

Baseline Report for the National Land Administration Interventions in Districts and Municipalities in Northern Mozambique under MCA-Mozambique's Land Tenure Services Project



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**Report submitted by
Michigan State University for
Comments**

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by

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Glossary

| | |
|-----------|---|
| AFRE | Department of Agricultural, Food and Resource Economics |
| CSUS | Department of Community Sustainability |
| CENACARTA | National Center for Cartography “ <i>Centro Nacional de Cartografia e Teledetecco.</i> ” |
| DNTF | National Directorate for Land and Forest |
| DUAT | “ <i>Direito de Uso e Aproveitamento de Terra</i> ” or Land Use Right (an official document provided by the land administration office providing formalized, long-term use rights for a particular land parcel) |
| LAUs | Land Administration Units |
| LIMS | Land Information Management System |
| LTR | Land Tenure Regularization |
| LSP | Land Tenure Services Project, a component of the five-year compact signed by the Millennium Challenge Corporation (MCC) and the Republic of Mozambique aiming to establish a more efficient and secure access to land by improving the local capacity in land administration. |
| MCA | Millennium Challenge Account |
| MCC | Millennium Challenge Corporation |
| MINAG | Ministry of Agriculture |
| MSU | Michigan State University |
| NLPAG | National Land Project Advisory Group |
| SPGC | “ <i>Servios Provinciais de Geografia e Cadastro</i> ”, or provincial land administrations offices |
| STATA | Data Analysis and Statistical Software |

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EXECUTIVE SUMMARY

This study aims at establishing a baseline for the impact evaluation of the MCA-MCC Land Project's institutional strengthening of the land administration system in Mozambique. The assessment focuses on whether the activity resulted in changes to 3 key variables: a) number of land conflicts as result of formalization of land use rights, b) number of land transactions and c) transaction time transpired to apply for a DUAT, specifically the amount of time between the DUAT application date and issuance date for clear legal rights for access and land use by Municipalities and provincial land administration offices (SPGCs). The number of land transactions, such as formal land use right application and land use right transfers, is an indicator of land market growth, while the "DUAT transaction" time is an indicator of efficiency in providing land administration services. Using a quasi-experimental design, this evaluation will measure changes in these variables using the administrative records at Land Administration Units (LAUs) within Municipalities and Districts. Essentially, this assessment is to use difference-in-difference (DID) approach to measure the difference of outcome indicators between participants (treatment group) and nonparticipants (comparison group) before and after program intervention.

Institutional Strengthening Impact Evaluation

Baseline Report for the Land Administration Interventions in Districts and Municipalities in Northern Mozambique under MCA-Mozambique's Land Tenure Services Project

1 Introduction

This report is organized as follows: Section 1 provides an introduction, Section 2 presents and discusses the methodology; Section 3 describes the data used; Section 4 presents and discusses the main results focusing mainly on the treatment-control comparison on the main outcome indicators; Chapter 5 draws conclusions and provides recommendation; and finally, Section 6 presents the main challenges faced and lays out the next steps towards the proposed impact evaluation.

1.1 Overview of the Land Project

The Government of the Republic of Mozambique and the Millennium Challenge Corporation (MCC), on behalf of the United States Government, signed a Compact Agreement (which entered into force on September 22, 2008) for a US \$507 million grant to be implemented over a 5-year period. The overall objective of the proposed Program was to reduce poverty through economic growth in the four Northern Provinces of Mozambique (Niassa, Cabo Delgado, Nampula, and Zambézia). The Program involved crucially needed investments in water, sanitation, and transport infrastructure, land tenure security, agriculture, capacity building, and institutional strengthening.

The Land Tenure Services Project (or simply the “*Land Project*”) of the Mozambique MCA compact aims to establish more efficient and secure access to land by improving the policy and regulatory framework, helping beneficiaries meet their immediate needs for registered land rights and better access to land for investment. The aim of the project was to improve the overall land governance system not only to formalize/provide DUATs on parcels. More specifically, the Land Project’s objectives are to (i) increase the level and value of the investment on land; (ii) expand access to land; (iii) reduce the costs associated with acquiring land user rights; and (iv) resolve and prevent conflicts over land. Investments are targeted to all four Northern Provinces, at all levels of administration – National, Provincial, and District / Municipal – and across a range of beneficiaries, including individual rural landholders, rural communities, urban landholders, and domestic and international investors.

The Land Project consists of three main types of activities and several component activities that will be implemented at different levels of geopolitical aggregation (i.e., national, provincial, District, Municipal, priority/“hot spots” areas, etc.). Overall, the *Land Project* works on improving policy, upgrading public land administration agencies (the title registry and cadastre), and facilitating site-specific land access. The three main types of activities described above (Activities I, II and III) address concerns widely shared across the private sector, government, and civil society with solutions that bring together their diverse perspectives. Benefits from the Land Tenure Services Project are projected to accrue to (i) rural households; (ii) urban households; (iii) communities; and (iv) business enterprises and investors in the form of increased income, lower transaction costs, and greater investment opportunities.

The specific activities are described as below:

Policy Monitoring Activity (Activity I) (all activities under Activity I were implemented at the **national level**): Support for an improved policy environment, including addressing implementation problems for

the existing land law and engaging in the regulatory review to improve upon it. Examples of activities include:

1. Development of a national land administration regulatory framework and needs assessment
2. Formation of Land Policy Consultative Forum that will provide technical and logistical support to monitor progress on land legislation reform and implementation. It is worth noting that little occurred beyond needs assessment and holding of the land policy consultative forum.¹
3. A broad campaign of public education, outreach and increasing awareness of non-judicial dispute resolution methods
4. Expanded program on legal and judicial training to paralegals
5. Advisory services to DNTF

Capacity Building Activity or Institutional strengthening (Activity II)²: Building the institutional capacity to implement policies and provide quality public land-related services. Examples of activities under Activity II include:

1. Development of LIMS (**national level**)³
2. Professional development and training, and upgrading of facilities (**4 Provincial SPGCs, 12 selected District land service offices and 8 selected Municipalities**)
3. Technical assistance for cadastral development in selected municipalities (**8 selected Municipalities**)

Site-specific Activity (Activity III)⁴: Facilitating access to land use by helping people and business with (i) clear information on land rights and access; (ii) resolution of conflict with more predictable and speedy resolution of land and commercial disputes – which in turn creates better conditions for investment and business development; and (iii) registering their grants of land use (land titles to long-term or perpetual use rights). Examples of activities include:

1. Mapping and needs assessment and rights inventory exercise (all **12 selected Districts and 8 Municipalities**) and piloting an approach to area-wide registration of land rights in “Priority areas”; streamlining investor and farmer access to land by making available simple informational tools and guidelines (**selected hotspot areas** within the **12 Districts and 8 Municipalities**). This includes but not limited to gathering the existing data from each province up to end December 2008 and the assessment of gaps and inconsistencies to identify the specific needs.
2. Support of the Community Land Fund (ITC) (**3 provinces** – Zambezia, Nampula, and Niassa). Initially established by a coalition of donors and implemented in Inhambane, Cabo Delgado, and Manica provinces, in 2009 it was replicated and funded by the Land component of MCA to support the community land delimitation, registration, negotiations, and resource planning (MINAG, 2011c).

1.2 Objectives of this report

¹ Legislation such as ability to transfer a DUAT was never reformed, which led to continued difficulties in transferring land rights.

² With respect to LIMS, it was first planned for project areas but then was expanded to all 10 provinces. LIMS training, however, was supposed to be covered by other donors and not the project while the technical assistance and upgrading occurred across 4 provinces and 12 Districts and 8 Municipalities within these provinces

³ The further development of LIMS was initially planned to be installed in DNTF, 4 SPGCs, and 8 Municipalities. Then, it was later expanded to another 6 SPGCs on the basis of a needs assessment early 2013, rendering it a national coverage (10 provinces). Complementary activities such as training, especially on the additional 6 SPGCs was funded by other donors given the insufficient time to be completed this activity with MCC funding.

⁴ MSU is evaluating the Activity 3 in separate evaluation reports.

This report summarizes the baseline evaluation of the impact of Activity II- the institutional strengthening and capacity building in the District and municipal land offices. As indicated above, Activity II consists of three components: 1) Institutional strengthening of land administration at the national level and outreach and sensitization; 2) Institutional Strengthening and Support to the Provincial Cadastral Offices in the Northern Provinces; and 3) Support to the Cadastral Development in the Municipalities of the Northern Provinces. These efforts aimed to produce the following outputs: Reduced processing time to obtain DUAT; Increased number of people trusting and utilizing formal land system; increased number of formal land transactions⁵, increased number of females entering the land administration profession, and increased number of land users trained.

Given that the strengthening of the municipal or district land offices is expected to lead to an improved and increased use of the formal land registration system, the goal of this study is to evaluate the impact of the institutional strengthening of the land administration system in Mozambique, particularly in (1) reducing DUAT transaction time, 2) increasing the number of formal land DUAT-related land transfers — both first time DUATs and transfers, as well as 3) track whether land regularization activities in Activity 3 helped reduce the number of land conflicts. What sets this evaluation apart from others is that it does not rely on household surveys but on administrative data to establish the control/treatment groups. Earlier attempt to use household survey was not successful to understand the big picture as it failed to capture a sufficient sample size of those undertaking formal transactions.

There was an earlier evaluation attempt using the national agricultural survey (TIA) data, but it was not effective due to lack of representativeness of the MCC interventions sites in the TIA data at the provincial level (insufficient sample size of those undertaking formal transactions). Therefore, the results of that evaluation would only give an overall trend which is not representative for lower administrative unit-level interventions.

2 Evaluation Design of the Institutional Strengthening Activities (ISA) of the Land Project

2.1 Overview of the activity being evaluated and expected impacts

The institutional strengthening activities (ISA) to be evaluated are a subset of activities under Activity II that include professional development and training, upgrading facilities, and assistance to the development of municipal and district LIMS in selected municipalities and districts in 4 Northern provinces (column 1 of table 3). Ideally, the impact evaluation of the ISA is to compare outcomes between the situation “with” ISA and the situation “without” ISA for a given municipality or district. Unfortunately, it is not possible to observe the situation “with” ISA and the situation ‘without’ ISA for any given municipality or district in the same time. In practice, the effects of ISA is estimated by comparing outcomes between municipalities (districts) receiving ISA and those not receiving ISA before and after the intervention. In order to argue that the identified effects of ISA through the evaluation exercise described in this section to be causal, we implicitly assume that all the other nation-wide activities under Activity I and Activity II have the same effects across municipalities and districts and the change in outcomes between the treatment and control municipalities/districts remain constant in absence of the intervention. We will come back to the evaluation method later.

For better exposition of the intended goal of this evaluation effort, we present in table 2 the impact pathway of the ISA, focusing on linking the activities to short-term outputs and then consequently to the outcomes the intervention aims to achieve. As indicated in table 2, the ISA (i.e., investments made to upgrade the municipal or district land administration systems) would lead to a number of outputs at the

⁵ Similarly to the Lesotho Project, the thought was that only those in middle to upper class would increase number of formal land transactions as those are the ones with the means and interest in accessing the system.

municipal or district level (e.g., increased number of clients aware of the land law, increased number of Cadastral officers trained, upgraded facilities). The ultimate objective of these activities is to increase efficiency and effectiveness of the municipal and district land administration offices which is explicitly measured by a number of outcome indicators the key of which include (1) reduced processing time to obtain DUAT, (2) reduced cost of obtaining DUAT; (3) increased number of DUATs demanded, (4) increased number of land transactions, and (5) reduced incidence of land disputes.

Table 2: Impact pathway for the Institutional Strengthening Activities (ISA) of the Land Project

| Activities | Outputs | Outcomes | Impact indicators |
|---|---|---|--|
| <ul style="list-style-type: none"> Professional development and training and further development of national level LIMS Technical assistance to the upgrading of facilities and cadastral development (ISA) | <ul style="list-style-type: none"> Outreach of Land Law and use rights conducted Comprehensive approach to professional development and training implemented Improvement of the National Land Administration System (LIMS) | <ul style="list-style-type: none"> Increased awareness of Land Law Increased number of Cadastral officers trained Upgraded facilities and IT equipment Improved/more effective operational procedures | <ul style="list-style-type: none"> Reduced processing time to obtain a DUAT; Reduced cost of obtaining a DUAT; Increased demand for DUATs; Increased number of land transfers; Reduced number of land disputes. |

2.2 Evaluation approach

By conducting an impact evaluation of the different activities under the Land Project (i.e., site-specific hotspot activities in urban areas, site-specific activities in rural areas, and institutional strengthening activities), we intend to quantitatively estimate the effect on population attributes due to the implementation of the relevant activities under the Land Project. Specifically, we use the difference-in-difference (DID) approach to evaluate the three separate evaluations – evaluation of the institutional strengthening activities, evaluation of the urban hotspot activities and the evaluation of the rural hotspot activities.⁶

The DID approach essentially measures the difference of outcome indicators between participants (treatment group) and nonparticipants (comparison group) before and after program intervention. In the context of panel data (a cross-sectional times series, such as a baseline survey and a follow-up survey of the same communities or households), DID is a common and valid method to estimate the impact of an intervention if the assumption that unobserved heterogeneity is time invariant and uncorrelated with the treatment effect is satisfied. While the main advantage of DID is its ability to allow for the selection of unobserved factors, its assumption of constant selection bias over time may be unrealistic in practice.

Let Y be the outcome of interest (e.g., total number of DUATs issued or the average time lapse between application and issuance of a DUAT). Our goal is to evaluate the impact of the institutional strengthening of LIMS on Y . Specifically, we can achieve this evaluation through DID as:

$$DID = E[Y_1^T - Y_0^T] - E[Y_1^C - Y_0^C] \quad (1)$$

where the superscripts T and C refer to treatment and control units respectively; the subscripts 1 and 0 refer to time period 1 (after the intervention) and time period 0 (the baseline period), respectively. The regression counterpart of (1) with multiple years of data before and after the intervention can be written as the following:

⁶ For the rural site-specific and urban site-specific hotspot activities, we can also combine the DID with the propensity score matching (PSM) method to further improve the reliability of the estimated impacts.

$$Y_{ij} = \alpha + \beta T_j + \gamma t + \delta(T_{ij} * t) + \rho X_i + \varepsilon_{ij} \quad (2)$$

Where, subscript i stands for a specific district or municipality, j for a specific output, T_i is the treatment dummy variable (=1 for treatment districts or municipalities, =0 for control districts/municipalities), t is a vector of time dummies for different years, X_i is a vector of other district/municipality or parcel level control variables, β captures the regional difference between the treatment and control groups, γ captures the common time trend effects over time, and δ is the vector of parameters of interest, measuring the impact of institutional strengthening program on outcomes of interest (e.g., time reduction in the process of DUAT issuance), and ε_{ij} is the idiosyncratic error that is assumed to be normally distributed with mean zero and unity variance. To test that the δ s corresponding to all the pre-intervention years are jointly equal to zero is to check the validity of DID method. (the “parallel” assumption under DID).

DID is widely used in the impact evaluation of policy interventions especially when the RCT-based data are not available (see discussion by Duflo, Glennerster, and Kremer, 2007; Ravallion, 2005). The DID approach was also used by similar studies on land titling projects in other countries (Deininger *et al.*, 2011, Di Tella, 2007; Field, 2007).

3 Data

3.1 Sampling

The sampling strategy adopted for this evaluation consists of three main steps described as follows:

Step 1: used the Land Administrative Units (LAUs) (i.e., districts/municipalities) as sampling units. MSU used the list of DUATs/parcels registered in those units (administrative records) over the past 31 years as the sampling frame;

Step 2: based on the sampling frame, MSU divided the DUATs registered into two groups, namely; one group consisting of DUATs registered sporadically pre-project implementation (2011⁷) and a second group composed of those DUATs registered after the project implementation was completed (e.g. October 2013). This strategy is intended to compare the processing time of sporadic DUAT registration before and after the intervention because the systematic registration under the capacity building and systems installation could bias time. For this reason, any land registrations occurred between January 2012 and September 2013 were not used as it may not be possible to separate systematic project registration from sporadic registration when the two types of registrations occur at the same time and place, and project contractors were still aiding land officers with processing DUATs. However, we believe that 2011⁸, is an ideal time threshold period to capture sporadic registration. We provide more discussion in section 3.2.

Step 3: To attribute the impact to MCC’s interventions, MSU considered the districts/municipalities where MCC had interventions as the treatment sites and selected districts/municipalities that share similar characteristics to those of the treatment sites (but were not targeted under Activity II) as our control group.

⁷ We use 2011 of the cut-off point based on the assumption that the LSP project activities under Pillar II would have been implemented by December 2011. This is most likely not a realistic time frame. Hence the exact cut-off time frame (T) was determined based on discussions with MCA Land team.

⁸ According to MINAG (2010c), the technical assistance for the land component of the MCA was planned in the following four stages: a) Inception: June – September 2009; b) Needs Assessment: October 2009 – October 2010; c) Implementation: November 2010 – March 2013; and Exit Strategy: April 2013 – May 2013.

3.2 Geographic coverage of the IE and identifying comparison group

The ISA was implemented in all the 8 municipalities and 12 districts as listed in Tables 1 and 2. Because the municipalities and districts serve very different clients who demand DUATs for different types of land (urban land versus rural land), it makes more sense to evaluate the ISA in municipalities and districts separately. Based on the discussion in the previous section, one of the critical steps for a rigorous impact evaluation is to identify the reliable counterfactual group (control group). According to Tables 2 and 3, the 8 municipalities and 12 districts were chosen according to a wide variety of selection criteria. It is important to identify the control municipalities/districts that face similar issues as the treatment municipalities/districts. We classify all the 8 selected treatment municipalities into seven different groups (A, B, C, D, E, F, and G), and the twelve districts into seven different groups (I, II, III, IV, V, VI, VII) as well, according to the selection criteria and similarity in geographic location and the condition of local land administration system prior to intervention. The classification of the Municipalities and Districts is indicated in the last column of Tables 3 and 4.

Table 3: Selection criteria met by the eight Municipalities selected for Land Project activities in four Northern provinces

| | Criterion 1 | Criterion 2 | Criterion 3 | Criterion 4 | Criterion 5 | Criterion 6 | Group |
|--|-------------|-------------|-------------|-------------|-------------|-------------|-------|
| Zambézia Province | | | | | | | |
| Quelimane-city | | | X | | | X | G |
| Mocuba-city | | X | X | | X | X | F |
| Nampula Province | | | | | | | |
| Monapo-Vila | X | X | X | | X | X | E |
| Nampula-city | X | | X | | X | X | D |
| Cabo Delgado Province | | | | | | | |
| Pemba-city | X | X | | | X | X | C |
| Mocimboa da Praia- vila | X | X | | | | X | B |
| Niassa Province | | | | | | | |
| Lichinga-city | X | X | X | | | X | A |
| Cuamba-city | X | X | X | | | X | |
| <i>Key for Criteria: 1 = high demand for DUATs; 2 = government priority; 3 = local technical capacity exists; 4 = support from other sources (financial and human); 5 = land use plans exist; 6 = high risk of land conflicts.</i> | | | | | | | |

Table 4: Selection criteria met by the 12 Districts selected for Land Project activities in four Northern provinces

| | Criterion 1 | Criterion 2 | Criterion 3 | Criterion 4 | Criterion 5 | Criterion 6 | Group |
|------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------|
| Zambézia Province | | | | | | | |
| Nicoadala | X | X | | | | X | I |
| Morrumbala | X | X | X | | | X | II |
| Mocuba | X | X | X | | | X | |
| Nampula Province | | | | | | | |
| Malema | X | X | X | | | X | III |
| Monapo | X | X | X | | | X | |
| Moma | X | X | | | | X | VI |
| Cabo Delgado Province | | | | | | | |
| Mocimboa da Praia | X | X | | X | X | X | IV |
| Montepuez | X | X | | X | X | X | |

| | | | | | | | |
|--|---|---|--|---|--|---|-----|
| Mecufi | X | X | | X | | X | V |
| Niassa Province | | | | | | | |
| Majune | X | X | | | | X | I |
| Lichinga | X | X | | | | X | |
| Metangula | | | | | | X | VII |
| <i>Key for Criteria: 1 = high demand for DUATs; 2 = government priority; 3 = local technical capacity exists; 4 = support from other sources (financial and human); 5 = land use plans exist; 6 = high risk of land conflicts.</i> | | | | | | | |

Next, for the treatment municipalities/districts in each category, at least one control municipality/ district was selected to match both the selection criteria and the local conditions before 2009 (the originally planned project implementation start time). Specifically, the local condition used for the matching includes the number of staff in cadastral service, the size of the cadastral unit, the average number of years of experience of cadastral staff members, the average number of previous trainings conducted, the quality of equipment in the cadastral office, the number of DUATs registered per year (See Annex 1 and Annex 2), and the quality of facilities (access to electricity, number of survey equipment by type). To further improve the reliability of the control group, we select the control municipality/district from those that had also applied for the Project but weren't selected. Tables 5 and 6 show the selected control municipalities and districts based on the selection process described above. As a result, seven control municipalities (districts) were selected to match with the seven categories of the treatment municipalities (districts).

Table 5: Selected Treatment and control Municipalities

| Province | Treatment Municipality (N=9) | Control Municipality (N=7) | Group |
|--------------|--|----------------------------|-------|
| Nampula | Monapo | Angoche | E |
| | Nampula city | Nacala-Porto | D |
| Cabo Delgado | Pemba | Mueda | C |
| | Mocimboa da Praia | Chiure | B |
| Niassa | Lichinga, Cuamba, Metangula ⁹ | Marrupa | A |
| Zambezia | Quelimane city | Alto Molocue | G |
| | Mocuba | Gurue | F |

Matching municipalities MSU faced challenges resulting from the limited number of control municipalities. Annex 2, provides detailed information on the selected control municipalities.

Table 6: Selected control Districts

| Province | Treatment (N=12) | Control (N=7) | Group |
|--------------|-------------------|---------------|-------|
| Nampula | Malema | Nampula | III |
| | Monapo | | |
| | Moma | Nacala | VI |
| Cabo Delgado | Mocimboa da Praia | Pemba | IV |
| | Montepuez | | |

⁹ Metangula was added later as beneficiary Municipality is small and HTSPE thought it could complete the cadaster 100% in the Municipality. It wanted to help at least 1 Municipality to complete and establish its cadaster so that all records could be accurate and reliable.

| | | | |
|----------|------------|--------------|-----|
| | Mecufi | Palma | V |
| Niassa | Majune | Cuamba | I |
| | Lichinga | | |
| | Metangula | Mandimba | VII |
| Zambézia | Nicoadala | | I |
| | Morrumbala | Alto Molocue | II |
| | Mocuba | | |

3.3 Data collection

Based on the discussion above, identifying the program effects of the institutional strengthening activities will depend on administrative data from the treatment and control municipalities or districts before and after the program implementation. **The first important question related to data collection is how many years of data are needed for the analysis?** In general, we would like to have as many years as possible based on the availability of the administrative data. The MSU visited Mozambique in the summer of 2013 and collected the baseline data for the study. We collected administrative land record data as early as in 1981 with the assistance of each land administrative office. The primary purpose of collecting data from the pre-reform years is to allow the test for pre-trend difference between the treatment and control municipalities/districts. While it is not necessary to have data from the distant past to test/control for the pre-program trend, it is beneficial to have as many years as possible for the analysis

On the other hand, more care is needed when it comes to the data from the post-reform period. Specifically, we cannot use the data from the years during and immediately after the implementation of the project activities because of the contamination effects of the program (i.e., artificially speeding DUAT processing and lowering the cost of DUAT issuance), it is important to exclude the data from those years. While there is no standard rule as to how many years should be excluded, we think it is reasonable to assume that the contamination effects is unlikely to be significant after two years from the completion of the intervention. During the visit to collect the baseline data for this project, we found that the implementation year of the institutional strengthening activities was 2012-2013 in almost all the municipalities or districts, so the administrative land record data from 2012 to 2014 was excluded. We did not account for the pre-project material “contamination” resulting from outreach or preparation activities that took place before 2012 as we felt that was minimal. As for when the end-line data collection after these few years of buffer period should be implemented, one critical rule is that the data collection should be conducted before any of the control areas starts to receive the (spillover) effects of a similar program. We recommend the end-line survey to be conducted in 2018/2019, so we have about 4-5 years useful post-reform data for analysis.

The second important question is which variables in the land administrative data set should be used? While ideally parcel level characteristics are preferred together with detailed owner characteristics of those applying for DUAT, we are facing the reality of a limited number of variables available in the administrative land records. To meet our objectives to evaluate the impacts of the institutional strengthening activities on three main outcome indicators, namely, the total number of DUATs issued, the time to process a DUAT (from application to issuance), and the number of land transfers (though we are interested in the monetary cost, information on cost is not available), we collected administrative record data on: (1) time when the application was filed; (2) time when a DUAT was issued; (3) time when each land transfer occurred. Besides these key variables, we also have data on the following variables:

- (1) Area of the parcel
- (2) The main use of a parcel from municipality data: residence, commerce, industry, social/religion, public services, residence & commerce.

- (3) The main use of a parcel from SPGC data: agricultural production (annual & perennial crops), forest plantations, livestock production (cattle & others), public services, commerce & industry, residence, tourism, social & religion, crop-livestock production, community.
- (4) Gender of the DUAT holder

To address the objectives of the study, two baseline data sets: the administrative land record data on urban land from the municipal cadastral office (for the municipality evaluation) and administrative land record data on rural land from district SPGC offices. While the administrative land record data from the SPGC's offices were available in digital form, the data from municipal cadastral offices are analog records. For the baseline data collection, it took little effort to copy the digitized data from district SPGC offices, but a lot of time and effort converting the paper form land administrative data from the municipal cadastral offices into digital form— For the transaction times, the as application date-stamped and time approved by the government data was retrieved from the administrative records and municipalities land administrative units, while the DUAT secondary transactions were collected only on the municipality units as the SPGC data does not systematically record this type of information.

In 2014, to establish pre-intervention baseline data MSU collected administrative records in both , municipalities and districts covering 1981 to 2011. MSU retrieved a total of 5,785 previously digitized district records by SPGCs (in Access database) containing records for the four northern provinces covering 57 Districts from 1988 to 2014. But, for our analysis, we discarded records with incomplete information, location and period beyond the study focus and remained with only 1,997 district records covering 1988 to 2011 from 12 treatment and 7 control districts with complete information, including area of parcel, main use of a parcel, gender of the DUAT holder, data of DUAT application, and data of DUAT authorization. Note that these records do not represent all records but a subsample the evaluation sites. Several records were incomplete and from a period outside the target our study period.

For the Municipality data MSU copied 4,035 municipal records to PDF files from sampled nine treatment (includes the additional Municipality added later by HTSPE as indicated earlier) and seven control Municipalities from 1988 to 2011. After discarding records with incomplete information, location and period beyond the study focus and remained with only 3,774 Municipality records which are used for the analysis. Table 6 summarizes the data requirements, availability and analysis performed.

Table 7: Summary of data requirements and analysis

| Objective | Data required | Data availability | Data collection tasks | Analysis | Disaggregation | Sample | Comments |
|---|--|--|--|--|---|--|--|
| 1: Increase the number of formal land DUAT-related land transfers — both first time DUATs and transfers | Number of sporadic land transfers (secondary transactions) | Total number of transfers is not reported in the SPGC database | District level: Not collected | For transfers, Difference-in-difference at the Municipality level only | Not possible to disaggregate by first-time registration/DUAT issuance transfers and other secondary transfers in the District records | 0 | For first-time registration/DUAT issuance, Only in the Municipalities . The District records do not allow to make a clear distinction between first and secondary registration |
| | | Available at Municipality level in log books | Municipal level: Collected, compiled and digitized from the land offices records | | | 135 ¹⁰ pre-project (reported secondary transfers) | |

¹⁰ In total there are at least 3,774 transfers of which 135 are secondary transfers reported in Pemba, Mocuba, Quelimane, Gurue, Alto-Molocue, Cuamba, Lichinga, Metangula, Monapo, Nampula, Angoche, and Nacala-Porto only.

| | | | | | | | |
|---|---|--|--|---|---|---|---|
| 2A: Reduce DUAT transaction time for first-time registrations | DUAT processing time for sporadic first-time registrations | The District level records are available and already digitized ¹¹ . | District level: Retrieved from the SPGCs data base | Difference-in-difference at the Municipalities and Districts levels | Disaggregated by residential/commercial and urban/rural | 1,997 District cases pre-project valid cases | |
| | | In the Municipality, DUAT processing time is available in paper files though Not Digitized | Municipal Level: Collected and digitized | | | 3,774 municipal pre-project valid cases | |
| 2B: Reduce DUAT transaction time for secondary registrations | DUAT processing times for sporadic secondary registrations (transfers and other secondary transactions) | Not available in Districts | Not collected | N/A | N/A | 0 | The secondary transactions are not clearly reported in the administrative records |
| 3: track whether the project interventions helped reduce the number of land conflicts | Number of land conflicts | Available in paper log book in Municipality in Mocimboa da Praia only | Collected | N/A | N/A | Formally registered two ¹² between 2006 and 2011 | Limited data availability for a rigorous analysis |

N/A: Not applicable

3.4 Data issues: Some useful lessons from the baseline data

The main challenge to this evaluation has to do with the data quality (completeness, reliability, validity). The number of DUATs made available to the evaluators is likely to be smaller than the actual number of transactions completed due to poor record storage/keeping (see Annex 1) which can compromise the reliability of the estimates (for e.g. in Mocimboa da Praia some a significant number of old DUATs were lost due to floods, in Marrupa due to not having a copy machine some original copies were given to the applicants and no alternative copy were kept in the cadastral office). Therefore, we warn MCC for the inability of fully answering all evaluation questions due to those data challenges. To minimize these potential data quality challenges, MSU used the entire population in the treatment sites for multiple years to obtain as many valid records as possible for a suitable evaluation.

Second, the success of the whole evaluation process depends on the collaboration and access to quality data from the local land administrative units. Therefore, we assume that relevant government institutions

¹¹ The digitization of SPGC records from 2006 to 2013 with the World Bank's funding.

¹² A total of 242 cases were observed between 2006 and 2011 and 399 between 2012 and 2013. But, only 2 were formally reported at the Municipality.

responsible for granting the access to those data will keep records systematically and easily accessible promptly once the appropriate clearance to access them is obtained.

Third, out of 16 municipalities, MSU visited, only the Mocimboa da Praia Municipality had well-maintained records on land conflicts, preventing any rigorous analysis of land-related conflict.

Finally, we are not able to evaluate the impacts of this program on cost savings associated with DUAT process or the number of land disputes/conflicts because the administrative data have no information on these variables. While collecting information on these important variables will not help us much in this impact evaluation due to the lack of this information in the baseline, it will be valuable to compare whether the cost and disputes (were reported) are indeed lower in municipalities or districts that were affected by the institutional strengthening activities, especially with the assumption that the differences between the treatment and control groups prior to the intervention were similar.

4 Baseline Data Findings

Below follows summary of findings from land records accessed in 2013 covering all historic records of sporadic land use rights from 1981-2011 in the 20 treatment and 20 control areas. Data analysis is provided by municipality and districts—the two levels of data collected. Results on land used for communities should be interpreted with care. As per local legislation, there is no DUAT for communities but associations or other organized collective groups can apply for DUAT. Communities register their land use rights through a completely different mechanism, the community land delimitation (CLD). The DUAT transaction times results reported referring to first-time transactions in the districts and both first time and transfers in the municipalities.

The results are sequentially organized in six distinct sections as follows: (1) the number of land transactions (by land size, by use, over the years); (2) Description of land parcels with DUATs; (3) DUAT transaction times (by land size, by use, over the years; and 90 day limit); (4) the number of land conflicts; (5) the number of land transfers; and (6) the heterogeneity of the key variables by the gender of the DUAT holder.

4.1 Number of Land Transactions

4.1.1 Number of land transaction over the years

About 6,000 both first-time and other time DUAT issued were recorded from the two data sources pre-project intervention as reported in Table 8.

Table 8: Number of DUATs transacted by province by treatment group in rural and urban areas

| Province | Application date* | Districts | | | Municipalities (a) | | |
|--------------|--------------------|------------|------------|------------|--------------------|------------|--------------|
| | | Control | Treatment | Total | Control | Treatment | Total |
| Cabo Delgado | 1981-1990 | 6 | 5 | 11 | 8 | 0 | 8 |
| | 1991-2000 | 39 | 25 | 64 | 22 | 24 | 46 |
| | 2001-2010 | 57 | 72 | 129 | 92 | 709 | 801 |
| | 2011 (pre-project) | 3 | 24 | 27 | 32 | 176 | 208 |
| | Total | 105 | 126 | 231 | 154 | 909 | 1,063 |
| Niassa | 1981-1990 | 10 | 10 | 20 | | | |
| | 1991-2000 | 48 | 27 | 75 | 0 | 54 | 54 |
| | 2001-2010 | 270 | 114 | 384 | 1 | 747 | 748 |
| | 2011 (pre-project) | 8 | 8 | 16 | 24 | 94 | 118 |
| | Total | 336 | 159 | 495 | 25 | 895 | 920 |

| | | | | | | | |
|----------|--------------------|-----|-------|-------|-----|-------|-------|
| Zambezia | 1981-1990 | 0 | 88 | 88 | | | |
| | 1991-2000 | 1 | 163 | 164 | 5 | 8 | 13 |
| | 2001-2010 | 47 | 616 | 663 | 205 | 312 | 517 |
| | 2011 (pre-project) | 6 | 54 | 60 | 86 | 55 | 141 |
| | Total | 54 | 921 | 975 | 296 | 375 | 671 |
| Nampula | 1981-1990 | 0 | 15 | 15 | 0 | 8 | 8 |
| | 1991-2000 | 12 | 41 | 53 | 46 | 122 | 168 |
| | 2001-2010 | 43 | 144 | 187 | 249 | 425 | 674 |
| | 2011 (pre-project) | 28 | 13 | 41 | 226 | 44 | 270 |
| | Total | 83 | 213 | 296 | 521 | 599 | 1,120 |
| Total | | 578 | 1,419 | 1,997 | 996 | 2,778 | 3,774 |

Source: Authors calculations from SPGC data, 2013; Municipalities Data, 2013 and 2014

* The records collected are from 1988 to 2011. Data presented in decades but for the case of municipality, the first decade (1980-1990) refers to 1988-1989 because data for earlier years are not available. We intentionally isolated 2011 to measure the potential material contamination due to outreach activities prior to the actual intervention.

The number of DUAT transactions in districts and municipalities within the four provinces varies across provinces and treatment status. Results in Table 7 show that the largest number of DUAT transactions was observed in Zambezia and Niassa provinces for rural districts and in Cabo Delgado and Niassa provinces for municipalities. There are also huge differences in numbers of transactions/DUATs between control and treatment (996 vs 2778 in municipalities and 578 vs. 1419 for districts). Part of the differences could be resulted from the fact that there are more treatment districts/communities than control districts/communities. And part of the reason is that the demand for transactions/DUATs has historically been higher in the treatment districts/communities than the control districts/communities, suggesting that the ISA intervention targeted at areas with more economic potential.

These differences have an implication on the quality of evaluation. Ideally, we would like the number of transactions/DUATs to be balanced between treatment and control sites, as in the case of randomized controlled intervention. If the balance is not achieved, specific econometrics technique is needed in order to address the pre-program biases. The DID approach discussed earlier allow for the pre-program difference between the treatment and control sites as long as the difference is constant over time in absence of the program. The constant difference over time is known as the “parallel assumption” in DID. Given we have many years of data before the intervention, we checked the validity of this assumption by running a simple regression of the number of transactions/DUATs (as well as other variables) on year dummies, treatment dummy and the interaction terms of the year dummies and treatment dummy and found that the coefficients of the interaction terms are jointly not significant in the Districts, suggesting that the parallel trend assumption is satisfied.

4.1.2 Number of land transactions by land size

Results in Table 9 show diversity on a land size of parcels with DUATs in the Districts but not in municipalities. As expected, all land sizes in municipalities are lower than 1000 ha whereby, the majority of parcels with approved DUATs in Districts are smaller than 1,000 hectares. Within each geographical area (districts and municipalities), statistically, significant differences between treatment and control sites are observed in all provinces except in Cabo Delgado. In Districts, the differences between treatment and control sites are mostly observed in the lower land size groups. However, after accounting for the difference in the total number of parcels between treatment and control in each province, the difference in share of parcels with DUATs between the treatment and control sites is not significant any more (see table 20).

Table 9: Number of parcels with approved DUATs recorded by Land size group

| Province | Land size group | Districts | | | Mean Diff. | Municipalities (a) | | | Mean Diff. |
|--------------------------|-----------------|-----------|-----------|-------|------------|--------------------|-----------|-------|------------|
| | | Control | Treatment | Total | | Control | Treatment | Total | |
| Cabo Delgado | <1,000ha | 102 | 120 | 222 | | 91 | 591 | 682 | * |
| | 1,000 -10,000ha | 3 | 4 | 7 | | 0 | 0 | 0 | |
| | >10,000ha | 0 | 2 | 2 | | 0 | 0 | 0 | |
| | No data | | | | | 63 | 318 | 381 | ** |
| | Total | 105 | 126 | 231 | | 154 | 909 | 1,063 | ** |
| Niassa | <1,000ha | 336 | 138 | 474 | * | 15 | 314 | 329 | ** |
| | 1,000 -10,000ha | 0 | 16 | 16 | ** | 0 | 0 | 0 | |
| | >10,000ha | 0 | 5 | 5 | | 0 | 0 | 0 | |
| | No data | | | | | 10 | 581 | 591 | ** |
| | Total | 336 | 159 | 495 | * | 25 | 895 | 920 | ** |
| Zambezia | <1,000ha | 49 | 887 | 936 | ** | 279 | 218 | 497 | |
| | 1,000 -10,000ha | 5 | 29 | 34 | * | 0 | 0 | 0 | |
| | >10,000ha | 0 | 5 | 5 | | 0 | 0 | 0 | |
| | No data | | | | | 17 | 157 | 174 | * |
| | Total | 54 | 921 | 975 | ** | 296 | 375 | 671 | + |
| Nampula | <1,000ha | 79 | 189 | 268 | ** | 304 | 91 | 395 | + |
| | 1,000 -10,000ha | 3 | 21 | 24 | * | 0 | 0 | 0 | |
| | >10,000ha | 1 | 3 | 4 | | 0 | 0 | 0 | |
| | No data | | | | | 217 | 508 | 725 | * |
| | Total | 83 | 213 | 296 | ** | 521 | 599 | 1,120 | + |
| Overall (four provinces) | <1,000ha | 566 | 1,334 | 1,900 | ** | 689 | 1,214 | 1,903 | ** |
| | 1,000 -10,000ha | 11 | 70 | 81 | ** | 0 | 0 | 0 | |
| | >10,000ha | 1 | 15 | 16 | ** | 0 | 0 | 0 | |
| | No data | | | | | 307 | 1,564 | 1,871 | ** |
| | Total | 578 | 1,419 | 1,997 | * | 996 | 2,778 | 3,774 | ** |

+p<0.1, * p<0.05, ** p<0.01, *** p<0.001; (a) records collected are from 1988 to2011

Source: Authors calculations from SPGC data, 2013; Municipalities Data, 2013 and 2014

4.1.2.1 Land Size of those with DUATs by Land Use

On the size of parcels with DUATs, there is a large variation in land size by main land use in districts only. In the districts, the average parcel size is about 60 hectares with the largest areas for livestock production (258 ha), forest plantations (210 ha) and smallest for residential use (3 ha). Results show that the differences in land sizes of parcels with DUATs are mainly due to large differences in parcels used for livestock production, tourism, and mixed crop and livestock production between the control and treatment sites. While the parcels dedicated to livestock and mixed production system are significantly larger in the treatment areas compared to those in the control areas, the opposite is true for parcels used for tourism. For land size greater than 1,000ha, no statistical differences are observed between treatment and control areas (Table 11)

Although there are significant differences between treatment and control areas regarding a number of parcels with DUATs used for various purposes, these differences are not observed area size, especially within municipalities.

Table 10: Area of parcels with DUATs in rural and urban areas by use by treatment group

| Parcel use | Control | Treatment | Total | Mean differences |
|---|---------|-----------|-------|------------------|
| A. Districts (<1,000ha) | | | | |
| Ag. production (annual & perennial crops) | 53.6 | 77.5 | 71.6 | |
| Forest plantations | 189.0 | 217.8 | 210.3 | |
| Livestock production (cattle & others) | 125.6 | 298.3 | 258.1 | ** |
| Public services | 0.8 | 1.8 | 1.4 | |
| Commerce & industry | 15.5 | 19.8 | 18.8 | |
| Residence | 4.4 | 2.6 | 3.3 | |
| Tourism | 116.9 | 8.6 | 23.1 | ** |
| Social & religion | 6.1 | 9.3 | 8.8 | |
| Crop-livestock production | 148.8 | 240.1 | 207.8 | ** |
| Total | 43.5 | 65.7 | 59.1 | ** |
| B. Municipalities (ha) | | | | |
| Residential | 0.1 | 0.1 | 0.1 | |
| Commerce | 0.1 | 0.3 | 0.2 | |
| Industry | 0.0 | 5.5 | 4.6 | |
| Social/religion/political party | 0.3 | 1.7 | 1.0 | |
| Public services | 17.0 | 19.3 | 18.0 | |
| Residence and commerce | 0.2 | 0.1 | 0.1 | |
| Agriculture | 10.0 | . | 10.0 | |
| Total | 0.4 | 0.2 | 0.3 | |

Source: Authors calculations from SPGC data, 2013; Municipalities Data, 2013 and 2014

+p<0.1, * p<0.05, ** p<0.01, *** p<0.001

^(a) There are few observations for computing t-statistics

Table 11: Area of parcels with DUATs in rural areas by use by treatment group

| Parcel use | Control | Treatment | Total | Control | Treatment | Total | Difference | |
|---|----------------|-----------|---------|-----------|-----------|----------|------------|-------|
| | A | B | | C | D | | [A-B] | [C-D] |
| | 1,001-10,000ha | | | >10,000ha | | | | |
| Ag. production (annual & perennial crops) | 1,400.5 | 2,477.8 | 2,358.1 | 1400.5 | 2477.813 | 2358.111 | | |
| Forest plantations | 2,918.4 | 3,514.8 | 3,349.1 | 2918.4 | 3514.802 | 3349.134 | | |
| Livestock production | 2,000.0 | 1,740.8 | 1,769.6 | 2000 | 1740.797 | 1769.597 | | |
| Commerce | 1,439.0 | 4,081.7 | 3,421.0 | 1439 | 4081.73 | 3421.048 | | |
| Residence | . | 4,357.0 | 4,357.0 | . | 4357 | 4357 | | |
| Tourism | . | 3,666.7 | 3,666.7 | . | 3666.667 | 3666.667 | | |
| Social & religion | . | 7,153.0 | 7,153.0 | . | 7153.02 | 7153.02 | | |
| Crop-livestock production | 1,000.0 | 2,067.8 | 2,005.0 | 1000 | 2067.843 | 2005.029 | | |
| Community | . | 5,000.0 | 5,000.0 | . | 5000 | 5000 | | |
| Total | 2,166.5 | 2,657.6 | 2,590.9 | 2166.546 | 2657.584 | 2590.9 | | |

4.1.2.2 Land Size of those with DUATs over time

In general, average parcel size with DUAT in the districts and municipalities decreased over two consecutive decades (e.g. 1990's and 2000's). But, within the land size categories in the districts, the land size decreased in the lowest size class categories while increased in the higher land size categories.

In the districts, the average parcel area with DUAT in the lowest size category was estimated at 157.1 ha between 1988 and 1989, 371 ha in the 1990's, 525.6ha in the 2000's, and 79.2 in 2011. 1980's to 526 ha in the 2000's. On the other hand, in municipalities, the average parcel area has decreased from 1.1 ha to less than a half of a hectare in the 2000's. In both districts and municipalities, significant differences are not observed when disaggregated over time (especially for the top two land size categories), suggesting that this is a potential alternative to controlling for the differences observed above in an evaluation.

Table 12: Average parcel area for DUAT transactions by land size category over time in the Districts and Municipalities

| Years | Control | Treatment | Total | Mean differences |
|---|----------|-----------|----------|------------------|
| A1. Districts (Land size <1,000ha) | | | | |
| 1981-1990 | 52.0 | 36.5 | 38.4 | |
| 1991-2000 | 79.8 | 105.2 | 97.9 | |
| 2001-2010 | 34.7 | 60.0 | 52.0 | ** |
| 2011 (pre-project) | 41.2 | 53.2 | 49.4 | |
| Total | 43.5 | 65.7 | 59.1 | ** |
| A2. Districts (Land size =1,001 -10,000ha) | | | | |
| 1981-1990 | . | 4,014.6 | 4,014.6 | |
| 1991-2000 | 1,801.0 | 1,755.3 | 1,759.1 | |
| 2001-2010 | 2,203.1 | 2,812.0 | 2,713.8 | |
| 2011 (pre-project) | . | 1,480.0 | 1,480.0 | |
| Total | 2,166.5 | 2,657.6 | 2,590.9 | |
| A3. Districts (Land size > 10,000ha) | | | | |
| 1991-2000 | 37,479.0 | 40,000.0 | 38,739.5 | |
| 2001-2010 | . | 34,372.2 | 34,372.2 | |
| Total | 37,479.0 | 34,747.4 | 34,918.2 | |
| A4. Districts (Total) | | | | |
| 1981-1990 | 52.0 | 171.3 | 157.1 | |
| 1991-2000 | 471.0 | 331.9 | 371.0 | |
| 2001-2010 | 86.7 | 719.0 | 525.6 | * |
| 2011 (pre-project) | 41.2 | 96.4 | 79.2 | |
| Total | 148.7 | 560.2 | 441.1 | * |
| Municipalities (a) | | | | |
| 1991-2000 | 1.3 | 0.9 | 1.1 | |
| 2001-2010 | 0.4 | 0.3 | 0.3 | |
| 2011 (pre-project) | 0.2 | 0.2 | 0.2 | |
| Total | 0.4 | 0.3 | 0.3 | |

+p<0.1, * p<0.05, ** p<0.01, *** p<0.001, (a) records collected are from 1988 to2011

Missing: No DUATs with complete information

Source: Authors calculations from SPGC data, 2013; Municipalities Data, 2013 and 2014.

4.1.3 Number of Land Transactions by Land Use

4.1.3.1 Land Use of those with DUATs by Rural/Urban Area

Table 13 reports the main use of parcels in the study area by treatment group. In general, the main uses of parcels with DUATs with less than 1,000 hectares in both district and municipalities are agricultural and residential; respectively. The columns indicate the percentage distribution of parcels with DUATs by main use while the rows indicate the distribution of parcels across treatment/control sites for each use. For instance, 14 percent of parcels with DUATs in the districts are used for agricultural production of which 75 and 25 percent are located in treatment and control areas; respectively.

As reported in Table 13, in municipalities, the majority of parcels with DUAT are mainly used for residential (85%) and followed in a distant second by commercial/industry use (11 percent). While in the districts only 36 percent of all parcels with DUATs were used for residential purposes with 16% used for commerce/industry, followed by crop production (14 percent), and mixed cropping systems (crop-livestock) occupying about 13 percent of the parcels in the districts.

Table 13: Main use of parcel with DUATs in rural and urban areas

| Use of the parcel | Districts | | | Municipalities | | |
|---|--------------|--------------|--------------|----------------|--------------|--------------|
| | Control | Treatment | Total | Control | Treatment | Total |
| Ag. production (annual & perennial crops) | 11.6 | 15.5 | 14.4 | 0.8 | 0.0 | 0.2 |
| Forest plantations | 1.9 | 2.2 | 2.1 | | | |
| Livestock production | 4.5 | 6.7 | 6.1 | | | |
| Public services | 3.5 | 2.2 | 2.6 | 2.0 | 0.6 | 0.9 |
| Commerce & industry | 13.5 | 16.7 | 15.8 | 0.30 | 0.39 | 0.37 |
| Residence | 45.2 | 32.0 | 35.8 | 82.8 | 85.4 | 84.8 |
| Tourism | 2.6 | 7.1 | 5.8 | | | |
| Social & religion | 2.1 | 4.9 | 4.1 | 4.6 | 1.1 | 2.0 |
| Crop-livestock production (Mixed) | 15.2 | 12.3 | 13.1 | 9.5 | 12.5 | 11.7 |
| Community | 0.0 | 0.4 | 0.3 | | | |
| Residence & commerce | | | | 0.4 | 0.4 | 0.4 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Number of observations | 578 | 1,419 | 1,997 | 996 | 2,778 | 3,774 |

Source: Authors calculations from SPGC data, 2013; Municipalities Data, 2013 and 2014

4.1.3.2 Land Use of those with DUATs by land size

Results in Table 14 show how the primary use of parcels with DUATs vary based on the land size in districts. While the two primary uses of parcels less than 1,000 hectares are residential and agricultural production, the main uses for those parcels between 1,001 and 10,000 hectares are for forest plantation and mixed crop-livestock production, and those with 10,000 hectares or more, are mainly for forest plantation and community uses.

Table 14: Main use of parcels with DUATs by land size class in Districts

| Use of the parcel | Control | Treatment | Total | Control | Treatment | Total | Control | Treatment | Total |
|-------------------------------------|------------|------------|------------|-------------------|------------|------------|------------|------------|------------|
| | <1,000 ha | | | 1,001 - 10,000 ha | | | >10,000 ha | | |
| Ag. production (annual & perennial) | 20.76 | 16.1 | 19.11 | 11.54 | 24.36 | 15.03 | 7.32 | 22.73 | 12.7 |
| Forest plantations | 1.94 | 1.55 | 1.8 | 31.73 | 17.95 | 27.97 | 60.98 | 4.55 | 41.27 |
| Livestock production | 3.11 | 5.22 | 3.85 | 12.5 | 20.51 | 14.69 | 4.88 | 0 | 3.17 |
| Public services | 5.37 | 3.41 | 4.67 | 0.96 | 0 | 0.7 | | | |
| Commerce & industry | 17.01 | 16.16 | 16.71 | 3.85 | 3.85 | 3.85 | 4.88 | 9.09 | 6.35 |
| Residence | 28.42 | 33.74 | 30.3 | 0.96 | 1.28 | 1.05 | | | |
| Tourism | 5.15 | 7.73 | 6.06 | 3.37 | 3.85 | 3.5 | 4.88 | 9.09 | 6.35 |
| Social/religion | 5.15 | 4.96 | 5.08 | 1.92 | 1.28 | 1.75 | 0 | 4.55 | 1.59 |
| Crop-livestock production | 12.88 | 11.08 | 12.24 | 23.56 | 25.64 | 24.13 | 4.88 | 4.55 | 4.76 |
| Community | 0.21 | 0.06 | 0.16 | 9.62 | 1.28 | 7.34 | 12.2 | 45.45 | 23.81 |
| Total | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |

Source: Authors calculations from SPGC data, 2013; Municipalities Data, 2013 and 2014

Only about 6.4% of land over 10,000 hectares is for commerce and industrial purposes and about 3.9 percent of land between 1000 and 10,000 hectares. Note that the typical dual use on municipal land is

residence & commerce and those parcels used for residence and home/vegetable garden are classified as for residential purpose.

4.1.3.2 Land Use of those with DUATs over time

To understand the changes over time, Table 15 to Table 18, present the number of parcels with DUATs by land use over time for the districts and municipalities, respectively. Results show that for parcels less than 1,000ha in the districts, an increase in the proportion of parcels with DUAT has been observed in those intended for residential and tourism while a decrease in proportion has been noted for those used for agricultural production, commerce and industry and crop-livestock production over the two consecutive decades. Similarly, for the same land size group, parcels with DUAT in the municipalities have also observed a slight increase in the proportion of those intended for residential use and a significant decrease for those used for social and religion purposes.

In the districts, parcels within the land size of 1,001-10,000ha, results show an increase in the proportion of parcels used for agricultural production while those used for livestock production observed a decrease in proportion.

Table 15: Percentage of District DUAT Transactions Conducted over Time by Main Use of Parcel (<1,000ha)

| Use of the parcel | Control | Treatment | Total | Control | Treatment | Total | Control | Treatment | Total | Control | Treatment | Total |
|-------------------------------------|-----------|-----------|-------|-----------|-----------|-------|-----------|-----------|-------|--------------------|-----------|-------|
| | 1981-1990 | | | 1991-2000 | | | 2001-2010 | | | 2011 (pre-project) | | |
| Ag. production (annual & perennial) | 62.5 | 29.8 | 33.9 | 20.4 | 23.8 | 22.8 | 6.9 | 10.9 | 9.6 | 15.6 | 11.5 | 12.8 |
| Forest plantations | | | | 0.0 | 0.4 | 0.3 | 1.2 | 1.7 | 1.6 | 2.2 | 1.0 | 1.4 |
| Livestock production | 12.5 | 7.0 | 7.7 | 7.1 | 8.6 | 8.2 | 2.7 | 5.2 | 4.4 | 8.9 | 4.2 | 5.7 |
| Public services | 0.0 | 0.9 | 0.8 | 0.0 | 1.6 | 1.2 | 3.9 | 1.9 | 2.6 | 8.9 | 9.4 | 9.2 |
| Commerce & industry | 6.3 | 11.4 | 10.8 | 21.4 | 18.0 | 19.0 | 12.8 | 18.8 | 16.9 | 6.7 | 10.4 | 9.2 |
| Residence | 18.8 | 46.5 | 43.1 | 27.6 | 25.0 | 25.7 | 54.6 | 34.8 | 41.0 | 20.0 | 34.4 | 29.8 |
| Tourism | | | | 0.0 | 2.1 | 1.5 | 2.7 | 8.2 | 6.5 | 8.9 | 20.8 | 17.0 |
| Social/religion | | | | 1.0 | 3.3 | 2.6 | 2.5 | 6.6 | 5.3 | 2.2 | 2.1 | 2.1 |
| Crop-livestock production | 0.0 | 4.4 | 3.9 | 22.5 | 17.2 | 18.7 | 12.8 | 11.8 | 12.1 | 26.7 | 6.3 | 12.8 |
| Community | | | | | | | 0.0 | 0.1 | 0.1 | | | |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

Source: Authors calculations from SPGC data, 2013; Municipalities Data, 2013 and 2014

Table 16: Percentage of District DUAT Transactions Conducted over Time by Main Use of Parcel (1,001-10,000ha)

| Use of the parcel | Control | Treatment | Total | Control | Treatment | Total | Control | Treatment | Total | Control | Treatment | Total |
|-------------------------------------|-----------|-----------|-------|-----------|-----------|-------|-----------|-----------|-------|--------------------|-----------|-------|
| | 1981-1990 | | | 1991-2000 | | | 2001-2010 | | | 2011 (pre-project) | | |
| Ag. production (annual & perennial) | | 25.0 | 25.0 | 100.0 | 9.1 | 16.7 | 10.0 | 23.1 | 21.0 | | 66.7 | 66.7 |
| Livestock production | | 50.0 | 50.0 | 0.0 | 36.4 | 33.3 | 20.0 | 17.3 | 17.7 | | 33.3 | 33.3 |
| Crop-livestock production | | 25.0 | 25.0 | 0.0 | 54.6 | 50.0 | 10.0 | 17.3 | 16.1 | | | |
| Forest plantations | | | | | | | 50.0 | 25.0 | 29.0 | | | |
| Commerce & industry | | | | | | | 10.0 | 5.8 | 6.5 | | | |
| Residence | | | | | | | 0.0 | 1.9 | 1.6 | | | |
| Tourism | | | | | | | 0.0 | 5.8 | 4.8 | | | |
| Social/religion | | | | | | | 0.0 | 1.9 | 1.6 | | | |
| Community | | | | | | | 0.0 | 1.9 | 1.6 | | | |
| Total | | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | | 100.0 | 100.0 |

Source: Authors calculations from SPGC data, 2013; Municipalities Data, 2013 and 2014

Table 17: Percentage of District DUAT Transactions Conducted over Time by Main Use of Parcel (>10,000ha)

| Use of the parcel | Control | Treatment | Total | Control | Treatment | Total | Control | Treatment | Total | Control | Treatment | Total |
|-------------------------------------|-----------|-----------|-------|-----------|-----------|-------|-----------|-----------|-------|--------------------|-----------|-------|
| | 1981-1990 | | | 1991-2000 | | | 2001-2010 | | | 2011 (pre-project) | | |
| Ag. production (annual & perennial) | | | | | | | | 35.7 | 35.7 | | | |
| Commerce & industry | | | | 0.0 | 100.0 | 50.0 | | 7.1 | 7.1 | | | |
| Crop-livestock production | | | | 100.0 | 0.0 | 50.0 | | 7.1 | 7.1 | | | |
| Forest plantations | | | | | | | | 7.1 | 7.1 | | | |
| Tourism | | | | | | | | 7.1 | 7.1 | | | |
| Social/religion | | | | | | | | 7.1 | 7.1 | | | |
| Community | | | | | | | | 28.6 | 28.6 | | | |
| Total | | | | 100.0 | 100.0 | 100.0 | | 100.0 | 100.0 | | | |

Source: Authors calculations from SPGC data, 2013; Municipalities Data, 2013 and 2014

Table 18: Percentage of DUAT Transactions Conducted Over Time by Main Use of Parcels in the Municipalities

| Use of the parcel | Control | Treatment | Total | Control | Treatment | Total | Control | Treatment | Total | Control | Treatment | Total |
|----------------------|--------------|-----------|-------|-----------|-----------|-------|-----------|-----------|-------|-----------|-----------|-------|
| | 1981-1980(a) | | | 1991-2000 | | | 2001-2010 | | | 2010-2011 | | |
| Residence | 100.0 | 100.0 | 100.0 | 58.5 | 74.7 | 71.2 | 82.2 | 75.2 | 76.6 | 49.1 | 84.0 | 67.3 |
| Commerce | | | | 5.7 | 12.1 | 10.7 | 8.8 | 11.6 | 11.0 | 4.9 | 7.3 | 6.1 |
| Industry | | | | 9.4 | 0.0 | 2.1 | 0.2 | 0.4 | 0.4 | 0.2 | 0.2 | 0.2 |
| Social & religion | | | | 17.0 | 0.5 | 4.1 | 4.7 | 1.2 | 1.9 | 0.9 | 0.4 | 0.7 |
| Public services | | | | 5.7 | 2.1 | 2.9 | 1.8 | 0.3 | 0.6 | 0.9 | 0.6 | 0.8 |
| Agriculture | | | | 1.9 | 0.0 | 0.4 | 0.8 | 0.0 | 0.2 | 0.2 | 0.0 | 0.1 |
| Residence & commerce | | | | | | | 0.4 | 0.5 | 0.5 | 0.2 | 0.2 | 0.2 |
| No data | | | | 1.9 | 10.5 | 8.6 | 1.2 | 10.8 | 8.9 | 43.5 | 7.3 | 24.6 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

Source: Authors calculations from SPGC data, 2013; Municipalities Data, 2013 and 2014(a) Records collected are from 1988 to 1990

4.2 DUAT Transaction times

This section analyses the variation of DUAT transaction times over time, by land use, and land size.

4.2.1 Transaction time by parcel size

Results reported in Table 19 indicate that the average DUAT's transaction time between 1988 and 2011 was about 472 and 116 days in districts and municipalities; respectively. In the districts, it took much longer to obtain a DUAT for agricultural production (a little over 2 years), for livestock production (about 1.5 year), and for residence and commerce/industry use (a little more than 1 year), while parcels used for social and religion purposes are quicker to obtain DUAT (about 6 months). In general, significant differences in DUATs transaction times are observed between controls and treatments in districts, mainly on parcels used for livestock production, residence, and mixed production system (crop-livestock), where much longer processing times are observed in treatment areas. Note that each transaction time in Table 19 is an average of a large period (23 years), which could mask large differences over time. Disaggregating the data by time periods reveal that the data is extremely biased by 1980s/1990s data. When looking at last decade or two, it is much more even in terms of timing between districts and municipalities, in fact, 2000-2010 municipalities took longer than districts. The analysis on transaction times disaggregated by time periods will be presented later.

Within the municipalities, the transaction times are much shorter (three to four times) perhaps due to their accessibility compared to the districts where in some cases landholders have to travel long distances to the administration office to apply. However, when looking at the historic data trends, we find that the difference in transaction times between districts and municipalities in the most recent data (over the last 10 years) is small. With similar application procedures in both district and municipality areas, the relatively small parcel sizes in the municipalities compared to those in the districts could have been a reason for such shorter processing times. On average, it took about 116 days for a landholder to obtain a DUAT within municipality areas. As in the districts, significant differences between treatment and control sites are observed in municipalities, but the treatment sites have significantly shorter processing time than their counterparts which took only 115 days to approve a DUAT application. These differences are mainly observed in parcels used for industry and social/religion purposes. Although the transaction times are significantly larger in the control than in the treatment areas for industry and social/religion parcels, there is still room for a potential effect of capacity building in reducing transaction time. However, when we control for parcel size, these differences are only significant for the smaller land size category (<1,000ha).

Given that the average transaction time in treatment areas is largely beyond the intended 90 days limit (except in treatment areas for industry, public services and community and in control areas for tourism) by the Ministry of Agriculture, investments in strengthening local capacity, while improving efficiency in local land administration units, may not be sufficient to reduce the transaction time if such procedures are not linked to reforms to simplify the current lengthy registration process and to meet the 90 days period for processing DUAT, as intended. We present further analysis with data disaggregated by time and land size categories below. Care must be exercised while interpreting these results because looking at the data over time; results show an impressive reduction in the transaction times, especially in the last decade and the last year before the LTR's intervention. In fact, in the year 2011, the transaction times in both regions are well below the 90 days. So again, data over 23 years prior to intervention may not be a realistic baseline data. Instead, data from the last decade or even shorter are better as a baseline. How many years prior to the intervention should be included also depends on the number of post-intervention years for which we will have data for evaluation.

Table 19: Average DUAT Transaction and delimitation time by use type by land size by treatment group

| Parcel use | Control | Treatment | Total | Control | Treatment | Total | Mean differences | |
|--|------------------------------|-----------|-------|------------------------------------|-----------|-------|------------------|-------|
| | A | B | | C | D | | [A-B] | [C-D] |
| | DUAT transaction time (days) | | | DUATs processed beyond 90 days (%) | | | | |
| A1. Districts (all land size groups; N=1,997) | | | | | | | | |
| Ag production (annual & perennial crops) | 539.6 | 786.4 | 728.8 | 55.2 | 56.4 | 56.1 | | |
| Forest plantations | 213.4 | 242.5 | 234.9 | 63.6 | 71.0 | 69.0 | | |
| Livestock production (cattle & others) | 299.2 | 677.7 | 596.4 | 61.5 | 53.7 | 55.4 | + | |
| Public services | 73.6 | 318.7 | 222.6 | 30.0 | 41.9 | 37.3 | | |
| Commerce & industry | 335.2 | 470.5 | 437 | 53.8 | 41.4 | 44.4 | | + |
| Residence | 213.4 | 600.6 | 459.3 | 37.5 | 37.4 | 37.5 | ** | |
| Tourism | 65.8 | 221.2 | 201.1 | 33.3 | 44.6 | 43.1 | | |
| Social & religion | 167.2 | 172.2 | 171.5 | 25.0 | 38.6 | 36.6 | | |
| Crop-livestock production | 280.5 | 637.2 | 517.4 | 56.8 | 46.0 | 49.6 | ** | + |
| Community | . | 57.3 | 57.3 | . | 16.7 | 16.7 | a | a |
| Total | 272.1 | 552.9 | 471.6 | 45.7 | 44.5 | 44.8 | ** | |
| A1. Districts (<1,000ha; N=1,900) | | | | | | | | |
| Ag production (annual & perennial crops) | 535 | 806.8 | 739.9 | 53.8 | 55.8 | 55.3 | | |
| Forest plantations | 220.8 | 271.2 | 258 | 50.0 | 64.7 | 60.9 | | |
| Livestock production (cattle & others) | 263.2 | 588.5 | 512.7 | 58.3 | 46.8 | 49.5 | | |
| Public services | 73.6 | 318.7 | 222.6 | 30.0 | 41.9 | 37.3 | | |
| Commerce & industry | 338.7 | 463.6 | 432.5 | 54.5 | 41.4 | 44.7 | | * |
| Residence | 213.4 | 601.8 | 459.8 | 37.5 | 37.5 | 37.5 | *** | |
| Tourism | 65.8 | 217.7 | 197.3 | 33.3 | 44.3 | 42.9 | | |
| Social & religion | 167.2 | 176.2 | 174.9 | 25.0 | 39.7 | 37.5 | | |
| Crop-livestock production | 277.1 | 595 | 482.5 | 55.8 | 44.6 | 48.6 | | + |
| Community | . | 27 | 27 | . | 0.0 | 0.0 | | |
| Total | 269.4 | 545.9 | 463.5 | 44.9 | 43.3 | 43.8 | *** | |
| B. Municipalities (N=3,774) | | | | | | | | |
| Residence | 120.1 | 116 | 117 | 29.3 | 34.6 | 33.3 | | * |
| Commerce | 119.9 | 102.8 | 105.9 | 30.4 | 34.4 | 33.7 | | |
| Industry | 168 | 47.8 | 97.3 | 71.4 | 20.0 | 41.2 | * | * |
| Social/religion/political party | 272.3 | 110.1 | 202.8 | 62.2 | 42.9 | 53.8 | + | |
| Public services | 164.4 | 48.8 | 110.5 | 25.0 | 21.4 | 23.3 | | |
| Residence and commerce | 59 | 159.7 | 138.1 | 33.3 | 54.5 | 50.0 | | |
| Agriculture | 616.2 | . | 616.2 | 66.7 | . | 66.7 | a | |
| Total | 119.3 | 114.8 | 115.9 | 31.5 | 34.6 | 33.9 | + | |

+p<0.1, * p<0.05, ** p<0.01, *** p<0.001; (a) There are few observations for computing t-statistics; (b) Interpreted as community land delimitation

Source: Authors calculations from SPGC data, 2013; Municipalities Data, 2013 and 2014

4.2.2 Percentage of transactions within 90 days limit¹³

Table 20 reports the share of applications for DUATs that were processed in more than 90 days by main use by treatment group. In general, there are no significant differences between treatment and control sites regarding the percentage of DUAT applications processed beyond 90 days. But, significant differences are observed between districts and municipalities, with districts observing a large percentage of DUATs processed beyond 90 days.

Overall in districts, the majority of DUATs processed beyond 90 days are those of parcels intended for forest plantations (69 percent), followed by those for agricultural production (56 percent), and livestock production (55 percent). Again, in general, there are no significant differences between treatment and control sites except for parcels used for commerce and industry and those for crop-livestock production where control sites have a large proportion of DUATs processed beyond the 90-day limit.

Controlling for land size, results in Table 19 show that for the land size less than 1,000ha the proportion of DUATs processed beyond 90 days are those intended for forest production (61 percent), agricultural production (55 percent), and livestock production (50 percent) with no statistical differences between treatment and control areas.

In the municipalities, on the other hand, the majority of DUATs that were processed beyond 90 days are those intended for agriculture (67%) which represent a small proportion of all parcels processed beyond 90 days (0.3 percent) , followed by those for social/religious uses (54%), and residential and commercial purposes (50%). A total of 33.3 percent of the parcels used for residential purposes were processed beyond 90 days. In general, there are no significant differences between treatment and control sites except for parcels for residential and industrial purposes. However, after controlling for parcel use, a higher proportion of parcels used for industry and a lower proportion of parcels used for residential purposes in the control sites were processed beyond 90 days compared to the treatment sites. Note that parcels for residential and industrial uses represent 74.2 percent and 0.56 percent of all parcels processed beyond 90 days; respectively.

4.2.3 Transaction time by land size

Acknowledging that the processing time for DUAT applications may depend on land size authorized, thus, the level of authority involved, two types of analyses were conducted:

- (i) The effect of authority level on DUAT processing time by disaggregating land size to represent authority levels. In principle, large areas such as those between 1,000 and 10,000 hectares and greater than 10,000 hectares are expected to have longer processing times as they require to be authorized by the Minister of Agriculture and Council of Ministers; respectively. On the other hand, DUATs applications for smaller areas, less than 1,000 hectares, which are authorized by the Provincial Governors are expected to have lower processing times, and
- (ii) the regional comparison is done in smaller areas (less than 1,000 hectares) given that all applications in the Municipalities are in the lowest area size category. However, for descriptive and reference reasons, we present the estimates for the other two land size categories for the Districts.

¹³ The Ministry of Agriculture has the intention of achieving a maximum of 90 days for processing DUAT applications. However, no legislation has been produced on this regard. Unfortunately, this intention does not make a reference to size, which is hard to use effectively as performance measure.

Results in Table 20 show that large land size takes longer transaction times compared to smaller areas, suggesting higher flexibility of the lower level authority in processing land use rights compared to higher authority level. This could be because land sizes over 1,000 and those over 10,000ha require additional steps in processing DUAT including a business plan, environmental assessment, and clearance from the authorities below the higher authority level that makes a final decision.

Table 20: Average DUAT Transaction time (days) in rural and urban areas by treatment group over time for land size

| Parcel size | Control | Treatment | Total | Mean differences |
|---|---------|-----------|-------|------------------|
| A. Districts | | | | |
| <1,000ha | 269.4 | 545.9 | 463.5 | ** |
| 1,001 -10,000ha | 375.8 | 695.1 | 651.7 | |
| >10,000ha | 648.0 | 512.6 | 521.1 | A |
| Total | 272.1 | 552.9 | 471.6 | ** |
| A.1 Farm size (Size parcels <1,000ha) | | | | |
| Small farm (<10ha) | 245.1 | 462.4 | 397.5 | *** |
| Medium farm (10-50ha) | 374.3 | 1020.1 | 807.6 | *** |
| Large farm (>50ha) | 309.7 | 661.9 | 563.4 | |
| B. Municipalities | | | | |
| <1,000ha | 119.3 | 114.8 | 115.9 | ** |
| 1,001 -10,000ha | n/a | n/a | n/a | |
| >10,000ha | n/a | n/a | n/a | |
| B.1 Farm size (Size parcels <1,000ha) | | | | |
| Small farm (<10ha) | 120.9 | 118.6 | 119.4 | |
| Medium farm (10-50ha) | 75.5 | 50.3 | 60.4 | |
| Large farm (>50ha) | 116.0 | 111.9 | 112.6 | |
| Total | 119.3 | 114.8 | 115.9 | ** |

+p<0.1, * p<0.05, ** p<0.01, *** p<0.001 (a): insufficient data for t-test

Source: Authors calculations from SPGC data, 2013; Municipalities Data, 2013 and 2014

For parcels under 1,000ha, descriptive analysis shows that the DUAT processing time is significantly longer in the treatment areas than in the control areas on small (<10ha) and medium farms (10-50ha) in rural districts. However, in the case of municipalities, there is no statistical difference between the treatment and control sites for any size category.

4.2.4 Transaction times over the years

To analyze the evolution of performance in providing land administration services to the public, we estimated the speed at which each land administration office (in the municipalities and districts) approved DUAT applications in the last 23 years before LTR's interventions.

Results in Table 21 show an impressive, significant progress in both districts and municipalities with statistically significant differences between treatment and control sites in each region in earlier periods (1980's and 1990's).

In the districts, the cadastral offices took about seven years to approve an application for DUAT in the 1980's, while in the two years preceding the LTR's intervention (2011), the processing time was reduced to about 80 days. Although municipalities are quicker in processing DUAT applications, the much slower incremental improvement was observed over time, with processing times changing from about eight months in the 1980's to a little more than two months in 2011. Results show that the transaction time decreased by 75% in municipalities and by 97% in districts.

Significant differences between treatment and control sites were observed in the earlier periods where treatment sites had larger processing times than their counterparts. This trend has been similar to one observed in the municipalities with processing times decreasing from about eight months in the 1980's to about 65 days in the last year, pre-project. But, contrary to the districts, the treatment areas in the municipalities observed significantly shorter processing times compared to the control areas in 1980's and 1990's but, in the 2000's, the treatment sites larger DUAT processing times.

The main implication of the fact that the processing times between the treatment and control sites are statistically significantly in the 1980s/1990s but not in the 2000s again reinforce the early argument that the baseline should not go far back before the project intervention. As per these results, the realistic baseline for this evaluation should be the last decade or even shorter. In the final evaluation, we can explore the different time lengths for the baseline period.

The results from Tables 21 also show an impressive improvement in reducing the percentage of DUATs processed beyond the 90-day limit. In the districts, the percentage of DUATs processed beyond the time limit reduced from 91 percent in the 1980's to 22 percent in the last two years before the project implementation (about 70 percent improvement). As indicated above, although the municipalities appear to have lower processing times compared to districts the performance improvement between the two periods in the analysis is smaller for the same land size group.

Table 21: Average DUAT Transaction time (days) in rural and urban areas by treatment group over time by land size group

| Authorization time & land size group | Control | Treatment | Total | Mean differences | | Control | Treatment | Total | Mean differences | |
|---|----------|-----------|----------|------------------|------------------------------------|---------|-----------|-------|------------------|-------------|
| | A | B | | [A-B] | [Over time] | C | D | | [C-D] | [Over time] |
| DUAT transaction time (days) | | | | | DUATs processed beyond 90 days (%) | | | | | |
| A1. Districts (all land size groups, N=1,997) | | | | | | | | | | |
| 1981-1990 | 1,152.70 | 2,657.20 | 2,477.60 | ** | | 75.0 | 93.2 | 91.0 | * | |
| 1991-2000 | 864.6 | 1,346.20 | 1,210.90 | ** | *** | 96.0 | 97.3 | 96.9 | | ** |
| 2001-2010 | 116.4 | 125.6 | 122.8 | | *** | 34.3 | 26.7 | 29.1 | ** | *** |
| 2011 (pre-project) | 85.4 | 76.3 | 79.2 | | * | 28.9 | 19.2 | 22.2 | | + |
| Total | 272.1 | 552.9 | 471.6 | ** | ** | 45.7 | 44.5 | 44.8 | | *** |
| A2. Districts (<1,000ha, N=1,900) | | | | | | | | | | |
| 1981-1990 | 1,152.70 | 2,599.20 | 2,421.10 | ** | | 75.0 | 93.0 | 90.8 | * | |
| 1991-2000 | 862.5 | 1,333.10 | 1,198.20 | ** | *** | 95.9 | 97.1 | 96.8 | | ** |
| 2001-2010 | 112.2 | 113.2 | 112.9 | | *** | 33.2 | 24.7 | 27.4 | ** | *** |
| 2011 (pre-project) | 85.4 | 73.6 | 77.4 | | + | 28.9 | 18.8 | 22.0 | | |
| Total | 269.4 | 545.9 | 463.5 | ** | ** | 44.9 | 43.3 | 43.8 | | *** |
| B. Municipalities (<1,000 ha only; N=3,774) | | | | | | | | | | |
| 1981-1990 (a) | 462.6 | 116.9 | 289.8 | * | | 100.0 | 50.0 | 75.0 | + | |
| 1991-2000 | 525.2 | 119.6 | 225 | ** | | 59.7 | 30.7 | 38.7 | * | ** |
| 2001-2010 | 97.9 | 122.5 | 117.6 | * | ** | 28.1 | 37.0 | 35.1 | ** | |
| 2011 (pre-project) | 63.1 | 65.9 | 64.5 | | *** | 27.3 | 22.7 | 24.3 | * | *** |
| Total | 119.3 | 114.8 | 115.9 | + | ** | 31.5 | 34.6 | 33.9 | | *** |

[†]p<0.1, * p<0.05, ** p<0.01, *** p<0.001; (a) data collected is from 1988 to 1990

Source: Authors calculations from SPGC data, 2013; Municipalities Data, 2013 and 2014

4.3 Land Conflicts

The land conflicts are mostly not formally reported and registered in the cadastral offices. Of all the 16 municipalities visited, there was only one municipality (Mocimboa da Praia) that data on conflicts can be found. Out of 6 DUATs compiled in Mocimboa da Praia, only two land conflicts were formally reported to the Municipality authorities pre-intervention.

4.4 DUAT transfers

There are no transfer records reported in the districts' data sets, but systematic records are available for the municipalities. Note that the currently land legislation possesses legal restrictions related to transfers given that land is State property which can't sell but leased. Most of the transfers are made through transfer of properties, not simply DUAT transfer. Results reported in Table 22 are for the municipalities and indicate that out of 3,774 recorded DUATs before the land project (1988-2011), only about 4 percent had been transferred and formally reported to the municipality authorities, equally distributed between treatment and control areas with 3.8 percent and 2.8 percent; respectively. A large majority of these transfers (75 percent) were owned by males mostly in treatment areas.

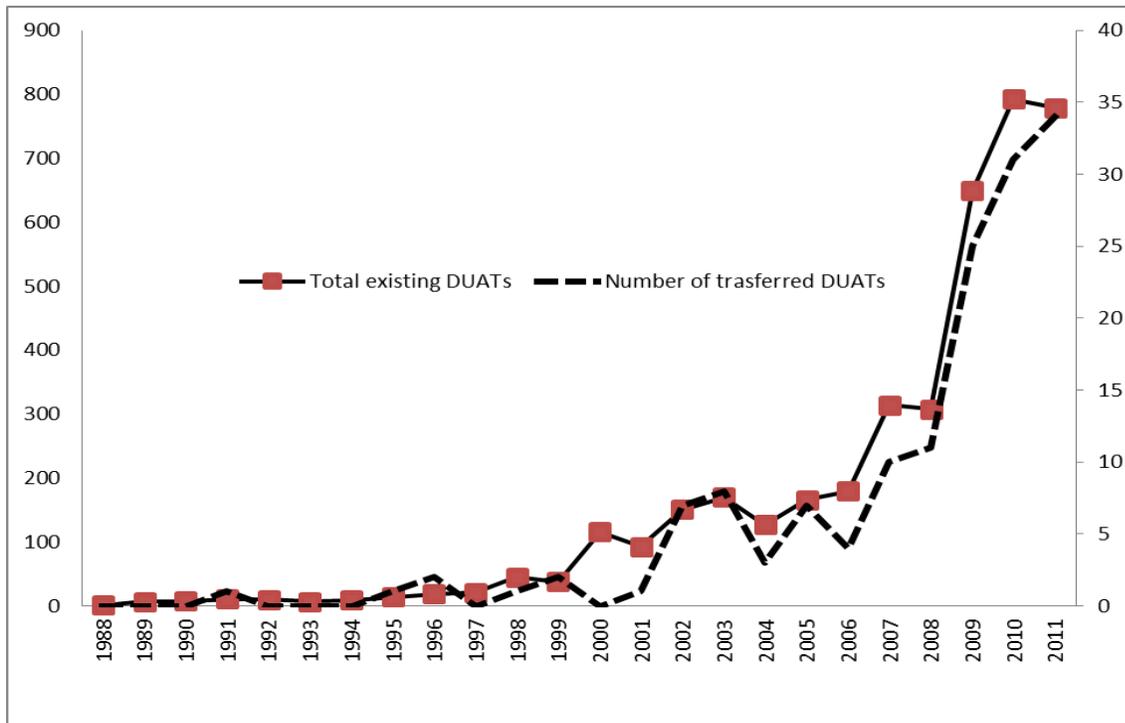
Table 22: Percentage of land DUAT transfers by gender of the landholder by treatment group

| Item | Control | Treatment | Total | Mean Diff. |
|--|---------|-----------|--------|------------|
| <i>Transferred DUAT</i> | 2.8% | 3.8% | 3.6% | |
| Total observations | 996 | 2,778 | 3,774 | |
| <i>If transferred, number of transfers by gender of DUAT's holder:</i> | | | | |
| Male | 57.1% | 75.2% | 71.4% | ** |
| Female | 35.7% | 22.9% | 25.6% | * |
| Co-owned | 3.6% | 0.0% | 0.8% | |
| No data | 3.6% | 1.9% | 2.3% | * |
| Total | 100.0% | 100.0% | 100.0% | |
| Observations | 28 | 105 | 133 | |

+p<0.1, * p<0.05, ** p<0.01, *** p<0.001

Source: Authors calculations from SPGC data, 2013; Municipalities Data, 2013 and 2014

Figure 1: Trend of DUAT transfers in the selected Municipalities



Source: Authors calculations from SPGC data, 2013; Municipalities Data, 2013 and 2014

Figure 1 depicts the evolution on the number of DUAT transfers (right scale) and compares with a total number of existing DUATs (right scale). Results show that both existing numbers of DUATs and DUAT transfer have been increasing over time.

Further details about transferred DUATs are presented in Table 23. Results indicate that the majority of those transfers are on parcels used for residential purposes (44 percent). Note that large number of transfers has no information on their main uses. Changes over time suggest market development. Five percent of total DUAT transfers occurred in the 1990's with about 71 percent of reported DUAT transfers occurring in the 2000's and 24 percent of DUAT transfers in 2011/2012, which is equivalent to a rate of 12 percent per year (greater than the average increase of about 7 percent per year in the decade before), it indicates the potential of land market growth in the next years. Compared to the existing DUATs, these figures are equivalent to about 4, 72, and 23 percent of the existing DUATs; respectively.

DUAT transaction times for transferred DUATs are presented in Table 24. The question of whether there are significant differences in transaction times between transferred DUATs and non-transferred DUATs¹⁴ and between treatment and control sites is addressed in the first panel of Table 24. Results show that there is a statistically significant difference between transferred and not transferred DUATs where the transferred DUAT is approved in a shorter time than the others. These differences are most significant in the treatment areas compared to the control zones. However, no regional differences are observed among the transferred DUATs.

¹⁴ We refer to first time registration of DUAT and others

Table 23: Percentage of transferred DUATs by land use, land size over time

| Item | Control | Treatment | Total | Mean Diff. |
|-----------------------|---------|-----------|--------|------------|
| <i>Use of parcel:</i> | | | | |
| Residence | 17.9% | 51.4% | 44.4% | |
| Commerce | 7.1% | 3.8% | 4.5% | |
| Public services | 0.0% | 1.0% | 0.8% | |
| No data | 75.0% | 43.8% | 50.4% | |
| Total | 100.0% | 100.0% | 100.0% | |
| <i>Land size:</i> | | | | |
| <1,000ha | 10.7% | 40.0% | 33.8% | |
| No data | 89.3% | 60.0% | 66.2% | |
| Total | 100.0% | 100.0% | 100.0% | |
| <i>Years:</i> | | | | |
| 1990-2000 | 3.6% | 4.8% | 4.5% | |
| 2000-2010 | 14.3% | 86.7% | 71.4% | |
| 2010-2011 | 82.1% | 8.6% | 24.1% | |
| Total | 100.0% | 100.0% | 100.0% | |
| Observations | 28 | 105 | 133 | |

+p<0.1, * p<0.05, ** p<0.01, *** p<0.001

Source: Authors calculations from SPGC data, 2013; Municipalities Data, 2013 and 2014

A significant transaction time reduction is observed among the transacted DUATs over the years, from about 6.4 months in the 1990's to about two months in 2011-2012, but no regional differences between treatment and control sites were observed.

Table 24: Transaction times (in days) for transferred DUATs by land use, land size over time

| Item | Statistics | Control | Treatment | Total | Mean difference |
|---|------------|---------|-----------|-------|-----------------|
| <i>Transferred DUAT:</i> | | | | | |
| Yes | Mean | 51.6 | 75.2 | 70.3 | |
| | N | 28 | 105 | 133 | |
| No (this parcel never had a transferred DUAT) | Mean | 121.2 | 116.3 | 117.6 | |
| | N | 968 | 2673 | 3,641 | |
| Total | Mean | 119.3 | 114.8 | 115.9 | * |
| | N | 996 | 2778 | 3,774 | |
| Mean difference | | | * | * | |
| <i>Use of parcel:</i> | | | | | |
| Residence | Mean | 18.0 | 93.6 | 87.2 | |
| | N | 5 | 54 | 59 | |
| Commerce | Mean | 12.0 | 36.8 | 28.5 | |
| | N | 2 | 4 | 6 | |
| Public services | Mean | . | 64.0 | 64.0 | |
| | N | 0 | 1 | 1 | |
| No data | Mean | 63.4 | 57.3 | 59.2 | |
| | N | 21 | 46 | 67 | |
| Total | Mean | 51.6 | 75.2 | 70.3 | * |
| | N | 28 | 105 | 133 | |
| <i>Land size:</i> | | | | | |
| <1,000ha | Mean | 13.0 | 78.7 | 74.3 | |
| | N | 3 | 42 | 45 | |

| | | | | |
|---------------|------|------|-------|-------|
| No data | Mean | 56.2 | 73.0 | 68.2 |
| | N | 25 | 63 | 88 |
| Total | Mean | 51.6 | 75.2 | 70.3 |
| | N | 28 | 105 | 133 |
| <i>Years:</i> | | | | |
| 1991-2000 | Mean | 14.0 | 234.2 | 197.5 |
| | N | 1 | 5 | 6 |
| 2001-2010 | Mean | 12.0 | 66.8 | 64.5 |
| | N | 4 | 91 | 95 |
| 2011 | Mean | 60.1 | 72.2 | 63.5 |
| | N | 23 | 9 | 32 |
| Total | Mean | 51.6 | 75.2 | 70.3 |
| | N | 28 | 105 | 133 |

+p<0.1, * p<0.05, ** p<0.01, *** p<0.001

Source: Authors calculations from SPGC data, 2013; Municipalities Data, 2013 and 2014

4.5 Gender heterogeneity of key indicators

Besides counting the number of land transactions, estimating the DUAT transaction times, gender analysis in land use rights is a source of other insights into land issues. Due to data limitations, we present an overall picture of sex differences in the districts and municipality areas with no distinction of treatment group. Table 25 summarizes the outcome indicators by gender DUAT holders' gender. A common feature in both study areas is the gender differentiation in DUATs' holders. Results indicate that women¹⁵ hold no more than one-quarter of DUATs. On transaction times, the SPGCs take on average one year more to authorize female-owned DUATs than those of men, while in the municipalities there is no statistically significant gender difference. In general, more significant gender differences are observed in districts than in the municipality areas, suggesting that women and men seem to be more equally treated in municipality areas than in the rural districts. Over time, the gender differences are decreasing especially for parcels in the lowest land size category.

Table 25: Outcome indicators by gender of DUATs' owner in the Districts and Municipalities

| Indicator | Male | Female | Co-owned | No data | Total | Mean difference |
|---|---------|---------|----------|---------|---------|-----------------|
| A1. Districts (All; N=1,997) | | | | | | |
| Gender of the DUAT -holder (%) | 37.6 | 19.9 | | 42.6 | 100.0 | * |
| Transaction time (days) | 391.7 | 715.6 | | 428.2 | 471.6 | ** |
| Area (ha) | 541.1 | 808.5 | | 181.2 | 441.1 | * |
| Processed in more than 90 days | 47.6% | 50.9% | | 39.5% | 44.8% | |
| A2. Districts (<1,000ha; N=1,900) | | | | | | |
| Gender of the DUAT-holder (%) | 37.7 | 18.7 | | 43.5 | 100.0 | * |
| Transaction time (days) | 399.5 | 703.7 | | 415.7 | 463.5 | ** |
| Area (ha) | 39.5 | 122.1 | | 49.0 | 59.1 | ** |
| Processed in more than 90 days | 47.1% | 48.9% | | 38.7% | 43.8% | |
| A3. Districts (1,001-10,000ha; N=81) | | | | | | |
| Gender of the DUAT -holder (%) | 32.1 | 42.0 | | 25.9 | 100.0 | |
| Transaction time (days) | 176.8 | 843.6 | | 929.0 | 651.7 | * |
| Area (ha) | 2,666.6 | 2,484.3 | | 2,669.7 | 2,590.9 | |
| Processed in more than 90 days | 61.5% | 70.6% | | 71.4% | 67.9% | |

¹⁵ Women-holder is referred to DUAT registered in the name of a women, whether they with husband or not.

A4. Districts (>10,000ha; N=16)

| | | | | |
|--------------------------------|----------|----------|----------|----------|
| Gender of the DUAT -holder (%) | 43.8 | 43.8 | 12.5 | 100.0 |
| Transaction time (days) | 392.1 | 695.3 | 362.5 | 521.1 |
| Area (ha) | 44,023.6 | 27,578.0 | 28,739.5 | 34,918.2 |
| Processed in more than 90 days | 42.9% | 57.1% | 50.0% | 50.0% |

B. Municipalities

| | | | | | | |
|--------------------------------|-------|-------|------|-------|-------|----|
| Gender of the DUAT -holder (%) | 75.3 | 20.9 | 0.0 | 3.8 | 100.0 | ** |
| Transaction time (days) | 116.7 | 128.6 | 49.0 | 115.8 | 119.1 | |
| Area (ha) | 0.9 | 0.5 | . | 0.3 | 0.8 | |
| Processed in more than 90 days | 34.2% | 34.0% | 0.0% | 27.2% | 33.9% | |

+p<0.1, * p<0.05, ** p<0.01, *** p<0.001

Source: Authors calculations from SPGC data, 2013; Municipalities Data, 2013 and 2014

Table 26: Outcome indicators by gender of DUATs' owner in the Districts and Municipalities over time

| Gender | Transaction time (days) | Area (ha) | Processed in more than 90 days (%) | Transaction time (days) | Area (ha) | Processed in more than 90 days (%) | Transaction time (days) | Area (ha) | Processed in more than 90 days (%) | Transaction time (days) | Area (ha) | Processed in more than 90 days (%) |
|---------------------------------------|-------------------------|-----------|------------------------------------|-------------------------|-----------|------------------------------------|-------------------------|-----------|------------------------------------|-------------------------|-----------|------------------------------------|
| | 1981-1990 | | | 1991-2000 | | | 2001-2010 | | | 2011 | | |
| A1. Districts (<1,000ha) | | | | | | | | | | | | |
| Male | 1970.8 | 31.2 | 75.0% | 1075.2 | 68.9 | 90.4% | 141.7 | 32.8 | 37.3% | 82.7 | 46.9 | 23.5% |
| Female | 2865.7 | 40.5 | 98.0% | 1214.5 | 177.3 | 100.0% | 108.5 | 120.0 | 24.1% | 72.4 | 157.3 | 17.6% |
| No data | 2367.9 | 44.2 | 100.0% | 1281.1 | 83.7 | 100.0% | 88.5 | 42.6 | 19.6% | 74.8 | 25.9 | 21.9% |
| Total | 2421.1 | 38.4 | 90.8% | 1198.2 | 97.9 | 96.8% | 112.9 | 52.0 | 27.4% | 77.4 | 49.4 | 22.0% |
| Difference | | | | | *** | | | *** | | | * | |
| A2. Districts (1,001-10,000ha) | | | | | | | | | | | | |
| Male | | | | | | 100.0% | 176.8 | 2666.6 | 61.5% | | | |
| Female | 5205.5 | 5742.5 | 100.0% | 1234.9 | 1638.9 | 100.0% | 333.5 | 2689.6 | 60.0% | 163.3 | 1480.0 | 33.3% |
| No data | 3420.0 | 2286.7 | 100.0% | 2087.3 | 2119.8 | | 400.4 | 2820.7 | 62.5% | | | |
| Total | 4312.8 | 4014.6 | 100.0% | 1448.0 | 1759.1 | 100.0% | 285.1 | 2713.8 | 61.3% | 163.3 | 1480.0 | 33.3% |
| Difference | | | | | | | | | | | | |
| A3. Districts (>10,000ha) | | | | | | | | | | | | |
| Male | | | | | | | 392.1 | 44023.6 | 42.9% | | | |
| Female | | | | 3275.0 | 40000.0 | 100.0% | 265.3 | 25507.7 | 50.0% | | | |
| No data | | | | 648.0 | 37479.0 | 100.0% | 77.0 | 20000.0 | 0.0% | | | |
| Total | | | | 1961.5 | 38739.5 | 100.0% | 315.3 | 34372.3 | 42.9% | | | |
| Difference | | | | | | | | | | | | |
| B. Municipalities (a) | | | | | | | | | | | | |
| Male | 307.6 | . | 71.4% | 201.1 | 1.0 | 35.0% | 117.6 | 0.1 | 35.7% | 67.5 | 0.2 | 25.7% |
| Female | 164.5 | . | 100.0% | 252.2 | 0.1 | 39.6% | 124.4 | 0.2 | 35.3% | 62.4 | 0.1 | 23.5% |
| Co-owned | | | | | | | | | | 118.5 | . | 50.0% |
| No data | | | | 527.8 | 0.2 | 53.8% | 77.4 | 4.1 | 25.0% | 43.3 | 2.0 | 11.7% |
| Total | 289.8 | . | 75.0% | 225.0 | 0.9 | 36.7% | 117.6 | 0.3 | 35.2% | 64.5 | 0.2 | 24.2% |
| Difference | | | | | | | | | | | | |

5 Conclusions and Recommendations

The major findings of this baseline report are:

Trend in the number of land transactions

The number of DUAT transactions in districts and municipalities within the four provinces had a contrasting pattern. Districts with the largest number of DUATs are located in the provinces in which the municipalities registered the smallest number of DUATs and vice-versa.

In general, the majority DUATs in the districts are of the lower land size category of smaller than 1,000 hectares, and there are significant differences in the number of DUATs in that land size group between the treatment and the control areas.

Although the majority of parcels with DUATs are mainly used for residential (85 percent) and commerce/industrial (11 percent) purposes in the municipality areas and about 36 for residential and 16 percent for commercial/industrial use in the districts, the main use of parcels with DUATs vary with land size. While the two main uses of parcels less than 1,000 hectares are residential and agricultural production, the main uses for parcels between 1,001 and 10,000 hectares are for forest plantation and mixed crop-livestock production, and those with 10,000 hectares or more are mainly used for forest plantation and community services.

There is large variability in land size by main use, with the largest areas in Districts used for livestock production, forest plantations and a small percentage for residential use, while in the Municipalities the largest areas are used for public services, agriculture, and industry, with the smallest parcels used for residential. Breaking down the parcels under 1,000 ha in the municipalities reveals that the majority of the small farm parcels (less than 10 ha) are used for residential purposes, the majority of medium farm parcels (10-50 ha) for agricultural purposes and surprisingly, more than three-quarters of the large farms (greater than 50 ha) for residence. The results on the last two farm size groups are biased by the number of parcels with valid information on their use which is about one-fifth of all recorded DUATs.

Results show an increasing demand for land use rights as shown by the increasing number of land transactions over time. The land size pattern shows a reciprocal trend, with an expansion in the number of transactions in the districts areas and reduction in the number of transactions in the municipality areas. This could be explained by the relative land abundance in the rural areas and an increased population pressure and density in the urban areas.

Results indicate that women hold no more than one-quarter of DUATs. A common characteristic in both study areas is the gender differentiation in holding DUATs. Women hold no more than one-quarter of the DUATs in rural areas and the SPGCs take an average 8 months more to authorize female-owned DUATs than those of men (equivalent to 0.13 days per square meter more), while in the municipalities this difference is not apparent (on average for both and women DUAT-holders it takes 0.77 days per square meter). In general, significant gender differences are observed more in rural areas compared to urban areas, suggesting that women and men seem to be more equally treated in urban areas than in rural areas. Results indicate a significant advantage of male-ownership in districts (rural areas), suggesting gender differences in how land use rights are treated in the districts which in part could be the result of limited land legislation knowledge of women or traditional cultural or socioeconomic barriers to accessing the services. Therefore, we recommend an intensification of Land Law dissemination to improve awareness of land rights, especially in women.

DUAT transaction times

In general, the registration of land use rights is still a lengthy and complex process with districts taking a much longer time to authorize a registration of land use rights compared to municipalities. The processing times also vary with land use (and consequently land size as per correlation above), where DUATs for agricultural production, livestock, and residence and commerce/industry uses take more than a year to be authorized in the rural districts, while those taking the longest periods in the municipalities are used for agricultural production, social religious, and residential purposes.

Although the authorization process is lengthy, an impressive progress in both district and municipalities with significant differences between treatment and control sites in each region only in earlier periods (1980's and 2011) is observed. From as much as seven years in the 1980's, this performance has improved to about 80 days in the two years preceding the LTR's intervention (2010 and 2011) in the districts and from about eight months in the 1980's to about 65 days in the municipalities during the same period.

Our results show that DUAT transaction times are positively associated with the size of the parcels, suggesting high flexibility of the lower authority level (provincial governor) in processing land use rights compared to higher authority level such as the Minister of Agriculture or Prime Minister. This association not only is caused by the size of the parcels involved but with additional steps required when it is to authorize DUATs on parcels with an area larger than 1,000 ha. On transaction times, the SPGCs take on average one year more to authorize female-owned DUATs than those of men, while in the municipalities this difference is not apparent.

There are significant inter-regional (districts and municipalities) differences in DUAT transaction times. It takes much longer to obtain land use title in districts than in the municipality areas. Intra-regional differences regarding DUAT transaction times are observed only for parcels for agricultural production, forest plantation and residential purposes in the districts but not in the municipalities except those parcels used for residential and industrial use. While in the districts the control sites perform better than the treatment sites, the opposite is observed in municipalities.

Although there are significant inter-regional differences in DUAT's transaction times, the proportion of DUAT application processed within 90 days is not significantly different between regions. This indicates the impressive progress in the districts from reducing dramatically the DUAT transaction times over time (large transaction times in earlier periods are driving the mean transaction times) and suggests the need to use both measures to analyze the performance of the land administrative units on processing DUAT applications.

DUAT land conflicts

The formal registration of land related conflicts is still in the incipient stage. The land conflicts are mostly reported and resolved at the community level, and very few require the intermediation of formal authorities and are mostly not formally reported to the land administration units. To our knowledge, only two land conflicts in the one municipality (Mocimboa da Praia) able to collect data were *formally* registered in the Municipality data base, but a total of 242 cases were *informally* reported to the municipality authorities visited. Systematic records of conflicts in a log book are available in the municipality of Mocimboa da Praia but the limited number of cases prevented us from undertaking a rigorous analysis of land conflicts as previously intended.

DUAT transfers

The formal land market is thin as indicated by only about 4 percent of total parcels with DUATs having been transferred and formally reported to the municipality authorities between 1988 and 2011 (before LTR). The small number of DUAT transfer is partly the result of the transfer-related legal limitation

given that by the land legislation posits that land is a State property which can be leased to land users, therefore limiting a free transfer among landholders. It is noteworthy that these transfers are equally distributed between treatment and control areas in number and DUAT transaction times but unequally distributed regarding use and gender of the DUAT holder. Transferred DUATs are mainly used for residential purposes, and a large majority of these transfers (75 percent) were owned by males mostly in treatment areas.

It is also important to note that the transaction time for transferred parcels are significantly different from that for not transferred parcels, with those transferred being approved in a shorter period than the others; these differences are most significant in the treatment areas than in the control zones.

6 Implications to Evaluation and Next Steps

We recommend a follow-up data collection to capture the post-project period to be scheduled for 2018/2019, which will allow for about 4-5 years of useful post-reform data for analysis. This timeline is intended to allow for few years of the additional intervention period and results to take effect. One other aspect to be considered is that the data collection should be conducted before any of the control areas starts to receive similar programs to avoid contamination. Given these are administrative records data from municipal and district land administration offices, it is not difficult to find out whether any of the control districts/municipalities received similar intervention between 2012 and 2018/2019, and if so when it occurred. This additional information would allow us to exclude the contaminated data from the evaluation.

A critical aspect in impact evaluation is the comparability of treatment/controls pre-intervention. Baseline results show significant differences between treatment/comparisons. However, these significant differences between treatment and control sites were mainly observed in the earlier periods where treatment sites had larger processing times than their counterparts. In the most recent periods, these differences were minimal or none. The fact that the difference for many variables (especially the outcome variables) between the treatment and control sites are significant overall and in early periods (1980s/1990s) but not in the most recent period (2000s) suggests that the baseline should not go far back before the project intervention.

Also, the matching exercise could also be implemented to improve the comparability between treatment and control areas. The results from the matching exercise are presented in Annex 5 show how matching removed significant differences between the treatment and control groups. For the districts, the results show a greater reduction of differences when using the last 11 years, while fairly balanced samples without matching are observed within the last five years. In the municipalities, balanced samples are found using the 11-year and 2011 samples and unlike the case of the districts, the balance using the last five years as baseline is not as good as that using the last 11 years. Perhaps, given the differences in the number of DUATs registered between districts and municipalities, the different cut-off period may be adopted.

We also tested the potential contamination due to pre- and post-intervention outreach activities using the current data and records for two years post intervention to estimate equation 3 in page 10 (note that the records that we had access to refer to sporadic only). We estimated the average treatment effect of the LTR controlling for the observed characteristics and four models were estimated by progressively adding more covariates to an initial model which has treatment/control as the only explanatory variable on DUATs transaction times as the dependent variable, and the results are reported in Annex 4.

Essentially, this analysis aims to test that: (i) there are no statistical differences between treatment and control sites; *ceteris paribus* (ii) there is no contamination effect (we don't need to implement a buffer period). We are therefore, suggesting to use data from years immediately after the implementation of the activities because of the contamination effects of the program (i.e., artificially speeding DUAT process and low cost of DUAT issuance or due to delays in implementation some activities being implemented even if the official termination date has passed) to avoid biased estimates. While it is important to exclude the data from these earlier years -- there is no standard rule as to how many years should be excluded, we think it is reasonable to assume that the contamination effects is likely to be significant after 2 years from the completion of the intervention, however a formal test is necessary, and we used two years immediately after the intervention to test the contamination hypothesis. Rejecting the null hypothesis that the coefficient of time variable is zero, suggests no contamination effect and the estimates of average partial effect is the short-term effect of the project intervention.

The current evaluation design uses the administrative records which in some cases are unavailable in digital form which possesses challenges in acquiring reliable data (quality and quantity), therefore, we recommend to improve data collection through the use of the LIMS, which is expected to be installed and running by the time of follow-up data collection. Some control sites in the Municipalities have initiated the digitalization of land use rights which is expected to continue, minimizing the laborious record scanning exercise. In cases where scanning is required, an effort of accessing DUAT, transfers, and conflicts records should be made. Currently, these are stored in different locations (paper files, log books) and mostly with incomplete information (e.g. area, use). Other relevant information on physical, human capacity of cadastral offices should be collected.

Annex 1: Records held in SPGC and Municipalities

| Region | Number of <i>Processos</i> | Archive Storage Capabilities |
|-----------------------|----------------------------|--|
| SPGC | | |
| Nampula | 3,088 | Reasonable: but in need of improvement |
| Cabo Delgado | 960 | Satisfactory: but few records are requiring little space. |
| Zambezia | 3800 | Good space and orderly storage: New cabinets required |
| Niassa | 1,303 | Poor storage and limited space: New space and facilities required. |
| TOTAL | 9,151 | |
| Municipalities | | |
| Nampula | 9,000 | Poor: new facility needed with proper storage, sorting and computerizing of records required |
| Monapo | 225 | Satisfactory: but few records currently stored |
| Pemba | 1,800 | Poorly stored at municipality works yard |
| Mocimboa de Praia | 200 | Very few records but conditions very poor: building in need of full renovation |
| Quelimane | 6,000 | Good space: but new cabinets required |
| Mocuba | 4,000 | Good new space provisions: but new cabinets required. |
| Lichinga | 3,816 | Poorly stored in facilities at works yard: New storage required. |
| Cuamba | 21 | Poor space and poor facilities for storage: New storage required. |
| TOTAL | 25,062 | |

Source: MINAG (2010c)

Annex 2: Population by Municipality in the Project intervention area

| Province | Municipalities | 1997 | 2007** | Average annual growth rate (%) | Group | Comments on selection of Municipalities |
|--------------|--------------------|---------|---------|--------------------------------|-----------|---|
| Niassa | Cuamba | 58.594 | 72.056 | 2.09 | Treatment | |
| | Marupaa | 6.525 | 17.908 | 10.62 | Control | Best control available based on the growth rate |
| | Metangula | n/a | n/a | n/a | Treatment | High growth potential due to tourism |
| | Lichinga City | 87.025 | 139.471 | 4.83 | Treatment | |
| Cabo Delgado | Mocimboa da Praia | 26.132 | 37.633 | 3.71 | Treatment | |
| | Montepuez | 57.408 | 65.659 | 1.35 | | |
| | Chiure | n/a | n/a | n/a | Control | High growth potential although recently turned Municipality |
| | Mueda* | 15.927 | 24.140 | 4.25 | Control | High growth potential although recently turned Municipality |
| | Pemba City | 87.662 | 125.635 | 3.66 | Treatment | |
| Nampula | Angoche | 59.778 | 77.794 | 2.67 | Control | |
| | Ilha de Moçambique | 43.188 | 48.839 | 1.24 | | Island with expected population growth in the long-run |
| | Monapo | 20.721 | 43.065 | 7.59 | Treatment | |
| | Nacala-Porto | 161.460 | 167.038 | 0.34 | Control | |
| | Ribáue* | 16.075 | 20.859 | 2.64 | | Few years as Municipality (turned Municipality in 2008) |
| | Nampula City | 310.955 | 414.958 | 2.93 | Treatment | |
| Zambézia | Alto Molocue* | 13.845 | 38.956 | 10.90 | Control | Became a Municipality only in 2008 with high growth potential |
| | Gurue | 100.319 | 140.025 | 3.39 | Control | |
| | Milange | 17.123 | 29.534 | 5.60 | | Potential candidate but it was inaccessible |
| | Mocuba | 57.584 | 154.704 | 10.39 | Treatment | |
| | Quelimane City | 153.501 | 191.476 | 2.24 | Treatment | |

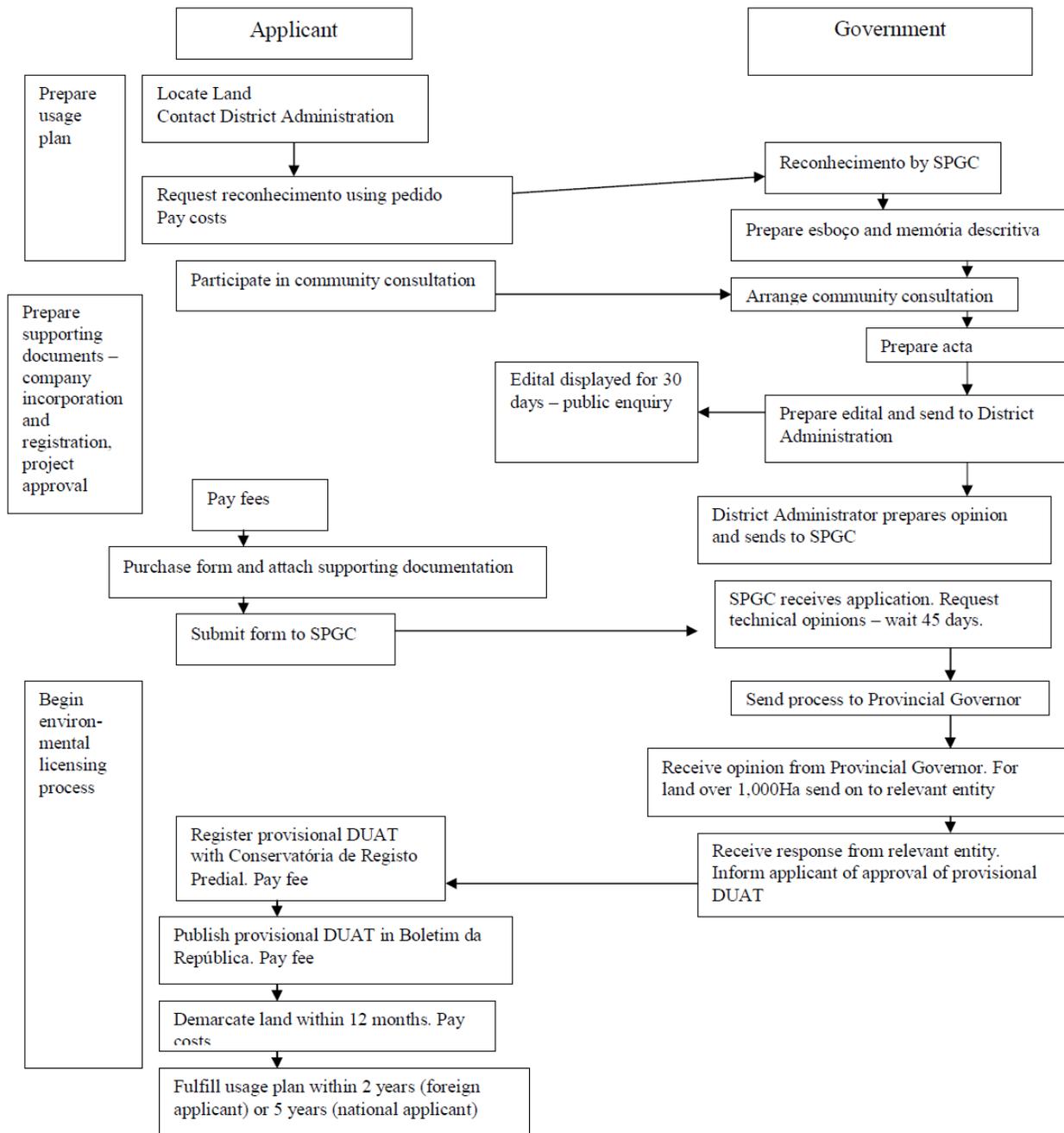
Source: INE (1997) and INE (2007)

Notes: * proposed new Municipalities in 2008; ** Preliminary results; n/a- Data not available.

Annex 3: Average number of DUATs registered per year in the Districts and Municipalities

| District | Control | Treatment | Difference | Municipality | Control | Treatment | Difference |
|---------------------|-------------|-------------|------------|---------------------|--------------|-------------|------------|
| CABO DELGADO | | | | CABO DELGADO | | | |
| MECUFI | | 7.7 | | Mocimboa | | 1.8 | |
| MOCIMBOA_DA_PRAIA | | 1.9 | | Mueda | 40.8 | | |
| MONTEPUEZ | | 2.1 | | Pemba | | 69.6 | |
| PALMA | 3.0 | | | Chiure | 3.4 | | |
| PEMBA | 6.2 | | | Metangula | | 69.0 | |
| TOTAL | 4.6 | 3.9 | | TOTAL | 22.1 | 46.8 | ** |
| NAMPULA | | | | NAMPULA | | | |
| MALEMA | | 4.0 | | Monapo | | 22.6 | |
| MOMA | | 8.7 | | Nampula | | 23.5 | |
| MONAPO | | 6.1 | | Angoche | 55.0 | | |
| NACALA | 2.0 | | | Nacala-Porto | 193.0 | | |
| NAMPULA | 12.8 | | | | | | |
| TOTAL | 7.4 | 6.3 | | TOTAL | 124.0 | 23.0 | *** |
| NIASSA | | | | NIASSA | | | |
| CHIMBUNILA | | 6.1 | | Cuamba | | 60.5 | |
| CUAMBA | 10.5 | | | Lichinga | | 97.8 | |
| LAGO | | 6.7 | | Marrupa | 23.1 | | |
| MAJUNE | | 2.6 | | | | | |
| MANDIMBA | 23.8 | | | | | | |
| TOTAL | 17.2 | 5.1 | * | TOTAL | 23.1 | 79.1 | ** |
| ZAMBEZIA | | | | ZAMBEZIA | | | |
| ALTO_MOLOCUE | 15.7 | | | Mocuba | | 32.0 | |
| MOCUBA | | 14.9 | | Quelimane | | 41.3 | |
| MORRUMBALA | | 16.8 | | Gurue | 1.7 | | |
| NICOADALA | | 30.8 | | Alto-Molocue | 96.1 | | |
| TOTAL | 15.7 | 20.8 | | TOTAL | 48.9 | 36.7 | * |

Annex 4. Provisional DUAT process (Authorization of application)



Source: ACIS; APSP; and CFJJ, 2009.

Annex 5: Propensity score matching

Table 27: Matching control and treatment areas in the Districts

| Variable | Matching sample | Mean | | %reduction | | t-test | | V(T)/V(C) |
|---|-----------------|---------|---------|------------|--------|---------|---------|-----------|
| | | Treated | Control | %bias | bias | t-value | p-value | |
| Full sample (33 years since 1981) | | | | | | | | |
| DUAT transaction time (days) | Unmatched | 493.2 | 272.1 | 26.5 | | 4.95 | 0.000 | 2.37* |
| | Matched | 485.7 | 267.9 | 26.1 | 1.5 | 6.84 | 0.000 | 2.27* |
| Area (ha) | Unmatched | 473.4 | 148.7 | 9.9 | | 1.74 | 0.081 | 7.38* |
| | Matched | 233.4 | 311.9 | -2.4 | 75.8 | -0.92 | 0.356 | 0.14* |
| Processed beyond 90 days (%) | Unmatched | 42.9% | 45.7% | -5.5 | | -1.12 | 0.263 | . |
| | Matched | 43.1% | 36.8% | 12.8 | -130.8 | 3.35 | 0.001 | . |
| * if variance ratio outside [0.90; 1.11] for U and [0.90; 1.11] for M; p-value of Chi2 of balanced samples (Unmatched=0.000; Matched=0.000) | | | | | | | | |
| Last 11 years (2001-2011) | | | | | | | | |
| DUAT transaction time (days) | Unmatched | 121.3 | 113.3 | 3.5 | | 0.58 | 0.562 | 2.34* |
| | Matched | 115.3 | 82.8 | 14.2 | -307.7 | 3.69 | 0.000 | 6.32* |
| Area (ha) | Unmatched | 525.4 | 82.3 | 12.9 | | 1.97 | 0.049 | 130.38* |
| | Matched | 135.5 | 132.5 | 0.1 | 99.3 | 0.13 | 0.898 | 0.74* |
| Processed beyond 90 days (%) | Unmatched | 26.1% | 33.8% | -16.8 | | -3.05 | 0.002 | . |
| | Matched | 25.3% | 25.5% | -0.3 | 98.4 | -0.06 | 0.949 | . |
| * if variance ratio outside [0.89; 1.13] for U and [0.88; 1.13] for M; p-value of Chi2 of balanced samples (Unmatched=0.000; Matched=0.004) | | | | | | | | |
| Last 5 years (2006-2011) | | | | | | | | |
| DUAT transaction time (days) | Unmatched | 99.6 | 80.7 | 14.7 | | 2.08 | 0.038 | 2.54* |
| | Matched | 94.6 | 78.0 | 12.8 | 12.6 | 2.61 | 0.009 | 2.40* |
| Area (ha) | Unmatched | 600.1 | 90.6 | 12.6 | | 1.65 | 0.100 | 156.10* |
| | Matched | 100.0 | 81.8 | 0.5 | 96.4 | 1.11 | 0.269 | 1.25* |
| Processed beyond 90 days (%) | Unmatched | 25.3% | 25.4% | -0.3 | | -0.05 | 0.964 | . |
| | Matched | 24.9% | 24.9% | -0.1 | 63.7 | -0.02 | 0.984 | . |
| * if variance ratio outside [0.86; 1.16] for U and [0.86; 1.16] for M; p-value of Chi2 of balanced samples (Unmatched=0.002; Matched=0.006) | | | | | | | | |
| Pre-project only (2011) | | | | | | | | |
| DUAT transaction time (days) | Unmatched | 76.3 | 85.4 | -9.8 | | -0.59 | 0.559 | 0.46* |
| | Matched | 75.9 | 49.6 | 28.5 | -191.7 | 2.29 | 0.024 | 0.9 |
| Area (ha) | Unmatched | 96.4 | 41.2 | 23.1 | | 1.12 | 0.265 | 12.52* |
| | Matched | 8.8 | 22.7 | -5.8 | 74.9 | -1.64 | 0.103 | 0.09* |
| Processed beyond 90 days (%) | Unmatched | 19.2% | 28.9% | -22.6 | | -1.3 | 0.197 | . |
| | Matched | 18.3% | 17.4% | 2.1 | 90.6 | 0.15 | 0.879 | . |

* if variance ratio outside [0.67; 1.49] for U and [0.64; 1.55] for M; p-value of Chi2 of balanced samples (Unmatched=0.325; Matched=0.001)

Note: The full Mahalanobis and propensity score matching, probit regression with 4 neighbors, was used to calculate the matched outcome

Table 28: Matching control and treatment areas in the Districts

| Variable | Matching sample | Mean | | %reduction | | t-test | | V(T)/V(C) |
|---|-----------------|---------|---------|------------|--------|---------|---------|-----------|
| | | Treated | Control | %bias | bias | t-value | p-value | |
| Full sample (33 years since 1981) | | | | | | | | |
| DUAT transaction time (days) | Unmatched | 493.2 | 272.1 | 26.5 | | 4.95 | 0.000 | 2.37* |
| | Matched | 485.7 | 267.9 | 26.1 | 1.5 | 6.84 | 0.000 | 2.27* |
| Area (ha) | Unmatched | 473.4 | 148.7 | 9.9 | | 1.74 | 0.081 | 7.38* |
| | Matched | 233.4 | 311.9 | -2.4 | 75.8 | -0.92 | 0.356 | 0.14* |
| Processed beyond 90 days (%) | Unmatched | 42.9% | 45.7% | -5.5 | | -1.12 | 0.263 | . |
| | Matched | 43.1% | 36.8% | 12.8 | -130.8 | 3.35 | 0.001 | . |
| * if variance ratio outside [0.90; 1.11] for U and [0.90; 1.11] for M; p-value of Chi2 of balanced samples (Unmatched=0.000; Matched=0.000) | | | | | | | | |
| Last 11 years (2001-2011) | | | | | | | | |
| DUAT transaction time (days) | Unmatched | 121.3 | 113.3 | 3.5 | | 0.58 | 0.562 | 2.34* |
| | Matched | 115.3 | 82.8 | 14.2 | -307.7 | 3.69 | 0.000 | 6.32* |
| Area (ha) | Unmatched | 525.4 | 82.3 | 12.9 | | 1.97 | 0.049 | 130.38* |
| | Matched | 135.5 | 132.5 | 0.1 | 99.3 | 0.13 | 0.898 | 0.74* |
| Processed beyond 90 days (%) | Unmatched | 26.1% | 33.8% | -16.8 | | -3.05 | 0.002 | . |
| | Matched | 25.3% | 25.5% | -0.3 | 98.4 | -0.06 | 0.949 | . |
| * if variance ratio outside [0.89; 1.13] for U and [0.88; 1.13] for M; p-value of Chi2 of balanced samples (Unmatched=0.000; Matched=0.004) | | | | | | | | |
| Last 5 years (2006-2011) | | | | | | | | |
| DUAT transaction time (days) | Unmatched | 99.6 | 80.7 | 14.7 | | 2.08 | 0.038 | 2.54* |
| | Matched | 94.6 | 78.0 | 12.8 | 12.6 | 2.61 | 0.009 | 2.40* |
| Area (ha) | Unmatched | 600.1 | 90.6 | 12.6 | | 1.65 | 0.100 | 156.10* |
| | Matched | 100.0 | 81.8 | 0.5 | 96.4 | 1.11 | 0.269 | 1.25* |
| Processed beyond 90 days (%) | Unmatched | 25.3% | 25.4% | -0.3 | | -0.05 | 0.964 | . |
| | Matched | 24.9% | 24.9% | -0.1 | 63.7 | -0.02 | 0.984 | . |
| * if variance ratio outside [0.86; 1.16] for U and [0.86; 1.16] for M; p-value of Chi2 of balanced samples (Unmatched=0.002; Matched=0.006) | | | | | | | | |
| Pre-project only (2011) | | | | | | | | |
| DUAT transaction time (days) | Unmatched | 76.3 | 85.4 | -9.8 | | -0.59 | 0.559 | 0.46* |
| | Matched | 75.9 | 49.6 | 28.5 | -191.7 | 2.29 | 0.024 | 0.9 |
| Area (ha) | Unmatched | 96.4 | 41.2 | 23.1 | | 1.12 | 0.265 | 12.52* |
| | Matched | 8.8 | 22.7 | -5.8 | 74.9 | -1.64 | 0.103 | 0.09* |
| Processed beyond 90 days (%) | Unmatched | 19.2% | 28.9% | -22.6 | | -1.3 | 0.197 | . |
| | Matched | 18.3% | 17.4% | 2.1 | 90.6 | 0.15 | 0.879 | . |

* if variance ratio outside [0.67; 1.49] for U and [0.64; 1.55] for M; p-value of Chi2 of balanced samples (Unmatched=0.325; Matched=0.001)

Note: The full Mahalanobis and propensity score matching, probit regression with 4 neighbors, was used to calculate the matched outcome

Annex 6: Testing the logic framework and the contamination effect: Short-term Project effect

Table 29: Determinants of land use rights processing times in rural areas (Districts), bootstrap quantile regression models

| Variables | Model1 (Basic) | Model2 | Model3 | Model4 (Full) |
|-----------------------------------|---------------------|----------------------|----------------------|----------------------|
| Treatment (1=yes) | 0.000 (0.00) | -3.000 (-0.45) | -3.000 (-0.46) | 1.000 (0.13) |
| Time (1=after LTR) | | -32.000** (-6.93) | -38.000** (-3.32) | -22.000** (-2.59) |
| Treatment effect (δ) | | | 8.000 (0.63) | -1.000 (-0.10) |
| Area: 1,000-10,000ha | | | | 29.000 (0.62) |
| Area: >10,000ha | | | | 62.000 (0.45) |
| Forest plantations (1=yes) | | | | -16.000 (-0.44) |
| Livestock production (1=yes) | | | | -1.000 (-0.04) |
| Public services (1=yes) | | | | -45.000** (-2.94) |
| Commerce & industry (1=yes) | | | | -15.000 (-0.99) |
| Residence (1=yes) | | | | -26.000+ (-1.78) |
| Tourism (1=yes) | | | | -30.000+ (-1.81) |
| Social & religion (1=yes) | | | | -17.000 (-1.08) |
| Crop-livestock production (1=yes) | | | | -19.000 (-1.24) |
| Community (1=yes) | | | | -112.000* (-2.00) |
| Constant | 76.000** (13.10) | 82.000** (13.09) | 82.000** (13.53) | 97.000** (6.18) |
| Observations | 2,204 | 2,204 | 2,204 | 2,204 |
| Pseudo R-square | 0.0170 | 0.0187 | 0.0187 | 0.0213 |

t statistics in parentheses; + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$

Source: Authors calculations from SPGC data, 2013; Municipalities Data, 2013 and 2014

Table 30: Determinants of land use rights processing times in urban areas (Municipalities)

| Variables | Model1 | Model2 | Model3 | Model4 |
|---|---------------------|--------------------|--------------------|---------------------|
| Treatment (1=yes) | -32.000 (-1.29) | -15.000 (-0.56) | -18.000 (-0.68) | -1.000 (-0.04) |
| Time (1=after LTR) | | 17.000** (2.91) | 14.000+ (1.90) | 16.000* (2.08) |
| Treatment effect (δ) | | | 9.000 (0.78) | 7.000 (0.57) |
| Commerce (1=yes) | | | | -126.000 (-0.27) |
| Industry (1=yes) | | | | -127.000 (-0.28) |
| Social/religion/political party (1=yes) | | | | -117.000 (-0.26) |
| Public services (1=yes) | | | | -141.000 (-0.31) |
| Residence & commerce (1=yes) | | | | -83.000 (-0.18) |
| Residence (1=yes) | | | | -124.000 (-0.27) |
| Constant | 35.000** (13.71) | 18.000** (2.94) | 21.000** (2.89) | 143.000 (0.31) |
| Observations | 4,188 | 4,188 | 4,188 | 4,188 |
| Pseudo R-square | 0.0384 | 0.0386 | 0.0400 | 0.0414 |

t statistics in parentheses; + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$

Source: Authors calculations from SPGC data, 2013; Municipalities Data, 2013 and 2014

Annex 7: Key indicators by gender of DUAT holder, by land size, by treatment group

| Indicator | Control | | Treatment | | Mean differences | |
|---|-----------|-------------|-----------|-------------|------------------|------|
| | 1 Male | 2 Female | 3 Male | 4 Female | 1vs.2 | 3vs4 |
| A1. Districts (<1,000ha; N=1,900) | | | | | | |
| DUAT Female-holder (%) | 0% | n/a | 0% | 100% | a | a |
| Transaction time (days) | 270.1 | 267.9 | 549.5 | 703.7 | a | a |
| Area (ha) | 24.2 | 84.6 | 57.3 | 122.1 | a | a |
| Processed in more than 90 days | 41% | 53% | 54% | 49% | | a |
| A2. Districts (1,000ha-10,000ha; N=81) | | | | | | |
| DUAT Female-holder (%) | 0% | n/a | 0% | 100% | a | a |
| Transaction time (days) | 190.8 | n/a | 173.5 | 843.6 | a | a |
| Area (ha) | 1287.8 | n/a | 2994.9 | 2484.3 | a | a |
| Processed in more than 90 days | 80% | n/a | 57% | 71% | a | a |
| A3. Districts (>10,000ha; N=16) | | | | | | |
| DUAT Female-holder (%) | n/a | n/a | 0.0 | 1.0 | a | a |
| Transaction time (days) | n/a | n/a | 392.1 | 695.3 | a | a |
| Area (ha) | n/a | n/a | 44023.6 | 27578.0 | a | |
| Processed in more than 90 days | n/a | n/a | 0.4 | 0.6 | a | |
| B. Municipalities (N=3,774) | | | | | | |
| DUAT Female-holder (%) | 0% | 100% | 0% | 100% | | |
| Transaction time (days) | 116.1 | 128.4 | 116.0 | 116.7 | | |
| Area (ha) | 0.2 | 0.1 | 0.2 | 0.2 | | |
| Processed in more than 90 days | 30% | 34% | 35% | 33% | | |

(a) Not enough observations for a test of means; n/a. Data not available

Source: Authors calculations from SPGC data, 2013; Municipalities Data, 2013 and 2014

Annex 8: Number of existing DUAT in the Districts and municipalities over time

| Year | Contro | Treatmen | Total | Contro | Treatmen | Total | Treatment | | | Contro | | |
|-------|-----------------------------|----------|-------|----------------------------------|----------|-------|-------------------------------------|-----|-----------|---|------|-----------|
| | l | t | | l | t | | l | l | Treatment | Total | l | Treatment |
| | Existing DUATs in Districts | | | Existing DUATs in Municipalities | | | Transferred DUATs in Municipalities | | | % of existing DUATs transferred in Municipalities | | |
| 1981 | 0 | 1 | 1 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| 1982 | 0 | 1 | 1 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| 1987 | 0 | 2 | 2 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| 1988 | 6 | 41 | 47 | 1 | 0 | 1 | 0 | 0 | 0 | 0.0 | | 0.0 |
| 1989 | 15 | 41 | 56 | 3 | 4 | 7 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 |
| 1990 | 5 | 42 | 47 | 4 | 4 | 8 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 |
| 1991 | 4 | 23 | 27 | 1 | 10 | 11 | 0 | 1 | 1 | 0.0 | 10.0 | 9.1 |
| 1992 | 5 | 18 | 23 | 0 | 10 | 10 | 0 | 0 | 0 | | 0.0 | 0.0 |
| 1993 | 9 | 19 | 28 | 4 | 3 | 7 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 |
| 1994 | 5 | 27 | 32 | 2 | 7 | 9 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 |
| 1995 | 19 | 33 | 52 | 10 | 4 | 14 | 0 | 1 | 1 | 0.0 | 25.0 | 7.1 |
| 1996 | 20 | 34 | 54 | 5 | 14 | 19 | 0 | 2 | 2 | 0.0 | 14.3 | 10.5 |
| 1997 | 9 | 40 | 49 | 9 | 12 | 21 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 |
| 1998 | 22 | 27 | 49 | 17 | 28 | 45 | 0 | 1 | 1 | 0.0 | 3.6 | 2.2 |
| 1999 | 19 | 23 | 42 | 14 | 24 | 38 | 1 | 1 | 2 | 7.1 | 4.2 | 5.3 |
| 2000 | 16 | 26 | 42 | 13 | 103 | 116 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 |
| 2001 | 19 | 26 | 45 | 15 | 78 | 93 | 0 | 1 | 1 | 0.0 | 1.3 | 1.1 |
| 2002 | 16 | 58 | 74 | 21 | 130 | 151 | 0 | 7 | 7 | 0.0 | 5.4 | 4.6 |
| 2003 | 30 | 62 | 92 | 29 | 141 | 170 | 3 | 5 | 8 | 10.3 | 3.5 | 4.7 |
| 2004 | 45 | 64 | 109 | 4 | 123 | 127 | 0 | 3 | 3 | 0.0 | 2.4 | 2.4 |
| 2005 | 64 | 115 | 179 | 1 | 165 | 166 | 0 | 7 | 7 | 0.0 | 4.2 | 4.2 |
| 2006 | 42 | 123 | 165 | 4 | 176 | 180 | 0 | 4 | 4 | 0.0 | 2.3 | 2.2 |
| 2007 | 87 | 143 | 230 | 7 | 307 | 314 | 0 | 10 | 10 | 0.0 | 3.3 | 3.2 |
| 2008 | 107 | 132 | 239 | 54 | 254 | 308 | 0 | 11 | 11 | 0.0 | 4.3 | 3.6 |
| 2009 | 86 | 121 | 207 | 181 | 468 | 649 | 0 | 25 | 25 | 0.0 | 5.3 | 3.9 |
| 2010 | 64 | 135 | 199 | 261 | 531 | 792 | 1 | 30 | 31 | 0.4 | 5.6 | 3.9 |
| 2011 | 47 | 104 | 151 | 402 | 377 | 779 | 23 | 11 | 34 | 5.7 | 2.9 | 4.4 |
| Total | 761 | 1,481 | 2,242 | 1,062 | 2,973 | 4,035 | 28 | 120 | 148 | 2.6 | 4.0 | 3.7 |

n/a: data not available

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