



Effects of Women Land Rights on Agricultural Outcomes in Rwanda

¹Mercyline W. Kamande, ²Emery Musonerwa Bahati

¹Mount Kenya University, mercykam@yahoo.com, Rwanda

²University of Rwanda, emery.musonerwa@gmail.com, Rwanda

ABSTRACT

This study examines the effect of land rights on agricultural outcomes in Rwanda. We characterize the effects of land rights from two perspectives. The first one is land rights indicated by the right to sell and guarantee land and the second one is land titling. The agricultural outcomes include agricultural productivity, food security and nutritional diversity. From the results, land rights are found to have a positive relationship with all the outcome variables. The effect of land rights on agricultural productivity is larger if the household head is male. Joint titling has a negative effect on food security but the effect is not conclusive in the case of agricultural productivity and nutritional diversity. We conclude that land rights are important for the three outcome variables. Women land rights have a positive effect on agricultural productivity although the effect is larger in the case of male land rights.

Key words: Land rights, food security, nutritional diversity, agricultural productivity

1. INTRODUCTION

In many African countries, property and land laws are often biased against women leaving them with little or no rights to own land. Furthermore, most African cultures propagate a patriarchal system where men have exclusive rights to own land and take the decisions on how land should be used. This is despite the fact that women take the lead in agricultural activities especially in the rural areas and also in the dietary planning of the household. Given their limited role in decision making on agricultural development, they remain poor and vulnerable and this has a ripple effect on the food security of the entire household. Rose (2002) note that women meet increased challenges merely from the customary land systems.

In Rwanda, arable land has been governed through a customary system for a long time which promotes the father to son inheritance system and hence is discriminatory against women. In 2004, the government of Rwanda adopted a new land policy and enacted the Organic Land Law in 2005 with the aim of enhancing the land tenure security of all citizens. These regulations were also aimed at protecting and safeguarding the land rights of vulnerable groups such as widows, female descendants and female orphans (see Uwayezu and Mugiraneza, 2011).

Given that the agricultural sector in Rwanda accounts for more than 80% of economic activities and rural women remain the primary agricultural producers, enhancing women land rights has the potential of improving agricultural productivity and hence contributing to food security. Further, given that mixed agricultural activities promote dietary diversity, women land rights are likely to improve their rights to decision making in terms of agricultural development and hence increase the sources and variety of food for the household.

This study seeks to investigate the effect of women land rights on agricultural productivity, food security and dietary diversity for rural households in Rwanda by answering the following key research questions:

- What is the effect of women land rights on agricultural productivity?
- Do women land rights have an impact on food security for the household?
- How does women land rights affect nutritional diversity of the households?

2. LITERATURE REVIEW

Researchers have explored the relationship between land rights and various development outcomes. Lawry et.al (2014) in their systematic review examined the existing evidence on the effects of land property rights interventions found that in most cases, existing land rights are defined through informal and customary systems and formalization of rights may have little impact on agricultural productivity in such cases, However, where no formal institutions existed before, formalization of land right may have a significant and impact on agricultural productivity.

Some evidence exists that postulates that land owned by women is less productive. For instance, Udry (1995) found that arable land under women's control have significantly lower outcome as compared to those under men's management for the same crop in the same year noting that the differences in output is merely attributed to increased labor and use of fertilizer per acre on land under men's control. Oseni et.al, (2015) have found that women produce less than men for observed factors of production and mostly have access to less productive resources than men, Mishra and Sam (2016) concluded that land ownership has ultimate positive and significant impact on women's socio-economic development and empowerment adding that in areas where agriculture is the basis of women's economy and livelihoods, policies that enhance land

rights equity are deemed to be very essential in terms of increasing women's empowerment and other beneficial welfare contributions.

Researchers have also examined the difference between single and joint titling make in terms of agricultural productivity and women's bargaining power. For instance, Newman, et. al., (2015) using a plot-fixed-effects approach on Vietnam's panel data concluded that land title leads to higher yields, for both individually and jointly held titles and that joint titles are potentially an imperative tool to enhance women's bargaining power within the household. In another study, Kousar et. al.(2016) found that land ownership had significant impact on women empowerment and agriculture productivity in rural areas of Pakistan and recommend that that the government development programs and policies should be oriented towards enhancing the productive role of women in addition to reproductive role through strengthening the property rights of poor rural women.

Although research has acknowledged women's role in food security, there is no consensus on how much and in what ways women actually contribute to household food security (see Neetu & Parthasarathy, 2007). As postulated by Prosterman (2013) safeguarding and securing land rights for women is essential for improved healthier nutrition, education for children and other socio-economic development aspects. Landesa (2012) argue that land can lead to an increase in household agricultural production and contribute to household food security and improved nutritional status.

Some evidence exists on the impact of Rwanda Land Reforms on the rights of women. For instance, Uwayezu and Mugiraneza (2011) found that the implementation of a new land policy and associated regulations had a positive impact in safeguarding, protection and enforcement of land rights for widow and female orphans. However, there are no studies

that link women land rights on socio-economic outcomes in Rwanda. Moreover, given that joint land rights have been found to have more far-reaching effects on socio-economic outcomes at the household level, this study seeks to contribute to this body of literature by examining the impact of women land rights on agricultural productivity, food security and nutritional diversity in Rwanda

3. DATA AND EMPIRICAL STRATEGY

3.1. Data and Variables

This study uses Integrated Household Living Conditions Survey panel data from the National Institute of Statistics of Rwanda. The panel data is available for 2010 and 2015. These two datasets contain outcomes of both female headed households and male headed households as well as whether the household head owns land rights or not as well as several household attributes related to agricultural productivity, food security and nutritional diversity.

3.2. Modeling Agricultural Productivity

We model the relationship between land rights and agricultural productivity using a Random Effects panel data model, in which female land rights are assumed to influence agricultural productivity. The choice of a Random Effects Model as opposed to a Fixed Effects Model is informed by the fact that although a fixed Effect Model is often considered superior in controlling for non-observable characteristics and hence similar to a random assignment in experimental research, it denies us the opportunity to measure the effects of such variables (Williams, 2017).

The basic panel data model is specified as follows:

$$\text{AgriProd}_{it} = \alpha + \text{LR}_{it} + \text{Z}_{it} + \text{X}_{it} + \delta_i + \mu_{it}$$

where households are indexed as i and the years are indexed as t

$AgriProd_{it}$ is the dependent variable and represents the agricultural production

LR_{it} is a binary variable measured as 1 if head of household i has Land rights; 0 otherwise

Z_{it} represents a vector of dummy variables related to land rights which include the kind of ownership of land (either sole or joint ownership) and whether land is purchased or inherited.

X_{it} represents a vector of control variables assumed to influence agricultural productivity which include area cultivated and age of the farmer

δ_i is a vector of household's time invariant characteristics such as region

μ_{it} is the stochastic error term

3.3. Modeling Food Security

We model the relationship between land rights and food security using a cross-section Logit model, in which female land rights are assumed influence food security with agricultural productivity being a moderating variable

The basic panel data model is specified as follows:

$$FoodSec_i = \alpha + LR_i + AgriProd_i + Z_i + X_i + \mu_i$$

where households are indexed as i

$FoodSec_{it}$ is a binary dependent variable and is measured as 1 if household i always consumed own output; 0 otherwise

LR_i is a binary variable measured as 1 if head of household i has Land rights; 0 otherwise

$AgriProd_i$ is the independent variable and represents the agricultural production

Z_i represents a vector of dummy variables related to land rights which include the kind of ownership of land (either sole or joint ownership)

X_i represents a vector of control variables assumed to influence food security which include whether the household head sold any output and household size

μ_i is the stochastic error term

3.4. Modeling Nutritional Diversity

We model the relationship between land rights and Nutritional Diversity using a cross-section Logit model, in which land rights are assumed influence Nutritional Diversity with Weekly consumption being a moderating variable. The Nutritional Diversity is defined as consumption of any animal product. Given that this data is only captured for 2015, a cross-sectional model will be used for the analysis which is specified as follows:

$$NutDiversity_i = \alpha + LR_i + Cons_i + Z_i + X_i + \mu_i$$

where

$NutDiversity_i$ is a binary dependent variable measured as 1 if the household i slaughtered any animal and 0 otherwise

LR_i is a binary variable measured as 1 if head of household i has Land rights; 0 otherwise

$Cons_i$ is a continuous variable capturing weekly consumption for household i

Z_t represents a vector of dummy variables related to land rights which include the kind of ownership of land (either sole or joint ownership)

X_i represents a vector of control variables assumed to influence Nutritional Diversity which include total number of animals owned and household size.

μ_{it} is the stochastic error term

To capture the effects of Women Land rights, the models will be estimated separately for

The summaries reveal that mean agricultural productivity was higher in 2015 than it was in 2010 although the total land cultivated was slightly lower. This would imply an improved land productivity. The 2010 data does not report Weekly consumption per household but this is reported in 2015 with a mean of 6 kgs. There is no much variation in age between the two cross sections.

Table 2 presents descriptive statistics for categorical variables that are useful in this analysis

The results show that there are fewer female headed households than male headed households and this is consistent in both cross-sections. Given that most households own multiple plots, we looked at the plot ownership for the main parcels of land and found that most of the land is owned jointly by spouses which is in line with Rwanda Land Rights Law which encourage joint ownership in order to protect women and ensure food security at the household level. However, this is only reported for EICV 2015.

Most of the land owned is inherited but the tendency to purchase land is equally high. The use of loaned or leased land for farming is also prevalent in the sample. Another factor worth noting is that households rarely sell their output but rather use it for household consumption which is very important for food

male headed households and female headed households and the results compared

Results and Discussion

3.5. Descriptive Statistics

We first present the descriptive statistics for the main variables. Table 1 summarizes the continuous variables used in this analysis

security. However, only EICV 2015 captures this variable.

Given that land rights is the main variable of interest, we further examine how the land rights are distributed between men and women and present the results in Table 3

In 2010, of the male total sample, 57% of the men had land rights while 43% did not have land rights. These numbers improved in 2015 where the number of those with land rights increased to 67% while those without land rights reduced to 33%. For women, ownership of land rights remained steady but it is important to note that land rights for women were higher in 2010 than those for men but in 2015 they were equal. This reflects the effectiveness of Rwanda Land Rights Policy which encourages joint land rights.

3.6. Estimating the relationship between Land Rights and Agricultural Productivity

In order to investigate the relationship between land rights and agricultural productivity, we use a Random Effects model where agricultural productivity is measured by the quantity of output. The Analysis is done for three different samples, the overall Panel Sample, a Male Only Sample and A Female Only. Table 4 presents results for the random effects model and is done stepwise first with only land Rights and then with all other covariates.

Looking at the results in Table 4, existence of land rights for the household heads is significant in determining the total output in all

models. For the simple model without covariates, the marginal effect is negative and significant at 5% significance level for the overall sample but positive and significant for the male-headed and female-headed household samples. For the model with covariates, the marginal effect is negative and significant at 5% significance level for the overall sample but positive and significant for the other two samples. However, the marginal effects are greater for the male-headed as compared to the female-headed household samples

In examining the effects of land rights, we explore if the head of household is male or female. The effect of the head of the household being male has a positive and significant impact on the quantity of outputs.

Other factors that influence the quantity of output include the area cultivated and household size which are both positive and significant in all samples. The effects of age and literacy level of household head are not significant in determining level of output. The geographical region is an important factor in determining agricultural productivity in Rwanda with dummy variable for Southern province having the biggest effect followed by Northern Province and Western Province. The dummy for Eastern province is only significant for female-headed households. This is reflective of how the regions fare in terms of agricultural productivity. Examining the effects of the land acquisition dummies, households that have purchased, loaned or leased lands tend to have a higher output and the effect is significant. Another important effect is that of appropriated or share-cropped land which is a government policy aimed at increasing productivity. The two dummy variables have very large and significant marginal effects

From this analysis, we can conclude that when the head of households have land rights, this has a positive impact on agricultural productivity. The panel data analysis does not

differentiate having land rights and the ownership of land called land titling since this is missing in EICV 2010.

3.7. Estimating the relationship between Land Rights and Food Security

The estimation of the relationship between land rights and food security is done using a cross-sectional logistic model. The choice of the cross-sectional model is based on the fact that EICV 2010 data omits some important variables such as land ownership that are found in EICV 2015. Food security is measured by whether the household consumed all, part or none of their agricultural produce. The model is estimated stepwise and results presented in Table 5.

From the results in Table 5, we observe that land rights have a positive effect on food security in the model with all covariates which is significant at 10% level of significance. To differentiate the actual land ownership and land rights, we explore the effect of joint titling and female titling on the relationship. The results reveal that joint titling of land significantly decreases the odds of a family consuming own output and hence being food secure while female titling decreases the likelihood of food security although the effect is not significant. The results further reveal that households that sell part or all their agricultural output are likely to be food insecure. The effect of quantity of output on food security is small and insignificant. Other factors that affect food security are household size and literacy level but the effects are not significant.

3.8. Estimating the relationship between Land Rights and Nutritional Diversity

The third part of this analysis examines whether the presence of land rights has any influence on Nutritional Diversity. Nutritional Diversity in this context is proxied by whether a family owned any animal with the assumption

that the animals can be slaughtered for family consumption. This assumption is valid given that the families that reported to have killed any animals, the animals were small animals such as chicken and rabbits which are often kept for family consumption. The Nutritional Diversity is therefore a binary dependent model and given that the data for this variable is only available for EICV 2015, a cross-sectional logistic model is estimated and the results presented in Table 6.

Examining the results in Table 6, the likelihood of Land Rights increasing the odds of nutritional diversity is positive and significant at 10% level of significant in the first two models but insignificant in the models with covariates. Weekly consumption, number of animals kept and female titling affect nutritional diversity negatively while household head literacy level and size of household has a positive effect on nutritional diversity. However, the covariates are generally insignificant in the relationship. However, these results should be treated with caution given the ambiguity with which the variable is measured¹.

6. CONCLUSION

This study sought to examine the effect of land rights on Agricultural Productivity, Food Security and Nutritional Diversity. Land rights are defined as the household head having the right to sell or guarantee land. This is different from land ownership which is defined by titling. From the results, we conclude that land rights have a significant and positive effect on agricultural productivity. The effects are larger if the head of household is male as compared to female. The size of area cultivated and household size also have a positive and significant effect on quantity of output. In households where land is purchased, loaned or leased, the effect is larger. However,

¹ It was assumed that the number of animals kept was related with the number of animals killed or slaughtered for home consumption

government policies such as appropriation and share-cropping have an even larger and positive marginal effect on agricultural productivity. The effect of land rights on food security positive and significant while joint titling of land significantly has a negative effect on food security. Households that sell part or all their agricultural output are likely to be food insecure. Land rights have a potential positive effect on nutritional diversity.

5. REFERENCES

Cross, C (1999). *“Women and Land in the Rural Crisis.”* Agenda: Empowering Women for Gender Equity, no. 42, pp. 12–27.

Government, of Rwanda (2013),’ Law N° 43/2013 Of 16/06/2013 Governing Land In Rwanda’ *Official Gazette no Special of 16/06/2013.*

Kousar, R., Makhdum, M.S.A, Ashfaq, M., Saghir, A. & Ajaz, A. (2016) ‘Impact of Land Ownership on Agricultural Productivity and Women Empowerment in Pakistan: A Gender Based Empirical Analysis’ “2016 World Bank Conference on Land and Poverty”

The World Bank - Washington DC, March 14-18, 2016

Landesa (2012) The Linkages between secure Land Rights Eomen and Improved household Food Security and Nutrition, *Issue Brief: Land rights and food security*

Lastarria-Cornhiel, S. (2007). *Who benefits from land titling? Lessons from Bolivia and Laos.* International Institute for Environment and Development.

Lawry, S., C. Samii, R. Hall, A. Leopold, D. Hornby, and F. Mtero. (2017). *“The Impact of Land Property Rights Interventions on Investment and Agricultural Productivity in Developing Countries: A Systematic Review.”* Journal of Development Effectiveness 9 (1): 61–81

Mishra, K., & Sam A. G., (2016). "Does Women's Land Ownership Promote Their Empowerment? Empirical Evidence from Nepal." *World Development* 78: 360–371.

Newman, C., F. Tarp, and K. van den Broeck. (2015). "Property Rights and Productivity: The Case of Joint Land Titling in Vietnam." *Land Economics* 91 (1): 91–105.

Oseni, G., P. Corral, M. Goldstein, and P. Winters. 2015. "Explaining Gender Differentials in Agricultural Production in Nigeria." *Agricultural Economics* 46 (3): 285–310.

Neetu C., & Parthasarathy, D., (2007). "Gender, Work and Household Food Security." *Economic and Political Weekly*, vol. 42, no. 6, 2007, pp. 523–531.

Prosterman R., (2013). *Enhancing poor rural women's land rights in the developing world.* *Journal of International Affairs*, vol. 67, no. 1, pp. 147–164.

Rose, L. L (2002). "Women's Strategies for Customary Land Access in Swaziland and Malawi: A Comparative Study." *Africa Today*, vol. 49, no. 2, 2002, pp. 123–149.

Udry, C (1995), *Gender, Agricultural Production and the Theory of the Household*, Northwestern University, Evanston, IL

Uwayezu, E. & Mugiraneza, T. (2011), *Land Policy Reform In Rwanda And Land Tenure Security For All Citizens: Provision And Recognition Of Women's Rights Over Land*

Williams, R. (2017) 'Conditional Logit/Fixed Effects Logit Models', University of Notre Dame, <http://www3.nd.edu/~rwilliam/> Last revised April 2, 2017

7. Appendix

Table 1: Summary Statistics for Continuous Variables

Years/Item	2010		Mean	2015 Standard Deviation
	Mean	Standard Deviation		
Total Agricultural Production	1492.1	1813.8	1605.1	1605.1
Total Agricultural Area	68.5	68.5	67.1	130.7
Weekly Consumption	0.0	0.0	6.1	135.8
Age	46.7	15.6	46.8	16.5

Source: Computed from EICV 2010 and EICV 2015

Table 1: Summary Statistics for Continuous Variables

Years/Item	2010		Mean	2015 Standard Deviation
	Mean	Standard Deviation		
Total Agricultural Production	1492.1	1813.8	1605.1	1605.1
Total Agricultural Area	68.5	68.5	67.1	130.7
Weekly Consumption	0.0	0.0	6.1	135.8
Age	46.7	15.6	46.8	16.5

Source: Computed from EICV 2010 and EICV 2015

Table 2: Descriptive Statistics for Categorical Variables

Item	EICV 2010	EICV 2015
Gender of Household Head		
Male	716	707
Female	260	269
Gender of Plot Owners		
Male Owners		130
Female Owners		310
Joint Ownership		499
Not Related		37
How the Land was Acquired		
Inheritance or Gift	380	488
Purchased	208	217
Loan or Leased	277	183
Others	111	88
Sale of Part or all the Output		
Sells All Regularly		11
Sells All Occasionally		18
Sells Part Occasionally		50
Never Sells		807

Source: Computed from EICV 2010 and EICV 2015

Table 3: Distribution of Land Rights Across Gender

Item	EICV 2010		EICV 2015	
Male with Land Rights	410	57%	474	67%
Male without Land Rights	306	43%	233	33%
Female with Land Rights	178	68%	181	67%
Female without Land Rights	82	32%	88	33%

Source: Computed from EICV 2010 and EICV 2015

Table 4: Results from Random Effects Model

Dependent Variable - Quantity of Output			
Independent Variables	Overall Sample	Male Headed Households	Female Headed Households
WITH NO COVARIATES			
Land Rights	-214.1 (67.31)***	310.2 (97.45)***	313.8 (120.0)***
WITH ALL COVARIATES			
Land Rights	-202.9 (74.72)***	646.9 (126.6)***	629.2(140.1)***
Age	2.62 (2.22)	3.05 (2.88)	2.54 (3.45)
Area Cultivated	1.31 (0.22)***	1.32 (0.262)***	1.26 (0.39)**
Male HH Head	221.3 (69.97)***		
Literacy of HH head	-172.3 (78.52)**	-148.2 (111.4)	-191.6 (107.6)*
Region Dummies			
Southern Province	448.2 (147.3)***	618.2 (199.2)***	163.3 (212.2)
Western Province	152.8 (151.1)	392.5 (203.6)**	-290.9 (219.4)
Northern Province	363.9 (153.1)**	511.3 (204.4)***	70.31 (226.3)
Eastern Province	-38.07 (155.6)	246.2 (207.3)	-450.6 (229.6)**
Land Acquisition dummies			
Purchased	250.5 (87.35)**	188.8 (110.1)*	280.9 (141.6)**
Gifted	40.06 (146.1)	57.77 (212.8)	146.8 (192.9)
Free use or on Loan	51.96 (106.7)	560.2 (154.1)***	541.0 (164.8)***
Appropriation	1446.7 (451.9)***	1664.1 (560.5)***	3063.2 (778.6)***
Share Cropped	237.5 (122.9)**	638.4 (165.1)	759.4 (201.7)***
Leased	173.7 (124.9)	727.6 (167.4)	310.2 (202.5)
Household Size	104.5 (14.79)***	111.6 (19.06)***	90.84 (23.04)***
Constant	-196.7 (197.1)	-1205.5 (265.9) ***	-319.4 (319.6)
N	1951	1218	733

*Source: From Random Effects Logistic estimation using Stata 14. ***, **, and * denote Significance levels at 1% , 5% and 10% respectively based on t-statistics*

Table 5: Results from Cross-Sectional Logistic Model

Dependent Variable - Food Security			
Independent Variables	No Covariates	With Quantity of Output	With all Covariates
Land Rights	0.019 (0.155)	0.019 (0.155)	0.317 (0.189)*
Quantity		0.0003 (0.0013)	-0.00004 (0.0015)
Land Ownership			
Female Titling			-0.346 (0.297)
Joint Titling			-0.752 (0.266)***
Literacy of HH head			-0.282 (0.189)
Regularly sells part of output			-2.827 (0.579)***
Occasionally sells all of the output			-1.527 (0.302)***
Occasionally sells part of the output			-2.575 (0.250) ***
Household Size			0.019 (0.037)
Constant	1.037 (0.127)	1.012 (0.176)	1.865 (0.348)***
N	976	976	965

Source: From Logistic estimation using Stata 14. ***, **, and * denote Significance levels at 1% , 5% and 10% respectively based on t-statistics.

Table 6: Results from Cross-Sectional Logistic Model

Dependent Variable - Nutritional Diversity			
Independent Variables	No Covariates	With Weekly Consumption	With all Covariates
Land Rights	0.439 (0.245)*		0.520 (0.837)
Weekly Consumption		0.015 (0.015)	-0.905 (0.734)
Female titling			-1.048 (0.819)
Literacy of HH head			0.763 (0.801)
No. of Animals			-0.119 (0.117)
Household size			0.065 (0.118)
Constant	-2.516 (0.214)***	-2.511 (0.214)***	-2.149 (1.013) **
N	976	941	175

Source: From Logistic estimation using Stata 14. ***, **, and * denote Significance levels at 1% , 5% and 10% respectively based on t-statistics.