

## LABOUR PRODUCTIVITY AND RESOURCE USE EFFICIENCY AMONGST SMALLHOLDER COCOA FARMERS IN ABIA STATE, NIGERIA

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### ABSTRACT

*The study examined labour productivity and resource efficiency amongst smallholder cocoa farmers in Abia State, Nigeria. A purposive random sampling technique was adopted in selecting 60 cocoa farmers from three agricultural zones in the State. The analytical techniques used involve inferential statistics like means, frequency and percentages. Loglinear regression analysis was also used. The results show that factors influencing labour productivity among cocoa farmers include level of education, experience and planting material. Also, the determinants of output among cocoa farmers revealed that planting materials, fertilizer use and capital were significant determinants of output among cocoa farmers in the study area. The determinants of allocative efficiency show that seed was under-utilized, while farm size, labour, fertilizer and capital were over-utilized. The results further revealed that poor farm wages (labour payments) ranked highest (38.3%) among labour inhibitor in the study area. It is therefore recommended that supply of adequate capital in terms of productivity should form a policy trust in agriculture; adequate policy that would encourage provision of capital to cocoa farmers is advocated. The farmers should be encouraged to utilize their family labour efficiently in order to reduce use of hired labour which has led to increase in the cost of food crops production and decrease in farm revenue.*

**Key words:** labour productivity, allocative efficiency, resource use, cocoa farmers, Abia State

### INTRODUCTION

Analysis of efficiency is generally associated with the possibility of farms producing a certain optimal level of output from a given bundle of resources or certain level of output at least cost. There are two approaches to it: parametric and non-parametric. The parametric approach relies on a parametric specification of the production function; the non-parametric approach has the advantage of imposing non apriori parametric restriction to the underlying technology (Adewuyi and Okunmadewa, 2001). Allocative efficiency has to do with the extent to which farmers make efficient decision such that inputs are used up to a level at which their marginal contribution value is equal to the factor cost. It is defined as the choice of the optimal input proportions given relative prices (Omonona *et al.*, 2010).

An increase in efficiency in crop production could present a ray of hope and could lead to an improvement in the welfare of the farmer and consequently a reduction in their poverty level and food insecurity. Low yields are as a result of inefficient production techniques manifested in technical and allocative inefficiencies, over-reliance on household resources, labour-intensive agricultural technology and rapidly declining soil productivity (Amaze and Manrice, 2005). The farm-level efficiency of smallholder resources has

important implications for the agricultural development of a nation. Efficient farms make better use of existing resources and produce their output at the lowest cost (Amaze and Manrice, 2005, Sunday *et al.*, 2014).

The term labour productivity is quantitatively determined by comparing labour cost with the total efficiency of labour, which is usually depicted by the amount of produced products. In the literature, the term is sometimes used to express the productivity of labour and in other times the total profitability of the coefficients and production factors. More broadly defined, productivity refers to production processes and is quantitatively expressed as the quantity of produced goods (output) divided by the units of the production coefficients used (input) (Polyzos, 2003). Human labour is about the only main source of labour available to small-holder farmers in Nigeria. Smallholder farmers contribute over 85% of domestic agricultural output in Nigeria (Gocowski, 2003). Okuneye (2000) noted that hired labour contributes 88% of the total labour use on farms thus highlighting its role in agriculture. Family labour and exchange labour could also be employed. Again, the seasonal relationship between the periodical changes in labour cost reduction, use patterns and different labour operations meant to be

timely performed exert a limit to the proportion of household labour that can be depended upon. Nearly all farm works are concentrated in the wet season. A slight delay will be costly, particularly at very short wet season. At such times, demand for labour becomes most alarming.

Cocoa, botanically known as *Theobroma cacao* belongs to the family Stericulinacea. It originated from the upper Amazon region of the South America from where it spread to different parts of the world (Osun, 2001). According to Microsoft Encarta (2009) cocoa has a high food value, containing as much as 20% protein, 40% carbohydrate, and 40% fat. It is also mildly stimulating because of the presence of bromine, an alkaloid that is closely related to caffeine. The beans are sold in international markets. African countries harvest about two-thirds of the total world output; Ghana, Côte d'Ivoire, Nigeria, and Cameroon are the leading African cocoa producers. Most of the remainder comes from South American countries, chiefly Brazil and Ecuador. The crop is traded on international commodity futures markets. Attempts by producing countries to stabilize prices through international agreements have had little success. It is worth noting that the world cocoa production is on the scale of 3 million tons and Ondo state is the largest cocoa-producing state in Nigeria (Amos and Adeleke, 2010).

## MATERIAL AND METHODS

### Study Area

The study was conducted in Abia State. Abia State was created out of Imo State on August 27, 1991. It has a land mass of 700 square km. The state lies between longitudes 7°23' and 8°02' East of Greenwich meridian and latitudes 5°49' and 6°12' North of the equator. Abia State is bounded on the east by the Cross River and Akwa Ibom States, on the north by Ebonyi and Enugu States, on the West by Imo State and on the South by Rivers State. According to the National Population Commission, Abia State is populated by 1,904,908 persons made up of 933,030 males and 971,878 females (NPC, 1999). With estimated annual population growth rate of 2%, the present population is about 2,368,574 consisting of 1,160,141 males and 1,208,433 females. This population consists of people in all walks of life with about 65% of their engagement being in agriculture (ASPC, 2008). Farming is done at subsistence level. The women only farm on their husbands' land as they do not have direct title to land. The state is endowed with a rich fertile soil that supports the growth of crops; yam, cassava, cocoyam, melon, maize, oil palm, garden egg, cocoa, to mention but a few. Poultry, goat, pigs and sheep are the major livestock kept. Abia State has 17 local government areas (LGAs). These are grouped into three agricultural zones namely Aba, Umuahia and Ohafia zones.

### Sampling Techniques

The population of this study consists of cocoa farmers in Umuahia and Ohafia agricultural zones of Abia State. A purposive sampling technique was used in choosing the sample. In the first stage, two agricultural zones in the state were purposively selected namely Umuahia and Ohafia zones. Secondly, in Umuahia zone, two LGAs were selected namely Umuahia and Ikwuano, while in Ohafia zone, Bende LGA was purposively chosen. The third stage involved selection of one community from the three LGAs. In the last stage, 20 cocoa farmers were selected from each of the selected communities. This gave a total of 60 respondents for the study.

### Data Collection

The study used only primary data sources. The primary data were obtained through aid of questionnaire and interview schedule. Additionally, personal observations also formed a critical means of data collection. Information collected included data on the socio-economic characteristics, the sources, labour-use types and periods of labour needs in cocoa production, the costs and returns associated with cocoa production, minimum amount of labour required to produce a given level of output, labour-use efficiency and determinants of labour-use efficiency in cocoa production, perceived labour cost reduction strategies in the study area and the factors constraining farmers labour supply in the study area.

### Method of Analysis

Both descriptive and inferential statistics were used to analyze data. Determinants of labour productivity of the cocoa farmers were estimated using Ukoha's (2000) method. The log-linear model derived from Cobb Douglas functional form was the econometric model specified for explaining labour productivity, as did Ukoha (2000) for cocoyam productivity. This functional form is the most popular in applied research because it is easier to handle mathematically. The model is described thus:

$$Y/N = f(\text{AGE, HHS, EDU, EXP, FARS, SEED, CAP});$$

where  $Y/N$  is labour productivity (kg/manday); i.e.,  $Y$  is cocoa output in kg while  $N$  is labour input for all activities in mandays; AGE is age (years); HHS is household size; EDU is farmers' level of education (years); EXP is farming experience (years); FARS is farm size (hectares); SEED is cocoa seed planted (kg); and CAP is capital (Naira).

Multiple regression model was used to analyze the determinants of output of the cocoa farmers:

$$Y = f(X_1, X_2, X_3, X_4, X_5, e);$$

where  $Y$  is value of output of famers,  $X_1$  is total area of farmland under cultivation (hectares),  $X_2$  is labour input in mandays,  $X_3$  is seed cost (Naira),  $X_4$

is fertilizer input (kg),  $X_5$  is capital input in (Naira) (which includes depreciation of farm tools and equipment, machinery, etc.; interest charges on borrowed capital; repair and maintenance costs; etc.), and  $e$  is error term.

The allocative efficiency of the cocoa farmers was obtained from the estimated equation by comparing the Marginal Value Product (MVP) of a given input with its Marginal Factor Cost (MFC). The MVP and MFC for an input were obtained as:

$$MVP_{xi} = MPP_{xi} \times p, \text{ and}$$

$$MFC_{xi} = MPP_{xi} \times r_x r_{ixi};$$

where  $MPP_{xi}$  is the Marginal Physical Product of  $x_i$ ,  $p$  is the unit price of the output ( $Q$ ), and  $r_x r_{ixi}$  is price of the input used.

## RESULTS AND DISCUSSION

### Socio-Economic Characteristics of Respondents

The data in Table 1 show that the mean age was 39 years. Nwaru and Ekwumankama (2002) reported mean ages of 42 and 49 years for men and women crop farmers, respectively. The implication of this age bracket on productivity is increased production and likelihood of poverty reduction in the area. However the result shows that majority of the respondents were adults, matured, energetic and enterprising. This represents an active stage in life. Majority (56.67%) of the respondents were males. These results agree with the findings in most studies carried out in the south-eastern region of the country (Iheke, 2006; Ogbe, 2009). Furthermore, 6.67% of the respondents were single, 91.67% were married, and 1.67% was separated. The implication is that there are more stable households which are better positioned to practice agriculture. This implies that a greater percentage of the farmers had family members. According to Nwaru (2004), such stability creates conducive environment for good citizen training, development of personal integrity and entrepreneurship, which are very important for efficient uses of resources.

An overwhelming majority (96.7%) of the respondents have formal education, with mean farming experience of 14 years in farming. This is desirable because according to Obasi (1991), the level of education of a farmer not only increases his farm productivity but also enhances his ability to understand and evaluate new production techniques. The implication is that the respondents are better positioned to take advantage of new technique and innovation that could improve agricultural productivity and boost food security. Imburr *et al.* (2008) reported that improved education level brings about positive changes in the knowledge, attitude and skills through research and extension. Results further show that 70.0, 26.67 and 3.33% of

the respondents had a household size of 1-4, 5-8, and 9-12 persons, respectively. The mean household was four persons. This is desirable, consistent and of great importance in farm production as rural household may rely more on their members than hired workers for labour on their farms. This is so if members are not made up of the aged and very young people, otherwise scarce capital resources that should have been employed for farm production would be channeled for upkeep of these dependent members (Nwaru, 2004). Also the mean hectare cultivated is 2.33. This further indicates that a greater percentage of the respondents in the study area had above 1.01 hectare of land under cultivation or active farm operations.

### Labour Source and Use by Some Farm Activities

Table 2 shows the labour-use portfolio of the cocoa farmers of the study. The data show that the farmers appreciably make use of share cropper labour option in cocoa farming. This notion emanates from the general perception that share croppers are honest and dedicated in the discharge of their duties on the farms. This invariably enhances the level of productivity and accruable profit (Akanni and Dada, 2012).

**Table 1:** Distribution of respondents according to socio-economic characteristics ( $n = 60$ )

Variables	Frequency	Percentage
Sex		
Female	26	43.33
Male	34	56.67
Age (years)		
21-30	17	28.33
31-40	17	28.33
41-50	16	26.67
51-60	6	10.00
61-70	4	6.67
Mean	39	
Marital Status		
Single	4	6.67
Married	55	91.67
Separated	1	1.67
Level of Education		
Never attended	2	3.32
Primary education	6	10.00
Secondary education	48	80.00
Tertiary education	6	6.67
Household size		
1-4	42	70.00
5-8	16	26.67
9-12	2	3.33
Mean	4	
Income (₦)		
0.1-1.0	15	25.00
1.1-2.0	9	15.00
2.1-3.0	16	26.67
3.1-4.0	20	33.33
Mean	2.33	
Experience(Years)		
1-10	25	41.67
11-20	17	28.33
21-30	18	30.0
Mean	14	
Total	60	100.0

Source: Field Survey, 2016

**Table 2:** Distribution of the respondents based on source of labour

Labour types	Frequency	Percentage
Family labour	15	25.0
Hired labour	13	21.67
Exchange labour	5	8.30
Casual labour	9	15.0
Share cropping	18	30.0
Total	60	100.0

Source: Field Survey, 2016

Allocation of labour usually varies with farming activities. While some tasks require skilled hired labour, household/family labour is sufficient for some. The cost and availability may preclude the use of hired labour of different classes for such activities as under-storey clearing, agrochemical spraying, pod harvesting and fertilizer application which are the most labour intensive operations in cocoa production.

Table 3 presents the use of labour by specific activities in the study area. The use of labour was minimal for under-storey clearing and fertilizer application. This corroborates the finding of Gocowski (2003) that slashing of vegetative under storey growth in cocoa farms was done just twice in a year prior to the harvesting season while fruiting fertilizers were applied once throughout a productive season. Labour was engaged more on agrochemical spraying and cocoa harvesting with the averages of 35 and 30%, respectively.

Log-linear result of the determinant of labour productivity among cocoa farmers are summarized and presented in Table 4. The coefficient of multiple determination was 0.892 which implies that 89.2% of the variation in the farmers output was explained by the explanatory variable. Level of education, experience and farm size were significant. The level of education had significant ( $p < 0.01$ ) positive relationship with labour productivity of the cocoa farmers. This implies that as the cocoa farmers attain higher level of education, their labour productivity increases. Better education has the effect of enabling household's conceptualized information on improved farming methods and other related issues capable of enhancing their labour productivity. This is desirable because the level of education of a farmer not only increases his farm productivity but also enhances his ability to understand and evaluate new production techniques (Obasi, 1991). Farming experience had significant ( $p < 0.05$ ) positive relationship with the labour productivity of the farmer. Thus, as the experience of the farmer increases, his labour productivity also increases. Increase in farming experience raises human knowledge and skill to adapt to new farming techniques which increase their efficiency of production (Nwaru, 2004). The coefficient of the relationship of farm size to labour productivity is significant ( $p < 0.01$ ) and negative. This implies that the more the land for under cocoa production the greater the lowering of the labour productivity.

**Determinants of output of the Cocoa Farmers**

The multiple regression results are summarized and presented in Table 5. The coefficient of multiple determination was 0.881 which implies that 88.1% of the variation in the farmers output was explained by the explanatory variable. Planting materials (seeds) was significant ( $p < 0.01$ ) positively related to output, implying that as planting materials (seeds) increase, output increases and vice versa. This implies that use of yield increasing seed is sine-qua-non to increase the cocoa farmers output. The fertilizer use was significantly ( $p < 0.05$ ) positively related; this implies that an increase in fertilizer use leads to significant improvement in the output level of the farmer. This corroborates the findings of Mban and Edeh (2011) that fertilizer use and farm productivity were positively related. Capital was also negatively related to the level of output. This indicates that an increase in capital (farm tools) in cocoa production leads to a decrease in the output levels of the farmers.

**Table 3:** Distribution of respondents based on labour-use by specific farm activities

Labour-se	Frequency	Percentage
Under-storey clearing	11	18.33
Agrochemical spraying	21	35.00
Harvesting	18	30.00
Fertilizer application	10	16.67
Total	60	100.0

Source: Field Survey, 2016

**Table 4:** Log-linear regression result on determinants of labour productivity of the cocoa farmers

Variables	Log-linear	Percentage
Intercept	4.447 (6.322)**	18.33
Age ( $X_1$ )	0.023 (0.364)	35.00
household size. ( $X_2$ )	0.014 (0.422)	30.00
Level of education ( $X_3$ )	0.809 (14.308)**	16.67
farming experience ( $X_4$ )	0.159 (2.169)*	100.0
farm size ( $X_5$ )	-0.052 (-1.888)†	
Planting materials ( $X_6$ )	-0.029 (-1.149)	
capital ( $X_7$ )	0.054 (1.906)	
R <sup>2</sup>	0.892	
R <sup>-2</sup>	0.877	
F-ratio	61.240**	

Source: Field Survey, 2016. Figures in parenthesis are t-values. \*\*significant at 1%, \*significant at 5%, †significant at 10%.

**Table 5:** Multiple regression result on output of the cocoa farmers

Variables	Double log+
Intercept	4.449 (7.083)***
Farm size ( $X_1$ )	0.050 (0.795)
Labour ( $X_2$ )	0.002 (0.046)
Seed ( $X_3$ )	0.783 (14.057)***
Fertilizer ( $X_4$ )	0.178 (2.371)**
Capital ( $X_5$ )	-0.050 (-1.795)*
R <sup>2</sup>	0.881
R <sup>-2</sup>	0.870
F-ratio	79.784***

Source: Field Survey, 2016

+lead equation. Figures in parenthesis are t-values. \*\*significant at 1%, \*significant at 5%, †significant at 10%.

**Table 6:** Determinants of resource use efficiency

Variables	MPP	MVP	MFC	Efficiency ratio	Efficiency level
Farm size	0.050	812.5	4000	0.203	Over utilized
Seed	0.783	12723.8	3308.3	3.85	Underutilized
Labour	0.002	32.5	6406.7	0.006	Over utilized
Fertilizer	0.178	2892.5	6250	0.463	Over utilized
Capital	-0.050	-812.5	6086.77	-0.133	Over utilized

Source: Field Survey, 2016

**Table 7:** Distribution of respondents based on cocoa labour supply inhibitor in the Abia State

Inhibitor	Frequency	Percentage
Labour payment	23	38.3
Seasonal migration	11	18.3
Schooling of children	10	16.7
Non-availability of adults	4	6.7
Improved non-farm Income	12	20.0
Total	60	100.0

Source: Field Survey, 2016

### Allocative Efficiency amongst the Cocoa Farmers

The determinants of allocative efficiency among the cocoa farmers are presented in Table 6. The results show the ratio of the marginal value product (MVP) to the marginal factor cost (MFC) for farm size, seed, labours, fertilizer and capital. Seed was under-utilized, meaning that farmers would earn higher returns from their production if they increase the use of these inputs while holding other inputs constant. Farm size, labour, fertilizer and capital were over-utilized, implying that a decrease in these inputs would, holding other input constant, increase the productivity level.

### Cocoa labour supply inhibitor in Abia State

Table 7 shows the distribution of various causes of constraints to labour supply in cocoa plantations in the study area. Poor farm wages (labour payments) ranked as the highest labour inhibitor in the study area, followed by improved non-farm income. Seasonal migration, of labour to the urban sector in search of promising non-farm employment activities, the schooling of children and non-availability of adults to supply labour were other labour inhibitors in the area.

### CONCLUSION/RECOMMENDATIONS

Based on the findings of this study, it is concluded that level of education, experience and farm size were determinants of labour productivity while planting materials, fertilizer use and capital were significant determinants of output among cocoa farmers. Also, planting material (seed) was under-utilized, meaning farmers will earn higher return from their production if they increase the use of these inputs while holding other input constant. Farm size, labour, fertilizer and capital were over-utilized; this implies that a decrease in these inputs holding other inputs constant would increase the productivity level. The farmers should utilize their family labour efficiently in order to reduce the hired labour that increases the cost of food crops production and decreases farm revenue.

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