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# Mobile Applications for Secure Tenure (MAST) and the Technical Register for Social Tenure (TRUST) – development and applications in Iringa and Mbeya Districts in Tanzania

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**Abstract**

Following completion of pilot work using the Mobile Application for Secure Tenure (MAST) in three villages in Iringa District, Tanzania, in June 2016, the U.S. Agency for International Development (USAID) commissioned the Land Tenure Assistance activity (LTA) under the Feed the Future program to add 41 more villages (estimated at 50,000 to 60,000 parcels) in the Southern Agricultural Growth Corridor of Tanzania (SAGCOT) in Iringa and Mbeya districts. The project is also assisting with low-cost methods for village land use planning.

The project commenced in December 2015 and will run through December 2019. It provides assistance to district- and village-level authorities in the delivery of land tenure services under the village land laws and acts of Tanzania.

All aspects of LTA are centered on developing workable, rapid, low-cost, transparent, and replicable procedures for first registration and subsequent transactions. Implicit in this goal is the need to streamline and package service delivery—both at village- and district levels—in such a way as to achieve full public buy-in at the lowest possible cost. To achieve this, LTA has developed and extended MAST as an adaptable data capture tool to support procedures and best practice for the first registration of land under Tanzanian land regulations.

For the long-term maintenance of the registers at village and district levels, LTA is developing the Technical Register Under Social Tenure (TRUST). TRUST will extend the basic philosophy of MAST and provide a district- and village-based system for managing transactions and maintaining the registers in the longer term using simple open source technology. TRUST will seamlessly link with the MAST functionality. Both systems will complement low-cost training and field and office procedures that are also being refined through LTA.

The project is ongoing and significant progress is being made. Capacity building at both village and district levels is progressing through learning by doing; the MAST software has been significantly improved; and development and testing of the TRUST software is now well advanced. Streamlined field procedures are now being implemented and improved. To date, LTA has completed mapping for more than 29,000 parcels in 22 villages. More than 22,000 Certificates of Customary Rights of Occupancy (CCRO) have been registered at an average cost of less than $10 each. Batch processing/production of

CCROs has enabled issuance on a scale never before achieved at the district level.

The process of village land use planning is also being supported and LTA has completed more than 20 village land use plans at an average cost of $1,800 per plan.

LTA has developed replicable, low-cost models for land use planning and first registration and subsequent maintenance of land administration at village and district levels. The land administration models are currently under development and being tested. These are now sufficiently developed and refined to enable planning for implementing in other districts and drafting a national plan. Understanding of best practices, operational requirements, and recording and data management issues is increasing. Capacity of village leaders and residents, as well as district authorities, has been strengthened and public interest is strong. Significant progress is being made toward implementation of Tanzania's land laws on several fronts. LTA has played, and continues to play, a lead role.

These developments have been well received by the Ministry of Land Housing and Human Settlement Development, which has recently moved to implement MAST in its projects as well as the processes used by LTA with other donor partners and government-funded land registration programs.

This paper describes progress and ongoing developments.

**Key Words:**

**Land administration; land registration; land use planning; mobile applications; low-cost procedures and processes; gender and youth; district and village institutions; participatory planning; public outreach; Tanzania: USAID**

**List of Abbreviations:**

| | |
|---|---|
| **MLHHSD** | **Ministry of Lands, Housing and Human Settlements Developments** |
| **SAGCOT** | **Southern Agricultural Growth Corridor of Tanzania** |
| **LTA** | **Land Tenure Assistance** |
| **CCRO** | **Certificate of Customary Right of Occupancy** |
| **MAST** | **Mobile Application to Secure Tenure** |
| **TRUST** | **Technical Register Under Social Tenure** |
| **VLUP** | **Village Land Use Planning** |
| **PLUM** | **Participatory Land Use Management** |
| **NLUPC** | **National Land Use Planning Commission** |
| **USAID** | **U.S. Agency for International Development** |
| **DFID** | **U.K. Department for International Development** |

# Mobile Applications for Secure Tenure (MAST) and the Technical Register for Social Tenure (TRUST): Development and Applications in Iringa and Mbeya Districts in Tanzania

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## 1. Background and Context

The U.S. Agency for International Development (USAID) has invested in several agricultural projects in the Southern Agricultural Growth Corridor of Tanzania (SAGCOT) and is seeking to develop focused land tenure programing to support its existing and planned investments in the region. The Feed the Future Tanzania Land Tenure Assistance (LTA) activity works in the districts of Iringa and Mbeya to assist local authorities in the delivery of land tenure services under the Land Act No 4, 1999, the Village Land Act No. 5, 1999, and the Land Use Planning Act No. 6, 2007.

From 2015 to 2019, LTA will clarify and document land rights, support land use planning efforts, and increase local understanding of land use and land rights. It is anticipated that the interventions will reduce land tenure-related risks and lay the groundwork for sustainable agricultural investment for both small land holders and commercial investors throughout the corridor, and in the value chains of interest for SAGCOT.

LTA's goal is to empower district and village land institutions, build capacity in land administration processes, and enable local authority administrations to function independently, with little or no outside financial support or assistance when LTA concludes. LTA will therefore collaborate and coordinate with the central and local Government of Tanzania and other donor partners. LTA work is being implemented under four activities:

- ***Activity 1:*** *Assist villages and District administrations leaders and institutions in completing the land use planning process and delivering Certificates of Customary Rights of Occupancy (CCROs) in selected villages within Iringa and Mbeya.*
- ***Activity 2:*** *Educate and build capacity of village land governance institutions and individual villagers to complete the land use planning and CCRO process, effectively manage land resources, respect women's, youth, and pastoralists' land rights and build agriculture-related business skills.*
- ***Activity 3:*** *Educate and build capacity of district-level land governance institutions in Mbeya to complete the land use planning and CCRO process (to be conducted in 2018).*
- ***Activity 4:*** *Build capacity to use the Mobile Application for Secure Tenure (MAST) throughout the SAGCOT and nationally.*

Activities 1-3 require the development of land administration and land use planning capability at district and village levels while Activity 4 specifies development of capacity to make use of MAST in land administration with a longer-term view of scaling up. Following completion of one-year pilot work[1] using MAST in three villages in Iringa in 2015, LTA[2] commenced in December 2015. LTA will scale up from three original pilots to a further 41 villages (estimated at 50,000 to 60,000 parcels) in the SAGCOT corridor in Iringa and Mbeya. The project is also assisting with low-cost methods for village land use planning.

Significant progress is being made in partnership with the district and village authorities. To date, the project has completed mapping of more than 29,000 land parcels in 22 villages with more than 22,000 CCROs printed and registered. The collection rate of CCROs was 88 percent at the end of 2017. Streamlined cost-efficient field procedures, making use of MAST, are being implemented and refined. Batch processing and production of CCROs has enabled issuance on a scale never before achieved at district level (up to 500 CCROs per day can now be printed from the system with two registration teams of four people per team). Capacity building at both village and district levels is progressing through learning by doing. The pace of work is increasing; costs are gradually reducing.

The Government of Tanzania's continued requirement to respond to the increasing interest and urgency to respect, clarify, and document the land rights of local populations, and to improve the overall land administration in the country are well known. The current systems of tenure land laws, and acts that support them in Tanzania, have been subject to numerous reviews and analyses. Nevertheless, many field initiatives to accelerate the process of bringing the laws into effect and delivering effective land administration and tenure security to areas where it is most needed continue to be slow. Local authorities struggle to manage and meet the requirements of the legislation in a reasonable timeframe. The costs of implementation, managing, and improving current land tenure arrangements are high and experience is often not available.

LTA is designed to address these imperatives, focusing specifically on regularization of land through district and village initiatives.

## 2. Mobile Application for Secure Tenure (MAST)

[1] Implemented by Cloudburst US, 2015-16
[2] Contract was awarded to DAI Global LLC in December 2015.

MAST[3] can be used on tablets or smartphones to capture data for land parcels and rights holders in villages. MAST records parcel boundaries and related adjudication information in mobile devices within a given set of simple field procedures. In the field, operators, known as para-surveyors, use mobile devices with GPS enhancers to increase accuracy, and work with village landholders and leaders to identify and record boundary and claimant information. These data are then used to register rights and provide legal title to land to approved claimants.

MAST supports display of raster image data (MBTiles) that facilitate the identification and recording of data points and corresponding parcel boundaries on an image backdrop to create polygons—land rights holders are recorded as attribute textual information—data can be recorded without mobile network coverage.

MAST alone does not provide secure tenure, as its name implies, but serves as a data capture and output tool in a sequence of processes for first registration involving public consultation, adjudication, and demarcation of land parcels and public display for objections and corrections, title preparation, registration, and issuance. In practice, MAST is designed to streamline procedures for the collection analysis and processing of data in support of the wider strategy for systematic first registration and regularization of tenure and the application of all related legal, regulatory, and procedural requirements. MAST is *not* a substitute for procedures but, under LTA, has been customized as a data tool to fit procedures and business logic rules for both field and office situations. Crucially, customization has also sought to address scalability and ongoing registry maintenance issues with regard to day-to-day transactions and maintenance of the register, through transition from MAST to TRUST.

The MAST system was originally piloted in three villages in Iringa from February 2015 to May 2016. Under the pilots[4], MAST was deployed using mobile phones and a web application deployed to the Amazon Cloud capturing land claims, parcel boundary, and rights holder information collected in villages. This was uploaded to a cloud-based platform and a web application hosted at the District Land Office (DLO). The resulting data was checked, "cleaned," and edited to enable the completion of adjudication forms and preparation of CCROs for signature and issuance to claimants. Under this system, a total of 1,970 CCROs were prepared and issued.

[3] Other USAID-funded versions of MAST being used in other countries, this paper, refers to MAST, which was adapted and improved on earlier versions of the original MAST. A version is in use in Burkina Faso and a different version is in use in Zambia. The authors are also aware of other private sector mobile applications in use for similar purposes.

[4] Implemented by Cloudburst US

Given that systematic registration in rural Tanzania had not been undertaken before at the scale deployed for the pilots, no formal strategy or procedures were in place. This resulted in an over-reliance and focus on the use of MAST as a solution, rather than as a tool in an overall process that allowed for implementation of safeguards in both field and office situations in line with regulations and best practice. This effectively meant that MAST—in its pilot form—could not be applied at scale.

Scaling up the use and application of MAST is one of the key tasks to be implemented under LTA. This has inevitably required further development of field procedures and of the functionality of MAST to cover the proposed 41 villages in Iringa and Mbeya. Tanzania currently has one of the lowest land registration records in Africa at less than 10 percent for individually owned land. In practice, all aspects of LTA work are centered on developing workable, rapid, low-cost, transparent, and replicable procedures for first registration and subsequent maintenance and transactions under sustainable land administrations at the village and district levels. The work also allows for provision of land use planning services to villages. Implicit in this goal is the need to streamline and package service delivery in such a way as to achieve full public buy-in at the lowest possible cost.

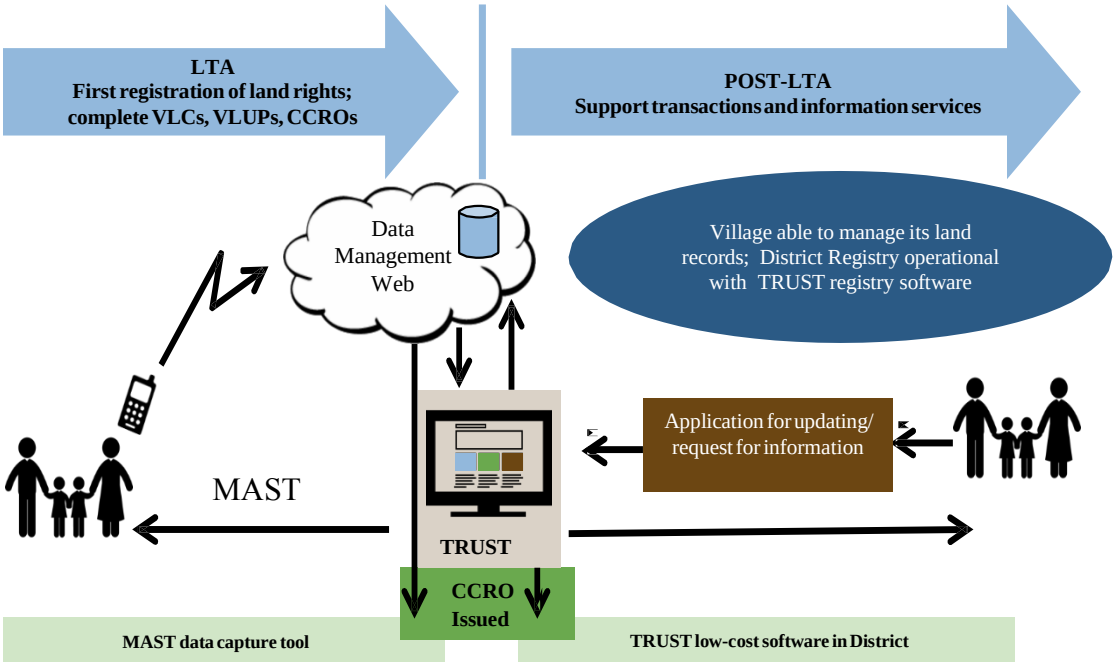
LTA has now completed significant improvements and extensions to MAST's functionality, making it an adaptable, open source data capture and management tool that supports sequential procedures for the first registration of land under Tanzanian land regulations.

### 3. Technical Register under Social Tenure (TRUST)

For the long-term maintenance of the land registers at village and district levels, LTA is developing the Technical Register Under Social Tenure (TRUST). TRUST will extend the basic philosophy of MAST and provide district and village systems for managing and maintaining registry records and transactions. TRUST will seamlessly link with the MAST functionality. A conceptual model of the project and its components is set out in **Figure 1**.

Both systems will complement low-cost field and office procedures that are also being developed and refined through LTA. When complete, TRUST will play a role as land registration software, supporting transactions within a district, allowing ongoing maintenance of adjudicated rights as well as new registrations as systems and service delivery takes hold.

**Figure 1**
**Conceptual Diagram of MAST TRUST**




As with the development of the new version of MAST, TRUST development will be phased according to existing and projected demand. Following the development stage, TRUST will be introduced on the district server and training carried out for the district staff. After the training, pilots will be run, making use of the new first registration data and records and existing records. Development and testing of the TRUST software is now well advanced and is due in the first quarter of 2018.

## 4. Summary of Procedures for Land Use Planning

LTA includes support of preparation of village land use plans (VLUPs) for those target villages where this has not already been completed as required under Tanzanian legislation. This support is being provided through capacity strengthening. Costs have been reduced through the more efficient use of district and government personnel in smaller facilitating teams, improved training of village committees that have improved their understanding and appreciation of the process, and the use of MAST and its base imagery which has reduced the number of days spent in the field.

**Figure 2a** sets out the main procedures for VLUP, adapted from the current Government of Tanzania guidelines. This shows a shortened field and office process that take approximately 10 days to complete at an average cost of $1,750 per village. The renewal requirements are 10 years with an estimated renewal

cost of $950 per plan, per village.

## 5. Summary of Procedures and Processes for First Registration

The most important function of participatory first registration is to clarify rights in land and access to land and its resources.

The process of implementation of planning and registration can bring into focus long running issues and disputes and provide a platform for these to be considered, legally documented, and eventually resolved. The outcome is a village land use plan and a register of individual rights (accompanied by CCRO issuance to rights holders) and a listing of disputes, supported by field evidence that must be resolved through village institutions. Communities often commend the process, and with guidance and minimal training are able to effectively minimize disputes and manage records and resources with little support from the DLO.

The procedures used require all land owners or claimants of rights in land (individuals or groups) in a designated village area to participate in planning and registration processes.

Low-cost, systematic first registration systems are normally undertaken through a given set of sequential procedures. Each procedural step has its own set of sub-procedures that contributes to the work flow. These are best practices, and are summarized as follows:

i) Village selections and linking with the village authorities
ii) Local information dissemination and training—selection of village personnel
iii) Demarcation and adjudication of land, including recording parcel boundaries personal details and parcel numbers, and hearing and recording objections in the field (MAST)
iv) Checking and compilation of records
v) Publication of adjudication record in the village (parcel maps and the listing of claimants)
vi) Objections and corrections period, finalizing the record and disputant lists
vii) Preparation of documents and registration
viii) Issuance campaign and ceremonial issuance of CCRO documents to claimants
ix) Transactions and registry maintenance—ongoing

The first six steps are largely administrative and are undertaken to a set of field procedures using simple general boundary demarcation and recording methods. The final three steps are legal or have legal outcomes that require the results of all the other steps to be completed. In practice, MAST and TRUST are tools that can be applied at key stages in this procedural sequence. This requires the business logic and rules

of the system be clarified to determine what, where, and how improvements may be made. The steps and procedures and their relationship with each other are summarized in **Figure 2b.**

Following detailed needs assessment and reviews of the procedural framework and its applications in Tanzania, changes were made to MAST to meet best practice, procedural, and operational requirements. These changes (summarized below) have all been implemented through an iterative and incremental software development process, in line with regulatory and procedural requirements, and are now currently in use on the project. The changes to MAST incorporate all the best practice procedures associated with low-cost registration and are specifically designed to improve service delivery, data quality, and ongoing monitoring.

MAST is a capture tool in item (iii), demarcation, and adjudication data capture. With the changes made by LTA, MAST now provides for more effective record quality checks and management tools for printing and displaying. This has beneficial consequences for transparency for all other tasks (iv—ix). First registration, batch processing of adjudication forms, and CCROs are now functioning at rates never before achieved in the target districts.

Item (viii) requires a proper issuance campaign and ceremony. This has replaced the old system of ad-hoc issuance according to claimant attendance at the village office. Since the introduction of this procdedure, issuance rates have increased considerably. Subsequent processing and maintenance under TRUST will ultimately come under item (ix).

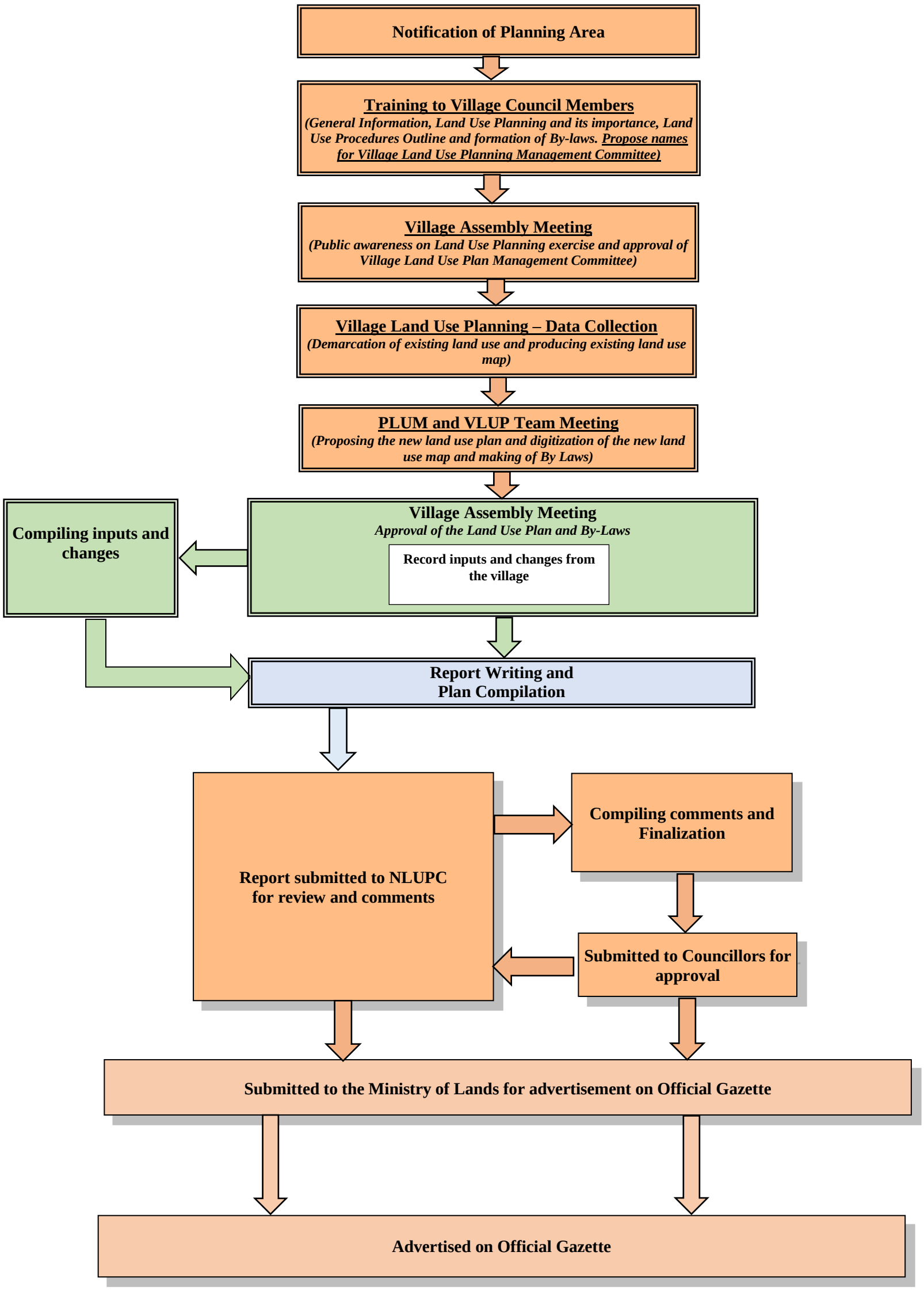
## 6. MAST—Fit for Purpose Software for Registering Rights

The existing MAST (as applied in the 2015-16 Pilots), was designed around three modules:

i) Administration module; defining project (individual village) related information, users, and managers (ie, setting up a village, information on village chairperson, and committee members)
ii) Mobile configuration tool; defining map layers and attribute data captured in the mobile application
iii) Data management tool with a user interface; with editing, display, printing tools, and also the printing of adjudication sheets, and CCRO certificates—only new CCRO parcels are captured. Existing CCROs are not captured.

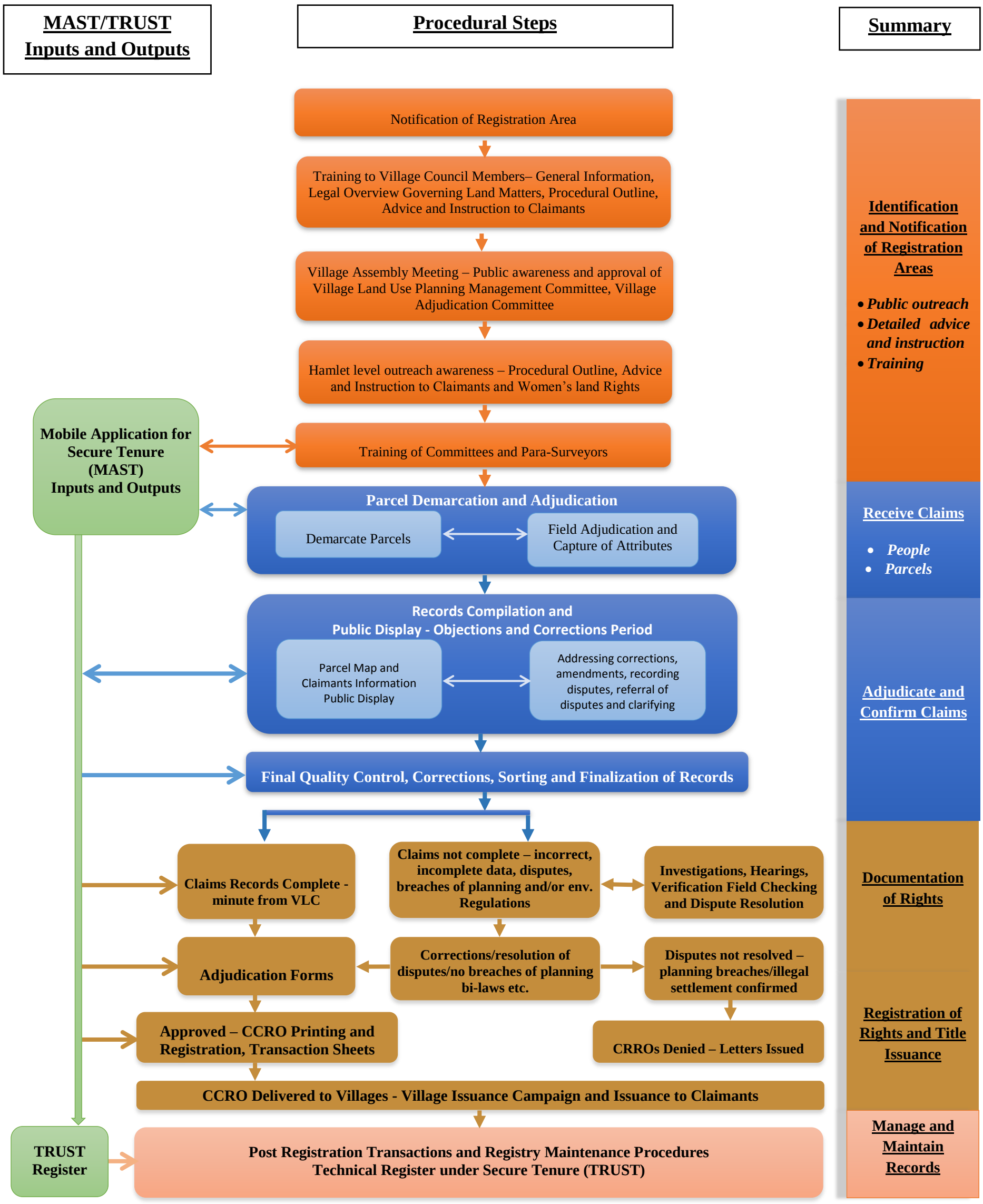
## Figure 2a

## Procedures for Village Land Use Planning



## Figure 2b

## Procedures for Clarification of Rights in Land and First Registration using MAST



*CCROs issuance ceremony in Ngano village attended by USAID, World Bank, and MLHHSD November 2017*

*CCROs issuance campaign at Nyamihuu village, November 2017*

*Objections and corrections process in Makota village, November 2017*

*Training of the adjudicators and para-surveyors at Isele village, November 2017*

*Adjudication and demarcation of land parcels at Isele village, November 2017*

*Hamlet-level sensitization meeting at Chalizanga in Isele Village and at Mkuta in Ikungwe village, November 2017*

In most systematic registration programs, great thought is given to organizing the field work in such a way that as few errors as possible are introduced—both for spatial and textual data.

There were clear problems in the application of the original MAST, which fed through to the resulting data and ultimately onto the final CCRO documents. These cannot be detailed here but were due to significant limitations of the software, training, field data capture (spatial and textual), management/supervision, quality control, and editing.

Field data capture and displays were particularly problematic. The georeferenced imagery was more accurately located than a GPS point captured by the device, yet the imagery was little used to validate the data recorded. Boundary data was being recorded several times—each neighbor and boundary line was recorded at least twice. This was compounded by users not being able to access data captured by an adjacent unit leading to overlap slivers and mapping errors requiring editing to remove (see images on pages 20-21).

It was also not possible to integrate key background vectors over the image, such as land use maps and other supporting layers such as road buffers as guides for para-surveyors. For completion it needed to be possible to include existing CCROs so these could be seen during fieldwork. Parcel numbers needed to be properly calibrated to avoid duplication and these needed to be seen on the device as soon as they were allocated.

Validation criteria for textual data also needed to be tightened and individual claimants given unique identifiers to ensure multiple parcel holders were not double or triple counted, or more, where persons held several parcels.

Problems could be easily fixed in the field without return to the office. The large amount of staff time spent on spatial and textual data cleaning, which would only marginally improve accuracy, with all of the cost additions, was not sustainable and was self-defeating.

Compared to these MAST-related problems and issues, the principle of "right first time" applied to data capture using paper mapping in the field, with back office digital data capture having greater efficiencies and accuracies than that achieved with MAST, and only required accuracy in data capture—under controlled conditions from paper drafts—in the back office.

All of these issues had to be addressed if MAST was to be applied successfully at scale. The development of TRUST naturally depended on this. The use of tablets in conventional low-cost systems is a natural progression from existing paper systems for first registration. Feedback from the

field and from the DLO regarding the pilot's use of MAST enabled LTA to identify issues with the software for remedial actions and development. At the same time, clear procedures (as described above) were designed, clarified, and tested in the field for the first villages in the program. A needs assessment was completed and business logic rules and procedures finalized.

Work still needs to be done to ensure effective accuracy of mapping that reflects what can be seen on the image (field boundaries, etc.) while maintaining accuracy where field boundaries are not so visible on the ground or on the image.

## 7. MAST Development

The scope of changes required to meet the legislative requirements, regulations, and best practices meant that several areas of MAST functionality needed to be redesigned. The following table summarizes the key issues and the main requirements for further MAST development. The work took six months to complete during which substantial part of MAST was recoded.

**Table 1**
**Overview and Scope of MAST Development**

| # | Issues | Actions/Mitigations |
|---|---|---|
| 1 | MAST did not have a proper open source license | MAST is to be applied to a formal agreed system of procedures for first registration—in line with the law and regulations) and made completely open source. |
| 2 | Under the pilots there was no clear procedural structure and system against which MAST was being applied. This resulted in too much focus on the software at the expense of key principles of participation transparency, accuracy of recording, and replicability. | Established formal field procedure and business logic rules in a clear overall sequence—in line with best practices and procedures as used in other countries. These are given as follows (see also **Fig 2**):<br><br>- **Identification and Notification of Registration Areas**<br>  o *Public outreach*<br>  o *Detailed advice and instruction*<br>  o *Training*<br>- **Receive Claims**<br>  o *People*<br>  o *Parcels*<br>- **Adjudicate and Confirm Claims**<br>- **Documentation of Rights and Recording Disputes**<br>- **Registration of Rights and Title Issuance**<br>- **Manage and Maintain Records (TRUST)**<br><br>Staff were trained in these and all related procedures (such as dispute resolution) and the use of MAST and MAST-related data at each of these stages. MAST outputs were tailored to meet specific requirements. |
| 3 | Roles and responsibilities were not clear, resulting in unstructured field activities and management that had negative consequences for data capture. Specifically, the use of just one person ("trusted intermediaries") capturing data in MAST, compromised the role of field adjudicators. | Identification of key personnel—composition of local councils and field teams with regard to their participation and the use and management of MAST and TRUST data, in terms of both the capture and outputs was revised. Clarifications of overall management, supervision, and responsibilities for the field program were undertaken with district personnel. |

| # | Issues | Actions/Mitigations |
|---|---|---|
| | Also, with no public display and period for objection and corrections the application of MAST managed by one 'trusted' user was not sufficiently transparent and prone to errors. | - Village Council Members<br>- Village Adjudication Committee<br>- Village Land Use Planning Committee<br>- Selection of para-surveyors**<br>- Selection of adjudicators<br>- Identification of village headmen<br>- District land office staff<br>- LTA field staff and technical support<br><br>The post of para-surveyor (replacing trusted intermediaries) was created to reflect their key function, which was walking and mapping parcel boundaries and recording attributes. This enabled the task of the adjudicators to focus on capturing key claimant attributes for recording in MAST and on paper records. |
| 4 | There was no business logic and admin and user guides on using MAST. Incomplete key features of existing MAST did not meet the requirements for effective first registration and delivery of CCROs at scale. | Needs assessment, detailed analysis of field pilot,s and clarifications on procedural and field operations design and training were completed, followed by development of the business logic rules and a review of options/requirements for scaling up and the seamless link to TRUST registry maintenance.<br><br>Identification of specific issues with MAST software as applied in the field, discussions with users, practical field tests, detailed assessment of report outputs and displays.<br><br>Detailed identification and costing of changes required to MAST. |
| 5 | The ability to record disputed and unclaimed land/parcels was not included in MAST thus excluding these from the process. This created data gaps and anomalies during systematic data collection. Existing CCROs were also excluded and could not be mapped and verified in the system | For completeness, parcel status was introduced to enable ongoing monitoring of status (disputed and awaiting resolution unclaimed with absent claimants, etc.) and retrospective checks and data added for claimants of previously unclaimed land and resolved disputes. Existing CCROs could be added to maps and attribute data to give a complete register of all CCROs. |
| 6 | Individual claimant IDs could not be made unique, limiting assessments and analyses of individual and household land portfolios, as well as land holdings by gender | Criteria introduced to ensure individual IDs were noted and correctly entered, enabling those making claims on multiple parcels to be analyzed. Editing and search criteria were introduced to enable data to be sorted and checked. |
| 7 | Significant time was spent on "data cleaning" both the spatial and attribute data. Despite this, there remained significant errors on the final adjudication and title documents. | Changes made to both mapping and attribute data to ensure tighter control on field data entry and final quality control for public display and final adjudication CCRO preparation and adjudication (see following table).<br><br>Changes to data management interface (DMI) to enable more effective date sorts and edits. |
| 8 | Initial outputs under MAST were limited to CCROs and adjudication forms, printed, and signed individually. There was no facility for printing and producing maps at scale with parcel ID numbers for public display, planning, and dispute resolution purposes. | Significant changes made to enable display and printing of maps and claimant listings, batch processing of adjudication forms and CCROs was introduced with electronic signatures, enabling up to 500 per day to be printed. Color printing on documents was eliminated to reduce costs but retained for mapping. |
| 9 | For all of the above, significant changes were made to MAST to meet the complete scope of requirements for effective first registration and ongoing maintenance. | An early program of post-pilot fieldwork was undertaken to test and clarify all of the issues arising, detailing all of the software requirements.<br><br>A program for MAST change/additional development to |

| # | Issues | Actions/Mitigations |
|---|---|---|
| | | meet all of the technical challenges for fast accurate and scalable registration was designed and implemented with support of USAID. Business logic rules were developed for key functions and specific problems and issues with the software addressed.<br><br>The scope of the changes resulted in MAST code being re-written and a new version being created. |
| 10 | No significant plans existed for post registration maintenance and management—the scale of this was not clear | Development of TRUST applications for ongoing transactions and maintenance at village and district levels—seamless transition from MAST. |

All work completed on the new version of MAST set in the procedural framework (**Figure 2b**) is given in **Table 2**.

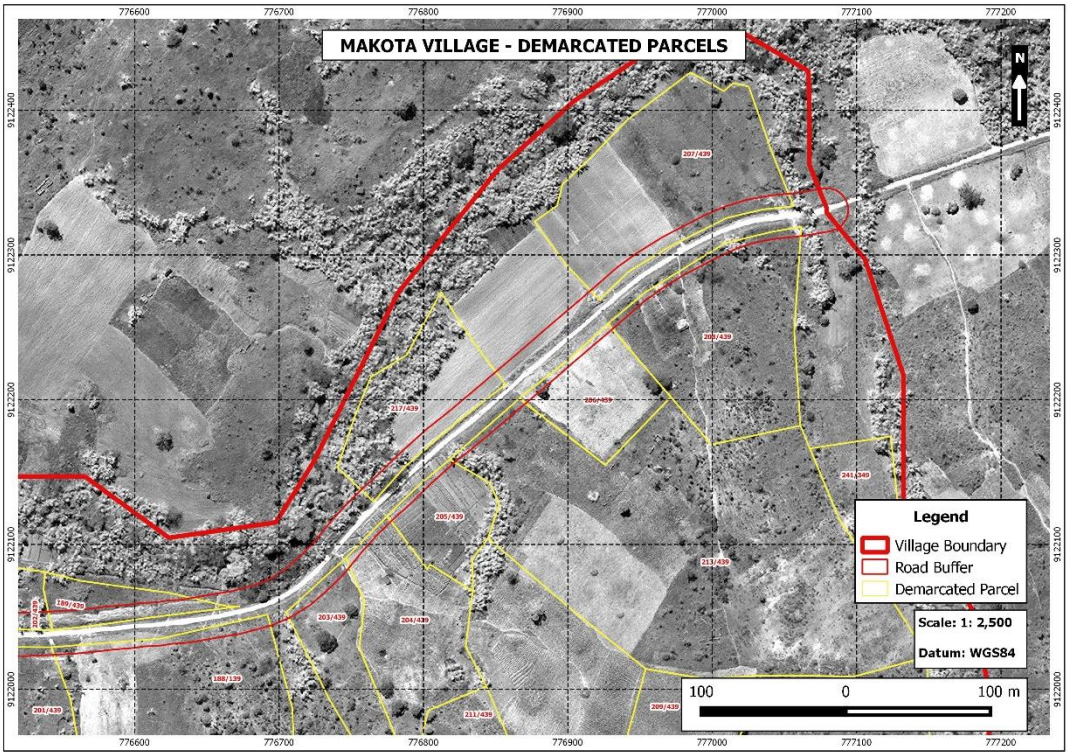
**Table 2**
**MAST Design Changes and New Functions**

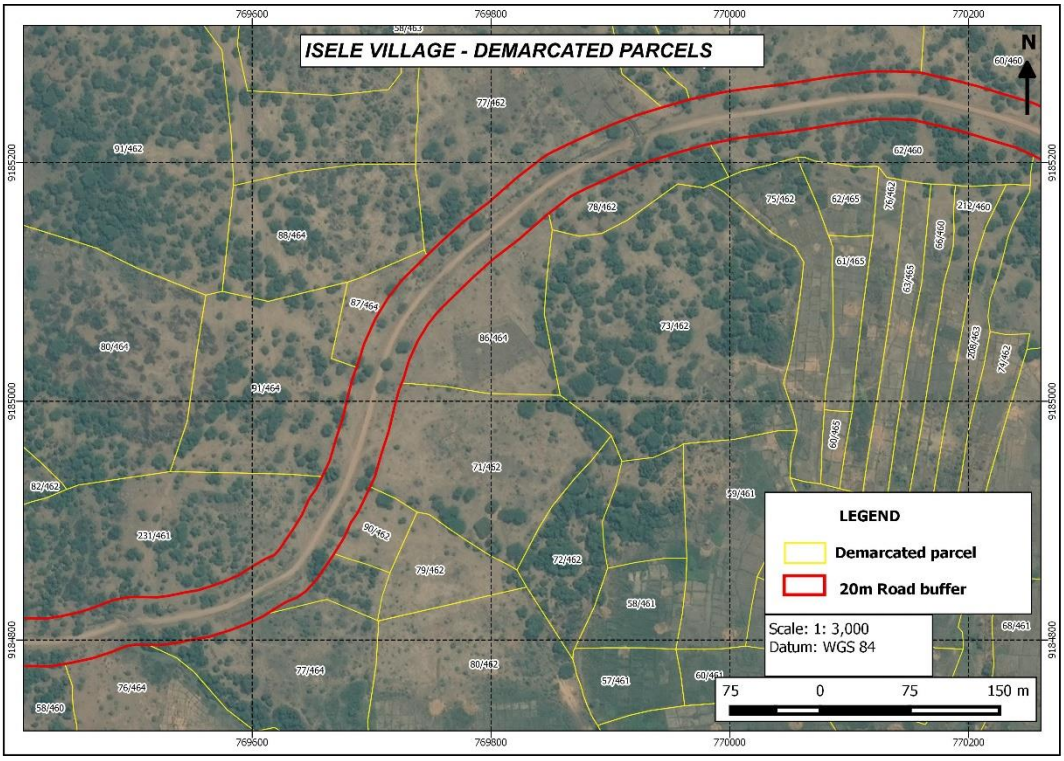
| # | Procedures | MAST Design Changes/Introduction of new functions |
|---|---|---|
| 1 | **Village Project Details** | - Village number<br>- Certificate number<br>- Para-surveyors and adjudication committee names<br>- Hamlet names and leaders |
| 2 | **Parcel Demarcations** | **Existing CCRO:** All data for existing CCROs captured from registry checks for inclusion in overall record for a given area<br><br>**New claims:** Parcel reference numbers, claim date, parcel boundaries, neighbor verification, current land use<br><br>Changes to mapping functions were made to improve snap distances and enable edits/corrections/deletions to be easily made (see examples below). The new design had to support polygon editing and polygon topology[5].<br><br>**Accuracy:** Georeferenced imagery was more accurately located than a GPS point captured by the device—to improve this wireless Garmin GPSs were introduced. |

[5] The original MAST software had no topology or structural link to adjacent parcels, while the collected attribute data recording the name of the right holder to the N, E, W, S, provided no link to CCRO or polygon numbers.

These samples illustrate the problems of overlaps and slivers for the parcel boundaries under the original version of MAST (Kinywanga'anga village). Parcel IDs were only visible on the printed maps and were not visible on the devices in the field.

These samples show improvements in parcel mapping, with the inclusion of village boundaries and road buffers. Land use plans can also be overlain.



| # | Procedures | MAST Design Changes/Introduction of new functions |
|---|---|---|
| 3 | **Recording Attribute Data** | All attributes with validation criteria to prevent errors and ensure effective cross referencing<br>**Disputed parcels:**<br>- type of dispute<br>- disputant names<br>**Non-disputed claims:** claimant person details<br>- Type of tenancy (single, joint, in common, etc.)<br>- Claimant ID type and number<br>- Claimant naming (first last middle names, etc.)<br>- Gender<br>- Marital status<br>- DOB<br>- Age<br>- Mode of acquisition of land<br>- Length of occupancy<br>- Proposed land use<br>- Supporting evidentiary documents (if any)<br>- Persons of interest<br>- Parcel status<br><br>Claims receipt with summary details handed to claimant<br>Simple interim maps printable at all times |
| 4 | **Public Display** | **Objections and Corrections (30 days):** Listing of names and key attributes for non-disputed parcels:<br>- Claim number/parcel ID<br>- Names (first, middle, last)<br>- Gender<br>- Marital status<br>- Claimant ID<br>- Mode of ownership<br>- Areas of parcel<br>- Neighbors (N,S,E,W)<br>Map displays<br>- Parcel boundaries<br>- Parcel IDs linked to attribute data<br>- Vectors for land use planning<br>- Disputed parcels and illegal settlements highlighted<br><br>Objections/disputes/illegal settlements and planning breaches recorded on separate datasheets by adjudicators for later consideration. Para-surveyors may make amendments to boundaries in dispute resolution.<br><br>Paper amendments submitted for corrections to digital data.<br><br>Listings and records provided from MAST of all recorded disputes for referral for dispute resolution.<br><br>Outputs from objections and corrections:<br>- Amendments/corrections to parcel and attribute data<br>- Resolved disputes through to completion<br>- Revised boundary configurations<br>- Final listings for CCRO preparation and issuance |

| | | |
|---|---|---|
| 5 | **Finalizing the Records** | **Quality Control: editing and final compilations of data**<br><br>Date sorts and simple queries to check records. Some sample checks;<br>- Check spatial data for consistency with imagery<br>- Claimant personal details checks and edits<br>- Check all IDs<br>- All corrections/anomalies from objections and corrections made into dataset<br>- Data sorting and simple queries to check records and details.<br>- Automation/printing of populated village registration, district registration, and issuance books |
| 6 | **Printing and Signing** | All finalized records (ie non-disputed and not in breach of land use plans) proceed to adjudication forms and CCRO preparation, signature, and issuance:<br>- Introduction of scanned signatures<br>- Digital village and district registries and issuance records with all relevant data fields<br>- Individual parcel maps with coordinates and ID numbers<br>- Transaction sheets |
| 7 | **Reporting and Statistics** | Baseline management statistics were included as outputs enabling numbers of parcels, numbers of claimants by gender and work rates to be easily monitored and recorded |

The changes made provide additional functionality and greater accuracy to MAST with much improved access to data and records for public display and verification. Procedural development, improved training, and the addition of key functions for editing, analyzing, and printing of reports and maps has ensured the work has become more consultative, transparent, and participatory.

MAST now supports all of the procedures more efficiently (ref **Figure 2b**) but responsibility for making effective use of the system remains with the community operators, adjudicators, and district officials. The inputs (parcel and claims records) and outputs maps, statistics, adjudication documents, and CCROs are still subject to adjudication and the application of the law and regulations by local communities and district officials.

MAST remains a tool for capture analysis and reporting of land records enabling rights to be clarified and confirmed. Its value, accuracy, and cost savings over conventional paper-based methods in the field with centralized data capture now need to be analyzed more thoroughly as the work progresses and the new version of MAST is refined. More work needs to be done before clear assertions can be made.

## 8. Post Registration— the Development of TRUST

Crucially, MAST does not serve the purpose of enabling ongoing management and maintenance of records. At present, LTA is moving ahead with the development and introduction of TRUST for the long-term maintenance of the registers and records. Developing systems for transactions and the practical problems of the interface between village and district services and record-keeping have still

to be resolved. However, the base design of TRUST is now completed and will be field tested in March 2018. Baseline transactions under the first field test at the DLO include;

i) CCRO registration (first/new)
ii) CCRO transfer and variation of ownership
iii) CCRO variation (land use, term)
iv) CCRO rectification register amendments (errors during registration)
v) CCRO surrender (only right)
vi) CCRO termination (for split/merge cases)
vii) Registration of mortgage
viii) Variation of mortgage—discharge of mortgage
ix) Caveats registration and removal

At present, transactions are being kept to a minimum until the actual requirements, volumes, and service requirements at village and district levels become clear as more CCROs are issued. Screen shots of the current version are shown as **Annex I.**

## 9. Village Selections and Impact Evaluation

In terms of village selections for LTA interventions the preferred option for USAID's Evaluation Policy was a Randomized Controlled Trial (RCT) design. RCTs involve initially identifying a pool of candidate villages for LTA interventions, and then randomly assigning them to either a "treatment" group that receives the LTA intervention or a "control" group that does not. RCTs allow for a higher degree of certainty in attributing changes in outcomes to the impact of the intervention—as opposed to other factors. In the present context of an Impact Evaluation (IE) for LTA, using an RCT design makes a significant contribution to the current evidence base as there have been very few previous RCT studies of land tenure interventions.

The IE will attempt to measure the impact of LTA activities (registration and CCRO issuance) in the following areas: 1) perception of tenure security; 2) land-related disputes; 3) investment and land use; 4) empowerment; and 5) economic and environmental outcomes.

The selection of villages for assistance, or treatment, has struck a balance between the local requirements and priorities of the district and the practicalities and requirements for conducting an IE that is consistent with USAID's Evaluation Policy[6]. Non-treatment villages have also been selected. A total of 30 treatment villages out of the 41 LTA villages have been selected and these have been divided into two phases. LTA will be responsible for implementing a standardized methodology

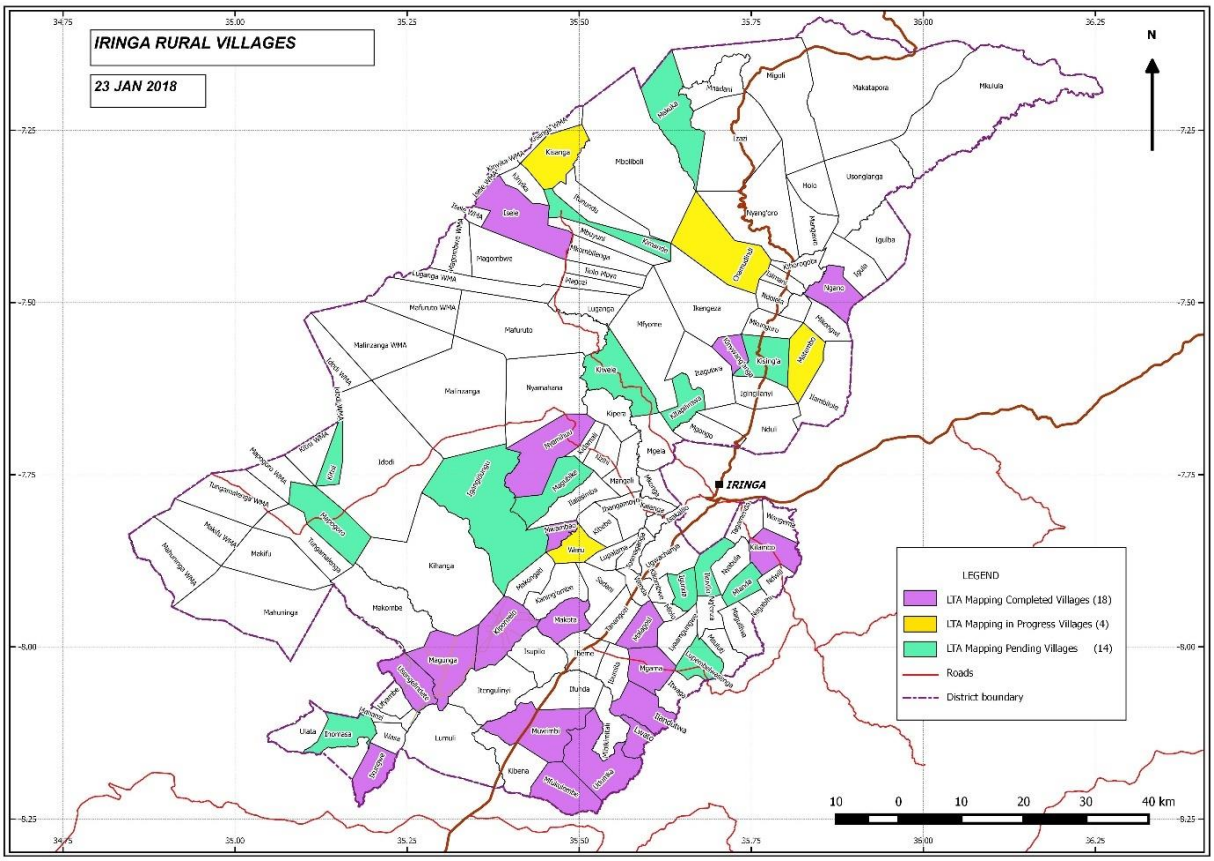
6 See: https://www.usaid.gov/sites/default/files/documents/1868/USAID_EvaluationPolicy.pdf. "For impact evaluations, experimental methods generate the strongest evidence. Alternative methods should be utilized only when random assignment strategies are infeasible." (p. 4).

across *all* villages, including the 30 treatment villages that will be part of the IE that started in 2017. The Evaluation Team[7] is independent of the LTA team and is responsible for structuring the randomization process within the framework of the LTA activity to the greatest extent possible while still preserving the integrity of the RCT process.

The first six villages under LTA were used to clarify and refine the CCRO delivery methodology (including the VLUP development) as described in this paper. The six villages are, thus, *not* part of the IE. However, the resulting standard methods and procedures are being applied across the 30 treatment villages that will be part of the IE. Completion of the IE will provide further evidence on the efficacy of scaling up to other areas using the current procedures and processes.

**Figure 3** gives the areas so far completed. **Table 3** (next section) shows progress in RCT and non-RCT villages.

**Figure 3**
**Village Locations and Progress in Iringa**




[7] MSI/NORC are responsible for developing the detailed impact evaluation design and collecting the baseline data with their own dedicated evaluation budget.

## 10. Field Results of Registration

LTA maintains ongoing tracking and monitoring of field progress and key data and base statistics for each stage of the process. This is provided as MAST outputs for monitoring and field management processes. Outputs include *inter alia*:

- Estimated parcels—usually used in planning for interventions at scale, this includes analysis of demographics for which estimates are made of the size of households and the average number of parcels held by households
- Actual parcel numbers and area of land parcel as measured in the field
- Start and finish dates for each stage of the process—public outreach and training, demarcation and adjudication, objections and corrections, and printing and processing—MAST is applied at all of these stages
- Numbers of CCROs registered (this will not include *all* parcels demarcated—some may be in dispute, some pending consideration of planning breaches), numbers of CCROs delivered, and the numbers issued/collected by claimants
- The number of unique claimants is crucial to establishing key issues and overall claims profiles in any one given area (eg, gender ratios and related issues, numbers requiring joint, single or in-common arrangements, numbers of parcels held by individuals, singly jointly, in common, or individual) portfolios of holdings

Overall progress summarized in **Table 3.** The work is currently approaching halfway and further analysis of results is required before definitive statements can be made or translated into a district model that can rolled out to other districts and eventually to a national program.

Work is proceeding on field manuals and the documentation for MAST in both English and Swahili. These are expected to be completed later in 2018 with the intention that the Government of Tanzania will adopt them. Further comments are made on this later in this paper.

Field registration work provides opportunities to gain detailed insights on issues at a scale that might not be possible under a more limited sample regime or through anecdotal evidence. Analysis of registration data, combined with focus group meetings at the public outreach stage, provides real opportunities to strengthen existing knowledge, systems, and procedures—or design new ones to implement corrective measures through village structures.

| Table 3: LTA Field Implementation Progress *(as at end 2017)* | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **S/N** | **Village Name** | **Village Land Use Planning Status** | ***Current Stage*** | **Estimated Parcels** | **Actual Parcels** | **CCROs Registered** | **Registered (%)** | **CCRO Delivered to Villages** | **CCRO Collected by Claimants** | **CCROs Collected (%)** | **Unique Claimants (no)** |
| **NON RCT VILLAGES** | | | | | | | | | | | |
| 1 | **Kinywang'anga** | Completed | *Issuance* | 338 | 852 | 780 | 92% | 727 | 695 | 96% | 323 |
| 2 | **Kilambo** | Completed | *Issuance* | 1,218 | 1,919 | 1,608 | 84% | 1,335 | 897 | 67% | 1,681 |
| 3 | **Kiponzelo** | Completed | *Issuance* | 2,720 | 2,257 | 2,018 | 89% | 2,014 | 1,763 | 88% | 1,419 |
| 4 | **Usengelindete** | Completed | *Issuance* | 1,388 | 1,594 | 1,570 | 98% | 1,570 | 1,297 | 83% | 855 |
| 5 | **Magunga** | Completed | *Issuance* | 1,316 | 1,898 | 1,591 | 84% | 1,588 | 1,301 | 82% | 613 |
| 6 | **Lwato** | Completed | *Issuance* | 400 | 550 | 533 | 97% | 524 | 498 | 95% | 346 |
| ***Subtotal*** | | | | ***7,380*** | ***9,070*** | ***8,100*** | | ***7,758*** | ***6,451*** | | ***5,237*** |
| 7 | **Malagosi** | Completed | *Issuance* | 908 | 1,070 | 1,041 | 97% | 1,041 | 1009 | 97% | 685 |
| 8 | **Mgama** | Completed | *Issuance* | 1,808 | 2,301 | 2,093 | 91% | 2,093 | 2004 | 96% | 1,375 |
| 9 | **Mfukulembe** | Completed | *Issuance* | 1,604 | 1,817 | 1,762 | 97% | 1,734 | 1710 | 99% | 811 |
| 10 | **Udumka** | Completed | *Issuance* | 1,168 | 1,164 | 1,065 | 91% | 1,032 | 967 | 94% | 560 |
| 11 | **Ilandutwa** | Completed | *Issuance* | 1,158 | 993 | 915 | 92% | 900 | 826 | 92% | 647 |
| 12 | **Muwimbi** | Detailed LU | *Issuance* | 2,356 | 1,569 | 1500 | 96% | 1500 | 184 | 12% | 931 |
| 13 | **Mwambao** | Completed | *Issuance* | 576 | 663 | 638 | 96% | 624 | 616 | 99% | 468 |
| 14 | **Nyamihuu** | Completed | *Issuance* | 964 | 1,823 | 1,765 | 97% | 1,456 | 982 | 67% | 866 |
| 15 | **Ngano** | Completed | *Issuance* | 490 | 1,115 | 1,047 | 94% | 1,012 | 959 | 95% | 486 |
| 16 | **Chamndindi** | Completed | *Mapping* | 984 | 507 | | | | | | 311 |
| 17 | **Makota** | In progress | *Objections and corrections* | 1,000 | 1,542 | | | | | | 739 |
| 18 | **Ikungwe** | In progress | *Objections and corrections* | 1,500 | 816 | | | | | | 520 |
| 19 | **Isele** | In progress | *Demarcation and adjudication* | 810 | 1,665 | | | | | | 807 |
| ***Subtotal*** | | | | ***15,326*** | ***17,045*** | ***11,826*** | | ***11,392*** | ***9,257*** | | ***5,788*** |
| ***Total*** | | | | ***22,706*** | ***26,115*** | ***19,926*** | | ***19,150*** | ***15,708*** | | ***11,025*** |

*Source: LTA Activity Iringa 2018*

The two key concerns most commonly raised when reviewing all of the resulting primary data from fieldwork are disputes and issues of gender and youth.

***Disputes***

Dispute registration and resolution is an essential component in any first registration initiative and accompanying land administration system development. The term "dispute" is often used interchangeably with "conflict"' resulting in some confusion as to what is being considered and what actions are required. Under LTA, disputes are the most common, representing one end of a continuum that are limited in geographical extent and numbers of persons involved (e.g. parcel boundary disputes and individual counter claims over land involving inter and intra family members). A summary of dispute typologies is given in **Table 4**.

**Table 4**
**Dispute Typologies LTA**

| Dispute Type | Sub-type | Arising From | Comments |
|---|---|---|---|
| **Boundary** | Private individuals on adjacent parcels challenging the position of a boundary | Residual from unmarked or badly marked boundaries possibly caused by natural circumstances, land grab from more powerful neighbor | |
| | Land use encroachment into communal/private land by one or more claimants, breach of environmental laws or VLUP | A land use boundary-related issue, possibly resulting from ambiguous or informal land use boundary arrangements between communal land and private land—this may or may not be deliberate encroachment | *If in sufficient numbers and encroachment is significant, potential for escalation into conflict.* |
| **Border** | Administrative border between villages as a result of the village demarcation programs. | Boundaries may or may not have been surveyed to a given standard so accurate border locations might not be known. | *Potential for wider conflict* |
| **Counter Claim (Ownership)** | Interhousehold (including extended family and non-family) counter claim from another household or individual not related to the original claimant(s) | **Transactions** including;<br>• Undocumented **gift**<br>• Undocumented **land sales**<br>• **Rental agreements** (cash and share crop)<br>• **Illegal occupation**/'squatting'<br>• **Other** reasons to challenge a claim on a particular parcel | |
| | **Intra-household** | **Inheritance**, among siblings, (between brothers and between brothers and sisters and widows), sibling rivalry, gifting to adult children | |

The other end of the continuum is conflicts, which are broader in scale/scope and cover wider areas, potentially impacting larger groups of people/claimants that can escalate to confrontation and even violence. Under LTA two key assessments are being made:

- The incidence, typology, and recording of disputes, and how these are being referred village and district for resolution under LTA procedures
- The incidence of conflicts, LTA recording, and the response where there is existing and potential wider-scale conflict

Dispute recording must be sufficient to enable resolution mechanisms to be evidence based. This requires proper recording and referral protocols to the appropriate legal and administrative levels for local resolution under the laws and regulations. LTA is currently recording disputes arising in the field directly into MAST. Disputes are then formally referred to the village council. The progress of the disputes and outcomes through the local systems is being regularly tracked.

**Table 5** shows current dispute levels for 11 villages at 0.02 percent[8]. Though compiled data is not available from other villages at the time of writing, evidence suggests that the overall level of disputes as a ratio of parcels adjudicated is low. One of the authors of this paper has investigated why dispute levels are consistently low. Under the procedures potential claimants are strongly urged to resolve any outstanding disputes and issues before the registration process commences. In most cases (and in most countries to date where this process has been followed) communities respond well to this request.

This is not the only explanation, however. Anecdotal evidence before public meetings begin (that cannot be accurately checked or confirmed) suggests the residual incidence of persistent disputes is often much lower than might be expected. Checking with groups in group meetings confirms there are disputes but usually few in number. Individuals usually share and cultivate land with a high degree of consent, usually being well aware of their boundaries and the extent of neighbor's land. They generally welcome the initiative to confirm and map this, and while minor quarrels do break out during fieldwork these are often quickly resolved and do not escalate to protracted and bitter disputes.

[8] This level is similar to that experienced on the Ethiopia LIFT program where more than 5 million parcels have been registered under the second level certification program—dispute levels were at around 0.18 percent. In Rwanda disputes were at < 2 percent (personal communication) over the national registration program.

**Table 5**
**Disputes Profile for 15 LTA Villages, Iringa District**

| # | Village/Activity | Parcels Mapped to end 2017 | Disputes Identified | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Dispute Type | Disputes Identified (Pending) | Disputes as a (% of Parcels Mapped) | Resolved (#) | Pending Resolution ** | % Resolved (%) | Level of Resolution |
| 1 | Kinywang'anga | 852 | Boundary | 0 | | 0 | 0 | 0% | N/A |
| | | | Counter-claim | 0 | | 0 | 0 | 0% | N/A |
| | | | Land Use designation | 0 | | 0 | 0 | 0% | N/A |
| | | | ***Sub Total*** | ***0*** | ***0%*** | ***0*** | ***0*** | *0%* | |
| 2 | Kiponzelo | 2,257 | Boundary | 4 | | 1 | 3 | 25% | Ward Tribunal |
| | | | Counter-claim | 8 | | 8 | 0 | 100% | Village Land Council |
| | | | Land Use designation | 0 | | 0 | 0 | 0% | N/A |
| | | | ***Sub Total*** | ***12*** | ***0.5%*** | ***9*** | ***3*** | ***75%*** | |
| 3 | Magunga | 1,896 | Boundary | 2 | | 2 | 0 | 100.0% | District Land and Housing Tribunal |
| | | | Counter-claim | 2 | | 2 | 0 | 100.0% | Village Land Council |
| | | | Land Use designation | 0 | | 0 | 0 | 0% | N/A |
| | | | ***Sub Total*** | ***4*** | ***0.2%*** | ***4*** | ***0*** | ***100.0%*** | |
| 4 | Usengelindete | 1,594 | Boundary | 0 | | 0 | 0 | 0% | N/A |
| | | | Counter-claim | 0 | | 0 | 0 | 0% | N/A |
| | | | Land Use designation | 0 | | 0 | 0 | 0% | N/A |
| | | | ***Sub Total*** | ***0*** | ***0.0%*** | ***0*** | ***0*** | *N/A* | *N/A* |
| 5 | Malagosi | 1,070 | Boundary | 3 | | 3 | 0 | 100.0% | Village Land Council |
| | | | Counter-claim | 2 | | 0 | 2 | 0% | Village Land Council |
| | | | Land Use designation | 0 | | 0 | 0 | 0% | N/A |
| | | | **Sub Total** | **5** | **0.5%** | **3** | **2** | **60.0%** | |
| 6 | Mgama | 2,301 | Boundary | 3 | | 3 | 0 | 100.0% | Village Land Council |
| | | | Counter-claim | 1 | | 1 | 0 | 100.0% | Village Land Council |
| | | | Land Use designation | 0 | | 0 | 0 | 0% | N/A |

| # | Village/Activity | Parcels Mapped to end 2017 | Disputes Identified | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Dispute Type | Disputes Identified (Pending) | Disputes as a (% of Parcels Mapped) | Resolved (#) | Pending Resolution ** | % Resolved (%) | Level of Resolution |
| | | | ***Sub Total*** | ***4*** | ***0.2%*** | ***4*** | ***0*** | ***100.0%*** | |
| 7 | Ilandutwa | 993 | Boundary | 4 | | 1 | 3 | 25.0% | Village Land Council |
| | | | Counter-claim | 13 | | 3 | 10 | 23.1% | Village Land Council |
| | | | Land Use designation | 2 | | 2 | 0 | 100.0% | Village Land Council |
| | | | ***Sub Total*** | ***19*** | ***1.9%*** | ***6*** | ***13*** | ***31.6%*** | |
| 8 | Lwato | 550 | Boundary | 4 | | 3 | 1 | 75.0% | Village Land Council |
| | | | Counter-claim | 1 | | 0 | 1 | 0.0% | Village Land Council |
| | | | Land Use designation | 0 | | 0 | 0 | 0% | N/A |
| | | | ***Sub Total*** | ***5*** | ***0.9%*** | ***3*** | ***2*** | ***40.0%*** | |
| 9 | Udumka | 1,164 | Boundary | 4 | | 4 | 0 | 100.0% | Village Land Council |
| | | | Counter-claim | 7 | | 7 | 0 | 100.0% | Village Land Council |
| | | | Land Use designation | 2 | | 2 | 0 | 100.0% | Village Land Council |
| | | | ***Sub Total*** | ***13*** | ***1.1%*** | ***13*** | ***0*** | ***100.0%*** | |
| 10 | Mfukulembe | 1,817 | Boundary | 7 | | 3 | 4 | 42.9% | Village Land Council |
| | | | Counter-claim | 28 | | 6 | 22 | 21.4% | Village Land Council |
| | | | Land Use designation | 1 | | 1 | 0 | 100.0% | Village Land Council |
| | | | ***Sub Total*** | ***36*** | ***2.0%*** | ***10*** | ***26*** | ***27.8%*** | |
| 11 | Muwimbi | 1,569 | Boundary | 5 | | 3 | 2 | 60.0% | Ward Tribunal |
| | | | Counter-claim | 2 | | 1 | 1 | 50.0% | Village Land Council |
| | | | Land Use designation | 0 | | 0 | 0 | 0% | N/A |
| | | | ***Sub Total*** | ***7*** | ***0.4%*** | ***4*** | ***3*** | ***57.1%*** | |
| 12 | Mwambao | 663 | Boundary | 1 | | 1 | 0 | 100.0% | Village Land Council |
| | | | Counter-claim | 4 | | 3 | 1 | 75.0% | Ward Tribunal |
| | | | Land Use designation | 0 | | 0 | 0 | 0% | N/A |
| | | | ***Sub Total*** | ***5*** | ***0.8%*** | ***4*** | ***1*** | ***80.0%*** | |

| # | Village/Activity | Parcels Mapped to end 2017 | Disputes Identified | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Dispute Type | Disputes Identified (Pending) | Disputes as a (% of Parcels Mapped) | Resolved (#) | Pending Resolution ** | % Resolved (%) | Level of Resolution |
| 13 | Nyamihuu | 1,823 | Boundary | 2 | | 2 | 0 | 100.0% | Village Land Council |
| | | | Counter-claim | 3 | | 3 | 0 | 100.0% | Village Land Council |
| | | | Land Use designation | 0 | | 0 | 0 | 0% | N/A |
| | | | ***Sub Total*** | ***5*** | ***0.3%*** | ***5*** | ***0*** | ***100.0%*** | |
| 14 | Ngano | 1,115 | Boundary | 1 | | 0 | 1 | 0.0% | Village Land Council |
| | | | Counter-claim | 1 | | 0 | 1 | 0.0% | Village Land Council |
| | | | Land Use designation | 3 | | 3 | 0 | 100% | Village Land Council |
| | | | ***Sub Total*** | ***5*** | ***0.4%*** | ***3*** | ***2*** | ***40.0%*** | |
| 15 | Kilambo | 1,919 | Boundary | 0 | | 0 | 0 | 0% | N/A |
| | | | Counter-claim | 0 | | 0 | 0 | 0% | N/A |
| | | | Land Use designation | 0 | | 0 | 0 | 0% | N/A |
| | | | ***Sub Total*** | ***0*** | ***0.0%*** | ***0*** | ***0*** | 0% | *N/A* |
| | ***Total Parcels*** | ***21,583*** | ***Total*** | ***120*** | *0.6%* | *68* | *52* | *57%* | |

***Dispute resolutions are ongoing. It is important to note that the manual system for reporting disputes was superseded in October 2017 by the introduction of an attribute into MAST to record disputes. This attribute is used on site in the event that a dispute is not resolved within 10 minutes during the demarcation and adjudication process.* The attribute has assisted in ensuring that all disputes are recorded and any issues resolved on site are not recorded as disputes. Since the introduction of the attribute the number of disputes has dropped considerably as there is no double counting of disputes resolved on site.

*Source: LTA Activity Iringa 2018*

Methods of recording and communicating have been scrutinized to ensure there are no hidden issues. However, the fact that this feature is now common, and repeating for each initiative in different countries, suggests that disputes are a minor constraint to progressing land rights clarifications. LTA has provided further evidence for this.

Wider conflicts, on the other hand, can be residual and long term, often triggered by issues related to common land or investment and/or expropriation driven conflicts and disputes. Where such conditions prevail, LTA must ensure issues are identified and recorded sensitively. Special local measures for mediation and resolution will be required especially where the conflict has been protracted and/or even violent. This requires evidence gathering, sensitivity awareness, and referral procedures to enable mediation and resolution.

Tanzania has demarcated village boundaries, but these have been undertaken through marking of straight lines between survey beacons (see **Figure 3**). This has the potential to create conflicts between villages where claimants from one village may hold parcels either side of the survey line.

During fieldwork there was a high incidence of individual parcels lying within two village areas. Sometimes a single village area requires a split into two where some villages wish to break away from the parent village. One split village (Ilandutwa) resolved an internal boundary position with a second village (Lwato). Other boundary conflicts have been related to resources—Itengulinyi and Lumuli villages over minerals, which is unresolved, and Makuka and Mbolimboli over water rights. The Ministry has recently placed a moratorium on splitting of villages.

***Gender and Youth***

Gender assessments of land claims are a function of the ratios of men and women claimants, parcels held by men and women as a ratio of the total parcels claimed, areas of land held by men and women, and the number of parcels. Households are usually multiple parcel holders and decisions are made within the household on issues of joint or single CCRO arrangements. Advice is provided in outreach, public meetings, and women's group meetings. Collectively, these data can be used to provide indications on gender-related access to and ownership of land. **Table 6** shows a distribution of multiple parcel access between men and women for four villages.

The number of men and women who own only one parcel are not dissimilar. However, as the number of parcels increase per unique claimant the figures skew significantly in favor of older men.

**Table 6**
**Distribution of Parcel Numbers by Gender for Chamndindi, Ikungwe, Isele, and Makota**

| Village | Number of parcels | Women | Men | Total |
|---|---|---|---|---|
| **Chamndindi** | 1 | 80 | 68 | 148 |
| | 2 | 41 | 48 | 89 |
| | 3 | 17 | 18 | 35 |
| | 4 | 7 | 8 | 15 |
| | 5 | 4 | 9 | 13 |
| | 6 | 1 | 6 | 7 |
| | 7 | 2 | 0 | 2 |
| | 9 | 0 | 1 | 1 |
| | 11 | 0 | 1 | 1 |
| ***Total*** | | ***152*** | ***159*** | ***311*** |
| **Ikungwe** | 1 | 138 | 114 | 252 |
| | 2 | 78 | 71 | 149 |
| | 3 | 27 | 32 | 59 |
| | 4 | 16 | 15 | 31 |
| | 5 | 7 | 10 | 17 |
| | 6 | 3 | 4 | 7 |
| | 7 | 1 | 4 | 5 |
| ***Total*** | | ***270*** | ***250*** | ***520*** |
| **Isele** | 1 | 182 | 183 | 365 |
| | 2 | 99 | 86 | 185 |
| | 3 | 44 | 57 | 101 |
| | 4 | 24 | 29 | 53 |
| | 5 | 13 | 19 | 32 |
| | 6 | 11 | 19 | 30 |
| | 7 | 6 | 12 | 18 |
| | 8 | 1 | 2 | 3 |
| | 9 | 2 | 3 | 5 |
| | 10 | - | 4 | 4 |
| | 11 | 3 | 3 | 6 |
| | 13 | - | 1 | 1 |
| | 14 | - | 2 | 2 |
| | 18 | - | 1 | 1 |
| | 19 | - | 1 | 1 |
| ***Total*** | | ***385*** | ***422*** | ***807*** |
| **Makota** | 1 | 178 | 162 | 340 |
| | 2 | 77 | 73 | 150 |
| | 3 | 49 | 50 | 99 |
| | 4 | 26 | 33 | 59 |
| | 5 | 8 | 26 | 34 |
| | 6 | 4 | 14 | 18 |
| | 7 | 6 | 2 | 8 |
| | 8 | 4 | 5 | 9 |

| Village | Number of parcels | Women | Men | Total |
|---|---|---|---|---|
| | 9 | 1 | 5 | 6 |
| | 10 | 1 | 7 | 8 |
| | 11 | 1 | 3 | 4 |
| | 12 | - | 2 | 2 |
| | 13 | - | 1 | 1 |
| | 16 | - | 1 | 1 |
| **Total** | | **355** | **384** | **739** |

*Source: LTA Activity, Iringa 2018*

**Table 7** gives the number of men and women claimants and areas statistics. Men still dominate by varying margins both in terms of the number of claimants and area (acres) claimed. An overall average of 52 percent claims are male and 48 percent female. This translates into 66 percent for men for the total land area and 33 percent for women, suggesting men remain dominant in the process. Special awareness-raising sessions are conducted for men and women by LTA at hamlet level, in addition to women's sensitization meetings to ensure that women participate and are aware of their land rights under the law. Six of 18 villages record > 50 percent women claimants but men generally dominate the area ratios with the exception of Kinywang'anga village. This suggests women are generally claiming smaller parcel areas.

Analysis and ongoing vigilance under LTA will continue to aim to ensure women's rights are safeguarded as the work expands.

**Table 7**
**Ownership and Area of land by Gender** *(as at Dec. 2017)*

| Village Name | Claimants (#) | | | | | Area (acres) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Total Claimants | Male | Female | Male (%) | Female (%) | Total Village Area (acres) | Male (acres) | Female (acres) | Area Male (%) | Area Female (%) |
| **Kinywang'anga** | 323 | 144 | 179 | 45% | 55% | 4,641 | 2,190 | 2,451 | 47% | 53% |
| **Kilambo** | 1,681 | 874 | 807 | 52% | 48% | 9,710 | 6,424 | 3,286 | 66% | 34% |
| **Kiponzelo** | 1,419 | 729 | 690 | 51% | 49% | 7,835 | 4,694 | 3,141 | 60% | 40% |
| **Usengelindete** | 855 | 447 | 408 | 52% | 48% | 8,447 | 6,134 | 2,314 | 73% | 27% |
| **Magunga** | 613 | 296 | 317 | 48% | 52% | 8,392 | 5,838 | 2,555 | 70% | 30% |
| **Lwato** | 346 | 180 | 166 | 52% | 48% | 5,404 | 2,927 | 2,478 | 54% | 46% |
| **Malagosi** | 685 | 393 | 292 | 57% | 43% | 7,907 | 5,517 | 2,391 | 70% | 30% |
| **Mgama** | 1,375 | 725 | 650 | 53% | 47% | 9,452 | 5,974 | 3,479 | 63% | 37% |
| **Mfukulembe** | 811 | 446 | 365 | 55% | 45% | 14,661 | 9,631 | 5,031 | 66% | 34% |
| **Udumka** | 560 | 341 | 219 | 61% | 39% | 13,972 | 10,200 | 3,772 | 73% | 27% |
| **Ilandutwa** | 647 | 354 | 293 | 55% | 45% | 10,246 | 7,274 | 2,972 | 71% | 29% |
| **Muwimbi** | 931 | 462 | 469 | 50% | 50% | 9,296 | 6,704 | 2,592 | 72% | 28% |
| **Mwambao** | 468 | 266 | 202 | 57% | 43% | 10,216 | 6,270 | 3,946 | 61% | 39% |

| Village Name | Claimants (#) | | | | | Area (acres) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Total Claimants | Male | Female | Male (%) | Female (%) | Total Village Area (acres) | Male (acres) | Female (acres) | Area Male (%) | Area Female (%) |
| **Nyamihuu** | 866 | 394 | 472 | 45% | 55% | 7,695 | 4,530 | 3,165 | 59% | 41% |
| **Ngano** | 486 | 224 | 262 | 46% | 54% | 8,038 | 5,034 | 3,004 | 63% | 37% |
| **Chamndindi** | 311 | 159 | 152 | 51% | 49% | 3,057 | 1,913 | 1,144 | 63% | 37% |
| **Makota** | 739 | 384 | 355 | 52% | 48% | 7,116 | 4,635 | 2,481 | 65% | 35% |
| **Ikungwe** | 520 | 250 | 270 | 48% | 52% | 4,183 | 2,646 | 1,536 | 63% | 37% |
| **Isele** | 807 | 422 | 385 | 52% | 48% | 4,617 | 2,987 | 1,630 | 65% | 35% |
| **Total** | **14,443** | **7,490** | **6,953** | | | **154,888** | **101,522** | **53,366** | | |
| **Mean** | | | | **52%** | **48%** | **8,152** | **5,343** | **2,809** | **64%** | **36%** |

*Source: LTA Activity, Iringa 2018*

The age of land claimants is usually in the older generational groups who tend to have greater attachment to the land. LTA is required to engage with youth through the process of registration as well as encouraging maximum participation in the field activities both within their village and training neighboring village youth.

The participation of youth is high at the level of para-surveyors and adjudicators who are selected during the course of field implementation at the outreach stage. Para-surveyors are required to operate MAST and youth are more likely to have the skills required to be selected. Youth represented 62 percent of para-surveyors and adjudicators. Women were under-represented at 24 percent. Efforts are being made to encourage more young women to join the training and make themselves eligible for selection.

Youth sensitization meetings are also being undertaken in secondary schools. In addition, Ardhi University in Dar es Salaam is collaborating with LTA to make use of LTA processes and procedures and MAST for practical training of students in villages in which they are working. The university has also requested LTA provide technical assistance and set up an internship program.

Levels of participation in LTA activities by youth and gender are given in **Table 8.**

**Table 8**

**Participation Counts from LTA Villages by Gender and Youth**

| # | Village | Type of Trainings | Number of trainings | Female | Male | Youth | Adults |
|---|---|---|---|---|---|---|---|
| 1 | Makota | Hamlet Training | 5 | 213 | 199 | 92 | 320 |
| 2 | Ikungwe | Hamlet Training | 5 | 239 | 162 | 110 | 291 |
| 3 | Chamndindi | Hamlet Training | 6 | 228 | 132 | 102 | 258 |
| 4 | Isele | Hamlet Training | 5 | 232 | 183 | 189 | 226 |

| # | Village | Type of Trainings | Number of trainings | Female | Male | Youth | Adults |
|---|---|---|---|---|---|---|---|
| ***Subtotal*** | | | ***21*** | ***912*** | ***676*** | ***493*** | ***1,095*** |
| 5 | Makota | Para surveyors and Adjudicators | 1 | 9 | 27 | 23 | 13 |
| 6 | Ikungwe | Para surveyors and Adjudicators | 1 | 7 | 18 | 18 | 7 |
| 7 | Isele | Para surveyors and adjudicators | 1 | 16 | 49 | 50 | 15 |
| 8 | Chamndindi | Para surveyors and Adjudicators | 1 | 9 | 33 | 13 | 29 |
| ***Subtotal*** | | | ***4*** | ***41*** | ***127*** | ***104*** | ***64*** |
| 9 | Chamndindi | Village Assembly meetings | 2 | 135 | 203 | 173 | 165 |
| 10 | Ihomasa | Village Assembly meetings | 2 | 62 | 131 | 100 | 93 |
| 11 | Kisanga | Village Assembly meetings | 2 | 87 | 246 | 202 | 131 |
| 12 | Matembo | Village Assembly meetings | 1 | 120 | 70 | 53 | 137 |
| 13 | Weru | Village Assembly meetings | 2 | 198 | 196 | 75 | 319 |
| 14 | Magubike | Village Assembly meetings | 2 | 317 | 138 | 176 | 279 |
| ***Subtotal*** | | | ***7*** | ***919*** | ***984*** | ***779*** | ***1,124*** |
| 15 | Chamndindi | Village Council meetings | 2 | 14 | 38 | 27 | 25 |
| 16 | Ihomasa | Village Council meetings | 2 | 11 | 34 | 26 | 19 |
| 17 | Kisanga | Village Council meetings | 2 | 16 | 36 | 4 | 48 |
| 18 | Matembo | Village Council meetings | 1 | 0 | 0 | | 0 |
| 19 | Weru | Village Council meetings | 2 | 16 | 34 | 25 | 25 |
| 20 | Magubike | Village Council meetings | 2 | 13 | 30 | 12 | 31 |
| ***Subtotal*** | | | ***7*** | ***70*** | ***172*** | ***94*** | ***148*** |
| 21 | Ngano | Women Focus Group meetings | 2 | 82 | 0 | 13 | 69 |
| 22 | Nyamihuu | Women Focus Group meetings | 1 | 95 | 0 | 6 | 89 |
| 23 | Ikungwe | Women Focus Group meetings | 2 | 104 | 0 | 35 | 69 |
| 24 | Isele | Women Focus Group meetings | 2 | 90 | 0 | 28 | 62 |
| ***Subtotal*** | | | ***7*** | ***371*** | ***0*** | ***82*** | ***289*** |
| 25 | Chamndindi | Women Sensitization meetings | 1 | 155 | 0 | 52 | 103 |
| 26 | Chamndindi | Women Focus Group meetings | 1 | 61 | 0 | 16 | 45 |
| 27 | Ikungwe | Women Sensitization meetings | 1 | 130 | 0 | 19 | 111 |
| 28 | Isele | Women Sensitization meetings | 1 | 145 | 0 | 81 | 64 |
| 29 | Makota | Women Sensitization meetings | 1 | 91 | 0 | 30 | 61 |
| ***Subtotal*** | | | ***4*** | ***582*** | ***0*** | ***198*** | ***384*** |
| 30 | Nyamihuu | Youth Focus Group meetings | 1 | 189 | 80 | 269 | 0 |
| 31 | Kinywang'anga | Youth Focus Group meetings | 1 | 199 | 142 | 341 | 0 |
| 32 | Muwimbi, | Youth Focus Group meetings | 1 | 179 | 125 | 304 | 0 |
| 33 | Ikungwe | Youth Focus Group meetings | 1 | 216 | 168 | 384 | 0 |
| 34 | Chamndindi | Youth Focus Group meetings | 1 | 107 | 69 | 176 | 0 |
| ***Subtotal*** | | | ***4*** | ***890*** | ***584*** | ***1,474*** | ***0*** |
| **Total** | | | **54** | **3,785** | **2,543** | **3,224** | **3,104** |

*Source: LTA Activity, Iringa 2018*

## 11. Monitoring Registration and Land Use Planning Costs

Cost is an essential component in determining whether it is feasible to undertake national programs. Field trials are the best method of assessing actual costs for inclusion in any cost-benefit analysis for scaling up. There are details of cost recovery to consider and willingness and ability to pay. Looking further ahead, governments will often look at fiscal cadasters and improving the collection of property taxes, particularly in urban areas. These are matters to be decided locally or nationally, particularly with regard to first registration. The imposition of costs on first registration with a possible property tax being the eventual outcome can be a considerable disincentive to potential claimants whatever rights are being offered.

Standard methods and procedures for measuring costs and benefits from country to country and area to area have not been systematically developed. There is perhaps scope for a detailed assessment and methodology to be developed given the rapid expansion of systematic first registration.

In practice, first registration is a clear exercise in clarifying rights, documenting, and stabilizing rights issues in what might be unclear, or even volatile, situations. First registration must be presented in this light and in poorer rural or urban settings should be undertaken at very low or, at best, no cost to claimants. Clarifying rights and establishing a viable land administration system can then provide the basis for any future cost recovery or taxation system. Ongoing transaction charges (transfers inheritance, etc.) can generate land-related revenues which may cover operational costs of land administration systems. In the longer term, national or local government may make use of registers for censuses, social surveys for development of public services and infrastructure and, eventually, taxation.

Management of costs and cost recovery is thus an important issue for local authorities for first registration and thence ongoing maintenance and management of the system. This is usually expressed as a unit cost—dollars per parcel for first registration whilst transaction costs are priced separately. Costs per parcel are dependent on what is included or excluded from the calculation, while transaction costs can be based on length of processing, staff cost, and material costs of documentation and photocopying. Where systems become digital there are additional costs of maintaining the system and establishing web access and fee collection systems.

LTA is engaged in all these activities, essentially developing and piloting systems that can be viably maintained and managed at district and village levels at minimal cost, and with revenue-generating potential. The basis of the work is first registration in up to 41 villages described in this paper, with a system to be put in place for ongoing transactions and maintenance. Some investment is being made

in village and district registry office infrastructure to enable effective storage of records and customer services. Progress continues to be made, and figures and frameworks are still being developed, but the guiding principles and current profile against which costs per parcel are being measured can be summarized as follows:

- Cost profiles are developed that will fit with and enable local authorities to manage this system. This means all aid support costs are excluded
- Capital costs, often borne by central government, are also excluded
- Costs of field operations and local authority participation are included—these are usually extra to normal salaries for district staff with village authorities also receiving remuneration during first registration activities
- The extent to which MAST can contribute to reducing costs of receiving claims and processing to title is being assessed
- There is no cost recovery from claimants in the field during field registration
- Transactions services, post-first registration, will be priced and charged based on actual costs

Cost inclusions and exclusions for LTA are shown in **Table 9.** The fundamental assumption here is that all staff costs for aid personnel are excluded on the principle that any government program would be supervised from district or central level, full-time, using government personnel. They would assume responsibility for all training, technical supervision, and quality control.

**Table 9**
**Inclusions and exclusions price per parcel**

| Costs | Status | Comments |
|---|---|---|
| **Capital Costs** | | |
| Software development and customization of MAST | Excluded | Considerable change and development from the original pilot MAST version |
| Procurement of tablets and Garmin GPS | Excluded | Initial capital costs to establish the infrastructure for first registration and subsequent land administration are generally excluded from analysis of parcel costs. In the case of LTA, these are currently donor funded. |
| Obtaining of imagery | Excluded | |
| Procurements of computers and printers | Excluded | |
| Vehicle procurement | Excluded | |
| Salaries and field allowance for LTA staff (not capital) | Excluded | These are operational costs that are a function of the contract. Staff supporting training and supervising local officials and village communities in a learning-by-doing process |
| Local village and district office rehabilitation and furniture supplies | Excluded | These are one-off costs associated with ensuring there is adequate infrastructure to maintain and mange land records |
| **Operational Costs** | | |
| Salaries for district staff | Included | A fixed cost to government, additional per diem and field costs depending on the level of field involvement is normally met by Government. Given the |

| Costs | Status | Comments |
|---|---|---|
| | | much longer involvement of staff over the period of first registration provision must be made by government for these costs (see below) |
| Per diem and field costs for district staff (local government) | Included | As above, these extra costs must be met by government, however, in most donor partner supported startups such as LTA these costs are met by donor partners for onward transition to government when programs expand |
| Per diem for village participants | Included | Often overlooked and not well monitored and managed are the regular field allowances provided to village participants during first registration of their areas. This includes the cost of para-surveyors, adjudicators, and village council officials and headmen. Currently met by the donor partners under LTA, these costs need to be included under nondonor-supported government programs.<br><br>These costs vary according to the stage in the process and the level of staffing required, (e.g. public meeting training, adjudication and demarcation, objections, and corrections, etc.). |
| Fuel and driver per diem costs | Included | Standard operational cost—the number of vehicles is dependent on the scale of operations and numbers of villages operating at any one time |
| Field stationery and support material (boots, umbrellas, books, files pencils/pens, etc.) | Included | All relevant costs for recording information, public display, consultation, maps, and table |
| Consumables—plotter paper and cartridges for mapping for public display | Included | |
| Crested paper for CCRO production | Included | Specialist embossed legal paper, this is often a considerable cost and does require that supply chains are clear and properly funded to ensure titles are produced in a timely manner and that paper is always available for batch processing |
| Printing toner and other paper costs | Included | For batch processing this is significant but can be reduced if just black and white products are issued |

Discussions of low-cost systems generally refer to local systems that can be managed at the district level and below. Some of the larger capital costs would ordinarily be borne by central government with or without donor partner support. Planning for registrations at a larger scale would involve taking these costs into account. Establishing costs per parcel at a national level would require these costs per parcel be divided by the projected numbers of parcels nationwide. This might give a figure that is higher than that considered to be low cost.

Targets for low cost with the inclusions and exclusion used by LTA and other programs (Rwanda, Ethiopia, Mozambique) might be < $10 per parcel. This might vary from area to area and the cost may be higher in urban or peri-urban areas where daily rate remuneration expectations for adjudicators and para-surveyors may be higher, and detailed land use planning is required. Inclusion of just one or two extra cost items will raise the cost per parcel.

In addition, there are issues relating to the number of parcels mapped and the actual number of CCROs issued. The number of CCROs issued may be lower than the total parcels mapped where claims have been excluded or denied for reasons of disputes and/or planning breaches. In general, the actual cost is considered as the total parcels mapped for which it is assumed (for costing purposes) all CCROs will be granted and issued.

A sample summary calculation for the village of Kiponzelo is given in **Table 10** and current cost estimates per parcel for villages completed so far on LTA are given in **Table 11**.

**Table 10**
**Kiponzelo First Registration Activities Costs**

| # | Activity | Days | Cost (TzS) | *Cost (US$)* |
|---|---|---|---|---|
| **1. Preliminary Meetings and briefings - Outreach and Public Awareness** | | | | |
| 1 | Village Council meetings/training | 1 day | 125,000 | ***56*** |
| 2 | Women & hamlet level training (facilitation) | 12 days | 720,000 | ***321*** |
| 3 | Fuel | | 850,000 | ***379*** |
| ***Sub-Total 1*** | | | **1,570,000** | ***757*** |
| **2: Village Adjudication and Para-Surveyor Training** | | | | |
| 4 | Facilitation cost, district officials allowances | 5 days | 1,020,000 | ***455*** |
| 5 | VC members, VLC members, adjudicators and para-surveyors, participants allowance | 5 days | 725,000 | ***324*** |
| 6 | Sundries | 5 days | 400,000 | ***179*** |
| 7 | Fuel | 5 days | 400,000 | ***179*** |
| ***Sub-Total 2*** | | | **2,545,000** | ***1,136*** |
| **3. Demarcation and Adjudication** | | | | |
| 8 | Adjudicators and para-surveyors | 30 days | 14,085,000 | ***6,288*** |
| 9 | Supervision ccost - district land officer | 30 days | 1,410,000 | ***629*** |

| # | Activity | Days | Cost (TzS) | *Cost (US$)* |
|---|---|---|---|---|
| 10 | Fuel | 30 days | 1,088,828 | ***486*** |
| ***Sub-Total 3*** | | | **16,583,828** | ***7,403*** |
| **4. Objection and Correction** | | | | |
| 14 | Supervision cost - objection and correction | 14 days | 480,000 | ***214*** |
| 15 | District official supervision twice weekly visits | 4 days | 120,000 | ***54*** |
| ***Sub-Total 4*** | | | **600,000** | ***268*** |
| **5. CCRO Printing and Registration** | | | | |
| 16 | Data quality attribute and spatial data cleaning | 7 days | 210,000 | ***94*** |
| 17 | Cost for DLO staff for printing, filing and registration | 18 days | 4,080,000 | ***1,821*** |
| 18 | Registration at village level | 15 days | 450,000 | ***201*** |
| 19 | District authorized land officer signature | 20 days | 600,000 | ***268*** |
| ***Sub-Total 5*** | | | **5,340,000** | ***2,384*** |
| ***Subtotal 1-5*** | | | **26,638,828** | ***11,948*** |

| *6. Materials - Other Costs* | | | |
|---|---|---|---|
| **#** | **Item** | **Cost (TzS)** | ***Cost (US$)*** |
| 20 | Crested paper | 1,280,000 | ***571*** |
| 21 | Land forms Na.21(a) | 2,390,400 | ***1,067*** |
| 22 | Assorted stationery | 2,203,600 | ***984*** |
| 23 | Printing toner | 1,026,000 | ***458*** |
| 24 | Adjudication records books | 240,000 | ***107*** |
| 25 | Claims receipt books | 195,000 | ***87*** |
| ***Sub-Total 6*** | | ***7,335,000*** | ***3,275*** |
| **Total** | | **33,973,828** | **15,223** |
| **Number of CCROs processed** | | | **1,992** |
| **Number of parcels mapped** | | | **2,261** |
| **Cost/parcel** | | | **6.73** |
| **Cost/CCRO** | | | **7.64** |

*Source: LTA Activity Iringa 2018*

In **Table 11**, the current average for LTA, by these measures, is running at < $10 per parcel. This is probably the lower threshold depending on the areas and levels of difficulty in demarcating parcels. The current aim is to at least maintain this level and, where possible, reduce it still further. In the case of MAST, the cost of tablet procurement and maintenance/replacement could be considered for inclusion in costs/parcel/village but given the attrition of the devices and the scale consequences of procurement figures have not yet been determined. This cost has therefore been excluded from the calculations in the interim.

The higher costs for Kinywang'anga village was due to startup and refining systems and procedures in the first of the 41 villages to be completed. Since then a consistently low-cost base has been recorded.

**Table 11**
**CCRO and Parcel costs for 12 Villages LTA**

| # | Village Name | Parcels Mapped (No) | CCROs Registered (No.) | Registered (%) | CCRO Delivered (no.) | CCRO collected by Claimants (No) | Total Cost for CCRO Implementation Activities (USD) | Unit Cost/CCRO (USD) | Unit Cost/Parcel (USD) |
|---|---|---|---|---|---|---|---|---|---|
| **1** | Kinywang'anga | 852 | 780 | 92% | 727 | 695 | 14,956 | 19.17 | 17.55 |
| **2** | Kiponzelo | 2,257 | 2,018 | 89% | 2,014 | 1,763 | 15,308 | 7.59 | 6.78 |
| **3** | Usengelindete | 1,594 | 1,570 | 98% | 1,570 | 1,297 | 15,313 | 9.75 | 9.61 |
| **4** | Magunga | 1,896 | 1,591 | 84% | 1,588 | 1,301 | 15,047 | 9.46 | 7.94 |
| **5** | Malagosi | 1,070 | 1,041 | 97% | 1,041 | 1,009 | 8,702 | 8.36 | 8.13 |
| **6** | Mgama | 2,301 | 2,093 | 91% | 2,093 | 2,004 | 10,569 | 5.05 | 4.59 |
| **7** | Mfukulembe | 1,817 | 1,762 | 97% | 1,734 | 1,710 | 9,830 | 5.58 | 5.41 |
| **8** | Udumka | 1,164 | 1,065 | 91% | 1,032 | 967 | 12,268 | 11.52 | 10.54 |
| **9** | Ilandutwa | 993 | 915 | 92% | 900 | 826 | 6,807 | 7.44 | 6.85 |
| **10** | Lwato | 550 | 533 | 97% | 524 | 498 | 5,300 | 9.94 | 9.64 |
| **11** | Muwimbi | 1,569 | 1,500 | 96% | 1,475 | 184 | 8,027 | 5.35 | 5.12 |
| **12** | Mwambao | 663 | 638 | 96% | 624 | 616 | 3,604 | 5.65 | 5.44 |
| **13** | Nyamihuu | 1,823 | 1,765 | 97% | 1,456 | 982 | 13,322 | 7.55 | 7.31 |
| **14** | Ngano | 1,115 | 1,047 | 94% | 1,012 | 959 | 8,903 | 8.50 | 7.98 |
| **Total / *Mean*** | | **19,664** | **18,318** | ***94%*** | **17,790** | **14,811** | **147,956** | ***8.64*** | ***8.06*** |

*Source: LTA Activity Iringa 2018*

## 12. Costs Reductions and MAST

Large-scale registrations have depended largely on field paper recording with centralized data capture, quality control, and batch processing to title. Paper recording on large-scale programs requires parcels to be penciled manually onto images, and attributes into field books for later electronic back office data capture under controlled conditions. Using a tablet to record data (MAST) moves the data capture element into the field. Using this method, a key variable is the amount of effort that must be expended on the merging and cleaning of erroneous mapping and attribute data.

Under the MAST pilots the amount of data cleaning required was clearly not sustainable. This could take up to three weeks requiring secondary field checks to rectify errors—though this has been significantly reduced under LTA under the improvements to MAST. The question is raised as to what advantages and value MAST adds from paper recording methods.

The addition of a small Garmin GPS and additional effort being put into training of para-surveyors and adjudicators in MAST has significantly improved the data. The alignment of parcel boundary

vectors created by the MAST operators is now more consistent with features on the image and on the ground. Data compilation and cleaning is still required, though on a much lesser scale. Adjudicators are still maintaining paper records in parallel with MAST digital capture to ensure local transparency, easy access to records, and effective group attestation during fieldwork[9]. Batch processing of output documents (adjudication forms and CCROs) has been enabled from MAST without recourse to large data capture centers. The introduction of the technology to the young people in the villages has also beneficial effects and generates considerable interest and attention.

The relative merits and costs of each approach need to be appraised according to different situations. Assessment of the current cost data from LTA suggests that applying MAST does not add significantly to costs when compared to traditional paper methods of field capture with centralized digital data capture and, based on current experience, could be applied on a larger scale.

### 13. Land Use Planning Costs

The LTA activity has worked to develop a replicable, cost-efficient system for delivering village land use plans under the legislation. **Figure 2a** sets out the current procedures, **Table 12** shows the current cost breakdown. In general, planning takes approximately 10 days to complete. Costs over 22 land use plans are averaging under US$1,800.

[9] Work concluded in Zambia (by Tetra-Tech) using different software undertook household to household pre-registration into the tablets before fieldwork commenced. During adjudication and demarcation, a centroid was taken and parcel boundaries marked onto an image. This method eliminated the need to record multiple parcel holders two or more times but determined that digital mapping in the field had no significant advantages over paper marking of boundaries, especially where local communities were completing the mapping.

**Table 12**
**Village Land Use Planning Costs (*as at end 2017*)**

| # | Village | Activity | Approved Date | Days (#) | Per diem - PLUM Team (x4) (TzS) | VC and VLUMC - Cost | Transport Costs (TzS) | Total Cost (TzS) | Total (US$) | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Kiponzelo | New Land Use Plan | Nov-16 | 15 | 2,700,000 | 990,000 | 500,000 | 4,190,000 | 1,905 | completed |
| 2 | Magunga | New Land Use Plan | May-17 | 15 | 2,700,000 | 825,000 | 500,000 | 4,025,000 | 1,830 | completed |
| 3 | Usengelindete | New Land Use Plan | May-17 | 15 | 2,700,000 | 990,000 | 500,000 | 4,190,000 | 1,905 | completed |
| 4 | Mfukulembe | New Land Use Plan | May-17 | 10 | 2,400,000 | 990,000 | 480,000 | 3,870,000 | 1,759 | completed |
| 5 | Ikungwe | New Land Use Plan | May-17 | 10 | 2,400,000 | 995,000 | 400,000 | 3,795,000 | 1,725 | completed |
| 6 | Mgama | New Land Use Plan | May-17 | 10 | 2,400,000 | 925,000 | 480,000 | 3,805,000 | 1,730 | completed |
| 7 | Ikungwe | New Land Use Plan | May-17 | 10 | 2,400,000 | 995,000 | 480,000 | 3,875,000 | 1,761 | completed |
| 8 | Muwimbi | New Land Use Plan | June-17 | 10 | 2,400,000 | 990,000 | 450,000 | 3,840,000 | 1,745 | completed |
| 9 | Nyamihuu | New Land Use Plan | June-17 | 10 | 2,400,000 | 990,000 | 450,000 | 3,840,000 | 1,745 | completed |
| 10 | Ilandutwa | New Land Use Plan | June-17 | 10 | 2,400,000 | 925,000 | 480,000 | 3,805,000 | 1,730 | completed |
| 11 | Lwato | New Land Use Plan | July-17 | 10 | 2,400,000 | 835,000 | 480,000 | 3,715,000 | 1,689 | completed |
| 12 | Mwambao | New Land Use Plan | July-17 | 10 | 2,400,000 | 850,000 | 480,000 | 3,730,000 | 1,695 | completed |
| 13 | Ngano | New Land Use Plan | July-17 | 10 | 2,400,000 | 995,000 | 360,000 | 3,755,000 | 1,707 | completed |
| 14 | Kimande | New Land Use Plan | July-17 | 10 | 2,400,000 | 710,000 | 480,000 | 3,590,000 | 1,632 | completed |
| 15 | Isele | New Land Use Plan | July-17 | 10 | 2,400,000 | 775,000 | 480,000 | 3,655,000 | 1,661 | completed |
| 16 | Makuka | New Land Use Plan | Aug-17 | 10 | 2,400,000 | 1,100,000 | 480,000 | 3,980,000 | 1,809 | completed |
| 17 | Makota | New Land Use Plan | Sept-17 | 10 | 2,400,000 | 1,055,000 | 480,000 | 3,935,000 | 1,789 | completed |
| 18 | Chamndindi | New Land Use Plan | Nov-17 | 10 | 2,400,000 | 1,235,000 | 540,000 | 4,175,000 | 1,898 | completed |
| 19 | Ihomasa | New Land Use Plan | Nov-17 | 10 | 2,400,000 | 1,100,000 | 540,000 | 4,040,000 | 1,836 | completed |
| 20 | Kisanga | New Land Use Plan | Nov-17 | 10 | 2,400,000 | 1,000,000 | 540,000 | 3,940,000 | 1,791 | completed |
| 21 | Weru | New Land Use Plan | Dec-17 | 10 | 2,400,000 | 1,285,000 | 540,000 | 4,225,000 | 1,920 | completed |
| 22 | Magubike | New Land Use Plan | Dec-17 | 10 | 2,400,000 | 850,000 | 540,000 | 3,790,000 | 1,723 | completed |
| **Total new VLUP** | | | | | | | | | **38,984** | |
| **Average Cost for New VLUPs** | | | | | | | | | **1,772.00** | |

*Source: LTA Activity Iringa 2018*

## 14. The Way Forward—Scalability

Effective scaling up of systematic registration requires strong technical management, properly managed cash flows, capital procurements, workable, rational systems and procedures, and accurate monitoring. Essential principles for all of these have been evolved and become well established, with some variations, over a number of years in Africa. Systems that are scalable replicable, and cost efficient have been applied in Rwanda, Ethiopia, Mozambique, and other places.

The essential difference between large-scale interventions elsewhere in Africa and that of LTA in Tanzania is the deployment of MAST and TRUST to support procedures and speed up data capture for first registrations and subsequent maintenance. While the LTA procedural framework is consistent with those applied in other countries, the question remains whether MAST and TRUST add real value, whether these are sustainable, and whether initial costs can be managed within a national program of first registration and ongoing maintenance. These costs must be balanced against first land-related revenues for transactions and land administration services and the use of land and property registers for taxation. These costs and benefits have to be carefully assessed from fieldwork such as that undertaken by the LTA before a national program can be implemented.

At present the full implications of scaling up LTA methods and procedures have yet to be incorporated into a broader strategy for reform. However, the operational procedures and costs for first registration and land use planning have now been established and tests are now underway on maintenance procedures under TRUST and possible revenue collections.

In terms of field costs, present work rates for LTA allow for one para-surveyor and two adjudicators to complete 10 to 12 parcels per day. The team is currently running seven para-surveyors and 14 adjudicators per village (70 to 84 parcels per day). Scaling up requires these numbers are replicated in each village. An assessment of how many villages can be managed concurrently needs to be made to establish viable timelines. At present, LTA is running up to four villages, covering approximately 300 parcels per day. Back-office processing and quality checking must be able to keep pace with the work along with the need to manage activities such objections and corrections and other issues arising that need to be recorded.

Once the record is confirmed, LTA is able to print up to 500 CCROs or adjudication forms per day with two teams of four registration staff. These only require the signature of the claimants as electronic signatures for authorization are now included in first registration procedures. LTA is also supporting file and data storage for registers at both the village and district levels.

A national program will require these rates be substantially increased with capacity building and sustainability planning to be at district level and below. To date, under LTA, this has largely been achieved.

Implementation in Mbeya will commence toward the middle of 2018 and through 2019. This will be an important test for scaling up in Tanzania as a whole. Considerable effort and planning will then be required to enable effective transfer and operationalization of these models in other districts for a national roll out. In the meantime, radio broadcasts and phone-ins reaching up to half a million people has resulted in some enquiries for the activity to move to other areas—most notably an enquiry from Dodoma. This suggests a national campaign reaching more people may generate a significant public response.

Local and national government responses to these developments will determine what will happen elsewhere in Tanzania. At the time of writing, LTA has prepared a draft operations manual and the government has largely endorsed the use of LTA procedures and MAST at a national level. There has also been technical cooperation and convergence with the Land Tenure Support Program (LTSP)[10] which is completing similar work in up to 200 villages. This program is currently using MAST and has advised that it is planning to use it in ongoing fieldwork. Operational manuals from both projects will likely converge with LTA. The World Bank is also considering appropriate models that can be scaled up for large-scale registration of CCROs, building on the experience of existing activities.

One of the most important considerations in scaling up (also in early pilot planning), often overlooked, is that of the limited operational capacity of government departments and ministries to implement programs of this kind, particularly at scale. The best model to use for implementation has proved to be through combining private sector implementers and professionals, in a technical and operational lead, with government, local staff, and members of the public to implement the work. This learning-by-doing experience builds significant capacity at all levels and ensures that the right standards and best practice are established at the outset. All of this should, initially, be under firm management leadership and partnership rules until systems take hold and momentum is achieved. Long-term technical assistance and advisory roles, without implementing mandates, should be avoided. Low costs are possible, but funding must be effectively controlled and managed; cash flows to project activities must be sufficient and timely.

This is the model applied by LTA at the district and village level and should be applied at the national level. Involvement by district-level government officials at all stages of the program has resulted in

[10] Funded by the Department for International Development (DFID) UK.

district land office staff being fully engaged with the program and capable of conducting various public outreach meetings, capturing and correcting the data, printing and registration of the CCROs, and conducting issuance ceremonies with ever decreasing supervision by LTA.

The LTA activity has been very well received by the Ministry of Land Housing and Human Settlement Development, which has, as stated, recently moved to implement MAST and the processes used by LTA on other donor partner and government-funded land registration programs. LTA has played, and continues to play, a lead role. Understanding of best practices, operational requirements, recording, and data management issues is increasing. Capacity in villages and districts has improved and public interest is strong. Progress is now being made toward implementation of Tanzania's land laws on several fronts.

A crucial stage in tenure reform implementation has been reached—the next few years will determine whether the laws are fit for purpose and whether the country can achieve effective land planning and administration capacity. Convergence of government, donor partners, and the private sector behind a viable strategic plan is now essential.

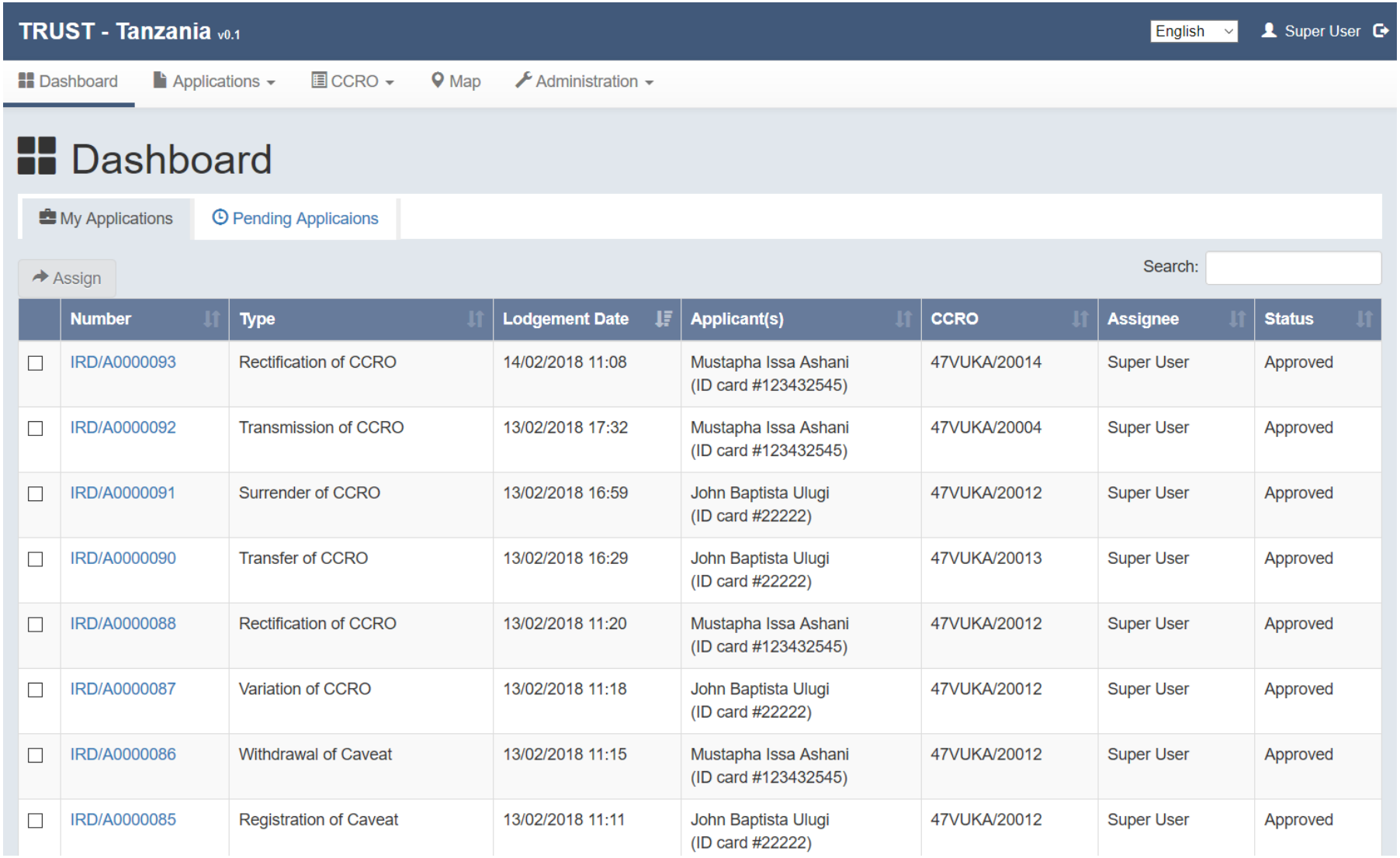
*The views expressed in this paper are entirely those of the authors and do not represent those of DAI, USAID or Government of Tanzania.*

*The authors are grateful for the continuing support of USAID for this important project. In particular we are grateful for the thoughtful support and deep understanding of Mr Harold Carey and Semaly Kisamo of USAID. We are also especially grateful for the ongoing partnership with the Ministry and District Land Office Iringa and the Ministry of Land Housing and Human Settlement Development, and the villages and communities in Iringa.*

# Annex I

# Screen Shots from Version 1 TRUST

## Dashboard


TRUST - Tanzania v0.1
English
Super User
Dashboard
Applications
CCRO
Map
Administration
Dashboard
My Applications
Pending Applicaions
Assign
Search:
Number
Type
Lodgement Date
Applicant(s)
CCRO
Assignee
Status
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Rectification of CCRO
14/02/2018 11:08
Mustapha Issa Ashani (ID card #123432545)
47VUKA/20014
Super User
Approved
IRD/A0000092
Transmission of CCRO
13/02/2018 17:32
Mustapha Issa Ashani (ID card #123432545)
47VUKA/20004
Super User
Approved
IRD/A0000091
Surrender of CCRO
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John Baptista Ulugi (ID card #22222)
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Super User
Approved
IRD/A0000090
Transfer of CCRO
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Super User
Approved
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Rectification of CCRO
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Super User
Approved
IRD/A0000087
Variation of CCRO
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Super User
Approved
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47VUKA/20012
Super User
Approved
IRD/A0000085
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13/02/2018 11:11
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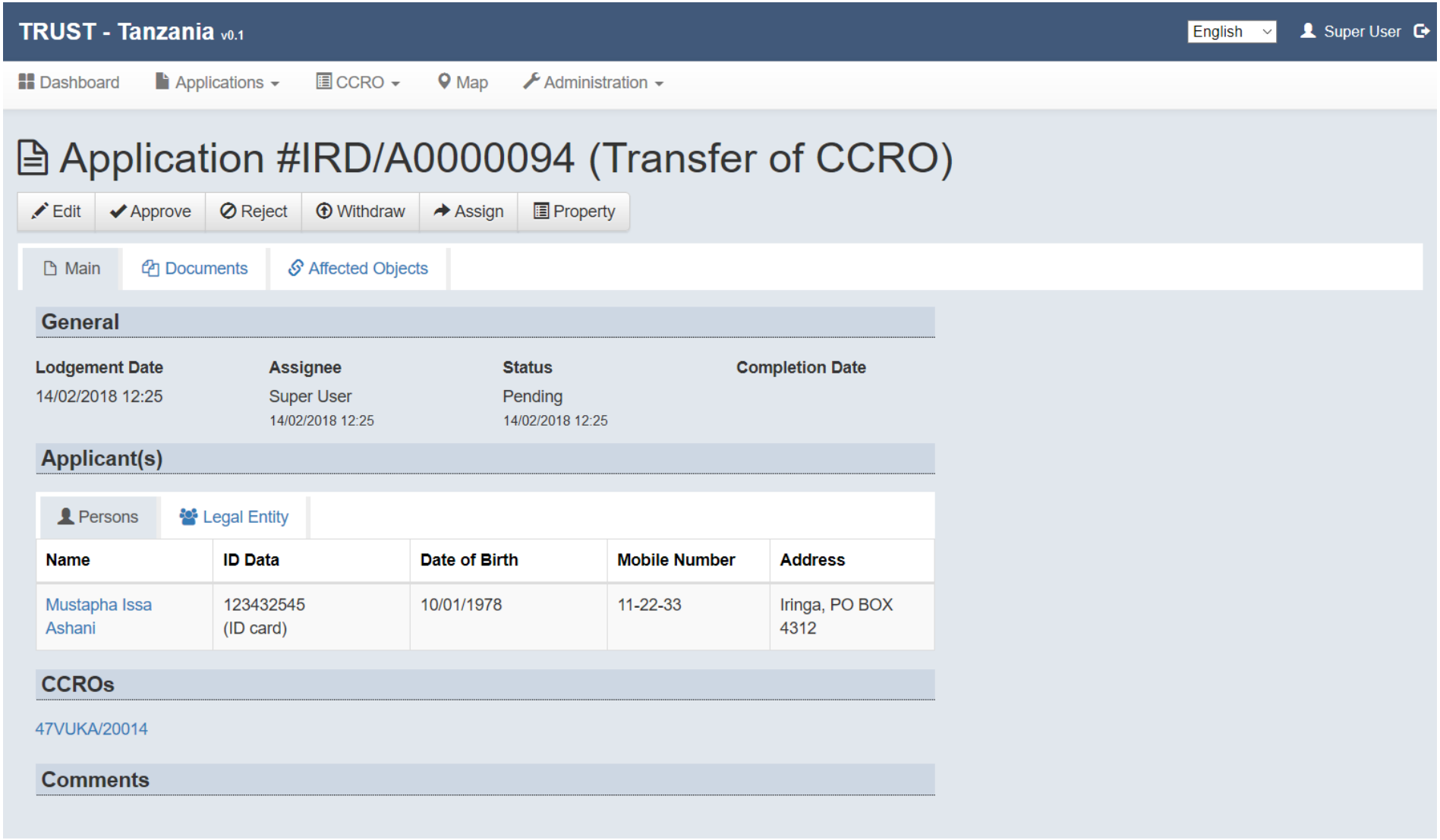
47VUKA/20012
Super User
Approved

## Application for transfer



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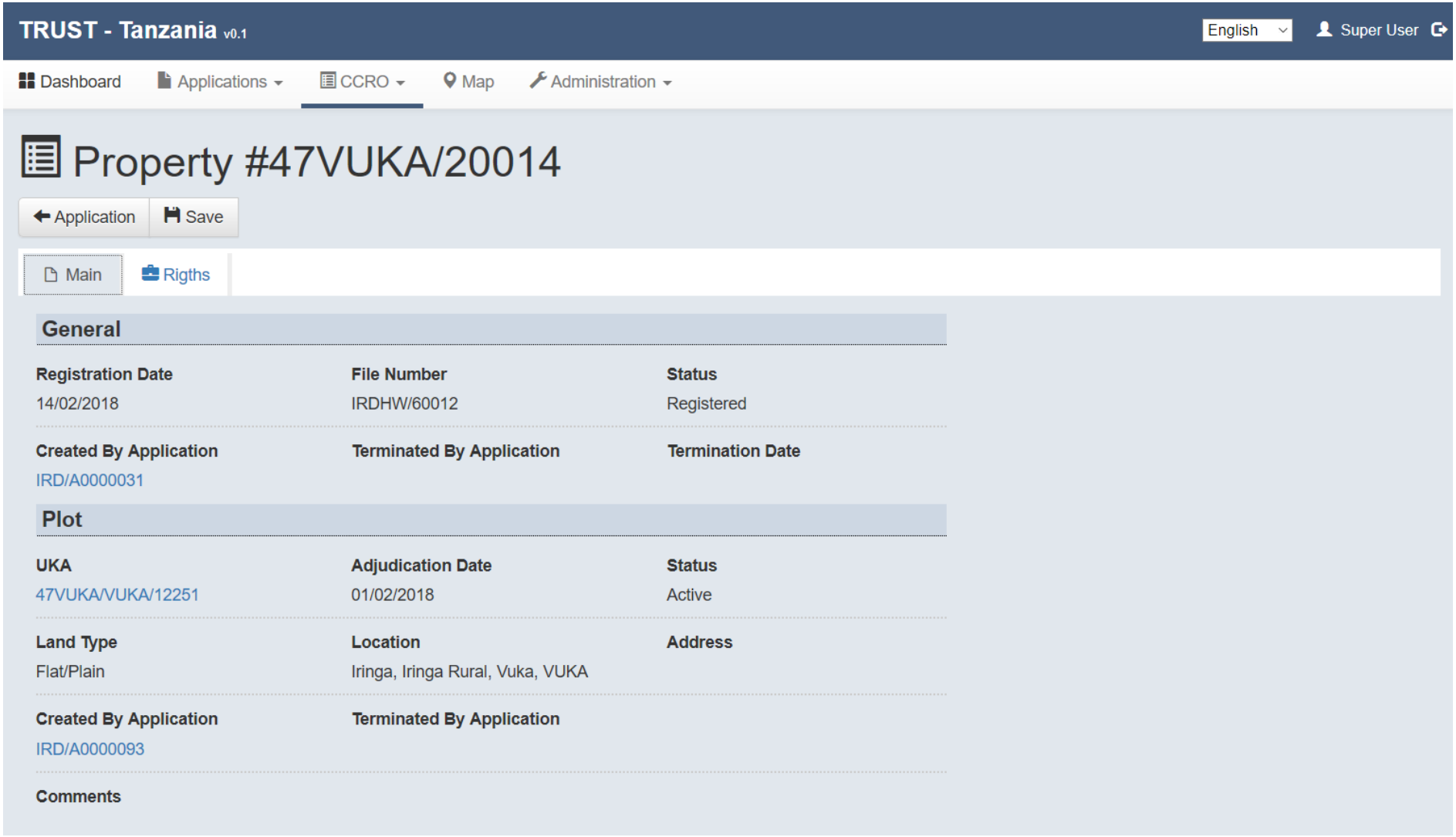
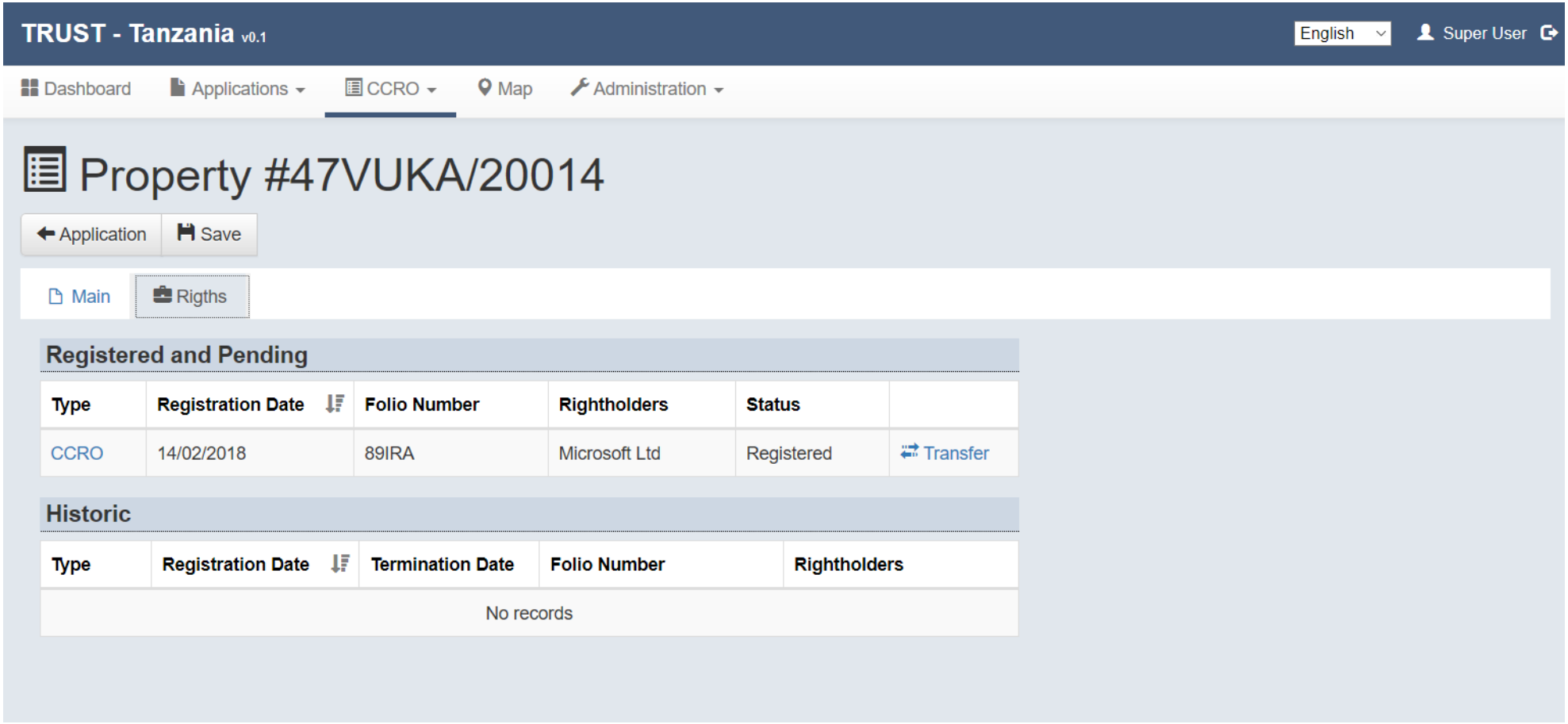
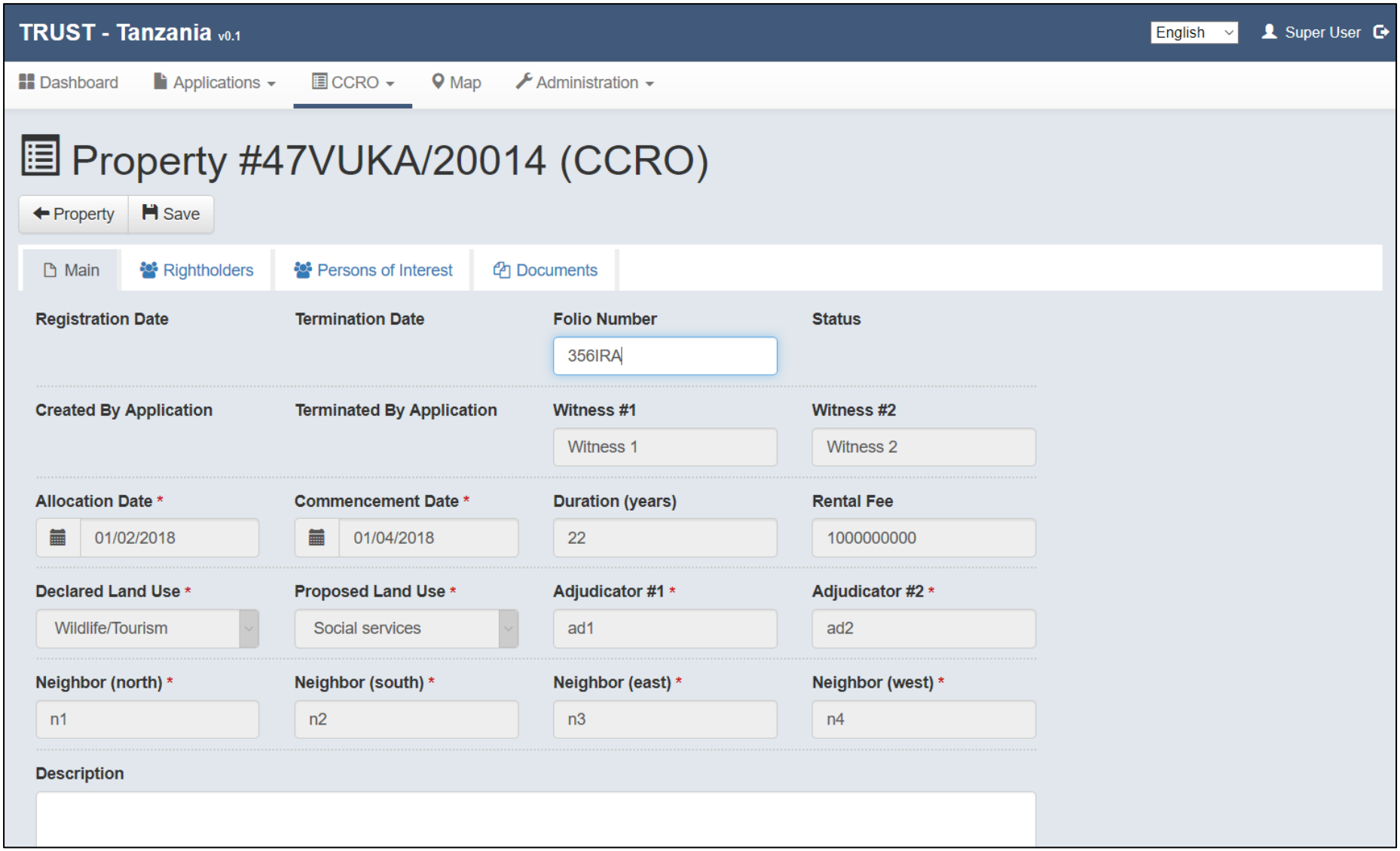


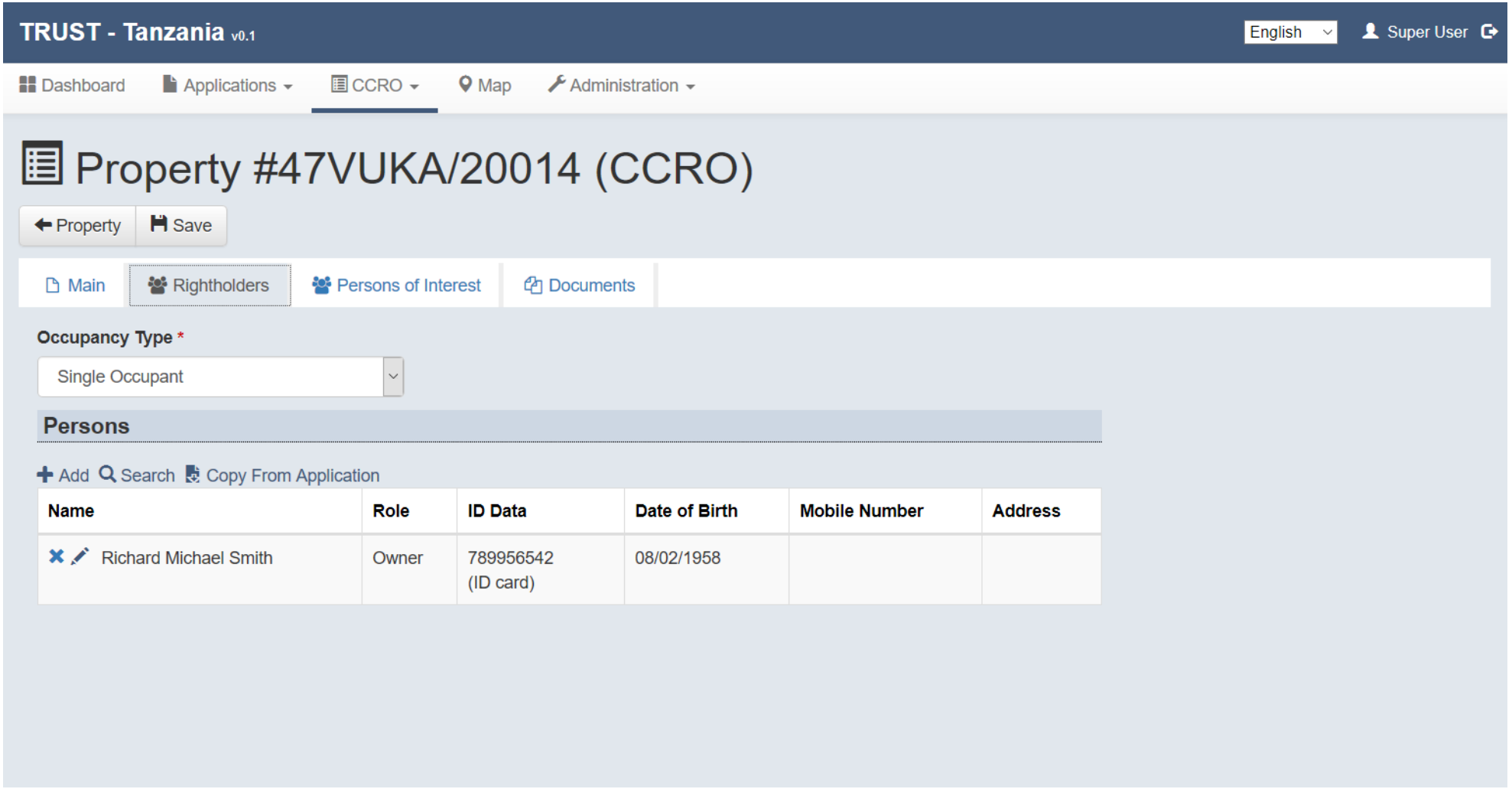
## Property form (rights tab)



## CCRO right form (general tab)



**CCRO right form (Right-holders tab)**



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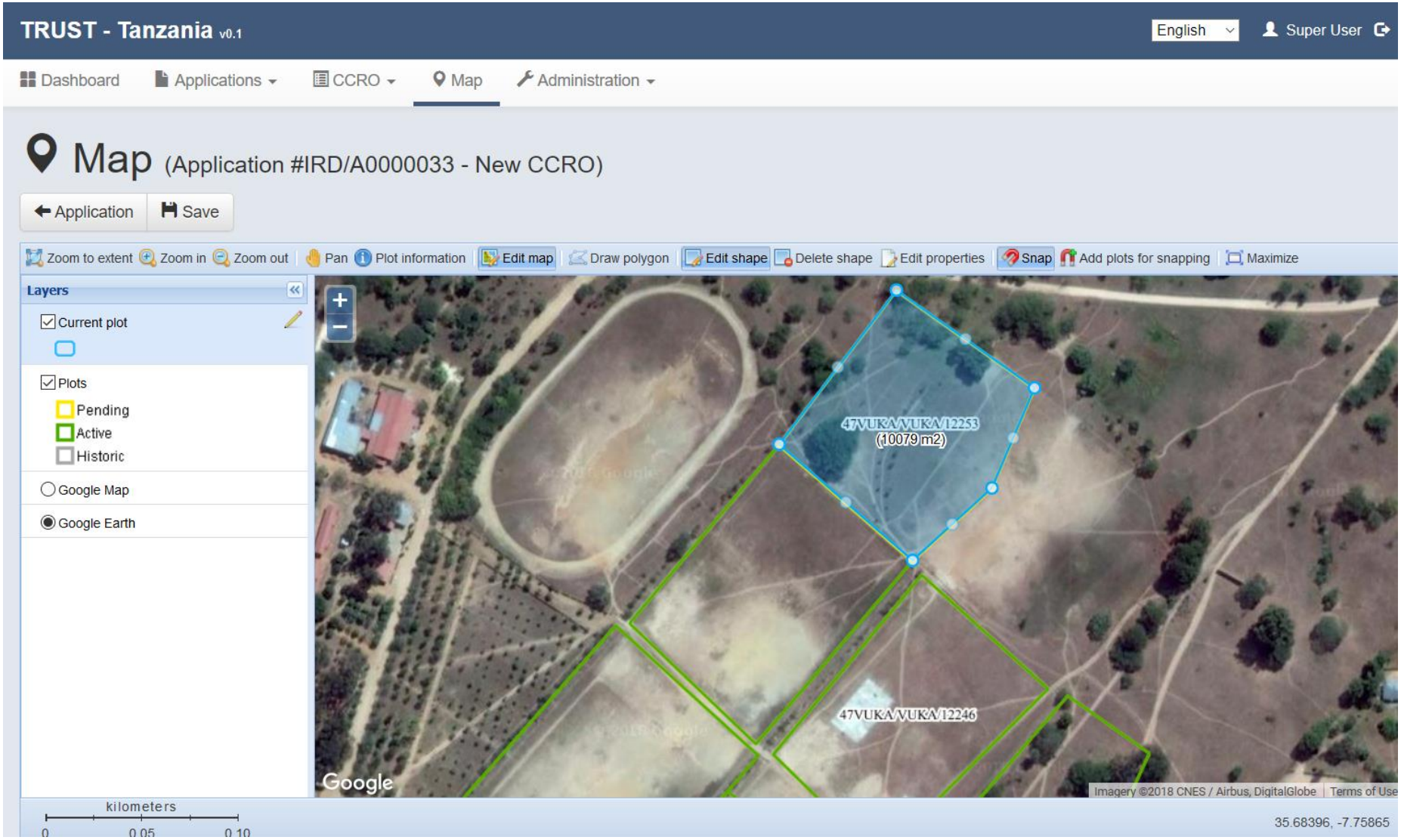

## Map component (Viewing plot information)