

Tenure Security among Women Farmers: Implications for Agricultural Productivity and Farm Income in Osun State, Nigeria.

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Abstract: This study compared the level of farm efficiency and farm income among tenure secured and non-secured women farmers in the study area. Structured questionnaire was used to obtain information from 84 women farmers and the data were analysed with descriptive statistics, stochastic frontier (SFA) and farm budget analyses. Results showed that the observed differences between the socioeconomic characteristics (farm size cultivated, years of schooling, and household size) of the two categories of women farmers were statistically significant at 5% level. Results further revealed that on the average, the tenure secure women farmers were more efficient (TE=81.9%) than their counterpart with non-secured tenure (TE=37.3%). Farm budget analysis also showed that women with secured land tenure generated higher income (GMNI= ₦4.65) than women with non-secured land tenure (GMNI= ₦0.75). We therefore conclude that a positive relationship exist between tenure security, level of farm efficiency and total farm income among women farmers in the study area.

Keywords: Agricultural productivity, farm income, tenure security, and women farmers.

I. Introduction

The need to focus on women farmers' productivity and improve their level of economic empowerment has become increasingly clear in many developing countries of the world including Nigeria. Rural women are the main producers of the world's staple crops - rice, wheat, and maize - which provide up to 90 percent of the rural poor food intake (FAO, 1994).[1] Women have a significant role in farming and post-harvest activities. Estimates of agricultural productivity in 2010 [2] by Food and Agricultural Organization (FAO, 2011)[3] showed that women constitute over 50% of agricultural labour force in sub-Saharan Africa including Nigeria (Nweke *et al.*, 2002,[4] and FAO, 1998;[5] 2011[3]). Agriculture is becoming a predominantly female sector; women are found performing duties on the farm and in the case where their husbands have migrated in search for wage labour, women have been found clearing bushes, and making heaps. Women now constitute the majority of smallholder farmers, managing a large part of the farming activities on a daily basis. Studies have shown that giving men and women equal access to production resources would raise yield by as much as 20-30 percent per household, and reduce hunger for 100-150 million people in developing countries thereby contributing to food security and economic growth (FAO, 2011).[3]

Nevertheless access to and use of production resources such as land between men and women, are often dictated by a complex set of rights and obligations reflecting social and religious norms which often act as disincentives to women farmers in terms of farm production (Saito *et al.*, 1994; [6] FAO. 1998, [5] Alkire *et al.*, 2012[7]) in many developing countries of the world. Women also have limited decision-making power and have had to depend on men for user rights which are easily lost if they become widowed or divorced (Shahra, 2007; [8] Annalisa *et al.*, 2009[9]). Insecurity of land tenure discourages women from investing time and resources in sustainable farming practices, and consequently reduces their level of farm income. Although Universal Declaration of Human Rights (UDHR) stipulates that human rights apply to all regardless of sex, women around the world- especially in Nigeria are still disproportionately affected by discrimination and violation of this right which keeps them trapped in poverty and food insecurity (Annalisa *et al.*, 2009; [9] FAO, 2010; [2] Lyn, 2014[10]).

Concerned with the slow progress in achieving the United Nation Millennium Development Goals (MDGs) of gender equality and women empowerment by 2015 in Nigeria, the government, policy makers and international donor agencies have in the last 5 years increasingly stressed the importance of secure land tenure for women and the need to support women's access to land in order to enhance their level of economic empowerment through agricultural production (Nweke *et al.*, 2002[4] and Alderman, 2003[11]). However, an important empirical question is whether tenure security actually influences the level of farm productivity among women farmers. We hypothesised that women farmers with secured land tenure will be more efficient with higher farm income than those with non-secure land tenure. This study therefore compared the farm level

efficiency and farm income among tenure secured and non-secured women farmers with a view to increase agricultural productivity among rural women farmers in the study area.

II. Materials and methods

2.1 Study area: The study was carried out in Ife-East and Ayedaade Local Government Areas (LGAs) of Osun State, Nigeria. The State is predominantly agrarian in outlook with larger percentage of its population being farmers. It covers an area of approximately 8602 square kilometers and the food crops grown in the State (particularly in the study areas) include maize, yam, cassava, cocoyam and rice. The permanent crops include Cocoa, Kola nut, Oil-palm, Citrus, Plantain and Bananas. The two LGAs were selected for this study because their population were predominantly farmers with a good percentage of women farmers growing major food crops in the areas.

2.2 Methods of data collection and analysis: We used structured questionnaires to collect information from 84 women farmers within the two local governments. We collected data that relate to farmer's socio-economic characteristics such as age, gender, years of schooling, marital status, farm size, as well as quantities and prices of various inputs used and outputs produced. We also limited farm activities to arable crop production for ease of analysis. We used purposive sampling techniques to select the State, the Local Government Areas and the villages; and a snow-ball sampling technique was used to select the women farmers because of their uneven population. Finally, we used descriptive statistics, stochastic frontier (SFA) and farm budget analyses to analyse the data collected.

2.2.1 Stochastic frontier production function (SFPF): We used this measure of productivity to compare farm level efficiency among the two categories (tenure secured and non-secured) of women farmers (Coelli, 1995; [12] Coelli and Perelman, 1999 [13]). The Model is specified as presented in equation below:

$$Q_1 = \beta_0 + \beta_1 X_1 + (V_1 - U_i) \tag{1}$$

The above equation was transformed and presented in equation (2):

$$\ln Y = \beta_0 + \beta_1 \ln X_1 + \beta_2 \ln X_2 + \beta_3 \ln X_3 + \beta_4 \ln X_4 + V_i - U_i \tag{2}$$

Where: \ln = Natural logarithm.

Y_i = Total farm output (kg/ha).

X_1 = Total Costs (₦/ha)

X_2 = Labour Used (man-days)

X_3 = Chemical (kg/ha)

X_4 = Farm Size (ha)

β_0 = Intercept.

$\beta_1 - \beta_4$ = Parameters to be estimated.

V_i is a random error which accounted for the random variations in output value by factors which are beyond the control of the farmers such as disease outbreak, weather, measurement errors, e.t.c., and it is assumed to be independently and identically distributed ($V_i \sim [0, \sigma^2]$) independent of U_i . U_i is a non-negative variable(s) associated with technical inefficiency in production and it is assumed to be independently and identically distributed as half normal, ($U_i \sim [0, \sigma^2]$). In order to determine the factors that contributed directly to technical inefficiency, equation (3) was estimated and jointly used with the stochastic models (Coelli, 1994) [14]:

$$TE = \alpha_0 + \alpha_1 Z_1 + \alpha_2 Z_2 + \alpha_3 Z_3 + \alpha_4 Z_4 + \dots + \alpha_9 Z_9 \tag{3}$$

Where TE = Technical efficiency of i-th farmer.

Z_1 = Age (years).

Z_2 = Households size (#).

Z_3 = Farming experience (years).

Z_4 = Education (years).

Z_5 = Access to credit (1= yes; 0= no).

Z_6 = Membership of association (1= yes; 0= no).

Z_7 = Extension contact (1= yes; 0= no).

Z_8 = Off- farm employment (1= yes; 0= no).

Z_9 = Rent paid on land used (₦).

α_0 = Intercept.

$\alpha_1 - \alpha_9$ = parameters to be estimated.

It was hypothesized that women farmers with higher education, who had access to farm land with tenure security, access to credit facilities and maintain large farm sizes tended to be more efficient. The maximum likelihood estimates (MLEs) of the parameters in the stochastic frontier production function (SFPF) model defined by equation (2), given the specification for the technical inefficiency effect defined by equation

(3), were obtained using FRONTIER 4.1 of the stochastic frontier analysis (SFA) (Coelli, 1994 [14]). The unknown parameters of the stochastic frontiers and the inefficiency effects were estimated simultaneously.

2.2.3 Farm budget analysis: We used this measure of productivity to analyse the costs and returns to production of arable crops in order to examine and compare the level of farm income among the tenure secured and non-secured women farmers in the study area. The gross margin (GM) is the excess of returns over variable costs of production. Total revenue was taken as the product of price per unit and quantity of various crops produced by the farm households. Products were sold at different markets with different prices. However, we used the average prices in our computation. Input costs were valued at prices paid by the farmers and the gross margin was calculated using the formula presented by equation (5):

$$GM_i = (\sum TR_i - \sum TVC_i) \quad (5)$$

Where: GM_i = Gross margin of i th farm household in naira per hectare (₦/ha),

TR_i = Total revenue of i th farm household in naira per hectare [Price (P) x Quantity (Q)], and

TVC_i = Total variable cost of i th farm household in naira per hectare (₦/ha).

III. Results and discussion

3.1 Socioeconomic characteristics of women farmers.

The socioeconomic characteristics of the women farmers in Table 1 showed that on the average, the tenure secured women farmers were much better than their counterpart with non-secured tenure in terms of farm size cultivated, years of schooling, and household size. The t-statistics also showed that the observed differences between these two categories of women farmers were statistically significance. The result further showed that there were no significant differences in age and farming experiences among the two groups. It is however important to note that women with non-secured tenure spent more on labour and other inputs as compared to women with secured tenure. The observed differences were also statistically significant.

Table 1. Socioeconomic characteristics of the women famers.

Variables	Non-Secured Tenure (N=52)		Secured Tenure (N=32)		t-test
	Coefficients	Std. Deviation	Coefficients	Std. Deviation	
Age (years)	46.94	11.04	43.75	7.70	1.55
Years of schooling	3.71	4.04	5.53	4.40	-1.89**
Household size (#)	6.00	2.38	7.00	1.77	-2.19*
Farming exp. (years)	17.02	6.41	15.69	4.71	1.09
Farm size (ha)	2.32	2.14	5.36	3.61	-4.32*
Labor cost (₦/ha)	35,687.00	7,257.43	13,397.79	2,572.97	20.18*
Cost of other Inputs (₦/ha)	69,981.49	9,219.26	25,220.42	2,572.98	32.99*
Married (% yes)	73.10	-	68.80	-	
Widowed (% yes)	26.90	-	31.20	-	

Source: Survey data 2012.

This might have negative impacts on the level of farm income generated by women farmers with non-secured land tenure. The average age of women with secured land tenure and women with non-secured land tenure in the study area were 43.8 and 46.9 years respectively. This implied that average woman in the area were neither too young nor too old but were in their active working age. The average years of schooling were 5.53 and 3.71 for women with secured land tenure and women with non-secured land tenure respectively. This showed that an average woman farmer in the area was educated and as such should be able to evaluate, use and adopt improve technologies to enhance their level of farm efficiency and hence their farm income. Average households in the area contained 6 and 7 members for women with secured land tenure and women with non-secured land tenure respectively. This indicated that average household regardless of whether they have secured tenure or not, had financial obligation to its members. The result further showed that on the average, women with secured land tenure cultivated more farm land (5.36 ha) compared those without secured land tenure (2.32 ha).

3.2 Farm level efficiency among women farmers.

The farm level efficiency among the farmers followed the same trend with observed differences in the socioeconomic characteristics of women with secured land tenure and women with non-secured land tenure in the study area. The maximum likelihood estimates (MLEs) of the parametric stochastic frontier analysis (SFA) in Table 2 revealed that among the women with secured land tenure, the independent variable (Xs) such as man-days of labour used and farm size were significant at 5%. This implied that farm size cultivated was significant

to their efficiency level. The coefficient further showed that 1% increase in the size of farm land cultivated by women with secured land tenure would lead to an increase in their level of efficiency by 5.9%. This result is consistent with the findings of Omonona *et al.* (2006) [15].

Table 2. Efficiency of women farmers-Stochastic frontier production function.

Variables	Parameters	Non-Secured Tenure (N=52) Coefficient	Secured Tenure (N=32) Coefficient
Constant	β_0	22.40 (4.548)*	-4.854 (0.383)*
lnX ₁	β_1	0.910 (0.512)	0.539 (0.035)
lnX ₂	β_2	-0.018 (-1.035)*	-0.014 (0.031)*
lnX ₃	β_3	-0.059 (0.838)*	0.007 (0.011)
lnX ₄	β_4	0746 (0.838)	5.952 (0.166)*
Inefficiency function			
Intercept	α_0	14.797 (-1.138)	0.208 (0.194)
Age	α_1	-3.851 (0.388)*	-0.19-E4 (-0.026)
Family size	α_2	0.094(0.057)	0.002 (0.011)
Farming experience	α_3	-0.166 (0.193)	0.0002 (0.0053)
Years of education	α_4	-0.073 (0.065)	0.0082 (0.0075)
Access to credit	α_5	-0.0126 (0.096)	-0.0079 (0.059)
Farmers' association	α_6	-1.884 (0.932)*	0.00033 (0.062)
Extension contact	α_7	0.916 (0.730)	-0.4-E6 (0.15-E6)*
Off-farm employment	α_8	0.3-E4 (0.2-E4)	0.0001 (-0.0001)
Land Rent	α_9	-1.512 (2.012)	0.89-E6 (0.15-E5)
Diagnosis statistics			
Sigma-square		1.636 (0.419)*	0.027 (0.0056)*
Gamma		0.999 (0.68-E7)*	0.023 (0.028)
Average TE		0.373	0.819

Source: Survey data 2012. Note: figures in parentheses are standard error, * indicates significant at 5%.

Contrariwise, farm size cultivated showed no significant influence on the farm level efficiency among the women with non-secured land tenure. However, man-days of labour used and cost of chemical (fertilizer and pesticides) were significant to their efficiency level at 5%. The result further showed that the average technical efficiency value of women farmers with secured land tenure and those with non-secured land tenure were 0.819 and 0.373 respectively.

In order to identify the factors that were responsible for inefficiencies among the two categories of women farmers, we considered the following inefficiency variables; age, farming experience, households' size, years of schooling, access to credit, membership of association, extension contact, off-farm employment, and rent paid on land used. For women with secured land tenure, only extension contact was significant and the statistics gamma ($\gamma = 0.023$) obtained was not significant. This implied that all the deviations from the production frontier were caused by random error. On the other hand, among the women with non-secured land tenure, inefficiency factors like age and membership of farmers' associations were significant, and the statistics gamma ($\gamma = 0.99$) was significant at 5%. This implied that all deviations were caused by technical inefficiency (Phan, 2004; [16] Coelli *et al.*, 2005 [17] & Tran *et al.*, 2008 [18])

3.3 Costs and returns to production among the women farmers.

Using costs and returns to crop production of the farm budget analysis in Table 3, we considered all the input used. These include labour, inorganic fertilizers, pesticides, amount paid for use of land (rent), cost of other inputs (seeds, seedlings, stems, hoes, cutlasses, bags, baskets, e.t.c.,) and other miscellaneous costs. The result showed that, on the average, the total variable cost (TVC) per hectare by women with secured land tenure was ₦42, 983.99, while the average TVC by women with non-secured land tenure was ₦130, 705.76 per hectare. The difference could be attributed to land rent incurred by women with non-secured tenure among other factors. This would contribute to their overhead cost and reduce average farm income of women with non-secured land tenure. The results further revealed that the average gross margin per hectare (GM/ha) of ₦100, 102.63 and ₦42, 278.09 for women with secured land tenure and women with non-secured land tenure respectively. The results also showed that there was a significant difference between the gross margins per hectare of the two groups. This supported findings by many literatures that tenure security could be a major incentive towards increased agricultural productivity and profitability especially among the women farmers (Saito *et al.*, 1994; [6] Nweke *et al.*, 2002 [4] and Omonona *et al.*, 2006 [15]).

However, farming business was generally profitable in the area because gross margin per naira invested (GMNI/ha) showed that every ₦1.00 invested per hectare yielded ₦4.65 and ₦0.75 for women with secured land tenure and women with non-secured land tenure respectively. This implied that women with secured land tenure generated higher income from their farm production than women with non-secured land tenure. This could have a serious implication on their total farm income and hence, their level of economic empowerment.

Table 3. Costs and returns (₦/ha) to crops production by women famers.

Items	Secured Tenure (N=32)	Non-Secured Tenure (N=52)	t-test
A. Mean yield (kg/ha)	1,641.84 (142.22)	2,370.15 (285.67)	-15.52*
B. Revenue (₦/ha)			
Maize	80,876.9 (8,008.28)	56,038.30 (8,229.01)	
(ii) Yam	17,966.8 (2,890.52)	32,108.15 (5,965.42)	
(iii) Cassava	42,784.7 (4,920.91)	84,626.94 (1,102.31)	
(iv) Vegetable	458.16 (106.67)	210.43 (123.76)	
(v) Revenue (i+ii+iii+iv)	143,086.63 (10,007.88)	172,983.86 (18,303.7)	-9.66*
C. Variable Costs (₦/ha)			
(vi) Cost of seed	6,774.38 (411.11)	5,887.21 (763.74)	
(vii) Land rent	1,801.74 (134.22)	3,071.54 (317.49)	
(viii) Cost of chemicals	2,157.79 (209.8)	3,598.43 (378.09)	
(ix) Labour cost (Hired & Family)	13,397.79 (2572.97)	35,687.00 (7,257.43)	
(x) Cost of other inputs (hoes, cutlass, etc.)	25,220.42 (2,572.98)	69,981.49 (9,219.26)	
(xi) Total variable cost (vi+vii+...+x)	42,983.99 (4,312.63)	130,705.76 (15,358.15)	-38.78*
D. GM (₦/ha) (v-xi)	100,102.63 (9,397.72)	42,278.09 (1,888.56)	7.73*
E. Gross margin per naira invested	4.65 (5.10)	0.75 (1.24)	4.25*

Source: Survey data 2012. Note: figures in parentheses are standard deviations, * indicates significant at 5%.

IV. Conclusion and policy implications.

This study compared the farm level efficiency and farm income among tenure secured and non-secured women farmers with a view to increase agricultural productivity among rural women farmers in the study area. The maximum likelihood estimate (MLE) and farm budget analysis results showed that a positive relationship exist between tenure security, level of farm efficiency and total farm income among women farmers. We therefore conclude that women farmers with secured land tenure have higher value of technical efficiency and farm income than women with non-secure land tenure, and that tenure security is a major determinant of the level of farm efficiency and farm income among the women farmers in the study area. However, an important policy question is how to improve women access to farm land in order to enhance their farm productivity, farm income and hence improve their level of economic empowerment in Osun State, Nigeria.

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