CONTRIBUTION OF LAND TENURE REGULARIZATION ON AGRICULTURAL INVESTMENTS: A CASE STUDY OF LARGE SCALE FARMERS IN EASTERN PROVINCE OF RWANDA

FELICIEN NIYONIRINGIYE
March, 2014

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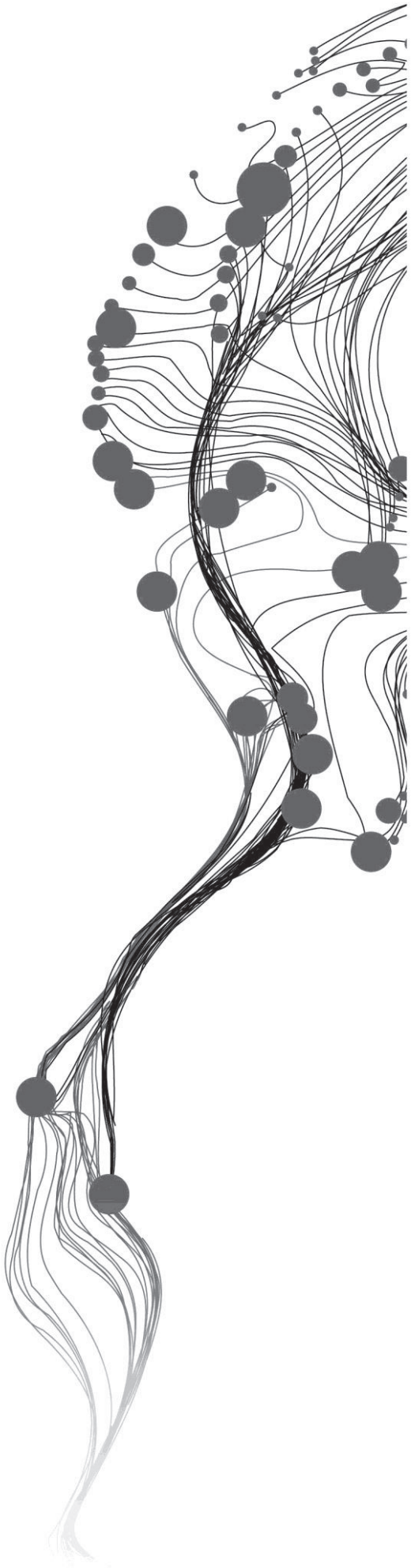

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Enschede, The Netherlands, March, 2014

Thesis submitted to the Faculty of Geo-Information Science and Earth Observation of the University of Twente in partial fulfilment of the requirements for the degree of Master of Science in Geo-information Science and Earth Observation.

Specialization: Land Administration

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ABSTRACT

The grant of land right through land titling has proven to be a boosting factor of society's economies. This idea has motivated different stakeholders to intervene in land titling especially in developing countries. In 2009, the Government of Rwanda launched the programme of Land Tenure Regularization (LTR) to increase tenure security, expecting that in return it would increase agricultural investments. The aim of this research was to assess the impact Land Tenure Regularization had in agricultural investments of large scale farmers. The case study of large scale farmers in Eastern Province in Rwanda was used to examine research variables. The sources of data are scientific research articles, administrative documents, views and opinions of respondents. Both qualitative and quantitative data were collected respectively through unstructured interviews with key informants and structured interviews with farmers. Empirical findings show that after LTR implementation, the programme contributed to economic growth. There have been a growing number of large scale farmers in the region, with LTR programme, people are able to use land certificates in land collateralisation to secure bank loans and grow their economic activity further. Comparing LTR with other factors of agricultural investments, the programme takes the first of a factor that should provide incentive to large scale farmers. The analysis of these results reveals that the implementation of land titling leads to significant increase of agricultural investments. However, land titling should not sorely result in agricultural investments because there are other investment conditions required for benefiting more from the use of land title. Large scale farmers need credits or government incentives to invest, but there are farmers who rely only on own savings.

Keywords: *Land titling, agricultural investments, large scale farmers, Rwanda*

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Felicien Niyoniringiye
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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

LIST OF ACRONYMS

BDF	: Business Development Fund
BRD	: Rwanda Development Bank
EDPRS	: Economic Development and Poverty Reduction Strategy
FAO	: Food and Agriculture Organization of the United Nations
Frw	: Rwandan franc
GDP	: Gross Domestic Product
GIS	: Geographic Information System
Ha	: Hectare
ICT	: Information, Communication and Technology
ID	: Identification
ITC	: Faculty of Geo – Information Science and Earth Observation of the University of Twente
IMF	: Micro Finance Institution
IPAR	: Institute of Policy Analysis and Research
LTR	: Land Tenure Regularization
MINAGRI	: Ministry of Agriculture and Animal Resources
MINECOFIN	: Ministry of Finance and Economic Planning
MINIRENA	: Ministry of Natural Resources
MINITERE	: Ministry of lands, environment, Forest, Water and Mines
MS	: Microsoft
NISR	: National Institute of Statistics of Rwanda
RDB	: Rwanda Development Board
RIF 2	: Rural Investment Facility (phase 2)
RNRA	: Rwanda Natural Resources Authority
SORWATOM	: Rwandan Company for Tomato production
UGB	: *Unité de Gros Bétail*
UN	: United Nations
UPI	: Unique Parcel Identifier
US$	: United States Dollar

1. INTRODUCTION

1.1. Background and justification

Since 1990s, scientists recognized securing property land rights as the way of improving economy (Feder et al., 1991), especially in developing societies where land was managed under informal tenure system (De Soto, 2000). The theory suggests that States register land rights and/or grant land titles in order to increase tenure security to owners (Feder et al., 1991; Feder et al., 1999). The latter argues that once land rights are registered, land owners can use it as collateral and get financial capital to invest from lenders. In response to the aforementioned, governments across developing countries are striving to invest in land titling programmes in order to guarantee tenure security to owners and create economic opportunities of land investments (Deininger et al., 2011).

Today there is a debate on the contribution level of land titling to the potential increase of land related investments among scholars. On one hand (Deininger et al., 2008) argue that tenure security granted through Land Certification in Ethiopia increases access to credit and facilitates land owners to have working capital and long term investments. On the other hand, Smucker et al. (2000) state that the relation between land titling programme and farm land investments is not certain. These arguments are based on experiences from land titling programmes executed in their respective research regions and the impacts of these programmes differ from one region to another.

In the case of Rwanda, the Government enacted, in 2004, the national land policy and the Parliament promulgated the related Organic Land Law for the first time in 2005 (MINIRENA, 2012). The main objective of the national land policy, and the related laws and decrees is to establish a land tenure system that guarantees security of land rights for all Rwandans, sustainable land management and adequate use of national resources (Republic of Rwanda, 2004). Article 20 of the Land Law on the use and management of land in Rwanda states that the registration of owned land held by persons is compulsory (Republic of Rwanda, 2013). To achieve this target, the programme of Land Tenure Regularization (LTR) was launched officially in 2009 after a pilot study (Government of Rwanda - MINIRENA, 2012). However, it is currently opportune to evaluate the expected outcomes of LTR program.

The outcomes expected from LTR are land tenure security, land conflict management, good governance, increased land investments and appropriate land use practices and sustainable natural resources management (MINIRENA, 2009). All these expected outcomes demonstrate how LTR can improve landowners' economic welfare and macro economy in general. The current research focuses on the contribution of LTR to agricultural investments, considering that agriculture is a primary sector that holds more than 60% of working age population (Republic of Rwanda, 2012).

Given the elapsed time since the beginning of LTR, literature about the impact of this programme on land investments is still insufficient. However, there is an important study that was conducted under that suggests that the titling has a large impact on investments and soil conservation, especially for marginalized women who had no legal right on land ownership before the new land policy implementation through LTR (Ali et al., 2011). The contribution of the present research is to evaluate the extent to which LTR has contributed to farmland investments undertaken by large scale farmers, who are especially prominent in the Eastern Province of Rwanda.

This thesis is divided into seven chapters. The introduction covers the background and justification of the research, the problem statement, research objectives and related research questions. The subsequent chapters are the concepts review, covering the main concepts of land titling, investments and large scale farmers (2); a historical analysis of titling and large scale farmers in Rwanda (3); data collection strategy to conduct empirical fieldwork (4); presentation of results (5); analysis and discussion on a relationship between LTR and agricultural investments (6); and, then the conclusion and recommendations (7).

1.2. Research problem

Although there are various discussions on whether there is a relationship between land tenure security and agricultural investments (Deininger et al., 2011; Smucker et al., 2000), the government of Rwanda is optimistic on the outcomes of LTR. The National Land Policy and LTR strategic plan presume that land tenure security and land investments would increase after the issuance of land lease certificates and titles (MINIRENA, 2009; Republic of Rwanda, 2004).

In past five years, a number of studies provide certain socio-economic effects of the LTR program. For instance Ali et al. (2011), investigated the environmental and gender changes as a result of the land tenure regularization in Africa with pilot evidence from Rwanda. This study came up with the conclusion that few years after the LTR programme, households, especially those headed by females, had increased their investments in land conservation (such as terracing, bunds and check dams). In addition, the World Bank noted that the LTR seemed to benefit agriculture growth and poverty reduction objectives (Ali et al., 2012). They argued that the use of land as collateral may be disabled by risk aversion and high transaction costs, thus the result of LTR on credit access vary across regions.

Although these studies highlight LTR as a potential for productive agricultural investments, they neither distinguish how LTR affects small from large farmers nor focus on how LTR has simplified the access to credit by farmers. If the large scale farmers undertake agri-business on large size land (Government of Rwanda - NISR, 2012), it is expected that large scale farmers borrow money from banks and invest much easier than small scale farmers. Further research will help to know whether the LTR brings change in types and volume of agriculture land investments of large scale farmers. This is especially prominent in the Eastern Province of Rwanda.

1.3. Research objectives

1.3.1. Main objective

Given the research problem, the main objective is *to assess the impact of Land Tenure Regularization on the changes in agricultural land investments of large scale farmers.* We aim at contributing to the evaluation of LTR outcome for effective land investments, as one of the strategies for boosting the economic development in Rwanda. This objective has three main components: the issue of land titling, agricultural land investments and large scale farmer' concepts, the assessment of agricultural land investments of large scales farmers before and after LTR implementation and lastly the issue of relationship between LTR and agricultural investments.

1.3.2. Specific objectives

To fulfil the main objective, specific objectives are formulated as follow:

1. To conceptualize land titling, agricultural investments of large scale farmers and their meaning in Rwandan context.
2. To determine the changes in types and volume of agricultural investments of large scale farmers.
3. To determine the level at which the LTR has impacted land investments of large scale farmers.

1.4. Research questions

The specific objectives are converted into the following structured questions:

Nr	Sub-objectives	Research questions
1	To conceptualize land titling, agricultural investments of large scale farmers and their meaning in Rwandan context.	a) To what extent the concepts of land titling, agricultural land investments of large scale farmers and their relationship are discussed among scholars? b) What is the meaning of land titling, agricultural land investments and large scale farmers in Rwandan context?
2	To determine the changes in types and volume of agricultural investments of large scale farmers	a) What are the trends of number of large scale farmers after LTR implementation? b) How do large scale farmers access capital for land investments before and after LTR? c) What types of agricultural land investments have large scale farmers invested in before and after LTR? d) How much financial capital have large scale farmers invested in agriculture before and after LTR?
3	To determine the level at which the LTR has impacted land investments of large scale farmers	a) Does a plausible relation exist between the introduction and implementation of the LTR and the changes in agricultural investments? b) To which extent LTR has contributed to agricultural land investments?

1.5. Conceptual framework of research

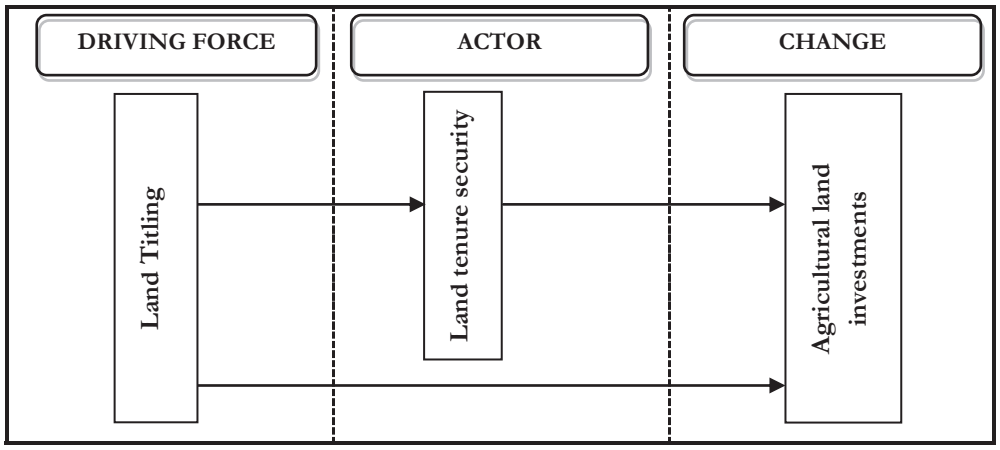

Figure 1-1: Conceptual framework

In this research, LTR is defined as an instance of land titling for which a land title is an output document. As illustrated by Figure 1-1, the concept of land titling is used to represent all the processes of recognizing land rights by issuance of either a certificate of land registration in case of emphyteutic land lease or a freehold land title (Republic of Rwanda, 2013). On one hand tenure security is considered as legal recognition proved by land title, and on the other hand, it is taken as perception of probability of eviction (Van Gelder J. L., 2009). Once the land titling is implemented, large scale farmers get land titles and feel more secure in their land ownership. This is an important incentive to invest in land. But large scale farmers can have incentive after being aware of land titling programme and undertake agricultural investments without waiting land title.

In the case of Rwanda agricultural investments include cropping, livestock, beekeeping, fishery, among others (Government of Rwanda - NISR, 2012). But in this research the term agricultural investments is used exclusively for cropping, livestock and related activities. This research aims at determining and analysing the impacts of LTR on farm land investments, particularly for the large scale farmers of Eastern Province of Rwanda.

1.6. Research design

Figure 1-2 presents briefly the research methodology followed in this research.

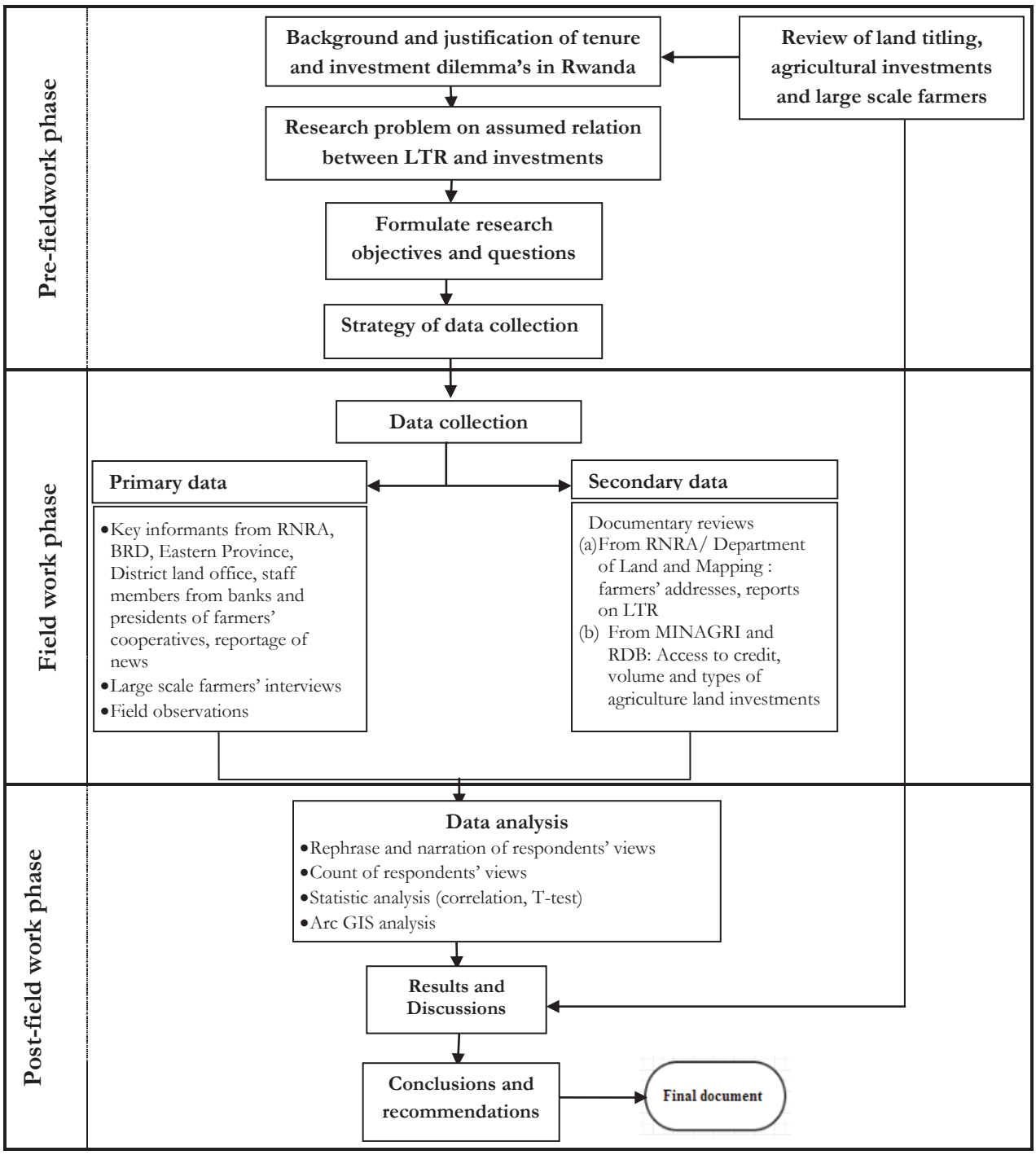

Figure 1-2: Research flow chart

1.7. Thesis Structure

The content of this thesis is structured in seven chapters:

Chapter one: Introduction

This chapter is an overall introduction to the research. It provides the background and justification of the research, research problem, research objectives, research questions and research design.

Chapter two: Concepts review: Land titling, agricultural investments and large scale farmers

Chapter two presents the literature review of land titling, agricultural investments and large scale farmers. The chapter starts with the definitions of land titling and related benefits, including tenure security, access to credit and agricultural investments. It describes the difference between large farmers from small farmers based on the literature. Then it addresses the debate on the relation between land titling and agricultural investments.

Chapter three: Land titling and agricultural investments of large farmers in Rwanda

This chapter clarifies the issue of land tenure systems before the promulgation of a new land policy, presents the implementation of the LTR programme, the agricultural investments, characteristics of a large scale farmer and the main drivers of agriculture in Rwanda.

Chapter four: Data collection strategy

This chapter explains in detail the research approach is used in data collection. The chapter presents how the primary data have been collected through unstructured interviews with the key informants, interviews schedule with large scale farmers in Eastern Province and field observations. At the same time, the secondary data were collected from documentary reviews.

Chapter five: Presentation of fieldwork results

Chapter five presents the results based on the research variables which include the number of large scale farmers, their access to financial capital, types and volume of land investments of these large scale farmers and the extent of contribution of LTR on agricultural investments in Eastern Province of Rwanda.

Chapter six: Effects of LTR on investments of large scale farmers in Eastern Province of Rwanda

This chapter compares our empirical findings with the literature; and then it brings out the relation between LTR and land investments of large scale farmers in Eastern Province of Rwanda.

Chapter seven: Conclusion and recommendations

The last chapter presents the conclusion of this research. It provides answers for the defined research questions. This chapter also provides the recommendations for both further researches and for professionals.

2. CONCEPTS REVIEW: LAND TITLING, AGRICULTURAL INVESTMENTS AND LARGE SCALE FARMERS

2.1. Introduction

In this chapter, the following research question is addressed: "*To what extent the concepts of land titling, agricultural land investments of large scale farmers and their relationship are discussed among scholars?*" The chapter starts by reviewing different concepts of land titling and its benefits. Some of these benefits consist of land tenure security, access to credit by pledging land as collateral and the increase of agricultural land investments made by large scale farmers. These benefits are discussed in the second section. The third section deals with the different opinions on the relation between land investments and land titling, as found in literature. The last section draws the conclusion about how land investments relate to land titling based on the reviewed studies.

2.2. Scholars's view on land titling and related benefits

This section presents the views of different scholars about land titling and related benefits mentioned in section 2.1. After defining the concepts based on literature, similarities and differences views are highlighted, and lastly we provide the definition of land titling in the context of the current study.

2.2.1. Land titling

Land titling is often defined as first land registration. Intervention in land registration, is the process of changing the way individual people or organizations benefit from land, from informal to formal systems (FAO, 2003; Zevenbergen, 2002). In democratic context, the process of giving individual land ownership to landholders even the poor people, is commonly called land titling (Atuahene, 2006). Williamson et al. (2010) argue that land titling involves the creation of infrastructure to run the processes for delivering registration, valuation, taxation, planning and development. In addition, Pagiola (1999) argues that land titling is the expensive activity of land administration projects. He states that land titling brings about benefits for the rural area like increasing land tenure security, access to credit, improvement of land market, long term land investments and working capital, environmental benefits and access to land information.

All above authors have similarity on how they define the concept of land titling. All of them state that land titling is a process of giving ownership to landholders. Apart from Atuahene (2006) whose view of land titling benefit is achieving democracy, other scholars agree that it can contribute to economic development of country in general and land owners in particular.

One definition, in line with topic of this research, is provided by Pagiola (1999) who says that land titling is a component of land administration, which "*can generate many benefits, including improved efficiency of land market, reduction in conflict over land, enhanced access to credit, and improved incentive to invest in agricultural production.*"

2.2.2. Land tenure security

Land tenure security is part of land titling as explained in subsection 2.2.1. Uwayezu et al. (2011) state that the main drivers of tenure security are recognition of the individual's land rights by the community, availability of land rights enforcement institutions, duration of property rights in land, clear definition of

property rights to land and clear boundary demarcation of land. According to FAO (2003), land tenure security is related to the degree of recognition and guarantee of piece of land without fear of eviction or external interference. The same document indicates that improving tenure security implies "*to encourage investments to improve the productivity of agriculture, for conservation and the sound use of natural resources, to encourage the use of temporary rights for the use of land and to reduce the number and the intensity of conflicts relating to the use and transaction of real estate*". Lunduka (2010) found that smallholder households under customary land in Malawi have more incentive to invest in tree plantation when tenure security is high or when it is expected to increase in future. Meanwhile Van Gelder J. L. (2009), using an example of low income settlement dwellers, he defines land tenure security in three forms: perception of dwellers, legal construct and de facto tenure security. Simbizi et al. (2014) state that the concept of tenure security in developed societies is absolute and supported by recognized institutions while in developing countries especially in Sub-Saharan Africa, it is still unclear and brings different meanings. Through economic, legal and adaptation lenses Simbizi et al. (2014) explain land tenure security in Sub-Saharan Africa as interaction between all components of land tenure system in dynamic equilibrium.

Land tenure has been a main issue all over the World since from the 1960s to 1970s, the security and equity of access to land was a focus for countries emerging from colonialism (Cotula et al., 2004). Even if the idea was to achieve the land right, the author says that the ways of granting land tenure security are different from society to society according to socio – cultural and geographic factors. To achieve land tenure security it often implies the approaches of land tenure reforms that are based on institutional changes and/or processes of implementation. Namely these processes are land titling reforms, land – to – the – tiller policies, market – assisted land redistribution reforms, radical land redistribution reforms, low-cost land certification reforms and customary tenure reform (Deininger et al., 2011; Deininger et al., 2006; Holden et al., 2009). All those efforts are gathered in order to improve tenure security which encourages rational use of natural resources, use of temporary land rights including leasing or mortgaging then land investments (Ali et al., 2011).

In defining the concept of land tenure security, some scholars point out similarities and differences. Land tenure security is defined as the perception of land holders to the recognition of their land right by legal institutions for a long time (FAO, 2003; Uwayezu et al., 2011; Van Gelder J. L., 2009). This feeling of tenure security encourages land owners to undertake economic activities including agricultural investments. Simbizi et al. (2014) have almost the same view as previous scholars. The difference with other scientists relies on the enjoyment of total tenure security in Sub-Saharan Africa where interactions of tenure elements have to be in equilibrium.

For this research, the definition of FAO (2003) is appropriate because it highlights important elements of land tenure security such as recognition of land right without worrying about eviction, incentive to invest more in agricultural production and land conservation. These elements are parts of conceptual framework of this research explained in chapter 1.

2.2.3. Access to credit

This subsection deals with "access to credit", which is the second benefit of land titling. The subsection begins by explaining the reasons of credit, highlights the challenges encountered by actors in the process, and provides an adequate solution to facilitate the access to credit.

Jacoby et al. (2007) posit that farmers have incentive to develop their land but they do not have enough savings or other capital resources to invest. Access to financing can facilitate farmers to have working

capital and long term investments. When they attempt to request loans from lenders, it is not possible unless they have collateral security in the form of land title (Jacoby et al., 2007). Lenders prefer land with title because it is easy to foreclose the landed property and recover principal and interest payment in event of mortgagor's default. The authors found that in Sub-Saharan Africa, banks have generally less regard for agricultural lending because there is no significant market value of land title. To explain this reluctance Pagiola (1999) argues that on one hand, lenders do not have enough information about farming conditions to evaluate risk of loans, financial markets are often disorganized due to insufficient government intervention and this has created fund accessibility gap between rural poor farmers and lending institutions, especially the commercial banks. On the other hand, farmers still depend on traditional agriculture in spite of the availability of mechanized alternative. The issue is that these farmers are interested in mechanized farming, but the fund accessibility gap and insufficient incentive from government are major drivers which have encouraged subsistence farming to date. In addition, majority of these farmers lack a business plan of projects successfully completed and are reluctant to borrow loan against land fear of losing it. The presence of rural banks failed to actually increase farm land investments for farmers in spite of their willingness to grant credits and create profitable farm projects (Pagiola, 1999).

One of the solutions to these issues is land titling. Once land is registered it can be ideal collateral that lenders trust and accept (Ali et al., 2011). The latter state that information about land including ownership is kept in central registry where it is shared if necessary. Then the registry helps actors to reduce the burden of checking reliability of land ownership during land transaction and securing loans. In addition, Byamugisha (2013) argues that the land right documentation enables agricultural investments and productivity.

2.2.4. Agricultural land investments

The chapter 1 explains the reasons of dealing with agricultural investments as outcome of LTR. This subsection has purpose of defining agricultural investments. The subsection starts by defining land investments in general, then defines the concept of agriculture and ends by deriving the definition of agricultural investment as particular land investments.

In line with assertion of Ball et al. (2012) land investment can be defined as the acquisition of an interest in land / landed property including all its resources in order to receive income and capital appreciation over time. They went further to state that investments from the macroeconomic perspective imply acquisition of real goods and fixed capital. The same definition is found in Oxford (2010) where investment is use of money or capital for future income or appreciation value. In this sense, land can be seen as fixed capital that can be put into numerous uses among which include agriculture.

In 1962, the joint committee of International Labour Office and World Health Organization on occupational health has defined agriculture as all activities related to cultivating, harvesting and primary processing of all types of crops, breeding of animals and shepherding and horticultural activities. It excludes forest domain unless the plantation of isolated trees is associated to cropping or livestock activities. (International Labour Office, 1999).

In line with the current research, agricultural investments consist of all inputs, capital goods and related efforts undertaken in order to gain appreciation value from agriculture. Basically, there are two types of agricultural investments which are fundamentally different: investments of large scale farmers or commercial farmers versus small scale farmers because these investments are different in nature but also in motives of investments. Therefore, this research focuses on large scale farmers.

2.2.5. Large scale farmers

As said in previous subsection large scale farmers undertake large investments with commercial purpose. This subsection presents the criteria of defining large scale farmers according to different scholars. The process of that presentation is based on the comparison between small farmers to large scale farmers.

According to Randhawa et al. (1990), to classify farmers into small or large category can be based on the size of land, capacity to absorb the family workforce, level of technology used in production, degree of family welfare or economic viability of the holding. However, it is difficult to consider all these criteria at once. These criteria are not uniform; they vary according to countries or regions of the same country. For instance, a large scale farmer from India has 10 ha and above while the large scale farmer in Malaysia may have more than 40 ha (Randhawa et al., 1990). Table 2-1 presents the main characteristics of farmers and how three scholars use the criteria to differentiate small from large scale farmers.

Characteristics	**Scholars*(*)*who use the criterion**	**Small farmer**	**Large farmer**
Area of land (size)	R, C,W	Relative small size	Relative large size
Payment of wage	R, C,W	Occasionally	Permanently
Knowledge, farming technology and machinery	R, C,W	Lack	Available
Availability of capital to invest	R, C, W	Lack of resources	Access to credit
Land quality	R, C	Low	Improved
Purpose of production	R, W	Family consummation/ subsistence	Commercial and/or including consummation
Techniques of soil conservation	R	Low	Improved
Farming system	W	Mixture of cultures	Mono cropping
Live on property	W	Majority (Yes)	Majority (Non)

Table 2-1: Similarities and differences between small and large scale farmers in developing countries

(*) R=Randhawa et al. (1990) ; C=Collier et al. (2009) ; W= World Bank (2007)

Large scale and small farmers are often defined by size of holdings, payment of wage, knowledge of farmers, access to credit, machinery and technology applied in farming activities (Collier et al., 2009; Randhawa et al., 1990; World Bank, 2007). These are common criteria adopted by three scholars to characterise farmers. Randhawa et al. (1990) show the limitations of defining small scale farmers by size because other characteristics of land mentioned in table 2-1 above are assumed to be homogeneous. To focus on large scale farmers however, Collier et al. (2009) give less importance to the size of land by identifying three key areas of potential economies of scale: skill and technology, finance and access to capital, and the organization and logistic of trading, marketing and storage.

Although the above criteria are important to differentiate small farmers from large scale farmers, this research considers size of holding as the main criterion for defining large scale farmers.

2.3. Debate on relation between agricultural investments and land titling

The section 2.2 presented the definitions of land titling and related benefits including land tenure security, access to credit and agricultural investments. Now the section 2.3 shows what literature says about the relation between land titling and agricultural investments. The section starts by presenting the views of different scholars then derives conclusion of views.

Given the benefits of land titling, scholars have recognized the role of land right in economy of societies for long time. Feder et al. (1991) argue that land title as result of land titling can bring benefits of land productivity through three main mechanisms. The first assumption is that increasing tenure security can increase incentive to invest in land or get capital equipment for improving land. The second is that it leads to increased access to credit, whereby land can be used as collateral. The third one it would improve land market, as the reallocation of land is easy to have efficiency or transaction effect.

Later, De Soto (2000) argued that the lack of access to formal property right is the main cause of poverty in developing countries. When a property fails to serve as collateral for securing loans, it is in essence called "dead capital". Recently Deininger et al. (2006) identified land tenure security as a main driver of access to credits and bring about high level of investments. In addition, Prosterman et al. (2009) posit that without such security investments are stalled, which hampers increasing productivity. When land is registered, there is a title which provides incentive for efficient land improvement to land owners feel comfortable if the advantages from these improvements would last for a long time (Miceli et al., 1998; Pagiola, 1999). De Soto (2000) proposed the representation of land property by title in order to generate capital investments in developing and communists societies.

Since 1980s, international organizations such as the World Bank, the FAO and the UN Habitat are inspired by the theory of land tenure security through land titling; they support academic debates on land policy and research initiatives (Arko-Adjei et al., 2011). World Bank assists governments from developing countries in elaboration of land policies and implementation of land titling programmes to secure land including customary tenure (Williamson et al., 2010). All these efforts are geared toward poverty alleviation (Arko-Adjei et al., 2011). For example land policies and administration programmes took place in Asia and Africa: land policy reform and administration in Indonesia from 2006; India moved from presumptive title to Torrens system since 2008; in Ghana Land Administration Project became effective since 2003 and new land administration system in Rwanda from 2004 (Sagashya et al., 2009).

Although the above scholars prove the relation between land titlind and agricultural investments, there other scientists who deny this relation. These scholars give some examples of land titling programmes that did not achieve the expected outcomes. The programmes are for instance in African countries like Kenya (Njoro) Burukina Faso (Houet) and Madagascar (Alaotra) where the relation between land tenure security and land investments is not significant (Brasselle et al., 2002; Carter et al., 1990; Jacoby et al., 2007). The absence of land tenure security motivates farmers to undertake more investments on land in order to enhance that security. In their research paper on land tenure and adoption of agriculture technology in Haiti, Smucker et al. (2000) argued that a land title does not necessarily provide more security than maintaining informal arrangements. In other words, the traditional tenure on land guarantees assurance to land access and investments compared to formalized tenures held by some Haitian peasants.

On one hand the following examples show that land titling projects have been successful: Guatemala Land administration project (Petén), Thailand Land Titling I and II (Pagiola, 1999), Ethiopia (Deininger et

al., 2011) and Malawi (World Bank, 2004). These authors also proved that land title grants tenure security which creates an incentive for farmers to undertake long term investments.

The arguments in existing literature concerning the contribution of land titling on agricultural investments are not conclusive. Some scholars argue that land titling influences agricultural investments because a land title proves land tenure security. Then the title allows using land as collateral before getting a loan for agricultural inputs. However, another group of scholars argues that land titling has no significant effect on agricultural investments. Once farmers feel unsecured, they try to enhance their land light by land improvements.

2.4. Conclusion

Land titling is a component of land administration, which grants land right to individual owners or corporations. It can generate many benefits, tenure security, increased access to credit, and improved incentive to invest in agricultural production. Using literature review, the chapter discussed benefits one by one and defines tenure security as recognition of land right without fear of eviction which confers incentive to invest more in agricultural production. Agricultural investments are inputs, capital goods and related activities undertaken with the target of getting future income from agriculture. These investments are done by farmers categorised into large scale farmers and small farmers. The characteristics of classifying farmers are land size, payment of wage, knowledge, farming technology and machinery, but land size is the main criterion considered in this research for selecting large scale farmers. Concerning the debate on the relation between land titling and agricultural investments, there are two views of scholars. One group has agreed on strong relation between land titling and agricultural investments while the second group proves that there is no significant relation.

The following chapter 3 presents the same concepts of land titling and related benefits in context while the relation between land titling and agricultural investments is subject of chapter 4 and chapter 5.

3. LAND TITLING AND AGRICULTURAL INVESTMENTS OF LARGE FARMERS IN RWANDA

3.1. Introduction

This chapter addresses the research question "*What is the meaning of land titling, agricultural land investments and large scale farmers in the Rwandan context?*" The second chapter addresses the conceptualization of land titling and related benefits, in a general context and the debate on the relation between land titling and agricultural investments. The third deals with the issue of land titling and agricultural investments, specifically, in the context of Rwanda. The chapter starts by presenting the issue of land tenure systems in Rwanda before LTR and its contribution to economic development in rural and urban area. The section 3.3 presents the genesis of LTR, its implementation and achievements. The section 3.4 shows the contribution of agricultural investments in Rwanda. The section 3.5 describes the characteristics of large scale farmers in Rwanda. Since LTR alone is not sufficient to boost agricultural investments, the section 3.6 discusses other drivers of agriculture sector. The last section summarises the chapter 3.

3.2. Issue of land tenure systems before LTR

This section explains the genesis of LTR in Rwanda and a brief presentation of the land right issues that have characterised the period before implementation of LTR programme.

In pre-colonial period land tenure was only characterised by customary system. During colonization, the Belgian authority introduced the statutory law and the tenure system became dual (Crook, 2006). Although all land belonged to the State, titles of rural land were only granted to churches and elites people by the Government, while the rest of rural land was under customary system (Republic of Rwanda, 2004). In addition to the tenure system in rural area, the statutory system was governing built-up areas in urban and trading centres where owners had to get land documents for economic purpose. The land formally registered with titles was only 1% until 2006 (IPAR Rwanda, 2009). This situation was an important obstacle to private investments, given that many landholders did not have tenure security (MINIRENA, 2009).

Sagashya et al. (2009) pointed out that unclear tenure system that was not consistently available all over the and not the same to the whole country created inequality between urban and rural lands and hampered economic development and sustainable land use. There was an evident fear of tenure insecurity among landholders, and in rural area the land was excessively subdivided into small plots (MINIRENA, 2009). Consequently, land owners did not have any incentive to invest in agriculture production and land conservation. To deal with this issue, LTR programme was one of the solutions proposed by the Government and its stakeholders.

3.3. Land Tenure Regularization (LTR) program

The term regularization or formalization of land rights is used where informal or illegal possession is legalized and occupiers get legal right to private ownership. This happens when there is a large amount of irregular settlements and the state needs to protect investments that might be undertaken illegally (FAO, 2003). In case of Rwanda, the objective of LTR was to record all existing land rights and clarify their status under the land law. The implementation of LTR should guarantee tenure security to all Rwandans and

stimulate agricultural land investments towards rational use of resources through easy access to credits (MINIRENA, 2009).

Since 2009, the land titling in Rwanda was implemented through the programme of LTR by the Government (Government of Rwanda - MINIRENA, 2012). Before the countrywide launch of LTR, the Government had organised a trial of the programme in four Districts: Gasabo, Karongi, Kirehe and Musanze. The LTR implementation requires participation and collaboration of many actors and stakeholders. These include Rwanda Natural Resource Authority, Department of Land and Mapping, land commissions, donors, local authorities and land owners. The participation of landowners was important to accomplish the process. This participation includes providing land information but also payment of registration fees (Ali et al., 2011). The payment of 1.47 US$ and 7.35 US$ asked to owners for registering each parcel respectively in rural and urban area (MINIRENA, 2009). Any other condition like investment plan on land was imposed to landholders before regularization of land right.

The implementation of LTR consists of two components which are land registration and installing a system of land information. Land registered through either systematic or sporadic registration. The systematic land registration, called also first registration, includes eight steps which are identification of cell as the LTR unit area, sensitization of local authorities and population, demarcation of general boundaries, adjudication, publication of records, objections and corrections, mediation for disputes and issuance of documents (Government of Rwanda - MINIRENA, 2013b). Before and during systematic land registration, land owners should need land title for economic or administrative reasons. In collaboration of District Land Bureau and the Office of Registrar, they register the land and issue the title without waiting when the systematic registration reaches the related cell. This process was called sporadic land registration because it was done on owner's demand. After first registration the way forward is management and maintaining information about all registered parcels. This is the third component of LTR that is known as "Land administration information system" (MINIRENA, 2009).

At the end of process, the information of recorded land is kept in national registry while land certificates are issued to land owners. Table 3-1 shows the outputs of the project at the end of May 2013.

Province	Southern	Eastern	Western	Northern	Kigali City	Total
Demarcated parcels	2,811,708	1,851,205	2,996,835	2,489,050	332,073	10,480,871
Issued leases	1,248,304	996,403	1,426,459	1,214,610	155,039	5,040,815
%	44.40%	53.82%	47.60%	48.80%	46.69%	48.10%

Table 3-1: report of Land certificates issuance

(Government of Rwanda - MINIRENA, 2013a).

According to the achievements of LTR, the RNRA has registered 10,480,871 parcels and issued 5,040,815 land certificates to landowners including farmers. Land certificates issuance in Provinces was under 50%, except the Eastern Province that was slightly higher (53.82%).

3.4. Agricultural investments in Rwanda

The previous section 3.3 described LTR programme and its objectives. The latter involves boosting of agricultural land investments among important goals. This section presents the characteristics of agricultural investments and its contribution to the national economy.

The economy of Rwanda is predominantly based on agriculture. More than 60% of working age population works in agriculture and mostly with subsistence farming (Republic of Rwanda, 2012). Rwanda prioritizes producing food crops in sufficient quantity (MINAGRI, 2009). Farmers start to invest in value food crops like soybeans, maize, vegetables and rice. Livestock also plays a big role in income generation, but its ratio is still relatively low (MINAGRI, 2009). Cash crops for export have importance of Rwandan economy where coffee and tea are competing on international market. Table 3-2 shows the contribution of agriculture investments to national Gross Domestic Product (GDP) against other economic sectors since 2006.

Description	2006	2007	2008	2009	2010	2011	Jan-Jun 2012
Total GDP	**1616**	**1926**	**2414**	**2807**	**3079**	**3573**	**1951**
Agriculture	660	729	834	1012	1058	1223	659
%	41%	38%	35%	36%	34%	34%	34%
Industry	236	285	382	430	491	625	316
%	15%	15%	16%	15%	16%	17%	16%
Services	720	912	1198	1365	1530	1725	976
%	45%	47%	50%	49%	50%	48%	50%

Table 3-2: Evolution of GDP by economic activities (in Frw billion).

Source: (National Bank of Rwanda, 2012)

From 2006 the contribution of agriculture sector to GDP was decreasing while services rises its percentage up to half of total GDP. The agriculture sector keeps many working population, but income from this sector is not proportional. This is consequence from different land issues which hamper agricultural investments. Some of the problems are land scarcity and environmental degradation (Republic of Rwanda, 2012).

After the genocide of 1994, the problem of land scarcity was crucial. In addition to land scarcity, there was a massive return of refugees who needed land for settlement (Republic of Rwanda, 2004). The Eastern region with natural zone was one of the potential areas to receive landless. The game reserve of the Akagera National Park and Gishwati natural forest were parcelled and distributed to returning 1959 refugees (Republic of Rwanda, 2004). In other regions there were also landless families or farmers with average size of cultivated land is below 0.5ha per household. This large number of land less and inequity in land tenure lead to land sharing and reallocation of land as resolution of the issue (Sagashya et al., 2009).

The foreign agricultural investments in Rwanda are still low because there are many challenges related to land and location of Rwanda. Foreign agricultural investments often require large land (FAO, 2012). In case of Rwanda the problem of land scarcity does not allow the Government to make these types of investments a priority. The focus is on increasing agriculture productivity of smallholders (Republic of Rwanda, 2012). Although foreign investments are not numerous in agricultural sector, the Government has granted state land to foreign investors. These investors include for examples Madhvani Group for sugar cane in Nyabugogo and Nyabarongo swamps, Jatropha plantation in Kayonza District, Stevialife Sweeteners Ltd for stevia production in Yanze swamp and Tea importers for tea plantation in Cyohoha Rukeri swamp.

Based on the size of landholdings, therefore, in Rwanda there are also two categories of farmers notably small scale and large scale farmers.

3.5. Characterizing a large farmer in Rwanda

In chapter 2, we defined large scale farmers according to different scholars. This section identifies the characteristics of large scale farmers in Rwanda. The size of land was main criterion to distinguish big from small farmers (cultivators) because a household is called large scale farmer when it has farmlands area of 3 hectares or more (Government of Rwanda - NISR, 2012). Recently, the NISR conducted a survey of large scale farmers with new criteria. Table 3-3 shows detailed criteria used to determine a large scale farmer during that survey.

Category of agricultural investments	Criterion per household	Observations
Crops	Size of land: ≥ 10 hectares	
Livestock	≥ 70 UGB	- 1 Cattle = 1 UGB - 5 goats/ships = 1UGB - 2 pigs = 1 UGB
Chicken	≥ 1500 chicken	
Beekeeping	≥ 50 hives	- Both traditional and modern

Table 3-3: Criteria of defining large scale farmers in Rwanda

Source: NISR (2013)

In addition to the size of land, this survey improves the criteria of large scale farmers by taking account also the size of herds including livestock, chicken and beekeeping.

3.6. Drivers of agricultural land investments in Rwanda

The section 3.1 explained that LTR programme alone cannot promote agricultural investments without being associated to other programmes. This section explains other drivers that should motivate farmers to invest more in agriculture.

The Government of Rwanda in collaboration with different stakeholders are applying numerous strategies to improve agricultural land investments. These strategies include access to finance (subsidies), integration of information, communication and technology (ICT) and capacity building for farmers and access to market (Republic of Rwanda, 2012).

3.6.1. Access to finance and granting subsidies to farmers

The financial capital is one of determinants of agricultural investments by large scale farmers. The government of Rwanda has a policy of facilitating investors in agricultural sector to access financial capital from banks and guaranteed funds (MINAGRI, 2009). The Government created the programme of agricultural loan guarantees (AGF) for private lending to agricultural domain such as production, processing and export activities. According to the report of MINAGRI (2009), the percentage of the guaranteed amount is decided after carrying out feasibility study including technical risk analyses. Then that amount is saved on a special account in the National Bank in order to insure loans given to farmers by private financial institutions (Banque Populaire du Rwanda, 2013; MINAGRI, 2009). Other funds have been established also to support women investors where a part of the credit is guaranteed by the National Bank of Rwanda and/or at low interest (Banque Populaire du Rwanda, 2013). The fund is used as guarantee in case they fail to pay back.

3.6.2. Role of information, communication and technologies in agricultural investments

Information, communication and technologies (ICT) consist of all tools used to collect, support, process, transmit and/or receive information (Asenso-Okyere et al., 2012). These tools are for example computers, internet, e-mails, telephone, radio, television, digital cameras that present information in different format like images, voice, text or figures. Asenso-Okyere et al. (2012) argue that ICT encourages a dissemination of knowledge and information and is creating incentive for agricultural investments in rural areas. The use of ICT allows the dissemination of market information in order to make agricultural investments more profitable. By using ICT large scale farmers can have self learning on farming practices, improve agricultural productivity and their livelihood (Asenso-Okyere et al., 2012; Republic of Rwanda, 2012).

People use the ICT multimedia to access to land information (Williamson et al., 2010). Thus land information system help farmers to get easy service when they need land documents to use in process of undertaking investments.

The recent increase of telephone usage in Rwanda has a positive effect on daily business of rural farmers who supply the production to town markets (Donner, 2006). The latter went far to explain that rural suppliers use their mobile phones to call and exchange text messages in order to stay in contact with markets. In the same line, the e-Soko (e-market), a project of Ministry of agriculture that facilitate also farmers to access local pricing information by mobile phones and/or internet and to make decision about when and where to supply their production (MINAGRI, 2010). Hence, the use of ICT helps farmers, especially large scale farmers to improve the efficiency and effectiveness of their agricultural investments by reducing travelling cost during market negotiations and by choosing the right price.

3.6.3. Access to market

Market is defined as formal or informal situation where seller and buyer meet with purpose of fixing prices at which commodities (goods and services) can be exchanged based on demand and supply (Smith, 2005). The latter argues that the variation of demand and supply function justifies how the market is balanced; more the demand is high more the sellers have incentive to supply. Rwanda as other developing countries has the problem of food insecurity due to low quantity of agricultural production to supply on market (MINAGRI, 2009). If farmers invest more in agricultural sector, they are sure to sell all their production, since the local demand is higher. Regarding the cash crops for export, like coffee and tea, the products are needed on international market and have generally fair prices motivate farmers to invest in (MINAGRI, 2009).

Furthermore, the programme of market-oriented rural infrastructure has been developed to provide infrastructures for handling, processing, selling agricultural production (MINAGRI, 2009). In the same program, efforts are also put into creating and improving existing transport infrastructures (roads, water and airlines) and construction of rural markets. Transport infrastructures facilitate farmers to easily access silos, local market, national or international market. All those factors added to access to finance, access to ICT, location of market place and price are main drivers of agricultural investments.

3.7. Conclusion

This chapter addressed the research question "What is the meaning of land titling, agricultural land investments and large scale farmers in the Rwandan context?" Before the new land policy established in Rwanda, land tenure system was under statutory law for urban and trading centres while rural land was under customary, but land was belonging to the State. The percentage of registered land was still insignificant and could not promote agricultural investments. To address this issue, the government of Rwanda started the countrywide programme of LTR in 2009 with the aim of providing tenure security of landowners and boosting land investments. Till May 2013, the Office in charge of the LTR has registered more than 1 million of parcels and issued about 50% of land certificates.

The statistics about Rwanda show that the agricultural sector in Rwanda is currently at a low level and hence needs to be improved. Occupying more than 60% of working age population, agriculture contributes less than 35% to GDP. This has prompted the government of Rwanda to gather all efforts, look all drivers that should help to promote agricultural investments. One of the instruments is the LTR.

Hence, the empirical evaluation should focus on the contribution of LTR to agricultural investments in Rwanda. The chapter 4 will explain the strategies of making this evaluation based on a case study.

4. DATA COLLECTION STRATEGY

4.1. Introduction

Given the definitions of land titling, land tenure security, agricultural investments and large scale farmers derived in chapter 2; given how these concepts are discussed in context of Rwanda with backing of statistics and documentation in chapter 3; the purpose of chapter 4 is to define the data collection strategies to evaluate empirically the concepts and related variables. The collected data are both quantitative and qualitative.

In order to zoom in the general concepts and overall questions, the approach of case study will be used. The advantage of a case study is the attachment on a real life situations and examination of views related to phenomena as they unpack in practice or to a very specific empirical case (Bent, 2006). The chapter starts by presentation of the case study, the variables and related indicators on which I will collect data. Those variables are including large scale farmers, access to credit, types and size of agricultural investments and relation between LTR and agricultural investments. Then the chapter presents methods and techniques of data collection and data analysis.

4.2. The case study of large scale farmers

In this research, the data were collected about large scale farmers who invest in the study area of Eastern Province of Rwanda. I visited large scale farmers in Buhabwa and Mbare cells, respectively in Kayonza and Nyagatare Districts. Since the LTR programme has been implemented in the study area, the target is to see if there is a general pattern where agricultural investments are related to this programme. The choice of Eastern Province as study area of this research was based on the number of large scale farmers relatively high. The Eastern Province is the first zone in Rwanda to have large farmers with 2.8% of all types of farmers while the national average is 1.9% (Government of Rwanda - NISR, 2012).

Figure 4-1 shows the location of case study of farmers who invest in Kayonza Districts (Buhabwa cell) and Nyagatare Districts (Mbare cell). The choice of two Districts in Eastern Province was based firstly on the location; the Districts must be in the former part of Akagera game lodge affected by land sharing in 2007-2009 and four Districts among seven are selected: Kirehe, Kayonza, Gatsibo and Ntagatare. The sampling of two cells located in two sectors of two Districts was done by random sampling method (Kumar, 2005). The choice of sector Murundi in Kayonza Districts and Karangazi in Nyagatare Districts was based on the map (figure 4-1). Since the map of cells was not complete, the random sampling method was used to select Buhabwa in Murundi sector and Mbare in Karangazi sector by using the list of administrative units published by RNRA. The random sampling method was used again to select farmers large scale farmers to interview. In this case, I selected farmers whose land is equal or more than 3 hectares using map digitized by RNRA during systematic land registration. The criterion of 3 hectares was used instead of 10 hectares because the new criteria applied by the Institute of Statistics in Rwanda were found in mid fieldwork. And the report was not yet published.

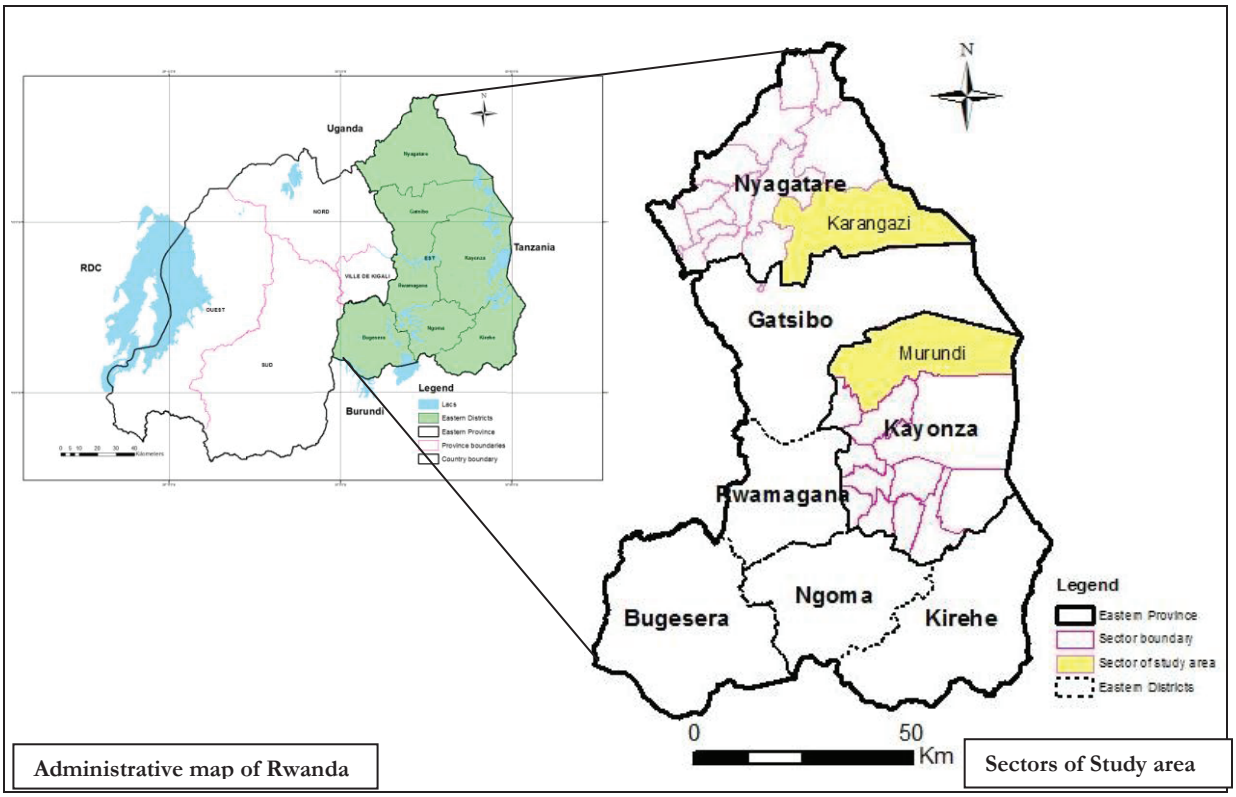

Figure 4-1: Administrative maps of research area

Source: (RNRA, 2013)

The process of sampling farms randomly started by exporting farms' attributes tables from ArcGIS to MS excel and make random sampling, then we joined tables of selected farms to tables of sampling frame in ArcGIS. The number of respondents, owners of sampled farms, in each cell was determined by the total number of large scale farmers of that cell. Figure 4-2 and 4-3 show the selected farms respectively in Buhabwa and Mbare cells.

Figure 4-2: Selected farms in Buhabwa cell

Source: (RNRA, 2013)

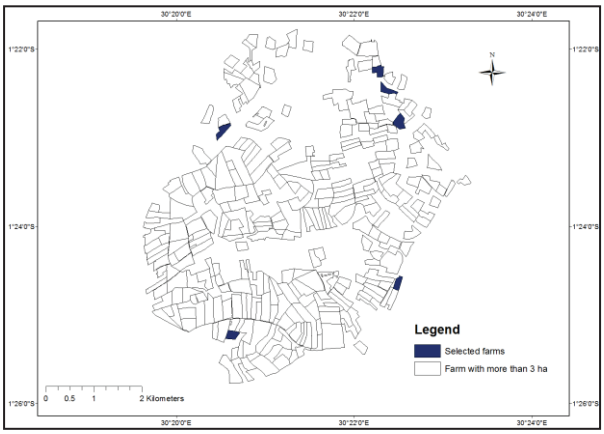

Figure 4-3: Selected farms in Mbare cell

Source: (RNRA, 2013)

4.3. Variables and related indicators

The section 4.1 lists variables on which I collected data for studying the case of investments of large scale farmers in Eastern Province. This section explains indicators of variable and why they are important to this research.

The first variable is "trend in number of large scale farmers". I gathered data about the number of farmers. The trend in number of large scale farmers indicates how they feel more attracted to invest in the agriculture sector after issuance of land documents.

Access to capital for agricultural investments is the second variable of this research. The survey question is about the source of financial capital to invest including credit from banks, government funds, donor aids, off-farm income and own saving. This indicator shows the level of incentive of large scale farmers. I collected data about facilities in the process of borrowing loans. Herein there are figures on registered mortgages by the Rwanda Development Board (RDB) and the trust of land title by banks. There is a question about challenges faced by large scale farmers and prevent their access to credit. The responses to the question show if those problems of access to credit are related to LTR or not.

The third variable of this research concerns to "types of agricultural investments". Data are collected about large scale farmers of the Eastern Province are interested in categories of agricultural investments which are crop growing and livestock. Then there are figures that show specific types of crops and livestock, types of capital goods, land improvement and land conservation. Land improvement and land conservation are daily activities which vary from farmer to farmer, according to financial capacity and willingness to do them. Land improvements activities consist in clearing and fencing farms while land conservation is related to techniques of terraces, dams and water pumps. Briefly, land improvement and land conservation imply investments (Ali et al., 2011). These data help to know if there is a change before and after LTR implementation.

The fourth variable is the "volume of agricultural investments". As indicators, I gathered firstly secondary data about money invested in agriculture in five Provinces of Rwanda from 2009 up to 2013 in order to make comparison and show the position of the study area. These data are from the project RIF 2, operating under the Ministry of Agriculture. The project has been created by the government of Rwanda with aim to provide incentive to banks and individual investors who are interested by agricultural sector (BDF, 2013). Second indicator is the monetary value of agricultural investments undertaken on each selected farm before and after LTR. Then the size of each farm is important to known because it helps in further analysis.

The fifth variable is "the relation between LTR and agricultural investments". Here two indicators, including the role played by LTR in investments and factors influencing investments are verified empirically through views of respondents.

The chapter 3 defined other factors that should influence large scale farmers to invest more in agriculture. Among those driving factors there are access to subsidies granted by Government, the use of ICT, access to market place, market price and availability of transport facilities. By comparison of all drivers that should have motivated farmers to invest, respondents were asked to choose the elements which gave more incentive to them. This comparison helps to study the last variable for the research "extent of contribution of implementation of LTR on agricultural investments".

4.4. Techniques of data collection

Given the variables and related indicators to observe, the next step is to determine the techniques used in the data collection process. Firstly the section makes an inventory of collected secondary data and related source. Secondly, it explains the techniques applied to collect primary data. These techniques include

structured interviews with selected large farmers, unstructured interviews with key informants and field observations (Kumar, 2005). Then the section shows the quality control of data and limitations of data collection.

4.4.1. Documentary review

To collect secondary data from government institutions, the technique of documentary review (Kumar, 2005) is relevant to some of research variables. I requested from the institutions to provide data about variables related to their daily activities. After receiving the requesting letter, every institution fixed an appointment according to their availability of professionals which may explain the data. Every time they provided a soft copy of the data. This method was used to collect data about the access to credit. The number of registered mortgages was provided by the Office of Registrar General under Rwanda Development Board (RDB). I also used this technique to get data about types and volume of investments made by large Rwandan farmers in general and in Districts of the study area. These statistics concern the disbursement by Districts from July 2009 to June 2013 done by Rural Investment Facility programme (RIF2) under Ministry of Agriculture. In addition, spatial data about farms in selected cells were provided by RNRA. The attributes of each farm are UPI number, administrative location and area.

4.4.2. Interviews

The interviews used in data collection consist in two types according to the kind of selected respondents. First, there are the interviews schedules also called structured interviews. They include list of closed and opened questions related to the variables about which data are collected from selected large farmers in two cells (appendix 1). Second, there are the unstructured interviews that include guiding questions for key informants (appendix 2).

The section 4.2 defined 34 and 6 selected farms in two cells, respectively Buhabwa and Mbare. The structured interviews were applied to collect quantitative data related to research variables and some of their indicators. The respondents answered question of specifying whether they started to invest before or after LTR. The response reveals the trend of number of large scale farmers. The respondents provide also information about facilities brought to them by LTR during access to credit, other sources of capital to invest if there was any, types of agricultural investments, estimated amount of money invested before and after LTR and the contribution of the LTR program to their investments. If respondents have not invested in land, I asked if they are intending to do it and what their rationale may be to invest or not. The structured interviews consist in closed and opened questions.

Based on experience and Rwandan practices, the interviews were not organised in group discussion or not collective because, according to my personal experience, Rwandans don't like to reveal their property value in public place. I organised individual and face to face interviews with selected farmers. On 40 predicted respondents, two of them missed to the appointment, I used the telephone to interview them. Each respondent has his/her own answer sheet where I recorded responses.

I organised also unstructured interviews by questions guidance with Key informants. The questions were open and related to indicators of research variables. The target was to get the views from administrative staff members and other stakeholders in agricultural investments. These interviewees include Project Analyst in Rwanda Development Bank (BRD), Agri-Commercial Officer in Banque Populaire du Rwanda, Commercial agent of DUTERIMBERE IMF, Professional in Charge of Land registration in the office of Deputy Registrar of land title in Eastern Province, Director of specific programmes in Eastern Province

of Rwanda and two leaders of cooperatives of farmers (cropping and livestock), Land Officer of Kayonza Districts. The key informants provided qualitative data related to the number of large scale farmers, source of capital to invest, types of agricultural investments and impact of LTR to agricultural investments in Eastern Province.

4.4.3. Field observations

Field observations are a technique I used to collect information about the case study. The target was initially to visit selected farms in order to get a better understanding on the types of agricultural investments of respondents. After visiting ten of them, the characteristics and types of investments on farms were the same. I observed also agricultural investments out the selected cells in order to have a general sight in the study area. Digital cameras were used to collect images of the types of investments.

In the morning of 3 October 2013, I was on the way from home to field and I was listening to the radio played by the taxi man. It was the time (at 6h40 am) of the Kinyarwanda news edition on Gicumbi Community radio. Spontaneously, I got report news about the situation of agribusiness in Rwanda and I recorded it.

4.4.4. Quality control

The use of multiple sources and different techniques above mentioned during data collection helped the researcher to examine and to compare results, then confirm the validity of research findings. The institutions, whose documentary reviews are useful for this research, provided to me soft copies as much as possible. Meanwhile unstructured interviews were recorded by an audio recorder in order to keep original responses.

4.4.5. Limitation of data collection

1) Accessibility to targeted data providers - Since some large scale farmers may not be inhabitants of selected case areas, if they live either in cities or far from their farms, it was crucial to make appointments in advance. The same issue was for getting data from Government officials, it took long time to wait with the risk of missing them. They often missed the appointments without communication of changes. Hence the distance between selected farmers and cities where I could get officials made the fieldwork very hard.
2) Technique of interviews – During three weeks of data collection, it was difficult to maintain the same quality of interactions with respondents especially for unstructured interviews. Hence, the quality of responses to the same question may vary significantly.

Nevertheless, after the fieldwork period, we have documents from government institutions, answer sheet from the interview schedule with 40 selected farmers, 6 audio recordings and two summaries of interviews with key informants, field notes, report news recorded from Gicumbi community radio and photos related to types of agricultural investments in Eastern Province.

4.5. Data analysis

The previous section defined the techniques of data collection and types of data collected during fieldwork period. This section shows how these data are processed. From documents issued by government institutions, I extracted secondary data related to LTR and agricultural investments in Eastern Province.

The audio records in Kinyarwanda were transcribed in English. During results presentation, the respondents' views are rephrased or narrated. A data entry was done for all responses from the interviews schedules using Microsoft Excel. To grasp the change on agricultural investments, the method of outcomes evaluation has been applied by "before and after design".

$$\triangle \mathbf{I} = \mathbf{I}_{t1} - \mathbf{I}_{t0}$$ (*Equation 4-1*)

Where

$\triangle$: *Change*

I : *Agricultural land investments*

$\mathbf{t_0}$: *Time before LTR (2008)*

$\mathbf{t_1}$: *Time after LTR (2013)*

The growth rate of a variable can also indicate the change of that variable (Parker, 2002). Therefore, the calculation of the percent of growth rate of agricultural investments from 2008 up to 2013 applies the following formula:

$$PR = \frac{\frac{(Vpresent - Vpast)\,x\,100}{Vpast}}{N}$$ (*Equation 4-2*)

Where PR : *Percent Rate*

V Present : *Present Value*

V Past : *Past Value*

N : *Number of years*

SPSS is used also to make statistical analysis of the data. Field (2009)states that the dependent t-test, also called paired samples t-test, helps to calculate the sampling distribution of the differences between scores using the following equation:

$$t = \frac{\bar{D} - \mu_D}{s_D/\sqrt{N}}$$ (*Equation 4-3*)

t : *Test statistic*

$\bar{D}$: *Difference of the mean between samples*

μ_D : *Difference expected between population means*

$s_D/\sqrt{N}$: *Standard error of the two differences*

Then ArcGIS software is used to compare the patterns of agricultural investments before and after LTR in Buhabwa and Mbare cells. The process starts by joining the table of value of investments - collected from respondents- to spatial data. I calculated the volume of investments per size of land, and then displayed the results in classes.

4.6. Conclusion

This chapter deals with the research strategy. The subsequent sections of this chapter address the choice of case study of investments of large scale farmers in Eastern Province, types of variables and related indicators, techniques used to collect those data, data analysis and expected outcomes as summarised in table 4-1.

Variables	Indicators	Data source	Techniques of data collection	Methods of data analysis	Expected outcomes
Trend of large scale farmers	Number of farmers before and after LTR	Views and opinions of key informants; Views of farmers/respondents	Unstructured interviews; Structured interviews	Rephrase and narrate responses; Count of responses frequency	Reasons of variation (increase or decrease)of large scale farmers in study area; Quantitative data proving the variation
Access to capital	Source of capital to invest	Views and opinions of key informants; Views of farmers/respondents	Unstructured interviews; Structured interviews	Rephrase and narrate responses; Count of responses frequency	Text of views and a histogram showing sources of capital in the study area
	Facilities of LTR / Registered mortgages	Views and opinions of respondents; Report from RDB	Unstructured interviews; Collection of report about financial support to farmers	Rephrase and narrate responses; Synthesis of report	Novelty brought by LTR in the process of borrowing money from banks; Histogram of secured transaction
	Challenges faced by farmers in borrowing loans	Views and opinions of respondents;	Unstructured interviews	Rephrase and narrate responses;	A list of challenges in the study area
Types of agricultural investments	Categories of agricultural investments	Views of respondents;	Structured interviews	Tabulation of responses	Main categories of agricultural investments in the study area by category
	Types of crops and livestock	Views and opinions of respondents; Rapports Field observations	Structured interviews Collection of report from MINAGRI Visits and of photos investments Unstructured interview	Tabulation of responses Synthesis of agricultural projects Description of investments photos	A list of crops and livestock activities in the study area

Table 4-1: Summary of the research strategy

Variables	Indicators	Data source	Techniques of data collection	Methods of data analysis	Expected outcomes
	Types of capital goods	Views and opinions of respondents; Field observations	Structured interviews Unstructured interview Visits and of photos investments	Count of responses Description of investments photos	List and description of capital goods in the study area by category
	Types of land improvement and land conservation (soil quality)	Views and opinions of respondents; Field observations	Structured interviews Field notes Visits and of photos investments	Count of responses Description of improvements	List of land improvements, land conservation activities in Eastern Province
Volume of agricultural investments	Level of agricultural investments	Reports on monetary value invested	Collection of reports	Comparison of figures	Position in research area
	Monetary value of farmers' investments	Views of respondents	Structured interviews	Tabulation of responses/ Quantitative data Annual growth rate	Investments of each respondent before and after LTR implementation Change in agricultural investments
	Size of farms	Spatial data on land registration	Request access permission from RNRA	Selection of farms whose owners are respondents Calculation of investments per size of land with Arc GIS	List of selected farms and related spatial data Maps of volume of investments per size
Contribution brought by LTR to agricultural investments	The role played by LTR in agricultural investments	Views of respondents	Structured interviews	Count of views frequency	Level of consensus on the role of LTR in agricultural investments
	Factors of agricultural investments	Views of respondents	Structured interviews	Count of views frequency	Listing (pie chart) factors of investments, according to their influence

Table 4-1: Summary of the research strategy (continued)

5. PRESENTATION OF RESULTS

5.1. Introduction

The chapter 4 addresses the types of data and the techniques used to collect them. Chapter 5 presents plain results of data collection. Guided by table 4-1 of the research strategy summary, this chapter compiles basic statistics from structured interviews with respondents and documents collected from government institutions. The statistics are represented by tables, chats, including histograms and pie charts. These statistics are supplemented by sequent texts from key informants' interviews and photos taken during fieldwork. The section 5.2 shows the views of the interviewees on the trend in large scale farmers' number and responses of respondents on their starting time of investments. The section 5.3 provides the results of access to capital for agricultural investments before and after LTR. The section 5.4 and 5.5 describe respectively the types and volume of agricultural investments before and after LTR. The section 5.6 indicates the statistics about the opinion of farmers on the role of LTR in their investments and the contribution extent of LTR among other drivers of agricultural investments. Then the chapter ends with a concluding section.

5.2. Trend in number of large scale farmers from 2008

This section presents the views of key informants on the variation of large scale farmers' number since 2008. It also gives the number of respondents according to the time they started to invest.

From 40 selected respondents, 22 have got farms before 2008 while 18 respondents are new owners who got land in the last 5 years with the intention to invest. In addition, among those 40 respondents only 21 have invested before 2008 but 13 respondents are new farmers that started to invest after the implementation of LTR programme and 6 respondents did not invest. All respondents are local farmers.

In order to observe the variable of trend in large scale farmers' number before and after LTR, the research asked key informants why the number of farmers in the region has been changed. Although none of eight interviewed people did not have numbers to support their statements, they testified that the number of large scale farmers has increased significantly in the last 5 years. According to respondents, there are reasons the number of large scale farmers has increased. First, the Eastern Province has many potentialities in livestock and cropping because land is still virgin and farmers can get large areas for their activities. The second reason is that land certificate issuance has motivated farmers to buy land in order to enlarge their farms. The third reason, the key informants argue that many farmers in the Eastern Province are either joining existing agricultural cooperatives or creating new cooperatives since members have more facilities of working with lenders and get easily capital to invest.

Interviewed staff members can provide indicators of the variation of farmers' number during their daily activities. On the side of banks the key informants from "Banque Populaire du Rwanda" and "Duterimbere Micro Finance Institution (IMF)", the number of agricultural projects received by their institutions can justify the trend of number. One of them says:
"*Actually, the big number of people who are working with Popular Bank of Rwanda have small businesses, but those who have big business are still less unless when there are in cooperatives. In cooperatives they can present big project for land consolidation or buying agriculture inputs. But individual big projects are still few. In general, during last seven years I was working in a bank, I recognized that the number of farmers financed by our bank is highly increased due to the department in charge of farming and growing that we have created*".

On the other side of administrative authorities, the professional from the office of the Deputy Registrar in Eastern Province says that today they receive many requests asking to correct land certificates before registering a mortgage. These requests are addressed to the Deputy Registrar when RDB only finds some errors. For him these excessive requests justify the increasing number of clients - including large farmers – who attempt to borrow money from banks.

5.3. Access to capital for agricultural investments before and after LTR

The chapter 4 indicates the access to capital for agricultural investments as a variable to observe. This section presents results from data collected on the indicators of this variable, including the source of capital, facilities during the process of getting loans and challenges faced by farmers in the process.

5.3.1. The sources of financial investments in agriculture

The source of capital to invest in agriculture indicates how large scale farmers acquire funds to invest. This subsection presents the statistical results from the structured interviews with respondents. It shows also the view of the Minister of Agriculture on the source of capital for agribusiness. It ends with an explanation about the support provided by the ministry of agriculture.

Five main sources of capital used to invest have been inventoried and ranked as illustrated by Figure 5-1: banks, government funds, donors' aid, off-farm income and own saving. Large scale farmers negotiate either with local micro finance institutions and/or commercial banks. The Government funds are budgeted and deposited in National Bank as a guarantee. The donors are not government institutions, but they consist of farmers' relatives working outside the region or non government organizations. Donors' aid, off farm income and own saving get used in combination with loans or support from guarantee fund. Figure 5-1 shows that most of the respondents, 22 out of 40 used own saving to invest in agriculture.

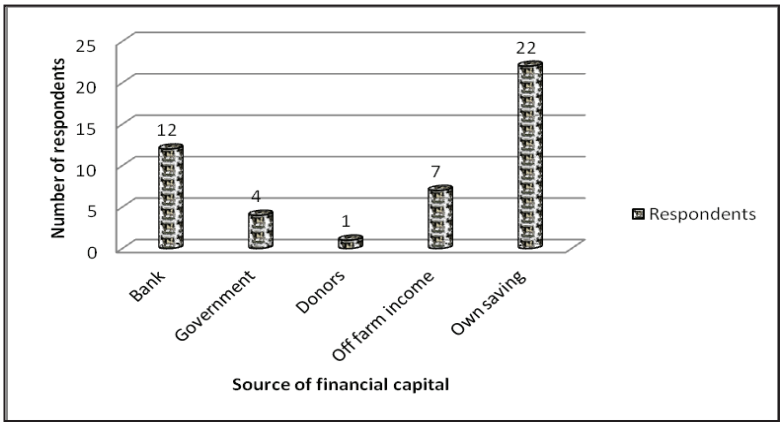

Figure 5-1: Source of capital used in agricultural investments.

This is in accordance to the Ministry of Agriculture statement during her interview of 3rd October 2013 on Gicumbi community radio: "*It is not easy for farmers to have to account enough money to invest in agribusiness. They need collaboration with banks, which grant loans to them*". Thus, the Ministry of Agriculture supports large scale farmers through its programme of Rural Investment Facilities (RIF 2) collaborating with the guarantee fund and banks to support agricultural projects. Statistics aquaried from MINAGRI show that RIF 2 grants 25% of the loan when borrowers do not have sufficient mortgages to cover the whole risk of the participation promised by banks.

5.3.2. Facilities of LTR in the process of borrowing loans from banks

The question about facilities brought about LTR from the situation before was responded as follows: Most of the respondents started by explaining that the procedures of accessing to land title, accessing and/or granting credit were very difficult. Then they ended describing the advantages of the LTR when wanting to borrow money.

The land administrators from Districts and province levels say that before the implementation of LTR there was little land registered formally with titles especially in rural areas. Even if large scale farmers were able to apply for sporadic land registration and then get land titles to use in business, the process was long, the number of qualified surveyors was not enough for serving all demands on time and the cost was high. In addition to that, they say that farmers were not informed if rural land could be registered. These difficulties discouraged farmers to apply for land titles. Hence it had a negative impact on farmers' investments because banks have always required the proof of land right.

Furthermore, these land administrators say that LTR is the special programme which grants tenure security through the systematic land registration. At the beginning of LTR implementation, all land holders were aware of this activity. The Government financed the programme and mobilised many grass root surveyors and local authorities for implementation. Then the costs were more affordable for land owners than before LTR. The respondents say that land titles are now available to owners.

In the interviews, staff members from banks mentioned that before the implementation of LTR there was a burden carried also by banks. The banks used to visit their clients and check if the land was really owned by these clients. One of them states:
"B*efore LTR implementation banks used to ask only proof of investments on land and the documents were signed by local authorities from village, cell and sector. It was a long process and the bank was sometimes reluctant of granting loans without hundred percent of certitude. Despite the documents were approved by sector authorities, the trust was less because people with bad faith should show the property that does not belong to them. The land owners could also cheat banks by presenting wrong land boundaries*." Also in some cases bad clients do use the same proof of ownership many times to different banks because the system of mortgage registration was still manual but today LTR has contributed to limit cases. Another staff member from the bank says:
"*Now the process is very clear when clients present the land registration proof with UPI number, we are no longer confused, we know the exact land location, the size, neighbours and they can even estimate the value of land before doing a land valuation. Then we trust it and make registration of mortgage to RDB that checks also the reliability of land documents*."

Although at the Office of Registrar General under RDB, they could not find specific information related to agricultural investments in Eastern Province, they gave me the table of all secured transactions from 2010. Figure 5-2 shows the evolution of registered mortgages and movable collaterals during the last four years. The registration of mortgages increased from 4859 in 2010 when the Office of Registrar General undertook these attributions under RDB to 12,321 in 2012. Projection in the last quarter of 2013 shows that the whole year of 2013 will have 13,041 registered mortgages. Figure 5-2 shows that in the last four years the number of registered mortgages increased more than the number of movable collaterals.

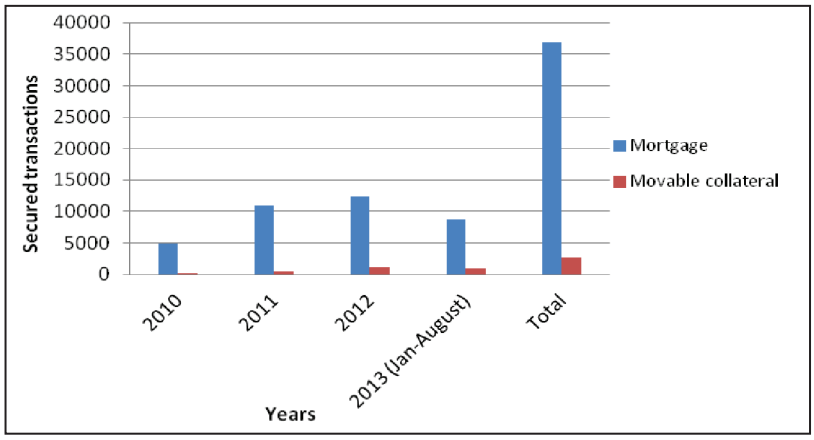

Figure 5-2: Evolution of secured transactions registration from 2010
(Source: RDB, Office of Registrar General)

According to the structured interviews with respondents from Buhabwa and Mbare cells, on 12 farmers who borrowed money from banks, all of them used land certificates to mortgage the land.

5.3.3. Challenges of borrowing loans from banks

To answer the research question about the challenges faced by farmers in the process of borrowing money. Most challenges found in our research area are:

1) **Lack of enough knowledge** to elaborate and/or manage agricultural projects. The challenge of insufficient knowledge is confirmed by Minister of agriculture in the interview with Gicumbi Community Radio. She says that investors in agribusinesses need to elaborate good projects, nice project ideas and explain how they will generate income.
2) **Land scarcity:** In the same reportage, the people interviewed by the journalist are from Gicumbi Districts in Northern Province. They do not have enough land for agricultural production. This should not worry large scale farmers.
3) **Weather uncertainty:** in addition to land scarcity, climate change and weather vulnerability impede the farmers' decision of investing in agriculture.
4) **Delay in getting a land certificate** is also a problem for some farmers as stated by one of the respondents

Other challenges are also mentioned by key informants such as:

5) **Instability of the price and/or quantity of farming products:** Farmers of Eastern Province are often experiencing a long dry season while in raining season, they get a lot of quantity of milk and there is a surplus on the market. Hence, they are scared to borrow money for investments because they do not have measures to mitigate those challenges.
6) **Saving traditions**: bank staffs declare that sometimes farmers have bankable projects, but they don't have the habit of using the banking system or they don't fulfil the condition of saving on their account, which is at least 20% of the total value of the project.

5.4. Types of agricultural investment in large scale farming of Buhabwa and Mbare cells before and after Land Tenure Regularization program

This section presents the results from primary and secondary data and field observations based on indicators of types of agricultural investments shown in table 4-1 under chapter 4. The indicators are categories of agricultural investments, types of crops and livestock, types of capital goods and types of land improvement and land conservation.

5.4.1. Categories of agricultural investments

During the interviews with selected farmers, a question related to their types of agricultural investments was addressed to them. Table 5-1 summarises the responses given by 34 farmers who have already activities on land. The table shows two main categories including crop growing and livestock, but 21 respondents are mixing both domains.

Category	No investments	Cropping	Livestock	Both	Total
Respondents	6	2	11	21	40
%	15.0	5.0	27.5	52.5	100

Table 5-1: Main categories of agricultural investments

In the interview with land administrator, he explains why livestock is a dominant activity in the study area: "*Before 1994, the region was virgin; after genocide land was distributed to returnees who had a lot of cattle. Cattle keepers used to move from area to area and they could use farms that do not belong to them because they are pastoralists. … In livestock you can move continuously from farm to farm and coming back looking for a nice savannah pasture*".

5.4.2. Specific types of crops and livestock

The results about specific types of investments, extracted from secondary, primary data and field observations, show that there is a tremendous variety of activities dominated by livestock. The report of Rural Investment Facility programme (RIF2) on support of agricultural projects in Rwanda from 2009 gives the view on types of agricultural investments in Eastern Province. Figure 5-3 below shows that among 788 agricultural projects supported by RIF2 first five are related to livestock, maize, bananas, chicken and coffee. These projects consist in farming or transformation of production the respondents were asked to list the types of cropping and/or livestock before and LTR.

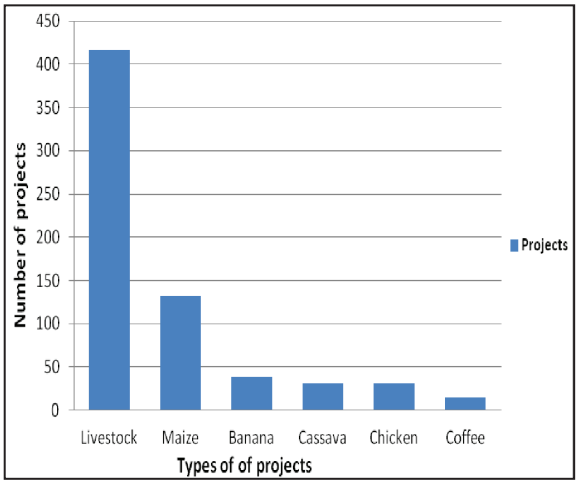

Figure 5-3: Top five agricultural projects funded by RIF 2 in Eastern Province
(Source: MINAGRI)

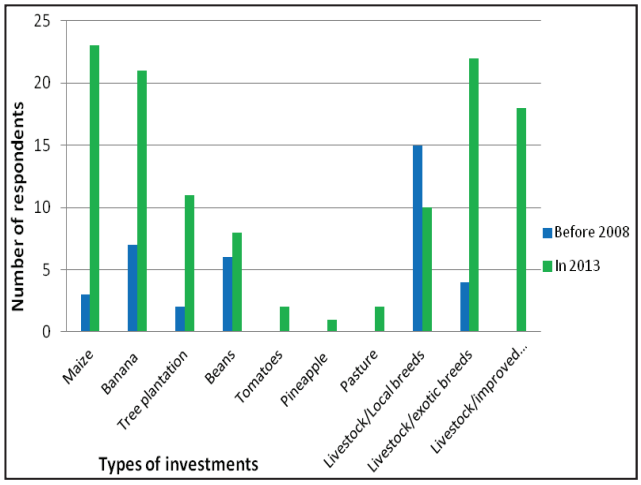

Figure 5-4: Types of crops and livestock investments by farmers before and after LTR
(Source: Author's survey)

Figure 5-4 above shows the comparison of crops and livestock investments undertaken by interviewed farmers since 2008. In the last 5 years, the number of farmers who grow maize has increased seven times, three times for banana plantation, five times for tree plantation and a little bit for beans. Tomatoes and pineapples are new crops adopted by these farmers. On 19 farmers who invested in livestock before LTR,

15 (79%) of them had local breeds of cows and only 4 (21%) had exotic breeds. The activity of crossing local and exotic breeds is also emerging for interviewed farmers after LTR. Among those farmers, one has goats of local breeds.

Figure 5-5: The Photos of banana and cattle investments in Buhabwa cell

Through field observations, we noticed that the study area holds different types of cropping and livestock. For example, one of visited farmer has invested in banana (figure 5-5: left photo). I visited also cornfields and beans plantation. Apart from the types of cropping hold by selected farmers, I observed other plantations of rice, cassava, and soybeans. Concerning the livestock, figure 5-5 (right photo) shows the cattle of visited farmer who has local breed and improved (crossing) breed. The local breeds are the cows with long horns while the improved breeds are cattle without horns. The pasture was still young.

During the interview with staff from the office of the Deputy Registrar in Eastern Province, he explained why farmers practice both livestock and cropping while the land use plan accepts only one type of use on one parcel. The RNRA is aware that the Ministry of agriculture in collaboration with the Ministry of natural resources, which has land in its attributions have given instructions to cattle farmers of taking a small part of the land for accessory uses. They can grow plants related to the livestock activity like a pasture, maize for cattle or sweet potatoes for pigs. In case the main land use is livestock and the farmer has not any other land for cropping, he/she is allowed also to use not more than 2 hectares. Otherwise, they apply for land use change to the Office of Registrar.

5.4.3. Types of capital goods

This subsection presents the results about the adoption of machinery in the daily activities of large scale farmers and the transport of harvest. The question addressed to respondents was about the choice of capital goods used by those farmers. Figure 5-6 below shows that none of 40 respondents, on that question, did used neither an animal for traction nor a tractor nor other machine in daily activities.

In the interview with the president of a farmers' cooperative in Nyagatare, he says that most of inhabitants of Eastern Province have pastoralist habits. They do not have machinery to use. When the cultivation season comes; they hire many daily workers who are less efficient. According to his point of view, the Government has to put more effort on agricultural technology development in the region so that they relieve the problem of insufficient workers.

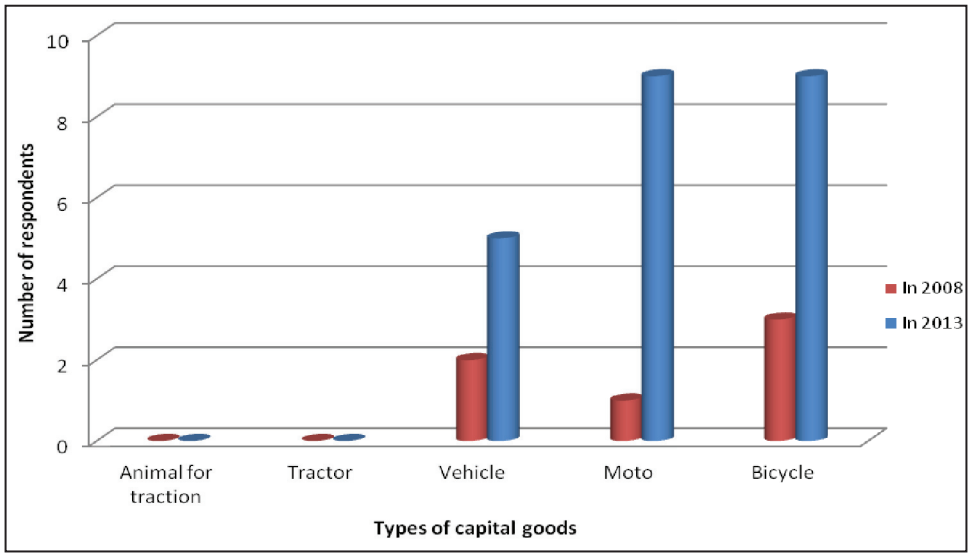

Figure 5-6: Capital goods investments before and after LTR

In contrast, the respondents claim to have invested in transport means as other types of investments which facilitate them to make regular monitoring of their farms and transport of harvest. Figure 5-6 shows that the number of respondents who bought cars increased from two in 2008 to five in 2013, from one motorcycle in 2008 to nine in 2013 and from three bicycles before LTR to nine bicycles in 2013.

The president of the farmers' cooperative in Nyagatare stated that the transport equipment is not exclusively for agricultural purposes, but that it can also be used for other businesses. For example, figure 5-7 displays a photo where the owner of this motorcycle wears a reflective vest, indicating that he belongs to cooperative bikers, indicating this alternative use. After the transport of milk, the motorcycle is used to transport passengers.

Figure 5-7: Transport of milk by motorcycle in Nyagatare Districts.

5.4.4. Types of land improvement and land conservation

As explained in chapter 4 (section 4.3), land improvement and land conservation are types of investments. This subsection gives applied techniques of land improvement and land conservation in our study area. In

addition to those techniques, the subsection presents the description of these investments types from my observations in the study area.

Table 5-2 shows that the number of respondents that have cleared and fenced their farms before LTR has doubled in five years ago. There are 12 (30%) respondents whose farms contain small dams. However, respondents who invested in land conservation like terraces and water pump for providing water to cattle or irrigation are still under 5%. Among 40 respondents, two have protected the land by terraces. These respondents say that they do not create benches inside grazing land to prevent cattle accidents.

Respondents by Period	Clearing the farm	Fencing	Terraces	Dam	Water pump
Farmers before LTR (2008)	15	17	0	2	0
Farmers before LTR (%)	37.5	42.5	0	5	0
Farmers after LTR (2013)	32	33	2	12	1
Farmers after LTR (%)	80	82.5	5	30	2.5

Table 5-2: Land improvement and land conservation before and after LTR

During fieldwork, I observed how the owners make clear, fence their farms and protect land against erosion. Most of the farms I visited are fenced by Euphorbia hedges tied by barbed wire. The activity of clearing a farm concerns to cut bushes, but some trees remain inside with the purpose of creating shadow to cattle in dry season. In the interview with an Eastern Province officer, he mentioned that clearing and fencing become the priorities of Districts in their performance contracts signed every year with the President of Republic. Performance contracts are signed also with citizen, including large farmers. In order to achieve their targets, Districts always monitor farmers' activities and require them to fulfil signed contracts. The fencing and clearing activities facilitate the management of farms, reduce boundary conflicts between farmers and install the type of paddock grazing against. Terraces are developed on cultivable land where farmers grow crops. Out of cells of study, there are big projects of soil protection against erosion by terraces undertaken by the Government of Rwanda. For example, there are terraces in Rukara sectors near the main road Karubamba-Murundi.

Table 5-3 indicates the responses provided by respondents about the level of land quality.

Land quality	No responses	Low improved	Improved	Very highly improved	Total
Respondents	6	7	10	17	40
%	15.0	17.5	25	42.5	100

Table 5-3: Appreciation of current quality soil by farmers

Among 40 respondents, 17 of them agree about their land fertility because they attest that it is very high improved, 10 respondents say that their land is improved while 11 respondents say that the land of their farms is not suitable for agricultural investments. Number of respondents whose land quality has worsened includes farmers that did not invest in their land.

5.5. Volume of agricultural land investments before and after LTR

The section 5.4 defines the types of agricultural investments in Eastern Province. The following section 5.5 continues with the size of these investments. The section starts with the contribution of RIF2 project in Eastern Province then the estimation of the monetary value of surveyed farms and related investments.

5.5.1. Contribution of Rural Investments Facility (RIF2) project to agricultural investments

The subsection 5.3.1 defined RIF 2 as one of sources of agricultural investment capital, where the project supports till 25% of the loan granted to borrower. This subsection presents the amount of capital investments in the study area from 2009 up to June 2013. The project has granted a total of 2,545,095,900 Frw which means that the amount of 11,880,056,177 Frw has been delivered for agricultural investments. The largest portion of this loan 10,810,730,678 Frw (90%) has been invested in primary agriculture production while 10% is used in agriculture processing and support services.

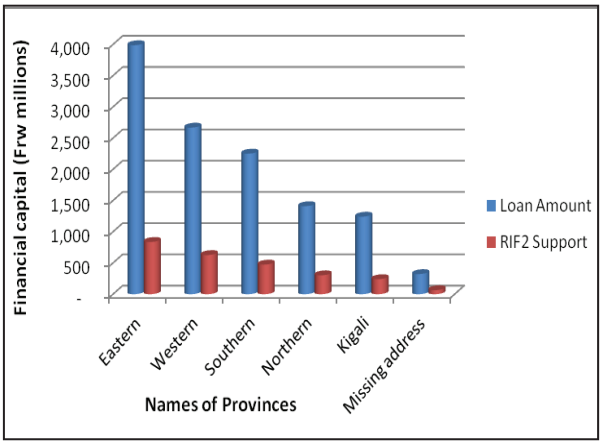

Figure 5-8: RIF2 disbursement by Province from July 2009 to June 2013
(Source: MINAGRI)

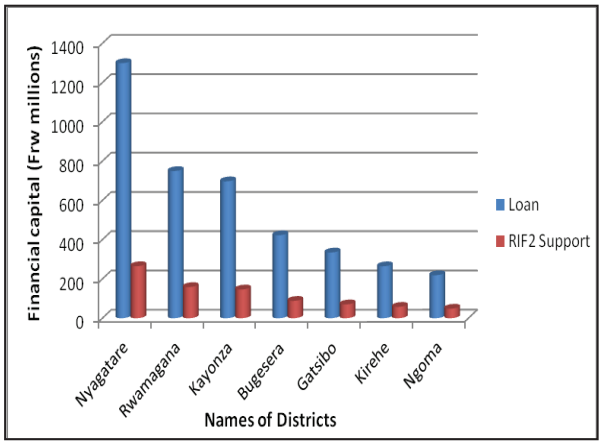

Figure 5-9: RIF2 disbursement by Districts in Eastern Province from July 2009 - June 2013
(Source: MINAGRI)

The statistics from the project RIF2 show the level of contribution on agricultural investments in the study area, compared to other zones. The disbursement by provinces (figure 5-8) during the last four years shows that the Eastern Province takes the first place in Rwanda to benefit the from the programme while the disbursement of the project in 7 Districts of Eastern Province (figure 5-9) shows that Nyagatare and Kayonza are respectively on first and third position.

5.5.2. Monetary value of agricultural investments and size of surveyed farms

The section 5.2 indicates that 34 respondents out of 40 have undertaken agricultural investments in both cells while other 6 did not invest. These investors include 21 farmers whose activities stated before 2008 and 13 farmers who started after the LTR programme. Now this subsection shows the monetary value of these investments and the size of each selected farm.

Table 5-4 presents the investments of 40 respondents in Buhabwa and Mbare cells. The table shows the parcel ID, the area, the value of investments in 2008 before LTR implementation and current value of investments for each respondent. Then table 5-4 presents the mean, median, minima and maxima in each cell. Each respondent calculated the value of his/her agricultural investments, including improvements on

land. Since it was not easy for them to calculate the added value of improved farms, the value of land is also included in the total value of investments. In 2008 the respondent 15 was the first with 35 million Rwandan franc invested on 31.45 ha, but in 2013 the respondent 39 becomes the first with 62 million Rwandan franc invested on 17.71 ha. Apart from respondents who did not invest, all others have increased the value of investments. Special case is the respondent 29 whose investments value is 800,000 Frw. Recently he rented the farm whose owner is not around. In the contract signed between two parties, the respondent 29 is allowed to mortgage the farm. He started to borrow credit from bank, meanwhile he is improving land and setting up cattle shade. In addition to the monetary value of investments, table 5-4 indicates also the size of land for each respondent. These statistics show that the size of farm in Mbare has an average of 4.12 ha while the average size of farm in Buhabwa cell which is 11.01 ha.

Cell	N/ Respondent	Parcel ID	Area (ha)	Investments in 2008 before LTR	Investments in October 2013
Buhabwa	Respondent 1		7.14	15,000	25,000
	Respondent 2		19.85	13,000	21,000
	Respondent 3		33.39	0	9,500
	Respondent 4	2338	4.42	0	12,500
	Respondent 5	2004	20.95	10,000	22,000
	Respondent 6	2012	20.68	20,000	38,000
	Respondent 7	2348	3.7	0	7,600
	Respondent 8	1292	18.27	8,000	10,000
	Respondent 9	1300	7.33	11,000	16,000
	Respondent 10	3055	6.54	0	0
	Respondent 11	3044	5.51	0	0
	Respondent 12	3134	3.98	0	5,500
	Respondent 13	3273	11.6	15,000	35,000
	Respondent 14	3350	6.62	0	0
	Respondent 15	3351	31.45	35,000	45,000
	Respondent 16	1232	7.62	0	6,000
	Respondent 17	956	8.07	29,000	45,000
	Respondent 18	1003	14.69	0	14,500
	Respondent 19	1037	6.31	0	16,000
	Respondent 20	1048	3.75	0	0
	Respondent 21	1140	21.33	30,000	40,000
	Respondent 22	1146	4.17	0	0
	Respondent 23	1163	4.44	0	16,000
	Respondent 24	1540	8.07	16,500	25,000
	Respondent 25	1545	12.73	0	40,000
	Respondent 26	115	4.35	0	0
	Respondent 27	1239	5.71	12,500	21,000
	Respondent 28	142	10.95	18,000	36,500
	Respondent 29	153	8.37	0	800
	Respondent 30	174	9.55	0	18,000
	Respondent 31	292	7.67	12,000	18,500
	Respondent 32	355	12.35	22,000	31,000
	Respondent 39	506	17.71	30,000	62,000
	Respondent 40	574	5.03	0	7,000
	Mean		**11.01**	**8,735**	**18,953**
	Median		**7.87**	**-**	**16,000**
	Min		**3.7**	**0**	**0**
	Max		**33.39**	**35,000**	**62,000**
Mbare	Respondent 33	11	4.17	12,000	18,000
	Respondent 34	1286	3.99	0	15,000
	Respondent 35	1115	4.31	7,000	11,000
	Respondent 36	2443	5.29	16,000	24,500
	Respondent 37	2448	3.68	12,000	17,000
	Respondent 38	2854	3.27	0	10,000
	Mean		**4.12**	**7,833**	**15,917**
	Median		**4.08**	**9,500**	**16,000**
	Min		**3.27**	**0**	**18,000**
	Max		**5.29**	**16,000**	**24,500**

Table 5-4: Size of farms and related value of agricultural investments (value in Frw "000"),

5.6. Respondents' views on contribution brought by LTR program on agricultural investments

The extent of contribution brought by LTR to agricultural investments is the last variable shown in table 4-1 of the research strategy summary. The indicator of this variable is the incentive of investment drivers

to farmers. The section starts by presenting opinions of respondents about the change brought by LTR. Then the section indicates the contribution of LTR compared to other drivers of agricultural investments.

In structured interviews, there was a question related to the role played by LTR to facilitate change on investments. Respondents mentioned whether they are full agree, agree or not agree. Table 5-5 shows the frequency of respondents' perception on this role of LTR.

Responses	Frequency of perception	Percentage (%)
Full agree with the famous role played by LTR to facilitate the change of agricultural investments.	28	70
Moderately agree with the role played by LTR to facilitate agricultural investments	6	15
Not agree with the role played by LTR to facilitate agricultural investments	3	7.5
No answer	3	7.5
Total	**40**	**100**

Table 5-5: Frequencies of respondents' perceptions about change brought by LTR on agricultural investments

Table 5-5 shows two main groups of respondents according to their opinions. One group agrees with the role played by LTR to facilitate agricultural investments, but 3 respondents deny the facilities of LTR in investments. There are also 3 respondents who did not provide answers to the question.

Again, respondents were asked to choose on the list factors influencing investments what has motivated them more to start their activities. These factors include access to transport infrastructures, location of market place compared to the distance from farms, market price of agricultural production, access to ICT and access to guaranteed funds from Government. The pie chart (figure 5-10) makes a comparison of LTR with these factors of agricultural investments. There are 12 respondents (30%) have been motivated more by LTR to invest in agriculture, 7 respondents (17%) got incentive after being aware of guaranteed funds that support farmers who do not have enough assets to mortgage. But the percentage of 15% of any motivation is derived from 6 farmers who did not answer to the question.

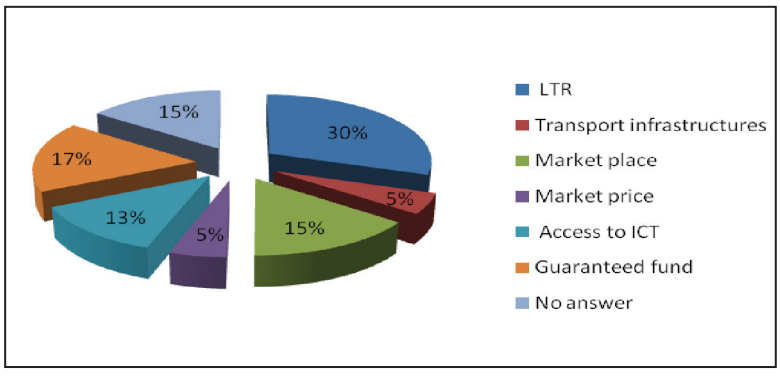

Figure 5-10: Drivers of agricultural investments in Buhabwa and Mbare cells

During unstructured interviews, 2 key informants highlighted the socioeconomic status of large land owners as a factor of agricultural investments. They say that there large farms hold by civil servants or

other elites whose primary activity is not agriculture. They often practice livestock as a hobby because they still have pastoralist culture. Hence, they do not get expected income.

5.7. Conclusion

This chapter addressed the sub objective of this research which aims *to determine the changes in types and volume of agricultural investments of large scale farmers*. In fact the chapter provided results from empirical data collected about 4 research questions of this second sub objective. Then this section presents the summary of research findings.

The first research question of second sub objective is; "What are the trends of number of large scale farmers after LTR implementation?" The results show that the number of large scale farmers in the Eastern Province is increasing (section 5.2). As indicators of this raise, the number of agricultural investors that present large projects to banks is increasing; the requests received by the Office of Deputy Registrar when RDB oblige correction of errors is high and among respondents, they are new farmers who started after LTR.

The second research question is; "How do large scale farmers access capital for land investments before and after LTR? The sources of agricultural investments in the Eastern Province are banks, government funds, donors' aids, off-farm income and own saving. The testimony of our respondents affirms that after LTR the procedures of accessing or granting credit are easier for clients and for banks than before the programme (subsection 5.3.2). The secondary data from the Office of Registrar General of mortgages show that the number of landowners who are using land as collateral increasing since 2010. Large scale farmers in eastern province still have challenges that hamper their investments. These challenges are related to insufficient knowledge to elaborate and manage projects, climate change and weather vulnerability.

The third research question is; "What types of agricultural land investments have large scale farmers invested in before and after LTR?" In Eastern Province they are two main categories of agricultural investments including livestock and cropping. On one hand the livestock consists in cattle and goats. On the other hand the crops are maize, banana, beans, tomatoes, pineapples, rice, and soya beans. They have also tree plantation. Capital investments, land improvement and soil conservation are other types of agricultural investments, but they are associated either with livestock or cultivation. The capital good of selected farmers is characterised by lack of machinery, but some respondents possess transport means like cars, motorbikes and bicycles. With regards to land improvements most of the respondents have fenced and cleared their farms, but the techniques of land conservation are applied by fewer respondents. In contrast, more than 70% of respondents assert that their farms soil is improved.

The fourth research is; "How much financial capital have large scale farmers invested in agriculture before and after LTR?" The data provided by the Ministry of agriculture show that the Eastern Province is the first to benefit the support from RIF 2 while Nyagatare and Kayonza Districts of this Province are respectively the first and third to have more agricultural investments financed by the project (section 5.5). According to the monetary value of agricultural investments, the figures show that respondents increased the size of investments in both cells Mbare and Buhabwa (table 5-3).

Most of selected farmers in Buhabwa and Mbare cells 34 respondents out of 40 at least moderately agree with the facilities brought by LTR to change their investments (section 5.6). The relation between agricultural investments and variables of LTR, transport infrastructures, location of market, market price,

guaranteed funds and access to ICT shows that LTR is the first factor to give incentive to respondents during their investments decision.

Therefore, the chapter 6 uses the results above presented for finding out the relation between agricultural investments.

6. EFFECTS OF LTR ON INVESTMENTS OF LARGE SCALE FARMERS IN EASTERN PROVINCE OF RWANDA

6.1. Introduction

Based on the results presented in chapter 5, the purpose of chapter 6 is to answer the research question about whether there is a plausible relation between the LTR characteristics and agricultural investments. The chapter 6 reflects again on the concepts defined in chapter 2, the genesis and the implementation of LTR programme both explained in the chapter 3. The section 6.2 provides interpretation of respondents' views on the trend in a number of large scale farmers. The section relates the trend of large farmers to the agricultural sector in Rwanda. The section 6.3 explains whether LTR implementation facilitates large scale farmers to access to capital for investments. The section 6.4 gives the interpretation about a variety of agricultural investments in types before and after LTR implementation. The section 6.5 compares the volume of investments before and after LTR through the calculation of annual growth rate, t-test analysis and calculation of investment volume per size of land. The section 6.6 explains the relationship between agricultural investments and LTR based on respondents' views. The views are related to the role played by the programme in investments and how investment factors compete to motivate farmers. Then the section 6.7 draws the conclusion on the extent to which the relation between LTR and agricultural investments exists.

6.2. Reasons and indicators of increased number of large scale farmers

In Eastern province, the number of large scale farmers increased after LTR implementation. The following reasons for this increase are plausible. According to the interviews with land administrators, they argue that the Eastern Province has many agricultural potentialities including free land and soil virginity. Landless people from other Provinces, attracted by the Eastern region potentialities, go there to buy land (section 5.2). The second reason concerns a land tenure security granted to landholders by the Government through LTR implementation. New large farmers feel more likely to invest, rush for Eastern Province, look for land and attempt agricultural investments (section 5.2). The interviews from bankers indicate also the creation new agricultural cooperatives of large farmers in order to collaborate with banks and the increased number of farmers who are financed by banks. Again, the interviews with land administrators say that they observe a high number of large scale farmers who request the correction of land certificates, if necessary, before registration of mortgages to the RDB (section 5.2). All these indicators give evidences of increased number of large scale farmers due to LTR. In accordance with the literature (section 2.2.2.), the more land owners feel secured, the more they are inclined to invest in agriculture. Although respondents do not include foreign agricultural investors in selected cells, they are probably in the eastern province (section 3.4). The LTR implementation is not only the reason of increased number of large scale farmers because agricultural potentialities of the Eastern Province can influence the increase. However, after the introduction of LTR, there is a significant increase of the number of large scale farmers. In contrast, the implication of the increased number is that more farmers may opt to request land titling and borrow money from banks.

6.3. Low impact of LTR in increasing access to financial capital

The chapter 2 provided criteria for classifying large scale farmers (table 2-1). One of these criteria is the easy access to credit. This section discusses how large scale farmers in Eastern Province access to credit and the role played by LTR in the process.

One of the objectives (and assumptions) of LTR was that farmers would increase their agricultural investments once the acquired title would provide them with access to financial credits (section 3.3). This objective (assumption) was only partly valid in the present research. The interviewed large scale farmers feel indeed having an incentive to invest once they have access to capital. The access was realised in different ways. First of all, the Minister of agriculture argues that, in her interview, farmers in general do not have enough money on their account in order to make intensive agriculture. Though, farmers have to collaborate with banks to increase their capital (subsection 5.3.1). The interviews with key informants and farmers show the long and difficult process of land registration that was the limiting factor to access credit and undermined agricultural investments before LTR implementation. When farmers do not have collaraterals, it difficult to increase investments (section 2.2.2). This is proven by respondents who say that banks are reluctant to grant credit when land is not registerd (subsection 5.3.2). However, both farmers and bankers agree that the novelty of LTR is the difference that came up after the countrywide land registration. LTR implementation has facilitated the collaboration and the access to credit because the process is no longer complicated. LTR has reduced the cost of land title than before. In addition to that, LTR increased the trust to banks due to land title reliability. To be sure that the land is not collateralised in many banks; the mortgage is registered by the Office of Registrar General under RDB (subsection 5.3.2). Figure 5-2 shows the increase in number of landowners who got credit from the bank for one year to another. Therefore, the land titling facilitates large scale farmers to increase investments because the trust in land titles leads to an easy collaboration between banks and farmers.

Although the LTR implementation leads to the access to financial credits, the level of facilitation is not enough. Figure 5-2 does not specify mortgages registered by categories (agriculture, constructions or other businesses) but what is known is that land titles used by large scale farmers are part of the registered mortgage. To register every mortgage, the Office of Registrar General records its land title after checking the reliability in the system of land information built and shared by the RNRA/ Department of lands and Mapping. During data collection we did not get information about registered mortgages before LTR that should enable to check the progression. The comparison of two periods should help to know if the programme has really contributed to access to finance. Despite this gap, the comparison of existing data shows that the number of parcels used as collaterals is still low. Table 3-1 show that in May 2013 RNRA has issued 5,040,815 land certificates to owners at national level. But figure 5-2 shows that in the last 4 years the Office of Registrar General under RDB has registered only 36,891 mortgages (0.7%) against the total number of land certificates issued. In addition, figure 5-1 shows that among 40 large scale farmers who invested in two cells only 12 (30%) have borrowed loans from banks. A large number of these large scale farmers do not collaborate with banks because 20 of them rely on their own savings. Figure 5-1 shows also that among 12 large scale farmers who got loans from banks, only 4 farmers have benefited the support of 25% from a guarantee fund by the Government. The evidences from Eastern province do not contrast with existing empirical findings revealing an increased number of farmers who access credit. One might expect a direct increase number of large scale farmers who take advantage of collateralising land title, as LTR potentiality, available to them. But all farmers do not do it at once.

There are many reasons why credits have not increased a lot. The limitation in getting credit could be explained by the conditions of large scale farmers themselves or by external factors limiting large scale farmers in getting access. On one hand, most of large scale farmers responded that they were insufficient able to elaborate and manage (large or new) agricultural projects. This operational inability limits their ability to oversee the implications for loans and credit payments. As a result, a main reason why they do not request for credits is simply the lack of experience and capacity to handle big investment projects. On the other hand, external factors limiting investments include the limited degree to which banks are now financing agricultural projects since the launch of LTR. Apparently, banks are not yet ready to increase their financial credits since the LTR. The government funds are not also enough to support all large scale farmers who intend to invest. Land titling alone is not sufficient to facilitate the collaboration between large scale farmers and banks. The access to credit depends also on the farmers' knowledge in project management and the financial capacity of lenders.

6.4. Agribusiness trend with dominant livestock in Eastern Province

The main categories of types of investments in the Eastern Province are cropping and livestock. This section explains why the livestock is the dominant activity while farmers started to produce cash crops. Table 5-1 shows that 32 (80%) large scale farmers out of 40 have invested in livestock. This proportion includes farmers who practice only livestock (27.5%) and farmers who associate crop growing to livestock (52.5%). Table 5-1 indicate that only 5 farmers out of 40 have invested exclusively in cropping. Figure 5-3 shows that in the Eastern Province the programme RIF2 gave more priorities to livestock than cropping activities. Although the sampling size of respondents does not allow making a statistic inference and confirming that livestock activity overtakes cropping in Eastern province; the situation is explained by the interview with one of land administrators who mentioned the specific characteristics of the zone which consists in eastern savannah (subsection 5.4.1). Wherefore, the recent occupation in the study area where virgin land was redistributed to returnees whose principal activity was pastoralism. The Eastern Province has the same characteristics as zones of the neghibouring countries, Tanzania and Uganda, where livestock is also dominant. But the priorities of RIF 2 should be less in case the LTR had not implemented in Eastern Province.

In the Eastern Province, large scale farmers adopt for integrated intensive livestock and cash cropping in order to gain more income because they have tenure security. Figure 5-4 shows that farmers are reducing the number of local breeds instead of exotic and improved breeds are new practice started after LTR implementation. These large livestock farmers introduce also cropping activities. Districts authorities in collaboration with central government allow using a maximum of 2 hectares for growing crops. Since 2008, the number of farmers who grow food crops is increasing continuously, but there are emergent types of crops (figure 5-4). In interviews with land administrators and cooperatives leaders, the augmentation of existing crops and adoption of new crops like tomatoes and pineapples reveal the adoption for cash crops by farmers (subsection 5.4.2). The recent creation of crop transformation factories motivates farmers to increase agricultural production and cultivate new products. Three examples can illustrate the motivation: farmers collaborate with SORWATOM factory to grow tomatoes; soya oil factory in Kayonza Districts supports farmers to produce more soybeans; Inyange industry signs contracts with farmers to grow pineapples. Holding a land certificate as a proof of land right, is the basic condition imposed to contracting farmers. Despite the government policy of encouraging large scale farmers to do agribusiness by changing activities, there is a tremendous change in varieties of activities just after LTR implementation.

However, the change from extensive to intensive agricultural investments is not abrupt. With a long tradition of pastoralism, the capital goods used by large scale farmers are not at professionalism level. Figure 5-6 reveals that interviewed farmers do not use machinery and modern technology of production. This means that they rely on traditional techniques of production without irrigation methods or without keeping cattle in cowsheds. Then they do not get much production as if input techniques were improved. The same figure 5-6 shows an increasing of transport means, including vehicles, motorcycles and bikes. These equipments serve to carry the production either from field to store or from store to market. Since the harvest is not too much to be carried all time, the capital goods serve to another destination. For instance, motorcycles are used for agricultural purpose in the morning and help to solve the existing problem of transport in the remaining hours. Although the number of transport means increased because they can serve for other purpose and generate extra income to farming activities, the LTR implementation does not influence the increase of capital good aiming professionalism in agriculture. However, land titling should lead to increased means of agricultural production.

The investments related to land improvement and land conservation are not too much influenced by LTR implementation. Table 5-2 shows that most of interviewed farmers have fenced and cleared farms. The benefits of these activities consist in prevention of diseases propagation between neighbouring farms. These activities are initiated by the Government of Rwanda (subsection 5.4.4). Although conservation measures are not important, table 5-3 indicates that most of interviewed large scale farmers are happy with their land quality. This research did not look at how large scale farmers use fertilizers to increase productivity, but we can assure that the soil fertility in the study cells is still good since they are located in part of the former Akagera National Park where land is not yet used several seasons. Since LTR has granted to large scale farmers a right to use land for long term without fear of eviction, they should undertake land improvement and land conservation as soon as possible because the current efforts are not sufficient to maintain the quality for a long time.

6.5. Increased volume of agricultural investments

The volume of agricultural investments is another variable by which we collected secondary data from Ministry of agriculture and primary data from respondents. This section presents the analysed data in order to know whether the agricultural activities generate an income or not since the beginning of LTR implementation.

The RIF 2 has influenced the location where and whether titles were registered and how much the degree of investments changed. Figure 5-8 shows that Eastern Province is the first to benefit the granted fund by RIF 2. At the province level, figure 5-9 shows the Districts of Nyagatare takes the first place while Kayonza is the third after Rwamagana. The amount of loan borrowed by Nyagatare farmers is larger than the amount borrowed together in Bugesera, Gatsibo, Kirehe and Ngoma. Even if there are beneficiaries whose addresses are not known, it cannot change the position of Eastern province in agricultural investments. This status should confirm the view of our interviewees who said that Eastern Province has more agricultural potentialities (section 5.2). The project report does not provide complete addresses of beneficiaries which should allow knowing if their list includes sampled large scale farmers. Since the whole Eastern Province has been covered by LTR programme and the access to this grant requires the collaboration between farmers and banks, the RIF 2 helps more where LTR took place. Therefore, land titling facilitates to increase volume of investments through guaranteed funds.

The volume of agricultural investments has been increased a lot since 2008 especially where LTR enabled farmers to borrow money from banks. Table 6-1 shows the total values of investments before LTR, the current value, the value gained during the past five years and the annual growth rate in both cells. The total value of 739.9 million Frw includes 178.4 million Frw (24%) of new large investors in agriculture. In five years ago, agricultural investments have been increased by 395 million Frw (Equation 4-1). The calculation of the general annual growth rate of agricultural investments of respondents is 23.02% in five years ago (*Equation 4-2*). The investments in Buhabwa cell have the annual growth of 2.75% more than investments of Mbare investments.

Cell	Value of investments before LTR	Current value	Value of investments during last 5 years	Annual percentage growth rate
Buhabwa	297,000	644,400	347,400	23.39
Mbare	47,000	95,500	48,500	20.64
Total	**344,000**	**739,900**	**395,900**	**23.02**

Table 6-1: Evolution of agricultural investments (value in Frw "000"),

The comparison between results provided by figure 5-1 indicating sources of capital used in agricultural investments and table 5-3 of respondent's investments show that farmers who borrowed credits from banks are those who increased a lot the value of investments. But farmers who rely on own savings have a small augmentation of investments value. Hence, land titling allows large scale farmers who borrow money to increase investments more than farmers who do not.

The analysis of farmers' investments reveals a difference between value of agricultural investments before and after LTR implementation statistical. First, table 6-2 shows T-test of two means of investments (the paired differences of means), standard deviation, standard error of mean, percentage of the confidence interval of difference, t value, degree of freedom and significance by p value.

	Paired Differences					t	df	Sig. (2-tailed)
				99% Confidence Interval of the Difference				
	Mean	Std. Deviation	Std. Error Mean	Lower	Upper			
Agric Investment after LTR - Agric Investment before LTR (Frw "000")	9897.50	8432.58	1333.30	6287.01	13507.98	7.423	39	.000

Table 6-2: Paired sample test between agricultural investments before LTR and after LTR implementation

As explained in section 4.5, t-test is used in this analysis to check whether the change in investments is significant (*Equation 4-3*). Table 6-2 shows the mean difference between the mean of investments before and mean of investments after LTR ($\bar{D}$) the: 9,897,500 Frw. The table reports the standard (std.) deviation of differences between the means (8,432,580 Frw) and the standard error of the differences between farmers' investments before and after LTR (1,333,300 Frw). The test statistic (t) is the result of mean of differences divided by the standard error of differences (7.423). In SPSS the degree of freedom (df) is the sample size minus 1 (40-1=39). Field (2009) states that when the probability value (p), labelled (sig) by default in SPSS, is more than 0.05 the t is statistically meaningful. Thus, the paired samples test t(39)7.423 and p=.000 indicate the statistical significant difference between the investments before and after LTR implementation. Second, the representation of investments in two cells before and after LTR implementation by maps gives evidences of change in volume of investments. Figure 6-1 indicates that

before LTR the farms without investments in red colour are eighteen while on the second map in right there only six farms without investments. Concerning farms with investments represented by green dots, the left map shows that they are sixteen. In contrast, the map of current situation shows that the farms with investments are twenty-eight and are bigger than the dots of 2008. Similarly figure 6-2 makes also a comparison of investments in Mbare cell where four farmers were active in 2008 while in 2013 all farmers have agricultural activities.

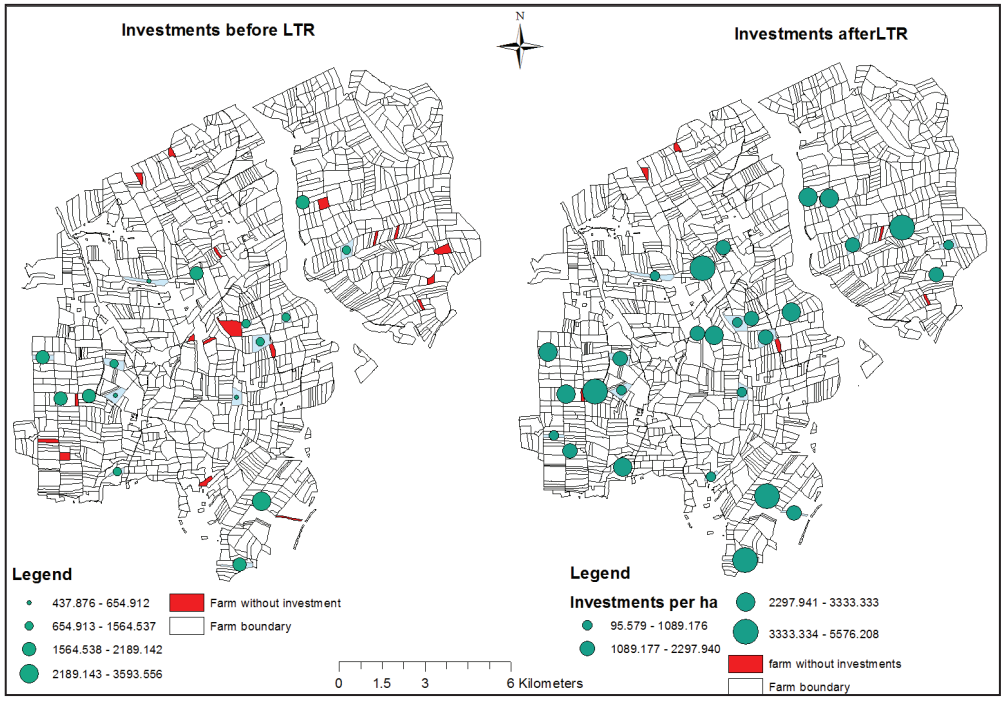

Figure 6-1: Value of investments per hectare in Buhabwa cell - value in Frw per hectare

Source: (RNRA, 2013)

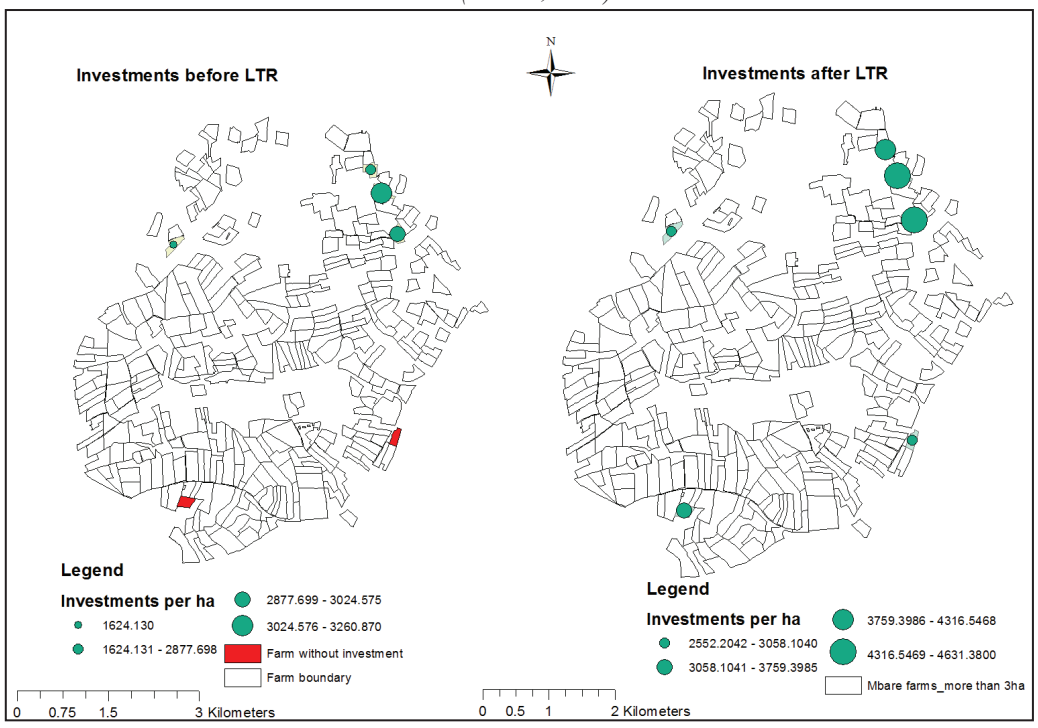

Figure 6-2: Value of investments per hectare in Mbare cell - value in Frw per hectare

Source: (RNRA, 2013)

The size of green dots between investments before and after LTR implementation reveals that the investments increased. In addition, the green dots represent the investments per hectare. The process starts firstly by creation of a new field in which, I calculate the area of 40 selected farms area hectares. Secondly, I import from Excel the table of respondents' investments before and after implementation of LTR. Based on the field of UPI, common for two tables, I join them. Then I create a new field again, which allows calculating the volume of investments per hectare. The final maps indicate symbology classes of the volume of investments per hectare. Therefore, figure 6-1 and figure 6-2 compare the volume of investments per the size of farms respectively in Buhabwa and Mbare cell. The maps analysis indicates the level by which farmers use land rationally in order to maximise the production. Some farmers own large scale farms but the value of investments is less while others invest the same amount even more on the small farms.

The computation of investments value per hectare shows that small farms are valorised than large farms. This difference is noticed also between two cells in the research area. From table 6-3, the comparison of median of farms area in two cells shows that land size per farmer is larger in Buhabwa (7.78 ha) cell than the size in Mbare (4.08 ha). Since the median of the investment's value in two cells is the same (1,600,000 Frw), the median of the investment's value per hectare in Mbare increases above twofold. This should be interpreted as surveyed farms in Buhabwa are not used rationally as Mbare farms.

Cell name	**Buhabwa**					**Mbare**				
	Σ	**Min**	**Max**	**Mean**	**Median**	**Σ**	**Min**	**Max**	**Mean**	**Median**
Area (ha)	374.3	3.7	33.39	11.01	7.87	24.71	3.27	5.29	4.12	4.08
Investments value in 2013 (Frw "000")	644400	0	62000	18953	16000	95500	18000	24500	15917	16000
Investments/ha (Frw "000")	-	0	5576.2	1807.3	1856.4	-	2552.2	4631.3	3822.87	4037.9

Table 6-3: Current investments per size of land

The comparison of the above evidences with the literature shows a relation between increased investments of large scale farmers after the LTR implementation in Eastern Province and findings from other countries. The results from table 5-3 compared to the figures 6-1 and 6-2 show that large scale farmers of study area increased the volume of investments after the LTR implementation. In the same line, scholars also argued that tenure security boosts land investments: Experience from Ethiopia reveals that after the programme of land registration farmers increased land investments and yield more benefits compared to the implementation coast (section 1.1). In addition, after a short term evaluation of LTR in Rwanda, households whose land was registered invested more than twice than households whose land was not registered (Ali et al., 2011). Therefore, large scale farmers usually increase investments after implementation of land titling.

6.6. Relationship between agricultural investments and LTR implementation

The previous section 6.5 indicates that agricultural investments increased a lot from 2008 to 2013 during LTR implementation. The present section explains whether this increase is related to LTR implementation or not.

Land titling implementation coincides with increase of agricultural investments. Interviews from bankers say that there is more trust before granting credit. Land administrators argue that land titling creates more incentive to large scale farmers. Most of interviewed farmers strongly agree with the role played by LTR to facilitate the change of agricultural investments (table 5-4). The reasons of respondents whose opinion is favourable to the role of LTR in investments are the security of investments linked to land tenure security, the possibility of transfer of land right in case they need to sell and the use of land as collateral.

The conceptual framework of chapter 1 needs to include associative variables. The following arguments provide the justification for this statement. The comparison of factors, which give more incentive to large scale farmers in the agricultural investment decision, shows that LTR implementation influence more respondents (figure 5-11). Since 12 farmers out of 40 (30%) have been motivated by LTR, the relationship between this factor and agricultural investments exists. The choice of this factor among 6 others does not mean it is the only one to give incentive but the most important to influence. Figure 5-11 shows that other 5 factors influenced the rest of the respondents. Despite LTR implementation in the whole Eastern Province, large scale farmers use different ways to invest in agriculture. The LTR implementation does not imply immediate investments in agriculture, there are many factors that intervene between two variables. This means that the type of relationship is not causal. Farmers who did not get land titles rely on own savings, off farm income and or donors' aid to attempt their investments. But there are farmers who use only these sources of investments while they have already land titles. Other large scale farmers with land titles, pledge land as collateral in banks and get credit for their investments. In case farmers need more money and do not have enough mortgages, guaranteed funds intervene to support them. Based on the conceptual framework of chapter 1, figure 6-3 summarises the relation between land titling and agriculture investments adapted to the current situation in Eastern Province of Rwanda.

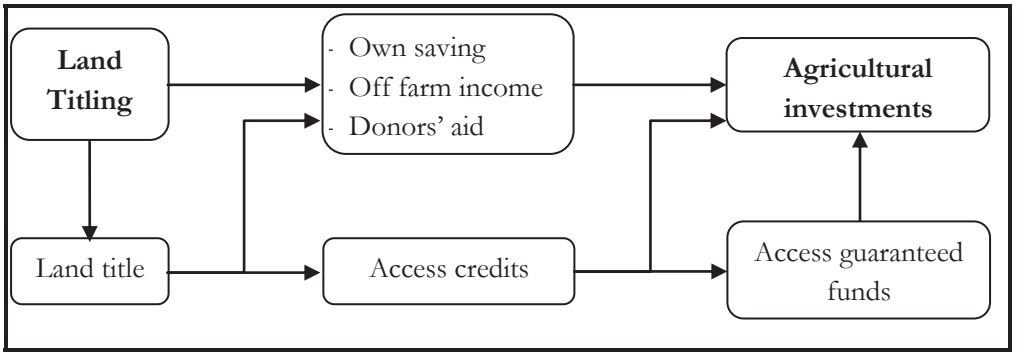

Figure 6-3: Adapted conceptual framework

The debate initiated on the relation between land titling programme and agricultural investments shows that one group of scholars confirms a strong relation between two variables while the second group denies the relation (section 2.3). Therefore, this study contributes to the debate where empirical findings indicate the existence of an associative relationship between LTR and agricultural investments in Eastern Province.

6.7. Conclusion

This section addresses the research question; *"To which extent LTR has contributed to agricultural land investments?"* The section explains how empirical findings provided in this chapter allow confirming the existence of a relation between LTR and agricultural investments. Then the section provides the extent to which LTR contributes to these investments.

The LTR programme increased the number of large scale farmers in Eastern Province. Before LTR many large scale farmers had not land certificates proving their right to land. Once land is secured, large scale farmers haven't any fear of eviction and their investments on land are also secured. Then large scale farmers are more likely to invest and there are new large scale farmers.

Large scale farmers of Eastern Province need capital to invest. In Rwanda, banks are a potential source from which farmers have to take advantage because there is the issue of insufficient own savings to invest in agriculture. The collaboration between farmers and banks in order to resolve the problem is necessary. The implementation of LTR has facilitated the process of borrowing money from banks than before the programme. Large scale farmers who mortgaged land and got credits from banks increased the volume of their investments significantly. However, the number of large scale farmers who are using land titles for mortgaging land in banks is still too low. Factors limiting the collaboration with banks are either from large scale farmers' behaviour or from external causes. Farmers have insufficient knowledge in agribusiness. Sometimes farmers elaborate nice projects, but they do not get credit because banks have not enough money to support all demands.

After LTR implementation large scale farmers are changing their types of investments that are categorised into livestock and cropping. The comparison of both categories before and after the LTR programme shows the change of large scale farmers' activities. They are reducing the number of local cattle breed instead of exotic livestock and they cultivate not only food crops but also cash crops. All these indicators reveal the degree of increased tenure security that creates incentive to improve agricultural investments. Even if they are improving agricultural activities, they do not use machinery and technology in order to increase production.

In the last five years large scale farmers increased a lot the monetary value of agricultural investments in Eastern Province. The reasons for this increase are the priority given to the Province by the project RIF2 that supports agricultural investments, but also the efforts of large scale farmers to invest more after getting land tenure security. The overall investments of respondents have been doubled the volume and show the great annual growth rate. The T-test of means reveals the statistical significant difference between agricultural investments before and after LTR implementation. However, the computation of the volume of investments per size of land indicates that small farms are not more exploited than large farms. It means that owning a large farm does not imply being large scale farmer.

The initial conceptual framework indicates a causal relationship between agricultural investments and land titling. The empirical findings show the existence of a relationship between two variables but LTR alone cannot enable large scale farmers to invest. They need to use either own savings or borrow credits from banks where they should be supported by government guaranteed funds. Large scale farmers possess land titles, have incentive to invest, but the relationship between LTR and agricultural investments is not strong. The incentive to invest increased, but the level of rational land use needs to be improved.

7. CONCLUSION AND RECOMMENDATIONS

7.1. Introduction

Given the empirical findings in this research, this chapter includes the conclusions section and recommendations section. The section 7.2 combines respective sub-conclusions by listing all research questions and related answers. The section 7.3 presents the limitations of this research. Then the section 7.4 provides the recommendations for further researches and the recommendations for professionals in the field of agricultural investments.

7.2. Conclusions

Returning to the introduction chapter (section 1.2), the research problem of this study is: *"It is not known more whether the LTR brings change in types and volume of agriculture land investments of large scale farmers"*. This research aimed to assess the impact of Land Tenure Regularization on the changes in agricultural land investments of large scale farmers. The conclusions are made to achieve the main and three sub-objectives; and addressing related research questions.

1.a) To what extent the concepts of land titling, agricultural land investments of large scale farmers and their relationship are discussed among scholars?

Land titling is defined as pillar of land administration, and a factor which can boost the economy. A commonly accepted assumption is that granting land rights to individual land holders increases tenure security and increases investments. Agricultural investments consist of inputs, capital goods undertaken with expectation of a future income. Based on different criteria, including land size, there are small and large scale farmers. This study focused specifically on agricultural investments of large-scale farmers and the degree to which such specific investments were dependent on whether or not titles were provided to these farmers (section 2.2).

1.b) What is the meaning of land titling, agricultural land investments and large scale farmers in Rwandan context?

The meaning was derived using the case of the LTR, an instance of a land titling programme. The objective of LTR was to record all existing land rights and clarify their status under land law. Expected outcomes of this programme are tenure security to boost agricultural investments (section 3.3). More than 60% of adult population works in the agricultural sector, but the contribution of agricultural investments on GDP is less than 35% (section 3.4). Rwanda has small and large farmers, according to criteria defined by government through the National Institute of Statistics (section 3.5). For this research the criterion of 3 hectares or above was used to select large scale farmers in Eastern Province (section 4.2).

2.a) What are the trends of number of large scale farmers after LTR implementation?

The general trend shows that the number of large scale farmers has been increasing since the implementation of LTR. In Buhabwa and Mbare cells, 18 out 40 respondents are new large farmers who felt more likely to invest, came to look for land and intended to invest. Among these respondents, 13 are farmers who started to invest after LTR implementation while 21 did it before and 6 did not start (section

5.2). Two main reasons explain this increase. First, the Eastern Province holds many agricultural potentialities, such as virgin soil and availability of land, that attract farmers. Second, after being aware of land tenure security granted by LTR, people craved for starting agricultural large investments in Eastern Province (section 6.2).

2.b) How do large scale farmers access capital for land investments before and after LTR?

In the study area, the agencies providing agricultural financial credit are banks, government, donors. The means of investments include respectively mortgages, government funds, off-farm income and own savings. The LTR implementation has facilitated the procedures of accessing to credit. The statistics of registered mortgages by the RDB since 2010, without distinguishing agricultural investments of large farmers, indicate that there is increased number of landowners who got credits. In the Eastern Province, only 12 out of 40 large scale farmers have gotten loans from banks (section 5.3). Based on these findings, it is not easy to confirm whether large scale farmers have more access to credits or not because the available data do not indicate a difference between the periods before and after LTR. However, interviewed people argue that today the process of borrowing loans from banks is much easier and banks have more trust in mortgages than the period before LTR started.

2.c) What types of agricultural land investments have large scale farmers invested in before and after LTR?

In Eastern Province they are two main categories of agricultural investments, including livestock and cropping. The livestock is the dominant activity, but most of large farmers integrate that activity with crop growing (section 6.4). In the region, the livestock consists of cattle, goats and chicken while the crops are cassava, coffee, maize, banana, beans, tomatoes, pineapples, rice, and soya beans. After the implementation of LTR the types of crops and livestock are changing. Large scale farmers started to adopt cash crops and to reduce the number of local cattle breeds instead of exotic breeds. Concerning capital good, large scale farmers invest more transport means than in agricultural technology and machinery (section 5.4). Fencing and clearing farms are not done on the farmers' initiative because they consist of performance contracts of Districts (section 6.4).

2.d) How much financial capital have large scale farmers invested in agriculture before and after LTR?

Large scale farmers increased the monetary value of agricultural investments from 2008 up to 2013 during the implementation of LTR. Apart from large scale farmers who did not invest, other farmers increased the volume of investments (table 5.3). The calculation annual growth rate indicates that respondents' investments increased 23.02% in last five years. The paired sample t-test of means reveals also a statistically significant difference between agricultural investments before and after LTR implementation. Even if there is a significant increase of investments, large farmers do not make a maximum of profit because the volume of investments per size is still low. Large scale farmers do not use modern techniques in order to gain more income (section 6.4).

3.a) Does a plausible relation exist between the introduction and implementation of the LTR and the changes in agricultural investments?

Yes, there is a relation between LTR implementation and agricultural investments (section 6.6). After being aware of LTR in 2008, large scale farmers are motivated to invest because of tenure security and agricultural potentialities in Eastern Province (section 6.2). Large scale farmers recognise the important

role played by LTR in their investments and LTR is the most factor that influenced farmers to increase investments (section 5.6). These findings support the view of scholars who agree with the relation between land titling programmes and agricultural investments.

3.b) To which extent LTR has contributed to agricultural land investments?

Although the findings suggest that there is a relationship between titling and agricultural investments, the conceptual relation needs to be further detailed. The relation between land titling and agricultural investments is not a direct cause-effect. In the Eastern Province of Rwanda, the empirical findings show that the issue of land tenure insecurity is solved by LTR implementation, but large scale farmers still have challenges that undermine the collaboration with banks and hamper their investments. These challenges are related to farmers' capacity in project management or to external factors. Therefore, once land titling takes place, motivated farmers either rely only on own savings and/or borrow credits from banks where they should be supported by government guaranteed funds. Otherwise the relation will not be true

The overreaching research objective is to assess the impact of land tenure regularization on the changes in agricultural land investments undertaken by large scale farmers. Given the time after start-up of LTR, the empirical findings of this study indicate how the programme results to agricultural investments. The LTR granted tenure security to holders which lead to increased number of new large scale farmers in this Province provided with agricultural potential. By LTR implementation, large scale farmers have facilities of accessing credit, they are changing the types of investments in order to earn more income and then, they increase the monetary value of investments. These couple of findings prove a significant increase of agricultural investments related to the implementation of land titling. However, land titling should not sorely result to agricultural investments because there are other investment factors.

7.3. Limitations of the research

The limitations inherent to this research consist of methods applied to evaluate the relation between land titling and agricultural investments. In this research, the starting point - reference year before LTR implementation - was 2008. I did not get data about the situation before this period. It was not easy to compare the evolution before LTR and the status of the last five years. This study is based on a single case of large scale farmers in the Eastern Province of Rwanda who have specific characteristics of pastoralism. The time allocated to the fieldwork was short and did not allow extending my sample size and choosing other cases of study for a comparison. This issue has a negative impact on the results because the data do not require statistical analyses and the conclusions are limited to respondents of Eastern Province. Therefore, it is too difficult to generalise the conclusions to other Province of Rwanda or other countries.

7.4. Recommendations

Given the above limitations (section 7.3), such study needs more time and strong methods. Using the same main objective, same sub objectives and same research questions, a further research can extend cases of study and sample size in Rwanda with LTR and Burundi where land titling did not yet start. Such study would compare the number of large scale farmers who borrowed credit and the monetary value of agricultural investments in a country with and without land titling.

During this research, I came across the issue of credits and government funds which play important role in agricultural investments. The findings show that farmers who got loans and support from government

increased a lot the value of investments, but they do not clarify whether the use is rational or not. I would recommend a new further research on the use of credits and government funds.

Agriculture is a prior economic sector in Eastern Province since there are many agricultural potentialities. However, one of the conclusion of this research says that large scale farmers do not use much technology and machinery and large farms are not well developed. This issue should limit farmers to produce enough and gain a maximum income. Hence, agronomists and land administrators should assist more large farmers and explain to them how the use of land title can contribute to introduction of agricultural technology.

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APPENDICES

Appendix 1: Questions of structured interviews with large scale farmers of Kayonza and Nyagatare Districts in Eastern Province

Form number: …….. Date …….

1.1. Protocol of interview

Self presentation and research purpose

Names: Felicien Niyoniringiye
Position: Land Officer of Rulindo District
Current activity: Student at ITC/ The Netherlands

In 2009, the Government of Rwanda launched the program of Land tenure regularization (LTR) with the main objective of promoting the socioeconomic well being.

A research is being conducted on the outcomes of this LTR program. As concerned and familiar to land use and land investments, I would ask you some questions and discuss on how LTR is playing a role or not in your daily life. The information gathered from the interview will be used anonymously and it will not be possible for others to identify you when the study is published.

Your answers are very valuable and important to my research, but also to the government that launched the LTR.

Explain how the conversation will be conducted

- Pose the question
- Explain it, whether it not well captured
- Writing the answer on the paper and
- Recording answers
- Ask the respondent if the techniques are convenient for him
- If yes, start the conversation if not use what is agreed upon

1.2. General information

District: …… Sector: ……
Cell: …… UPI: ……

1. Name of Respondent (optional): …….
2. Addresses of Respondent (optional): …… Tel: (+250)7…….

3. Access to ICTs: Radio ☐ Television ☐ Mobile phone ☐
   Computer ☐ Internet ☐

Question n° 2.a:	**How many new large scale farmers are after LTR?**	
	1) How long you own this farm?	☐
	2) Did you already get the land certificate?	Yes ☐ No ☐

3) When did you start your investments on the farm?

Before 2008 ☐ After 2008 ☐

No investments ☐

4) If not, why did you not yet start?

Question nº 2.b:	**How do large scale farmers access capital for land investments before and after LTR?**

5) Indicate the source of capital used for your investments

- From bank ☐ - Off farm income ☐
- Donors aid ☐ - Saving ☐
- Other (specify): - ……

6) If your capital is from a bank, what did you use as collateral?

- Land certificate of the farm ☐ - Other (specify): ……..

7) What LTR has brought as new facilitation in the process of getting credit from a bank?

Question nº 2.c:	**What types of agricultural land investments have large scale farmers invested in before and after LTR?**

8) What category of agricultural land investments are you interested in?

-Livestock (A) ☐ -Cropping (B) ☐

9) If (A) what investments in livestock inputs did you have after LTR (2013)?

-Pasture ☐ -Improved breeds of domesticated animal ☐

-Local breeds of domesticated animal ☐ -Other (specify): ……

10) If (B) what investments in cropping inputs did you have after LTR (2013)?

-Tomatoes ☐ -Banana ☐

-Pineapple ☐ -Coffee ☐

-Maize ☐ -Other (specify): ……

11) What long investments do you have on the farm after LTR (2013)?

- Capital goods:
  - Animal for traction ☐ -Other (specify): ……
  - Tractor ☐ -No (why) ……..
- Land improvement:
  - Clearing the farm ☐ -Other (specify): ……
  - Fencing ☐ -No (why) ……
- Soil conservation :

-Terraces ☐ -Water pump ☐

-Dam ☐

Other (specify): …… -No (why) ……

12) Among these types of investments, is there any one you have made before LTR (2008)?

- YES ☐ - NO ☐

13) If YES, what are they?

Livestock

-Pasture ☐

-Improved breeds of domesticated animal ☐

-Local breeds of domesticated animal ☐

-Other (specify): ……

Cropping

-Tomatoes ☐

-Pineapple ☐

		-Banana ☐ -Coffee ☐ -Maize ☐ -Other (specify): ……..
	-Capital goods:	Animal for traction ☐ Tractor ☐ -Other (specify): …….. -No (why) ……
	-Land improvement:	Clearing the farm ☐ Fencing ☐ -Other (specify): …….. -No (why) ……
	-Soil conservation :	Terraces ☐ Water pump ☐ Dam ☐ -Other (specify): …….. -No (why) ……
Question nº 2.d:	**How much financial capital have large scale farmers invested in agriculture before and after LTR?** 14) If you have started farming activity before 2008, how much did your investments value at that time in Frw? ☐ 15) What is the current value in Frw of your investments? ☐ 16) If you estimate all capital from banks and from other resources, how much have you invested in this farm till now? ☐	
Question nº 3.a:	**Is there a significant change in agricultural land investments of large scale farmers?** 17) In your opinion LTR has facilitated you to invest more? -Fully agree -Moderately agree ☐ -Disagree ☐ -If disagree, ask reasons …….	
Question nº 3.b:	**To which extent LTR has contributed to agricultural land investments?** 18) Among following programs, what has given you more incentive to invest in agriculture? (*) -LTR ☐ -Access to road ☐ -Access to market place ☐ -Good market price ☐ -Access to ICTs (mobile phone, computer, internet, radio, television) ☐ -Guaranteed fund ☐	

(*): The first factor to motivate respondents

Thank you for your participation in this research!

Appendix 2: Guiding questions of unstructured interviews with key informants

Recording number: …… Date ……
Name of key informant: …… Position: ……..

1.1 Protocol of interview

Self presentation and research purpose

Names: Felicien Niyoniringiye
Position: Land Officer of Rulindo District
Current activity: Student at ITC/ The Netherlands

In 2009, the Government of Rwanda launched the program of Land tenure regularization (LTR) with the main objective of promoting the socio-economic well being.

A research is being conducted on outcomes of this program of LTR. As concerned and familiar to land use and land development, we would ask you some questions and discuss on how LTR is playing its role or not in your daily life. All information collected through this interview will be used anonymously and it will not be possible for others to identify you when the study is published.

Your answers are very valuable and important to my research but also for our government that initiated the programme of LTR.

Explain how the conversation will be conducted

- Pose the question
- Explain it, whether it not well captured
- Recording answers
- Ask the respondent if the techniques are convenient for him/her
- If not, the answer will be noted in a field notebook
- Then start the conversation if not use what is agreed upon

1.2 Questions:

1) What are the reasons and indicators of variation of farmers' number in Eastern Province (or in a District) since 2008?
2) What types of activities do they invest in more?
3) Do you believe that LTR has created facilities in the process of granting (getting) credit by (from) lender?
   a. If yes, explain in detail how?
   b. Why these facilities come after LTR while large scale farmers were able to get land certificates through sporadic registration?
   c. If not explain in detail how?
4) In your opinion, do you think that LTR is one of the drivers of agricultural land investments in Eastern Province (or in District …)?
   a. If yes, explain in detail how?
   b. If not explain in detail how?

Thank you for your participation in this research!