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AN EFFECTIVE POLICY STRATEGY FOR UTILIZATION OF FRAGMENTED LANDS IN RWANDA: LAND USE CONSOLIDATION FROM FARMERS PERSPECTIVES

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ABSTRACT: *Land consolidation model have been adopted by the government as a major agricultural transformation strategy in Rwanda, despite the consolidation of farming, a large number of farmers continue to maintain smallholdings and therefore some of the old problems still persist and some new challenges have emerged. This study evaluated effects of land consolidation use among maize farmers in Kayonza district eastern part of Rwanda. Multistage sampling techniques were used to select survey villages and respondents. Data were collected from 213 respondents using structured questionnaire. T-test was used to estimate effect of land use consolidation on yield and level of input usage. The mean difference in yield between adopters and non adopters across all growing seasons that is 2016A, 2015A, 2015B and 2014B group were 133.4, 225.1,151.1 and 124.8 kg ha-1.The analysis showed a statistical significant difference between those two groups with P <0.05 at 95% of confidence level. The mean difference in level of input usage between adopters and non adopters across all growing seasons that is 2016A, 2015A, 2015B and 2014B group were 1607.5, 559.4, 1229.6 and 1828.7 in Rwandan francs. The analysis showed a statistical significant difference between those two groups with P <0.05 at 95% of confidence level. The study concludes that land consolidation is the efficient policy strategy that can improve the welfare of farming communities through effective utilization marginal lands.*

KEYWORDS: Smallholder dairy farmers, Land use consolidation, Kayonza, Rwanda.

INTRODUCTION

The current global challenges of ensuring the availability of access to food in both quantity and quality, require deliberate and far-reaching solutions historically, research for development in agriculture and land consolidation has been a strong driving force for meeting food supply around the world, countries still face major challenges of food insecurity, poverty, and malnutrition and diversity in the size, population, and agricultural and economic development of the countries reflect the large differences in their agricultural production systems, agro climatic potential, population density, and infrastructure (Beintema & Stads, 2008). Land reform has been ubiquitous all over Africa for various purposes. The driver of land reform in Rwanda can largely be the need to improve land use management and to reverse the adverse effects of land fragmentation and related problems especially in the period after the 1994 Tutsi genocide. The pillars of land reform in Rwanda have been the Land Policy of 2005 and Land Law of 2005 (Musahara & Huggins, 2005).Five years in its implementation LUC has been studied by a limited number of scholars but stimulated a wide debate on the extent of its success (Bizoza & Havugimana, 2013).According to Binagwaho et al. (2012), Rwanda's economy is largely agrarian. More than 80% of the Rwanda's projected population of 10, 718, 3791 depends on farming. The total land area of the country measures 26,338 square kilometers. The

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country is the mostly densely nation in the continent faced with an average of 407 persons per square Km. Hence the land distribution is highly fragmented and skewed in Rwanda. According to Arumugam Kathiresan (2012),about 36 % of the households own 6% of the farm lands, with an average of 0.11 Ha. The national average holding of 0.76 Ha is generally divided over 4 to 5 small plots, often in multiple locations. Given the demographic pressure on land in Rwanda however, securing production of food crops for the growing population from the limited land poses a persistent challenge. The priority food crops under land consolidation in Rwanda include maize, wheat, rice, Irish potato, cassava, soya bean and beans. To a great extent, the volumes of production of these food crops determine the levels of food security in Rwanda. Consolidated use of lands allows farmers to benefit from the various services under CIP such as inputs (improved seeds, fertilizers), proximity extension services, post harvest handling and storage facilities, irrigation and mechanization by public and private stakeholders. However, the effects of land use consolidation policy on the increase in food crop production triggered by crop intensification program are still not clearly understood and therefore require a scientific study.

The acceptance of land use consolidation is generally more widespread in Eastern and Northern provinces than in the Southern and Western provinces. Despite a significant physical expansion (13%) of total cultivated area in the country, the pressure on consolidation of lands for cultivation of priority crops has caused a steady decline in area under cultivation of other (non priority) traditional crops – from 52.6% in 2004 to 42.4% in 2011(Cantore, 2011).Land use consolidation mission by itself is challenging as it deals with uneducated rural poor with the aim of changing their behavior positively. There is also problem of market access resulting in low prices of agricultural products as production increases, which is expected under extension based farming. According to A Kathiresan (2012),despite the consolidation of farming, a large number of farmers continue to maintain smallholdings and therefore some of the old problems still persist and some new challenges have emerged. Both the agents and farmers in several places still have not yet clearly understood the voluntary nature of the program and the benefits associated with land use consolidation. This is a research gap that needs to be filled through scientific research and this study contribute to give a clear image of land use consolidation with empirical evidence on the objective to evaluate effect of land use consolidation in Kayonza district.

METHODOLOGY

The study was carried out in Kayonza District in Eastern province of Rwanda. There are seven sectors in Kayonza district and the selected respondents were identified from Nyamirama and Ruramira sectors only. Area selection was based on the intensity of the land use consolidation practice in the area compared to other sectors in the district.

This study targeted Kayonza district farmers in the selected sectors of Nyamirama and Ruramira with the population of 213 farmers with 120 adopters and 93 non adopters randomly selected from the two cooperatives in the selected sectors of Nyamirama and Ruramira.

The sample size was determined based on groups of farmers who adopted land consolidation and farmers without in two sectors. The sample size was determined by a mathematical formula given by (Dhokhikah, Trihadiningrum, & Sunaryo, 2015).

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The study adopted multistage sampling procedure to select the farm households for this study. The Eastern Province was selected purposely out of the total 4 provinces of Rwanda.

The motivations for such choice are that it is a potential agricultural zone; the area is qualified for food diversity and a food reserve of the country. It is sub-divided into seven districts by which Kayonza district was purposively selected since it is a strategic district which hosts a lot maize farmers and land consolidation has been effective. The sample unit was a household head who is a farmer who either adopted land consolidation or not. Stratified sampling was used to divide respondents into two strata of those who adopted land consolidation and those who did not.Simple random sampling was used to select respondents in all cooperatives and every member had a chance of being selected for the sample as shown below.

Table 1. Representation of maize farmers who adopted and those who did not

Sectors	Total number of maize farmers	Number of sample selected		Total sample
		Adopted	Non-adopters	
Nyamirama	220	55	43	97
Ruramira	240	65	50	116
	460	**120**	**93**	**213**

Data collection and analysis

Primary survey data was collected for maize production year 2014/2016through a structured questionnaire which included both closed and open-ended questions. The questionnaire was modified before execution of the survey. Secondary data collection involved reviewing existing information in the form of documents, text books, published and unpublished articles, newspapers, journals and government policies. Data was analyzed using STATA 13 program.

RESULTS AND DISCUSSION

Estimation effect of land use consolidation on yield in Kg ha-1

In all agriculture seasons, the sampled farmers were 213 respondents including 120 adopters and 93 non adopters of land consolidation. The mean difference in yield between adopters and non adopters across all growing seasons that is 2016A, 2015A, 2015B and 2014B group were 133.4, 225.1,151.1 and 124.8 kg ha-1.The analysis showed a statistical significant difference between those two groups with $P < 0.05$ at 95% of confidence level.

This means, the farmers who adopted land consolidation increased yield compared to non adopters. These findings are relevant to those of (Niroula & Thapa, 2005).

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Table 2.Effect of land use consolidation using t-test on yield in Kg ha-1

Season	Total		Adopters		Non-Adopters		Diff	P-value
	Obs	Mean	Obs	Mean	Obs	Mean		
2016 A	213	611.5	93	478.0	120		133.4	0.03*
2015 A	213	537.1	93	312.0	120		225.1	0.04*
2015 B	213	480.8	93	329.6	120		151.2	0.01*
2014 B	213	424.8	93	300	120		124.8	0.02*

*Note: * significant at 5%*

Effect of land use consolidation on level of inputs use in Rwandan francs

In all agriculture seasons, the sampled farmers were 213 respondents including 120 adopters and 93 non adopters of land consolidation. The mean difference in yield between adopters and non adopters across all growing seasons that is 2016A, 2015A, 2015B and 2014B group were 1607.5, 559.4, 1229.6 1828.7 Rwandan francs. The analysis showed a statistical significant difference between those two groups with P <0.05 at 95% of confidence level. This means, the farmers who adopted land consolidation increased level of input use compared to non adopters. These findings are relevant to those of (Niroula & Thapa, 2005).

Table 3.Effect on capacity to purchase inputs in Rwandan francs

Season	Total		Adopters		Non-adopters		Diff	P-value
	Obs	Mean	Obs	Mean	Obs	Mean		
2016 A	213	8443.8	93	6836.6	120		1607.5	0.01*
2015 A	213	1078.4	93	518.9	120		559.4	0.03*
2015 B	213	7790.5	93	6560.8	120		1229.6	0.02*
2014 B	213	13273.6	93	11444.9	120		1828.7	0.01*

*Note: * significant at 5%*

CONCLUSION AND RECOMMENDATIONS

In view of the major findings and the above conclusions, the following recommendations are drawn:

The government should improve farmer associations which can play an important role in the process of adoption. The farmer associations should also target the farmers' need and should provide them with the necessary information about the associations and strengthen the current strategies of extension education, visits, trainings and direct contact of extension workers with farmers increased as this can increase benefits of adoption to beneficiaries hence increased production of maize through improved production systems, this can ensure the optimal realization of their livelihoods' potentials.

The government should also improve the output market environment at least by constructing roads to markets where farmers can sell their products, so they will have the incentive to adopt land consolidation.

The results of the study illustrate that level of input usage, yield for the farmers in cooperative was significant therefore the study recommends farmers should be organized in cooperatives,

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this can help the country in the current strategies in National policy on promotion of cooperatives of facilitating the development of co-operatives to improve supply development and support market development programmes to capture both domestic and export markets and strengthening the capacity of producer groups and encouraging them to work together and improve their standards of living in doing this adoption of land consolidation will be increased and policy challenges of accessing social services improved.

This study focused on one aspect of land consolidation. However, there are many aspects of land consolidation that need to be researched and data pertains to only two sectors in one district in rural Rwanda, given the limited scope of the study, this research suggests that further research should be undertaken in other districts of the country where land consolidation is in progress more especially on challenges faced in land consolidation, effect of mono cropping in land consolidation of production and factors influencing adoption. This will provide a broader image on land use consolidation and suggests better ways of increasing adoption of land consolidation.

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