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LAND TENURE SECURITY AND FARM INVESTMENTS AMONGST SMALL SCALE COMMERCIAL FARMERS IN ZIMBABWE

Lighton Dube[1] and Emmanuel Guveya[2]
[1]Faculty of Commerce and Law, Zimbabwe Open University
[2]Rural Development and Land Administration, Mpumalanga, Republic of South Africa

ABSTRACT

Zimbabwean farmers and development practitioners have for a long time been advocating for security of tenure in the agricultural sector. It is generally argued that lack of tenure security in the farming sector constrains farmers' access to credit, farm investments, technology adoption and sustainable agricultural development and productivity. This paper contributes to this debate by examining the effect of land tenure security on investment by small scale commercial farmers in Zimbabwe. The study was conducted in Chipinge district of Manicaland province using a sample of 116 farmers (57 with permit tenure and 59 farmers with freehold tenure). Using a probit model, the findings suggest that (a) under a more secure tenure system, farmers are likely to have some longterm investments, in this case in plantation crops, (b) Secure tenure is likely to influence investment in property improvement of fixed assets such as fencing and woodlots, (c) Secure tenure is likely to positively influence an investment in permanent housing facilities but does not seem to influence an investment in associated infrastructure such as garages, workshops or shades, (d) Secure tenure seems to be associated with a higher propensity to invest in improving existing farm infrastructure, (e) Tenure security appears not to significantly affect medium term soil improvements, and (f) The type of tenure system may not necessarily influence an investment in non-fixed assets like livestock. The paper concludes that there is a strong relationship between tenure security and farm investments by small scale commercial farmers in Zimbabwe and that sustainable agriculture and rural development can only be achieved if issues of security of tenure and capacity to invest on land productivity are effectively addressed.

Keywords: Land tenure security, farm investments, agricultural productivity, small scale commercial farmers, Zimbabwe and sustainable agricultural development

INTRODUCTION

The debate on appropriate land tenure systems for sustainable smallholder agriculture development has been going on for quite some time now in the Southern African Development Community (SADC) region. Land tenure security has long been identified as one of the key elements necessary to bring about higher levels of investment and access to credit, for intensifying agricultural production, facilitate reallocation of production factors to maximize allocative efficiency in resource use, encouraging better natural resource management and sustainable development, and allow economic diversification and growth.

Smallholder farmers within SADC often attribute the poor performance of smallholder agriculture to existing land tenure systems. Most smallholder farmer organizations in SADC argue that freehold tenure and adequate land are the most important pre-conditions for smallholder agriculture commercialization and development. Existing literature suggests that increased tenure security in productivity resources leads to enhanced and sustainable agricultural production (Maxwell and Wiebe, 1998; Roth and Haase, 1998)

Development specialists argue that land tenure security is a pre-requisite to increased smallholder agricultural productivity and development. Arguments in favour of statutory, individualized land tenure systems (titling) claim that tenure security (1) increases credit use through greater incentives for investment, improved creditworthiness of projects, and enhanced collateral value of land; (2) increases land transactions, facilitating land transfers from less efficient to more efficient users by increasing the certainty of contracts and lowering enforcement costs; (3) reduces the incidence of land disputes through clearer definition and protection of rights; and (4) raises productivity and sustainability through increased agricultural investment (Barrows and Roth 1990, Besley, 1995; Feder and Noronha 1987). According to Roth and Hasse (1998) the fact that there would be fewer land disputes farmers would be able to use resources on land investments that might otherwise have been used for litigation.

Tenure security has a marked effect on expectations of a return on an investment of both labour and capital and many development thinkers have attributed the weakened incentives to invest in smallholder agriculture to the absence of security of tenure to land ownership (Bruce and Migot-Adholla, 1994; Feder and Noronha 1987; Rukuni, 2000). Rukuni (2000) argues that the inability of smallholder farmers to use “their” land as collateral to borrow the much needed short and long term credit for investment in agriculture denies most of them access to technology (hybrid seed, fertilizer, equipment etc). This in turn can lead to low productivity and unsustainable practices. Tenure security is also considered an important precondition for increasing land-based economic development and environmentally sustainable natural resource use (Bruce and Migot-Adholla, 1994). According to Rukuni (2000) tenure security in as far as an exclusive land right of groups and individuals is concerned, is the very basis of economic, political and social power and status.

A number of studies have also shown that farmers will be more likely to make medium- to long-term land improvements if their tenure is secure because they will be more likely to benefit from investment. Assuming that farmers have access to

viable technologies, inputs and extension advice, and adequate household labour and financial resources, then enhanced tenure security often lead to higher investment and higher agricultural production which in turn leads to sustainable agricultural development. Maxwell and Wiebe (1998) also note that there is widespread evidence linking secure property rights to a higher propensity to invest in tree planting, manuring, soil and water conservation and other permanent improvements.

Tenure security is also seen as one of the factors affecting the way households utilise assets (Economic Commission for Africa, 2003). In its report on the impact of land tenure systems and sustainable development in Africa, the Economic Commission for Africa (ECA) notes that if tenure is secure, the standard of living is *relatively* high given available household resources and an environment conducive to production. If tenure becomes insecure, however, the household becomes less productive and the standard of living declines. The ECA also notes that since land is central to promoting rural livelihoods Africa, access to land and security of tenure are the main means through which sustainable economic development can be realized. This is so because over 70 percent of the population in Africa is mainly linked to land and natural resources exploitation. Adams (2001) also argues that tenure security is basic to human rights and essential if people are to be able to manage their land resources, invest in the land and to sustain their use of it.

However, this emphasis on the benefits from more secure property rights is at variance with the empirical literature on this issue, especially in Africa, which has yielded results that are largely inconclusive. In fact, a large number of studies which often equated tenure security with possession of formal title found little impact of such security on either credit access or investment (Migot-Adholla, Place and Oluoch-Kosora, 1994). More recently, there is evidence suggesting that the causality may run the other way, i.e. that investment may be undertaken to enhance tenure security rather than as a response to higher levels of tenure security (Besley, 1995; Sjaastad and Bromley, 1997). Descriptive evidence seems to be consistent with this hypothesis (Gray and Kevane, 2001; Platteau, 1996). In fact, in Burkina Faso, land-related investment appears to be undertaken primarily to increase tenure security rather than as a consequence of more secure rights (Brasselle, Gaspart and Platteau, 2002).

This paper seeks to provide evidence on the link between tenure security and farm investment for the case of Zimbabwe where land tenure security is of high relevance to the policy debate on sustainable agricultural development and where insecurity of tenure is considered to be higher than in other African countries. There has also been a growing debate in Zimbabwe and the SADC region on whether land tenure security constrain farmer innovation and investment in agriculture.

RESEARCH METHODOLOGY

Study Area

The research was carried out in Chipinge district of Manicaland province in southeastern Zimbabwe. It is one of the seven districts in Manicaland province (Figure 1). The average annual rainfall of Chipinge district is about 1,105 millimetres. The hot climate and high rainfall are well suited to agriculture. A two-stage sampling procedure was adopted for the study. First,

the study selected two Intensive Conservation Areas (ICAs) - one under freehold tenure and another under leasehold / permit tenure which are adjacent to each other. Small-scale commercial farms are scattered around the country in clusters. These clusters are known locally as Intensive Conservation Areas (ICAs). These sites were in the same agro-ecological zone and therefore there are no obvious differences in soil types and climates. Within each selected ICA, the study selected a 58 percent random sample (57 farm units) of the total farm units with permit tenure and 34% (59 farm units) for farm units with freehold tenure. Thus, the farm unit within each ICA was the secondary sampling unit.

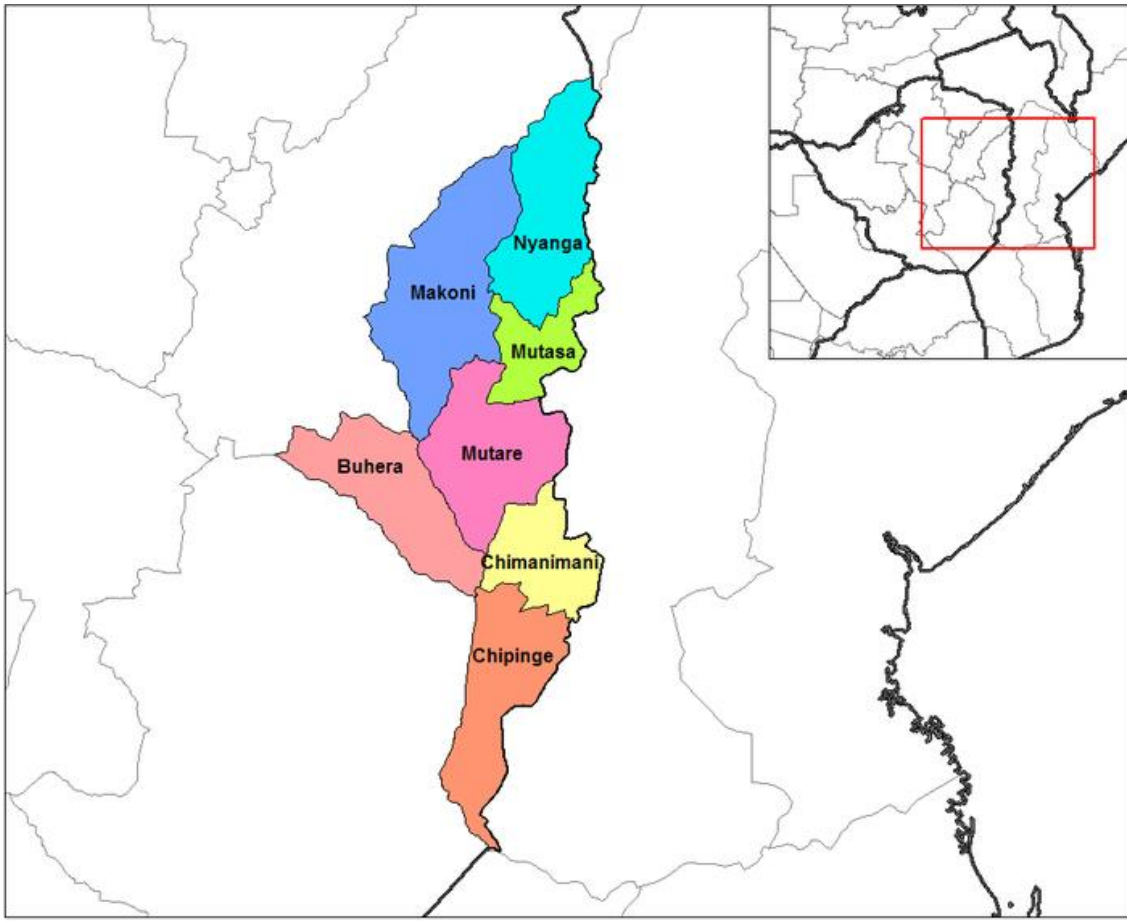

Figure 1: Manicaland Province Districts

Data Collection and Analysis

Both secondary and primary data were collected for the study. Primary data was collected through a questionnaire that was administered through personal interviews to 116 selected farmers. In addition, key informant interviews with local farmer leadership and extension staff were done to augment the data that was collected from secondary sources and the in-depth interviews with the selected sample farmers.

Primary data was collected to address the key issues identified for the study namely:

- Does land tenure security affect farm infrastructure development and investment amongst SSC farmers in Zimbabwe?
- Does land tenure security affect farmers' access to credit?
- Does land tenure security affect farm productivity amongst SSC farms in Zimbabwe? Tenure security enhances long-term investments, which in turn enhance yields. Tenure security provides farmers with adequate incentives or means to make land improvements or adopt new technologies that could enhance production efficiency.

Administered questionnaire and survey provided information on farmers' household characteristics, land holding, farm structure and land use, marketing, livestock and other capital holdings, farm planning and access to credit, production problems and constraints.

The study used an adapted version of a regression model developed by Feder, Onchan, Chalamwong, and Hongladaron (1988) to measure the effect of land tenure security on farm investment and productivity. Feder and Onchan (1987) formally developed Feder's framework of investment and tenure security as an optimization problem. Tenure insecurity is represented by the probability of being evicted from one's land. The farmer chooses between investments in capital equipment, which is not lost in the event of eviction; land improvements, which are completely lost in an eviction; and nonagricultural activities and assets, which are unaffected by eviction. The farmer invests in the first period and produces in the second with the objective of maximizing expected terminal wealth at the end of the second period. Terminal wealth consists of production value, land value, and returns to non-agricultural activities, less any debts incurred through credit use. The first conditions for maximum terminal wealth yield the following structural form equations used by Place and Hazell (1993):

$$C = f(X, TS) \quad [1]$$

$$L = f(X, TS, C) \quad [2]$$

$$I = f(X, L, C) \quad [3]$$

$$Y = f(X, L, I) \quad [4]$$

Where the endogenous variables are:

C is credit,

L is land improvements

I is variable inputs, and

Y is yield (Y).

Tenure security (TS) is exogenous, and X represents exogenous characteristics of the farm and its cultivator(s). This system of equations is recursive in the sense of the model structure, not necessarily temporally. That is, tenure security indirectly affects productivity through investment.

Feder (1987) used this framework to examine the relationship between land title, yield, and inputs in three provinces in Thailand. Migot-Adholla, et. al. (1994), and Place and Hazell (1993) adopted a variation of Feder's system for their econometric work in Kenya, Ghana, and Rwanda. Their studies were innovative in their attempt to control for parcel, household, and village characteristics and for their use of lexicographic transfer rights bundles to create tenure categories. Roth, Cochrane, and Kisamba-Mugerwa (1993, 1994), in their study of Rukungiri District, Uganda, consider the role of title in promoting farm investments.

Following Place and Hazell (1993), tenure security is measured based on whether a farmer has title deeds or a permit to their farm. With freehold tenure (title deeds) the farmer has complete transfer rights (the right to sell the land), whereas with the permit system, the farmer only has use rights. The investments considered are grouped into three types: long-term or fixed improvements, (wells and fences), plantation crops, and medium-term soil improvements (soil and water conservation and fallowing). Long-and medium-term improvements are thought to be complementary, and both of these are considered to affect the use of variable inputs.

The structural model employed here takes its inspiration from that of Place and Hazell (1993) and Migot-Adholla et. al. (1994), and can be written as the following system:

$$L=f(X[sub\ 1], TS) \quad [5]$$

$$T = f(X[sub\ 2], TS) \quad [6]$$

$$M = f(X[sub\ 3], TS, L) \quad [7]$$

$$I = f(X[sub\ 4], L, M) \quad [8]$$

$$Y = f(X[sub\ 5], L, T, M, I) \quad [9]$$

where long-term improvements (L), the presence of trees (T), and medium-term soil improvements (M) are binary endogenous variables; commercial inputs (I) and yield(Y) are continuous endogenous variables; tenure security (TS) is exogenous; and the X's are exogenous explanatory variables included in each respective equation. Data from the survey is used to construct variables to estimate equations [10] to [15] and the variable definitions are presented in Table 1.

$$PLANT = \alpha_0 + \alpha_1 HHEDUC + \alpha_2 TRAINING + \alpha_3 EXPERIENCE + \alpha_4 FARMSIZE + \alpha_5 TENURE + \alpha_6 EXTENSION + \mu_0 \quad [10]$$

$$LONGT = \beta_0 + \beta_1 HHEDUC + \beta_2 TRAINING + \beta_3 EXPERIENCE + \beta_4 FARMSIZE + \beta_5 TENURE + \beta_6 EXTENSION + \beta_7 CREDIT + \beta_8 NFINCOM + \beta_9 RIVER + \beta_{10} OUTVALUE + \beta_{11} IRRIGAREA + \beta_{12} MIDTERM + \mu_1 \quad [11]$$

$$MIDTERM = \delta_0 + \delta_1 HHEDUC + \delta_2 TRAINING + \delta_3 EXPERIENCE + \delta_4 FARMSIZE + \delta_5 TENURE + \delta_6 EXTENSION + \delta_7 CREDIT + \delta_8 NFINCOM + \delta_9 OUTVALUE + \delta_{10} DRAFT + \mu_2 \quad [12]$$

$$TVCHA = \partial_0 + \partial_1 HHEDUC + \partial_2 MIDTERM + \partial_3 SEXFARM + \partial_4 EXTENSION + \partial_5 LONGT + \partial_6 TRAINING + \partial_7 NFINCOM + \partial_8 ARABLE + \partial_9 RELATIVE + \mu_3 \quad [13]$$

$$YIELDHA = \sigma_0 + \sigma_1 HHEDUC + \sigma_2 MIDTERM + \sigma_3 TVCHA + \sigma_5 SEXFARM + \sigma_6 PLANT + \sigma_7 EXTENSION + \sigma_8 LONGT + \sigma_9 FARMSIZE + \mu_4 \quad [14]$$

$$CREDIT = \delta_0 + \delta_1 HHEDUC + \delta_2 AGEHHH + \delta_3 LONGT + \delta_4 FARMSIZE + \delta_5 TENURE + \delta_6 EXTENSION + \delta_7 PLANT + \mu_5 \quad [15]$$

Equations [10] to [12], specifying the relationships between tenure security, investment, input use, and yield, were estimated using SPSS. Probit analysis was used to estimate the equations coefficients. Equations [13] and [14] were estimated using multiple regression analysis technique – ordinary least squares (OLS).

Table 1: Land Tenure Econometric Model Variable Description

Variable	Variable Description	Mean
Dependant Variables		
PLANT	farmer has at least a plantation crop (1 = yes, 0 = otherwise);	
LONGT	farmer has long-term investments, i.e. irrigation infrastructure, buildings, paddocks, fencing, (1 = yes, 0 = otherwise);	
MIDTERM	farmer has mid-term investments, i.e. soil and soil water conservation, manuring, (1 = yes, 0 = otherwise);	
TVCHA	annual total variable costs per hectare (Z$/ha),	
YIELDHA	value of annual total farm production/output per hectare (Z$/ha);	
CREDIT	farmer has access to credit (1 = yes, 0 = otherwise);	
Explanatory Variables		
HHHEDUC	education level of farm owner;	
AGEHHH	Age of household head (years);	
TRAINING	farmer received formal agricultural training (1 = yes, 0 = otherwise);	
EXPERIENCE	number of years farming;	
FARMSIZE	total farm size (ha);	
TENURE	tenure type (1 = freehold, 0 = leasehold/permit);	
EXTENSION	farmer receive agricultural extension services (1 = yes, 0 = otherwise);	
NFINCOM	non-farm income (Z$);	
RIVER	farmer has access to a river for irrigation (1 = yes, 0 = otherwise);	
OUTVALUE	value of annual total farm production/output (Z$);	
IRRIGAREA	current area under irrigation (ha);	
DRAFT	farmer has access to draft power (1 = yes, 0 = otherwise);	
SEXFARM	sex of farm owner;	
ARABLE	total farm arable land (ha);	
RELATIVE	farmer receive money from relatives who live away from the farm (1 = yes, 0 = otherwise).	

RESULTS AND DISCUSSION

One of the major hypotheses of this study is that farmers with a more secure tenure are likely to have higher levels of investment compared to farmers with less secure tenure. This is because farmers with more secure land rights may have a higher probability of recouping the benefits from land improvements and thus will be more inclined to make medium- or long-term land improvements and to use complementary yield-increasing inputs. To test this hypothesis, the study looked at whether tenure security influences investment in plantation crops, long-term farm investments and medium-term farm investments. The results are presented in Table 2.

To assess the relationship between land tenure security and investment in plantation crops, the model correctly predicts the presence of plantation crops 76.7% of the time, with a majority in each category correct. Freehold tenure, representing secure tenure, is positively and significantly associated with finding plantation crops on a given farm. As expected a priori, the presence of plantation crops on a farm is positively and significantly affected by farm size. The larger the farm, the more farmers can afford to put some of the land under plantation crops. Conversely, farmers with small farms cannot afford to grow plantation crops. Thus, farmers with more land can afford to hold some of it in plantation crops rather than in higher-density crops or they may opt to hold more of it in plantation crops, which require less intensive labor application than most other crops. The education level of owner farmer, agricultural training, and access to extension services all has negative coefficients. However, these are statistically insignificant. Farming experience, ceteris paribus, does not significantly affect the probability of whether a farmer produces plantation crops or not.

The long-term improvements equation (Equation 11) shows a very good fit, as measured by prediction accuracy. The model correctly predicts 91.1% of the dependent variable, with a majority in each category correctly predicted. Secure tenure, represented by freehold tenure, positively and significantly affects the propensity to make long-term investments – buildings, irrigation infrastructure, and paddocks. The coefficient for experience in farming, which can be used to represent a farmer's age, is not statistically significant.

Table 2: Probit and OLS Model Results

	EQUATION					
	1	**2**	**3**	**4**	**5**	**6**
	Probit	**Probit**	**Probit**	**Probit**	**OLS**	**OLS**
Variable	**PLANT**	**LONGT**	**MIDTERM**	**CREDIT**	**TVCHA**	**YIELDHA**
CONSTANT	-0.06211 (-0.140)	0.30592 (0.306)	-0.38986 (0.252)	-3.661 (-7.394***)	-22944 (-0.527)	-19191 (-0.497)
CREDIT		0.80074 (1.095)				
MIDTERM		0.31392 (0.457)			98130 (0.265)	12590 (0.373)
LONGT				.364 (1.169)	25001 (0.082)	10872 (0.397)
TVCHA						0.155 (0.916)
PLANT				-.155 (-.866)		-9612.8 (-0.661)
HHHEDUC	-0.06821 (-0.642)	-0.12003 (-0.703)	-0.18914 (-0.628)	-011 (-.192)	-21011 (-0.422)	7825.8 (1.717)
AGEHHH				.009 (1.618)		
TRAINING	-0.09592 (-0.247)	8.18947 (0.000)	-3.60229 (-2.098*)		20091 (91.147)	
EXPERIENCE	0.01552 (1.025)	0.11330 (0.177)	0.24236 (1.919)			
FARMSIZE	0.01982 (1.882)	-.48491 (-1.821)	-0.01265 (-0.365)	-007 (-1.056)		990.58 (3.382**)
TENURE	0.99552 (2.460*)	2.50989 (2.121*)	0.74584 (0.914)	0.355 (1.820*)		
EXTENSION	-0.43641 (-1.278)	-0.49302 (-0.755)	0.33648 (0.335)	.262 (1.069)	14790 (0.825)	-33652 (-2.080*)
NFINCOM		-0.42848 (-0.833)	0.80863 (0.874)		22267 (1.533)	
RIVER		1.06616 (1.393)				
OUTVALUE		0.13591 (2.548*)	0.00003 (2.385*)			
IRRIGAREA		0.26132 (0.611)				
DRAFT			-1.25389 (-1.524)			
SEXFARM					94113 (0.467)	17413 (0.954)
ARABLE					2775.9 (0.686)	
RELATIVE					-20742 (-1.412)	
% correct prediction	76.7%	91.2%	94.7%	81.9%		
Adj. R^2					1.5%	14.3%
F					0.852	2.833
Sig. F					0.571	0.008

Farm size is negatively and significantly associated with long-term land improvements. This result is not as expected *a priori*. A larger farm would be expected to generate a greater marketed surplus, which could be reinvested on the farm. The coefficients for the presence of a river or irrigation facilities on the farm prior to acquisition are positive, indicating that these influence further long-term investments on the farm. However, the coefficients are not significant, thus the presence of a river or irrigation facilities prior to acquisition does not seem to have any influence on subsequent long-term improvements.

The coefficients for the education level of the owner farmer, formal agricultural training, access to extension services and credit, access to non-farm income, and medium-term investments (i.e. soil conservation) are not significant. Thus, these variables seem not to affect the propensity to make long-term farm investments.

The model for medium-term investments in soil improvement (Equation 12) has a very good predictive record. The model correctly predicts 94.6% of the dependent variable's values on medium-term investments. Contrary to expectations, secure tenure, as in freehold tenure, have an insignificant coefficient for this equation. Thus security of tenure does not seem to affect medium-term investments in soil improvements. Medium-term investments in soil improvement are positively and significantly affected by experience in farming and agricultural output. As experience in farming increases, farmers tend to invest in soil improvements. Similarly, higher agricultural output propels an investment in soil improvements.

Contrary to a priori expectations, medium-term investments are negatively and significantly affected by formal agricultural training. The result seems to indicate that ceteris paribus, farmers with formal agricultural training have a lower probability of investing in soil improvements than farmers who did not receive formal agricultural training.

The probability of making medium-term investments in soil improvement is not significantly affected by the education level of the owner farmer, farm size, and access to extension services, access to credit, access to non-farm income, and access to draft power for land preparation.

The model estimation for investment in variable inputs (Equation 13) show that the included explanatory variables account for only 1.5% of the variation in the dependent variable. The model results seem to indicate that the level of input use is not significantly affected by the level of long-term and medium-term farm investments, the education level of owner farmer, sex of owner farmer, access to extension services, access to formal agricultural training, and arable land acreage.

The second major hypothesis of the study is that farms under freehold tenure have higher productivity than those under leasehold tenure. Tenure security may enhance long-term investments, which in turn enhance yields. Tenure security provides farmers with adequate incentives or means to make land improvements or adopt new technologies that could enhance production efficiency (Parsons, 1971). Estimation of the equation for the value of agricultural output per hectare (YIELDHA) (Equation 14) accounts for 14.3% of the variation in yield (Table 30). The variables for medium and long-term farm investment have insignificant coefficients. Thus, medium-term and long-term investments do not seem to affect farm productivity. This result is not as expected. A priori, both medium-term and long-term investments are expected to positively

impact on farm productivity. Contrary to expectations, the coefficient for the level of input use is also statistically insignificant. YIELD is positively and significantly affected by the level of education of owner farmer and farm size. As the level of education of the owner farmer increases, farm productivity increases.

Contrary to expectations, as the farm size increases, farm productivity increases. A priori, as farm size increases, yield is expected to decrease indicating that inefficiencies arise in production on larger farms. This might be attributed to the ability of large farm holders to fallow their land and they can continually cultivate on land previously under fallow – resulting in higher yields. This might also be attributed to the ability of large land holders to grow a diversity of crops – food crops, cash crops, and plantation crops. This diversity in the crops grown results in increased productivity. However, the presence of plantation crops on a farm seems to result in lower productivity as indicated by the negative coefficient for the variable PLANT. However, the coefficient is insignificant.

Contrary to expectations, the coefficient for access to extension services in negative and significant. Thus farmers with access to extension services, *ceteris paribus*, have a lower productivity than farmers who do not have access to extension services.

The model for access to credit (Equation 15) has a good predictive record for those without access to credit. The model correctly predicts 81.8% of the dependent variable's values on access to credit. As expected *a priori*, secure tenure, as in freehold tenure, positively and significantly affects access to credit. Thus security of tenure seems to affect access to seasonal credit for farm inputs. The probability of accessing credit is not significantly affected by the education level of the owner farmer, farm size, access to extension services, on-farm long-term investments, and whether the farmer has plantation crops or not. This is indicated by the insignificant coefficients for these variables.

CONCLUSION

This paper examined the determinants of investment, input use, and productivity in agriculture under freehold and permit tenure systems in the small-scale farming areas of Zimbabwe. This study has shown that the freehold tenure system is associated with a higher propensity to (i) make long-term investments in land improvement, (ii) invest in plantation crops, and (iii) access credit. The results for long-term investment and plantation crops suggest that land tenure may influence the long view taken by farm managers. Tenure security appears not to significantly affect medium term soil improvements. The higher output farms tend to have higher investment in such improvements. Against expectations, those with formal training in agriculture are less likely to be investing in medium-term improvements. One possible explanation is that those trained in agriculture have a strong production focus with an emphasis on the short-term.

The results of this study are similar to those obtained by Feder and Onchan (1987) and Hayes and Roth (1997). Feder and Onchan (1987) investigated the impact of land ownership security on farm investment and land improvements in Thailand. They found that land-improving investments were significantly affected by ownership security, and also that ownership security enhances capital formation by providing better incentives and improved access to credit. Roth and Haase (1998) also

found that farmers with more secure tenure are more likely to make medium- to long-term land improvements because they will be more likely to benefit from investment. Thus tenure security promotes sustainable resource management. The results are also similar to those of Hayes and Roth (1997) on the other hand investigated the impacts of different levels of tenure security on farm investment, input use, and yield in order to examine the role of tenure security in increasing agricultural production. In their study they found positive relationships between tenure security, the propensity to make long term land improvements, and the presence of trees on a plot. Also long term land improvements were found to enhance yield. These results are similar to the ones obtained by this study as well.

The results of this study help us to identify some important non-tenure-related determinants of investment, input use, and yields. The important variable to investing in plantation crop is farm size. Larger farm sizes are conducive to establishing plantation crops. Higher agricultural output seems to be associated with a higher propensity to make long-term investments in farm buildings, irrigation infrastructure, and paddocks as well as medium term investments in soil improvement. Experience in farming is also an important determinant in making investments in medium-term soil improvements. Contrary to *a priori* expectations, (i) formal agricultural training is negatively associated with medium-term soil investments; and (ii) access to extension services is negatively associated with farm productivity.

Overall, the results of this study have shown that tenure security is an important determinant in influencing farmers' capacity to invest in long-term productive activities and in the sustainable management of their resources. Thus tenure security significantly contributes to sustainable agriculture and rural development.

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ABOUT THE AUTHORS

Lighton Dube is a Senior Lecturer in the Faculty of Commerce and Law, Zimbabwe Open University

Emmanuel Guveya is a Consultant Agricultural Economist with the Department of Agriculture, Rural Development and Land Administration, Mpumalanga, Republic of South Africa.