Contribution Of Labour, Irrigation And Fertilizer On The Yield Of Rice Production (A Case Study Of Olam Integrated Nigeria Limited)

Adekanbi Olukemi O.

Abstract— **This research, analysis on contribution of the labour, irrigation and fertilizer on the yield production of rice produce at Olam Integrated Nigeria Limited is aim to model equation for the production of rice , to examine the contribution of labour, irrigation and fertilizer on the production of rice and to determine whether the contribution of labour, irrigation and fertilizer will be increase or decrease the yield of rice at Olam Integrated Nassarawa state. The data use in the research work is secondary data which extracted from the sales and production of Olam, multiple regression is use to analyse the data and the result of the analysis show that the model is fitted for the data and that contribution of labour, irrigation and fertilizer increase the yield of rice production.we thereby conclude that federal government should fund Olam rice production in order to increase the production of rice in Nigeria**

Index Terms—**Rice, Rice yield, Olam Rice**

I. INTRODUCTION

Rice is cultivated in all regions of Nigeria. It ranks sixth after sorghum, millet, cowpea, cassava and yam (CBN, 2003). It accounts for about 12 percent of the total cereals produced in Nigeria (CBN, 2004). Five major production systems have been identified. These are the upland rainfed, inland shallow swamp, deep water floating, lowland and irrigated rice production systems [1]. In 1990, rice yield in Nigeria was 2.07tonnes/hectare. This reduced to as low as 1.3 tonnes/hectare in 2007. In 2012, Nigeria rice yield was 1.88tonnes/hectare [3]. The land area under rice cultivation in Nigeria in 2005 was about 2.708 million hectares. But the estimated area planted with rice in 2012 stood at 2.685 million hectares (FAO, 2013). These figures indicated a reduction in area cultivated for rice over the period 2005-2012. Rainfed lowland, upland and irrigated systems accounted for 47%, 30% and 16% respectively to the total land area devoted to rice production [2]. Among these systems, it is known that the rainfed upland system is the least productive . The yield in the rainfed upland is relatively low when compared with the lowland and irrigated production systems [4].

Yet, most rice farmers are in the upland system due to the limited area available for lowland rice production. This is as a result of preference or priority given by government to horticultural crops in the lowland. In 1998, the World Bank gave a $3 million loan facility to Nigerian Rice Project. In 1999, it gave $300 million for horticultural crops under Fadama II project. To improve and encourage the increased production of rice in Nigeria, WARDA bred NERICA for upland ecologies which were introduced to farmers through the Participatory Varietals Selection (PVS) trials in 1999 and 2001. NERICA was to address the problem of low productivity of upland rice in Africa. It promised to be particularly well suited to the low input conditions of rain-fed upland rice production system (Dingkuhn et al., 1998; Johnson et al., 1998). It is resistant to drought, weeds competition, blast virus diseases, soil iron toxicity and acidity [2] and has higher protein content [3]. The NERICA rice varieties embody improved seed technology to enhance yield and productivity. It embodies management practices in terms of biological and chemical technologies. Production parameters of the adopters of these technologies, their productivity levels and their determinants, the seed's response to inputs and overall, the efficiency of the adopters and how these can be used to solve the problem of low yield, low productivity and rice self-insufficiency in Nigeria require empirical quantification. Hence, this study examined the measures of productivity, scale efficiency, and the factors that influence the productivity measures of NERICA in Kaduna State.

Adekanbi Olukemi O., Department of Agriculture Federal College of Education Katsina State

II. HISTORY OF RICE IN NIGERIA

Rice (Oryza sativa) a cereal belonging to the Gramineae, a large monocotyledonous family of some 600 genera and around 10,000 species. It is valued as the most important staple food for over half of the world population and ranks third after wheat and maize in production on world basis. More than half of the world's population depends on rice as the major source of calories. The amount consumed by all these people ranged from 100 kg to 240 kg per annum in the year 2000 alone. Two species have emerged as our most popular cultivated rice, Oryza sativa and Oryza glaberrima; of these two species the more widely produced is Oryza sativa.

In Nigeria, rice consumption has risen tremendously at about 10% per annum due to changing consumer preferences. However, discovered that most Nigerians prefer to consume imported rice brands as compared to local rice varieties. The reason is that most Nigerian rice processors lack adequate technology of rice processing to meet international standard.

Rice processing involves several steps: removal of the husks, milling the shelled rice to remove the bran layer, and an additional whitening step to meet market expectations for appearance of the rice kernels. This process generated several streams of material which include the husks, the bran, and the milled rice kernel. Nigeria has the potential to be self-sufficient in rice production, both for food and industrial raw material needs and for export purpose. However, a number of constraints have been identified as limiting factors to rice production. These include problems with research, pest and disease management. Addressing at least most of these problems is good first step towards attaining the target of rice self-sufficiency. Therefore the aim of this paper is to review the causes of the challenges facing rice production in Nigeria and provide guide to overcome these problems.

The world rice production for over almost a decade (2003–2012) in 2003, about 580 million tons of rice was produced worldwide, 602 million tons in 2004, 620 million tons in 2005, and 622 million tons in 2006. The production continued to grow yearly; by 2007, the production had risen to 648 million tons. The production reached the peak in 2011 with a total production 720 million tons in order to feed the increasing global population. Furthermore, the world's annual production growth rate was stagnated in 2012. The reason could be attributed to natural disaster such as storm, tornado, and unfavorable climate as reported by.

Three types of rice are cultivated in Nigeria. These are the African rice, *Oryza glaberrima*; Asian rice, *O.sativa*; and only recently, WARDA's hybrid rice, NERICA available only to farmers under WARDA's PVSprogramme. According to [2], the African rice *O. glaberrima* originated from the wild rice *O.barthii* some 3500 years ago and its offspring, domesticated probably in the inland delta area of the Nigerfrom where it spread through the upper Niger valley to the rest of West Africa. African rice is cultivatedboth as a field crop and a paddy crop. For the Niger-Benue trough, Sokoto-Rima and Chad Basin rice hasbeen in cultivation long enough for a rice culture to have evolved going as far back as 1500 BC [5]. Remarkable deepwater varieties of *O. glaberrima* exist which are specific to the unusualflood conditions that occur in the inland Niger Delta; the Sokoto-Rima Valley and other floodplains of theextreme north of Nigeria. It is also a common rice type on the floodplains of the Benue trough. The rice canbe harvested, like the weedy wild rice, *O. barthii*, from canoes when the flood has risen, a technique alsoused by American Indians to harvest *Zizania aquatica*. *O. glaberrima* is known by different local names as*hakorin Montol* (literally, the tooth of Montol people because of its grain size) in the Plateau/Nasarawaarea; and *jatau* (red) throughout Hausa land and the Chad Basin. In view of its importance, indigenousAfrican rice is one of the least-known major cereals [1].

III. METHODOLOGY

A. Regression Analysis

Regression is a procedure which selects, from a certain class of functions, the one which best fits a given set of empirical data (usually presented as a table of ***x***and ***y***values with, inevitably, some random component). The *'independent'* variable ***x***is usually called the *regressor* (there may be one or more of these), the *'dependent'* variable ***y***is the *response* variable. The random components (called *residuals*) are usually assumed *normally* distributed, with the same σ and independent of each other.

The class from which the functions are selected (the *model*) is usually one of the following types:

a linear function of x(i.e. $y = a+b\,x$) ;a simple (univariate) linear regression,

a linear function of $x_1, x_2, \ldots, x_k$; a multiple (multivariate) linear regression,

a polynomial function of x;a polynomial regression,

any other type of function, with one or more parameters *(e.g.* $y = ae^{bx}$*)*; a nonlinear regression.

The coefficients (parameters) of these models are called regression coefficients (parameters). Our main task is going to be to find good estimators of the regression coefficients (they should have correct expected values and variances as small as possible), to be used for predicting values of ***y***when new observations are taken.

Linear regression is an approach to modelling the relationship between a scalar dependent variable ***y*** and one or more explanatory variables denoted *x*. The case of one explanatory variable is called simple regression. More than one explanatory variable is multiple regressions.

The linear regression model, with infinite response variables, is given by:

$$y_i = \beta_0 + \beta_1 x_{1i} + \beta_2 x_{2i} +, \ldots, +\varepsilon_i$$

Decomposition of Sum of Squares of ANOVA

ANOVA table can be summarized as follows:

Sources of Variation	Degree of Freedom	Sum of Squares	Mean Squares	F calculated
Regression	$k-1$	$SSR = \hat{\beta}'\,x'y - n\bar{Y}^2$	$MSR = \frac{SSR}{k-1}$	$F_c = \frac{MSR}{MSE}$
Residual	$n-k$	$SSE = y'y - = \hat{\beta}'x'\,y$	$MSE = \frac{SSE}{n-k}$	
Total	$n-1$	$SST = SSR + SSE$		

B. PRESENTATION OF DATA

Table 1 : show the yields of rice in tons and amount spend in millions on labour,irrigation and fertilizer

Year	Labour	Irrigation	Fertilizer	Yield
1991	56728	259506	20000	1280000
1992	57605	266200	20000	1300000
1993	58503	222600	20000	1430000
1994	59428	256700	20000	1416320
1995	60368	235100	20000	1780000
1996	61311	325200	20000	2081000
1997	62237	363900	20000	3303000
1998	63134	400380	230000	2500000
1999	64001	429200	233000	3226000
2000	64843	440000	233000	3260000
2001	65663	461000	233000	3065000
2002	66465	296000	233000	2427000
2003	67252	183000	233000	2920000
2004	68026	1735000	233000	3122000
2005	68787	137700	233000	3268000
2006	69547	163200	233000	3275000
2007	70316	167700	245000	3277000
2008	71101	187500	257000	3298000
2009	71908	221000	270000	2752000
2010	72732	166200	282000	2928000
2011	73570	229747	268752	3116000
2012	74415	152170	272579	3334000
2013	75261	215171	276407	3567000
2014	76108	157166	276407	4042000
2015	76956	150864	286235	3186000
2016	77807	144814	284062	4179000
2017	3402590	78662	1139007	287890

SOURCE: OLAM INTEGRATE PRICE PRODUCTION 2017

C. MODEL DIAGNOSTICS

Regression

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.860[a]	.739	.705	506459.	1.819

a. Predictors: (Constant), IRRIGATION, FERTILIZERS, LABORERS

b. Dependent Variable: YIELD

Model		Sum of Squares	df	F	Sig.
1	Regression	16744128385125	3	21.760	.000[b]
	Residual	5899525407740.871	23		
	Total	22643653792866.668	26		

Model		Unstandardized Coefficients		T	Sig.
		B	Std. Error		
1	(Constant)	1800957	218770.553	8.232	.000
	LABORERS	-2.520	.316	-7.987	.000
	FERTILIZER	.025	.329	.076	.940
	IRRIGATION	6.204	.959	6.468	.000

Y(yield) = $\beta_o + \beta_{x1} + \beta_{x2} + \beta_{x3}$

Y_t= 1800957.566 -2.520 x_2 + 0.025 x_3 + 6.204x_3

Where

Y_t is the Yield

X_1= is the Labour

X_x = is the Fertilizers

X_3= is the Irrigation

Ho: The model not fitted

Hi: The model is fitted

D. TEST STATISTIC

P value = 0.000

α = 0.05

DECISION RULE = Reject Ho if P (value)< α (0.05), if otherwise do not reject

DECISION: Reject H_O

CONCLUSION: Since P (0.000) < α (0.05) we there for concluded that the model is fitted for the production of rice

INTERPRETATION: Based on the model fitted $\hat{Y}_t$= 1800957.566 -2.520 x_2 + 0.025 x_3 + 6.204x_3 from table 3 it was discovered that the coefficient of labour is not significant but coefficient of fertilizer and irrigation are significant .

IV. SUMMARY AND CONCLUSION

The research work aim to investigate the contribution of labour, irrigation and fertilizer on the production of rice produce at Olam Integreted Nigeria Limited , result of the analysis show that in the production of the rice the labour adopted is minimal while the fertilizer used during the process is also minimal and the irrigation adopted is very higher during the production of the rice. Also it was discovered that labour is not much effective, while the uses of fertilizer increase little by little. The model obtain from the analysis is fitted for the production of rice produce at Olam Integrated Nigeria Limited.

Based on the result of analysis we therefore conclude that more emphasis should laid on irrigation in the production of rice in Olam Integrated because it has major contribution on the increase in yield of rice which will reduce rice importation.

REFERENCE

[1] Abdulai, A., V. C. Owusu and J. E. A. Bakang (2011), 'Adoption of Safer Irrigation Technologies and Cropping Patterns: Evidence from Southern Ghana', Ecological Economics, Vol. 70, No. 7, pp. 1415–23.

[2] Adeoti, I. A. (2009), 'Factors Influencing Irrigation Technology Adoption and its Impact on Household Poverty in Ghana', Journal of Agriculture and Rural Development in the Tropics and Subtropics, Vol. 109, No. 1, pp. 51–63.

[3] Dillon, A. (2011), 'Do Differences in the Scale of Irrigation Projects Generate Different Impacts on Poverty and Production?',Journal of Agricultural Economics, Vol. 62, No. 2, pp. 474–92.

[4] Huang, Q., S. Rozelle, J. Huang, B. Lohmar and J. Wang (2006), 'Irrigation, Agricultural Performance and Poverty Reduction in China', Food Policy, Vol. 31, No. 1, pp. 30–52.

[5]Carpenter, A.J. 1978. The history of rice in Africa. In Buddenhagen, I.W and Persley, G.J (eds.). Rice in Africa, p. 3-10. London, Academic Press.

.