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POLICY ANALYSIS AND COMPETITIVENESS OF PLANTAIN PROCESSING IN SOUTHWESTERN NIGERIA

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Abstract

Plantain processing has potential promise to promote food security and economic development. Empirical studies have always indicated strong linkage between value addition and enhanced farmers' income. The study analyzed Competitiveness and effect of government policies on Plantain Flour and Chips processing in Southwestern Nigeria. A total of 100 processors were sampled; data were analyzed using Policy Analysis Matrix. Result indicated that plantain chips and flour processing had positive private and social profit indicating that processing of the commodities was economically profitable under existing government policies. Result of the Protection coefficients showed that the prevailing incentive structure affected processors negatively. Sensitivity analysis result indicated that policy indicators were sensitive to changes in exchange rate and world price of the products. The study recommends the need for provision of incentives to processors to enhance competitiveness of the commodities.

Keywords: Competitiveness, Policy Analysis, Incentive structures, Plantain Flour and Chips, Southwestern Nigeria.

BACKGROUND

Plantain is a multipurpose crop with great processing potential, it is the fourth most important food crop in the world after rice, wheat and maize, and is used as food, beverages and cooked foods (Phillip, Shittu, Aiyelaagbe & Adedokun, 2009, Nelson, Ploetz & Kepler, 2006; Ogazi, 1995). Plantain is an important food and cash crop (Nkendah & Akyeampong, 2003; Nwosu & Lawal, 2010) with outstanding and proven medical and industrial relevance (Faturoti, Madukwe, Tenkouano & Agwu, 2007). This major food staple and cash crop is important in the rural and urban economy, social and cultural life in sub- Saharan Africa (IITA, 2009). Nigeria is one of the major plantain producing and consuming countries in Africa, and is ranked among the 20 most important plantain producing countries worldwide (FAO, 2011). The demand for plantain has increased tremendously in the last one decade as a number of local processing industries have emerged which use it industrially for making bread, cakes, biscuits (Ogazi 1996). With increasing urbanization, bananas and plantains are fast becoming more and more important as cash crop, in some cases providing the sole source of income to rural population, thereby playing an important role in poverty alleviation (Frison and Sharrock, 1999).

Nevertheless, Plantain subsector faces several constraints such as high post harvest losses, diseases, poor pricing, bad road networks and inadequate transportation to convey produce amongst others (Ekunwe & Ajayi, 2010, Edeoghon & Okoedo-Okojie, 2011). The perishability of plantain like other crops gives rise to the need to preserve it. According to Cauthen, Jones, Gugerty, & Anderson, (2013), Fresh bananas and plantains have a short shelf-life and rough handling, unprotected storage conditions, and poor transportation lead to post-production losses of 30-40%. Postharvest losses have been a constraining factor in plantain production such that increase in yield brought about by advances in technologies through research did not make any significant impact on the economy of small scale farmers (Ladapo & Oladele, 2011). Increased production without improved post harvest handling and processing techniques may lead to high post harvest losses in the commodity. Nigeria's traditional food crops are seriously under exploited, due to lack of commitment to processing and or preservation. Thus, it is imperative to examine the Competitiveness level of Processed Plantain products to ascertain the level of government incentives in the commodity sub sector.

Competitiveness is the set of institutions, policies and factors that determine the level of productivity of a country (Martin, Blanke, Hanoouz, Geiger, Mia & Paua, 2009). Competitiveness is equivalent to strong performance of economies relative to other countries, where strong performance can mean economic growth, success in exports and increased wellbeing (Cockburn, Siggel, Coulibaly & Vézina, 1998). Competitiveness is the fundamental determinant of the level of prosperity a country can sustain (Porter, 2007). Competitiveness remains an important measure of benchmarking economic performance (Dunning, 1995).

Processing of Plantains would reduce wastages especially during the peak period of production, could create employment, lead to income generation, commercialization and reaching markets (Ekunwe & Atalor, 2007). This is because Plantain cannot be stored for a long period of time except when processed (Pikuda & Ilelaboye, 2009). **In order to sustain the interests of farmers and allied stakeholders in the Plantain subsector, processing becomes imperative to address critical issues of glut and post harvest loss especially during the peak period. In addition, processed products command higher prices due to the value that has been added. To enhance sustainability, food security, food**

sovereignty, economic growth and employment generation, there is the need to examine the Competitiveness and Effects of government policies on processing of the commodity. Previous studies on Plantain is focused on the marketing, production, Pest and Disease control and assessment of Returns on investment in processing (Folayan & Bifarin, (2011) while little attention is focused on the effect of government policies on processed plantain products. This study therefore examined Competitiveness of Plantain Processing and the effects of government policies on the commodities in order to devise appropriate policies that shall enhance development of Plantain subsector.

METHODOLOGY

Study Area

The study was carried out in the southwestern region of Nigeria. The region was selected because it is one of the major centres of plantain production in Nigeria (Akinyemi, Aiyelaagbe & Akyeampong, 2010, NPFAS, 2009). Also, the prospect for value addition is promising due to the presence of emerging processing industries. The South western is one of the six geo political zones in Nigeria. The zone is made up of six states namely Lagos, Oyo, Ogun, Osun, Ekiti and Ondo States. It falls on latitude 6^o to the North and latitude 4^o to the south. It is marked by longitude 4^o to the west and 6^o to the east. It is bounded in the North by Kogi and Kwara states, in the east by Edo and Delta states in the south by Atlantic Ocean and in the west by Republic of Benin. The zone is characterized by a tropical climate with distinct dry season between November and March and a wet season between April and October. The mean annual rainfall is 1480mm with a mean monthly temperature range of $18^oC – 24^oC$ during the rainy season and $30^oC – 35^oC$ during the dry season. The Southwest Nigeria covers about 114,271 kilometres square land area. The total population is 27,581,992 and predominantly agrarian. Major food crops grown in the area include cassava, Plantain, cowpea and yam (NPC, 2006). The study was concentrated in the major plantain processing areas in the zone (Oyo, Osun, Ondo and Ogun state).

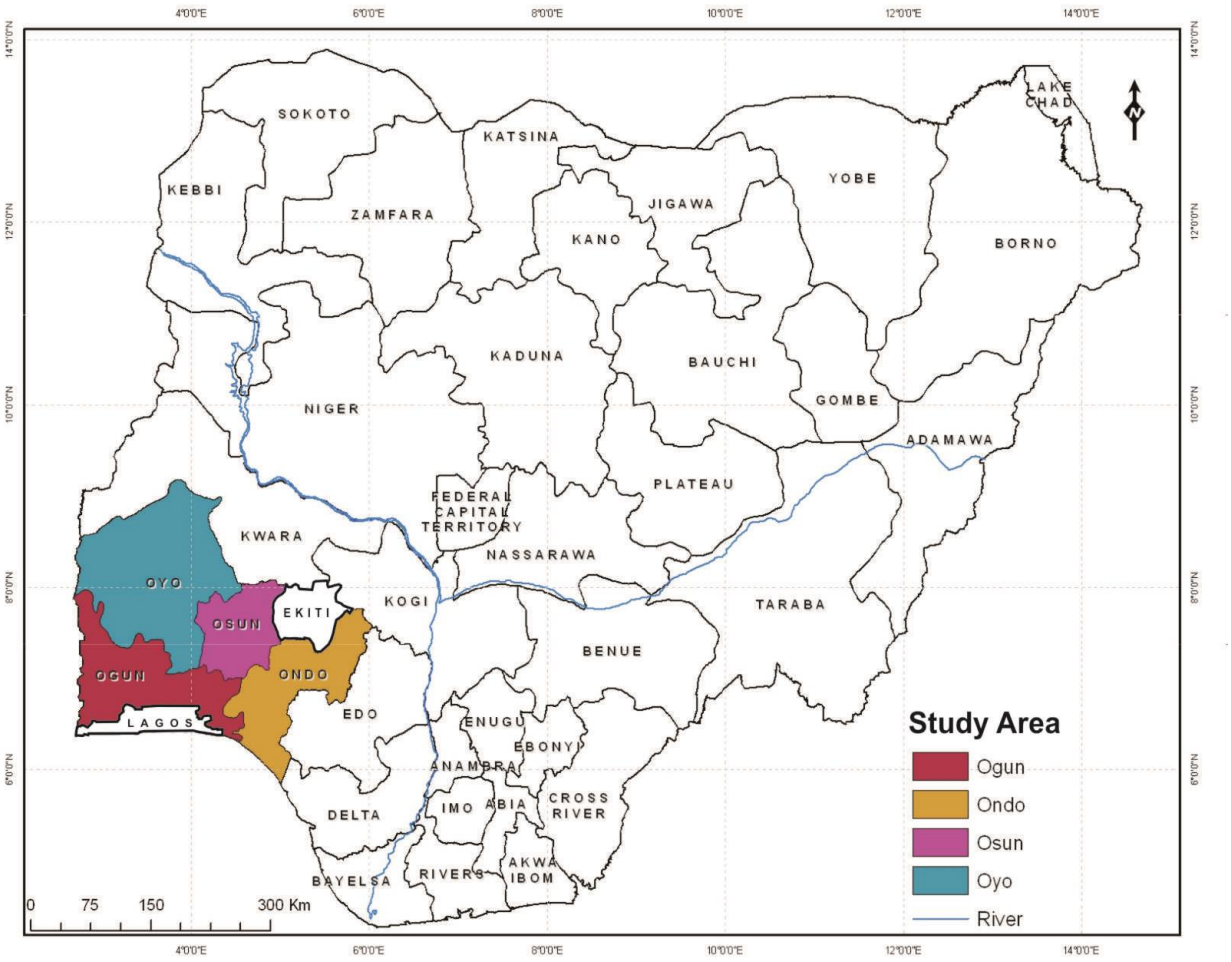

Figure 1: Map of Nigeria showing the study area in Southwestern Nigeria.

Sampling procedure and Sampling size: Multistage sampling technique was employed within the zone. Four local government areas identified for intensive Plantain Processing were selected in the zone in the first stage while 4 communities were selected at the second stage. In the last stage processors of plantain chips and flour were randomly selected from the communities to constitute 50 respondents each for flour and chips. The status of the Local Government areas and communities were observed from the results of the cursory survey and confirmed from existing data collected at the state Agricultural Development Programmes offices in the region.

Sources and types of data: Primary and Secondary data were utilized for this study. Primary data were obtained through the use of well structured questionnaire. The questionnaire was pretested to remove any ambiguity. The primary data collected include: yield, input requirements, market prices for inputs and outputs, transportation cost, storage cost, while secondary data include production subsidy, port charges, import and export tariffs and exchange rates. The secondary data were sourced from Nigeria Port Authority, International Trade Statistics and Central Bank of Nigeria.

ANALYTICAL TECHNIQUE

The Policy Analysis Matrix (PAM) is a computational framework developed by Monke and Pearson, (1989) and augmented by Masters and Winter–Nelson (1995) for measuring input use efficiency in production, comparative advantage and degree of government interventions (Nelson and Panggabean, 1991). The basic format of PAM is presented in Table 2.1.

Table 1: Policy Analysis Matrix

Items	**Value of Output**	**Value of Tradeable input**	**Value of Domestic factor**	**Profit**
Private Prices	A	B	C	D
Social Prices	E	F	G	H
Policy Transfer	I	J	K	L

Source: Monke & Pearson, 1989

A = Private revenue, B = Tradable input cost at private price, C = Domestic factor cost at private price, D= Private profit = [*A*– (*B*+*C*)], E = Social revenue, F = Tradable input at social price, G = Domestic factor cost at social price, H = Social profit = [E– (*F*+*G*)]; I= Output transfer: [*A*–*E]*, J = Input transfer =[*B*– F], K = Factor transfer = [*C*– G], L = Net policy transfer = [D– H] = [I-J-K].

The following were calculated from the Policy Analysis Matrix

MEASURES OF COMPETITIVENESS

Private Profitability (PP)

The private profitability demonstrates the competitiveness of the agricultural system given current technologies, prices of input and output and policy (Monke and Pearson, (1989). Private profit is calculated on the first row of the matrix and it is the difference between observed revenues and costs valued at market prices (private values) received by the processors.

$$\pi_i^p = p^*_o q^*_o - p^*_i q^*_i \quad \ldots \quad (1)$$

Where: π_i^p= Profit at private level, $p^*_o q^*_o$ = value of output produced at private prices, $P^*_i q^*_i$= value of input used at private prices.

Private Profit < 0 = operators are earning subnormal rate of return,

Private profit = 0 operators are earning normal profit.

Private profit > 0 operators are earning supernormal returns and this should lead to expansion of the system.

Private Cost Ratio (PCR)

PCR shows the private efficiency of the processors and is an indication of how much one can afford to pay domestic factors (including a normal return to capital) and still remain competitive. Thus PCR<1 indicates that entrepreneurs are earning excess profits while PCR>1 implies entrepreneurs are making losses (Monke & Pearson, 1989).

PCR = 1 indicates the breakeven point.

The *Private Cost Ratio* (PCR) is used in measuring competitiveness:

$$PCR = \frac{\sum_k a_{ki} P_k{}^p}{P_i{}^p - \sum_j a_{ij} P_j{}^p} = \frac{C}{A-B} \quad \ldots \quad (2)$$

a_{ki} = output coefficient for plantain flour and chip; P_k^p = private prices of domestic factor for plantain flour and chips (Naira) P_i^p = private profit for plantain for plantain flour and chips; aji = input coefficient for plantain for plantain flour and chips; P_j^p = Private prices of tradeable input for plantain flour and chips; Pjs = Social prices of tradeable input for plantain flour and chips.

MEASURES OF COMPARATIVE ADVANTAGE

Social Profitability (SP)

Social Profitability is a measure of comparative advantage and efficiency because outputs and inputs are valued in prices that reflect scarcity values. This is calculated on the second row of the matrix.

$$SP = \left(P_o^s - \sum a_{oj} P_j^s - \sum b_{ok} P_k^s\right) x Y_o \quad \ldots \quad (3)$$

P_o^s = shadow price of output of plantain flour and chips; Pjs = shadow price of tradable input for plantain flour and chips. P_k^s = shadow price of domestic factors used in the production of plantain flour and chips; a_{oj} = quantity of tradeable input needed to produce a unit of output of plantain flour and chips; b_{ok} = quantity of domestic factor input needed to produce a unit of output of plantain flour and chips; Y_o = Yield per hectare of output of plantain flour and chips.

+ A positive social profit indicates that the system uses scarce resources efficiently and the commodity has a static comparative advantage.

_ Negative Social profits indicate that the sector cannot sustain its current output without assistance from the government, with a resulting waste. The cost of domestic production exceeds the cost of importing at the margin.

Domestic Resource Cost (DRC)

The domestic resource cost (DRC) is a measure of relative efficiency of domestic production by comparing the opportunity cost of domestic production to the value generated by the product (Tsakok, 1990).

$$DRC = \frac{\sum_k a_{ki} P_k^s}{P_i^s - \sum_j a_{ij} P_j^s} = \frac{G}{E - F} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(4)}$$

aij, k+1 to n = coefficients for domestic resources and non traded inputs for plantain flour and chips; aij, 1+k = coefficients for traded inputs for plantain flour and chips (in Naira); Vj = shadow price of domestic resources for plantain flour and chips (in Naira); Pib = border price of traded output for plantain flour and chips (in Naira); Pjb = border price of traded input for plantain flour and chips (in Naira).

DRC < 1 Value of domestic resources used in production is less than value of the foreign exchange earned or saved.

DRC > 1 Value of domestic resources used in production is greater than value of foreign exchange earned or saved.

Social Cost Benefit Ratio

A good alternative for the DRC is the social cost-benefit ratio (SCB), which accounts for all cost and avoids classification errors in the calculation of DRC (Masters and Winter-Nelson 1995).

$$SCB = \frac{\sum P_j^s Q_j^s + \sum P_k^s Q_k^s}{\sum P_i^s Q_i^s} = \frac{F + G}{E} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(5)}$$

Where: Pi^d = wholesale price; Qi: Quantity of tradable commodity for plantain flour and chips in Kg;

Qji: Quantity of tradable input used for plantain flour and chips in Kg; Qid = domestic factors and tradable inputs for plantain flour and chips in Naira.

SCBR ratio > 1 indicates that the selected system does not have comparative advantages.

SCBR ratio < 1 indicates that the selected system have comparative advantages

OTHER INDICATORS USED IN POLICY ANALYSIS:

Nominal Protection Coefficient (NPC)

The NPC is a measure of the extent to which domestic price policy protects domestic producers or consumers from the direct input or output of foreign markets (Tsakok, 1990). NPC is calculated as a ratio of domestic price to border parity price. It is calculated for the output (NPCO) and input (NPCI).

$$NPC = \frac{P_i^d}{P_i^w} \quad \text{..... (6)}$$

NPC_o = Nominal Protection Coefficient on plantain output

$$NPC_o = \frac{Pi^p}{Pi^s} = \frac{A}{E} \quad \text{..... (7)}$$

NPC_i = Nominal Protection Coefficient on input for plantain

$$NPCi = \frac{\sum a_{ij} Pj^p}{\sum a_{ij} Pj^s} = \frac{B}{F}$$

..... (8)

B= cost of tradable inputs such as fertilizer, seeds at private price; F= cost of tradable input in social prices. P_j^p= Private prices per unit of tradeable input; P_j^s= Social prices per unit of tradeable input; aij, k+1 to n = coefficients for domestic resources and non traded inputs

aij, 1+k = coefficients for traded inputs.

If the NPCO is < one = there is negative protection on output and this confirms the presence of taxes on output.

NPCO > one indicates the presence of subsidies.

Inputs subsidies lead to NPCI smaller than one.

Effective Protection Coefficient (EPC)

The EPC goes a step further by incorporating tradable inputs into the analysis in such a way that it measures the ratio of value added at domestic prices (A - B) to value added at world reference prices (E- F).

EPC=A-B/E-F..... (9)

$$EPCi = \frac{VAD_i}{VAB_i} \quad \text{..... (10)}$$

Where

$$VADi = Pi^d - \sum_k^k a_{ij} Pj^d \quad \text{..... (11)}$$

$$VABi = Pi^b - \sum_k^k a_{ij} Pj^b \quad \text{..... (12)}$$

VAB = Value added at Border Price; VAD = Value added at Domestic price; P_i^d is domestic price of plantain flour and chips; a_{ij} = units of input used in processing; P_{jd} = domestic price of inputs used in processing; P_{ib} = border price of inputs for processing. A value of EPC greater than one indicates a net subsidy to value added. The EPC ignores the transfer effects of factor market policies like NPC.

Profitability Coefficient (PC)

The Profitability Coefficient (PC) shows the impact of all transfers on the profitability. The index is calculated as a ratio of private profit to social profit.

$$PC = \frac{\prod i}{\prod i^s} = \frac{Pi - \sum_j a_{ij}P_j - \sum_k a_{ki}P_k}{pi - \sum_i a_{ij}P_j - \sum_k a_{ki}P_k} = \frac{A-B-C}{E-F-G} = \frac{D}{H} \quad \text{..... (13)}$$

Where:

PC = Profitability coefficient of plantain flour and chips; πip = private profit of plantain flour and chips; πi^s = social profit per unit of plantain flour and chips; P_i^p = private profit per unit of plantain flour and chips; P_i^s= social profit per unit of plantain flour and chips; P_j^p = Private prices of tradeable input; P_j^s == Social prices of tradeable input

a_{ji} = input coefficient; a_{ki} = output coefficient; P_k^p = private prices per unit of domestic factor

P_k^s = social pries per unit of domestic factor.

When PC< 1= policies and market failures transfer income away from the production system (or impose a net tax)

PC > 1= policies (and market failures) transfer income toward the system (or provide a net subsidy).

Subsidy Ratio to Processors (SRP)

Subsidy ratio to processors (SRP) is the net policy transfer as a proportion of total social revenues or SRP = L/E = (D - H)/E. The SRP shows the proportion of revenues in world prices that would be required if a single subsidy or tax were substituted for the entire set of commodity and macroeconomic policies (Monke & Pearson, 1989).

$$SRP = \frac{L}{E} = \frac{(D-H)}{E} \quad \textbf{..... (14)}$$

- The positive value of SRP indicates the overall transfer from society to producer while
- negative value of SRP means overall transfer from producer to society and taxpayers

Processors subsidy equivalent (PSE) is a more complete measure of protection from trade as it accounts for factors affecting input and output prices. The PSE is extracted from the PAM as (L) divided by A. it measures the impact of policies on profits of as share of revenue.

$$PSE = \frac{L}{A} \quad \text{..... (15)}$$

The PSE is the level of producer subsidy that would be necessary to replace the array of actual farm policies employed in the country in order to leave farm income unchanged. It can be thought of as the cash value of policy transfers occasioned by price and non price policies. The PSE includes policy effects on all inputs (Pi) and factors (Pj) (Mucavele, 2000) .The negative value of PSE indicates overall transfer from producer to consumer and taxpayers while the positive value means the overall transfer from consumer to producer.

Sensitivity analysis

Due to the static nature of the Policy Analysis Matrix, sensitivity analysis was carried out Following Nguyen & Heidhues, (2004) and Mane-Kapaj, Kapaj, Chan-Halbrendt & Totojani, 2010) approach to determine earning capacity of the investment due to changes in factors such as domestic price, exchange rate, and FOB price. Sensitivity analysis provides a way of assessing the impact of changes in the main parameters on both private and social profitability (Monke & Pearson 1989). The sensitivity analysis illustrates the reaction in the policy indicators such as NPC, DRC, EPC and SRP due to changes in the aforementioned factors. Three conditions were evaluated:

1. An increase of 20% in domestic price of plantain fruit and vice versa.
2. An increase of 20% in world price (FOB) of products and vice versa.
3. An increase of 20% in exchange rate and vice versa.

RESULTS AND DISCUSSION

Competitiveness of Plantain Processing

Plantain chips and flour are the commonest plantain products that are tradeable in the study area. The result of the analysis (Table 2) indicated that plantain chips production has positive private profit of ₦434,543 per tonne while plantain flour had positive private profit of ₦425,588.79/ton. This implied that plantain flour and plantain chip processing were competitive given prevalent government policies and transfers. Although, plantain chips production had higher private profit compared to plantain flour. The lower return in plantain flour at private price was due to the price per unit of the processed product. The Private Cost Ratio (PCR) obtained for the two products range between 0.10 and 0.13 indicating that the enterprises were profitable. This agrees with the findings of Ekunwe & Atalor, (2007). They found that plantain flour processing and plantain chip processing was profitable in Benin City, Nigeria. Similarly, Folayan & Bifarin (2011) also reported that plantain flour processing was a profitable venture with gross margin per annum of ₦192, 007.66. **Overall inference from the result of the positive private profitability indicated that plantain flour and chips could be processed on a sustainable basis since they generated higher returns compared to costs involved in the processing.**

Table 2: Competitiveness in Plantain Processing.

Types of Plantain product	Revenue ₦/ha	Cost of tradeable input ₦/ha	Cost of domestic factors ₦/ha	Net private profitability ₦/ha	Private cost Ratio
Plantain Chips	833,329	334,008	64,773.32	434,543.68	0.13
Plantain flour	714,300.04	240,426.40	48,285.85	425,587.79	0.10

Note 1$= ₦160 at the time of the analysis.

Source: authors construct.

Social profitability and Comparative Advantage of Plantain Processing

The result of the analysis (Table 3) indicated that plantain flour processing has positive social profit of ₦855,822.46/ton while plantain chips processing had positive social profit of ₦1,162,000/tons. This implies that processing of plantain into flour and chip is economically profitable under existing government policies and transfers. It also indicated that scarce resources were being utilized efficiently in the processing of the two products indicating that the processing of the commodities could lead to sustainable development. However, based on the result of the analysis, higher social profit was obtained with plantain chip compared to plantain flour. This was attributable to higher social price per kilogram that was obtained with the plantain chips. The result of the analysis of the DRC for plantain flour (0.06) and plantain chips (0.07) that were less than unity indicated that the zone had comparative advantage in the processing of the two products. It also implies that cost of domestic factor was lower than value added in social prices. This was further confirmed by the SCB which was also less than unity for plantain flour (0.32) and plantain chips (0.33) confirming the existence of comparative advantage in processing of plantain flour and plantain chips. It can therefore be inferred that the processors has comparative advantage for export promotion which further supports the results of the DRC.

Table 3: Social profitability and Comparative Advantage of Plantain Processing in Southwestern Nigeria.

Types of Product	Revenue ₦/ha	Cost of tradeable input ₦/ha	Cost of domestic factors ₦/ha	Net social profitability ₦/ha	Domestic Resource Cost ratio	Social cost Benefit Ratio
Plantain flour	855,822.46	239,089.25	37,662	579,070.25	0.06	0.32
Plantain chip	1,162,000	333,198	55,222.67	773,579.33	0.07	0.33

Source: authors construct

Protection Coefficient

The result of the analysis (Table 4) indicated that NPCO of 0.83 and 0.72 were obtained for plantain flour and plantain chip which indicated that plantain flour and plantain chip market price were 17% and 28% below the world reference price. It can be inferred that the plantain flour and plantain chip processing system were not protected by policy as a result of transfer of resources from the system. The Nominal Protection Coefficients on input such as tools and equipment used in the processing of plantain flour and chips were greater than one translating that market price of inputs were greater than the world reference price. Thus processors were not receiving sufficient incentives in the processing of plantain. The absence of incentives was further confirmed by the result of the Effective Protection Coefficient (EPC) that was less than one. EPC values of 0.76 and 0.60 were obtained for plantain flour and plantain chips. The EPC values of less than one obtained indicated that value added at market prices were lower than value added at world reference price.

The absence of incentives was further supported by the result of the profitability coefficient presented in Table 4. The profitability coefficient was also less than one for plantain flour and plantain chips. Profitability coefficient of 0.74 and 0.56 were obtained for plantain flour and plantain chips. The result of the analysis of the profitability coefficient indicated that private profits were lower than profit obtained at world reference price level. SRP values of -0.18 and -0.29 were obtained for plantain flour and plantain chips. The negative SRP indicated that the producers were taxed in the production of the commodity. The equivalent producer subsidy estimate for plantain flour and chips were also less than one indicating implicit tax and transfer of resources from the system.

Table 4: Protection coefficient and incentives in Plantain Processing

Plantain product	NPCO	NPCI	EPC	PC	SRP	PSE
Plantain flour	0.83	1.005	0.76	0.74	-0.18	-0.21
Plantain chip	0.72	1.005	0.60	0.56	-0.29	-0.41

Source: authors construct

Sensitivity Analysis for Plantain Chip

The sensitivity analysis showed the effect of changes in plantain market price, world price and exchange rate on the competitiveness of Plantain chip processing. At 20% increase in plantain fruit market price and vice versa, plantain chip processing was less competitive with private profitability reducing by 12% implying that the processors would receive less profit in the activity. The Nominal protection coefficient on input was also increased by 16% indicating that the processors are taxed on input used in the processing of the commodity. The EPC and PC showed reduction in incentives by 11% and 13% with the increase in the market price of plantain fruit. Transfers from the processors to the society was revealed by the SRP and PSE ratio indicating a 7% and 9% transfer from the processors to the society. The social profitability, DRC and SCB remain unchanged.

Plantain chips processing appear to be more competitive with increase in FOB and exchange rate by 20%. A percentage increase of 21% in social profit was observed when exchange rate was increased by 20% and vice versa. The DRC and SCB

ratios improved with changes in the FOB and exchange rate from 0.07 to 0.05 at 20% increase and vice versa. However reduction in the EPC value was observed with an increase in the exchange rate and FOB. A reduction of 30% in EPC was observed when FOB increased by 20% while reduction of 42% in value added was obtained when exchange rate was increased by 20% and vice versa. This is an indication that increasing exchange rate and FOB value of the commodity would reduce the value added at private price compared to the border price. Increases in the exchange rate and FOB led to reduction in PC and transfer from the processors to the society reflected in the values of SRP and PSE obtained and vice versa.

Table 5: Sensitivity Analysis for Plantain Chips

Ratios	**Base Values**	**Increase plantain market price 20%**	**decrease plantain market price 20%**	**increase FOB price 20%**	**decrease FOB price 20%**	**increase exchange rate 20%**	**decrease exchange rate 20%**
PP (₦/ha)	434,543.68	381,912.96	483,127.53	434,543.68	434,543.68	434,543.68	434,543.68
PCR	0.13	0.15	0.12	0.15	0.15	0.15	0.15
SP (₦/ha)	1,162,000	1,162,000	1,162,000	1,394,400	929,600	1,544,640	779,760
DRC	0.07	0.07	0.07	0.05	0.09	0.04	0.14
SCB	0.33	0.33	0.33	0.28	0.42	0.24	0.53
NPCO	0.72	0.72	0.72	0.60	0.9	0.52	1.14
NPCI	1.002	1.002	0.85	1.16	1.16	1.16	1.16
EPC	0.60	0.54	0.66	0.42	0.75	0.35	1.1.3
PC	0.56	0.50	0.62	0.38	0.71	0.32	1.12
SRP	-0.33	-0.34	-0.25	-0.45	-0.17	-0.52	0.05
PSE	-0.46	-0.47	-0.35	-0.75	-0.19	-0.99	0.05

1$ = ₦160 Source: authors construct

Sensitivity analysis for Plantain flour

Raising plantain fruit market price by 20% would reduce private profitability by 5% and vice versa. The values of social profitability, DRC, SCB and NPCO remain unchanged while the value of NPCI increases by 3% with an increase in domestic price and vice versa. Increase in the market price of plantain also leads to reduction in value added at market prices indicated by the EPC value reducing from 0.77 to 0.73 and vice versa.

An increase in exchange rate and FOB by 20% and vice versa lead to a 3% and 5% improvement in social profitability. At 20% decrease in FOB, plantain flour appears less competitive with DRC ratio increases from 0.06 to 0.08 while an increase in FOB lead to an improvement in the DRC. A decrease of 20% in exchange rate reduces the comparative advantage of

plantain flour. At 20% decrease in FOB and Exchange rate, the processors will be receiving 4% and 34% above the world reference price on their product. Similar trends were observed with the EPC with reduction in the FOB and exchange rate. The processors were protected and there were transfers from consumers to processors.

Table 6: Sensitivity Analysis for Plantain Flour

Ratio	**Base Values**	**Increase plantain market price 20%**	**decrease plantain market price 20%**	**increase FOB price 20%**	**decrease FOB price 20%**	**increase exchange rate 20%**	**decrease exchange rate 20%**
PP	425,587.79	403,264.87	489,919.40	425,587.79	425,587.79	425,587.79	425,587.79
PCR	0.10	0.11	0.08	0.10	0.10	0.10	0.10
SP	579,070.25	579,070.25	579,070.25	750,913.34	407,731.49	899,967.87	257,727.89
DRC	0.06	0.06	0.06	0.05	0.08	0.04	0.13
SCB	0.32	0.32	0.32	0.30	0.40	0.24	0.52
NPCO	0.83	0.83	0.83	0.69	1.04	0.61	1.34
NPCI	1.16	1.20	0.74	1.005	1.005	1.005	1.005
EPC	0.77	0.73	0.87	0.60	1.06	0.51	1.60
PC	0.73	0.70	0.85	0.50	1.04	0.47	1.66
SRP	-0.18	-0.21	-0.10	-0.32	0.02	-0.40	0.32
PSE	-0.21	-0.25	-0.12	-0.46	0.03	-0.66	0.24

1$ = ₦160 (prevailing exchange rate at the time of analysis) Source: authors construct

CONCLUSION AND POLICY IMPLICATIONS

This study employed Policy Analysis Matrix (PAM) to x-ray Plantain Processing in southwestern Nigeria. The result of the analysis indicated that Plantain Flour and Plantain Chips were privately and socially profitable. Although Plantain chips had higher private and social profit compared to Plantain flour. Results also indicated that the region had comparative advantage in the processing of Plantain into Flour and Chips. In addition plantain chips and plantain flour prices were lower than the reference price. The incentive structure indicated that government through its macroeconomic policies did not protect the processors. Sensitivity analysis revealed that policy indicators are sensitive to changes in the domestic price of plantain fruit used in processing, world price (FOB) and the exchange rate.

However the Policy implications from this study are:

1. A multi stakeholders approach should be encouraged to put in place requisite processing infrastructure to reduce post harvest loss in order to enhance income at production level. Better household income and food security are an imperative for sustainability.
2. Improvement on quality of phyto-sanitary regulations enforcement in order to meet up with the international products standard and traceability.
3. Need for provision of incentives to processors to enhance competitiveness of the commodities.

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