Relationship Between Communal Leasehold Right and Investment in Small-Scale Farms: A Case Study in Kavango West, Mpungu Constituency

Paulus Mekondjo Amaambo
Master's Degree student, Namibian University of Science and Technology, Department of Agriculture and Natural Resources, Sciences. 13 Storch Street, Private Bag 13388. Windhoek, Namibia

David Uchezuba*
Senior Lecturer Namibian University of Science and Technology, Department of Agriculture and Natural Resources, Sciences. 13 Storch Street, Private Bag 13388. Windhoek, Namibia

Acknowledgement: This research is financed by the Programme for Communal Land Development in Namibia

Abstract
The government of the Republic of Namibia enacted the Communal Land Reform Act (Act No. 5 of 2002) to ensure the smooth administration and management of communal land resources. The impact of land reform on agricultural production and investments has had mixed results as to whether security of tenure enhances investment and productivity. This study assesses the level of investments made by beneficiaries of the leasehold rights, determines the relationship between access to leasehold rights and investments, and assesses the perceptions of the farmers on the Communal Land Reform Act using the independent T-test, Binary Logistic Regression model and situation analysis. The results indicate that leasehold tenure rights have positive effects on farmers' decisions to invest in physical farm infrastructure. Private farmers were found to invest more than farmers in the communal land zone did. Using the situational analysis, the perception of the farmers toward the Communal Land reform Act shows that leasehold land rights are accepted to have impact on investments, while the customary land rights do not have significant impact on investments, and the farmers did not recognise its importance. Awareness campaigns on the importance of customary land registration and the importance of farm investments must be intensified. Further research is recommended on farm investments.
Keywords: farm investment, land reform, security of tenure, leasehold rights, binary logistic

1. Introduction

A form of communal land reform initiative has been in place in many countries since the 19th century. Alufah (2015) has observed that, across most of the sub-Saharan African region, communal land was neglected in the past due to colonial administration. The main objectives of land reform processes are to ensure security of tenure, improve land productivity, and enhance investment.

Namibia encompasses 825 418 square kilometres, with 15% being state land (including national parks and desert), 44% freehold/commercial farms, and 41% communal land (Mendelsohn & El Obeid, 2003). In the communal area, agricultural production is primarily subsistence in nature, which is mainly associated with a social and cultural way of farming rather than the economic norm. In addition, there is no proper control over land and livestock (Werner, Adams & Vale, 1990).

The government of the Republic of Namibia initiated the communal land registration programme in 2003 under the communal land development programme, in line with the Communal Land Reform Act, No. 5 of 2002. This programme involves the registration of customary, occupational, and leasehold land rights. The land registration programme is aimed at enhancing investment to improve land productivity in communal areas. According to the Ministry of Land Reform (2013), the registration of communal land rights seeks to enhance security of tenure for the land holders, to give legal documentary proof to land holders, to avoid land disputes between family and neighbours, to provide the right to compensation for registered land holders, and most importantly, to give land holders the liberty to invest in their land. The Ministry of Land Reform (2007) designated and gazetted small-scale commercial farming in communal areas primarily for livestock farming in the Kavango, Ohangwena, Zambezi, Omusati and Omaheke regions, and these farming units have been surveyed as having an average of 2500 hectares each. This concept is supported by the study conducted in Malawi by Chirwa (2006), which established that access to larger parcels of land was associated with the commercialisation of food crops in Malawi. The primary objectives of the policy are to develop the underutilised land and to ensure security of tenure for the farmers by issuing them with leasehold rights for periods ranging from 25 years to a maximum of 99 years. The longer lease period seeks to encourage maximum investment in the land. As previously mentioned, the study by Li, Rozelle and Brandt (1998) indicated that the right to use land for long periods of time encourages the use of land saving investments and that land tenure influences agricultural production decisions.

Literatures indicates that there are mixed results as to whether security of tenure enhances investment and agricultural productivity in communal areas (Brasselle, Gaspart & Platteau, 2002; Chirwa, 2005a & 2005b; Do & Iyer, 2008; Gavian & Ehui, 1999; Gebremedhin & Swinton, 2003; GOM & World Bank, 2006; Graham & Darroch, 2001; Green & Ng'ong'ola, 1993; Li *et al* 1998; Mukherjee & Benson, 2003; Place & Otsuka, 2002; Purnell, 1995;Smith, 2004).

The mixed results elsewhere and the current programme of the Ministry of Land Reform justifies the need for further research on whether, in the Namibian case, security of tenure leads to an increase in investment in farms by the beneficiaries. The objectives of this study are to assess the levels of investment by beneficiaries of the leasehold rights and to determine the relationship between access to leasehold rights and investment by farmers, as well as to assess farmers 'perceptions of the Communal Land Reform Act, Act No. 5 of 2002.

2. Materials and methods

A cross-sectional survey design was employed for this study. The sampling was conducted using the multistage sampling method. Firstly, the population was divided into smaller groups (strata) and farmers were stratified by gender. Secondly, random sampling was used to select actual respondents from each stratum. Mitelhammer (1996) stated that an object from a population must be selected in such a way that each object has an equal chance of being selected. A total of 510 farmers were interviewed. The structured questionnaire was designed and administered during farmers meetings, through emails and phone calls. Details of the farmers where obtained from the Ministry of Land Reform and traditional authority villages headmen. The data were analysed using the SPSS program.

2.1 Data collection and analysis

Ghauri, Grønhaug and Kristianslund(1995) stated that when conducting research, collected data can be either secondary or primary. Bryman and Bell (2007) observed that primary data comprise the information that the researcher gathers on his own by using tests, questionnaires and interviews. On the other hand, secondary data refers to data such as literature, documents and articles collected by other institutions and researchers (Bryman & Bell, 2007). In this study, both primary and secondary data were collected. Primary data were collected using a structured questionnaire, containing both open-ended and closed-ended questions, and the questionnaire was administered through personal interviews and emails, while telephone interviews were held with selected farmers.

An independent T-test was used to compute the descriptive statistics in order to provide visual information and data descriptions between the private and communal farmers. Using a binary logistic regression, two sets of models where fit, namely the land tenure and investment model. Firstly, a land tenure model was used to investigate the effect of the land tenure system on farm investment. Secondly, an investment model was used to investigate whether having adequate farm investment influences the acquisition of tenure rights and whether investment decisions have effects on other investments. The following data points were used in the regression model: gender, education, age, total number of household members, farming experience, investment in fences, boreholes, farm houses, generators, solar energy, water piping, water troughs and water tanks.

2.2 Empirical model/estimation procedure

The equation for the logit model was formulated as follows:

$$Z_i = \ln(\frac{p_i}{1-p_i}) = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_n X_n \quad \ldots\ldots 2.1$$

where Zi denotes 1 or 0;
where Zi is the probability that a farmer has invested or did not invest in any of the investment types, given Xi;
$X1$ and$B1$ represents the explanatory variable (covariates) to be estimated; and
α and β are the estimated parameters.
It is now clear that as P moves from 0 to 1, the logit goes from negative infinity or lemniscate to positive infinity (- ∞ to ∞). This means that, even though the probabilities are positioned between 0 and 1, the logit are not so bounded (Gujarati, 1995). Therefore, by taking the disturbance term μ_{1i} into consideration, the equation (2.1) was re-formulated as follows:

$$Zi = \alpha + \sum_{j=1}^{m} \beta_i X_i + \mu_i \quad \ldots\ldots 2.2$$

where Zi denotes 1 or 0;
where Zi is the probability that a farmer has invested or did not invest in any of the investment types given Xi;
Xi represents the explanatory variable (covariates) to be estimated;
α and β are the estimated parameters; and

μi represents error term or disturbance term.

Equation 2.2 above was used as a guiding econometric model for the analysis in this study. Furthermore, this model was used in the analysis of possible variables that might have an effect on the investment decisions made by the farmers on different types of investments. As observed by Hanushek and Jackson (1977), the coefficient of the Logit Regression Model indicates the change in the log of the odds that are associated with a change in the explanatory variables.

3. Results and discussion

3.1 Descriptive statistics

The descriptive statistics in Table 1 indicate that the mean educational level is 0.84 for private farmers and 0.33 for communal farmers. This means that, at least, the farmers with leasehold land title are more educated than those who reside in the communal land zone are. The mean average age for leaseholders is 48 years, and communal farmers who are non-leaseholders have a mean value of 51 years. This means that greater numbers of older farmers are found in communal land zone than those of private farmers. One of the interesting results is that the communal farmers have more experience in farming then the private farmers do. This could be attributed to the fact that communal farmers had been farming for many years before the private land zone was designated for livestock farming. However, the communal farmers do not have financial power to make investments, hence they have invested less than the private farmers have, despite them having more farming experience.

Private farmers have invested more in fencing, with a mean value of 0.62 as compared with 0.01 for communal farmers. Private farmers have also invested in drilling and repairing of boreholes, with a mean value of 0.37 as compared with a mean value of 0.4 for farmers in the communal land zone. Mahabile, Lyne and Panin (2002) found that private farmers have invested more in boreholes and fencing than communal farmers have. Interestingly, farmers in the communal land zone have invested more in the construction of houses, compared with those in the private sector, as indicated by a mean value of 1 for communal farmers, and 0.47 for private farmers. Generators, solar installations, water pipes, water tanks and tick removers recorded higher mean values for private farmers than the investment decisions made by the communal farmers did. Private and communal farmers have the same investment levels for water troughs, with a mean value of 0.2.

Private farmers have invested in goats, with a mean value of 1.53, compared with communal farmers with a mean value of 0.98. The private farmers have invested in cattle at a mean value of 0.31, compared with 0.04 for communal farmers. Additionally, private farmers have invested in the purchase of bulls to improve their breed, with a mean value of 0.12, compared with 0.00 mean values for communal farmers.

When it comes to livestock ownership, the private farmers own an average of 81 cattle, compared with9 head of cattle per communal farmer. This also indicates that a private farmer produce around 31 calves per year, compared with 2 calves for each communal farmer. This implies that the herd productivity and calving mean value are much higher on private farms than among communal farmers in the study area. Behnke (1987) and Scones (1992) observed the same results regarding these two investments. The income data from the farms were also collected and computed. Interestingly, farmers in the communal land zone received a greater annual income – N$4816.86 – from their farm products, such as mahangu (pearl millet), beans and maize, while the private farmers recorded N$785.10, which is significantly less than communal farmers, and they are mainly recorded this income from selling firewood and thatch grass. These findings could be attributed to the fact that private farmers are concentrating more on livestock farming than subsistence farmers do in the communal land zone.

Table 1: Descriptive statistic of variables for private and communal farmers' level of investments

Variables	Study area	Mean (N=510)	Std. Deviation	Variables	Study area	Mean (N=510)	Std. Deviation
Gender	Private	0.31	0.462	**Goats bough (Quantity)**	Private	1.53	6.147
	Communal	0.29	0.457		Communal	0.98	2.704
Education	Private	0.84	0.368	**Cattle bought(Quantity)**	Private	0.31	2.117
	Communal	0.33	0.471		Communal	0.04	0.347
Age (Years)	Private	48	0.25	**Different supplement investment**	Private	0.17	0.379
	Communal	51	0.22		Communal	0.00	0.063
Total Number of Household Members	Private	4.72	2.526	**Buying bull(Quantity)**	Private	0.12	0.504
	Communal	5.42	2.008		Communal	0.00	0.063
Farming Experience (years)	Private	2.67	0.641	**Tick remover investment**	Private	0.06	0.236
	Communal	3.11	0.318		Communal	0.01	0.108
Fence Investment	Private	0.62	0.485	**Income per year from cattle(N$)**	Private	11860.22	30893.864
	Communal	0.01	0		Communal	0.00	0
Borehole investment	Private	0.37	0.483	**Income per year from goats(N$)**	Private	810.29	3056.191
	Communal	0.04	0.204		Communal	0.00	0
Farmhouse investment	Private	0.47	0.5	**Income per year from sheep(N$)**	Private	24.31	290.867
	Communal	1.00	0		Communal	0.00	0
Generator investment	Private	0.15	0.361	**Number of livestock owned**	Private	80.63	53.802
	Communal	0.04	0.194		Communal	9.26	4.044
Solar investment	Private	0.17	0.375	**Calves born each year**	Private	30.67	22.131
	Communal	0.01	0.108		Communal	1.86	1.885
Water pipe investment	Private	0.07	0.263	**Heifers sold in 2015**	Private	0.40	2.737
	Communal	0.03	0.164		Communal	0.09	0.421
Water trough investment	Private	0.02	0.152	**Other income from the farm per year (N$)**	Private	785.10	4759.426
	Communal	0.02	0.139		Communal	4816.86	4749.421
Water tank investment	Private	0.23	0.423	**Nonfarm income each year(Salary)**	Private	139866.68	156788.428
	Communal	0.01	0.108		Communal	19619.06	45298.556

3.2 Regression results

Using the binary logistic regression model, two sets of models were fit. Firstly, an investment model was used to investigate the effect of the land tenure system on farm investment, and secondly, a land tenure model was used to investigate whether having adequate farm investments influences the acquisition of tenure rights.

The model summary indicates a high *Nagelkerke's* R^2 of 0.864 which is higher than the *Cox and Snell* of 0.648. The *Nagelkerke's* R^2 is normally higher than the *Cox and Snell*, which represents the standard acceptable results in logistic regression. The results of this study indicate that *Nagelkerke's* R^2 is 0.864. This indicates a very strong relationship of 86.4% between the predictors (independent variables) and the prediction (dependent variable) as presented above. In other words, this explained variation ranges between 64.8% and 86.4% of the variation

Using a statistical significant benchmark of 0.05, the results of the *Hosmer and Lemeshow* test indicate a test value of 7.518. These values are greater than 0.05, which indicates the statistical insignificant, and this means that the model fits well with the data. Hosmer and Lemeshow (1989), Agresti and Hartzel (2000), and Monela and Kayunze (2014) observed that a finding of non-significance means that the model adequately fits the data.

The land tenure model indicates that the variables that made significant contributions to prediction are education, age, fence investment, and water tank with $p = 0.000$, while solar energy recorded $p = 0.016$. This finding indicates that farmers' education and age, and the investment in fences, water tanks and solar energy increase the probability of applying for land tenure or of having security of land tenure. This finding is consistent with previous a study by Alufah (2015). Similarly, Danso-Abbeam,Setsoafia and Ansah (2014) found similar results, to the effect that education had a significant, positive effect on farmers' investment in agrochemicals.

In Table 2, the Exp(B) value indicates that when investment in fences is raised by one unit (fence investment), the odds ratio is 110.803 times as large, and therefore farmers are 110.803 times more likely to acquire land tenure. Additionally, when the farmer age is raised by one unit (farmer age), the odds ratio is 63.755 times as large, and therefore farmers are 63.755 times more likely to acquire land tenure. With regard to solar investment, the Exp(B) value indicates that when investment in solar equipment is raised by one unit (solar), the odds ratio is 10.424 times as large, and therefore farmers who invested in solar equipment are 10.424 times more likely to acquire land tenure. The Exp(B) value for water tank investment indicates that when water tank investment is raised by one unit, the odds ratio is 35.149 times as large, and therefore farmers who invested in water tanks are 35.149 times more likely to acquire land tenure.

The regression result explains that farming experience is negative and statistically significant. This implies that the experience of the farmers does not contribute positively to a farmer's decision to apply for land tenure. Moreover, farmers who own private farms are mainly in the middle class and those with the financial means, but are not necessarily farmers with farming experience. This is evident, in that owning a land title does not necessarily mean that the farmer would be sufficiently experienced to contemplate owning a farm through land title; this has more to do with an individual's decision to acquire a farm and to safeguard it through obtaining security of tenure. Gockowski and Ndoumbé (2004) reported that young farmers are more likely to adopt new technologies. Therefore, the age of the farmer gave a positive effect and significant results that indicate that a farmer's age is an influential characteristic of those farmers who would apply for land rights. Wagayehu and Lars (2003) reported that older farmers were more likely to be reluctant in their decisions to take up new technologies because of their short planning horizons. Similarly, this study found that a lower age of a farmer has a positive effect and contributed significantly to the farmer's decision to apply for land rights.

3.2.1 Investment model

The second model used was an investment model which was utilised to investigate whether having adequate farm investment influences the acquisition of tenure rights. The model summary is indicated in Table 3 and Table 4. The details of information from the model summary are not presented here since they are straight forward and are only presented in the result tables. The different investments, namely in fences, boreholes, farm houses, generators, solar equipment, water pipes, water troughs and water tanks, were categorised as dependent variables in the model, while the farmers' socio-characteristics and land tenure details were used in the analysis as independent variables. Table 3 and Table 4 indicate the results of this analysis, with the Exp(B) value, p value and the model summary for each investment model. The results of this model indicates that when the Exp(B) value predictor is larger than 1, that particular predictor has a positive effect on the prediction because of the positive sign, while if the Exp(B) value is less than 1, that particular predictor has a negative effect on the dependent variable due to its negative sign in terms of the b coefficient.

3.2.2 Investments versus tenure security

The variables that made a significant contribution to the prediction of investment in fencing are borehole investment, with $p = 0.000$, and land tenure with $p = 0.000$. The main observation with regard to a farmer's decision to invest in fencing is that the probability of investing in fencing is higher for farmers who have been issued with a land title. Farmers who have invested in boreholes have a higher probability of investing in fencing. In Table 4, the Exp(B) value for fencing investment indicates that a farmer with land tenure is 70.811 times more likely to invest in fencing, compared with a farmer without tenure security. Smith (2004) and Zhllima and Imami (2012) found similar results to the effect that tenure security enhances physical investments. The result also shows that one type of farm investment can influence investment in another type. For instance, investing in a borehole renders the farmer 5.170 times more likely to invest in fencing. Similar results were found by Smith (2004) and Zhllima and Imami (2012). The investment in boreholes was found to be influenced by education, with $p = 0.039$, solar energy investment with $p = 0.002$, water tank investment with $p = 0.010$, and fencing investment with $p = 0.000$. This implies that education, solar energy, water tank and fencing investments have positive effects and are statistically significant when it comes to influencing the probability of farmers investing in boreholes.

The significant and positive effect of the education predictor on borehole investment implies that the probability of farmers investing in boreholes is higher for farmers who have a higher educational level, as compared to farmers who are less educated or are illiterate. Wynne and Lyne (2003) found that farmers who have a better education tend to allocate resources more efficiently and to invest in new technology more than the farmers who are less educated do. These findings are in conformity with the finding of this study because a farmer needs to understand the need to invest in water facilities to supply water to livestock. Consequently, it is obvious that educated farmers have greater knowledge of the prevailing economic growth of the region, a greater ability to understand and respond to anticipated policy changes, a greater ability to forecast future scenarios such as drought, and better access to information and opportunities than other farmers do with regard to the commercialisation of livestock production. Danso-Abbeam *et al*. (2014) similarly found education to have a significant positive effect on a farmer's investment in agrochemicals.

Additionally, the model findings in Table 4 indicate a negative b coefficient for farmers age, which is statistically significant, at $p = 0.000$, in relation to a farmer's decision to invest in a borehole. Acquah (2011) found that a farmer's age has a negative effect on the decision to adopt to climate change strategies. Furthermore, farmers who have invested in generators, solar energy, water tanks and fencing are more likely to invest in boreholes because of the positive effect of the b coefficient on the decision to invest in boreholes. In Table 4, the Exp(B) value for borehole investment shows that farmers who invest in fencing are 5.108 times more likely to invest in boreholes.

The result shows that farmhouse investment was influenced statistically by the farmer's age, with $p = 0.001$. This implies that the farmer's age predictor has a significant effect on a farmer's decision whether or not to invest in a farmhouse. The predictors for generator investment that are statistically significant comprise the number of household members, with $p = 0.004$, and water tank investment, with $p = 0.008$. The results explain that the number of household members and the investments in water tanks are statistically significant and have a positive effect on the farmer's decision to invest in a generator. The level of significance and the positive effect of the number of household members could be attributed to the fact that household members assist with farm labour, particularly in farming activities such as the weeding of crop fields, threshing, herding of livestock and other activities in communal land zones. Dengu and Lyne (2007) found that in the communal areas of the KwaZulu-Natal Province of South Africa, there was a positive, significant relationship between family labour and level of investment in crop production. This finding is consistent with the finding of this study that the number of household members has a positive effect on the farmer's decision to invest due to shared farm labour.

Table 5 indicates investments in solar energy, water pipes, water troughs and water tanks as dependent variables. The predictors that are statistically significant for solar energy investment are land tenure, with a statistical significance of p = 0.000, and borehole investment that is significant at p = 0.002. The farmers with land tenure have a positive probability effect for investing in solar energy. This could be attributed to the fact that farmers are more secure when it comes to investing where there is security under their name, rather than when investing in land where they are not sure if they might one day be evicted or a dispute might arise and they would not have any documentary evidence to prove land ownership. The Exp(B) value for solar energy investment indicates that farmers with secure tenure are 12.132 times more likely to invest in solar energy, and that investment in boreholes positively influences the investment in solar energy (Table 5).

Water pipe investment has two predictors that are statistically significant with a negative b coefficient, namely number of household members, with p = 0.008, and farming experience with p = 0.038. This implies that the statistically significant predictors contribute negatively to a farmer's decision to invest in water pipes. The solar energy investment predictor was found to be statistically significant at p = 0.052 and positive with an odds ratio of 5.201 for water trough investment. The water tank investment shows that land tenure is statistically significant at p = 0.000 with the odds ratio of 16.233, borehole investment at p = 0.008 with the odd ratio of 2.543, and generator investment at p = 0.007 with odd ratio of 2.932. This implies that farmers who have acquired land tenure have a high probability of investing in water tanks due to tenure security. The predictors of borehole and generator investments have a positive effect on a farmer's decision to invest in a water tank. The age predictor was found to be negative on fence investment, borehole investment, generator investment, solar investment, water pipe investment, water trough investment, and water tank investment. This implies that the probability of a farmer investing in these investments significantly decreases as the farmer grows older. Such farmers have less interest in making investment decisions on these physical investments. This might be because older farmers do not see the necessity to improve their farming profitability by providing these infrastructure items on their farms, notwithstanding that these might enable them to farm commercially. Acquah (2011) found that a farmer's age has a negative effect on the farmer's decisions to adopt to climate change strategies.

3.3 Farmers' perceptions of the Communal Land Reform Act

The perceptions of the farmers toward the Communal Land Reform Act (Act No. 5 of 2002) were examined through a situational analysis exercise. The respondents were asked for their reasons for applying for their leasehold rights in the private land zone, and reasons for not applying for customary land rights in respect of those farmers who reside in the communal land zone. The allocation of the farming units started with a farmer approaching the Ukwangali and Mbunza traditional authorities where these farming units are situated. Farmers are issued with consent letters, in consultation with the farming and land committee of the respective traditional authorities. Farmers consider the consent letters issued by the traditional authorities to be insufficient to enable them to invest in their farms. This supports the evidence noted by Shiferaw and Holden (1999) and Kabubo-Mariara (2004; 2007) who observed that farmers are inhibited from investing in technology and obtaining credit for making investments by the weak security of tenure provided by traditional indigenous property rights and the lack of land titles.

The respondents in the private land zone indicated that the main reason for them applying is to secure their farms and to make investments. Additionally, farmers indicated that in Kavango west, they have accepted registering for leasehold land rights, although they did not accept the registration of their customary land rights. This was mainly the position of farmers in the communal land area which is zoned for the allocation of customary land rights in terms of the Communal Land Reform Act (Act No. 5 of 2002). However, this indicates that not all the provisions of the Communal Land Reform Act (Act No. 5 of 2002) are accepted for implementation by the respondents. The respondents reasoned that customary land registration is not in conformity with the way they live. Therefore, the perception of the farmers is that while there are provisions that they are happy with, there other provisions which they require the policy makers to review. Mendelson (2008) observed that confusion regarding land registration was caused by the actions of 10 traditional authorities in Zambezi Region, 5 traditional authorities in the Kavango Region, and by Otjikaoko traditional authorities in the Kunene Region. Mendelson (2008) further argued that the reluctance by traditional authorities to support land registration stemmed from grievances that were not directly related to land registration. Mendelson (2008) further noted that the views on land registration were mainly expressed by senior leaders. This study found similar evidence, as the farmers interviewed in the communal land zone indicated that they were not supporting the customary land rights registration since it is against their customs and traditional way of life to register traditional land. They also noted that their traditional chief and senior leaders had taken a stance not to apply for customary land rights registration, and as such, the subjects have to follow their traditional chief and senior leaders, and this is their custom since time immemorial.

4. Conclusions and recommendations

4.1 Conclusion

The predictors of education, age, fence investments, solar investment and water tank investment have positive effects on the land tenure model.

Furthermore, the results indicate that farmers invest more in the private land zone than in the communal land zone because individuals are more willing to invest where they feel that their investments are secured. The investment in fencing is mainly associated with the control of livestock movement and better land management through rotational grazing. It is also logical that water plays a major role in farming. It was found that water is one of the main variables, identified with a positive b coefficient in terms of borehole investment, and contributed positively to the decisions of the farmers to apply for or to own land title, and to farm commercially.

The lack of investment in the communal land zone is attributed to the fact that customary land rights are not surveyed according to the appropriate procedures / standards. As a result, they cannot be registered as legal deeds in the Deeds Office in terms of the Communal Land Reform Act (Act No. 5 of 2002),thus reducing their capital value because they cannot be used as collateral for investment.

4.2 Recommendations

There is a need to intensify the awareness campaign on land registration, particularly in the communal land zone where the importance of land titles is not well understood, as identified by the findings of this study. The lack of interest among community members in the communal land zone in registering for customary land rights, as evidenced by the farmers' perceptions of the Communal Land Reform Act (Act No. 5 of 2002), is mainly attributed to the lack of formal tradability, of collateral and of rights for commercial use, in addition to political and social reasons provided by the respondents. It is therefore recommended that the policy on the land tenure system should accommodate tradability and collateral in order to realise the full potential of communal land and to enhance investments thereon.

Educated farmers have a high probability of investing in physical investments. Therefore, development partners, government, and other agencies should invest in the education of private and communal farmers, since this enhances the probability of farm investments materialising. Furthermore, there are many gaps that need to be explored by further study. For example, there is a need to look at the effect of the land tenure system on insurance, risk mitigation, and premium payments for livestock or crops during drought. Further studies could examine land tenure systems and credit, and land tenure systems and the land market, particularly where there are many illegal land sales in a communal area. These studies might produce results to unlock the economic potential of communal land in Namibia. As suggested by de Soto (2000), further studies on the effects of different land tenure systems on rangeland management, on land tenure systems and employment creation, and on the effect of land tenure systems on culture would enhance the theories based on the different results obtained in other countries, within the context of Namibia.

References

Acquah, H.D. (2011). Farmers' perception and adaptation to climate change effects: A willingness to pay. *J. Sustain. Dev. Afr.,*13: 150-161.

Agresti, A. & Hartzel, J. (2000). Strategies for comparing treatments on a binary response with multi centre data. *Stats. Medic.*, 19(8): 1115-1139.

Alufah, S. (2015). *The effects of land tenure systems and investments on cocoa productivity in Ghana*. Thesis submitted in partial fulfilment of the requirements for the degree of Master of Philosophy in Agricultural Economics. Kwame Nkrumah University of Science and Technology, Department of Agricultural Economics, Agribusiness and Extension.

Behnke, R.H. (1987). Cattle accumulation and the commercialization of the traditional livestock industry in Botswana. *Agricultural Systems*, 24(1): 1-29.

Brasselle, A.; Gaspart, F. & Platteau, J.P. (2002). Land tenure security and investment incentives: Puzzling evidence from Burkina Faso. *Journal of Development Economics*, 67(2): 371-420.

Bryman, A. & Bell, E. (2007).*Business research methods,* 2nd Edition. Oxford: Oxford University Press.

Chirwa, E.W. (2005a). Pro-poor growth in agriculture and the land question in Malawi. *Department of Economics Working Paper 2005/01.*Zomba: Chancellor College.

Chirwa, E.W. (2005b). Adoption of fertilizer and hybrid seeds among smallholder maize farmers in Southern Malawi. *Development Southern Africa*, 22:1-12.

Chirwa, E.W. (2006). Commercialisation of food crops in rural Malawi: Insights from the household survey. *Department of Economics Working Paper 2006/04*.Zomba: Chancellor College.
Danso-Abbeam, G.; Setsoafia, E.D. & Ansah, I.G.K. (2014).Modelling farmers' investment in agrochemicals: The experience of smallholder cocoa farmers in Ghana. *Research in Applied Economics*, 6(4): 1-16.
Dengu, T. & Lyne, M.C. (2007). Secure land rental contracts and agricultural investment in two communal areas of KwaZulu-Natal. *Journal of Agrekon*, 46(3): 398-409.
De Soto, H. (2000). *The mystery of capital*. New York, NY: Basic Books.
Do, Q. & Iyer, L. (2008). Land titling and rural transition in Vietnam. *Economic Development and Cultural Change*, 56(3): 531-576.
Gavian, S. & Ehui, S. (1999). Measuring the production efficiency of alternative land tenure contracts in a mixed crop-livestock system in Ethiopia. *Agricultural Economics*, 20(1999): 37-49.
Gebremedhin, B. & Swinton, S.M. (2003). Investment in soil conservation in northern Ethiopia: The role of land tenure security and public programs. *Agricultural Economics*, 29: 60-89.
Ghauri, P.; Grønhaug, K. & Kristianslund, I. (1995).*Research methods in business studies: A practical study*. New York, NY: Prentice-Hall.
Gockowski, J. & Ndoumbé, M. (2004).The adoption of intensive mono-crop horticulture in Southern Cameroon. *Agricultural Economics*, 30: 195-202.
GOM (Government of Malawi) and World Bank. (2006). *Malawi poverty and vulnerability assessment: Investing in our future*. Lilongwe: Ministry of Economic Planning and Development.
Graham, A.W. & Darroch, M.A.G. (2001).Relationship between the mode of land redistribution, tenure security and agricultural credit use in KwaZulu-Natal. *Development Southern Africa*, 18(3): 295-307.
Green, D.A.G. & Ng'ong'ola, D.H. (1993). Factors affecting fertilizer adoption in less developed countries: An application of multivariate logistic analysis in Malawi. *Journal of Agricultural Economics*, 44: 99-109.
Gujarati, N.D. (1995). *Basic econometrics,* 3rd Edition. New York, NY: McGraw-Hill.
Hanushek, E.A. & Jackson, E.J. (1977).*Statistical methods for social scientists*. New York, NY: Academic Press.
Hosmer, D.W. &Lemeshow, S. (1989). *Applied logistic regression*. New York, NY: Wiley.
Kabubo-Mariara, J. (2004). Poverty, property rights and social-economic incentives for land conservation: The case for Kenya. *African Journal of Economic Policy*, 11(1): 35-68.
Kabubo-Mariara, J. (2007). Land conservation and tenure security in Kenya: Bosemp's hypothesis revisited. *Ecological Economics*, 64: 25-35.
Li, G.; Rozelle, S. & Brandt, L. (1998). Tenure, land rights, and farmer investment incentives in China. *Agricultural Economics*, 19(1): 63-71.
Mahabile, M.; Lyne, M. & Panin, A. (2002). Factors affecting the productivity of communal and private livestock farmers in Southern Botswana: A descriptive analysis of sample survey results. *Agrekon*, 41(4): 326-338.
Mendelson, J. (2008). *Customary and legislative aspects of land registration and management on communal land in Namibia*. Windhoek: Research and Information Services of Namibia (RAISON).
Mendelsohn, J. & El Obeid, S. (2003). *Sand and water. A profile of the Kavango region*. Cape Town: Struik Publishers and Windhoek: RAISON.
Ministry of Lands and Resettlement. (2013). Annual Report 2011 - 2012. Windhoek: Republic of Namibia.
Ministry of Lands and Resettlement. (2007). *Communal Land Reform Act, 2002. Designation of area for granting of rights of leasehold for agricultural purposes*. Government Gazette No. 3878. 16b July 2007. Windhoek: Republic of Namibia.
Mittelhammer, R.C. (1996). Mathematical statistics for economics and business. *Review of Economics and Statistics*, 78(1): 16-34.
Monela, A.J. &Kayunze, K.A. (2014)' .*Access to and adoption of improved seeds by smallholder farmers in Tanzania: Cases of maize and rice seeds in Mbeya and Morogoro regions*. Dissertation submitted in partial fulfilment of the requirements for the degree of Master of Arts in Rural Development. Sokoine University of Agriculture, Morogoro, Tanzania.
Mukherjee, S. & Benson, T. (2003).*The determinants of poverty in Malawi 1998*.World Development, 31: 339-358.
Place, F. & Otsuka, K. (2002).Land tenure systems and their impacts on agricultural investments and productivity in Uganda.*Journal of Development Studies*, 38(2002): 105-125.
Purnell, J. (1995). *Popular resistance to the privatization of communal lands in 19th century Michoacan*. Boston, MA: Boston College, Department of Political Science.
Republic of Namibia. (2002). *Communal Land Reform Act (Act No. 5 of 2002)*. Windhoek: Republic of Namibia.
Scones, I. (1992).The economic value of livestock in the communal areas of southern Zimbabwe. *Agricultural Systems*, 39: 339-359.
Shiferaw, B. & Holden, S. (1999). Soil erosion and smallholders' conservation decisions in the highlands of

Ethiopia. *World Development,* 27(4): 739-752.
Smith, R.E. (2004). Land tenure, fixed investment, and farm productivity: Evidence from Zambia's Southern Province. *World Development*, 32(10): 1641-1661.
Wagayehu, B. & Lars, D. (2003). Soil and water conservation decisions of subsistence farmers in the eastern highlands of Ethiopia: A case study of the Hunde-Lafto. *Journal of Agricultural Economics,* 18:125-133.
Werner, W.; Adams, F. & Vale, P. (1990).*The land issues in Namibia: An enquiry*. Windhoek: University of Namibia, Institute for Social and Economic Research.
Wynne, A.T. & Lyne, M.C. (2003).Factors affecting the growth of small-scale poultry enterprises in Kwazulu-Natal.*Development Southern Africa*, 20(5): 564-578.
Zhllima, E. &Imami, D. (2012).*Agricultural land rights in Albania and their impact on agriculture land market and investments*. Tirana: Agriculture University of Tirana.

Annexure 1

Table 2: Binary logistic regression results on predictors and land tenure as dependent variable

Variables in the Equation									
								95 % C.I. for EXP(B)	
		B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Step 1[a]	Gender	-0.341	0.439	0.602	1	0.438	0.711	0.301	1.682
	Education	2.27	0.455	24.875	1	0	9.68	3.967	23.619
	Age	4.155	1.017	16.678	1	0	63.755	8.679	468.338
	Total Number of Household Members	-0.167	0.105	2.52	1	0.112	0.846	0.689	1.04
	Farming Experience	-4.014	1.089	13.589	1	0	0.018	0.002	0.153
	Fencing Investment	4.708	0.778	36.628	1	0	110.803	24.123	508.948
	Borehole Investment	0.246	0.704	0.123	1	0.726	1.279	0.322	5.085
	Farmhouse Investment	-6.887	1.527	20.334	1	0	0.001	0	0.02
	Generator Investment	1.007	0.822	1.502	1	0.22	2.738	0.547	13.704
	Solar Energy Investment	2.344	0.978	5.751	1	0.016	10.424	1.535	70.808
	Water Pipe Investment	-2.633	1.259	4.374	1	0.036	0.072	0.006	0.847
	Water Trough Investment	-2.831	3.195	0.785	1	0.376	0.059	0	30.914
	Water Tank Investment	3.56	0.776	21.045	1	0	35.149	7.681	160.838
	Model Summary								
	Cox & Snell R^2=	0.648							
	Nagelkerke R^2	0.864							
	Hosmer & Lemeshow Test:								
	Chi-square	7.518							
	-2 Log Likelihood	174.760							
	Observations	510							

Source: Author's calculations from field data

Table 3: Binary logistic regression results on predictors and investments as dependent variable

FENCING			BOREHOLE			FARMHOUSE			GENERATOR		
Predictors	**Sig.**	**Exp(B)**	**Predictors**	**Sig.**	**Exp(B)**	**Predictors**	**Sig.**	**Exp(B)**	**Predictors**	**Sig.**	**Exp(B)**
Gender	0.643	1.148	Gender	0.148	1.549	Gender	0.873	1.047	Gender	0.207	1.615
Education	0.985	1.007	Education	0.039	2.058	Education	0.421	1.334	Education	0.6	0.804
Age	0.001	0.444	Age	0	0.327	Age	0.001	2.337	Age	0.004	0.469
Number of Household Members	0.198	0.929	Number of Household Members	0.601	1.03	Number of Household Members	0.114	1.088	Number of Household Members	0.004	1.194
Farming Experience	0.247	0.769	Farming Experience	0.079	1.533	Farming Experience	0.154	1.363	Farming Experience	0.08	0.627
Borehole	0	5.17	Farmhouse	0.004	0.423	Generator	0.797	1.103	Solar Energy	0.939	1.04
Farmhouse	0.634	0.875	Generator	0.052	2.105	Solar Energy	0.14	1.72	Water Pipe	0.433	0.519
Generator	0.911	1.047	Solar Energy	0.002	3.224	Water Pipe	0.202	1.911	Water Trough	0.258	2.696
Solar Energy	0.993	0.996	Water Pipe	0.309	1.665	Water Trough	0.167	0.239	Water Tank	0.008	2.864
Water Pipe	0.292	1.983	Water Trough	0.826	1.206	Water Tank	0.94	0.976	Land Tenure	0.119	2.338
Water Trough	0.802	1.326	Water Tank	0.01	2.436	Land Tenure	0	0.008	Fencing	0.905	0.952
Water Tank	0.148	0.605	Land Tenure	0.53	1.36	Fencing	0.955	0.984	Borehole	0.07	2.072
Land Tenure	0	70.811	Fencing	0	5.108	Borehole	0.013	0.47	Farmhouse	0.87	0.942
Model summary: Cox & Snell R^2= 0.517, Nagelkerke R^2= 0.689, Hosmer &Lemeshow Test, Chi-square 3.754 (Sig. 0.879), -2 Log likelihood = 335.818, Observations 510			**Model summary:** Cox & Snell R^2= 0.485, Nagelkerke R^2= 0.647, Hosmer &Lemeshow Test, Chi-square 2.515 (Sig. 0.961), -2 Log likelihood = 368.164, Observations 510			**Model summary:** Cox & Snell R^2= 0.494, Nagelkerke R^2= 0.659, Hosmer &Lemeshow Test, Chi-square 4.279 (Sig. 0.831), -2 Log likelihood = 359.291, Observations 510			**Model summary:** Cox & Snell R^2= 0.565, Nagelkerke R^2= 0.754, Hosmer &Lemeshow Test, Chi-square 3.666 (Sig. 0.886), -2 Log likelihood = 282.070, Observations 510		

Source: Author's calculations from field data

Table 4: Binary logistic regression results on predictors and investments as dependent variable

SOLAR ENERGY			WATER PIPES			WATER TROUGHS			WATER TANKS		
Predictors	**Sig.**	**Exp(B)**	**Predictors**	**Sig.**	**Exp(B)**	**Predictors**	**Sig.**	**Exp(B)**	**Predictors**	**Sig.**	**Exp(B)**
Gender	0.584	0.818	Gender	0.223	1.943	Gender	0.374	0.545	Gender	0.619	1.182
Education	0.913	1.05	Education	0.181	0.498	Education	0.669	0.732	Education	0.537	1.298
Age	0	0.24	Age	0.802	0.917	Age	0.749	0.804	Age	0	0.358
Number of Household Members	0.653	1.032	Number of Household Members	0.008	0.704	Number of Household Members	0.177	0.776	Number of Household Members	0.336	0.94
Farming Experience	0.352	1.362	Farming Experience	0.038	0.484	Farming Experience	0.935	1.061	Farming Experience	0.96	1.013
Water Pipe	0.332	1.736	Water Trough	0.896	0.851	Water Tank	0.997	0	Land Tenure	0	16.233
Water Trough	0.204	2.977	Water Tank	0.488	0.625	Land Tenure	0.161	0.103	Fencing	0.093	0.565
Water Tank	0.086	0.424	Land Tenure	0.931	1.071	Fencing	0.437	2.337	Borehole	0.008	2.543
Land Tenure	0	12.132	Fencing	0.196	2.278	Borehole	0.423	1.918	Farmhouse	0.623	0.857
Fencing	0.858	0.931	Borehole	0.226	1.885	Farmhouse	0.118	0.183	Generator	0.007	2.932
Borehole	0.002	3.366	Farmhouse	0.486	1.409	Generator	0.09	4.472	Solar Energy	0.113	0.455
Farmhouse	0.356	1.384	Generator	0.764	0.788	Solar Energy	0.052	5.201	Water Pipe	0.308	0.491
Generator	0.842	1.104	Solar Energy	0.21	2.087	Water Pipe	0.755	1.431	Water Trough	0.999	0
Model summary: *Cox & Snell R^2= 0.592, Nagelkerke R^2= 0.789, Hosmer &Lemeshow Test, Chi-square 8.922 (Sig.0.349), -2 Log likelihood = 250.278, Observations 510*			***Model summary:*** *Cox & Snell R^2= 0.648, Nagelkerke R^2= 0.863, Hosmer &Lemeshow Test, Chi-square 3.651 (Sig. 0.887), -2 Log likelihood = 175.170, Observations 510*			***Model summary:*** *Cox & Snell R^2= 0.702, Nagelkerke R^2= 0.936, Hosmer &Lemeshow Test, Chi-square 4.974 (Sig.0.760), -2 Log likelihood = 90.020, Observations 510*			***Model summary:*** *Cox & Snell R^2= 0.558, Nagelkerke R^2= 0.744, Hosmer &Lemeshow Test, Chi-square 6.379 (Sig. 0.605), -2 Log likelihood = 290.347, Observations 510*		

Source: Author's calculations from field data