

Competitiveness of Pineapple Production in Osun State, Nigeria

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Abstract

Pineapple has encouraging potentials for economic development in the country. However, there are little empirical evidences on the Competitiveness and Effect of Government Policies on the commodity. The study therefore assessed the Competitiveness of Pineapple Production in Osun state, Nigeria. A Multistage sampling technique was used in selecting 120 respondents within the study area. The study utilized both primary and secondary data. Data were analyzed using descriptive statistics and Policy Analysis Matrix (PAM). Results revealed that 58.3% of the producers used sucker technique in pineapple production while 46.2% used crown technique. PAM results revealed that the crown and sucker production techniques were privately (₦550, 438/ha and ₦679, 138/ha) and socially profitable (₦730, 228/ha and ₦841, 828/ha) with Sucker production technique having higher competitiveness. Nominal Protection on Input and Output and the Effective Protection Coefficients for the two production systems indicated presence of tax and the producers were not protected by policy. Subsidy Ratio to Producer (SRP) value obtained for crown (-0.16) and sucker (-0.14) techniques and Producer Subsidy Estimate (PSE) value of -0.18 was obtained for Crown and sucker (-0.15) techniques indicating pineapple producers' income were transferred to consumers and taxpayers which further confirmed that Pineapple production was taxed by policy. Sensitivity analysis indicated that increase in Free On Board (FOB) price; Farm gate price, Yield and Exchange rate at 20% improved Competitiveness and Comparative advantage of Pineapple production. The study recommends provision of incentive structures that will protect pineapple producers.

Key words: Pineapple, Production Techniques, Competitiveness, Policy Analysis Matrix, Osun state.

1. Introduction

Pineapple is the third most important tropical fruit in world after Banana and Citrus (Bartholomew *et al,* 2003). Pineapple as an economic crop has encouraging potentials for foreign exchange earnings. It can increase national income through the expansion of local industries and higher incomes for farmers involved in its production (Fawole, 2008). It is one of the crops with the most potential in the international market and highly profitable, an activity that demands a large workforce (Quijandria *et al*, 1997). Pineapple production therefore can be used as a panacea for food security and job generation, help in rural development, launch the country on the path of self sufficiency, increase food production and help in improving lives and health care delivery services (All Africa, 2011). Nigeria, ranked 7th on the list of world producers, as well as the leading pineapple producer in Africa with a production of 1,400,000 MT of fresh pineapple having the largest land area of about 180, 000 ha for Pineapple production in the world and yield of 77778 tons/ha (FAOSTAT, 2011). Pineapple is a wonderful tropical fruit having exceptional juiciness, vibrant flavor and immense health benefits (Joy, 2010). It is grown both for the fresh and processed market, which makes it an important food which can be eaten fresh or eaten in a processed form (FAO, 2009). In developing countries like Nigeria, most of the fresh pineapples produced are sold in domestic markets and bought for domestic consumption (Spore Magazine, 2008). Also the Fruit Juice market (Pineapple) in Nigeria had witnessed a tremendous growth since 2002 (Manufacturing today, 2011).

Despite Nigeria's position and potential in Pineapple production in the world and the enormous economic advantages the country has over the crop, Nigeria has the lowest productivity of 7 tons/ha when compared with the other nine top producers in the world thereby, contributing a small share (5%) of the world Pineapple production (FAOSTAT, 2010, Mark, 2010) thus, reflecting a low yield in pineapple production in the country (Mark, 2010). Although Nigeria's position on the list of world pineapple producers is encouraging, majority of the harvested produce is wasted due to production inefficiencies, post harvest losses, low level of technology to facilitate processing of quality pineapple products and inefficient marketing system (Ivan *et al*, 2011). Arable land in Nigeria is suitable for cultivating most types of crops implying the productivity potential of Nigeria is

enormous, the share of global trade has declined to the point where little of Nigeria's Agricultural produce is seen in the World's markets which makes Nigeria the sleeping giant of Africa in Agriculture (Ken, 2009). According to Khalid *et al*, (2007) in the past, relatively more emphasis is placed on enhancing the production and productivity of major crops by ignoring that of the horticultural crops, fruits inclusive. Though Nigeria occupy a notable position in Pineapple production in Africa and the world at large, its inability to fully tap into the economic potentials of the crop might be a reflection of its inefficient nature in production which otherwise, would have served as an important tool in achieving some of the objectives of the transformation agenda in Nigeria.

Competitiveness can be defined as the set of institutions, policies, and factors that determine the level of productivity of a country (Porter and Schwab, 2008). Consequently, the importance of Competitiveness in Pineapple Production cannot be overemphasized because Competitiveness is a base for success in the local, regional and international market. In other words, more competitive economies tend to produce higher level of income for their citizens. Competition encourage producers of agricultural products to offer a high-quality product, to reduce costs in relation to the competitive one and to decide on the product line or services in accordance with customer needs, meeting quality and food safety standards (Ivan *et al* 2011) for the local market needs and export dynamism.

Past studies conducted on Pineapple in Nigeria, such as Oladapo *et al*, (2007), Amao *et al,* (2011), Adesope *et al*, (2009) emphasized on the marketing aspect of pineapple while neglecting the competitiveness aspect of Pineapple production. Also relevant studies on Competitiveness such as Akramov *et al*, (2012), Liverpool *et al*, (2009), Elly and Lis, (2004), Ogbe *et al*, (2011), Emam *et al,* (2011) used PAM framework to analyze competitiveness, efficiency, comparative advantage and policy effects on different agricultural crops and livestock such as Rice, Maize, Cassava, Poultry, Piggery in different countries as well as Nigeria but none has been conducted on Pineapple in Nigeria. Therefore, it becomes imperative to conduct a study to analyze the Competitiveness of Pineapple production using the two major production techniques (Crown and Sucker) with a view of determining the Competitiveness, Comparative advantage and Policy effects on Pineapple Production in Nigeria using Osun state as a case study due to its prominence in Pineapple production.

2. Methodology

2.1 Study Area

The study area is Osun state. It is located in Southwestern part of Nigeria, inhabited mainly by the Yoruba people. The state has a covering of tropical rain forest, occupies 9,251 square kilometers and shares borders with Kwara State to the North, Oyo State to the West, Ogun State to the South, Ondo and Ekiti States to the East (Osun State profile, 2004). The provisional 2006 population census results put the population of Osun state at 3,423,535 (NPC, 2006 Estimate). The study was carried out in three local government areas of Osun state namely: Ayedaade, Ife East and Ife North due to their prominence in Pineapple production in Osun state.

2.2 Sampling Technique

A multi-stage sampling technique was used in selecting respondents for the study. The first stage involved purposive selection of 3 Local Government areas that were prominent for pineapple production in Osun state which include Ayedaade, Ife East and Ife North, the second stage involved selection of 2 communities in each local government and finally a total of 120 pineapple farmers were randomly selected from the 6 communities based on probability proportionate to size.

2.3 Method of Data Analysis

The analytical methods used were descriptive statistics and Policy Analysis Matrix (PAM).

2.3.1 Analytical Framework

The PAM is a computational framework, developed by Monke and Pearson (1989) and augmented by Masters and Winter-Nelson (1995), for measuring competitiveness, input use efficiency in production, comparative advantage and the degree of government interventions. The PAM framework uses detailed information on a farm level production budget, explores the composition of production and other system related costs and how changing various production constraints and/or the policy environment can change the profitability of a production system (Akter *et al*, 2003).

Table 2.3.1: Policy Analysis Matrix (PAM) Framework

	Revenue	Costs		Profits
		Tradable Inputs	Domestic Factors	
Private prices	A	B	C	D
Social prices	E	F	G	H
Divergence	I	J	K	L

Source: Based on Monke and Pearson (1989)

Where: 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 indicator in the first row of Table-1 provides a measure of private profitability (D), or competitiveness. Private profitability demonstrates the competitiveness of the agricultural system, given current technologies, prices for inputs and outputs, and policy interventions and market failures. The second row of the matrix calculates the measure of social profitability (H). Social profitability measures economic efficiency/ comparative advantage of the agricultural system. The impact of policy is then assessed as the divergence between private and social valuation. Important Policy indicators such as Domestic resource cost (DRC) ratio, Private Cost ratio (PCR), Social cost benefit (SCB) ratio, Profitability coefficient (PC), Nominal protection coefficient (NPC), Effective protection coefficient (EPC), Producer subsidy estimate (PSE) and Subsidy ratio to producer (SRP) which are useful in analyzing Competitiveness, Comparative advantage and the effect of Policy on crops or production systems can be calculated from the PAM framework for policy analysis (Monke and Pearson, 1989; Masters and Winter-Nelson, 1995).

2.3.2 Data and Modeling Assumptions

Primary and secondary data were used for the study. Structured questionnaires were used to obtain primary data on the socio economic characteristics of the pineapple producers in the study area, data on output, tradable and non tradable inputs, market prices of inputs and output to calculate the private price of fresh pineapple. Secondary data collected were Free on Board price obtained from Trade website, Transportation cost, Port charges, Storage costs, Production subsidy and Import/export tariffs obtained from Customs website, Exchange rate was obtained from CBN website. Other sources include Food and Agricultural Organizations and National Bureau of Statistics (NBS).

The PAM constructed for this study made use of farm budget values obtained from two Pineapple production techniques (Suckers and Crown technique). Further estimations in the PAM were based on World reference price and these were used as reference prices for computing social prices for output and input respectively. The US FOB Gulf price was used as reference price for Pineapple. The world prices were adjusted for transportation and handling cost to be comparable with farm gate price. For imported commodities, social prices at the farm gate were calculated by adding transportation cost, port charges, tariffs to the respective CIF price (calculated by adding ocean freight charges to FOB price) in domestic currency. The social price of land is the opportunity cost of land taken to be the net return (profit) of the competing crop production system i.e. the net return (profit) that would be earned from the next best alternative production system. However in this study it was not possible to study alternative crops to estimate the social price of land therefore, the social price of land was taken to equal the private land rental rate. Following Yao (1997) the social valuation of labour was obtained by dividing labour into peak-season and off-peak season components. The wage rate in the peak-season is the opportunity cost of labor for the period considered and the opportunity cost of labour in the off peak season is half the prevailing wage rate. With this, social price of labour is calculated by:

$$P_L = \frac{W_P + 0.5W_O}{2}$$

Where; P_L = Social price of labour

W_p = prevailing wage rate in peak season

W_o = prevailing wage rate in off peak season

In a PAM framework, inputs were disaggregated into tradable and non-tradable. For this study, the tradable inputs include fertilizers, Pineapple Suckers and Crowns while the non-tradable inputs were land, labour, capital, tractor, plough and other fixed farm tools and implements.

3 Results and Discussion

3.1 Profile of Pineapple producers in Osun State

Results from Table 3.1 revealed that two major production techniques (Sucker and Crown) were used by Pineapple producers in the study area which were managed mostly under Sole cropping system (98.3%). 58.3% of producers used Sucker technique in production with an average yield of 21.9t/ha while 46.2% used Crown technique with an average yield of 20.5t /ha. Most of the producers (91.7%) were producing on a small scale (0.1- 1ha farm holdings) and were within 41-60 years age group (75.8%) implying that older farmers were involved in Pineapple production in the study area.

Table 3.1: Profile of Pineapple producers in Osun State

Variables	Frequency	Percentage
Type of production technique		
Sucker	70	58.3
Crown	39	32.5
Others	11	9.2
Total	120	100.0
Type of Cropping System		
Sole cropping	118	98.3
Intercropping	2	1.7
Total	120	100.0
Average Yield (T/ha)		
Sucker technique	21.9	
Crown technique	20.5	
Farm Size		
0.1 - 1	110	91.7
1.1 - 5	10	8.3
Age		
0-20	0	0
21-40	8	6.7
41-60	91	75.8
Above 60	21	17.5
Total	120	100.0
Mean	54	

Source; Field survey, 2013

3.2 Competitiveness of Pineapple production

Competitiveness reflects the ability of a farming system to earn profits at the actual market prices in place (ERD, 2011). Results of the analysis from Table 3.2 revealed that Pineapple production system using Crown production technique had private profitability of ₦550,438/ha while ₦679,138/ha was estimated for Sucker production technique. This implied that Pineapple production is a profitable business. This result is consistent with the findings of Fawole, (2008) who reported that Pineapple farmers in Edo state (75%) attributed their main purpose

of pineapple production to profit making. The Private Cost Ratio (PCR) is also an indicator of competitiveness. A PCR less than one indicates competitiveness and shows that the production system is competitive for resources given the actual prices in the product and factor markets. Results showed that the two Pineapple production techniques were competitive (PCR ratios much less than one). However the Sucker production technique was more competitive (PCR = 0.31), than Crown production technique (PCR = 0.40).

Table 3.2: PAM results for Competitiveness of Pineapple production/ha using Crown and Sucker Production Techniques

	Revenue	Cost		Private Profits	PCR
		Tradable Input Cost	Domestic Factor Cost		
Crown					
Private Prices	1,024,900	102,278	372,184	550,438	0.40
Sucker					
Private Prices	1,092,400	101,078	312,184	679,138	0.31

1. PCR = Private cost ratio

Source: Field Survey, 2013

3.3 Comparative Advantage of Pineapple production

Comparative advantage refers to the ability of one nation to produce a commodity at a lower opportunity cost of other products forgone than another nation (ERD, 2011). Results from Table 3.3 revealed that Pineapple production system using Crown technique had Social profitability of ₦730,228/ha while ₦841,828/ha was estimated for Sucker production technique. This implied Nigeria can generate foreign exchange earnings through the export of fresh Pineapple because the country has a comparative advantage in its production which was further confirmed by the DRC ratio. The Domestic Cost Ratio (DRC) is an indicator of comparative advantage/efficiency. A DRC less than one indicates positive social profit and shows that the production system is economically efficient and the country has a comparative advantage in production of the commodity. The lower the DRC, the greater is the degree of economic efficiency (Elly and Lis, 2004). Results from table 3.3 showed that the two pineapple production techniques were efficient (DRC ratios much less than one). However Suckers production technique was more efficient (DRC = 0.22) than Crown production technique (DRC = 0.27). Though pineapple production has comparative advantage in both techniques, using Sucker technique had a higher comparative advantage than Crown technique.

The Social cost benefit ratio measures how much greater the value of output created is relative to the associated cost of production estimated in social prices. A ratio less than one, indicates an activity is profitable and the difference between the ratio and one indicates the rate of return on an investment in this activity. Results from table 3.3 showed that both pineapple production techniques were profitable (SCB ratios less than 1). However, using Sucker technique was more profitable (SCB = 0.28) than Crown technique (SCB = 0.43) with 0.72 and 0.60 rate of return on investment respectively.

Table 3.3: PAM results for Comparative Advantage of Pineapple production/ha using Crown and Sucker production Techniques

	Revenue	Cost		Social Profits	DCR	SCB
		Tradable Input Cost	Domestic Factor Cost			
Crown						
Private Prices	1,106,892	101,200	275,464	730228	0.27	0.43
Sucker						
Private Prices	1,179,792	100,000	237,964	841,828	0.22	0.28

1. DRC = Domestic resource cost ratio
2. SCB = Social cost benefit ratio

Source: Field survey, 2013

3.4 Transfers and Impact of Government Policies on Pineapple production: This was measured using Output transfer, Input transfer and Net transfer. The output transfer is the difference between the valuation of revenues in private (actual market) prices and (social) prices, or (I=A-E). Results from Table 3.4 showed that Pineapple production using both techniques had negative output divergence of -81,992 for Crown technique and -131,088 for Sucker technique. This implied that government's prevailing policies on output reduced the profitability of pineapple producers. The tradable input transfer is the difference between the valuation of tradable inputs in private (actual market) prices and in efficiency (social) prices, or (J=B-F). Results from table 3.4 showed that Pineapple production using both techniques has Input divergence of 1,078. This indicated that inputs used in Pineapple production were taxed. Negative net transfer of Crown (-179,790) and Sucker (-162,690) production techniques from Table 3.4 indicated that the net effect of distortion policies and/market failure reduced profitability of Pineapple producers.

Table 3.4: PAM results for Transfers and Effects of Government Policies on Pineapple Production

	Output Transfer	Tradable Input Transfer	Domestic Factor Transfer	Net Transfer
Crown				
Divergence	-81,992	1,078	96,720	-179,790
Sucker				
Divergence	-131,088	1,078	74,220	-162,690

Source: Field Survey, 2013

3.5 Protection Coefficients in Pineapple production

These were measured using Nominal protection coefficient on output (NPCO), Nominal protection coefficient on Input (NPCI), Effective protection coefficient (EPC), Profitability coefficient (PC), Subsidy ratio to producer (SRP) and Producer subsidy estimate (PSE). Nominal protection coefficient on tradable output measure output transfers. This ratio shows the extent to which domestic prices for output differ from international reference prices. If NPCO is greater than 1, the domestic farm gate price is greater than the international price of output and thus the system receives protection. On the contrary, if NPCO is less than 1, the system is not protected by Policy. Results from Table 6 showed that producers of pineapple were not protected by policy (NPCO = 0.93), which indicated implicit tax on Pineapple production. The Nominal protection coefficient on tradable input measure input transfers. This ratio shows how much domestic prices for tradable inputs differ from their social prices. If NPCI exceeds 1, the domestic input cost is greater than the comparable world prices

and thus the system is taxed by policy. If NPCI is less than 1, the system is subsidized by policy. Results from Table 3.5 (NPCI = 1.01) indicated that tradable inputs used in Pineapple production were taxed by policy, though the amount of tax is negligible. The input divergences in Pineapple production were caused either by distorting Government policies or market failures. The Effective Protection Coefficient (EPC) shows the joint effect of policy transfers affecting both tradable inputs and tradable outputs added. In cases where producers are taxed more for the tradable inputs than outputs, there is a net tax on their value added (EPC < 1). The EPC value for the two production techniques were 0.92 (Table 3.5) indicating that producers were not protected through policy intervention on value added processes. The Profitability Coefficient (PC = D/H) is a ratio of private profits (D) to social profits (H). The PC shows the impact of all divergences on private profits. If the PC is less than one, policies (and market failures) transfer income away from the production system (or impose a net tax), whereas if the PC exceeds one, policies (and market failures) transfer income toward the system or provide a net subsidy (Elly and Lis, 2004). Results from table 3.5 showed that PC of Sucker production technique (PC = 0.81) was higher than Crown production technique (PC = 0.75). This implied that Policies transferred 19% of income away from Pineapple producers using Sucker production Technique and 25% from farmers using Crown production technique.

SRP measures net policy transfers to producers out of total social revenue of a nation. 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 taxpayer. Results from Table 3.5 showed negative SRP values for Crown and Sucker production techniques (SRP = -0.16 and -0.14) indicating overall transfer from pineapple producers to society and taxpayers. This implied 16% and 14% (Crown and Sucker techniques) of the divergence as a result of policy distortions were used to subsidize other commodities. Producer Subsidy Estimate analysis was used to gauge government intervention in production and processing. It is the producer subsidy that would be necessary for removal of array of government farm policies employed in particular country in order to leave farm income unchanged (Ali and Khan, 2012). The negative value of PSE indicated overall transfer from producer to consumer and taxpayers while the positive value means the overall transfer from consumer to producer. Results from Table 3.5 showed negative PSE values for Crown and Sucker techniques (PSE = -0.18 and -0.15) indicating 18% and 15% of pineapple producers' income were transferred to consumers and taxpayers which further confirmed Pineapple production was taxed by policy.

Table 3.5: Summary of Transfers and Effects of Policy Indicators, Pineapple Production, Osun State, 2013

Indicators	Sucker Technique	Crown Technique
NPCO	0.93	0.93
NPCI	1.01	1.01
PC	0.81	0.75
EPC	0.92	0.92
SRP	-0.14	-0.16
PSE	-0.15	-0.18

Source: Field Survey, 2013

1. NPCO = Nominal protection coefficient on output
2. NPCI = Nominal protection coefficient on Input
3. EPC = Effective protection coefficient
4. PC = Profitability coefficient
5. SRP = Subsidy ratio to producer
6. PSE = Producer support estimate

Source: Field survey, 2013

3.6 Sensitivity Analysis on Competitiveness

PAM is a static model, which cannot capture the potential changes in policy parameters and productivity (Akter *et al*, 2003). To minimize this limitation, following Yao (1997) and Monhanty *et al*, (2003), Sensitivity analyses were conducted to analyze the effects of changes in FOB price, Farm gate price, yield and exchange rate on competitiveness and policy indicators at ±20%.

Sensitivity analyses results from Table 3.6 revealed that, increasing the FOB price at 20% improved Social profit of Pineapple production by 38% and comparative advantage as DRC ratio reduced from 0.25 (base value) to 0.19 and vice versa. Similar trends were observed with the SCB ratio. Increasing the Farm gate price at 20% led to improvement in competitiveness as Private profit increased by 34% and PCR decreased from 0.36 to 0.29. Reducing the Farm gate price at 20% reduced competitiveness as Private profit reduced by 34% and PCR increased from 0.36 to 0.46. Results further revealed that, increasing yield at 20% increased Competitiveness (PCR reduces from 0.36 to 0.29), Comparative advantage (DRC reduced from 0.25 to 0.22 and SCB from 0.31 to 0.26) and Profitability as Private profits increased from ₦614788 to ₦826518 and Social profits from ₦786028 to ₦1014696. Also, DCR improves from 0.25 to 0.21, SCB from 0.31 to 0.26 and Social profit from 786028 to 1059861 at 20% increase in exchange rate (₦160/US$ to ₦192/ US$) which imply depreciation of naira against the US$, favours comparative advantage. This conforms to the findings of Ogbe *et al* (2011). They reported that overvaluation of exchange rate reduces the competitiveness of the local producers in international markets because they are practically taxed. However, depreciation of exchange rate increases the competitiveness of the local producers in international market because they are been subsidized.

Table 3.6: Sensitivity Analyses

	Base Value	**20% Increase in FOB**	**20% decrease in FOB**	**20% increase in Farm gate price**	**20% Decrease in Farm gate price**	**20% Increase in Yield**	**20% decrease in Yield**	**20% increase in Exchange rate**	**20% decrease in Exchange rate**
Private profit	614788	614788	614788	826518	403058	826518	403058	614788	614788
Social profit	786028	1082450	489606	786028	768028	1014696	557360	1059861	489606
Output transfer	-84692	-381114	211730	127038	-296422	-101630	-67754	-381114	211730
Input transfer	1078	1078	1078	1078	1078	1078	1078	1078	1078
Net transfer	-171240	-467662	125182	40490	-382970	-188178	-154302	-445073	125182
DRC	0.25	0.19	0.34	0.25	0.25	0.2	0.32	0.21	0.34
PCR	0.36	0.36	0.36	0.29	0.46	0.29	0.46	0.36	0.36
SCB	0.31	0.25	0.42	0.31	0.31	0.26	0.39	0.26	0.42
NPCO	0.93	0.74	1.25	1.11	0.74	0.93	0.93	0.74	1.25
NPCI	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
PC	0.78	0.57	1.26	1.05	0.51	0.81	0.72	0.58	1.26
EPC	0.92	0.71	1.28	1.12	0.71	0.92	0.92	0.71	1.28
SRP	-0.22	-0.43	0.26	0.05	-0.50	-0.18	-0.28	-0.42	0.26
PSE	-0.28	-0.76	0.20	0.05	-0.95	-0.23	-0.38	-0.72	0.20

4 Conclusions

Pineapple production system using sucker technique was more competitive and had a higher comparative advantage than the production system using crown technique. The present incentive structure indicated that governments through their policies were not protecting pineapple producers. Increase in FOB price; Farm gate price, Yield and Exchange rate at 20% would favour Competitiveness and Comparative advantage of Pineapple production. The study therefore expressed the need for government to remove policy distortions and put in place incentive structures that will protect pineapple producers in order to increase competitiveness.

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