some equipment costs for items such as computers, smartphones, GPS units, GIS software, satellite imagery or other materials or equipment that DLOs already owned through other projects, but probably put to use for the current project. Due to higher uncertainty over the reliability of this type of cost information from comparison projects, most of the team's sensitivity analyses focused on varying assumptions for these costs, to understand their impacts on the overall cost-per-parcel estimate. The aim was to generate a reasonable range of estimates on cost-per-parcel across MAST and the comparison projects, which results from varied key assumptions on costs elements for which there was less certainty.

The following adjustments were also made: Exclude VLUP costs, and any costs associated with renovating or building village registries (all projects), and include estimated national staff personnel costs

(Haki Ardhi). In addition, income via project implementation was estimated for the Haki Ardhi project (as an offset to the cost-per-parcel), since fieldwork indicated that villagers had been asked to contribute a small fee for CCRO receipt (Tsh 3,000 for each individual who had any land mapped). Fee compliance was unknown, but respondents indicated it had generally been paid. Assuming that 90 percent of households paid the fee resuled in a roughly 7 percent reduction in the unit cost per CCRO prepared. Finally, per USAID's request to consider what MAST implementation costs might look like if implemented more locally, the study team made some assumptions about what local implementation might entail, informed by cost information from comparison projects, and excluded partner implementation fees and reduced the personnel effort by 45 percent as part of the adjusted calculations.

QUALITATIVE RESULTS: TRANSPARENCY, INCLUSIVENESS, EASE OF USE, TIME AND PERSONNEL CONSIDERATIONS

Overview of Quality Dimensions

The study team found that the following factors contributed to higher quality of the land formalization process under the MAST approach as compared to the more traditional mapping and CCRO delivery approaches of comparison projects (Table 9):

- Conducting extensive village sensitization efforts that devoted time and resources to multiple events within a given village, and aimed for broad knowledge on land laws, rights, gender issues, and the land mapping and CCRO delivery process. While several of the comparison projects also devoted substantial resources to sensitization efforts, the additional hamlet-by-hamlet effort and training content adopted by MAST appears to have been effective at garnering greater inclusion, feelings of inclusiveness, empowerment, and trust in the accuracy of the information, and depth of knowledge. These are important achievements for the longer-term sustainability of these activities.

- Using the more accessible smart-phone app plus Geographic Information Systems (GIS) to conduct integrated land mapping and digital collection of land user information according to GoT needs, rather than less streamlined approaches used by the comparison projects. The MAST app enabled more efficient collection of information, direct verification by land users, and substantially reduced opportunities for data entry errors that were reported to be common for the uncoupled process. The MAST technology also had a lower learning curve and enabled a more participatory team structure for land mapping, use of less costly staff, and greater flexibility for the timing and duration of land mapping in a village. In turn, this appears to have enabled a greater number of potential beneficiaries

to have their land mapped, and may provide flexibility and additional mediation resources for more protracted disputes to be resolved within the time available for mapping.

- Using village youth as trained intermediaries to conduct technical land-mapping and rights documentation work. Because these intermediaries are already located in villages, and do not require per diem expenses at the level of district staff, this approach allows for conducting parcel mapping over a longer time period, if needed. This flexibility of the MAST approach may be important from a quality and completion standpoint, where village-wide mapping is the aim. Study respondents across all of the comparison approaches expressed dissatisfaction at the short window allocated for land mapping, noting it was a key reason why many households could not have their land mapped. In the Tanzanian context, a process that can maintain quality and accuracy of parcel and land user information via a set of village staff, with reduced time required for district staff to be in the field, will likely be more cost-effective and improve the overall quality of the mapping effort.

- Having integrated, electronic transmission of the parcel data and land user information by the MAST app in a database that is automatically backed up, accessible to the DLO, and conforms to GoT standards for CCROs. The efficiencies for data entry and the potential for reducing errors in land user information appear to be salient benefits of the MAST approach for DLO staff, as compared to the approach commonly used for land formalization in Tanzania that tends to require lengthier and more error-prone manual data entry. While MAST was expected to provide more transparent and internet-accessible land user information, this expected benefit does not currently appear to be strongly important to villagers in the Tanzanian context.

In terms of time and personnel implementation requirements, there was little difference in the time to map individual parcels between the different technologies adopted across the comparison cases, which respondents agreed was most strongly driven by plot context factors rather than the mapping technology. However, the MAST process appears to have provided CCROs to village land users substantially more quickly. DLO respondents also agreed that MAST's integrated technology and streamlined process was more efficient and less prone to errors than their traditional system.

Transparency and Inclusiveness of the Mapping and Verification Process

The MAST approach appeared to be one of the most expansive with respect to the village sensitization and awareness-raising process, which helped to educate communities not only on the process and approach, but also on villager land rights and the benefits and functions of the CCRO. Group discussions

indicated positive knock-on effects for villagers' broader understanding of the mapping and verification process, overall feelings of inclusiveness and trust in the accuracy of the information, and understanding about their land record information accessibility. These are important achievements for the longer-term sustainability of the approach. Given that MAST appears to have directed a greater relative portion of its resources towards village-level training and workshops than several of the comparison projects, such resource allocation may be important.

Considering some of the associated differences observed around transparency and inclusiveness of the mapping, this may also be an area where there is a clear quality and potential longer-term sustainability benefit to the relatively costlier MAST approach. All of the projects undertook an initial village-wide meeting to inform the community about the project and the benefits of the CCRO. Following the community-level meeting, MAST and some of the comparison projects undertook additional steps to increase the reach of sensitization, and made targeted efforts to reach potentially vulnerable groups such as women, widows, the disabled, and elderly villagers who live alone. These approaches also expanded the time and availability for community members to become informed, including those who may not have been able to attend the initial meeting because of travel or other circumstances. Another difference was the meeting content and depth of information provided, with MAST and some of the other approaches appearing to include more detailed, or more effectively communicated, information on land rights and gender issues -- based on the degree to which participating villagers could describe the information and what they learned from it.

In general, MAST GD participants thought that the verification and dispute processes were fair and effective. Across all village GDs, conflict resulting in no mapping or issuance of CCROs was reported to be low. MAST villages estimated this as 10 to 25 percent of people who were interested in having their land mapped, which may have been an overestimate given that respondents also indicated it was not a serious problem. In some of the comparison cases, respondents estimated the number as 10 to 30 households. Participants across all approaches mentioned that the common sources of conflict were over boundary disputes, and internal family disputes on how to allocate family land and name beneficiaries (which often appeared to relate to inheritance issues, or uncertainty over the implications of different naming decisions on the CCRO, for inheritance issues).

Although projects seemed to have some influence in reducing conflict, none of the approaches, including MAST, appear to have distinct dispute resolution components or mediation resources. Instead they relied on villagers and community leaders to resolve conflicts on their own. Moreover, all of the approaches

would not survey the parcel boundaries for a plot if there was any existing disagreement or conflict (although for some approaches, it was unclear whether the surveyor would be in a position to know this at the time of mapping, since neighbors or land owners were not required to be present). Overall, however, GD respondents largely expressed that this was an effective and fair way of dealing with conflict, except – unsurprisingly -- for individuals present at the GDs who had not been able to continue with the CCRO process due to their inability to resolve personal land conflicts.

The post-mapping verification process also varied across the approaches. However, most projects held public meetings for the villagers to verify the information. One comparison project did this individually rather than via public process, by requesting villagers to come to the village office to review their forms. Based on the village GDs and KIIs, the verification process was an important marker of the overall perceived success and trust in the CCRO process for respondents, and a clear indication of their perception of the quality of the process. For example, when the forms came back and required a lot of corrections, land users who had been confident in the process at the beginning lost some faith in the project's accuracy as well as the capacity of the DLO. This was particularly true for projects that required multiple verification sessions before the CCROs were correct.

Quality of the Data Collection and Transmission Platform in Terms of Accuracy, Functionality, Ease of Use, and Accessibility

Overall, the qualitative data suggested some clear efficiencies and quality benefits to the MAST approach in terms of: (1) ease of use and time to achieve fluency/capacity to use the system by the technicians conducting the parcel mapping (including by trusted intermediaries rather than district surveyors); (2) error avoidance and integrated collection of land boundary and land user information and systematic transmission to an integrated electronic database that automatically links parcel boundary and user information together into a central database with built-in backup and storage (which avoids requiring land office staff to do this manually, or having to create their own electronic backup database); and (3) conformance of information collected to GoT standards for CCROs. District staff and villagers also indicated that it is less technical to learn and use the MAST smartphone application to map land and record user rights information relative to the GPS+GIS system. However, while one of MAST's intended benefits was to include wider transparency and accessibility of land user information to individual villagers via internet accessibility, GD respondents did not indicate this to currently be of strong interest or relevance to MAST CCRO beneficiaries.

Still, there appear to be some clear advantages of the MAST approach over the typical approaches to land formalization documentation adopted by the comparison projects, with benefits to overall quality of the results, time to complete the CCRO process, and the overall trust of beneficiaries in the process. The integrated entry of the land user's information during the physical process of mapping their parcel boundaries, and the automatic creation of an integrated database of the parcel boundaries linked to individual user information via the MAST system, appears to have clear efficiencies and benefits in terms of fewer data entry errors associated with the land user information. DLO staff in the KIIs mentioned erroneous land use information as a common source of errors and inefficiencies during CCRO preparation, necessitating additional staff time to correct erroneous information.

For the MAST approach, efficiencies and contributions to greater accuracy of the information listed on the CCRO document (distinct from the accuracy of the parcel boundaries and mapping) appeared to stem from at least two elements of that approach that differ from the process and technology used by all of the comparison projects. First, the land user is present for the data entry process, as it occurs during the parcel boundary mapping, and can verify the information directly as it is entered into the MAST application by the trusted intermediary. This reduces the potential for errors in the land user's information, spelling errors, or incomplete information (this is also reduced by checks in the MAST system that will not allow data entry to proceed if key elements have not been entered). Second, the MAST system automatically links a particular parcel map with a given land user individual, their photograph, and other document information, in an integrated database at the time of the parcel mapping.

In contrast, other systems require DLO staff to manually link data in the GIS to the supporting information about individual users, their beneficiaries, and boundary neighbors, and to later attach their photographs to the paper documents. This provides many opportunities for errors, which can result in CCRO documents that include the wrong names, pictures, or parcel boundaries. Data collected for the comparison projects indicated that such errors are common, and can result in long delays or inefficiencies in CCRO production. In one district that the field team visited, land officers estimated that such data entry and linkage errors resulted in up to 30 percent of CCROs containing errors that required subsequent corrections to documents. In another district, the extent of incorrect information on CCROs (including names and pictures incorrectly paired with parcel maps belonging to other individuals) was so problematic that three rounds of CCRO verification with villagers were required before the information was correctly sorted onto the CCROs. Villagers estimated that each additional verification round took three to four months, thus adding an additional six to eight months' time to the total process in that instance.

Unsurprisingly, this also shook villagers' confidence in the process and their trust in the accuracy of the information held in the district land information system. The below discussion from a village where three rounds of CCRO verification were required, due to information errors, illustrates how the contributions to error avoidance from the integrated MAST system can provide a benefit for the quality and sustainability of the land formalization effort overall.

> ***Facilitator:*** *The way I have understood, villagers were not confident with the accuracy of information and verification processes.*
> ***…***
> ***Woman #1****: During that time, villagers were confident and very happy with the verification process, but now, even if you play drums, no one will allow his/her plot to be surveyed*
> ***Facilitator:*** *During the verification process, were there complaints that villagers found their information inaccurate?*
> ***Man #2****: Yes, as said by the previous speaker, you might find your face in someone else's plot.*
> ***Facilitator:*** *But why did you say that you trusted the information collected during the verification process?*
> ***Man #3:*** *Yes, we trusted that at the initial survey process, but during the verification, they came twice or thrice asking the same information. For example, for the first time, they ask about the ownership of your picture, is it you? Who is your neighbour in the south? You verify, and agree that everything is fine. Next day when they came, you do not see yourself, the picture is replaced, or you find your face being put into another person's plot, also your picture might be with someone's wife instead of your wife and your wife is with another person or it's your face but a different name.*
> ***Facilitator #2 - DLO:*** *I would like to ask an additional question to that. Were you not confident because the mapping and verification process did not finish or you were not confident about the whole verification process?*
> ***Man #4****: As said, we trusted the initial survey process, but when we saw the inconsistency in verification process, then the ultimate confidence in the process was very hard to see.*
> Source: Comaprison Village GD, December 2016.

For both technologies, villagers expressed high confidence that the boundary information and representation of their land parcels was accurate and reflected reality. Villagers also expressed no concerns over the security of their information as held in the land information system or by the district. It could be argued, however, that without any reference point or juxtaposition of their information with underlying base maps or the VLUP, villagers may have little ability to know if their parcel maps might conflict with other land designations. In this respect, the MAST villagers noted some added benefits of the MAST system, in which a satellite base map and the VLUP are displayed during the parcel mapping of individual plots, which contributed to their high confidence in the veracity of their parcel maps.

> ***Facilitator*** *Do you think the MAST technology reflect the reality that you know]*

Man #1: *Yes, the technology reflected the reality, for example if the technology (the MAST app) says that this place is a road or a reserve, you find it to be true. …*
Woman #1: *In my opinion, I think it reflected the reality. For example, this village is near to the boundary of another village, so if you try to map close to another village, then it shows that you are in another village.*
Source: MAST Village GD, December 2016.

The study team drew on the perspective of DLO staff to report on quality of the land information system with respect to functionality, ease of use, and conformance to GoT standards for issuing CCROs. Iringa DLO staff noted that in general the MAST system provided several added benefits for ease of use and functionality over the traditional handheld GPS for mapping, coupled with entry into a GIS and manual entry and linking of the accompanying land user information. Some of the benefits noted include: the ability to remove or avoid overlapping parcel boundaries, and the ability to produce disaggregated statistics on customary land rights fairly easily (e.g., by gender or marital status). In other districts, land office staff who saw a MAST demonstration noted that the way the MAST system enables the information to go straight into an integrated electronic database appeared to be more efficient, and an improvement over the GPS+GIS system that they use. DLO staff also reported that the MAST system and accessing records within the system was easy to learn, with standard training provided. In other words, the training required was not seen as unreasonable or a necessitating a significant amount to become comfortable using the system.

However, respondents also noted that the MAST system is not without limitations and constraints that would need to be addressed for the system to be truly functional under more widespread implementation. This is to be expected, given the small scope of the initial pilot and emergent nature of the technology. But, the technology challenges associated with the MAST system are in contrast to the challenges associated with the substantially less streamlined handheld GPS+GIS approach for parcel mapping, coupled with manual data entry and linkage of land user information system that is currently the standard in Tanzania for customary land use formalization efforts. While DLO staff generally reported ease of use working in their systems and making changes as needed, provided there are staff with the requisite GIS and GPS skills, this system has several steps that require manual data entry, and is neither directly established as an electronic database nor is it automatically integrated across the parcel mapping information and the land user's information. Thus, while MAST understandably has a distance to travel in terms of full functionality of the system for large-scale implementation, there clearly are a number of benefits to data quality and functionality for facilitating accurate CCRO delivery that stem from the MAST approach in comparison to the standard system that is currently used in Tanzania

For comparison project districts that did not yet have an integrated electronic database for their CCROs, even finding a particular CCRO file can be very difficult, and it is overly time consuming and error prone to calculate any village- or district-wide statistics from paper files. As one comparison project DLO staff member commented, "Even to count the number of [CCRO] forms, for example, you are just doing it manually now."

Requirements for Implementation in Terms of Time and Personnel

In general, the study team found the time and personnel requirements for the MAST approach to be feasible and in some aspects more conducive to facilitating a high-quality land mapping and CCRO delivery process. The approach also appears to enable more villagers who would like to have their land mapped (and obtain a CCRO) to do so. One of the key findings for the overall time to measure plots was that there was very little difference between the technologies (e.g., handheld GPS+GIS versus the MAST smartphone application). Project respondents (i.e., DLO staff, villagers, and community leaders) all reported a similar range of times for mapping small and large plots, irrespective of the technology used. The main time factor for mapping different plots was the actual characteristics of the land and not the technology. Obviously larger plots took more time, but also the location of the plot and vegetation were factors. Land that was located on a slope or mountain would also take more time as well as plots that had dense vegetation or were not cleared.

Another key time consideration during the CCRO preparation process was the implementation time saved between having all the information entered during the mapping in a mobile app that they were able to later upload (MAST) versus information being taken manually by handheld GPS+GIS and then manually entered into a database. Although the study team was not able to estimate the exact time savings that result from this, DLO interviewees agreed that it was a clearly a more efficient process and less prone to errors. For Iringa, the only district that has used the MAST technology, the DLO expressed it being a positive change from using the GPS technology. During interviews with DLOs outside of Iringa, there was great interest in the MAST technology and being able to adopt it to ease the mapping.

The time and potential cost efficiencies for the MAST approach also likely resulted from the personnel requirements and team structure for parcel mapping under the pilot. Specifically, the use of the trusted intermediaries for the mapping, rather than more expensive district surveyor staff. The MAST approach was unique in drawing on villagers to implement the technical aspects of parcel mapping work. In other cases, villager participation was purely non-technical, from simply being present during mapping to supplying members of the Village Land Use Management Committee to accompany the district survey

team. While there is some precedent for training villagers on GPS and geospatial data collection in Tanzania and elsewhere, there is little doubt that GPS technology is clearly more technical and time consuming to learn than that of the mapping via the MAST app.

An additional potential benefit to using trusted intermediaries to conduct the mapping is that, because they are already located in the villages and do not entail additional per diem expenses that district staff do, it is possible to conduct parcel mapping over a longer time period, if needed. This flexibility may be important from a quality and completion standpoint, where village-wide mapping in the aim. The MAST approach had a longer window for parcel mapping than the other approaches, which generally used a fixed 3- or 10-day window for parcel survey and mapping in a given hamlet or village. GD respondents across all of the comparison projects expressed dissatisfaction at this, and noted it was a key reason why many households could not have their land mapped.

> ***Man #1:*** *there was another thing happened, other villagers were given three days as a deadline. If you miss that, there's no chance to map your land. This discouraged most people, and because of this we have other villagers who couldn't map their land*
> ***Facilitator:*** *So did you say the time was only 3 days for mapping only, or the whole process?*
> ***Man #1:*** *For example if you are given ten days, once those days are over, no additional days were granted. There were other villagers who couldn't map their land because of this and now they don't know when and how to map their plots*
> Source: Comparison Village GD, December 2016.

> ***Facilitator:*** *Let ask you one question, why some other people did not get their land measured?*
> ***Woman #1:*** *Time was too short*
> ***Facilitator:*** *Does somebody give any different reason? The committee members, why do you think so?*
> ***Land use Committee member #1:*** *Other people thought that the government want to take away their land*
> ***Facilitator*** *What sort of criteria did you use to select the eligible person's land for measuring?*
> ***Land use Committee member #2:*** *we did not have any criteria … all who wanted their land got measured*
> ***Woman #1:*** *But there were others like me who could not get my land measured, because whenever we wanted to measure my land, their time was off for the day, then next day the same happens. It happened for the three days without any luck.*
> Source: ComparisonVillage GD December 2016.

> ***Facilitator:*** *What about the whole time used in the mapping and verification process, let us say ten days, was it enough?]*
> ***Woman #2:*** *The time was limited as there were others' land could not get measured because the time was not enough*
> ***Woman #3:*** *The time was not enough because in our sub village, the exercise took like only three days to complete. Due to the population of people who needed to map their plot, three*

days is not enough. They said that if you do not belong to the sub village who receive the mapping service in that day, you could not get your land measured.
Woman #4: *Most people followed up to one week, but could not get their land measured*
Facilitator: *So, the time was not enough?*
Man #2: *Yes, time was not enough as mentioned by the women, for instance in [this] village, most plots are far away from the owners …*
Man #3: *The other reason of not succeeding in this, is having scattered plots, sometimes plots are located in places where you need to use a vehicle to get there*
Woman: 5 *Others were there during the process but did not receive the mapping services*
Source: Comparison Village GD, December 4, 2016.

Facilitator: *What sort of skills were required for the village member to participate directly in this (mapping) process?*
Man #1: *You must know how to use the smart phone*
Facilitator: *If I were to come back in this village doing the same MAST activity, do you think it is easy to get the skilled personnel?*
Collective response: *Yes, so many.*
Source: MAST Village GD, December 2016.

Drawing on villagers to conduct the mapping can also be beneficial, given that DLO KIIs indicated fairly wide variation in DLO staff availability and capacity across districts. For example, in one district, even staffing a team of three surveyors to conduct mapping for 10 villages strained the district's resources. To meet project needs, the district office borrowed surveyors from other DLOs, and also relied on university students trained in GIS to help fill personnel gaps. Other districts had a sufficient number of staff trained in GPS and GIS, but district staff per diem was a costly element of land formalization efforts. Thus, projects were constrained in how much time they could spend in villages. In contrast, the MAST approach was able to draw on villagers for much of the technical surveying and mapping work, and the villagers were also able to serve as broader day-to-day sources of knowledge on project processes and aims. One apparent result of personnel constraints is that all steps in the process are kept to a short and fixed number of days. However, qualitative data collected for this study suggest that such constraints can have clear negative implications for overall quality of the effort, with likely effects on project objectives around increased tenure security, land investment, and household economic wellbeing.

Facilitator: *[After the land mapping and verification completes, were there villagers who tried to access their information due to various reasons like transfer of ownership, wants to take loan etc?]*
Man #1: *[No, but they told us once we have CCRO, Banks are open for loans. However, since they left, now one has tried to access the information]*
Facilitator: *[Why there is no such culture of requesting land use information? Don't you have any use needs for these information?]*
Man #3: *[We have needs, but we did not have clear guidance on how we can access these information, we didn't know where to get, also we don't know even the value and use of these*

information, don't know how the transfer of ownership happens, if I want to sell, I don't know the procedures]
Facilitator: *[Do you think it is true about what our colleague says?]*
Collective response: *[Yes]*
Man #5: *[We missed that education and awareness]*
Woman #1: *[The main issue here is that awareness, yes we have CCRO, but to know that CCRO could be of big help in case of problems, that awareness is still in our minds]*
Woman #3: *[I think it is like students in the classroom, others might not get what the teacher said, may be we only understood the mapping process, but to understand the how this CCRO is more beneficial to me, I think we missed that.*
Facilitator: *[Do we have a different opinion? The committee members are 100% confident that villagers are not aware.]*
Land use committee member: *[Yes]*
Facilitator: *[Do you know where that information are being stored?]*
Widow: *[We do not know, like myself a widow, I just received it as a piece of paper]*
Source: Comparison Village GD, December 2016.

CONCLUSIONS

Cost and Quality Trade-offs

There is some evidence of a trade-off between per-unit cost and quality. While the estimated cost of the MAST approach appears to be on the higher end of the comparisons, the approach also appears to have provided CCROs to village land users substantially more quickly. There also appear to be some clear advantages of the MAST system over the typical approaches to land formalization documentation adopted by the comparison projects, with benefits to overall quality of the results, time to complete the CCRO process, and the overall trust of beneficiaries in the process. The MAST approach scored higher on key quality criteria, with potential efficiency benefits, and villagers more knowledgeable and trusting in the land formalization process.

While all of the comparison projects appeared to experience challenges in completing the culminating step from CCRO preparation to actual delivery of the document to target beneficiaries, the MAST process appears to have navigated this process fairly successfully. This is important, as delivery of the CCRO documents to individual villagers is a key objective of any land formalization process, and a crucial element of the overall theory of change for improved household tenure security and economic wellbeing through customary land formalization programs.

Key Considerations and Learning

While cost is a crucial consideration to inform scaling up, the qualitative component of this study provided an opportunity to examine differences in equally important non-cost dimensions, such as transparency and inclusiveness of the mapping and verification process, quality and accessibility of the land information compiled, and overall time and personnel resources required. Although the cost-per-parcel analysis suggested that some of the comparison approaches may be more parsimonious to achieve CCRO delivery than the MAST approach, it is not clear that the quality of service provided under such less costly approaches is as well situated to effectively meet the broader objectives of customary land formation efforts, such as reduced land conflicts, improved tenure security, increased land investment, and overall household economic wellbeing. Still, villagers across all of the comparison cases expressed a lack of certainty as to how the CCRO would ultimately help them to obtain some of the benefits purported by projects, including access to loans.

Contributions to Approaches to Cost-Accounting of Per-Parcel land Formalization Efforts and Overall Effectiveness

Although many sectors increasingly highlight the need for CEAs of development interventions, there is currently no standard CEA methodology in the land sector, and a lack of comparable existing work in this area. Given the lack of precedent for detailed analyses of per-parcel-costs and associated quality of customary land formalization efforts, the study team aimed to describe the cost comparisons as systematically as possible, and also note the challenges encountered with the adopted approach. Keeping such limitations in mind, this analysis aimed to state assumptions that were made and key sources of uncertainty, and to focus on estimated cost ranges rather than point estimates. This initial exploration of a cost-effectiveness accounting, together with quality considerations, may also serve as useful entry point for future efforts to draw on or improve.

The exploratory nature of this study highlighted some key challenges and contributors to uncertainty in trying to systematically compare per-parcel costs of land formalization efforts across different cases. This initial effort may serve as a useful entry point for other research to examine the per-parcel costs of customary land formalization projects, consider how such costs may relate to the overall quality and sustainability of the effort, and facilitate informed decisions on intervention options. To improve on the accuracy of cost estimates, future efforts may benefit from tracking costs during project implementation with this explicit goal in mind. Accuracy may also be improved by tracking effort and staff days across each of the steps in service delivery more explicitly, which may also contribute to understanding where

greater efficiencies to time and personnel costs might be gained. This would also include, for example, considerations of volunteer or unpaid personnel or labor contributions to activities, including that of villagers who may not always be paid allowances for their inputs, and accounting for materials and equipment used by the project that were not directly paid for with project funds.

To enable assessment of the cost effectiveness of different potential land formalization approaches against the longer-term outcomes that such interventions aim to promote, future work could also consider drawing on effectiveness measures obtained from rigorous surveys of beneficiaries examining longer-term outcomes that are anticipated to result from CCRO provisioning, such as measures of tenure security, conflict incidence, land rental, or investment within villages. However, this would require more extensive data collection than was possible for this study, as well as sufficient time for such potential outcomes to accrue. Understanding costs per unit CCRO and the links to quality and the likelihood of achieving longer-term project goals is an important contribution. In addition, such longer-term analyses can also ultimately enable evidence-based decisions on development programming that decision-makers are able to select interventions that are both cost effective and likely to reach quality goals.

REFERENCES

Deininger, K., D. Ali, S. Holder, and J. Zevenbergen. 2008. Rural land certification in Ethiopia: Process, initial impact, and implications for other African countries. World Development 36(10):1786-1812.

Deininger, K. and G. Feder. 2009. Land registration, governance and development: Evidence and implications for policy. World Bank Research Observer 24:233-266.

Dhaliwal, I., E. Duflo, R. Glennerster, and C. Tulloch. 2012. Comparative Cost-Effectiveness Analysis to Inform Policy in Developing Countries: A General Framework with Applications for Education. J-PAL Working Paper Accessed from: https://www.povertyactionlab.org/policy-lessons/cost-effectiveness

Levin, H. M., and P. J. McEwan. 2001. *Cost-Effectiveness Analysis*, 2nd Edition. Sage Publications Inc., Thousand Oaks, CA.

McEwan, P.J. 2012. Cost-effectiveness analysis of education and health interventions in developing countries. *Journal of Development Effectiveness* 4(2):189-213.

TABLE 1: COMPARISON PROJECT EFFORTS AND NUMBER OF VILLAGES BY DISTRICT

	Project	District	# of Villages Covered
1	MAST	Iringa*	3
2	MLHHSD	Bagamoyo	2
3	MLHHSD	Babati	4
4	MLHHSD	Mvomero*	97
5	MKURABITA	Ludewa	2
6	MKURABITA	Sumbawanga	2
7	MKURABITA	Kilombero	2
8	MKURABITA	Mbarali	2
9	MKURABITA	Rufiji*	5
10	MKURABITA	Mvomero*	2
11	Haki Ardhi	Kilolo*	10
12	Haki Ardhi	Mufindi	6
13	Haki Ardhi	Mkinga	3
14	WB PSCP	Bariadi	9
15	WB PSCP	Babati	9
		Total Non-MAST Villages	**155**

*Districts and projects included in qualitative data collection.

TABLE 2: GENERALIZED ACTIVITY STEPS FOR LAND USE MAPPING AND CCRO DELIVERY IN TANZANIA

Activity Step/CCRO program	MAST	MLHHSD	MKURABITA	Haki Ardhi	WB PSCP
Village sensitization and awareness raising on VLUP; committee formation as needed		✓	✓	✓	✓
District and village land registry establishment and capacity building	✓	✓	✓	✓	✓
Obtain and process satellite images	✓	✓			✓
Village land survey and boundary demarcation; issuance of Certificate of Village Land		✓	✓	✓	✓
Prepare and implement participatory VLUP; prepare and approve village by-laws		✓	✓	✓	✓
Village sensitization and awareness raising on CCROs, including:[a]	✓	✓	✓	✓	✓
Villager training on land laws	✓				
Selection and training of trusted intermediaries	✓				
Training of Village Executive Officers or Village Land Use Management Committee	✓	✓	✓	✓	✓
Parcel surveying and adjudication within villages	✓	✓	✓	✓	✓
Information download, plotting of parcel maps	✓	✓	✓	✓	✓
Verification of parcel maps and CCRO document information within villages	✓	✓	✓	✓	✓
Public verification and village wide consent	✓	✓	✓		?
Individual verification	✓	✓	✓	✓	?
CCRO preparation and finalization, including document printing	✓	✓	✓	✓	✓
CCRO registration and issuance to beneficiaries[b]	✓	✓	✓	✓	✓

✓: Project records indicate this was done for a subset of project villages, when not completed prior to project arrival.
?: Not clear from project documentation.
[a]: Based on incomplete information; specific village-level training is highlighted where it differs across the projects listed.
[b]: Although CCRO delivery is an overarching objective for all of the projects, the qualitative fieldwork indicated that projects differed in the extent to which they funded and facilitated all aspects of CCRO registration and issuance.

TABLE 3: CLASSIFICATION MATRIX FOR QUESTION 1B

Dimension/ Quality Criteria		High (score: 4-5)	Medium (score: 3)	Low (score: 1-2)	Information Source for Scoring
I. Transparency and inclusiveness of the mapping and verification process	*Inclusive sensitization*	• The project included widespread information and sensitization outreach targeted to all villagers and including distinct efforts to reach vulnerable groups.	• The project included some information and sensitization outreach but did not reach all villagers or specifically aim to reach vulnerable groups.	• The project did not include widespread information and sensitization outreach targeted to all villagers and including distinct efforts to reach vulnerable groups.	• Village KII and GD
	Broad understanding of process	• Nearly all villagers (at least 90%) understood the mapping and verification process.	• Many villagers (between 50-90%) understood the mapping and verification process, but others did not.	• Less than 50% of villagers understood the mapping and verification process.	• Village KII and GD
	Broad consultation	• The verification process included consulting nearly all villagers, including men and women, and members of vulnerable groups.	• Verification included a process of consultation, but some villagers were not aware of the process, including members of vulnerable groups.	• The majority of villagers were not consulted about verifying claims, including many members of vulnerable groups.	• Village KII and GD
	Fairness of verification and dispute resolution process	• Nearly all villagers perceived the verification process and approach to resolving disputes as fair.	• Many villagers perceived the verification process and approach to resolving disputes as fair, but others did not, including members of vulnerable groups.	• Less than 50% of villagers perceived the verification process and approach to resolving disputes as fair.	• Village KII and GD
	Effectiveness of verification and dispute resolution process	• Nearly all villagers perceived the verification and dispute resolution process as effective; all or nearly all disputes that arose during verification were resolved in a way that did not prevent households from receiving CCROs.	• Many villagers perceived the verification and dispute resolution process as effective, but others did not, including members of vulnerable groups; with some exceptions disputes that arose during verification were resolved in a way that did not prevent households from receiving CCROs.	• Less than 50% of villagers perceived the verification process and approach to resolving disputes as effective; many disputes that arose during verification that were not resolved and prevented households from receiving CCROs.	• Village KII and GD
II. Quality of the land information system (data collection and transmission) in terms of accuracy, functionality, ease of use and accessibility	*Accuracy*	• District staff and villagers have high confidence that the information held in the land information system is secure and reflects reality.	• District staff and villagers have some confidence that the information held in the land information system is secure and reflects reality.	• District staff and villagers have low confidence that the information held in the land information system is secure and reflects reality.	• Village KII and GD • DLO KII
	Functionality	• District lands staff report few and only minor problems accessing and changing user land information in system.	• District lands staff occasionally encounter major difficulties in accessing and changing land records.	• District lands staff frequently encounter major difficulties in accessing and changing user land information.	• DLO KII
	Ease of use	• The process to access land information records from the system is clear and	• The process to access land information records from the system requires	• The process to access land information from the system is	• DLO KII

Dimension/ Quality Criteria		High (score: 4-5)	Medium (score: 3)	Low (score: 1-2)	Information Source for Scoring
		feasible for typical district staff, to use for their land administration needs; it requires minimal training by peers to learn.	substantial training, but with training system use is feasible for typical district staff, to use for their land administration needs.	unclear and infeasible for typical district staff, for their land administration needs; challenges not easily resolved with peer-to-peer training.	
	Conformance to standards	• Accuracy and functionality of the data exceeds MLHHSD requirements.	• Accuracy and functionality of the data meets MLHHSD requirements.	• Accuracy and functionality of the data fails to meet MLHHSD requirements.	• DLO KII
	Information accessibility to village land users	• Detailed land information sufficient to meet a village landholder's typical needs is easily accessible; villagers report very few or no concerns over access and/or the information content that is available.	• Some but not all of the land information sufficient to meet a village landholder's typical needs is easily accessible; villagers report moderate concerns over access and/or the information content that is available.	• None of the land information sufficient to meet a village landholder's typical needs is easily accessible; villagers report serious concerns over accessing land information, and/or information content.	• Village KII and GD • DLO KII
III. Implementation requirements in terms of time and personnel at both the village and district levels	*Reasonable time to implement*	• Time required to survey a typical village (400-700 HHs) is less than one month.	• Time required to survey a typical village (400-700 HHs) is between one and two months.	• Time required to survey a typical village (400-700 HHs) exceeds two months.	• Village KII and GD • DLO KII
	Feasible personnel requirements	• There are few difficulties recruiting enough personnel with the qualifications needed to implement the methodology	• There is a shortage of personnel with the qualifications needed to implement the methodology; there may be some difficulties fielding multiple teams for large scale implementation.	• There is a shortage of personnel with the qualifications needed to implement the methodology; this is likely to significantly inhibit implementation on a large scale.	• Village KII and GD • DLO KII

TABLE 4: COMPARISON PROJECT SELECTION CRITERIA ACROSS PROJECT, DISTRICT AND VILLAGE FACTORS

1. ***Project factors***
   - (P1) Similar land mapping technology as MAST: handheld Global Positioning System (GPS) used in conjunction with topomaps, satellite imagery or aerial photos
   - (P2) Similar set of project activities and intensity of effort devoted to each (although timing and process for each step may differ across projects), including:
     - Awareness raising and sensitization
     - Village land use planning[10]
     - Parcel mapping and adjudication/disputes resolution
     - Field verification processes
     - CCRO registration and issuance[11]
   - (P3) Project scale within the selected district: few villages versus widespread effort
   - (P4) Village selection criteria or targeting, especially with respect to existing land conflicts
   - (P5) Household targeting within project villages:
     - Project aims for broad coverage of most/all households or a more selective effort?
     - Anyone can participate, or only those who meet particular criteria?
   - (P6) Detailed cost information that can be disaggregated across CEA ingredients categories
2. ***District context factors***
   - (D1) DLO and District Office land capacity and experience
   - (D2) District accessibility to Iringa District or Dar es Salaam[12]
   - (D3) Project involvement by current personnel in the DLO, to ensure the ability to obtain implementation information about the project from district staff
3. ***Village context factors***
   - (V1) Proximity to district center[13]

[10] MAST was designed to operate after VLUPs had already been finalized in a village. In some comparison projects identified for this study, the VLUP effort was folded into the project, however, because the costs associated with that effort were itemized, the study team will be able to exclude them as needed in the final CEA results.
[11] Although CCRO delivery is an overarching objective for all, the projects differ in the extent to which they funded and facilitated CCRO registration and issuance. Such differences will also be considered and adjusted for in the final CEA results.
[12] Included only to ease the field logistics for the data collection; all else equal, districts that were close to Iringa or Dar es Salaam were selected, to complete the field work in a timely manner.
[13] Included for logistical purposes and to ensure similar accessibility to the DLO for the comparison and the MAST villages.

- (V2) Village was not first or last one completed by the project, to ensure representativeness of typical implementation
- (V3) Primary land uses
- (V4) Primary economic and livelihoods activities
- (V5) Socio-economic and demographic characteristics (relative poverty and education level)
- (V6) Types and relative level of pre-existing land rights issues and disputes (e.g. large-scale investment activity or concerns, intra-household or inter-village boundary disputes, inheritance disputes, farmer-pastoralist disputes)[14]
- (V7) Similar topography/accessibility of parcels within the village as MAST pilot villages[15]
- (V8) Parcels mapped per village and number of CCROs planned for household delivery was similar to the MAST pilot village effort, or at least exceeds 100 plots surveyed and CCROs issued (to exclude villages where the comparison project effort was very limited in scope)

TABLE 5: RESPONDENT TYPES

KII Protocol Category	**# of KIIs/Respondents**
1. Village Chairman, Executive Officer or other village government representative	6 (2 MAST pilot villages and 4 comparison project villages)
2. District Land Officer	4 (1 MAST pilot district and 3 additional districts where comparison projects were located)
GD Protocol Category	**Total # of GDs**
Cross-section of 10-15 land users who had: a. Land mapped through MAST or a comparison project (regardless of CCRO receipt); or b. Not participated, or dropped out prior to CCRO preparation.	6 (2 MAST pilot villages and 4 comparison project villages)

[14] All of the selected villages had these issues, although there was some variation in the extent of certain kinds of conflict.
[15] In practice this was difficult to control for adequately, since some of the districts were located in areas with more topography than others, while in other accessibility issues related more to the season during which the mapping was conducted.

TABLE 6: SUMMARY OF VILLAGE CONTEXT AND TIME TO CCRO PREPARATION

District	Iringa	Iringa	Kilolo	Mvomero	Mvomero	Rufiji
Project	**MAST**	**MAST**	**Haki Ardhi**	**MLHHSD**	**MKURABITA**	**MKURABITA**
Village Name	Itagutwa	Kitayawa	Lyamko	Lukenge	Melela	Nyamwege
Population	1,672	2,118	2,139	2,227	3,052	4,997
# of households	441	546	~560	~580	826	1,234
Distance to district town (km)	30	22	50	~100	35	32
Key village context	Good road access	Good road access	External land investment pressure, for tree farms; more isolated	Borders a sugarcane plantation; farmer-herder conflict; more isolated	Farmer-herder conflict; good road access	Forest and sugarcane cash crops; farmer-herder conflict; good road access
Year of land mapping	2015	2016	2014	2014	2009	2008
Sensitization and awareness raising	2 weeks	2 weeks	2 weeks	2 weeks	7-14 days	2 weeks
Time allotted for parcel mapping	1 month	~ 1 month	10 days per hamlet (fixed by project)	10 days per hamlet (fixed by project)	10 days	2 weeks
Mapping and verification time (includes district preparation time)	1.5 - 2 months	~ 3 months	1-2 months	5 months	Not available	1 year[1]
Time to receive CCROs, after verification	3-4 months	~5-6 months	3 months	3 months	~ 6 years	> 9 years
Total time from sensitization to CCRO receipt (from villager perspective)	5-6 months	8-9 months* (expected)	5-6 months	8 months	6 years	10+ years*
Land mapping team structure	8-15 trusted intermediaries from village	8-15 trusted intermediaries from village	3 survey experts from district, and 2-3 from VILUM	3 survey experts from district, and 2-3 VILUM	3 survey experts from district, and 2-3 from VILUM	3 survey experts from district, and 2-3 from VILUM
Villagers involved in technical mapping roles	Yes	Yes	No	No	No	No
# of CCROs prepared	1126	1878	353	~250-500 (estimated)	769	437
Overall time per CCRO received[2]	0.2 days / CCRO	0.1 days / CCRO	0.5 days / CCRO	0.5 - 1.0 days / CCRO (estimated)	2.9 days / CCRO	> 8.4 days / CCRO

* Villagers were still waiting to receive CCROs at the time of the field work for this study, in part because they had not finished building the village registry required by GoT to store the CCROs.

[1] Three rounds of verification were conducted to correct errors, contributing to a longer time period relative to other villages.

[2] This is calculated similar to the overall cost-effectiveness measure, drawing on the villager's perspective on time to CCRO receipt. It is calculated as: the number of CCROs prepared/overall time from sensitization activities in village to CCRO receipt.

TABLE 7: COST ADJUSTMENTS SUMMARIZED BY PROJECT AND DISTRICT

Comparison Project	District	CCROs Prepared	Total Villages	Year	Cost per CCRO (2010 dollars)	Adjusted cost per CCRO (2010 dollars)	Adjustments
MLHHSD	Babati	4400	4	2012	15.0	9.0	a
MLHHSD	Bagamoyo	4100	2	2006	32.0	9.3	a,b
MKURABITA	Kilombero	2678	2	2012	14.6	11.1	a
MKURABITA	Ludewa	2126	2	2012	19.6	15.4	a
MKURABITA	Mvomero	2064	2	2010	19.7	16.3	a
MKURABITA	Rufiji	1995	5	2009	22.9	18.9	a
HAKIARDHI	Mkinga	901	3	2015	14.8	21.5	c
MKURABITA	Mbarali	1463	2	2010	27.2	22.9	a
WB PSCP	Babati	17500	9	2010	29.3	24.5	a,b
HAKIARDHI	Mufindi	1313	6	2015	19.9	26.6	c
HAKIARDHI	Kilolo	1852	10	2015	23.3	30.0	c
WB PSCP	Bariadi	17500	9	2010	34.3	30.3	a,b
MAST	Iringa	3017	2	2015	47.7	32.7	d
MKURABITA	Sumbawanga	947	2	2010	42.3	35.7	a
MLHHSD	Mvomero	5000	97	2013	143.8*	143.8*	n/a

* This estimate is disregarded due the inability to separate out survey and adjudication costs for CCRO delivery in a small number of project villages, and those related only to the VLUP in other project villages.

[a] VLUP costs removed.

[b] Registry renovation costs removed.

[c] Personnel costs estimated (staff increased)

[d] Personnel staffing effort reduced by 50 percent; overhead costs removed.

TABLE 8: MAST AND COMPARISON APPROACH SCORING ON QUALITY DIMENSIONS

Criteria	MAST	MLHHSD	Mkurabita - Mvomero	Haki Ardhi	Mkurabita - Rufiji
I. Transparency and inclusiveness of the mapping and verification process					
Inclusive sensitization *(Villagers)*	5	3	4	3	4
Broad understanding of process *(Villagers)*	3	3	3	2	4
Broad consultation (verification) *(Villagers)*	4	3	4	3	4
Fairness of verification and dispute resolution process *(Villagers)*	4	3	4	3	3
Effectiveness of verification and dispute resolution process *(Villagers)*	4	3	4	4	3
Section Total	20	15	19	15	18
Section Mean	4.0	3.0	3.8	3.0	3.6
Section Score (%)	0.80	0.60	0.76	0.60	0.72
II. Quality of the land information system					
Accuracy *(District Officers)*	4	4	4	3	4
Accuracy *(Villagers)*	5	4	4	4	2
Functionality *(District Officers)*	3	4	4	2	3
Ease of Use *(District Officers)*	3	4	4	2	2
Conformance to standards *(District Officers)*	5	4	4	3	3
Information accessibility to village land users	4	2	3	3	2
Section Total	24	22	23	17	16
Section Mean	4.0	3.7	3.8	2.8	2.7
Section Score (%)	0.80	0.73	0.77	0.57	0.53
III. Requirements for implementation in terms of time and personnel at both the village and district levels					
Reasonable time to implement *(District Officers)*	3	3	3	3	3
Reasonable time to implement *(Villagers)*	3	2	2	2	3
Feasible personnel requirements *(District Officers)*	4	4	4	2	3
Feasible personnel requirements *(Villagers)*	4	2	3	3	4
Section Total	14	11	12	10	13
Section Mean	3.5	2.8	3.0	2.5	3.3
Section Score (%)	0.70	0.55	0.60	0.50	0.65
Overall Total	58	48	54	42	47
Overall Mean	3.8	3.1	3.5	2.8	3.2
Overall Percentage (%)	0.8	0.6	0.7	0.6	0.6

Color Codes:	Rating	Score	Percentage
	Good	4 or 5	75 - 100%
	Med	3	55 - 74%
	Low	1 or 2	0 - 54%

FIGURE 1: STUDY DISTRICTS FOR QUALITATIVE DATA COLLECTION

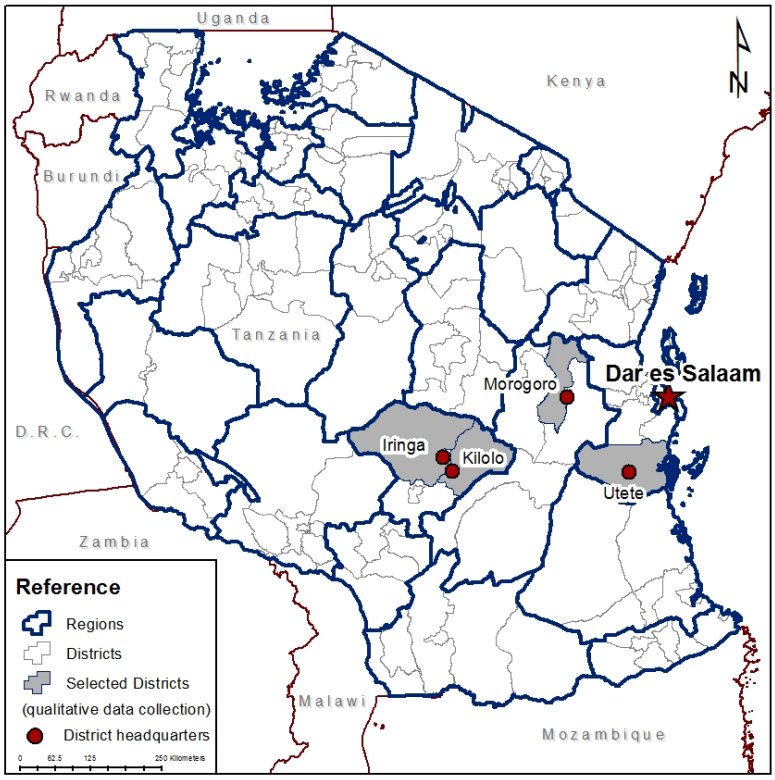

FIGURE 2: RESOURCE ALLOCATION BY INGREDIENTS BASKETS (ADJUSTED COSTS)

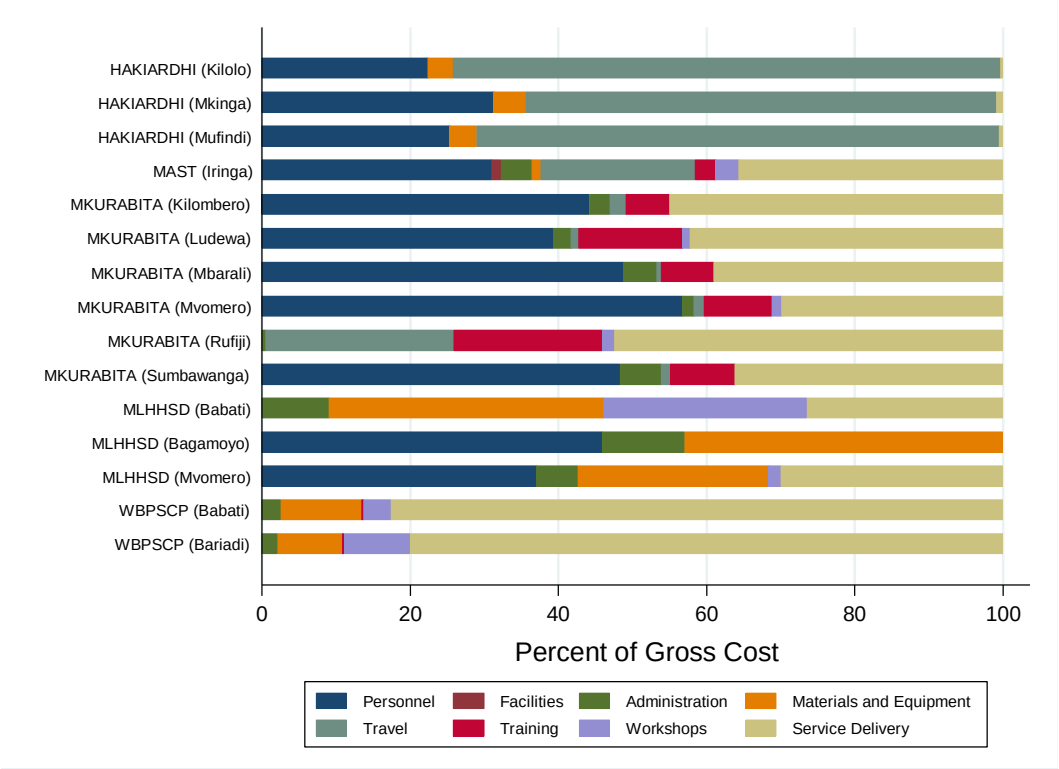

FIGURE 3: ESTIMATED PER UNIT COST RANGE PER CCRO PREPARED