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Gender Differentials among Subsistence Rice Farmers and Willingness to undertake Agribusiness in Africa: Evidence and Issues from Nigeria

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***Abstract*:** Gender disparities in resource access, utilization and competitiveness in agricultural production have been critical challenges to the achievement of food security and inclusive growth in Africa. Thus, this article determined rice farmers' productivities and competitiveness, their willingness to undertake and factors influencing their participation in agribusiness across gender, using descriptive and inferential statistics. The study employed a case study of rice farmers in Ibaji Local Government Area of Kogi State, Nigeria, to reach its conclusion. The study concluded that in spite of the willingness to invest in agribusiness, gender imbalance in socioeconomic status, resource use and incomes were still recurring issues limiting productivity, competiveness in rice production and by extension, food security. To feed Africa, there is the need to close the gender gap in socio-economic status, resource access, productivity and competitiveness, align national with regional agenda and the global sustainable development goals on hunger and equity, with the view to pooling resources towards tackling the food insecurity on an equitable and sustainable basis. It has also become imperative to support effective policy deployment, implement proven innovative and sustainable agri-business models and embark on targeted gender support within country and regional settings.

1. Introduction

In spite of being at the high point of its development fortune and having enjoyed its strongest growth in recent times, put at an average of 5–6 per cent in the last 40 years, with progress made on some of the Millennium Development Goals (MDGs) (African Development Bank (AfDB), 2015), this growth has not translated into improved food security and well-being for all Africans. Presently, approximately 240 million Africans are undernourished, and this is attributed to technical and economic challenges hindering agricultural transformation and food security goals (AfDB, 2016).

Ironically, the disproportionate effects of these constraints were mainly on the marginalized populations, especially, women and youths. According to FAO (2011), the roles of women differ within and between countries and have become more dynamic in numerous parts of the world. AfDB (2014) noted that 70 per cent of Africa's smallholder farmers are women, and are responsible for more than 90 per cent of Africa's agricultural production.

On gender under-representation in agricultural production and productivity, AfDB (2016) affirmed that the diversity of the African continent prompted the diverse roles ascribed to the male and female genders. The fundamental argument here is that culture has long been used as a reason to legitimize differences in gender status. Aside from this, Njogu and Orchardson-Mazrui (2009) revealed that gaps in policy, the legal framework and investment opportunities constrain women folk from performing optimally in social, economic and political spheres. Ilahi (2000) and AfDB (2000) further noted that the combined time burden of household chores and farm work may have been too rigorous for women in Africa. Numerous studies (AfDB, 2000; FAO, 2011) also affirmed that gender disparity weakens women's rights to land and their position in accessing financial resources where collaterals are needed. AfDB (2014) thus affirmed that inequality between female and men is among the highest in the world.

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Even though numerous works have been undertaken in the area of gender productivity within and outside Nigeria (Offodile *et al*., 2010; Simonyan *et al*., 2011; Adewuyi and Adebayo, 2014; Addison *et al*., 2016), these studies were not in tandem with the renewed orientation on Africa's transformation, while only few are available on competitiveness and willingness to invest in agribusiness. The need to provide evidence on gender linkage to food security was also imperative. Consequently, this article (i) examined the socio-economic characteristics of respondents in the study area along gender lines; (ii) determined the total factor and partial productivities of respondents along gender lines; (iii) ascertained the competitiveness of respondents' rice production enterprise along gender lines; (iv) determined respondents' willingness to invest in agri-business along gender lines and its determinants; and (v) identified the challenges limiting rice productivity, production and competitiveness.

2. Conceptual and Theoretical Insights

2.1 Gender and Agricultural Transformation

World Bank (2012) noted that women's ability to make choices and transform them into actions can be transformative for the society. It posited that transformation can shape institutions, markets and social norms that limit their individual agencies and opportunities. Bryson (1981) posited that women's role in agriculture enabled past development.

2.2 Gender Equality and Food Security in Africa

OECD (2011), Mukasa and Salami (2015), Blackden *et al.* (2006) and Saito *et al*. (1994) have all argued on the need to ensure gender equality in order to achieve food security within Africa. World Bank (2012) also noted that the share of assets and the share of land owned by women are positively associated with higher food expenditures.

2.3 Gender and Economic Growth

AfDB (2014) and Blackden *et al*. (2006) have all affirmed that gender is a critical economic issue for Africa, directly linked to its economic and social development. World Bank (2005) also noted that Africa suffers from low poverty elasticity of growth due to its high inequality. The Bank (2012) further posited that gender equality is smart economics that contributes to economic efficiency and achievement of development goals. It affirmed that the control over household resources by women leads to more investment in children's human capital with dynamic positive effect on economic growth (see also Anyanwu, 2016). Not unexpected, numerous studies (Blackden *et al*., 2006; World Bank, 2012; Adewuyi and Adebayo, 2014; AfDB, 2015) have shown that gender inequality acts as a significant constraint to economic growth in sub-Saharan Africa. On this, numerous researchers have voiced their opinions (Mohammed and Abdulquadri, 2011; Elson and Evers, 1997). Moleketi, Geraldine Fraser, the AfDB Special Envoy on Gender, further explained that women's economic gains benefit not only themselves but also the next generation, magnifying the development impact.

2.4 Gender and Competitiveness

Latruffe (2010) identified two perspectives for competitiveness measurement to include: (i) measurement of strategic management such as production cost, profitability and efficiency; and (ii) measurement based on trade competitiveness premised on comparative advantage. Krugman (1996) argued that true competitiveness is measured by productivity and that productivity is the goal, not export per se.

2.5 Gender and Agribusiness

The growth of modern farming and the quest for high-valued produce has been associated with the development of agribusiness enterprises and contract farming within the African continent. According to Maertens and Swinnen (2009), women comprise fewer than 10 per cent of the farmers involved in smallholder contract-farming schemes in the Kenyan fresh fruit and vegetable

export sector (Dolan, 2001), and only one of a sample of 59 farmers contracted in Senegal to produce French beans for the export sector was a woman. Ironically, much of the farm work done on contracted plots is performed by women as family labourers. Also, Porter and Howard (1997) revealed that in 70 per cent of the cases of sugar contract-farming in South Africa, the principal farmer on the sugarcane plots is a woman. Alunga and William (2013) identified the challenges of women in agribusiness to include: negative reaction to self-employment, inability to access loans using farm lands, restriction of women, limited funds and opinion of what is masculine or feminine.

FAO (2015) explained the fact that discrimination against women when land was redistributed clearly excluded them from participating on an equal footing with men in consultation and decision-making processes.

2.6 Agricultural Productivity and Gender

Comparative Analysis of Agricultural Productivity

Kalai and Helali (2016) further affirmed that productivity growth makes it possible to measure production efficiency gain and can serve as an indicator of technological progress. They argued that the lack of technological change was the main cause of failure of total productivity of thematic sectors. OECD (2011) noted that though agricultural productivity had been strong in high level countries like Brazil, China and South Africa, the situation had contrasted in developing countries. The source affirmed that at the global level, the growth rate of crop yields had declined in the last 15 years compared to the previous period. In general, agricultural productivity situation in developing countries has been diverse (OECD, 2011), with productivity growth particularly strong in Brazil and China in recent years. With respect to sub-Saharan Africa, Block (2010) observed that significant increases have been achieved since the 1980s, following the decline recorded in the 1960s and 70s. The trends in total factor prodcuctivity (TFP) growth of agriculture in the world region are detailed in Table 1.

In their review of partial factor productivity (Table 2), the researchers further noted that SSA labour ratio had declined. Relative to the other regions, Block (2010) affirmed that the average partial factor productivity growth in SSA is low and has been largely driven by increased yield per hectare, with little growth of output per worker.

Recent empirical data (Addison *et al.,* 2016; AfDB, 2016) have also affirmed the low productivity within the African continent compared to best practices (Figure 1).

Gender and Agricultural Productivity

On the nexus between gender and agricultural productivity, OECD (2011) and FAO (2011) affirmed that the obstacles that confront women farmers mean that they achieve lower yields than their male counterparts. According to the Organization, empirical evidence revealed that if the female gender has access to same level of resources, same yield would be achieved. It stated that productivity differential between men and women averages around 20–30 per cent due to differences in resource use. It concluded that bringing yields on the land farmed by women up to the levels achieved by men would increase agricultural production in developing countries to between 2.5 and 4 per cent and reduce the number of undernourished

Table 1: Total factor productivity growth of agriculture in world regions, 1961–2007
Average annual growth rate by period (%)

Groupings	1960–69	1970–79	1980–89	1990–99	2000–07	1961–2007
All developing countries	0.16	0.54	1.66	2.30	1.98	1.35
Sub-Saharan Africa	0.36	−0.07	0.57	1.17	1.08	0.62
West Africa	1.06	0	2.82	2.25	2.04	1.64
North Africa	−0.1	0.61	1.33	1.46	0.95	0.89
All developed countries	1.21	1.52	1.47	2.13	0.86	1.48
USA and Canada	0.86	1.37	1.35	2.26	0.33	1.29

Source: Alston *et al*. (2010).

Table 2: Global growth in agricultural land and labour productivity, 1961–2005
Average annual growth rate by period (%)

	Land productivity		Labour productivity	
Groupings	1961–90	1990–2005	1961–90	1990–2005
World	2.03	1.82	1.12	1.36
Africa	2.18	2.21	0.68	0.90
China	2.81	4.50	2.29	4.45

Source: Alston *et al.* (2010).

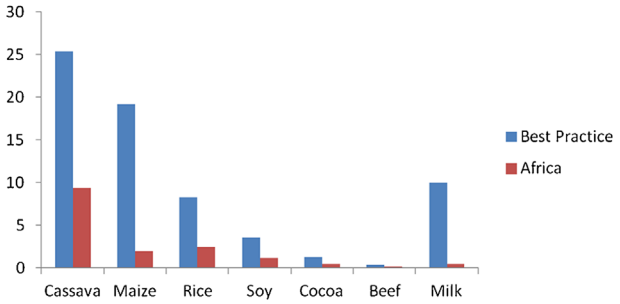
people globally by 12–17 per cent. Numerous studies (Udry, 1996; Udry *et al*., 1997; Blackden and Bhanu, 1999; Goldstein and Udry, 2002) within the African continent have also substantiated the fact that the gender gap reduced the efficiency of agricultural production and that if input used were at par, food production would increase by 10–15 per cent. In addition, AfDB (2014) revealed that women's productivity is 30 per cent lower than that of the men because women lack access to relevant production inputs. World Bank (2012) further affirmed that ensuring gender parity with respect to agro-inputs would enhance yield by 11–16 per cent in Malawi and by 17 per cent in Ghana. The source revealed that increasing women property rights in Burkina Faso through resource allocation from men to women would raise household agricultural production by 6 per cent with no additional resources. World Bank (2012) established that increasing the productivity gap between gender by one third to one half and increasing output per worker from 3–25 per cent across a range of countries will yield positive outcomes.

3. Research Methods

The research was a case study undertaken in Ibaji Local Government Area (LGA), Kogi State. Kogi State is one of the 36 states in Nigeria, located in the north central zone of the country within the north guinea savannah. It lies within latitudes 7° 30 N′ and 7.56° N and between longitudes 6° 42′ E and 6.58° E. Estimated average annual rainfall is put at 1,231 mm; mean and average high temperatures are 22.1 °C and 32.7 °C respectively (Climate Nigeria, 2014). The state ranks 13th in the country by area, and covers a land area of 29,833 km^2 with a population of 3,595,789 (National Population Commission, 2012). The state shares a common boundary with 11 states within the country. It is known as the confluence state, given its uniqueness at the meeting points of the rivers Niger and Benue, which are the two major rivers in Nigeria. Agriculture is a main part of its economy, with major crops such as maize, rice, cassava, yam, melon coffee, cocoa, palm oil and cashew cultivated (https://en.wikipedia.org/wiki/Kogi_State).

The study employed a multi-stage sampling design comprising a first stage random selection of 3 wards out of the 12 in the LGA and a further random selection of two villages from each ward, following which the sample size formula (Yamane, 1967; Israel, 2009) was applied to select a sample of 165 from a population of 280 at 95 per cent confidence

Figure 1: Average yield across Africa versus best practice (tonnes/hectare or animal, 2013)



Source: AfDB (2016).

interval and 5 per cent precision level. Five questionnaires were dropped due to poor responses. Stratification was taken into consideration, with 80 each of male and female respondents selected. All respondents under the survey were subsistent farmers.

Questionnaires for the study were administered by the researchers and the graduate students involved in this study. Data collected covered farmers' socio-economic characteristics, input and output data, information on respondents' willingness to undertake agribusiness activities along gender lines. Data collected were analysed using descriptive statistics (objectives 1 and 5), productivity index (objectives 2 and aspect of 3), net farm income (objective 3) and probit regression analysis for objective 4.

3.1 Specification of Models

The model specifications for the study are as follows:

(i) Sample size model (source: Yamane, 1967; Israel, 2009)

$$n = N/1 + N(e) \tag{1}$$

where n is the sample size, N is the sample frame and e is the precision level.

(ii) Total Factor Productivity Index

$$\text{Total Factor Productivity} = \text{Output}/\text{Total Cost of Production} \tag{2}$$

(iii) Partial Factor Productivity Index

$$\text{Partial Factor Productivity Land} = \text{Rice Output (Kg)}/\text{Area cultivated (Ha)} \tag{3}$$

$$\text{Partial Factor Productivity Labour} = \text{Output of rice (Kg)}/\text{Labour utilized (man-days)} \tag{4}$$

(iv) Net farm income

$$NFI = GFI - TVC - TFC \tag{5}$$

where *NFI* is net farm income, *GFI* is gross farm income, *TVC* is total variable cost and *TFC* is total fixed cost.

(v) Probit model

The probit model as used by Alabi *et al*. (2014) is usually represented thus:

$$\text{Prob}\ (Y = 1) = 1 - F\left[-\sum_{k=1}^{k} \beta_k b_k\right] = F\left[-\sum_{k=1}^{k} \beta_k b_k\right] = \phi\left[-\sum_{k=1}^{k} \beta_k b_k\right] \tag{6}$$

The equation for probability of non-event is then:

$$\text{Prob}\ (Y = 0) = 1 - \phi\left[-\sum_{k=1}^{k} \beta_k b_k\right] \tag{7}$$

The farmers' decision to embark on agribusiness depends on the function:

$$Y^* = \text{ч}Z_i + u_i \tag{8}$$

where Y^* is the underlying index reflecting the difference between willingness to undertake agribusiness and its non-willingness to undertake agribusiness; ч is a vector of parameters to be estimated; Z_i is a vector of exogenous variables which explain willingness to undertake agribusiness; and u_i is the standard normally distributed error term.

Given the farmers' assessment, which Y_i^* crosses the threshold value, 0, rice farmers are willing to undertake agribusiness. In practice, Y_i which is defined by:

$Y_i = 1$ if $Y_i^* > 0$ (farmers willing to untertake agribusiness)

$Y_i = 0$ if otherwise

In the case of normal distribution function, the model to estimate the probability of a farmer willingness to undertake agribusiness can be stated thus:

$$P\left(Y_{\mathrm{i}} = \frac{1}{X}\right) = \phi(X\beta) = \int_{-\alpha}^{X\beta} \frac{1}{\sqrt{2\Pi}} \exp\left(\frac{-Z2}{Z}\right) \mathrm{d}z \tag{9}$$

where P is the probability of the ith farmer's willingness to undertake agribusiness and 0 otherwise; X is a $K \times 1$ vector of the explanatory variables; Z is the standard normal variable (i.e. $Z \sim N(0,\delta^2)$); and β is a $K \times 1$ vector of the coefficients estimated.

For a non-dichotomous variable, the marginal probability is defined by the partial derivative of the probability that $Y_i = 1$ with respect to that variable. For the jth explanatory variable, the marginal probability is defined by:

$$\frac{\delta p}{\delta X ij} = \phi.(X_i\beta)\beta_j \tag{10}$$

where $\phi.$ is the distribution function for the standard normal random variable and β_j is the coefficient of jth explanatory variable.

The probit model specification in this analysis can be expressed as:

$$Y_i^* = X_i\beta + \varepsilon_i \tag{11}$$

$$Y_i = 1 \text{ if } Y_i^* > 0, 0 \text{ if } Y_i^* < 0$$

where Y_i is the observed dichotomous dependent variable which takes value 1 when the ith rice farmer is willing to undertake agribusiness and 0, otherwise; Y_i^* is the underlying latent variable that indexes willingness to undertake agribusiness; X_i is a row vector of values of K regressors for the ith rice farmers; β is a $K \times 1$ vector of parameters to be estimated; and ε_i is the error term which is assumed to have standard normal distribution.

4. Results and Discussion

4.1 Socio-economic Characteristics of Respondents across Gender

Blackden *et al*. (2006) explained that full understanding of gender issues requires an analysis of household issues. Table 3 shows that the majority (75 per cent) of the respondents; comprising 77 per cent male and 74 per cent female were less than 41 years. Ajah (2012) and Onwusiribe *et al*. (2015) reached same conclusion. This implies that young people are gradually taking up farming, probably given the inducement which arose under the Agricultural Transformation Agenda in Nigeria. This is a positive development for the food security revolution in Africa, given the likelihood of productivity increases from this generation of farmers. About 92 per cent of the female respondents had no education compared to the 50 per cent recorded by the male. Numerous studies (Blackden *et al.*, 2006; OECD, 2011; AfDB, 2014; Anyanwu, 2016) have all shown that the female gender was disadvantaged educationally compared to the males. Nwaru (2007) and Bala *et al.* (2015) have also isolated illiteracy as a key hindrance to institutional support towards agriculture, while Amos (2007) and Nyagaka *et al*. (2010) revealed that education had positive relationship with efficiency. Without prejudice to gender, the majority (95 per cent) of respondents are smallholder rice farmers cultivating between 1 and 5 hectares. Simonyan *et al.* (2011) revealed that farm land and other production inputs influenced the efficiency of female farmers. About 90 per cent of the male rice farmers acquired their holdings through inheritance compared to 24 per cent under the female gender, while 76 per cent of the latter either borrowed or resorted to communal land compared to 10 per cent recorded by the male counterpart. Also, 76 per cent of the female gender had difficulties in accessing land for farming compared to 9 per cent of the male folks. In addition, only 6.3 per cent of the female respondents

Table 3: Socioeconomic characterization of the rice farmers

	Male		Female		Pooled	
Variable	Frequency	%	Frequency	%	Frequency	%
Age						
<31	24	30	32	40	56	35
31–40	37	46.25	27	33.75	64	40
41–50	15	18.75	12	15	27	16.87
51 and above	4	5	9	11.25	13	8.13
Total	**80**	**100**	**80**	**100**	**160**	**100**
Education						
None	41	50	73	92	114	72
Primary	19	23	5	6	23	14
Secondary	15	19	1	1	16	10
Tertiary	5	8	1	1	7	4
Total	**80**	**100**	**80**	**100**	**160**	**100**
Farm size						
1–5	77	96	75	94	152	95
6–10	3	4	5	6	8	5
Total	**80**	**100**	**80**	**100**	**160**	**100**
Land acquisition method						
Inherited	72	90	19	24	91	57
Borrow	2	2.5	25	31	27	17
Communal	6	7.5	36	45	42	26
Total	**80**	**100**	**80**	**100**	**160**	**100**
Farming experience						
1–10	36	45	40	50	76	47.5
11–20	36	45	32	40	67	41.9
>20	8	10	8	10	17	10.6
Total	**80**	**100**	**80**	**100**	**160**	**100**
Limited access to credit						
Yes	52	65	80	100	132	82
Part. in non-farm activities						
Yes	26	32.5	5	6.3	31	19.4
Income non-farm						
Nil	54	67.5	75	93.7	129	80.6
1–20,000	14	17.5	5	6.3	18	11.3
>20,000	12	15	–	–	13	8.1
Total	**80**	**100**	**80**	**100**	**160**	**100**
Access to extension						
Yes	74	92	2	2	154	96
Membership cooperatives						
Yes	55	68.7	3	3.7	58	36.3

Source: Analysed results from field data, 2016.

were engaged in non-farm activities compared to 32.5 per cent under the male gender. Expectedly, 5 per cent of the captured female farmers earn income off-farm relative to 32.5 per cent for men.

4.2 Productivity of Respondents along Gender Lines

In determining productivity across gender, the study employed three approaches, namely, total factor productivity (TFP), partial factor productivity land (PFP-Land) and partial factor productivity labour (PFP-Labour). The TFP as detailed in Table 4 shows a

Table 4: Total factor productivity

	Male		Female		
Class	Frequency	%	Frequency	%	Mean Diff.
0.00–0.01	56	70	68	85	2.26**
0.02–0.03	24	30	12	15	
Total	80	100	80	100	
Mean	0.014		0.011		
STD	0.01		0.01		
COV	0.39		0.47		
Min	0.01		0.01		
Max	0.03		0.03		

Source: Analysed results from field data, 2016.

mean productivity of 0.014 and 0.011 for the males and females respectively. The means were significantly different at the 5 per cent probability level, implying that the difference was due to differences in gender rather than due to chance. The coefficient of variation (CoV) for males was 0.39 compared to 0.47 for females. This implies that there was more consistency in productivity within the rank of the males compared to the females.

For the PFP-Land (Table 5), the mean productivities recorded were 2.5 and 2.1 tons/ha for males and females respectively and was significantly different at the 1 per cent probability level, implying that there were differences in productivities between both genders. While productivity ranged from 2.2–3.3 tons for the males, the females had a range of between 1.5 and 2.7 tons. The CoV further showed more consistency in productivity for the male compared to the female. Relative to global standards, available statistics show that the average recorded under both genders was far from the 8.3 tons reported under best practice for rice by AfDB (2016).

Available statistics on Table 6 returned a similar trend as with the other two productivity indices earlier discussed. The table shows that PFP-Labour was higher for men compared to that of women, put at 9.01 and 6.75 respectively. CoV values were similar, put at 0.57, implying similar consistency across gender. The test of significance, however, shows that the difference in productivity between the males and females was not due to chance. The implication of the emerging outcome is that female rice farmers are still way behind their male counterparts, in terms of productivity. This is not unexpected given the gap in productive resource access and extension contacts between the two in the study area.

Table 5: Partial factor productivity land

	Male		Female		
Class	Frequency	%	Frequency	%	Mean Diff.
1001–1500	–	–	1	1.3	8.54***
1501–2000	–	–	29	36.3	
2001–2500	69	86.25	42	52.4	
2501–3000	10	12.5	8	10	
3001–3500	1	1.25	–	–	
Total	**80**	**100**	**80**	**100**	
Mean	2,473.18		2,133.54		
STD	129.44		331.1		
COV	0.05		0.16		
Min	2,200		1,500		
Max	3,333.33		2,650		

Source: Analysed results from field data, 2016.

Table 6: Partial factor productivity labour

	Male		Female		
Class	Frequency	%	Frequency	%	Mean Diff.
0.01–5.0	13	16.3	29	36.2	3.12***
5.01–10	52	65	40	50	
10.01–15	5	6.2	8	10	
15.01–20	4	5	1	1.3	
20.01–25	4	5	2	2.5	
25.01–30	2	2.5	–	–	
Total	**80**	**100**	**80**	**100**	
Mean	9.01		6.75		
STD	5.7		3.86		
COV	0.57		0.57		
Min	3.64		2.44		
Max	26.6		22.94		

Source: Analysed results from field data, 2016

4.3 Competitiveness of Respondents across Gender

The determination of competitiveness across gender was undertaken using three indicators, namely productivity, average cost of production and incomes, in line with Latruffe (2010). The triangulation of productivity measures using three indices clearly revealed a significant difference between both genders and a high productivity for males, implying they were more competitive in rice production compared to the female. The results from the comparison of costs (Table 7) and incomes (Table 8) also complemented previous results, with higher significant values for the males, implying they were more competitive. Heinrich Boll Stiftung (2015) mooted that subsistence production limits competitiveness.

4.4 Rate of Willingness to Invest in Agribusiness by Respondents across Gender

Across the respondents in the study area an average of 73.8 per cent showed willingness to embark on agribusiness. However, the index across gender shows that the male gender had a higher rate of 80 per cent compared to the 67.5 per cent obtained for the female gender. The implications of this result is that there is a high interest by rice farmers to partake in agribusiness, possibly in view of the worsening economic situation and the need to diversify into other areas to keep body and soul together and, possibly, the awareness created under the Agricultural Transformation Agenda in the country. The higher rate recorded by the male beneficiaries could be as a result of the need to be able to support the family, given the extended family landscape and high household size. The study puts the average household size at 7. On the other hand, the lower rate by the women folk could have been due to illiteracy, put at about 90 per cent in the study area.

4.5 Determinants of Respondents Willingness to Invest in Agribusiness – Male Gender

The results of the estimated probit regression on the willingness of the male rice farmers to invest in agribusiness are presented in Table 9. The results show that the coefficients of marital status, farming experience and limitation in land acquisition were

Table 7: Z-test statistics on production cost between gender

Variable	Mean	Variance	Z-statistics
Male	394,765.20	3.70E+10	1.93*
Female	340,953.11	2.50E+10	

Source: Computed from survey data, 2016.

Table 8: Z-test statistics on net farm income between gender

Variable	Mean	Variance	CoV	Z-statistics
Male	110,037.70	8.09E+10	2.58	2.76***
Female	18,543.76	6.83E+09	4.46	

Source: Computed from survey data, 2016.

significant determinants of the male farmers' willingness to undertake agribusiness. However, while the coefficient of farmers' marital status was positive, implying that willingness to undertake agribusiness by male rice farmers increases with marital status, the negative coefficients of farm size and limitation in land access connotes that male farmers' willingness to embark on agribusiness decreases with these variables.

The marginal estimates in Table 10 show that the probability that a male rice farmer will embark on agribusiness increases with marital status by 0.2252 and decreases with farming experience and land acquisition limitations by 0.0290 and 0.0818 respectively.

The results of the probit estimates on the willingness of female rice farmers to embark on agribusiness are presented in Table 11. The estimates showed that the willingness of the female gender to embark on agribusiness increases with age, but decreases with farming experience, farm size and limitation in acquiring land to farm rice. The implications of these results are that as the female gender age and attain maturity they are likely to be able to take decisions that will likely impact positively on them and their children, such as embarking on agribusiness. On the other hand, as they acquire more experience in farming and probably become well established, they are likely to be reluctant to leave farming for other enterprises. Similarly, as the hindrance to land acquisition persists, the female farmers may likely lose interest in agricultural related enterprises, likely due to marginalization.

The results of the marginal effect and elasticity estimates of the probit analysis on the female rice farmers (Table 12), shows that the probability of undertaking agribusiness increases with age by 0.4625 and decreases with farming experience, farm size and limitations in land acquisition by 0.0496, 0.8095 and 0.3080 respectively.

4.6 Challenges Hindering Respondents' Productivities, Competitiveness and Production

The challenges hindering respondents' productivities, food production, competitiveness and returns are presented in Table 13. The results show variability and peculiarity of challenges across gender, even though some issues were cross cutting. The critical

Table 9: Probit regression results on factors influencing willingness to undertake agribusiness – male gender

Variable	Coefficient	Z-value	*P* value
Constant	0.1715629	0.16	0.875
Age	0.3584277	0.69	0.493
Marital status	1.184507	2.18**	0.029
Education	−0.1785739	−0.63	0.531
Household size	0.0804074	0.9	0.369
Farming experience	−0.152478	−2.11**	0.035
Farm size	0.01419144	0.04	0.965
Land acquisition limitation	−0.430432	−1.97**	0.049
Non-farm activities	−0.6903717	1.38	0.168
Access to extension	0.7841216	1.16	0.211
Membership cooperative	−0.5606491	–1.25	0.211
Net farm income	3.53E–06	1.02	0.306
Probability Chi > 2	0.03		
Pseudo *R* squared	0.2579		
Log likelihood	−30.707873		

* Significant at 10%, ** Significant at 5%, *** Significant at 1%.
Source: Output of analysed field survey data, 2016.

Table 10: Marginal effect and quasi elasticity estimates on male farmers' willingness to undertake agribusiness

Variable	Coefficient	Z-value
Marital status	0.2252285	2.31**
	(0.4468954)	2.17**
Farming experience	−0.028993	−2.37**
	(0.4198284)	−2.24**
Land acquisition limitation	−0.0818447	−1.63
	(0.1174773)	−1.54

Notes: * Significant at 10%, ** Significant at 5%, *** Significant at 1%. Marginal effects are indicated above and partial elasticity in parentheses.
Source: Output of analysed field survey data, 2016.

Table 11: Probit results on the determinants of female rice farmers willingness to undertake agribusiness

Variable	Coefficient	Z-value	*P* value
Constant	4.317583	2.6***	0.009
Age	1.576288	2.86***	0.004
Marital status	−0.4076345	−1.07	0.286
Education	0.8309882	0.89	0.373
Household size	−0.0320689	−0.34	0.737
Farming experience	−0.1691624	−2.78***	0.005
Farm size	−1.054849	−2.04**	0.041
Land acquisition limitation	−1.049545	−3.09***	0.002
Non-farm activities	−0.3423844	−0.41	0.68
Access to extension	–	–	–
Membership cooperative	–	–	–
Net farm income	8.21E–06	1.59	0.112
Probability Chi > 2	0.0007		
Pseudo *R* squared	0.297		
Log likelihood	−34.028309		

Notes: * Significant at 10%, ** Significant at 5%, *** Significant at 1%.
Source: Output of analysed field survey data, 2016.

Table 12: Marginal effect and quasi elasticity estimates on female rice farmers willingness to undertake agribusiness

Variable	Coefficient	Z-value
Age	0.4625467	3.05***
	(1.716175)	2.81***
Farming experience	−0.0496391	−3.01***
	(−0.8093541)	−2.81***
Farm size	−0.8095353	−2.1**
	(−0.7006604)	−2.01**
Land acquisition limitation	−0.307979	−3.7***
	(−1.195103)	−3.46***

Notes: * Significant at 10%, ** Significant at 5%, *** Significant at 1%. Marginal effects are indicated above and partial elasticity in parentheses.
Source: Output of analysed field survey data, 2016.

Table 13: Challenges faced by respondents across gender (%)

	Pooled		Males		Females	
Variables	%	Rank	%	Rank	%	Rank
Difficulties in land access	43	9th	9	9th	76	9th
Pests and diseases	100	1st	100	1st	100	1st
Flood and drought	99	3rd	100	1st	99	6th
High cost of agrochemicals	96	4th	94	4th	98	7th
Limited access to credit	83	6th	65	6th	100	1st
Limited extension contact	96	4th	93	5th	100	1st
Weak cooperatives	71	7th	43	7th	100	1st
Poor road network	100	1st	100	1st	100	1st
Inadequate agro-inputs	58	8th	39	8th	78	8th
Excess workload	28	10th	2.5	10th	54	10th

Source: Field survey, 2016.

constraints faced by the male gender were pest infestation and diseases, and poor road network, which were ranked highest. On the contrary, limited access to credit, insufficient extension contacts, challenge of pests and diseases, and weak cooperatives were the key constraints faced by the female respondents. FAO (2011) noted that women are met with gender-specific constraints which reduce their productivity and limit their contributions to farming, household well-being and economic growth. In spite of being placed bottom, the issue of excess work load deserves mention, given the wide disparity between the male and female genders. Relatively, over 50 per cent of the female rice farmers reported this as a challenge compared to only about 3 per cent of their male counterparts. OECD (2011), World Bank (2012) and AfDB (2014) have all confirmed the huge disparity in workloads across gender, with the imbalance largely to the disadvantage of the female gender.

5. Conclusion and Recommendations

The study brings to bear empirical evidence and concludes that gender imbalance in socioeconomic status, resource use, productivity, and competiveness are still recurring issues limiting the attainment of increased rice productivity, competitiveness and food production. Productivity and competitiveness are still very low compared to the developed economies and differs significantly across gender. Even though interest in agribusiness is high among respondents, there are differences across gender. In addition, farmers' socio-economic characteristics were determinants of farmers' willingness to embark on agribusiness across gender. The challenges limiting farmers' productivities and competitiveness also differ across gender.

Arising from the outcome of the study, the article recommended as follows:

(1) There is the need for continuous targeted policy measures by governments on gender empowerment, through education and skill acquisition, land reform, focused gender based incentives to redress the low gender representation in resource ownership and use. This will require legislative sensitization and parley, continuous capacity building by local and development partners, advocacy groups, NGOs, etc.
(2) Towards ensuring parity in production outcomes across gender and enhancing food security, there is a need for wider adoption of the innovative technology-driven input delivery growth enhancement support scheme within the African terrain, with amendments for targeted incentives to the vulnerable households, including women and youths. Local and regional innovative market integration will further open up markets and thus stimulate production, productivity and food security.
(3) Given the interest in agribusiness by both genders, there is the need for policy support by government and sustained awareness creation to completely move agriculture away from subsistent or mediocrity level to sustainable business models. Implementing proven gender targeted enterprises will also enhance returns and development outcomes.
(4) To redress the gender dualism, there is a need to develop a holistic framework of both genders, with a view to redressing gender specific challenges, through participation, awareness creation, concession, role redress and specific interventions

which favour or give priority to women. The development and mass adoption of labour-saving technologies through incentives will go a long way in redressing some of the highlighted challenges.

(5) It has become imperative for government to work in conjunction with development partners and non-governmental organizations to review global acclaimed best practices, such as a grant scheme targeting empowerment of the vulnerable, including women.

(6) It is apt to align national with regional agenda and the global sustainable development goals (SDGs) on hunger and equity, with the view to pooling resources for the achievements of food security in Africa.

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