EFFECT OF AGRICULTURAL COMMERCIALIZATION ON THE EFFICIENCY OF MAIZE-BASED SMALLHOLDER FARMERS IN KWARA STATE, NIGERIA.

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ABSTRACT
The study was conducted to analyze the effects of agricultural commercialization on the efficiency of maize-based smallholder farmers in Kwara State. A multistage sampling technique consisting of the purposive sampling of two agricultural zones and a random sampling of four Local Government Areas (LGAs) from the two zones was employed. Structured questionnaire was used to obtain primary data from a total of 300 maize-based crop farmers. Commercialization index was used to determine the level of agricultural commercialization. Two Stage Least Square (2SLS) regression was used to analyze the effect of agricultural commercialization on efficiency of maize production, followed by Stochastic Frontier Production Function analyzed the mean technical efficiency of the maize farmers. The results revealed that agricultural commercialization level was about 56.8%. The results further showed that efficiency of maize production was significantly determined by agricultural commercialization ($p < 0.01$), age ($p < 0.01$), amount of input ($p < 0.1$), quantity of maize harvested ($p < 0.1$) and amount of seeds which was significant at $p < 0.01$. The results of Stochastic Frontier Production Function showed that the mean technical efficiency of the maize farmers was 86.7% and was significantly determined by agricultural commercialization ($p < 0.05$), hectare of land used ($p < 0.01$), amount of seed planted ($p < 0.01$) and man-day of labour used ($p < 0.1$). It is concluded that agricultural commercialization directly influenced efficiency of the maize–based crop farmers. It is recommended that maize-based farmers should commercialize their produce.
Keywords: Commercialization, effects, efficiency, smallholder farmer

INTRODUCTION

Background to the Study

Self-sufficient which is the production for the immediate consumption of the farmers and their household without market exchange has been the predominance method of production most especially in African continent. However, for a country to be developed and rise to meet up with the needs of its populace in term of food security and economic development and produce largely for market exchange, there is need to commercialize the agricultural sector (World Economic and Social Survey, 2013).

Agricultural commercialization has been defined as the ratio of value of agricultural sales divided by the total value of agricultural production. Agricultural production is the aggregate sum of sale and consumption of field crops and horticulture (Linlin, 2012).Commercialization of agriculture offers great potentials for diversifying Nigeria's export base given the vast agricultural land, labour force and climatic conditions which makes it possible for the production of cash crops such as cocoa, rubber, palm-oil, palm-kernel and cotton as well as food crops to support the teeming population (Ahmed and Murtala, 2013). Expansion of agricultural exports and the development of agricultural sector has employ over 70% of the work force and provide 80% of the food requirement in Nigeria is very important in reducing poverty and hunger that engulfed millions of her people most of whom are in the rural areas.

Agricultural commercialization refers to the process of increasing the proportion of agricultural production that is sold by farmers (Pradhan, *etal.*, 2010). Commercialization of agriculture as a characteristic of agricultural change is more than whether or not a cash crop is present to a certain extent in a production system. It can take many different forms by either occurring on the output side of production with increased marketed surplus or occur on the input side with increased use of purchased inputs. According toChukwukere,*et al.*,(2012), involvement in commercialization of agricultural systems enhance greater market orientation of farm production; progressive substitution out of non-traded inputs in favour of purchased inputs; and the gradual decline of integrated farming systems and their replacement by specialized enterprises for crop, livestock, poultry and aquaculture products.

In most of the earlier literature, quantity of cash crops produced, proportion allocation of its products to market or sells a considerable proportion of its agricultural outputs will make a farm household assumed to be commercialized (Immink and Alarcon 1993).The United Nations Population Division projects the global human population to grow from 7 billion in 2012 to 9.3 billion by 2050, Forty-seven percent of the population growth will be in sub-Saharan Africa, where agricultural productivity and soil quality is exceptionally low and where reliance on imports of basic staples is already high (Craig, 2013). Therefore agricultural commercialization which as defined as the proportion of agricultural production that is marketed. As a result of this definition, commercialization can be measured along a range from zero (total subsistence oriented production) to

unity (100percentof production is sold). This involves a transition from subsistence oriented to increasingly market oriented patterns of production and input use.

OBJECTIVES OF THE STUDY

The objectives of this study are to:

i. describe the socio-economic characteristics of respondents
ii. determine the current level and its determinant of agricultural commercialization among farmer's households in the study area.
iii. examine the effect of agricultural commercialization on efficiency of farmers in the study area.

RESEARCH METHODOLOGY

The study Area

The study was carried out in Kwara State of Nigeria. Kwara State(8.9848° N, 4.5624° E) is located in the North Central part of Nigeria and lies between latitude 8° 29' 48N of the equator and longitude 4° 32' 32E of the Greenwich meridian. It shares common internal boundary with Niger State in the north, Kogi State in the east, Oyo, Ekiti and Osun States in the south and an international boundary with the Republic of Benin in the west. Kwara State covers a land area of about 36,825 km² with a population 2,371,089 as at 2006 population census (NPC, 2007). It consists of 16 Local Government Areas.Agriculture is the main source of the economy,and the principal cash crops includes: Cotton, Cocoa, Coffee, Kola nut, Tobacco, Beniseed and Palm produce. Kwara State has a tropical climate with temperatures between 30^{o}C to 35^{o}C which supports the planting of food crops such as Maize, Cassava, Yam, etc. The mean annual rainfall pattern shows that the amount range from 800 mm to 1200mm (Yahaya and Timothy,2015).

Sampling Procedure and Sample Size

Multistage sampling was used in the selection of the respondents. Firstly, two Local Government Areas (LGA's) were selected purposively from two zones (C and D) out of the four agricultural zones which are major producers of maize crop, making a total of four LGA's. Secondly, from each of the four LGA's, five maize farming villages were simple randomly selected from the list of farmers in the study area through an Extension Agent in the State, making a total of twenty villages. Thirdly, in each of the twenty villages, simple random sampling technique was used to selectfifteen households making a total sample size of three hundred respondents for this study.

Nature and Sources of Data

Primary data were used for this study and they were obtained through the administration of structured questionnaire on to the respondents. Data obtained were on personal information of the respondents such as age, gender, level of education, household size, years of farming experience, extension contact, membership of association, inputs prices, produce consumed, produce stored and produce sold, farm income of the household, farm size of the household, land ownership pattern, accessibility to basic amenities and other information relevant to the research.

RESULTS AND DISCUSSION

Table 1: Socioeconomic Characteristics of respondents

Variables		Frequency	Percentage
Gender	Male	236	78.66
	Female	64	21.33
Age(years)	<30	20	6.67
	31-40	62	20.67
	41-50	98	32.67
	51-60	94	31.33
	>60	26	8.66
Level of Education	No education	74	24.67
	Primary education	101	33.67
	Secondary education	96	32
	Tertiary education	29	9.66
Farming Experience	1-10	42	14
	11-20	67	22.33
	20-30	87	29
	>30	104	34.67
Farm Size (ha)	1-2	142	47.33
	3-4	135	45
	>4	23	7.67
Household Size	1-5	46	15.33
	6-10	157	52.33
	11-15	97	32.33

Source: Field Survey, 2017

Results show that (20.67%) of the respondents were between 21-40 years, 32.67% were between the age of 41-50 while a total of 31.33% were between the age of 51-60. Studies by Nwaru (2004) revealed that the ability of a farmer to bear risk and be innovative decreases with age. Majority (78.66%) of the respondents were male while females constitute 21.33%. Onu(2006)stated that gender plays significant role in accessing production resources.

It could be observed that 47.33% of the total respondents had farm size between 1-2 hectares while another 45% of the respondents had between 3-4 hectares. Olagunju and Ogunniyi (2006) reported that a large proportion of the farmers in Nigeria have relatively small cultivated land areas. This finding also corroborates that of Jamilu et al. (2014) who found that maize farmers operate on small scale. It was estimated that 60 percent of Nigerians are employed in agriculture and are predominantly smallholders(Agwu *et al.*,2012).A characteristic feature of the agricultural production system in Nigeria is that a disproportionately large fraction of the agricultural output is in the hands of these smallholder farmers whose average holding is about 1.0-3.0 hectares (Tollens, 2000). With these conditions,there is very limited access to modern improved technologies and their general circumstance does not always merit tangible investments in capital, inputs and labour (Yemisi and Mukhtar, 2009).

The table also shows that 15.33 % of respondents had household size of between 1 and 5 people while 32.33 % had between 11-15 people. About half (52.33%) of the respondents had a household size of 5-10. A relatively large household size is more likely to provide more labour required for farm operations such as weed control, fertilizer application (Udensi et al 2011)

Level of Agricultural Commercialization

Table 2: Level of Maize Commercialization

Variable	Frequency	Mean	Std. Dev.	Min.	Max.
Maizecommlevel					
<25	2	21.38	2.91	19.32	23.44
25 - 50	109	46.39	6.18	25.00	50.00
50.01 – 75	155	56.83	5.75	50.13	75.00
>75	34	91.86	8.57	76.92	100.00
Mean	300	56.77	15.06	19.32	100.00

Source: Field Survey, 2017

The result in Table 2 revealed that the mean value of maize commercialization level of maize farmers was 56.77 of the percentage sold. This implies that maize farmers in the study area moved a little bit above average towards commercialization of maize. This corroborates with the findings of Govereh *et al* (1999) that "commercialization can be measured along a continuum from zero (total subsistence – oriented production) to unity (100% production sold)". It also showed that the highest level of commercialization were between the ranges of 50.01 – 75.00 which amounted to 56.83 percent, followed by 46.39 percent of 25.00 -50.00 maize commercialization level.

Effect of Agricultural Commercialization on Efficiency

Table 3a: 2SLS Regression on maize effect of Agricultural Commercialization on Efficiency

Variable	Instrumental variable regression		
Maizecomlevel	**Coefficient.**	**Standard. Error**	**P > /t/**
Age	-0.096	0.099	0.332
Labour man-day	0.103	0.128	0.424
Access to credit	0.109	0.551	0.844
Amount of input	0.018	0.044	0.680
Quantity of maize harvested	0.058	0.061	0.342
Amount of maize seed used	-0.098	0.064	0.130
Access to extension agent	-0.353	0.479	0.461
Marital status	-0.029	0.036	0.416
Gender	-0.049	0.038	0.198
Adult caring for	0.067	0.151	0.658
Hectare of land	-0.143**	0.058	0.014
Farmer association	0 .041	0.369	0.913
Maize selling price/100kg	-0.347**	0.195	0.077
_cons	7.416	2.368	0.002

Number of obs = 300
F(13, 286) = 2.42
Prob > F = 0.0042
R-squared = 0.1037
Adj R-squared = 0.0629

Root MSE = 0.2427			
Efficiency		**Stage two**	
Maize commercialization level	0.233**	0.108	0.031
Age	0.091***	0 .032	0.004
Labour man-day	0.033	0 .028	0.237
Access to credit	0.075	0 .134	0.576
Amount of input used	-0.024*	0 .014	0.085
Quantity of maize harvested	0.381***	0.044	0.000
Amount of maize seed used	-0.345***	0 .046	0.000
Access to extension agent	-0.118	0.154	0.443
_cons	-2.927***	0.802	0.000
Number of obs = 300			
Wald chi2 (8) = 96.51			
Prob > chi2 = 0.0000			
R-squared = 0.5424			
Root MSE = .07798			

Source: Field Survey, 2017, *** p<0.01, ** p<0.05, * p<0.1obs. = observation

The results in Table 3 showed the stages of 2SLS regression model. At the first stage, it was revealed that farm size/hectare of land used and maize selling price/100kg were significant at10 percent. Farm size which had negative coefficient (-0.143) indicated that at 1percent level of significant, a unit increase in the number of hectares of farm size will likely reduce the effect of agricultural commercialization on the efficiency of food production by -0.143.

The maize selling price also had negative coefficient indicated that an increase in the price of maize, the lower will be the effect of commercialization on efficiency and level of food security and vice versa. Other variables were not significant at any level of significance.

The second stage of 2SLS regression showed that the R square is 54 percent and significant at 5 percent which indicated that maize commercialization level have a direct relationship with efficiency of food production by the farmers in the study area. This is in line with (Von Braun and Webb, 1994; Kennedy and Haddad, 1994) confirmed that agricultural commercialization can be a powerful means to improve agricultural efficiency, increase rural household income and, therefore, enhance household access to food. It also revealed that age of the respondents influence the effect of commercialization on efficiency of production, is positive and significant at 1 percent, meaning that a unit increase in age will increase the level of commercialization effect with (0.09) on efficiency of food production.

The amount of input used significantly influence the effect of commercialization, though is negative, at 10percent level of significance. An increase in amount of input will reduce the effect of commercialization on efficiency by 0.024 which result to wastage of inputs.

Also, quantity of maize harvested is significant at 1percent and positively influence the effect of commercialization on efficiency of production by 0.3815, they have a direct relationship with each other. Amount of seed used has great influence on commercialization effect. It is negative and significant at 1percent. It indicated that a unit increase of maize seeds will definitely reduce the effect of commercialization on efficiency of food production and cause wastage of resources

Endogeneity Test of Maize Commercialization on Efficiency

Table 3b: Endogeneity TestTable

Variable	**Coefficient**	**P >/1/**
Robust score $chi^2(1)$	6.314	0.012**
Robust regression $F_{(1,290)}$	6.770	0.009***

Source: Field Survey, 2017, *** p<0.01, ** p<0.05

Table 3 revealed that maize commercialization was instrumental because it was assumed to be endogenous itself, and these p values (Robust score chi^2 (1) which was 6.314 was significant at 10% (0.012) and Robust regression $F_{(1,290)}$ was 6.770 which was also positive and significant at 5% (0.009)) justified the endogeneity of maize commercialization in the study area.

The StochasticFrontier Production Function analysis

This sub-section discussed the results of technical efficiency estimates of the arable crop maize farmers. Four functional forms of stochasticfrontier production model were fitted (Half-normal, Truncated-normal, Exponential and Gamma distributions) but only exponential distribution provided the best fit based on the number of significant variables that exceeded other in the model which is clearly shown in table 4.

The coefficients of variables are very important in discussing the results of the analysis of the data. Among the food crop farmers in the study area the variables that were significant

includes hectare of land was significant at 1percent, number of adult caring for,was significant at 5percent and quantity of maize seed used was significant at 5percent and man-day of labour was significant at 10percent while the other variables like age, education, amount of input used, access to extension agent, access to loan and fertilizer used were all not significant at all known levels of significance. This implies that number of hectare of land used, number of adult in the household, amount/quantity of seed used and man-day of labour are the major productive inputs that has great effect on the production of the maize farmers in the study area. Hectare of land and quantity of seed used had the highest coefficient, with a value of 0.17, 0.91 which are positive in the preferred model and by implication the farm size and quantity of seed used existed as the most important inputs that had the great impact on the output among the food crop farmers. In economic terms, 1percent increase in the hectare of land and the quantity of seed used will result in an increase in the output of maize harvested and vice versa. The other significant variables were negative which are number of adult and labour man-day. This implies that these variables were excessively utilized which is economically interpreted as any attempt to increase the quantities of such variables will bring about wastage of resources; this leads to technical inefficiency of maize crop farmers in the study area.

Variance components of the two error terms in each model are significant at 99 percent confidence interval with the exception of Vsigma and sigma_v under gamma model. Also the calculated lambda(λ) value for normal, truncated normal and exponential model becomes significant at 99 percent confidence interval confirming the existence of efficiency loss across the maize farmers in the study area. At this junction, the gamma model is rejected by this research since it could not meet up to the standard of one of the core assumptions in stochastic frontier analysis. By considering the percentage of total variation in output is lost due to the existence of technical inefficiency or other uncontrolled factors. This involves calculating gamma (λ) from the estimated standard errors of inefficiency and noise component. In half normal case, takes value of (0.823) confirming 82percent of the total variation in the error term happened because of the farmer's technical inefficiency. Likewise, truncated normal, exponential and gamma distributions took (0.867),(0.867) and(0.908). This suggests, each model accounts for 87 percent, 87 percent and 91 percent of variation in the total error term happened due to the maize farmer's technical inefficiency, respectively. This confirmed the work of (Greene, 1990) which assumed that gamma model will offer alternative frontier estimate as of half normal, truncated normal and exponential model and have much higher predicted values than the other models but exponential model fit to be the best model in this study based on the number of significant variables in the model.

Table 4:Stochastic Frontier for Efficiency Analysis

Variable	Half-Normal	Truncated Normal	Exponential	Gamma
Age	-0.082	-0.077	-0.077	-0.013
		(0.083)	(0.083)	(0.095)
	(0.085)	{0.352}	{0.352}	{0.355}
	{0.340}			
Education	-0.037	-0.027	-0.027	-0.013
	(0.044)	(0.042)	(0.042)	(0.095)
	{0.932}	{0.522}	{0.522}	{0.355}
Hectares of land	0.177***	-0.175***	0.175***	0.144
	(0.055)	(0.051)	(0.051)	(0.081)
	{0.001}	{0.001}	{0.001}	{0.838}
+Adult caring for	-0.082	-0.400**	-0.400**	-2.526
	(0.159)	(0.159)	(0.159)	(0.052)
	{0.340}	{0.012}	{0.012}	{0.418}
Amount of maize seed	0.908***	0.915***	0.915***	0.875
	(0.034)	(0.033)	(0.033)	(0.026)
	{0.000}	{0.000}	{0.000}	{0.499}
Amount of input	0.049	0.042	0.042	0.071***
	(0.051)	(0.052)	(0.052)	($1.35e^{-1)}$
	{0.332}	{0.418}	{0.418}	{0.000}
Man-day of labour	-0.196	-0.205*	-0.205*	0.176***
	(0.124)	(0.117)	(0.117)	($1.15e^{-0}$)
	{0.116}	{0.079}	{0.079)	{0.000)
Extension access	0.197	0.277	0.277	0.162
	(0.417)	(0.412)	(0.411)	(0.038)
	{0.637}	{0.499}	{0.499}	{0.838}
Loan access	0.183	0.097	0.096	18.892
	(0.483)	(0.474)	(0.474)	(0.045)
	{0.705}	{0.838}	{0.838}	{0.432}
Fertilizer (kg)	0.347	0.030	0.030	0.082
	(0.041)	(0.038)	(0.038)	(0.038)
	{0.391}	{0.431}	{0.432}	{0.411}
-cons	5.293***	5.271***	5.271***	-36.129***
	(1.593)	(1.556)	(1.556)	($1.19e^{-1}$)
	{0.001}	{0.001}	{0.001}	{0.000}
Usigma	-2.677***	3.502***	-3.751***	-2.851***
	(0.351)	(0.216)	(0.298)	($5.13e^{-1}$)
	{0.000}	{0.000}	{0.000}	{0.000}
Vsigma	-3.347***	-3.342***	-3.342***	0.651
	(0.227)	(0.197)	(0.197)	-
	{0.000}	{0.000}	{0.000}	-
Sigma_u	0.262***	5.761***	0.154***	0.240***
	(0.046)	(0.622)	(0.023)	($6.17e^{-1}$)
	{0.000}	{0.000}	{0.000}	{0.000)
Sigma_v	0.187***	0.188***	0.188***	1.384
	(0.021)	(0.018)	(0.018)	-
	{0.000}	{0.000}	{0.000}	-
Lambda	1.397***	30.627***	0.816***	0.174
	(0.061)	(0.631)	(0.035)	-
	{0.000}	{0.000}	{0.000}	-
g_Shape	-	-	-	155.369***
				0.001
				0.000

Mu	-	-215.653*** (1998869) {0.000}	-	-
Log Likelihood	-2.159	3.103	3.113	2.423
Mean Efficiency	0.823	0.867	0.867	0.908
Observation	300	300	300	300

Source: Field Survey, 2017
Standard error in parenthesis ( ), Probability level (p>/t/) in { }, *** p<0.01, ** p<0.05, * p<0.10.

CONCLUSION

From the findings, it is concluded that agricultural commercialization directly influenced the efficiency level of the maize–based smallholder farmers. It is recommended that government should render financial assistance, provision of modern farm inputs and encouragement to young people to participate in agriculture. This implies that any attempt to increase level of agricultural commercialization will increase efficiency in production as well as improving the food insecurity.

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