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## Competitiveness of cocoa-based farming household in Nigeria

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Nigeria is the third largest producer of cocoa in Africa producing about 6% of the total World production. The objective of this study is to assess the competitiveness, comparative advantage and effect of government policies on cocoa production in Ondo State, Nigeria. The analysis was conducted for sole and intercropped cocoa production systems. Primary and secondary data were utilized for the study and were analyzed using the framework of the Policy Analysis Matrix (PAM). The results of the PAM indicated that the two production systems were profitable, competitive and have comparative advantage. Private profitability recorded in sole cropping was ₦69,986.13 against ₦91,246.33 that was obtained in the intercropping system. Social profitability for sole cropping was ₦121,865.14 while ₦158,989.10 were obtained in intercropping system. The values of the Nominal Protection Coefficient for output (NPCO) were 0.89 and 0.78 for sole and intercropping systems indicating that the farmers were taxed. This was further confirmed by the values of Nominal Protection Coefficient for input (NPCI) which 1.37 and 1.39 were for both sole and mixed production system respectively. Also, the Effective Protection Coefficients (EPC) for both productions were 0.72 and 0.65 respectively, indicating the presence of taxes.

**Key words:** Cocoa, competitiveness, farming household, policy analysis matrix, Nigeria.

### INTRODUCTION

The contributions of cocoa to the Nation's economic development are vast (Olayide, 1969; Olayemi, 1973; Abang, 1984; Folayan et al., 2006) and in terms of foreign exchange earnings, no single agricultural commodity has earned more than cocoa (Nkang, 2009). The cocoa subsector offers quite a sizeable number of employments, both directly and indirectly. It is an important source of raw materials, revenue to governments of cocoa producing states and a significant contribution to the Gross Domestic Product GDP (Central Bank of Nigeria, 2007). Nigeria ranked among one of

the highest cocoa producer in the world.

Nigeria is the third largest producer of Cocoa in Africa producing about 6% of the total world production behind Ivory Coast which produces 43% of the world's cocoa and Ghana with about 14% of the world's output. At present the production capacity of Cocoa in Nigeria has reached about 385,000 tonnes per annum, an increase of 215,000 t from year 2000 production level (Erelu, 2008). But with the increase in production the disposition has placed Nigeria the fourth highest cocoa producing nation in the world after Ivory Coast, Indonesia, and Ghana.

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Mainly, small holder farmers grow cocoa and these small holders whose average farmstead is 2 ha, account for about 60% of Nigeria's output (Nkang, 2009). Apart from being the major source of income for the farm families, it is raw material for the beverage industry and agro commodity marketing firms. The average delivery per farmer is less than 5 bags (roughly 300 kg ha<sup>-1</sup> of cocoa) per person. In terms of capacity, Ondo State is rated as the largest cocoa producing state in Nigeria (Oluyole and Sanusi, 2005).

Cocoa is the second major non-oil foreign exchange earner in Nigeria after leather. It is produced in 16 states of the federation namely Ondo, Cross River, Oyo, Osun, Ekiti, Ogun, Edo, Kogi, Akwa Ibom, Delta, Abia, Kwara, Ebonyi, Rivers, Taraba and Adamawa with an annual production of 400,000 metric tons; however 98% of this is exported. It provides means of livelihood, sustenance and employment opportunities to over five million Nigerians, in the year 2005 alone; export revenue from the sale of cocoa amounted to US\$136.7 million.

Prior to the Structural Adjusted Programme (SAP), cocoa marketing was carried out by the erstwhile highly regulated commodity marketing boards, which were known to pay farmers far less than the export price of cocoa (Folayan and Sanusi, 2007). After abolition of the marketing board structure, cocoa production has still not fared better and is evident in the declining production trend reported earlier. One of the possible reasons for this was the nature of investment in cocoa production, as some worry has been expressed as to whether the returns from cocoa were not being threatened by such factors as rising costs of production, price instability and differences in management systems and perhaps declining productivity due to ageing trees. Generally, if investment in cocoa production were attractive, the farmers/investors would allocate scarce resources to cocoa farming. Most individual investors and even governments have only a vague idea of the potential of the cocoa industry and as such are sometimes slow in committing investment funds into the subsector (Nkang, 2009).

## MATERIALS AND METHODS

A multi-stage sampling procedure was adopted. The first stage involved purposive selection of the three local government areas known to be the largest Cocoa producing areas in the state which are Ondo, Ile Oluji and Idanre Local government area of the study area. The second stage was random selection of three villages in each local government area while the last stage was random selection of twenty Cocoa farmers in each village making total number of 180 respondents.

### Data collection

Primary and secondary data were the main source of data used for this study. A structured, open-ended questionnaire was used to obtain the information from respondents in the study area. Primary data collected were cost of input used and cocoa yield obtained for

both sole cocoa production and mixed production. Secondary data was collected on social cost of inputs, Free on Board (FOB) price of cocoa at international market from Ministry of Agriculture, planning, research and statistics, Central Bank of Nigeria.

### Method of data analysis

The analytical tool was Policy Analysis Matrix Model (PAM). PAM model was employed to analyze comparative advantage as well as policies effect on cocoa production. Nominal Protection Coefficient (NPC) and Effective Protection Coefficient (EPC) together with Domestic Resource Cost Ratio (DRC). The PAM was developed by Monke and Pearson (1989) and augmented by Masters and Winter-Nelson (1995), for measuring input use efficiency in production, comparative advantage, and the degree of government interventions. The basis of the PAM is a set of profit and loss identities, that is, it is a matrix of two-way accounting identities (Nelson and Panggabean, 1991). Furthermore Monke and Pearson (1989) established the basic format of the PAM, as shown in Table 1.

The data in the first row of the PAM table provide a measure of private profitability. The private profitability demonstrates the competitiveness of the agricultural system. The second row of the PAM is used to calculate social profits. Social profits are those profits calculated at efficiency (shadow) prices. Positive social profit indicates that there is a positive valuation of output and is an incentive to the farmers. The third row shows the difference between the private valuation and social valuation.

If I is positive, it means the producers are paid above the world price for their output and producers do not need to sell their products to international market but to local market.

If I is negative, producers are paid lower than the world price for their output. In order to gain more profit, they can sell directly to the international market and not to local market.

If J is positive, it means the tradable inputs used in production are costly at local market and it will increase their profitability if they can import such inputs.

If J is negative, tradable inputs used are costly at international market. It is advisable to purchase inputs at local market than importing.

If K is positive, it means non-tradable inputs used in production are costly at local market.

If K is negative, it means non-tradable inputs used are cheap at local market.

If L is positive, it means it is profitable to obtain inputs at local market and sell the products at local market. If L is negative; it is profitable to import inputs and sell the product at international market.

### Measure of protection

#### Nominal Protection Coefficient (NPC)

The NPC is calculated by dividing the revenue in private prices (A) by revenue in social prices (E). It can be calculated for output and input.

$$NPC_1 = P_i^d / P_i^w$$

Where NPC<sub>i</sub> nominal protection coefficient of the commodity i, P<sub>i</sub><sup>d</sup> = domestic price of commodity i and P<sub>i</sub><sup>w</sup> = world reference price of commodity i, adjusted to transportation, handling and marketing expenses.

In the PAM context,

**Table 1.** Basic format of PAM.

Prices (Accounts)	Value of input			Profit
	Value of output (Revenue)	Tradable input cost	Non-tradable input cost (Domestic factor)	
Privates prices	A	B	C	D
Social prices	E	F	G	H
Policy transfer (divergence)	I	J	K	L

Source: Monke and Pearson (1989). A = revenues evaluated at domestic prices of the output; B = Cost of Tradable Input evaluated at Domestic Price; C =Cost of Non Tradable Input evaluated at Domestic Price; D = A – (B + C) = Private Profitability; E = revenues evaluated at border prices of the output; F =Cost of Tradable Input evaluated at International Price; G= Cost of Non Tradable Input evaluated at International Price ; H = E – (F + G) = Social Profitability; I = A – E = Output Transfers; J = B – F = Input Transfer; K = C – G = Factor Transfer; L = D – H = Net Policy Transfers.

NPC (on output) = A/E

NPC (on input) = B/F

If NPCO = 1, the domestic market price equals world price and therefore, there is no protection and the price is efficient. If NPCO > 1, there is positive protection of output. If NPCO < 1 there is negative protection on output. If NPCI = 1, the domestic cost of input equal world price of input. If NPCI > 1, the domestic cost of input is expensive compared to imported inputs and it is preferred to use import for production, If NPCI < 1, it is profitable to use domestic input.

### Effective Protection Coefficient (EPC)

The EPC is defined as the ratio of value added in private prices to value added at social prices. It measures the ratio of value added at domestic prices (A - B) to value added at world reference prices (E - F). Conceptually this ratio can be written as:

$$EPC_i = V_i^d / V_i^w$$

Where,  $EPC_i$  = Effective protection coefficient of commodity i;  $V_i^d$  = Value added at domestic prices and  $V_i^w$  = Value added at world reference prices.

Using PAM elements,  $EPC = (A - B) / (E - F)$ , If  $EPC > 1$ , means net subsidy to value added, If  $EPC < 1$  means net tax to value added, If  $EPC = 1$  means no value added.

The EPC ignores the transfer effects of factor market policies like NPC.

### Data for calculating efficiency prices of land, labour and capital

The major tradable inputs are seedlings, fertilizers, chemicals. The non-tradables are land, labour etc, and other production costs goes to land and labour which are non tradable inputs. For sole cropping system, this study used an average yield of 404.94 kg/ha while average yield of 243.44 kgs/ha was used for mixed cropping. The sole cropping system comprised of 898 cocoa trees per hectare, while in intercropping system, there is 500 trees of cocoa with a total of 550 stands of plantain and banana per hectare.

The PAM constructed for this study made use of farm level budget value obtained from two production system (sole and intercropping system). In order to compute social price of input and output, world reference price and subsidized prices were used. The FOB price was obtained from international trade statistics, 2010. The world prices was adjusted for transportation and handling cost in order for it to be comparable to world prices.

According to Yao (1993), the social valuation of labour was obtained by dividing labour into peak season and off peak season components and the wage rate of labour in the peak season is the opportunity cost of labour for the period considered. The opportunity cost of labour in the off season is half the prevailing wage rate. Therefore social price of labour is:

$$SP_L = \frac{Wp + 0.5Wo}{2}$$

$SP_L$  = social price of labour;  $Wp$  = prevailing wage rate in

peak season, and  $Wo$  = prevailing wage rate in off season

The study makes use of ₦930 as the private cost of labour which is the average cost of labour obtained from farmers. Social price of land was obtained by using the government rental value on land. Private costs of tradable input used were obtained from market and agro allied shops. For the tools used in production, the depreciation cost was calculated by assuming salvage value to be zero. The average cost of such tools less salvage value divided by the average life span was used to get the depreciation for tools used in production. This study made use of US\$3250 for the output which was the average of the price for both systems. The intercropped products were also valued by making use of Cameroon price. Banana is US\$200 per tonne, plantain is US\$150 per tonne while pineapple is US\$0.38 per kilogram. All these cost were converted to Naira and the handling cost, transportation to port and charging cost were deducted before they were used in the analysis.

## RESULTS AND DISCUSSION

### Competitiveness of cocoa production

The study examined two cocoa production systems (Sole Production and Mixed Production in Ondo State, Nigeria). The result of the analysis (Tables 1 and 2) showed that cocoa production system is profitable and highly competitive in the two systems of production due to private

**Table 2.** Policy analysis matrix for sole cocoa production system.

Item	Revenue (₦/ha)	Cost of tradeable Inputs (₦/ha)	Domestic factors (₦/ha)	Profit (₦/ha)
Private price	174,630.38	70,443.16	34,201.09	69,986.13
Social price	195,383.55	51,253.89	22,264.52	121,865.14
Effect of policies and other divergences	-20,753.17	19,189.27	11,936.57	-57,879.01

Source: Field survey, 2011.

**Table 3.** Policy Analysis Matrix for Mixed Cocoa Production System

Item	Revenue (₦/ha)	Cost of tradeable Inputs (₦/ha)	Domestic factors (₦/ha)	Profit (₦/ha)
Private price	169241.52	54198.88	23791.31	91,246.33
Social price	215793.13	38918.35	17885.68	158989.10
Effect of policies and other divergences	-46,551.61	15280.53	5910.63	-67,742.77

Source: Field survey, 2011.

profitability that are positive in the two systems. The private profitability recorded in sole cropping was ₦69,986.13 while ₦91,246.33 was recorded in the intercropping system. However the result showed that intercropping system was more profitable than sole cropping system. This may be through the advantage of having other products apart from cocoa beans which increased income for mixed cocoa producers. This agreed with findings of Neptune and Jacque (2007), they found out that cocoa production is profitable, internationally competitive and had comparative advantage in Trinidad and Tobago.

Social profitability is also positive in the two systems studied. The social profitability recorded in sole cropping was ₦121,865.14 against ₦158,989.10 that was recorded in the intercropping system. At the social profit, mixed cropping has edge over sole cropping due to its highest profit. The positive social profit indicates that the state is using scarce resources efficiently in the production. The positive social profit means that the domestic resources are been efficiently utilized in the production of Cocoa.

Similarly, the output transfer was negative. The output transfer for sole production was - ₦20,753.17 while - ₦46,551.61 was recorded for mixed production. This shows that producers were receiving a price lower than what could have earned at international market. Input transfer was positive in the two systems. Tradable input transfer was ₦19,189.27 and ₦15,280.53 for the sole and intercropping system indicating that the farmers are paying more for the input compared to what is obtained in the international market. The non tradable transfer for both systems was ₦11,936.57 and ₦5,910.63 for sole and intercropping system. The profit transfer for both system were negative - ₦5,879.01 was recorded for sole production while - ₦67,742.77 was recorded for intercropped system. This shows the amount producers

are earning is less than what is obtained in the international market.

Summary of the ratio of protection coefficient of Cocoa production are shown in Table 3. The result reveals that the Nominal Protection Coefficient for output in the two production system is less than one. NPCO for sole production was 0.89 while 0.78 was obtained for the intercropped system. This indicates that there is negative protection of output. This also implies that domestic farm gate price is less than the international price for cocoa and policies are decreasing the market price by 0.11 and 0.22 for sole and intercropping system below the international price respectively.

The Nominal Protection Coefficient on input is greater than one. NPCI for sole was 1.37 and 1.39 for intercropped system. This indicates that policies increase tradable input cost by 37% for sole and 39% for mixed system above world prices. It also means that producers were taxed.

The effective protection coefficients were less than one in both productions (Table 4). EPC for sole system was 0.72 and 0.65 for mixed system; this indicates that producers were taxed with 26% and 33% on value added at world reference prices.

The output transfer for both sole and intercrop system were - N20753.17 and - N46551.61. Tradable inputs transfer were N19189.27 and N15,280.53 for both sole and intercrop system. Non tradable input transfers for sole and mixed system were N11,936.59 and N5,910.63. The indicators of policy effects and comparative advantage result for both systems were recorded as follows: NPCO was 0.89 and 0.78 for sole and intercrop system, NPCI was 1.37 and 1.39 for sole and intercrop system. EPC was 0.72 and 0.65 for sole intercrop system. DRC was 0.15 and 0.10 while SCB was 0.38 and 0.26 for sole and intercrop system.

**Table 4.** Four indicators of policy effects and comparative advantage.

Indicator	Sole production	Mixed production
Nominal protection coefficient of output (NPCO)	0.89	0.78
Nominal protection coefficient of input (NPCI)	1.37	1.39
Effective protection coefficient (EPC)	0.72	0.65
Private profitability (N)	69986.13	91246.33
Social Profitability (N)	121865.14	158989.10
Domestic Resource Cost (DRC)	0.15	0.10
Social Cost-Benefit Ratio (SCB)	0.38	0.26

Source: Field survey, 2011.

## Conclusions

1. Cocoa production is privately and socially profitable in the study area.
2. There is negative protection on output and policies are decreasing the market price below international price.
3. Policies also increase tradable input costs which shows that producers were highly taxed on tradable inputs purchased. Farmers were also taxed on value added at World Reference Price.

## RECOMMENDATIONS

1. Replacement of aging cocoa plantation.
2. Increased planting density per hectare should be encouraged.
3. Incentives for improving productivity (e.g improving public and farm infrastructure) will help farmers to boost their income.
4. Policy on tax for tradable input have to be reviewed in a way that farmers will be compensated for their production.
5. Government intervention is needed in raising commodity price to world price level which will reduce the poverty level of farmers in the country.

## Conflict of Interest

The authors have not declared any conflict of interest.

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