



# Responsible Land Governance: Towards an Evidence Based Approach

ANNUAL WORLD BANK CONFERENCE ON LAND AND POVERTY  
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## **Scope for Decentralization of Land Administration in Africa: Evidence from Local Administrative Data in Mozambique**

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## Abstract

The performance of the land administration system in Mozambique faces several challenges, including the organizational arrangements and limited capacity for service delivery. Results show that even with few land-related conflicts in the rural Mozambique, it takes approximately 300 days (about 10 months) to register land use rights and about 33 percent of the registered land use rights took less than 3 months. This level of performance is lower compared to less than one day reported elsewhere in the region including the neighboring South Africa as reported by (World Bank, 2007). In part, such poor performance could be associated with high level of complexity in processing land use rights related to a mostly centralized structure of the land administration system in Mozambique. Recognizing that there is no agreement on the method for a comprehensive land administration evaluation that is universally accepted because of the evolutive the land management systems are in constant evolution to respond to the current societies changing needs, this paper makes a methodological contribution by applying the widely used market research approach, the Structure, Conduct, and Performance (SCP) paradigm to public sector. To my knowledge, this is the first time that such method is used to evaluate the performance of land administration system in Mozambique. This study aims at assessing the scope of decentralization by testing the fragmentation or competition hypothesis arguing that decentralization is likely to improve the performance of land administration system in Mozambique. In a way, this paper assesses the relationship between the structures and performance by identifying the correlations or the effect of the structure on the performance to have a better understanding of other factors that are likely to improve its performance.

**Key Words: Decentralization, Administration, Tenure, Mozambique, Structure-Conduct-Performance**



## 1 Introduction

Many African countries, Mozambique's government, have been engaged in land reform policies and programs aiming to increase the security of land ownership by providing power over their owned land resources, believed to be a condition to improve land investments, increase incomes, boost land markets which will lead to more efficient land use.

Despite its impressive economic growth over the past decade, Mozambique remains a developing country with more than 50 percent of the population still living below poverty line (MPD, 2010) and no written land administration strategy exists. To address this issue and realizing the need and the importance of increasing the productive capacity of the population, the Government of Mozambique has initiated several parallel initiatives, including: Land Tenure Regularization (LTR), the Community Land Delimitation (CLD), Project GesTerra; and the consultative group (locally known as "*Forum Consultivo de Terra-FCT*") created in 2011 to stimulate dialogue between the government and the civil society on land administration.

The LTR initiative has been implemented by the National Directorate of Land and Forest (DNTF) since 2004 at the rate of 4 districts per year, aiming to regularize individual properties in urban and rural (especially in high-density areas) areas. Given the financial and capacity limitation to implementing LTR using government funds, the Mozambique's government initiated the Land Tenure Services Project ("*Land Project*") with the aim of establishing an efficient mechanism of guaranteeing secure access to land as well as upgrading the land information system and services and improving land policy framework; helping beneficiaries meet immediate needs for registered land rights; and better access to land for investment. The Land Project is one of the projects financed under the Compact signed in 2008 between the Millennium Challenge Corporation (MCC) and the Government of Mozambique. The project aim at (1) increasing the level and value of the investment on land; (2) increasing access to land, and (3) reducing the costs associated with acquiring land user rights; and (iv) resolve and prevent conflicts over land. The Land Project interventions were targeted to four Northern Provinces (Cabo Delgado, Niassa, Nampula, and Zambezia), at all levels of administration – National, Provincial, and District / Municipal – and across a range of beneficiaries, including rural individual landholders, rural communities, urban landholders, and domestic and international investors. However, the component that can be most rigorously evaluated at the household level is the site-specific interventions targeted in selected districts and municipalities.

Motivated by recent evidences that individual titling may not be a more cost-effective way to protect land rights of women and other minority groups as the costs and complexity associated with implementing the full title initiatives are high, the community land delimitation (CLD)



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program aiming to improve tenure security for collectives, enhancing private sector investments (both domestic and foreign) is cost-effective, efficiency-enhancing land transfers, leading to small-holder agricultural productivity and rural livelihoods more broadly (Ghebru et al., 2015).

Despite all these initiatives, land administration is still facing several challenges. According to MINAG (2010), the performance of land administration in Mozambique is affected by several factors including institutional and organizational arrangements and capacity of delivering the land administration services. More specifically, the key factors identified by MINAG (2010) are: (i) the inadequate financial and human resource allocation for training, staffing, and equipment for better deliver the administration services; (ii) a complex organizational structure challenging and effective decision making, communication, and control. Essentially, with a complex array of actors, delivering administration services requires great coordination; (iii) Inconsistent legal code related to land; (iv) limited public capacity to implement the Land Law; and (v) the need for regular amendments to the Law and its regulations to be consistent with current conditions.

Speaking about the organizational arrangements, MINAG (2010) note seven (7) issues that need to be resolved. First, the mapping services are separated from the cadastral services, while the DNTF and municipal cadastral systems are not aligned, making it difficult to create a harmonized land management system. Second, it appears that the individual municipality cadaster is not harmonized with each other resulting in the limited ability for data sharing. Third, the difference in registration systems is observed between DNTF and the ministry of Justice. While the DNTF and SPGC use land registrations in their land registry, the *Registo Predial* of the Ministry of Justice uses a deeds registration system. Fourth, there are two overlapping planning laws, including the Land Law 19/97 and the Territorial Planning Law 19/07. Fifth, the limited implementation of the Land Law 19/97 is plagued by a limited inter-ministerial coordination. While the Ministry of Agriculture and its land related departments (DNTF, SPGCs, SDAE) are responsible for implementing the Land Law, other Ministries and departments such as Forestry and Wildlife, Public Works and Housing, MICOA, and MICTUR (Ministry of Commerce and Tourism) implement independently their sectoral policies related to land.

All these challenges suggest that the current level of land administration need reform. However, for that purpose, one may want to understand what drives the current level of performance and what the options for its improvement are. Answering such question is challenging and complex given the multiplicity of factors and actors. However, this paper addresses this issue using the administrative data and the review of land-related policy directives, strategies, and annual land administration reports; to assess the relationship between the land administration structure and its performance and draw lessons on how to improve land administration in Mozambique. More specifically, this study intends to answer the following research questions: Is the current land



administration performance significantly associated with its structure? If so, what structural transformation would lead to improved performance?

## 2 Conceptual Framework

According to Steudeler *et al.* (2004), there is no internationally accepted methodologies to evaluate and compare the performance of land administration systems because land administration systems are in constant evolution, context specific, and reflect the stage of socio-economic development. The evolutionary pattern of land administration systems ranges from the traditional systems created to respond the societies' changing needs in developing countries to a more sophisticated system to respond to the development dynamic of the current world (Dale & McLaughlin, 1988). An attempt to fill this gap is a framework developed by Steudler *et al.* (2004) consisting of four evaluation elements –objectives, strategies, outcomes and review process but they could go further into the details of the indicators. Later in 2006, Land Equity International Pty prepared a report in support of the World Bank's Policy Research report on Land Policy that resulted in developing twenty indicators and seven criteria for a successful land administration system. These indicators were used to compare the performance of sixteen countries of Europe, Latin America, and Africa. The later although does not present an elaborated framework based on well-developed theory, it makes a clear description of the indicators and its limitations. Unfortunately, their case studies, Mozambique is among the African countries in which the performance indicators were estimated limiting the comparison of performance indicators to thirteen countries only.

Recognizing the importance of the conclusion of the Bathurst Declaration that a sustainable development requires a sound land administration system and echoing Lavandez *et al.* (2002) for the need of more comprehensive approach in land administration system, this paper contribute to methodological approaches for the evaluation of land administration system by suggesting the application of the Structure, Conduct, and Performance (SCP) paradigm to test the “*structure performance hypothesis*” that better land administrative structure have a positive effect on the performance of the land administration. Developed in 1959 by Joe S. Bain derived from neoclassical analysis of markets and brainchild of the Harvard school of thoughts and popularized during 1940-60 (Edwards *et al.*, 2006), the SCP paradigm was first published by economist Edward Chamberlin and Joan Robinson as a model in industrial organization economics which offers a theoretical explanation for a firm's performance trough economic conduct and structure. The SCP framework states that an industry performance, which can be measured in terms of potential benefits to the individuals and a society as a whole, is determined by the conduct of the firms within the industry, which depends on the structure of the market (Policonomics, 2012).





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According to Edwards *et al.* (2006), there are two competing hypothesis in the SCP paradigm, including the “*structure performance*” and “*efficiency structure*”. The inverse relationship between market concentration and level of competition because the market concentration encourages firms to collude, especially if there is a positive relationship between concentration and performance is claimed as a feature of the former hypothesis. The idea is that in more concentrated industries, firms will earn more profits than those in less concentrated industries, irrespective of efficiency. On the other hand, the “*efficiency structure hypothesis*”, the performance of the firm is positively associated with its efficiency.

Translating these ideas to the public sector, I draw from insights by Eberts & Gromberg (1990) and Kizito (2011) on their theoretical implications of public sector structure on public sector performance. The SCP framework for analyzing the land administration in Mozambique is depicted in Figure 1.

Essentially, this conceptual framework recognizes four main components that characterize the land administration in Mozambique: the basic conditions, structure issues, conduct issues, performance issues and public policies. Essentially, the framework distinguishes structure and conduct design issues, and their performance issues. The various components of the SCP framework for the land administration are described as follows:

**Basic conditions:** describe the environment in which the land administration operates including: (1) government policies, (2) some key macroeconomic characteristics (e.g. inflation rates, credit markets; infrastructure; human capital (e.g. number of trained staff by type of expertise).

**Structure design issues:** composed by a set of variables that relatively stable over time and affect the behavior buyers/or sellers (which in this case I refer to as clientele and the District land administration units - DLAUs). The literature argues that the way in which markets fail to follow perfect competition conditions depend essentially on the degree of concentration (supply/demand) and the level of product differentiation and market entry barriers (Policonomics, 2012). In the present study, the structure of the public sector is composed by:

1. The land administration mandate (Aims, objectives, and clientele): Policy formulation, Attainment of efficiency in service delivery, and Clientele (individual people, local and foreigners, private companies or investors, communities; government).
2. Institutional home, organization, and coordination: Geographical coverage and range of services provided, Design of incentives, and Training and other human capacity development

**Conduct design issues:** represents the way DLAUs and their clientele behave, both amongst themselves, and amongst each other:



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1. Services provided: Surveying, demarcation, delimitation, land certification and regularization
2. Awareness (e.g. Dissemination of Land Laws and Regulations, conflict mediation and resolution)
3. Land administration system used: Traditional Land Information Management System (LIMS) and Modern LIMS
4. Funding strategies: Government; Donor finding (e.g. iTC, MCC, etc.); and Investors

**Performance (outcomes) design issues:** it is measure comparing the DLAUs within land administration in efficiency terms, including measures of level of priced quantity, service quality (Reliability, Credibility, Timeliness), sustainability and financial support (government, donors, or user support -land use taxes); and cost minimization strategy.

The framework depicted in Figure 1 suggests that the structure design issues affect the conduct, which in turn affects the performance, and the basic conditions shape the structure of the land administration. The conduct design issues, in turn, affect the overall performance of land administration, which is measured by a number of land conflicts, DUAT processing time, revenue (taxes collected income received by communities). In the long run, the performance affects the conduct and basic conditions while the structure affects basic conditions.

**Figure 1: Insert here**

### 3 Data and Methods

This study uses administrative records from the land administration system accessed through the provincial land administration offices at the Ministry of Agriculture. This is a nationally representative administrative data from the National Directorate of Land and Forestry containing records from ten provinces and 158 Districts spanning from 1986 to 2013 with more than 17,000 land use rights (DUATs) nationwide. These data contain information on individual DUAT, including applicant/owner (name, nationality, gender, type of ownership (whether the right belongs to a particular person) and transaction time (date of application and date of DUAT authorization); DUAT status (approved, cancelled); location of the parcel (province, district, locality); parcel characteristics (e.g. size, end use). These data were used to establish the relationship between the structure and performance of the land administration using the conceptual framework described below. District profiles data from the third population census publicly available from the Bureau of National Statistics of Mozambique contains demographic and other information at District level relevant for describing the study area was complementary to the main administrative data

#### 3.1 Estimation Strategy

This study uses an application of the Structure, Conduct, and Performance (SCP) paradigm to test the “*structure performance hypothesis*” that, a better land administrative structure has a positive



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effect on the performance of the land administration. The SCP framework states that an industry performance, which can be measured in terms of potential benefits to the individuals and a society as a whole, is determined by the conduct of the firms within the industry, which depends on the structure of the market (Policonomics, 2012). Given that the purpose of this paper is to assess empirically the relationship between the structure of the local public service and its performance, the estimation strategy consists of three main steps as follows.

**Step 1- Measuring land administration’s structure:** the structure of the land administration is measured in two dimensions: the concentration and fragmentation. The fragmentation is measured by the number of localities (locally known as “*localidade*” - a lower administrative unit within the District from which one must obtain the initial documentation to apply for DUAT. To measure concentration, two indicators are used: a) the population density in each district to capture the level of competition of the clientele on the public sector services. The assumption is that high population density is positively associated with competition for public services (e.g. regularization of land use rights is high population density implies various field trips to regularize small land plots resulting in high operation costs than in less dense areas) and the proportion of population of central city and the rest of the entire District and b) the authority level involved in land administration. The Mozambique’s land legislation indicates three levels of authorities involved in land administration based on land size. For the land size of 1,000 hectares or less the DUATs are authorized by the provincial governors; for land size between 1,000-10,000 hectares by the Minister of Agriculture; and for land sizes of 10,000 hectares or more by the Council of Ministers. As such, this variety on the authority level involved in DUATs authorization is an important structural characteristic that affects the performance of land administration; therefore, was used to assess the effect of level of authority in the performance of land administration. The proportion of DUATs authorized by each level of authority in a District was used to measure the level of authority.

**Step 2 - Measuring land administration’s performance:** The performance land administration is measured by two indicators: 1) the land use rights (DUAT) transaction times for private land titles, defined as the time period between DUAT application and issuance by District offices and 2) own-source revenue defined as the revenue generated by the local DLAUs land use taxes (not received as grant) to reflect the size of operations that can be afforded by DLAUs using the own resources).

**Step 3: Empirical model:** In order to empirically estimate the effect of land administration structure on its performance the empirical is estimated by a multivariate regression of the performance measures on a measure of concentration; fragmentation or competition; authority level; characteristics of District Land Administration Unit.

In order to empirically estimate the effect of land administration structure on its performance the following empirical model is estimated using Ordinary Least Squares:

$$Y_i = \alpha_0 + \alpha_1 CM_i + \alpha_2 FG + \alpha_3 AT + \alpha_4 X_i + \alpha_5 Z_i + \varepsilon_i \quad (1)$$





where  $Y_i$  represents the performance indicators (e.g. the average “DUAT transaction” time) in District  $i$ ;  $CM_i$  is a measure of concentration (measured as the number of localities per capita in each District). A significant effect on this measure may support decentralization;  $FG_i$  is a vector of measures of fragmentation or competition (measured by the population density) and intensity of application (measured by the number of applications per area);  $X_i$  is a vector of other characteristics of DLAU (e.g. number of sporadic DUAT applications, proportion of DUATs by use; and the proportion of applications by gender of the applicant); and  $\epsilon_i$  is the random error term assumed to be normally distributed with mean zero and standard error of one.

To control for differences among the DLAUs, District-level demographic variables is added in the estimation equation as vector  $Z_i$ . These demographic characteristics were obtained from national regional profiles developed by the Ministry of Local Administration.

The research hypotheses tested in this study are the following:

- 1) *Structure-performance hypothesis*:  $\alpha_1 > 0, \alpha_2 > 0, \alpha_3 > 0$ . Essentially this hypothesis intends to test whether the performance of the land administration in Mozambique is a function of its structure as measured by concentration, competition, and the authority level. If such hypothesis is valid, then investments in improving the structure will likely result in improved performance. This hypothesis is composed of three individual hypotheses below.
- 2) *Concentration hypothesis*:  $\alpha_1 > 0, \alpha_2 = 0, \alpha_3 = 0$ . This hypothesis sets that the performance of the land administration is solely dependent of the concentration of service provider units because of the competition among the clients to be served.
- 3) *Fragmentation or competition hypothesis*:  $\alpha_1 = 0, \alpha_2 > 0, \alpha_3 = 0$ . As indicated by Eberts & Gromberg (1990), according to decentralization hypothesis, an increased fragmentation should lead to the greater choice of taxpayers and thus increased competition among the local administrative government units, reducing the size of the central government public services.
- 4) *Power differential hypothesis*:  $\alpha_1 = 0, \alpha_2 = 0, \alpha_3 > 0$ . Consistent with the decentralization hypothesis, the power differential hypothesis intends to measure not only the potential for decentralization but also the effect of bureaucracy on the performance of land administration. This hypothesis sets that the higher the authority level the lower the performance with respect to processing times and the opposite with respect to revenues collection.

With District as the unit of analysis, the empirical approach begins by analyzing the entire country as a whole, and then the regional analysis was done by dividing the DLAUs into two geographical (South, Central-North) and in each region. Essentially, three empirical estimations are conducted in each of them (National, Southern, and Central & Northern) to assess the regional differences in structure and performance and within each region, the comparison is made. Given the limited number of variables in the main data set, the empirical estimation was interpreted mostly as the correlation between the structure variables and the measures of performance.



The main research hypotheses tested in this study is the *fragmentation or competition hypothesis* that tests decentralization hypothesis that an increased fragmentation should lead to the wide range of choices for the clientele of land administration services (landholders) and thus increased competition among the local administrative government units, reducing the size of the central government public services. With District as the unit of analysis, the empirical approach will begin by dividing the DLAUs into three geographical (South, Central, and North) and in each region, and then the empirical estimations are conducted in each of the three regions to assess the regional differences in structure and performance.

## 4 Results and Discussion

### 4.1 Descriptive results

Table 1 presents the descriptive statistics for the analysis of land administration system's performance in Mozambique. As can be observed, the initial approach was to conduct the analysis in three different regions, including south, central, and north based on their socioeconomic and agricultural potential differences. However, when the key characteristics related to the land administration system are compared across the regions, it was observed that there were no significant differences between the central and Northern regions while a significant difference was observed between these and the Southern region. Therefore, comparisons and analysis were conducted in two regions (Southern vs. Central & Northern).

Since the key objective of this study is to assess the relationship between the structure of land administration system and its performance, Table 2 presents results of a bivariate analysis between structure and performance measures by region, where the structure measures were compared against the distribution of performance measures (terciles in the first column). Results in Table 2 show a significant relationship between structure and performance of land administration system and highlight four key findings.

First, the application intensity (a measure of fragmentation/competition) as measured by the number of applications per square Kilometer is inversely related to DUAT processing time and positively related to revenues collection, suggesting that higher the intensity or demand for DUAT increases pressure over the land services reducing the processing time while rendering high revenue collection deriving from those massive applications. This finding is consistent with the expectation. This could be justification improvements of the land administration system in collecting revenues from DUAT applications. If one believes that shorter the processing times result in higher revenues as a result, then there is an incentive to improve the system.



Second, it appears that the population density (a measure of fragmentation/competition) does not have a significant effect on the performance of the land administration system in either region although it follows a similar pattern as the application intensity.

**Table 1: Insert here**

Results in Table 1 show that the Central & Northern region (CN) is significantly better off in several characteristics. For instance, it can be noted that on average, the CN region has a shorter time to process a DUAT application and has collected significantly large revenues compared to the Southern region.

The Southern, on the other hand, has an average significantly a large number of localities per square kilometer, higher out-migration rate, and a large number of public administration compared to CN, which is likely to contribute to increased provision of complementary services to the land administration in the region.

Third, the number of localities per square Kilometer (a measure of concentration) follows the pattern of the intensity of applications (fragmentation/competition), suggesting that concentration increases efficiency (reduces processing time and increases revenues).

Fourth, the use of authorized area of the parcel, intended to test whether the authority level involved in processing a specific DUAT has any effect on the performance of the land administration system. The majority of the applications for DUAT were in the land size less than 1,000 hectares followed by those in the size range of 1,000-10,000 hectares and finally those with an area greater than 10,000 hectares. It appears that in each land size group, the number of applications is inversely related to processing time and positively proportional to the revenue. Suggesting that in each land size group, the majority of applications are processed in the lowest time range.

As per the efficiency of the different land sizes corresponding to the authority level involved, additional analysis show that 47 percent of application with land size less than 1,000 hectares and 21 percent of applications with more than 10,000 hectares are in lowest processing time group while about 34 percent land size less than 1,000 hectares and only 13 percent of applications with more than 10,000 hectares are in highest processing time group.

**Table 2: Insert here**

These results suggest that the lower authority is more efficient in processing DUATs than the higher authority. However, within the higher authority level, a higher proportion of application is processed quickly. This can be confirmed from results in Appendix C which show lower



processing times for parcels with a size lower than 1,000 hectares (authorized by the Provincial Governor) than those authorized by the Council of Ministers (greater than 10,000 hectares).

## 4.2 Empirical Results

Before delving into the discussion of the empirical results, it is worth presenting the estimation strategy adopted. As indicated in Table 3, Table 4 and Table 5, four models were estimated for each performance measure (dependent variable). The first model considers only the structure measures as regressors. Given that the administrative data has a significant number of observations with missing data on the performance indicators, the second model adds to the first model a variable to capture the effect of missing data. The third model is an extended model including other covariates in addition to the structure measures but excluding the missing data variable. The fourth model, it is a full model with including structure measures, other covariates, and the missing data variable. The dataset used consists of 138 District Land Units aggregated from the original administrative data on land administration covering more than 44,000 DUAT applications nationwide.

### 4.2.1 National

Although the results in Table 3 do not support the structure performance hypothesis, the fragmentation and power differential hypothesis are supported. Results indicate that an additional locality per square kilometer leads to a reduction in the number of days to authorize a DUAT application, suggesting that decentralization of services from District capital to localities or lower administrative level may lead to a performance gain. On the other hand, an additional DUAT application of more than 10,000 ha, authorized by the Council of Ministers, leads to a significantly higher gain in revenue collected compared to that revenue collected for smaller areas. Care must be exercised in interpreting this result as it may just reflect the revenue collection which is proportional to area and not necessarily the performance of council of Ministers in authorizing DUAT applications per se.

Results at the national level confirm the descriptive statistics on the differential performance across the regions. Results show that controlling for other factors, the Central and Northern region has significantly lower DUAT processing times and revenues compared to the Southern region. These significant differences suggest that regional differences in the drivers of performance of land administration system in each region and regional analysis are provided In Table 4 and Table 5 for Southern and Central and Northern regions; respectively.

**Table 3: Insert here**



#### 4.2.2 Southern region

The results in Table 4 support the structure performance hypothesis for the following reasons: First, as expected, the number of localities per square Kilometer and the number of applications per square Kilometer have a negative and statistically significant effect on the full model for the DUAT processing times. However, for revenues, the results do not fully support the structure performance hypothesis, but only the concentration and fragmentation/competition hypothesis.

Second, the “*power difference hypothesis*” is supported in processing time models where the higher authority level has significantly lower processing times compared to the lower authority level which shows to have a not significant effect although with a negative sign. These results support the hypothesized power differential force in land administration in rural Southern Mozambique.

Third, the number of localities per square kilometer is significant on days for processing DUATs. This suggests that given the relative concentration of land administration services (District capitals) densely populated Districts will need to decentralize services to localities to allow DNTF to alleviate the pressure and demand for land administration services. Finally, parcel uses were found to be affecting the performance of land administration. Results in Table 4 show that DUATs used for livestock and aquaculture, increase and decrease processing time, respectively. This can be explained by the fact that livestock production requires large areas (about 785 hectares in average in the Southern region) and represent about 5 percent while although large areas are requested for aquaculture it represents only 0.04 percent of applications, corresponding to only 12 applications countrywide.

#### **Table 4: Insert here**

#### 4.2.3 Central and Northern region

Contrary to the Southern region, results in the Central-North region only support power differential with respect to total revenue. Results in Table 5 a positive and significant effect hierarchal power effect with an addition application of parcels with area between 1,000 and 10,000 hectares (authorized by the Ministry of Agriculture) increasing the revenues by only 10 percent, while an additional DUAT application of area greater than 10,000 hectares (to be authorized by the Council of Ministers) increasing the revenues by about 40 percent.

As observed in the Southern region, the use of DUAT has an effect on the performance. Results show a 39 percent decrease in revenues for an additional DUAT application for industrial purposes while only 7 percent increase is observed with an additional DUAT application for livestock production purposes. Although with lower magnitude, the DUAT’s ownership was found to be





another significant driver of performance. Results in Table 5 show that an additional application with single ownership decreases processing times by 0.1 percent while additional community land (delimitation) increases the processing time by 1.3 percent. This can be explained by the fact that single owned DUATs are usually of small areas (mainly for residential and agriculture) while the community owned land certification follows a more complex procedure compared to private titling. A recent study on the community land delimitation (Pitro, 2014), identified eleven main challenges for implementing community land delimitations in Mozambique, including: time limitation to complete delimitation, weak social preparation to the communities, financial constraint to support community land delimitation (estimated at US\$US8,000 per community), limited capacity of NGOs in assisting communities with larger areas; lack of clarity by the State concerning the development priorities and access to land, limited legal assistance and limited Land Law dissemination and other relevant information among others.

**Table 5: Insert here**

## 5 Conclusions and Recommendations

Results show that a significant competition among clients and a small concentration of land administration units increases the performance, suggesting that decentralization of land administration units to lower geographical units, such localities are likely to favor performance. The key recommendations from this study focus in two strategic areas of concern of the land administration system, namely the institutional and technical arrangements. The former suggests joining mapping services and the cadastral services together in order to make the flow of information a smooth process, to engage in public-private partnerships given that the land administration system in Mozambique is under-resourced with few registered professional surveyors to cover large extensions of land. Given that the major challenge faced by the land administration system in Mozambique is the limited capacity to deliver land administration services, decentralizing services to lower administrative units is a potential alternative to the lower performance. Given that this effort will require financial and human resources become crucial, for an effective decentralization, qualified surveyors and registry staff must be available and a well-developed system of property rights must exist because an effective record and regulation of land use rights are not possible without a well-trained cadre of professionals; including land surveyors, cartographers, land information systems and cadaster specialists, real estate appraisers, and land use planners and managers. Therefore, investing in human resources is crucial.

The current environment in curriculum development and infrastructure (girl's dormitory and supplies), enrollments and graduation rates at the Land Administration and Cartography Training Institute (INFATEC) within its limited context of its current 3-year certificate program shows an increase in the proportion of female graduates. If this trend continues, more women will be graduating than men, reversing the male-dominant graduation trend, which is beneficial to the recommended decentralization of land services to lower administrative level.



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Given the INFATEC's institutional, human resources, and financial long-term vision, it is expected that this trend will continue, however, to maintain a sustainable growth on land administrators and officers and to meet the perceived professional demand in a transitioning economy, it is a societal and institutional interest to establish a solid graduate-level institution focusing on the training of professional and certified surveyors, cartographers and land information system (cadaster) specialist, possibly with future program expansion to regional centers.

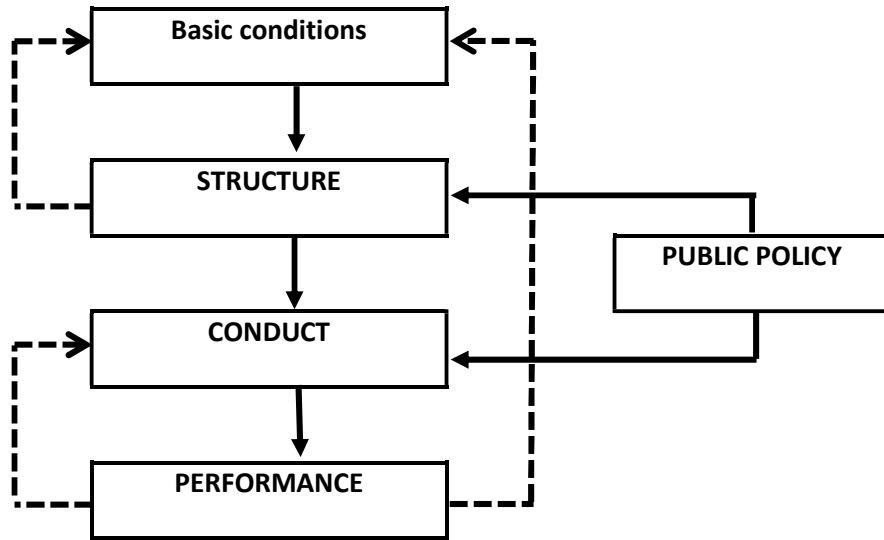
## 6 Study limitations

Due to data limitation, the performance is measured by only two indicators (the processing time and revenue). For a comprehensive evaluation of the effect of structure on performance, more performance indicators would be estimated given the data availability as those described by World Bank (2007). Recognizing that estimating all these performance indicators possess is subject to data availability (Burn & Dalrymple, 2006), suggest that at least four of these indicators (e.g. *Annual registered transfers as percentage of registered parcels, Ratio of annual registry running costs/registered parcels, Registration staff days/registration, and Ratio revenue/expenditure* --a version used in this paper) would be sufficient to assess the efficiency of land administration system as they are chosen on the breath of internal system efficiency and minimal data collection recommended.



## List of Figures and Tables

Figure 1: Structure, Conduct, and Performance Framework





**Table 1: Descriptive statistics by region**

Characteristic (N=138)	Region			Difference S vs. CN
	Southern	Central & Northern	National	
<i>Performance measures (Average):</i>				
Percentage of applications with no response	0.04	0.09	0.08	**
DUAT processing time (days)	534.7	215.1	293.8	**
Annual fee per hectare (million MNZ) <sup>a</sup>	0.625	4.05	3.06	+
<i>Structure measures:</i>				
Applications per Km <sup>2</sup>	0.09	0.34	0.28	+
Population density (people/km <sup>2</sup> )	163.3	131.1	139.1	
Localities per Km <sup>2</sup>	0.003	0.002	0.002	+
Parcels: <1,000ha	72.1	277.8	227.1	**
Parcels: 1,000-10,000ha	7.4	10.4	9.7	
Parcels: >10,000ha	2.6	3.3	3.1	
<i>District characteristics (Average):</i>				
Percentage of males	0.5	0.5	0.5	**
Percentage of out-migration	0.4	0.1	0.1	
Number of primary schools	58.2	87.1	79.9	**
Number of farms (000)	19,04	28,63	26,25	**
Number of commercial units	73.4	71.3	71.8	
Public administration units	25.6	20.9	22.0	*
Health service units	8.8	7.2	7.6	+
<i>Average number of applications by use:</i>				
Agriculture	60.1	107.5	95.8	*
Commerce	9.7	25.1	21.3	*
Residential	15.1	176.6	136.8	*
Religion/social	2.8	8.2	6.9	*
Aquaculture	0.1	0.2	0.1	**
Public services	4.8	7.5	6.9	
Livestock	8.6	23.5	19.8	**
No data	0.1	3.8	2.9	**
Number of applications	116.2	390.2	322.7	**
<i>Average number of applications by type of ownership:</i>				
Individual ownership (#)	74.5	196.2	166.2	**
Company (private, state) (#)	26.2	49.1	435	*
<i>Average number of applications by authorization date:</i>				
Authorized before 1980 (#)	0.0	0.3	0.3	*
Authorized: 1980-1990 (#)	0.6	4.1	3.2	**
Authorized: 1990-2000 (#)	8.6	31.1	25.6	**
Authorized: 2000-2010 (#)	30.0	226.8	178.3	**
Authorized: 2010-2014 (#)	6.6	9.9	9.1	
<b>Total Number of applications</b>	<b>3,952</b>	<b>40,585</b>	<b>44,537</b>	
<b>Districts</b>	<b>34</b>	<b>104</b>	<b>138</b>	

Significance level: + at 10%; \* at 5%; \*\* at 1%;

<sup>a</sup> MNZ (the local currency known as Mozambique *Metical*) in real terms. Exchange rate: 1USD=30.69MNZ (projected for 2015 available at [http://www.bancomoc.mz/fm\\_MercadosMML.aspx?id=15](http://www.bancomoc.mz/fm_MercadosMML.aspx?id=15), accessed on 10/20/2015).

Source: Author's computation from DNTF, 2014 and INE, 2015 data



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**Table 2: Relationship between structural measures and performance by region**

Terciles performance measures (N=138)	<i>Performance measure I: DUAT processing time (days)</i>			<i>Performance measure II: Annual fee per ha (MZN)</i>		
	Region			Region		
	Southern	Central & Northern	Total	Southern	Central & Northern	Total
<b>Applications per Km<sup>2</sup></b>						
1 (Low)	0.20	0.40	0.38	0.04	0.21	0.17
2	0.14	0.32	0.31	0.02	0.04	0.03
3 (Top)	0.07	0.24	0.12	0.16	0.80	0.59
Total	0.09	0.34	0.28	0.09	0.34	0.28
Dif. (1-3)	+			+		
Dif. (2-3)				*	+	*
<b>Population density (people/km<sup>2</sup>)</b>						
1 (Low)	117.7	154.1	150.8	40.0	104.7	91.7
2	1131.6	85.5	126.5	148.0	60.1	79.1
3 (Top)	98.3	260.8	142.2	253.6	231.8	238.9
Total	163.3	131.1	139.1	163.3	131.1	139.1
Dif. (1-3)						
Dif. (2-3)				+		
<b>Localities per Km<sup>2</sup></b>						
1 (Low)	0.006	0.003	0.003	0.002	0.003	0.002
2	0.002	0.002	0.002	0.004	0.002	0.002
3 (Top)	0.003	0.002	0.003	0.004	0.002	0.003
Total	0.003	0.002	0.002	0.003	0.002	0.002
Dif. (1-3)	*			*		
Dif. (2-3)				+		
<b>Parcels: &lt;1,000ha</b>						
1 (Low)	206.8	223.3	221.9	68.8	212.8	181.8
2	63.0	348.3	337.8	15.1	107.3	89.3
3 (Top)	53.5	140.0	76.3	104.9	543.2	400.3
Total	72.1	277.8	227.1	72.1	277.8	227.1
Dif. (1-3)	*			**		
Dif. (2-3)				**	*	*
<b>Parcels: 1,000-10,000ha</b>						
1 (Low)	25.5	6.9	8.5	5.2	7.1	6.7
2	12.5	12.8	12.7	0.8	4.8	4.0
3 (Top)	4.4	12.9	6.6	12.5	20.5	17.9
Total	7.4	10.4	9.7	7.4	10.4	9.7
Dif. (1-3)	**			+	**	**
Dif. (2-3)	*			**	**	**





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**Table 2 (Cont'd)**

Terciles performance measures (N=138)	<i>Performance measure I: DUAT processing time (days)</i>			<i>Performance measure II: Annual fee per ha (MZN)</i>		
	Region			Region		
	Southern	Central & Northern	Total	Southern	Central & Northern	Total
Parcels: >10,000ha						
1 (Low)	8.3	2.6	3.1	0.7	1.5	1.3
2	10.5	3.7	4.0	0.5	3.4	2.8
3 (Top)	1.2	4.1	1.9	5.0	5.6	5.4
Total	2.6	3.3	3.1	2.6	3.3	3.1
Dif. (1-3)	**			*	**	**
Dif. (2-3)	**		*	**		*

Significance level: + at 10%; \* at 5%; \*\* at 1%

Source: Author's computation from DNTF, 2014 and INE, 2015 data



**Table 3: Determinants of land administration performance in Mozambique, 1986-2014**

Variables	<i>Performance measure I: DUAT processing time (days)in Logs</i>				<i>Performance measure II: Total annual fee (MZN)in Logs</i>			
	Model1	Model2	Model3	Model4	Model5	Model6	Model7	Model8
<i>Structure measures:</i>								
Applications per km2	0.050 (0.49)	0.009 (0.09)	0.042 (0.43)	0.005 (0.06)	-0.198 (-0.24)	0.084 (0.10)	0.327 (0.50)	0.334 (0.49)
Localities per km2	-46.239* (-2.53)	-43.251* (-2.39)	-38.979* (-2.20)	-37.474* (-2.14)	-5.746 (-0.04)	-19.489 (-0.13)	-42.873 (-0.36)	-43.017 (-0.36)
Population density (people/km2)	0.000 (0.01)	0.000 (0.14)	0.000 (0.46)	0.000 (0.64)	0.002 (0.87)	0.001 (0.72)	0.001 (1.01)	0.001 (0.99)
Parcels: <1000 ha (#)	-0.000 (-0.92)	-0.001* (-2.28)	0.000 (0.61)	-0.000 (-1.13)	0.003* (2.15)	0.009 (1.58)	0.001 (0.48)	0.001 (0.19)
Parcels: 1,000 -10,000ha (#)	0.006 (1.00)	0.004 (0.63)	-0.003 (-0.49)	-0.004 (-0.62)	0.128** (2.82)	0.123** (2.69)	0.041 (0.89)	0.041 (0.88)
Parcels: >10,000ha (#)	-0.010 (-0.69)	-0.011 (-0.81)	-0.012 (-0.84)	-0.020 (-1.37)	0.231* (1.99)	0.217+ (1.87)	0.250* (2.55)	0.250* (2.53)
<i>Region (a):</i>								
Central & Northern	-1.146** (-7.45)	-1.116** (-7.33)	-0.971** (-5.95)	-0.961** (-5.97)	-2.179+ (-1.76)	-2.174+ (-1.76)	-4.818** (-4.41)	-4.818** (-4.39)
<i>Main Uses of DUATs:</i>								
Industry (#)			0.004 (0.43)	0.009 (0.88)			-0.182** (-2.63)	-0.184* (-2.40)
Livestock (#)			0.005+ (1.74)	0.003 (1.22)			0.077** (4.31)	0.077** (4.28)
Aquaculture (#)			0.108 (1.00)	0.153 (1.42)			-0.838 (-1.16)	-0.837 (-1.16)
<i>Ownership:</i>								
Individual ownership (#)			-0.001* (-2.31)	-0.001** (-2.82)			-0.001 (-0.32)	-0.001 (-0.26)
Community owned (#)			0.013** (3.00)	0.013** (2.93)			-0.095** (-3.18)	-0.095** (-3.11)



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**Table 3 (Cont'd)**

Variables	Model1	Model2	Model3	Model4	Model5	Model6	Model7	Model8
<i>Missing data:</i>								
Dependent variable (#)		0.001*		0.001*		-0.005		-0.000
		(2.14)		(2.14)		(-1.04)		(-0.04)
Constant	6.284**	6.216**	6.493**	6.360**	6.571**	6.811**	2.035	2.045
	(41.86)	(41.06)	(24.36)	(23.57)	(5.44)	(5.54)	(1.14)	(1.13)
Observations	133	133	133	133	133	133	133	133
R-square	0.334	0.357	0.455	0.476	0.243	0.250	0.571	0.571

*t* statistics in parentheses; Significance level: + at 10%; \* at 5%; \*\* at 1%; (a) reference is Southern region

Source: Author's computation from DNTF, 2014 and INE, 2015 data



Table 4: Determinants of land administration performance in Southern Mozambique

Variables	<i>Performance measure I: DUAT processing time (days)in Logs</i>				<i>Performance measure II: Total annual fee (MZN)in Logs</i>			
	Model1	Model2	Model3	Model4	Model5	Model6	Model7	Model8
<i>Structure measures:</i>								
Applications per km <sup>2</sup>	0.238 (0.40)	-0.463 (-0.72)	-0.837 (-1.44)	-1.637** (-2.99)	4.870 (0.66)	19.367** (3.04)	0.628 (0.07)	14.203+ (2.01)
Population density (people/km <sup>2</sup> )	-0.000 (-0.00)	0.000 (0.59)	-0.000 (-0.82)	-0.000 (-0.07)	0.002 (0.76)	-0.001 (-0.29)	0.001 (0.48)	-0.001 (-0.59)
Localities per km <sup>2</sup>	-60.789+ (-1.75)	-26.825 (-0.75)	-24.386 (-0.80)	15.983 (0.56)	450.498 (1.05)	-262.448 (-0.74)	638.928 (1.43)	-68.542 (-0.19)
Parcels: <1000 ha (#)	-0.004* (-2.20)	-0.006** (-3.13)	-0.004* (-2.58)	-0.007** (-4.32)	0.012 (0.52)	0.060** (2.99)	0.010 (0.44)	0.058** (2.89)
Parcels: 1,000 -10,000ha (#)	0.003 (0.15)	-0.006 (-0.31)	-0.020 (-1.13)	-0.030+ (-2.01)	-0.235 (-0.97)	-0.062 (-0.33)	-0.336 (-1.31)	-0.171 (-0.88)
Parcels: >10,000ha (#)	-0.061+ (-1.87)	-0.044 (-1.42)	-0.083** (-2.99)	-0.064* (-2.64)	0.815+ (2.02)	0.476 (1.54)	0.737+ (1.81)	0.391 (1.24)
<i>Main use of DUATs:</i>								
Livestock (#)			0.041** (3.70)	0.042** (4.49)			0.190 (1.16)	0.190 (1.56)
Aquaculture (#)			-0.487+ (-1.94)	-0.392+ (-1.82)			0.654 (0.18)	-1.411 (-0.50)
<i>Missing data:</i>								
Dependent variable (#)		0.005* (2.19)		0.006** (3.26)		-0.103** (-4.63)		-0.100** (-4.47)
Constant	6.751** (46.68)	6.419** (31.59)	6.645** (53.85)	6.256** (39.51)	5.096** (2.85)	12.191** (5.99)	4.385* (2.41)	11.444** (5.49)
Province fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	33	33	33	33	33	33	33	33
<i>R-square</i>	0.614	0.676	0.756	0.834	0.292	0.618	0.364	0.660

*t* statistics in parentheses; Significance level: + at 10%; \* at 5%; \*\* at 1%

Source: Author's computation from DNTF, 2014 and INE, 2015 data



**Table 5: Determinants of land administration performance in Central and Northern Mozambique**

Variables	Performance measure I: DUAT processing time (days)in Logs				Performance measure II: Total annual fee (MZN)in Logs			
	Model1	Model2	Model3	Model4	Model5	Model6	Model7	Model8
<i>Structure measures:</i>								
Applications per km2	0.035 (0.30)	0.004 (0.04)	0.009 (0.08)	-0.027 (-0.24)	-0.000 (-0.00)	0.188 (0.19)	0.100 (0.14)	0.139 (0.19)
Localities per km2	-33.711 <sup>+</sup> (-1.66)	-31.994 (-1.59)	-31.620 (-1.62)	-30.712 (-1.60)	-44.734 (-0.28)	-50.628 (-0.31)	-68.860 (-0.56)	-68.918 (-0.56)
Population density (people/km2)	-0.000 (-0.04)	0.000 (0.03)	0.000 (0.50)	0.000 (0.66)	0.001 (0.35)	0.001 (0.24)	0.002 (1.10)	0.002 (1.04)
Parcels: <1000 ha (#)	-0.000 (-0.68)	-0.001 <sup>+</sup> (-1.75)	0.000 (0.91)	-0.000 (-0.76)	0.003 <sup>+</sup> (1.80)	0.006 (1.05)	0.001 (0.35)	0.001 (0.29)
Parcels: 1,000 -10,000ha (#)	0.011 <sup>+</sup> (1.76)	0.009 (1.46)	0.004 (0.55)	0.003 (0.39)	0.145 <sup>**</sup> (2.97)	0.142 <sup>**</sup> (2.89)	0.095 <sup>+</sup> (1.93)	0.095 <sup>+</sup> (1.92)
Parcels: >10,000ha (#)	0.002 (0.12)	-0.000 (-0.02)	-0.005 (-0.32)	-0.015 (-0.89)	0.200 (1.57)	0.191 (1.49)	0.338 <sup>**</sup> (3.30)	0.340 <sup>**</sup> (3.28)
<i>Main uses of DUATs:</i>								
Industry (#)			0.002 (0.15)	0.008 (0.63)			-0.322 <sup>**</sup> (-4.33)	-0.329 <sup>**</sup> (-3.95)
Livestock (#)			0.002 (0.81)	0.001 (0.39)			0.065 <sup>**</sup> (3.53)	0.065 <sup>**</sup> (3.52)
Aquaculture (#)			0.093 (0.79)	0.141 (1.19)			-0.759 (-1.03)	-0.752 (-1.02)
<i>Ownership:</i>								
Individual ownership (#)			-0.001* (-2.03)	-0.001* (-2.54)			0.002 (0.54)	0.002 (0.56)
Community owned (#)			0.013 <sup>**</sup> (2.85)	0.013 <sup>**</sup> (2.78)			-0.090 <sup>**</sup> (-3.05)	-0.088 <sup>**</sup> (-2.94)





**Table 5 (Cont'd)**

Variables	Performance measure I: DUAT processing time (days)in Logs				Performance measure II: Total annual fee (MZN)in Logs			
	Model1	Model2	Model3	Model4	Model5	Model6	Model7	Model8
<i>Missing data:</i>								
Dependent. Variable (#)		0.001 (1.66)		0.001 <sup>+</sup> (1.94)		-0.003 (-0.59)		-0.001 (-0.19)
Constant	5.016** (43.35)	4.990** (43.12)	5.292** (17.11)	5.151** (16.45)	4.504** (4.88)	4.654** (4.84)	-4.155* (-2.15)	-4.093* (-2.08)
Province fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	100	100	100	100	100	100	100	100
<i>R-square</i>	0.078	0.104	0.253	0.285	0.259	0.262	0.632	0.632

*t* statistics in parentheses; Significance level: + p at 10%; \* at 5%; \*\* at 1%

Source: Author's computation from DNTF, 2014 and INE, 2015 data



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