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FARM CHARACTERISTICS, PROFITABILITY AND EFFICIENCY IN RESOURCE USE AMONG COCOA FARMERS IN OSUN STATE, NIGERIA

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ABSTRACT

Cocoa is an important cash crop in Nigeria with great potentials both in terms of employment and foreign exchange earnings. This study analysed the profitability and resource use efficiency in cocoa production in Osun State. Sixty (60) cocoa farmers were randomly selected and data were collected on farm characteristics, inputs, output and market prices. Descriptive statistics, budgeting and efficiency analysis were the analytical techniques adopted. Results indicate that the majority of farmers (73%) cultivated farm size of less than 2 ha, with 23% only planted to cocoa. Most cocoa trees had less than 30 years of age, comprising high yielding hybrid varieties only or in combination with old varieties. Cocoa production is profitable with a rate of return of 1.67. The age of cocoa trees had influence on yield, profit and rate of return to cocoa farm, with optimum values achieved between 16 and 30 years. Current farm size, yield and age of trees were below optimum. In terms of resource use, only chemical inputs were utilized efficiently. It is recommended that farmers should increase investment on cocoa farms including size and adopt more of the high yielding varieties of cocoa to improve output.

Keywords: Cocoa trees, profitability, yield, efficiency, inputs use

INTRODUCTION

Cocoa (*Theobroma cacao* L.) is one of the major cash crops grown in Nigeria which doubles as a potential source of income and employment for producers, processors and marketers. Cocoa export contributes to foreign exchange earnings of the country and its output was projected to reach 300,000 mt in the year 2013/2014 (USDA Foreign Agricultural Service, 2014). Akinwale (2001) highlighted the importance of cocoa production and identified it as a primary source of cash for small holder farmers. Koka *et al*. (2011) identified cocoa as a source of raw materials for the chocolate industry and a market for the agro-chemical industry with the pod husks serving as ingredient in livestock feed, soap making and organic fertilizers production.

Cocoa a perennial crop, is a long-term farm venture with long cycle of production. The trees take few years to mature followed by many years of productive life with annual harvest period in Nigeria falling between September and March for the main season and June to August for the mid season every year (ICO, 2014). According to Deola-Tayo (undated), Amelonado, F3 Amazon and Hybrids varieties are the most widely cultivated cocoa varieties in Nigeria. However, cocoa production has assumed an alarming trend in recent years. Oduwole (2004) identified old age of farms as one of the factors causing decline in cocoa output in Southwest Nigeria. Ayoola *et al*. (2000) had attributed this to the predominance of low yielding old varieties, and Ogunlade *et al*. (2009) reported low soil fertility while Anikwe *et al.* (2010) adduced pests infestation as the major reasons for cocoa output decline in the country. The low international market price has also been another influencing factor, though from 2012/2013 there has been some improvement in the price of cocoa that could stimulate production (USDA Foreign Agricultural Service, 2014).

Theoretically, factor-product relationship is the basic production relationship between inputs and output and is concerned with resource use efficiency as a guide and a way of optimizing the use of resources (Reddy *et al.*, 2009). The relationship is conceptually expressed as $Y = f(X_1 | X_2, \ldots\ldots, X_n)$ with (X_1) and ($X_2,\ldots,X_n$), the variable input and fixed resources respectively, and following the law of diminishing returns, the marginal value product (MVP) which is the additional income received from using an additional unit of input, serves as means of evaluating the efficiency in resource use.

Studies that had highlighted the importance of profitability for the sustainability of cocoa industry in Nigeria (Folayan *et al*., 2007; Onoja *et al.*, 2012; Onumah *et al.*,2013) recommended that efficiency in the resources use would be essential for the cocoa industry to grow and closing the gap between *demand* and supply in the cocoa market.

Since 2007, the policy of the Federal Government of Nigeria was targeting at reviving the cocoa industry through rehabilitation of plantations; raising productivity; expanding cocoa farms and promoting new high yielding cocoa hybrids (Adesina, 2012). The response of farmers to the policy depends on the economic viability of the production; hence a comprehensive economic analysis of cocoa production is necessary to serve as a guide to policy makers so as to achieve the goal of improving national cocoa output. The sustainability of cocoa industry depends on increased production and profitability through an efficient use of inputs, hence the need for this study. The study therefore intends to assess the profitability of cocoa production and the level of resources use among cocoa farmers in the study area.

METHODOLOGY

Area of study

The study was carried out in Osun state, Southwest of Nigeria, specifically in Obokun Local Government Area of the State located in the humid tropical climate of southwestern Nigeria, with about 65% of its land mass as forest and 30% as derived savanna. Obokun is characterized by two distinct seasons, namely a rainy season, from March to October and a dry season, from November to February. The temperature in the area varies from 21°c to 30°c under high humidity. The main crops grown in the area include cocoa, kola, citrus, mango, plantain, oil palm, yam, maize, cassava, cocoyam and vegetables. Cocoa represents one of the sources of cash for farm inputs and other valuable assets acquisition among farmers. The area also benefitted from government policy at reviving cocoa production in the country in the year 2000.

Sampling and Data Collection

Multistage sampling technique was adopted to select cocoa farmers to be interviewed for the study. The first stage was the purposive selection of Obokun Local Government Area. The second stage was the random selection of ten (10) major cocoa growing villages in the local government; and in the third stage six (6) cocoa producers were randomly selected per village making a total of sixty (60) respondents for the study. Primary data were obtained with the use of pre-tested structured questionnaire. Data were collected on farmer's socio-economic characteristics, including cocoa farm age, farm size, cocoa varieties planted, types of inputs used and the output obtained, including the market prices.

Analytical Methods

Data were analyzed using descriptive statistics, budgeting technique and Ordinary Least Squares. Linear and Double log functional forms were fitted to estimate cocoa production function with the Linear form as the best fit used for further analysis. A quadratic profit function was fitted to determine the optimal characteristics of the cocoa farm, while Scheffe-test was adopted to capture the effect of age on yield, profit and rate of return, while Marginal Productivity Analysis was applied to assess the efficiency of inputs used.

Profitability Analysis

Farm profit was determined as follows.

$\pi = Q*P - VC - FC$…………………. (1)

Where,

π = profit

Q = Cocoa beans output (kg)

P = Cocoa unit price (₦/kg)

VC= Variable costs (₦)

FC = Fixed costs (₦)

The fixed costs are made up of rent equivalent on land and depreciation equivalent on land clearing, planting materials, planting and farm materials, while the variable costs include weeding, spraying, harvesting, processing, fertilizers and chemicals.

Depreciation was assessed over a period of 25 years using straight line method. According to Gittinger (1985), this is the optimum period for analyzing the profitability of an agricultural investment project.

The Linear Production function

This was specified as follows:

$Y_i = \alpha_0 + \sum\alpha_i X_i + e_i$, with, i = 1….n ……… (2)

Where,

Y_i = Cocoa producer's output in value (₦)

X_1 = Depreciation (₦)

X_2 = Weeding cost

X_3 = Spraying cost (₦)

X_4 = Harvesting cost (₦)

X_5 = Processing cost (₦)

X_6 = Cost of fertilizers (₦)

X_7 = Cost of chemicals (₦)

β_0 = Intercept

$\beta_1 \ldots \beta_5$ = elasticity

u_i = error term

Determination of Optimum Farm Size, Age and Yield of cocoa farms

A quadratic profit function was fitted to determine optimum values for cocoa farms while account for the law of diminishing returns. The model was specified as follows;

$\pi = \delta_0 + \beta_1 A + \beta_2 A^2 + \alpha_1 S + \alpha_2 S^2 + \gamma_1 Z + \gamma_2 Z^2$ …………….(3)

First and second derivatives are given as follows

$\partial\pi/\partial A = 0$ and $\partial^2\pi/\partial A^2 < 0$;

$\partial\pi/\partial S = 0$ and $\partial^2\pi/\partial S^2 < 0$; and

$\partial\pi/\partial Z = 0$ and $\partial^2\pi/\partial Z^2 < 0$

Optimum farm size, yield and age are derived respectively as follows:

$A^* = -\beta_1/2\beta_2$; $S^* = -\alpha_1/2\alpha_2$ and $Z^* = -\gamma_1/2\gamma_2$

With,

Π = profit of cocoa farms (₦)

A = age of cocoa trees (years)

S = cocoa farm size (ha)

Z = yield of the cocoa farm (kg/ha)

S* = cocoa farm size that maximizes profit (ha)

A* = Age at which profit is maximum (year)

Z* = Yield level that maximizes profit (kg/ha)

Efficiency Analysis (using the best fit)

The linear production function being the best fit, the coefficients of inputs variables (α_i) represent directly the MVP of the inputs used, for output being in values and the comparison with the input in monetary terms determining the efficiency status of every resource.

If $\alpha_i = 1$, we have efficient use of resource i.

If $\alpha_j \neq 1$, there is inefficient use, and when the coefficient is not significantly different from zero, this adduces to under-utilization.

For $\alpha_j < 1$, there is over-utilization of input; and for $\alpha_j > 1$, there is under-utilization.

The scale efficiency was determined as follows:

$MVPs = \sum\alpha_i$

If MVP= 1, it implies efficient scale of production; if MVP $\neq 1$, it implies inefficient scale of cocoa production.

MVP = Marginal Value Product

RTS = Returns to scale

RESULTS AND DISCUSSION

Characteristics of Cocoa Farms

Descriptive results in Table 1 indicate that 66 percent of cocoa farms had a combination of old (Amelonado, Amazon) and hybrid varieties of cocoa planted on them. Most cocoa farms had farm sizes of less than 2.0 ha (73 percent). The age of most farms was less than 30 years. Most farmers used insecticides and fungicides (98 percent) and yields were between 500 and 1000 kg/ha in 61 percent of cases. This is better and far above the range of traditional yield but still below the potential yield of 1,200 to 2000 kg/ha as reported in IITA (2009).

Analysis of Annual Profit in Cocoa Production

Results in Table 2 present the outcome of the analysis of annual profit for 1ha of cocoa farm. The average revenue of cocoa farms was ₦ 369000. The total cost was ₦138000. The total fixed cost comprising land rent and depreciation was ₦ 37500 and represents about 27% of the total cost; while the total variable cost made up of labour, fertilizers and chemicals costs was ₦100500 representing 73% of the total cost of production. This high rate of variable costs reveals the need for disaggregating inputs use on cocoa farms to check for efficiency. The profit per ha was ₦ 231000, representing a rate of return of 167%. Cocoa production was more of capital intensive with 0.79 capital ratio.

Table1. Characteristics of Cocoa Farms

Farm characteristics	Frequency	Percentage
Varieties cultivated		
Amelonado	10	16.66
Amazon	07	11.66
Hybrid only	23	38.33
Hybrid and old Varieties	20	33.33
Total	60	100.0
Farm size distribution		
0.1 – 2.0 ha	44	73.33
2.1 – 4.0 ha	12	20.00
4.1 – 6.0 ha	01	01.67
6.1 – 8.0 ha	01	01.67
8.1 – 10.0 ha	02	03.33
Total	60	100.0
Age distribution of cocoa trees (years)		
01 – 15	29	48.33
16 – 30	20	33.33
31 above	11	18.34
Total	60	100.0
Fertilizers usage		
Yes	35	58
No	25	42
Total	60	100.00
Insecticides/fungicides usage		
Yes	59	98.33
No	01	1.67
Total	60	100.0
Herbicides usage		
Yes	18	30.00
No	42	70.00
Total	60	100.00
Yield (kg/ha)		
300 - 500	12	20.0
501 - 1000	37	61.6
1001 – 1500	04	06.7
1501 - 2000	04	06.7
Above 2000	03	05.0
Total	60	100.0

Source: Field survey

Effect Age of Cocoa Trees on cocoa farm Yield, Profit and Rate of Return

The analysis of the effect of cocoa trees age on yield, profit and rate of returns is presented in Table3. Low yield, profit and rate of returns were recorded within the brackets age 0-15 years and above 30 years, while peak values were obtained in the age range 16 -30 years with values of 1,397kg·ha^{-1}; ₦ 160332·ha^{-1}; and 3.4 for yield, profit and rate of returns respectively. Cocoa yield and rate of returns seemed not to be different between the brackets 0-16 and above 30 years. The bracket age for maximum yield of cocoa trees tallies with reports from IITA (2009). In addition it could be observed that the small scale and low productivity of cocoa farms are in conformity with the findings of Idowu et al. (2007), while the relatively young age of cocoa trees would be an indication of the effect of the new policy towards replacing old cocoa trees with the new hybrids. Although the young age would probably affect productivity of the farms as optimum could only be reached much later after age sixteen.

Profitability of Cocoa production which is also confirmed by Onoja *et al*. (2012) and Oluyole *et al*. (2013) is found to be below optimum probably as a result of inefficient scale of production and low productivity. This is in line with Oluyole and Usman (2006) who found that the low land allocated to cocoa could negatively affect productivity.

Table2. Profitability of Cocoa Production

Budget items	Value/ha (₦)
Total revenue	369000
Fixed costs	
Rent	6300
Depreciation(land clearing, planting materials, planting, farming materials)	31200
Total fixed costs	**37500**
Variable costs	
Labour (Weeding, spraying, harvesting, processing)	28500
Fertilizers	14100
Chemicals	57900
C- **Total variable costs**	**100500**
D-**Total cost (B + C)**	**138000**
Profit (A-D)	231000
Ratio of fixed cost	0.27
Ratio of variable cost	0.73
Ratio of chemicals cost	0.42
Rate of return to investment	1.67
Labor ratio	0.21
Capital ratio	0.79

Source: own computation

Table 3. Effect of Age on Farm Yield, Profit and Rate of Returns

Farm economic characteristics	Age range of cocoa farms (years)			F-value	Scheffe-test
	[0-15] (a)	[16-30] (b)	> 30 (c)		
Sub-sample size	29	20	11		
Yield (kg·ha^{-1})	1056	1397	754	2.13*	a = c; b ≠ a; b ≠ c
Profit·ha^{-1}(₦)	131,244	160,332	75,188	2.28*	a=b; a ≠ c; b ≠ c
Rate of return	2.48	3.4	1.76	3.4**	a=c; b ≠ a; b ≠ c

**; *: F test significant at 5% and 10% respectively
Source: Data analysis

Optimum Cocoa Farm Values

The results of the quadratic profit function estimation in Table 4 shows a significant estimate given the significant F-test and Adjusted R^2 values. The results indicate that profit increases with age of cocoa trees, to reach a maximum before declining. Same could be said of farm size and yield. Optimal values of cocoa farm size (S*); trees age (A*) and yield (Yd*) were 2.80 ha, 32 years and 4,519 kg/ha respectively compared to actual mean values of 0.65 ha, 22 years and 1,018kg·ha^{-1} of yield, respectively. In other words, currently cocoa farms present a deficit of about 2.15 ha in farm size, 10 years in age and a yield deficit of about 3.5 tonnes per ha far below optimum values.

Table 4. Actual and Optimum Cocoa Tree Age, Farm Size and Yield

Variable	Value of 1st order coefficient	Value of 2nd order coefficient	Observed values	Optimum*** values

Age (years)	1461.765	-22.157	22	32
Farm size(ha)	148176.911	-26,442.026	0.65	2.80
Yield($kg{\cdot}ha^{-1}$)	90.396	-0.010	1,018	4,519

***:Computations using formulae: $A^* = -\beta_1/2\beta_2 = 32$ years; $S^* = -\alpha_1/2\alpha_2 = 2.80$ ha and; $Yd^* = -\gamma_1/2\gamma_2 = 4{,}519\ kg{\cdot}ha^{-1}$

Source: Data analysis

Cocoa Production Function

The linear production function presented the best fit with an Adjusted R^2 of 0.69 and a significant F-test value of 16.69, which implies a meaningful overall estimation. Depreciation, harvesting, processing and chemicals were significant and made positive contributions to output, while weeding, spraying and fertilizers were not significant, meaning almost zero impact on cocoa output.

Table5. Results of the Estimation of Cocoa Production Function

Variables	Linear Function		Cobb-Douglas Function	
	Coefficient	t-value	Coefficient	t-value
Constant	15278 ^{NS}	(1.25)	-4.333 ^{NS}	(-1.16)
Depreciation(₦)	-87.42 ^{NS}	(-0.694)	0.111 ^{NS}	(1.371)
Weeding (₦)	-0.083^{NS}	(-0.036)	1.221 ^{NS}	(0.414)
Spraying (₦)	-1.61 ^{NS}	(-0.541)	-0.104 ^{NS}	(-0.227)
Harvesting (₦)	9.527 *	(1.71)	0.218 ^{NS}	(0.231)
Processing (₦)	19.577**	(2.13)	2.81***	(2.861)
Fertilisers (₦)	-2.17 ^{NS}	(-0.171)	-0.533 ^{NS}	(-0.591)
Chemicals (₦)	1.07***	(4.80)	0.023 ^{NS}	(0.199)
Diagnostics tests	Adj.R^2 = 0.699; F = 16.69***		Adj.R^2 = 0.213; F = 2.41**	

***; **; *: coefficients significant at 1%; 5% and 10% respectively. ^{NS}: Not significant

Source: Data analysis

Inputs Use and Scale Efficiencies

The results of the analysis of the resource use are summarized in Table 6. The results show that depreciation, weeding, spraying and fertilizers with non-significant effects on output were therefore overused while harvesting and processing with efficiency ratios of 9.52 and 19.57 respectively were underused. Of all the inputs only chemicals seem to be efficiently used with efficiency of 1.07 (≈ 1). The MVP value of 30.17 (linear) for scale of production also indicates an underutilized scale in cocoa production meaning an inefficient scale of production. Though the efficient use of chemicals was partly in contrast with Oluyole *et al*. (2013) who rather found inefficient use of labor, spraying and chemicals. The results of inputs use and scale inefficiency were also confirmed by Nkamleu *et al.* (2010) and Danso-Abbeam (2010) in Nigeria and Ghana, respectively.

It could be of note that the **c**urrent technology in cocoa production implies inefficient use of most resources. Increasing land size generally beyond the current level and improving yield would make the use of land clearing; harvesting, processing and therefore the scale of production more efficient. Results also imply that in doing this, cocoa farmers also gain more in efficiency on weeding, spraying and fertilizers usage.

The findings of this study imply that farmers would improve overall efficiency by investing further on inputs and by increasing farm size.

Table 6. Efficiency in Inputs Use and Scale of Production

Item	MVP_X (₦)	UFC_X (₦)	Efficiency Value	Resource use
Depreciation	-87.42 ≈ 0	1	0	overused
Weeding	-0.083≈ 0	1	0	overused
Spraying	-1.610 ≈ 0	1	0	overused
Harvesting	9.527	1	9.527	underutilised
Processing	19.577	1	19.577	underutilised
Fertilisers	-2.170 ≈ 0	1	0	overused
Chemicals	1.07	1	1.07	Efficient use
Returns to Scale	30.17	1	30.17	Under-scaled

Source: Data analysis

CONCLUSION AND RECOMMENDATION

Cocoa production is highly profitable in the area. It is characterized by scale and resource use inefficiency with most farm characteristics below optimum. The study therefore suggests an increase in the scale of operations especially, the farm size and yield of cocoa so as to improve the efficiency of the overall inputs use. This implies the adoption of high yielding cocoa hybrids. Cocoa farmers must also invest more on cocoa farms to enhance productivity. There is the need for an aggressive policy of more of high yield cocoa varieties adoption by farmers to increase productivity. The current government policy of distributing new hybrids varieties and the progressive adoption by farmers to replace old varieties should be continued. To increase scale for overall efficiency, the need for scaling up the current level of production through increased size of cocoa farms and adoption of high yielding improved cocoa varieties should be noted as this will also improve efficiency in the use of other farm inputs. The study also concludes on the need to speeding up the policy of introducing new varieties of hybrids among farmers so as to lifting up current yield to optimum level and a bit of mechanization of some of the operations to palliate the observed growing scarcity of labor in the area.

REFERENCES

Adesina, A. (2012). Unlocking the potential of Agriculture in Sub-Saharan Africa: Nigeria's Transformation Agenda for Agriculture. Symposium on Growing food: New places, new technologies. John Hopkins University School of Advanced International Studies. 53 p. Available online at: http://www.allianceforagriculture.org/downloads/Agric_Transformation_Agenda_Presentation.pdf

Akinwale, A. O. (2011). Cocoa production and socio-economic problems. A paper Presented at the 13th International Cocoa Research Conference. CTA, pp. 1141-1145.

Anikwe, J. C., Okelana, F. A. and Omoloye, A. A. (2010). The population dynamics of the brown cocoa mirid, Sahlbergella singularis haglund in Ibadan, Nigeria. *African Journal of Food, Agriculture, Nutrition and Development*. 10(7): 2772-2783. Available online at: http://findarticles.com/p/articles/mi_7400/is_7_10/ai_n55817489/?tag=content;col1

Ayoola, B; Fasina, K. B. and Aikpokpodion, P. (2000). Development of the Nigerian cocoa industry: current issues and challenges for research and production. Proceedings of the 13th International Cocoa Research Conference Sabah, Malaysia. pp. 1367-1373.

Danso-Abbeam, G. (2010). Empirical Analysis of Productivity and Resource Use Efficiency in Ghana Cocoa Industry: Evidence from Bibiani-Anhiawso-

Bekwai District. M. Phil. Thesis, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana. 106 p. Available online at:http://dspace.knust.edu.gh:8080/xmlui/bitstream/handle/123456789/256/G.%20DANSO-ABBEAM.pdf?sequence=1

Deola-Tayo, L. (undated). Cocoa production and processing in West Africa: An Nigerian example. Afanis Publications. 21p. Available online at:afanis.org/.../2014/05/COCOA-PRODUCTION-AND-PROCESSING.pdf

Folayan, J. A., Oguntade, A. E. and K. Ogundari (2007). Analysis of Profitability and Operational Efficiencies of Cocoa Marketing: Empirical Evidence from Nigeria. *Journal of Social Sciences*, 15(2): 197-199.

Gittinger, J. P. (1982). *Economic Analysis of Agricultural Projects. EDI Series in Economic Development, World Bank*. The John Hopkins University Press. Baltimore and London. 505 p.

Idowu, E. O.; Osuntogun, D. A. and Oluwasola, O. (2007). Effects of market deregulation on cocoa (*Theobroma cacao*) production in Southwest Nigeria. *African Journal of Agricultural Research*, 2(9): 429-434.

IITA (2009). The productivity of cocoa systems in West Africa. Sustainable Tree Crops Programme. Issues for Roundtable Discussions. International Institute for Tropical Agriculture, 42 p. Available online at: www.iita.org/c/document_library/get_file?p_l_id=98898&...

ICO (2014). What time of year is cocoa harvested? International Cocoa Organization, FAQ. Available online at: http://www.icco.org/faq/58-cocoa-harvesting/131-what-time-of-year-is-cocoa-harvested.html

Koka, J. K., Dodoo, D. K., Kwakye, P. K. and Kambo-Dorsa, J. (2011). Assessment of copper residue in cocoa pods and beans in cocoa growing areas in the central region of Ghana. *Journal of Chemical and Pharmaceutical Research*. 3(4): 467-471.

Nkamleu, G. B., Nyemeck, J. and Gockowski, J. (2010). Technology Gap and Efficiency in Cocoa Production in West and Central Africa: Implications for Cocoa Sector Development". Working Papers Series N° 104, African Development Bank, Tunis, Tunisia. 18 p. Available online at: www.afdb.org/fileadmin/.../WORKING%**2010**4%20%20PDF%20d.pdf

Oduwole, O. O. (2004). Adoption of Improved Agronomic Practices by Cocoa Farmers in Nigeria: A Multivariate Tobit Analysis. Ph.D. Thesis. Federal University of Technology Akure, Nigeria.

Ogunlade, M. O., Oluyole, K. A. and Aikpokpodion, P. O. (2009). An evaluation of the level of fertiliser utilisation for cocoa production in Nigeria, *Journal of Human Ecology*, 25(3): 175-178.

Oluyole, K. A. and Usman, J. M. (2006). Assessment of Economic Activities of Cocoa Licensed Buying Agents (LBAs) in Odeda Local Government Area of Ogun State, Nigeria. *Akoka Journal of Technology and Science Education*, 3(1):130-140.

Oluyole, K. A., Usman, J. M., Oni, O. A. and Oduwole, O. O. (2013). Input Use Efficiency of Cocoa Farmers in Ondo State, Nigeria". *Journal of Finance and Economics*, 1(11): 8-10. Available online at: http://pubs.sciepub.com/jfe/1/1/2.

Onoja, A. O., Deedam N. J. and Achike, A. I. (2012). Profitability and yield determinants in Nigerian cocoa farms: evidence from Ondo State. *Journal of Sustainable Development in Africa*, 14(4): 172-182.

Onumah, J. A., Al-Hassan, R. M. and One-man, E. E. (2013). Productivity and Technical Efficiency of Cocoa Production in Eastern Ghana. *Journal of Economics and Sustainable Development*. 4(4):106-117. Available online at: www.iiste.org.

Reddy, S. S., Ram, P. R., Sastry T. V. N. and Devi, B. (2009). Factor-Product Relationship:(Chapter 18) in Agricultural Economics. Oxford and IBH Publishing CO. PVT. LTD, New Delhi, India. pp. 166-176.

USDA Foreign Agricultural Service (2014). Nigeria Hikes Target on Cocoa Production.Gain Report. Global Agricultural Information Network. 8 p. Available online at: gain.fas.usda.gov/Recent GAIN Publications/Nigeria Hikes...