# Labour Productivity and Yield Determinants in Cocoa Farming: Evidence from Abia State, Nigeria

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## Abstract

The study examined labour productivity and yield determinants among cocoa farmers in Abia state, Nigeria. A multistage purposive sampling technique was adopted in selecting 60 cocoa farmers from the two agricultural zones in Abia State. The analytical techniques used involve inferential statistics like percentages, means, frequency and percentages. Also Log-linear and multiple regression analysis were also used. The results indicated that mean ages was 39 and the use of family labour, hired labour, exchange labour and casual labour constituted 25.0%, 21.67%, 8.3% and 15.0% of labour-use portfolio while the share croppers carried the balance of (30.0%). Also under storey clearing was estimated as 18.3% and fertilizer application was 16.7 %. Labour was engaged more on agrochemical spraying while cocoa harvesting operations gave the averages of 35.0 % and 30.0 % respectively. Results showed that the coefficient of multiple determinations was 0.892.The coefficient for level of education was estimated as 0.809 with t-ratio of 14.308 at ($p<0.001$).Also farming experience has coefficient of 0.159 t-ratio of 2.169 at ($p<0.05$) and Farm size has -0.052 coefficient, t-ratio of-1.888 at ($p<0.01$) were significant determinants of labour productivity. Also multiple regression result of the determinants of output indicated that the coefficient of multiple determination was 0.870 Planting materials, fertilizer use and Capital were significant determinant of output among cocoa farmers at ($p<0.001$),($p<0.05$) and ($p<0.01$) respectively. The result further showed that poor farm wages (labour payments) ranked highest (38.3 percent) among labour inhibitor in the study area. The study therefore recommends adequate policy that would encourage provision of capital and farm inputs to cocoa farmers.

**Keywords:** Labour, Productivity, Yield, Determinants, Cocoa, Farmers.

## 1. Introduction

Human labour is one of the major sources of labour available to small-holder farmers in Nigeria, small-holder farmers contribute over 85% of domestic agricultural output in Nigeria (Ikassim and Olayinka, 2012). Thus, there is the need to continue to supply food to the ever-growing Nigerian population which anchors on human labour productivity. Olukunle, (2013) noted that hired labour contributed 88.0% of the total labour-use on farms thus emphasizing its importance in agricultural activities. Other types of human labour that could be employed are family labour and exchange labour. 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 except for dry season farming through the aid of FADAMA. A slight delay will be costly, particularly at very short wet season. At such times, demand for labour

becomes most alarming.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 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. Furthermore, according to another broader definition, 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).

Cocoa, botanically known as Theobroma, cacao belongs to the family Stericulinacea. Cocoa 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 percent protein, 40 percent carbohydrate, and 40 percent fat. It is also mildly stimulating because of the presence of theobromine, 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 countries. 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 & Adeleke, 2010). The high value accorded cocoa in Nigeria was due to its significant contribution to economic development before the discovery of crude oil in the 1970s. Cocoa could be processed into powder, confectioneries, beverages and wine. It is a major source of foreign exchange and a principal source of raw materials for local industries. In 1960, it contributed 21.6% of Nigeria's foreign exchange earnings, which later dropped to 1.8% in 1982 and average of about 4 % between 1980 and 2000 (Ojoet al., 2014). This research therefore seek to determine the socioeconomic characteristics of cocoa farmers and there source of labour, more so, the research will determine labour productivity, determinants of output among cocoa farmers and possible policy recommendation to help reposition cocoa farming in the study area.

**Research Methods**

*Study Area:* The study was conducted in Abia State. Abia State was created out of the former Imo State on August 27, 1991. It has a land mass of 700 square km. The state lies between longitudes $7^{o}$ 231 and $8^{0}$ 021 East of Greenwich meridian and latitudes $5^{o}$ 491 and 6o 121 North of the equator. Abia State is bounded on the east by the Cross River and Akwa Ibom Sates, on the north by Ebonyi and Enugu States, on the West by Imo State and on the South by Rivers State. According to (NPC, 2006). Abia state is populated by 1,913,917 persons made up of 933,030 males and 971,878 females. With estimated annual population growth rate of 2.7 per cent annually, the present population is about 2,368574 consisting of 1,160,141 males and 1,208,433 females. This population consists of people in all walks of life with about 65 percent of their engagement in agriculture (CBN, 2005). The annual rainfall ranges from 2000-2500mm while the temperature ranges from $22^{0}$c to $35^{0}$c. 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 the 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 is divided into 17 local government areas. These are group into

three agricultural zones namely, Aba, Umuahia, and Ohafia zone.

*Sampling Technique*

The population of this study consist of Cocoa producers in the Umuahia, and Ohafia agricultural zones of Abia state. A purposive multi-stage random sampling technique was used in choosing the sample. In the first stage, all the two (2) agricultural zones in the state were purposively selected namely Umuahia, and Ohafia zones. Secondly, from each zone, two (2) Local Government Areas (LGAs) was purposively selected giving us 4 LGAs. The third stage involve selection of (Two) 3 communities from the 4 LGAs giving us 12 communities. In the last stage (Five) 5 cocoa farmers was selected from each of the selected communities. This gives a total of 60 respondents for the study.

*Data Collection*

The study used only primary data source. The primary data were obtained through the aid of questionnaire and interview schedule. Additionally, personal observations also form a critical means of data collection. Information collected includes data on the socio-economic characteristics, labour-use types and periods of labour needs in cocoa production. More so, the costs and returns associated with cocoa production were measured. Minimum amount of labour required to produce a given level of output, labour-use efficiency and determinants of labour-use efficiency in cocoa production were also determined. Perceived labour cost reduction strategies in the study area and the constraining farmers' labour supply in the study area were also measured.

*Method of Analysis*

Both descriptive and inferential statistics were used to analyze data. Determinants of labour productivity of the cocoa farmers was estimated using the model adapted by Ukoha, (2000).The log-linear model derived from Cobb Douglas functional form was the econometric model specified for explaining labour productivity following Ukoha (2000) in 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 (AGE, HHS, EDU, EXP, FARS, SEED, CAP) + e

Where

Y/N = Labour productivity (kg/man day)

Y = Cocoa output in kg;

N = Labor input for all activities (in man days);

HHS = household size (number of person per household)

EDU = farmers level of education in years;

EXP = farming experience in years;

FARS = farm size in hectares;

SEED = Cocoa seed planted in kg;

CAP = Capital (N);

e = error term

Estimation of the slope coefficients of the determinants of output of the cocoa farmers was done with the aid of a multiple regression models.

The model was specified implicitly as follows;

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

Where;

Y= Value of output of famers in Nigerian Naira (NGN)

$X_1$=Total area of farmland under cultivation (ha),

$X_2$=labour input in man-days,

$X_3$=Cost of planting materials (NGN)(such as improved seeds, agrochemicals,etc.),

$X_4$=fertilizer input (kg),

$X_5$=capital input in (NGN) (which include depreciation of farm tools and equipment, machinery, etc, interest charges on borrowed capital, repair and maintenance costs etc),

e = stochastic error term

**Results and Discussion**

The result obtained in Table 1.0 shows that the mean ages of the farmers were 39 years. Nwaru and Ekwumankama (2002) reported

mean ages of 42 years and 49 years for men and women crop farmers respectively. The Implication of this age bracket on productivity is increase production and likelihood of poverty reduction in the area. However the result shows that majority of the respondents were adults, matured and energetic and should be reasonable enterprising. This represents an active stage in life. Majority (56.67%) of the samples respondents in the study area were males, while 43.33% were female. This result is in line with the findings in most studies carried out in the south-eastern region of the country (Iheke, 2006 and Ogbe, 2009). Furthermore 6.67% of the respondents were single, 91.67% were married and 1.67% were separated. The implication is that there were more stable households which were better positioned to practice commercial agriculture. This implies that a greater percentage of the farmers had family members. According to

Nwaru (2004), this stability create conducive environment for good citizen training, development of personal integrity and entrepreneurship, which are very important for

**Table 1: Distributions of Respondents according to socioeconomic 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** | |
| **Farm size (ha)** | | |
| 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*

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 these 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 improved education level brings about positive changes in the knowledge, attitude and skills through research and extension. Result further review that 70.0%, 26% and 3.33% of respondent had a household size of 1-4, 5-8, and 9-12 persons respectively. The mean was 4 persons. This is desirable, consistence 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 scare 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 2.23, this further indicate that a greater percentage of the respondents in the study area had above 1.01 hectare of land under cultivation or active farm operations.

**Source of Labour and Labour-use by Specific Farm Activities**

**Table 2 Sources of Labour of Farmers**

| 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

Table 2.0 shows that the use of family labour, hired labour, exchange labour and casual labour constituted 25.0%, 21.67%, 8.3% and 15.0% of labour-use portfolio while the share croppers carried the balance of (30.0%) . This implies 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 more honest and dedicated in the discharge of their duties on the farms. This invariably enhances the level of productivity and accruable profit. (IKassim and Alfred 2012).

**Labour-use by Specific Farm Activities**

**Table 3. Distribution of respondent based on Labour-use by Specific Farm Activities**

| Labour-use | Frequency | Percentage (%) |
|---|---|---|
| Understorey 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

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 activities such 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 very minimal for under storey clearing and fertilizer application ; use under storey clearing (18.3percent) and fertilizer

application (16.7percent). This corroborates the finding of Gocowski and Oduwole (2003) which observed 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 are also applied once throughout a productive season. Labour was engaged more on agrochemical spraying and cocoa harvesting operations given the averages of 35.0 percent and 30.0 percent respectively.

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**Determinants of Labour Productivity of the Cocoa Farmers**

**Table 4 log-linear result on determinants of labour Productivity of the Cocoa Farmers**

| Variables | Log-linear |
|---|---|
| Intercept | 4.447 |
| | (6.322)*** |
| Age ($X_1$) | 0.023 |
| | (0.364) |
| household size. | 0.014 |
| ($X_2$) | (0.422) |
| Level of | 0.809 |
| education ($X_3$) | (14.308)*** |
| farming | 0.159 |
| experience ($X_4$) | (2.169)** |
| farm size ($X_5$) | -0.052 |
| | (-1.888)* |
| Planting | -0.029 |
| materials ($X_6$) | (-1.149) |
| capital ($X_7$) | 0.054 |
| | (1.906) |
| $R^2$ | 0.892 |
| $R^{-2}$ | 0.877 |
| F-ratio | 61.240*** |

*Source: field survey (2016).*., *** Significant at 1%,

** Significant at 5%,*significant at 10%, figures in parenthesis are t-value.

The double-log functional form was chosen as the lead equation. The choice of the lead equation was based on the number of significant variable, the magnitude of the coefficient of multiple determination ($R^2$), the conformity of signs borne by the variables to with a priori expectation as well as the

significance F-ratio. The coefficient of multiple determination was 0.870 which implies that 87.0% of the variation in the farmers output was explained by the explanatory variable. Planting materials was significant at 1% and positively related to output; this implies that planting material significantly affect output: as planting materials increase, the output increases and vice versa as shown by the positive coefficient. This implies that use of yield increasing seed is sine-qua-none to increase the cocoa farmers output. The fertilizer use was significant at 5% and positively related, this implies that an increase in fertilizer use lead to significant improvement in the output level of the farmer. This corroborates with the findings of Amos and Adeleke (2010) where fertilizer used was significant and positive related. Capital was significant at 10% and negatively related to the level of output. This indicates that an increased in capital (farm tools) in cocoa production lead to a decrease in the output levels of the farmers.

Cocoa Labour Supply Inhibitor in Abia State

Table 6: Distribution of Respondent Based on Cocoa Labour Supply Inhibitor in 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*

Table 6 shows the distribution of various causes of constraints to labour supply in cocoa plantations in the study area. Poor farm wages (labour payments) ranked highest (38.3 percent) labour inhibitor in the study area. This was followed by the seasonal migration (18.3 percent) of labour to the urban sector in search of the promising non-farm employment activities. The schooling of children (16.7percent) was another problem followed by improved non-farm income (6.7 percent) when mostly needed, and lastly non-availability of adults to supply labour (6.7 percent).

## Conclusion

Base on the findings on labour productivity and yield among cocoa farmers in Abia State, the study therefore concluded that the most popular farm labour used in cocoa production revolved round cocoa harvesting and application of agrochemicals. Poor labour remunerations in terms of wages was a major constraint to farm labour supply for cocoa production in the study area. It was found that level of education, experience and planting material were determinants of labour productivity while planting materials, fertilizer use and Capital were significant determinant of output among cocoa farmers. There is advantage in having adequate capital in terms of productivity; adequate policy that would encourage provision of capital to cocoa farmers is advocate for. In addition government and non- government organization should supplied farm tools (capital) to farmers, this is a step in the right direction.

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