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INVESTIGATING THE EFFECTS OF IMPORT TARIFF LIBERALIZATION ON NIGERIAN PALM OIL INDUSTRY

Henry Egwuma, Mad Nasir Shamsudin, Zainalabidin Mohamed, Nitty Hirawaty Kamarulzaman and Kelly Kai Seng Wong
Department of Agribusiness and Bioresource Economics, Universiti Putra Malaysia, UPM Serdang, Selangor, Malaysia
E-Mail: henry4him@gmail.com

ABSTRACT

Government intervention in the palm oil industry, primarily guided by the objective of stimulating domestic production, takes the form of high import tariffs. This study is an attempt to quantify the impacts of reductions in import tariff on important variables including area harvested, fresh fruit bunch yield, production, imports, domestic demand, and price of palm oil in Nigeria. Four scenarios were considered including a 10%, 30%, 50% and 100% reduction in import tariff. The results from the simulation analysis reveal that all the scenarios resulted in a decline in oil palm area harvested, yield, palm oil production, domestic and producer prices of palm oil. On the other hand, in imports and domestic consumption of palm oil recorded significant increases relative to baseline projections. The study recommends that governments' support to the palm oil industry should be increased in order to offset or mitigate the negative impacts on palm oil output and income of farmers that may arise from due to liberalization. This support could take the form of extensive investment in infrastructures such as transportation facilities, provision of input subsidies, and extension of incentives such as subsidized credit and low-interest loans to farmers and producers in the palm oil sector.

Keywords: palm oil, import tariff, liberalization, baseline projection, scenario.

INTRODUCTION

Government interventions have been a major feature of the palm oil industry in Nigeria. Following the low level of palm oil production and the corresponding rise in domestic demand, Nigeria has become a net importer of palm oil. Domestic production of palm oil has not kept pace with rising demand due to factors such as limited availability of inputs and the preponderance of smallholders with small farm size. From being the world's largest producer and exporter of palm oil in the 1960s, Nigeria now sources for over 500,000 metric tons of palm oil from the international market to augment local production in order to meet the growing domestic demand. Meeting domestic demand, while at the same time reducing imports of palm oil and achieving international competitiveness, is the major objective of the government (Olagunju, 2008). Consequently, the government has embraced a protectionist policy by imposing a system of import tariff intended to help keep domestic prices high in favor of local producers but at the expense of potential benefits from trade.

The import tariff system creates a wedge between domestic and world prices, with domestic prices significantly above world prices so that domestic consumers currently pay higher than the world prices for palm oil. Considering the important role palm oil plays in the diets of households, the price-raising effect of import tariff system leads to significant reduction in the income and purchasing power of the poor, thus, undermining governments' attempt at poverty alleviation. Additionally, the imposition of import tariff implies that domestic consumers are forced to subsidize palm oil producers. Although government revenue is increased when import tariffs are applied, resources are allocated inefficiently thereby hampering the competitiveness and economic efficiency of the Nigerian palm oil industry.

Nigeria is a member of a number of international organizations such as the Economic Community of West African States (ECOWAS) and the World Trade Organization (WTO). In line with Nigeria's commitment to the WTO and the ECOWAS Economic Trade Liberalization Scheme (ETLS), Nigeria is obliged to abolish import restrictions and tariffs on agricultural commodities which will lead to greater regional integration. Consequently, the Nigerian palm oil industry is expected to face increasing exposure to international markets which will further exacerbate the complexity and dynamic environment of the industry. What is more, palm oil import tariffs in most West African countries are generally lower than the rate in Nigeria and the sharp disparity in tariffs between Nigeria and neighboring West African countries creates incentives for palm oil smuggling from these countries into Nigeria. Thus, a large volume of palm oil is imported into Nigeria using these countries as gateways under the ECOWAS ETLS that allows for zero duty between West African States. In this way, palm oil smugglers, in collaboration with corrupt government officials, are able to circumvent import tariffs. By implication, Nigeria loses revenue in both uncollected duties (including taxes) and decreased importation of legitimate palm oil.

Although import tariff has been applied by the government to stimulate the upstream palm oil sector, growth in local production has remained sluggish; falling short of domestic demand. The imposition of import tariff meant to protect domestic producers appears to be counterproductive: importers benefit, domestic consumers are penalized, government revenue is eroded and local production is not stimulated. The question then arises as to

whether import tariff liberalization offers a more effective mechanism for repositioning the Nigerian palm oil industry. The crux of this paper is to analyze the impact of changes in import tariff on several critical variables, notably including oil palm area harvested, yield, palm oil domestic and import demand, and price of palm oil.

The makeup of the remainder of the paper is as follows: section two sketches the Nigerian palm oil industry while a brief literature review is presented in section three. In section four, the methodology adopted in the study is discussed, consisting of the conceptual setting, the model and simulation approach. The results of the analysis are presented in section five while section six concludes the study suggesting some possible policy alternatives.

OVERVIEW OF NIGERIAN PALM OIL INDUSTRY

Palm oil has emerged as the most important vegetable oil produced and consumed in Nigeria(Gourichon, 2013). From being the world leader in both production and export accounting for about 43% of total world output in the 1960's, Nigeria has lost its position in the global market for palm oil. Over the 1970 to 2013 period, total area harvested only grew modestly from about 2.15 million hectares in 1970 to 3.25 million hectares in 2013, increasing less than two-fold and growing at an average rate of 1.1% annually (Figure-1). Assuming area harvested is equal to the total area under oil palm cultivation, this implies that of a total of 24 million hectares available for oil palm cultivation in Nigeria (see, Potter, 2015) only about 13.5% is currently under cultivation. This presents a huge opportunity for oil palm expansion in Nigeria. Figure-1 also shows that the palm oil industry is characterized by low productivity of oil palm, with an annual yield of fresh fruit bunch (FFB) of about 2.67 tons per hectare in 2013.

Between 1970 and 2013, palm oil production sluggishly increased from 432,000 metric tons to 930,000 metric tons in 2013 (Figure-2). This poor performance can be attributed to a number of factors including the dependence on traditional methods of production. In Africa, however, Nigeria's palm oil production is put at an estimated 55% of total output (Gourichon, 2013). Besides, Figure-2 shows the trend in the consumption of palm oil in Nigeria. The trend indicates that total domestic consumption of palm oil in Nigeria has increased over the years. From 412,000 metric tons in 1970, domestic consumption increased to 879,000 metric tons by 2000 and has continued to rise reaching 1,415,000 metric tons by 2013. The increase in consumption is largely driven by rapid increase in population (which is growing at 2.55%) and income growth suggesting that palm oil production must be increased to meet the increase in domestic demand. Due to the low level of production, Nigeria imports palm oil from other palm oil producing countries to meet the growing domestic demand. The imports of palm oil have increased at the same time with the increase in domestic consumption, reaching a level of 518,000 metric tons in 2013. A bulk of the imports of palm oil is from neighboring West African countries like Ghana, Benin, Togo and Cote d'Ivoire. A significant portion of palm oil imports (for example, around 50% from Cote d'Ivoire alone) flow into Nigeria through informal trade channels making it difficult to capture in official statistics (Gourichon, 2013; Nzeka, 2014).

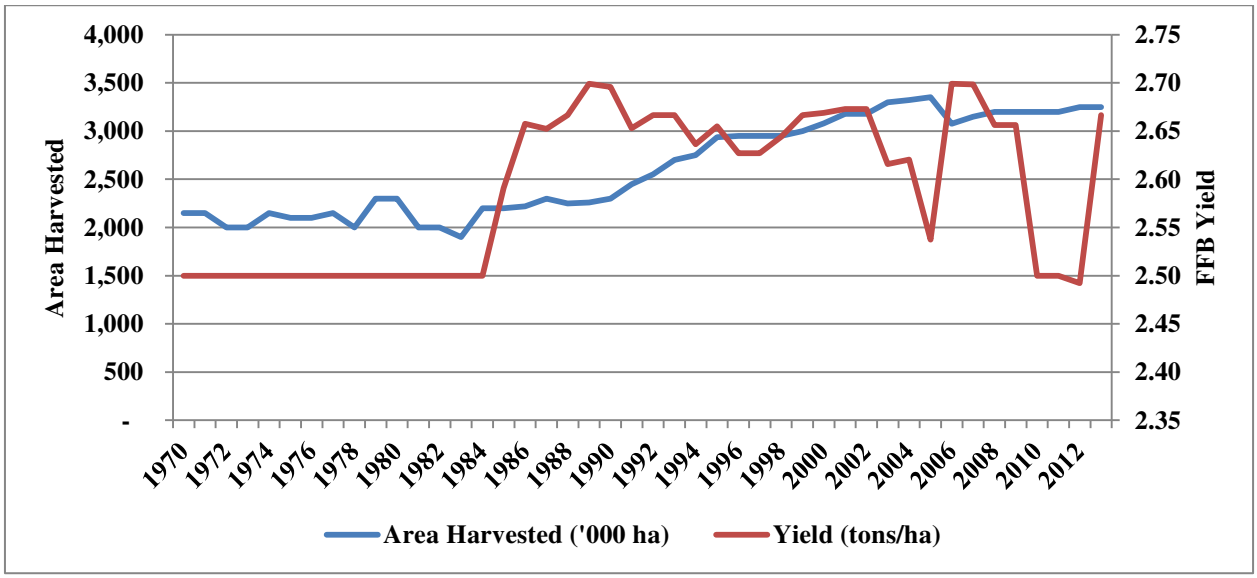

Figure-1. Oil palm area harvested and fresh fruit bunch yield in Nigeria, 1970-2013
Source: USDA, FAO, CBN (2015).

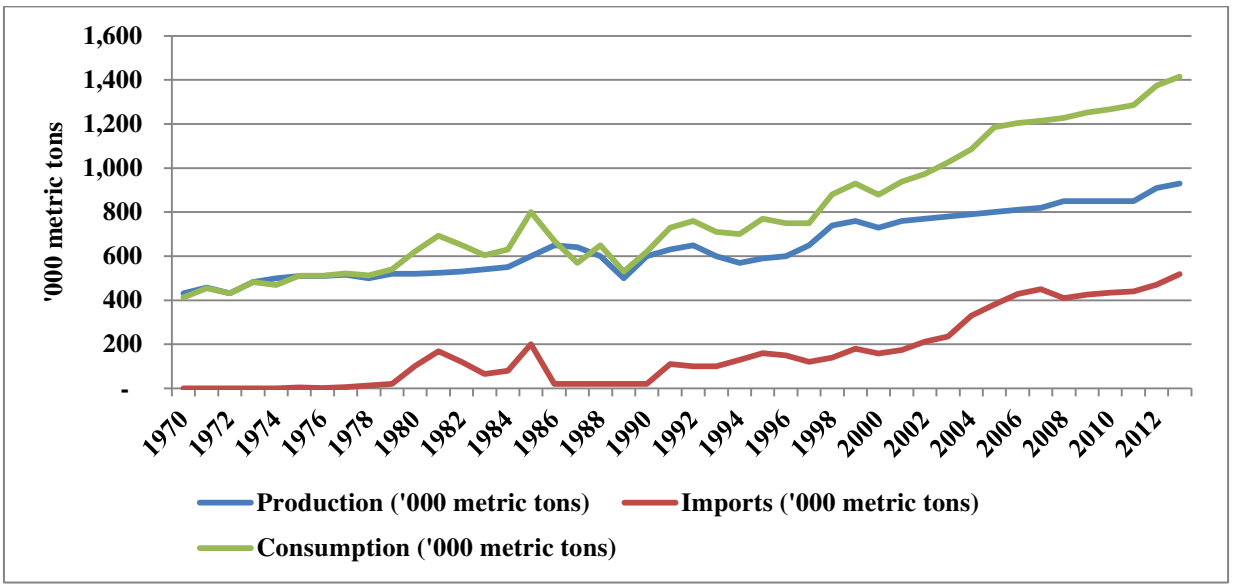

Figure-2. Palm oil production, consumption, and imports in Nigeria, 1970-2013
Source: USDA (2015).

As a step towards reducing over-reliance on imports, protect domestic production and stimulate production, the government in 2005 applied an import tariff of 50% which was reduced to 35% since 2008(Nzeka, 2014). In other words, domestic farmers are incentivized through the import substitution policy of the government which effectively raises the domestic price of palm oil relative to the world price. This policy measure, notwithstanding, domestic production has relatively remained stagnant as high costs of production make domestic palm oil production unable to compete.

LITERATURE REVIEW

In recent decades, there has been a rapid increase in the exchange of goods and services across national borders, reflecting increasing globalization of the of the world economy. For the most part, trade liberalization is attributed as the chief thrust behind the speedy integration of nations. Trade liberalization refers to the elimination or reduction of trade barriers such as tariffs and non-tariff barriers (NTBs) with the aim of moving towards a free trade regime where goods and services are exchanged freely between countries. Generally, import tariff liberalization falls under the broad term trade liberalization; consequently, the theoretical underpinnings and virtues advanced by the pundits of free trade for evaluating trade liberalization also apply to import tariff liberalization.

International trade theory advocate that trade liberalization stimulates the creation of more competitive markets thereby providing an incentive for innovation and productivity growth. Melitz (2003) argues that trade liberalization heightens competition which leads to the displacement of less efficient firms with a corresponding increase in the average productivity of the industry. Increased competition between countries as a result of trade has the potential to increase the losses a firm would run into for failing to innovate. This, in turn, heightens competition between firms and the stimulus to innovate. Conventional trade theory indicates that trade liberalization induces the lowering of trade costs, which typically insulate domestic producers, thereby increasing competition by opening the domestic market.

Theoretically, both traditional and new trade models are in accord with regards to the view that trade barriers such as tariffs introduce distortions to the economy, leading to wasteful allocation of resources and a drive away from optimal levels. From a theoretical point of view, higher tariffs produce proportionally greater distorting effects. Additionally, the distortionary impact of trade barriers is asymmetrically larger for smaller countries than for larger ones(Nenci and Pietrobelli, 2008). Ocampo and Taylor (1998) contend that there are significant welfare and output losses generated when trade distortions are introduced to an otherwise competitive allocation. Tariffs create distortions to the price system leading to substantial loss of efficiency in the economy. This cost to the economy can be mitigated by liberalizing or reducing the tariffs, leading to a change in relative prices and cause resources to be attracted away from import substituting to export sectors. Ultimately, resources will be efficiently allocated with a consequent increase in production, consumption, employment, and welfare in both small and large economies involved in trade with one another.

At an empirical level, there are relatively few studies on the Nigerian palm oil industry. In additional, the existing studies are mostly descriptive in nature (Dada, 2007; Ekine, Onu, and Unaeze, 2008; Kajisa, Maredia, and Boughton, 1997; Ojemade and Bankole, 2013). However, studies on vegetable oils and oilseeds in other countries have been well documented in the literature. For example, Tengku Ahmad and Tawang (1999) applied partial equilibrium approach to evaluate the impacts of trade

liberalization on Malaysian agriculture with special reference to palm oil, paddy, and tobacco. Based on commodity perspective they found that trade liberalization will affect prices, supply, domestic demand and import and export volume leading to gains and losses for different stakeholders. Specifically, the results indicate that when importing countries eliminate tariffs exports of Malaysian palm oil will increase leading to an increase in foreign exchange earnings, domestic prices of palm oil will increase thus increasing supply and depressing domestic demand.

The study by Ernawati, Arshad, Shamsudin, and Mohamed (2006) examined the impact of export duty and import tariff reductions on Indonesia's palm oil export demand. The model was simulated separately for a 10, 30, 50 and 100 percent reduction each for export duty and import tariff and also simultaneously for a 10, 30, 50 and 100 percent export duty and import tariff reductions. They found that trade liberalization exerts opposing effects on domestic and world prices of palm oil; domestic prices would increase while world prices would decline. Furthermore, export duty and import tariff reduction would have a substantial increasing effect on Indonesia's palm oil export demand. The simulation results showed that the percentage changes in palm oil export quantity demanded increases the greater the percentage decrease in export duty and import tariff. In evaluating the impacts of tariff liberalization on India's edible oil and oilseed sector, Ghosh (2009) developed and applied a model that reflects the entire value chain from oilseed production to edible oil consumption. The model was simulated for five counterfactual scenarios including complete import tariff liberalization; zero import; WTO binding tariff rate, which is equivalent to 300% tariff; 65% tariff imposition; and, 50% reduction in import tariff. The study estimated that with WTO binding and zero import there would be a decrease in the demand for edible oils while production of edible oils and oil meal as well as area and yield of oilseeds would register increases. The stated outcome was found to have been triggered by increases in oils and oilseeds wholesale prices and producer prices of oilseeds. However, the study found opposite effects on the above variables under a complete liberalization, 65% tariff application, and 50% import tariff cut.

METHODOLOGY

Conceptual framework

As a result of the increasing significance of palm oil in the global economy in terms of food and non-food uses and in view of the highly complex and dynamic agricultural environment, the need for making the right decisions and strategies become very apparent. Modeling and forecasting provide quantitative forecasts which enhance better policy design and formulation through abetter understanding of the endogenous and exogenous blocks within the system. This will, in turn, facilitate a deeper understanding of the underlying dynamics and inherent characteristics of the agricultural sector, thereby improving the ability of government, agribusinesses and farmers in decision-making and policy analysis.

The basic structure of the Nigerian palm oil model is shown in Figure-3, comprising of supply and demand blocks. The model follows the conceptual framework developed by Labys (1973) and Wong, Shamsudin, Mohamed, and Sharifuddin (2014) and provides a foundation for establishing economic relationships applicable to supply, demand, price, and trade of palm oil. In the supply component, current production of crude palm oil (CPO) depends on the total fresh fruit bunch (FFB) production and the oil extraction rate (OER). The total FFB production is determined by FFB yield and the area harvested. Climatic conditions such as rainfall, input prices such as fertilizer price, and producer price are expected to influence the FFB yields. The area harvested is determined by the area planted. However, because of the unavailability of data for area planted, this study uses area harvested as a proxy for area planted. Thus, the area harvested is influenced by the total cost of production and the expected returns both of which depend on the expected producer prices and the price of alternative tree crops such as cocoa, fertilizer price, the lending rate and government spending on the agricultural sector. The previous year's area harvested is expected to influence planting decisions and so it is included as a determinant of area harvested in the current year to account for the dynamics of the model. The total current production of CPO is the smallholders and estates production. However, due to lack of data availability disaggregation into these categories of farmers will be impossible. The import of CPO is another component of supply and is determined by the import price of CPO, the Nigerian exchange rate, the gross domestic product (GDP) of Nigeria and the world price of a substitute commodity such as soybean oil.

In the demand block, demand for CPO consists of demand for domestic use (food and industrial use). The quantity of palm oil exported by Nigeria is insignificant and, hence, exports are not reflected in the demand block. The own local price of CPO, price of a substitute commodity such as soybean oil, and the level of economic activity (a proxy for income) influence the domestic demand for CPO. The price linkage block facilitates the integration of the various components into one model by formalizing the supply and demand blocks via the link between the producer price and the domestic price of palm oil.

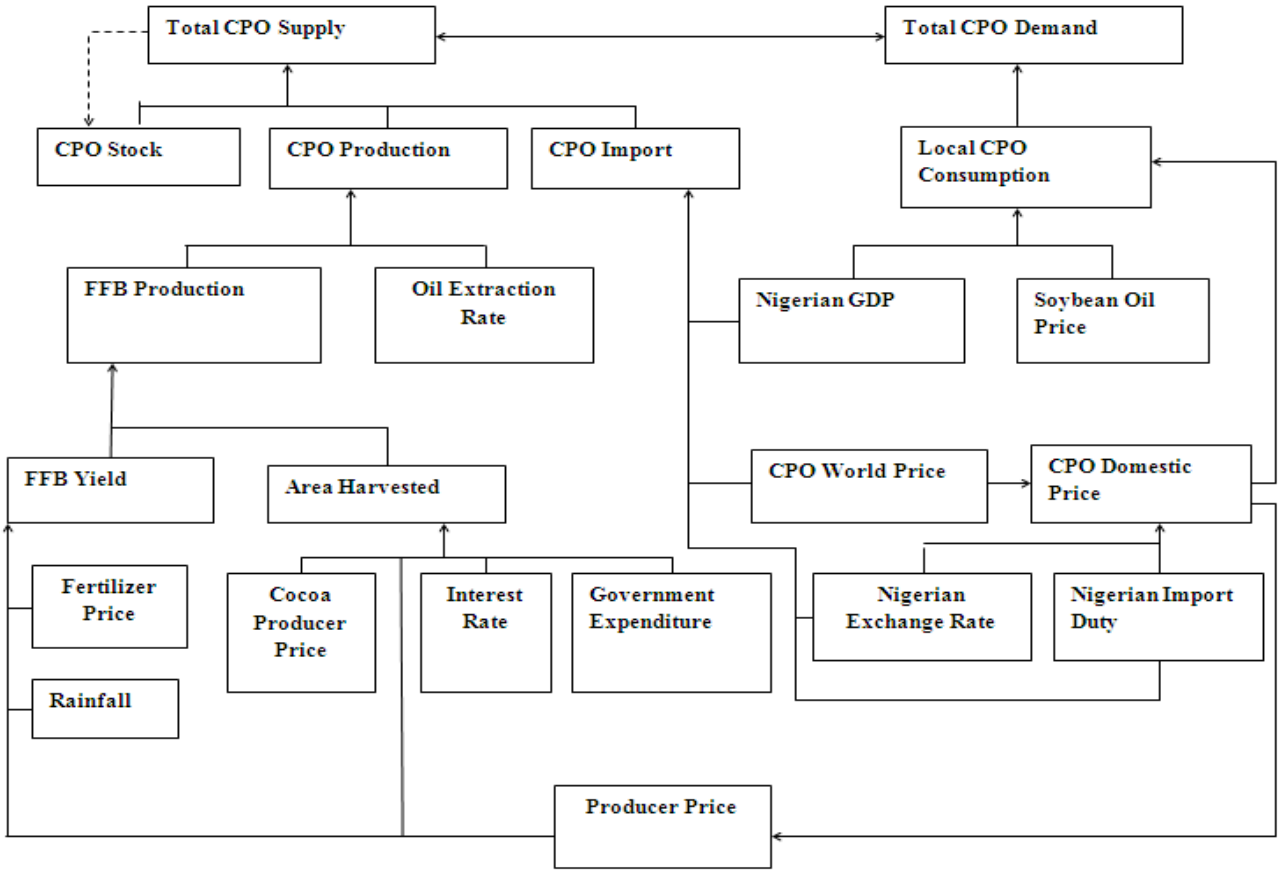

Figure-3. Conceptual framework for Nigerian palm oil market model
Note: Fixed arrows indicate major direction of influence, dotted arrow indicates feedback.

Model specification and estimation technique

Econometric modeling provides an important tool for predicting the anticipated effects of changes in policy(Elsheikh, Elbushra, and Salih, 2015; Shamsudin, 2008). In this study, the model utilized consists of equations explaining the behavior of different actors in the Nigerian palm oil market and reflects the supply and demand components abstracted from the conceptual framework. Five structural equations are specified, including equations for area harvested as a proxy for area planted, FFB yield, CPO imports, domestic demand, and producer price of palm oil. In addition, FFB production, CPO production, the domestic price of palm oil, and CPO ending stock are included as identities.

The area harvested ($NGPCAH_t$) is postulated to be a function of lagged area harvested ($NGPCAH_{t-1}$), lagged palm oil producer price ($NGPCFP_{t-i}$), lagged price of cocoa as a competing crop ($NGPPC_{t-i}$), the bank lending rate as a component of cost of production (IR), and government expenditure on agricultural development ($GOVEX$). The lagged palm oil price is used as a proxy for the expected price which is unobservable. The lagged area harvested is included in the area harvested equation to reflect the dynamics associated with farmer's planting decisions.

$$NGPCAH_t = \beta_0 + \beta_1 NGPCAH_{t-1} + \beta_2 NGPCFP_{t-i} + \beta_3 NGPPC_{t-i} + \beta_4 IR_{t-i} + \beta_5 GOVEX_{t-i} + \varepsilon_t \quad (1)$$

where,

$NGPCAH$ = Oil Palm Area Harvested in Hectares
$NGPCFP$ = Producer Price of Crude Palm Oil in Naira/ton
$NGPPC$ = Producer Price of Cocoa in Naira/ton
IR = Nigerian Average Lending Rate in percentage in percent
$GOVEX$ = Nigerian Government Expenditure in Agricultural Development in Naira
t = Time Period
i = Time Lag

The FFB yield is assumed to be influenced by the price of fertilizer, the price of crude palm oil and rainfall. Compactly, this can be written as:

$$NGPCYD_t = \gamma_0 + \gamma_1 NGPCYD_{t-1} + \gamma_2 NGPCFP_{t-i} + \gamma_3 PFERT_t + \gamma_4 RAIN_t + \varepsilon_t \quad (2)$$

where,

$NGPCYD$ = Oil Palm Fresh Fruit Bunch Yield in tons Per Hectare
$PFERT$ = Fertilizer price in Naira/ton
$RAIN$ = Annual Rainfall in millimeters

Nigerian palm oil import demand is assumed to be determined by the import price of CPO, gross domestic

product, and Nigerian exchange rate. The import demand equation can be written as:

$$NGPCQM_t = \delta_0 + \delta_1 NGPCQM_{t-1} + \delta_2 MPP_t + \delta_3 GDP_t + \delta_4 NGXR_t + \varepsilon_t \quad (3)$$

where,

$NGPCQM$ = Crude Palm Oil Import Demand in tons
MPP = Crude Palm Oil Import Price in US$/ton
$NGXR$ = Nigerian Currency Exchange Rate in Naira/US$
GDP = Nigerian Gross Domestic Product in Naira

The domestic demand equation is given as a function of the domestic producer price of palm oil, Nigerian gross domestic product and the world price of soybean oil (price of asubstitute). The domestic demand equation can be expressed as follows:

$$NGPCQC_t = \varphi_0 + \varphi_1 NGPCQC_{t-1} + \varphi_2 PCDP_t + \varphi_3 GDP_t + \varphi_4 SYWP_t + \varepsilon_t \quad (4)$$

where,

$NGPCQC$ = Nigerian Crude Palm Oil Domestic Demand in tons
$PCDP$ = Domestic Price of Palm Oil in Naira/ton
$SYWP$ = World Price of Soybean Oil in US$/ton

The price linkage block is made up of two equations: one structural equation that links the local producer price to the local consumer price (domestic price) of palm oil; and, an identity equation that associates the domestic price to the world price of palm oil. Thus, the producer price is determined by the domestic price and is written as:

$$NGPCFP_t = \omega_0 + \omega_1 NGPCFP_{t-1} + \omega_2 PCDP_t + \varepsilon_t \quad (5)$$

In this study, there are four identity equations specified for oil palm FFB production, CPO production, the domestic price of palm oil, and the ending stock. These equations are given as follows:

$$NGPCQU_t = NGPCYD_t * NGPCAH_t \quad (6)$$

$$NGPCQP_t = NGPCQU_t * PCOER_t \quad (7)$$

$$PCDP_t = [PCWP_t\ (1 + TARIFF)] * NGXR_t \quad (8)$$

$$NGPCES_t = NGPCES_{t-1} + NGPCQP_t + NGPCQM_t - NGPCQC_t \quad (9)$$

where,

$NGPCQU$ = Oil Palm Fresh Fruit Bunch Production in tons
$NGPCQP$ = Crude Palm Oil Production in tons
$PCOER$ = Nigeria's Oil Extraction Rate in Percentage
$PCWP$ = World Price of Palm Oil in US$
$TARIFF$ = Import Tariff in percent
$NGPCES$ = Crude Palm Oil Ending Stock in tons
$NGPCES_{t-1}$= Crude Palm Oil Opening Stock in tons

Estimation technique and data

It should be noted that all variables are expressed in their logarithmic form so that estimated parameters represent elasticities with respect to the various exogenous variables. The above structural or behavioral equations are estimated using the autoregressive distributed lag model (ARDL) technique. This study uses published secondary data from various sources. Annual data covering 1970 to 2011 are used for the variables. The selection of this time frame is based on data availability and the fact that beginning from the early 1970's palm oil experienced a phenomenal rise in the world oils and fats market in terms of volume of exports.

Model simulation and scenarios

The simulation technique adopted in this study follows the modeling approach developed by Arshad et al. (2012) known as Malaysian Agricultural Policy Analysis (MAgPA).The estimation of structural equations provides values of elasticities of endogenous variables with respect to relevant exogenous variables. These elasticities together with growth rates or rates of change of exogenous variables are used to estimate the annual growth rates for endogenous variables. Thus given the following equation:

$$Y = \theta_0 + \theta_1 X_1 + \theta_2 X_2 + \theta_3 X_3 + \cdots + \theta_n X_n + \varepsilon \quad (10)$$

where,

Y = dependent or endogenous variable
X_i = independent variables
$(i = 1, 2, 3 \ldots n)$
θ_i= coefficients to be estimated
$(i = 0, 1, 2, 3 \ldots n)$
ε = error term

Expressing equation (10) in double logarithmic form gives:

$$lnY = \theta_0 + \theta_1 lnX_1 + \theta_2 lnX_2 + \theta_3 lnX_3 + \cdots + \theta_n lnX_n + \varepsilon \quad (11)$$

From equation (11), the coefficients of each of the independent variables represent the elasticities expressed as percentage changes. Thus, elasticity is the percentage change in Y as a result of the percentage changes in the respective independent variables. The growth rates or rates of change of the exogenous variables are determined based on the following equation:

$$\Delta X = \frac{X_t - X_{t-1}}{X_{t-1}} \quad (12)$$

Where ΔX denotes the annual growth rate of the exogenous variable X and t represents the current year. The elasticities generated from equation (11) together with the growth rates or rates of growth of exogenous variables are then used to obtain the annual growth rate for the endogenous variable of interest according to the formula:

$$\Delta Y = \theta_1 * \Delta X_1 + \theta_2 * \Delta X_2 + \theta_3 * \Delta X_3 + \cdots + \theta_n * \Delta X_n \quad (13)$$

where,

ΔY = annual growth rate of the endogenous variable, Y
ΔX_i = annual percentage rate of change of X for $i = 1, 2, 3 \ldots n$
θ_i = elasticity of Y with respect to X_i for $i = 1, 2, 3 \ldots n$

For econometric commodity models like the one employed in this study, the projected values of both endogenous and exogenous variables are generated using the equation below:

$$Y_t = Y_{t-1} + Y_{t-1}(\Delta Y) \quad (14)$$

where,

Y = endogenous or exogenous variable of interest
ΔY = annual growth rate of Y
t = current year

The calculated projected values of endogenous variables (baseline simulation) generated by applying equation (14) play a very crucial as they form the benchmark for comparison once the scenario results are calculated. The5-year average covering 2007-2011 is used as the base value for all endogenous variables in this study. Four scenarios are employed to simulate the impact of import tariff liberalization on Nigerian palm oil industry: a 10%, 30%, 50% and 100% import tariff reduction. These hypothetical scenarios are intended to reflect partial and complete liberalization. Furthermore, a counterfactual approach is adopted, with the system shocked in 2012 to obtain values for the endogenous variables that are then used to compare with the baseline projections.

Table-1. Results of the estimated equations.

Independent variables	Dependent variable				
	Area harvested	**FFB yield**	**Import demand**	**Domestic demand**	**Producer price**
Constant	6.673** (2.635)	0.084 (0.769)	-8.562 (-1.585)	3.829*** (3.105)	0.102 (0.5780
NGPCAH(-1)	0.450*** (2.761)				
NGPCYD(-1)		0.744*** (6.243)			
NGPCQM (-1)			0.692*** (5.679)		
NGPCQC (-1)				0.495*** (4.086)	
NGPCFP(-1)		0.007** (2.300)			0.850*** (11.155)
NGPCFP(-3)	0.047** (2.036)				
NGPPC(-3)	-0.016 (-0.644)				
IR(-3)	-0.097 (-0.538)				
GOVEX(-1)	0.059* (2.031)				
PFERT		-0.007** (-2.178)			
RAIN		0.026** (2.257)			
MPP			-0.675* (-1.724)		
PCDP				-0.070* (-1.744)	0.163* (1.861)
GDP			0.651** (2.313)	0.118*** (2.763)	
NGXR			-0.576* (-1.791)		
SYWP				0.064 (1.604)	
Adj-R^2	0.943	0.735	0.735	0.942	0.989
BG-LM	5.331* [0.070]	1.457 [0.483]	1.994 [0.369]	3.310 [0.191]	5.398* [0.067]

Note: ***, ** and * denote significant at 1%, 5% and 10% levels, respectively. Figures in parenthesis (…) are t-statistics while figures in brackets […] are p-values.

RESULTS AND DISCUSSIONS

Empirical results of estimated equations

The five behavioral equations have been estimated using the ARDL econometric technique and the estimated results are exhibited in Table-1 above. All the equations performed reasonably well in explaining the endogenous variables with reference to the goodness of fit evidenced by the high adjusted-R2 and the theoretically expected signs of the estimated coefficients. As mentioned before, the estimated coefficients represent elasticities. The own price lagged 3-period and government expenditure to the agricultural sector are the main determinants of oil palm area harvested. The results for the FFB yield equation shows that productivity is significantly influenced by own price, the price of input (fertilizer), and rainfall. The own price, income, and exchange rates are the determinants of import demand while domestic demand for palm oil is driven by own price and income. Additionally, the domestic price plays a significant role in determining the producer price of palm oil in Nigeria. The diagnostic test also indicates that the equations are free from serial correlation at the 5% significant level.

Effects of import tariff liberalization

The changes in the Nigerian palm oil industry are examined under alternative scenarios. Four counterfactual scenarios are considered: Scenario 1 (SN1) involves a 10% reduction in import tariff in 2012; Scenario 2 (SN2) simulates a 30% reduction in import tariff in 2012; Scenario 3 (SN3) includes import tariff reduction by 50% in 2012; and, Scenario 4 (SN4) is based on complete elimination of import tariff in 2012. The expected impacts of the four scenarios are presented graphically in Figures 4 to 10 and the summary results of the percentages changes from baseline projections are shown in Table-2.

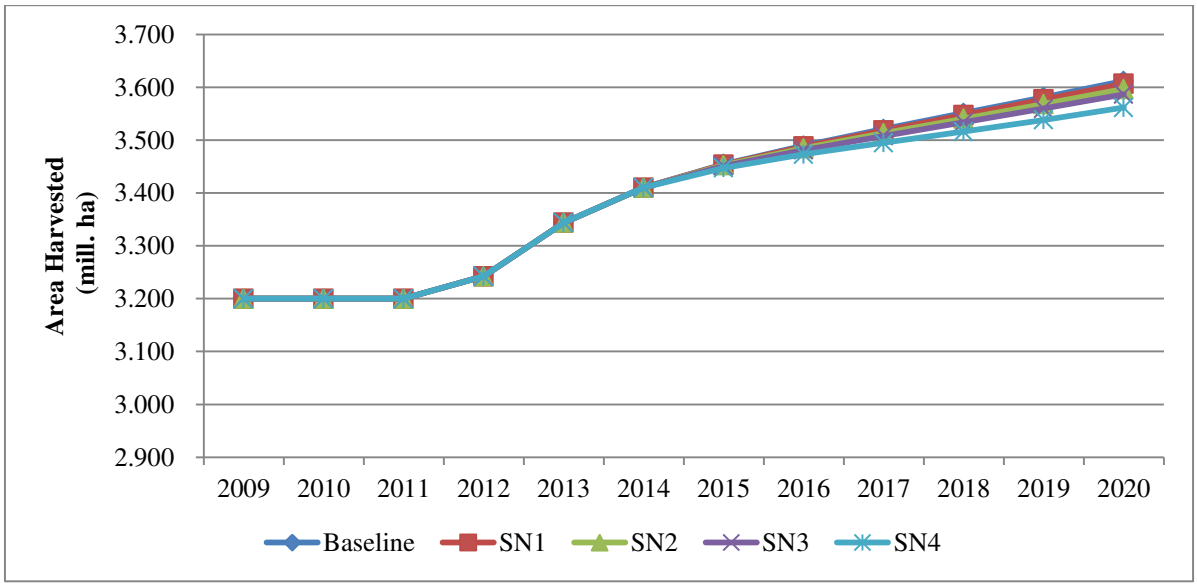

Figure-4. Area harvested under the baseline and scenarios.

In SN1, oil palm area harvested decreases slightly from the baseline by 0.02% in 2015 and continues to decrease until it gets to a level about 0.14% lower than the baseline level in 2020. Thus, SN1 results in a decrease in the area harvested from 3.61 million ha (baseline) to about 3.57 million ha in 2020 (Figure-4). This finding is similar to those of SN2, SN3, and SN4 which results in a decrease in the area harvested from baseline level in 2020 by about 0.42%, 0.70%, and 1.39%, respectively. The FFB yield decreases from the baseline level under the four scenarios (Figure-5). With a 10% reduction in import tariff, FFB yield decreases by approximately 0.04% less than the baseline value in 2020. Based on SN2, SN3, and SN4, however, FFB yield declines by about 0.13%, 0.21%, and 0.43%, respectively in 2020 in comparison to the baseline.

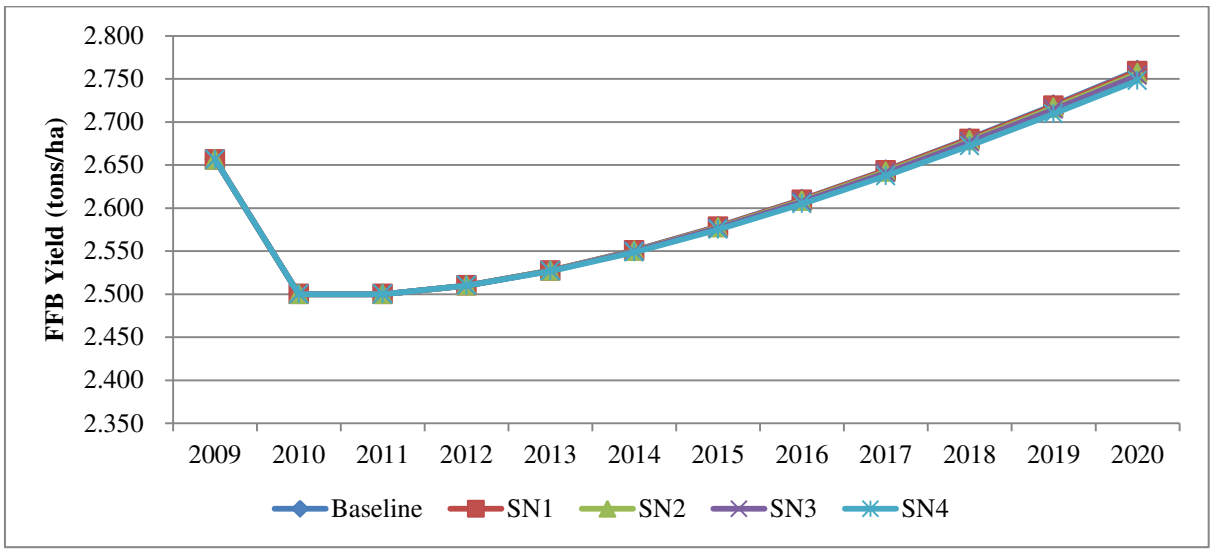

Figure-5. FFB yield under the Baseline and Scenarios.

The combined effect of decreases in area harvested and FFB yield results in a decrease in CPO production. Relative to the baseline, CPO production in 2020 decreases by about 0.18%, 0.55%, 0.91% and 1.81% under SN1, SN2, SN3 and SN4, respectively (Figure-6). The reduction in import tariff by 10% will cause palm oil imports to increase to 615 thousand tons in 2020 (representing about 5.42% greater than the baseline level in 2020). The impact on palm oil imports is more pronounced under SN2, SN3 and SN4: reduction in import tariff by 30%, 50%, and 100% would respectively increase palm oil imports relative to 2020 baseline level by about 16.98%, 29.54% and 52.60% respectively (Figure-7).

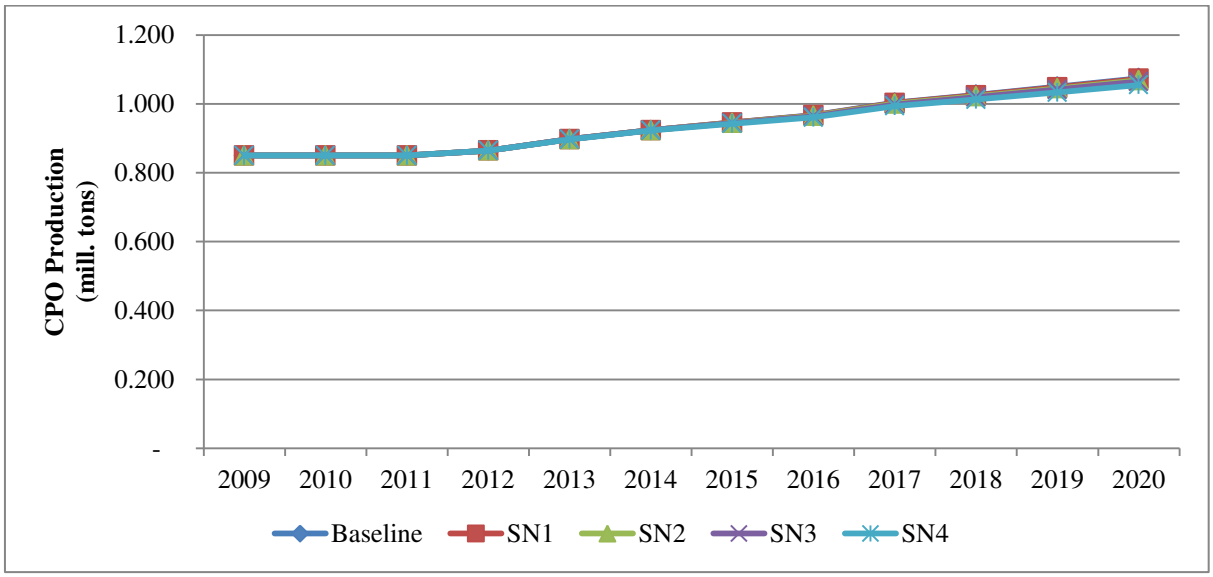

Figure-6. CPO production under the baseline and scenarios.

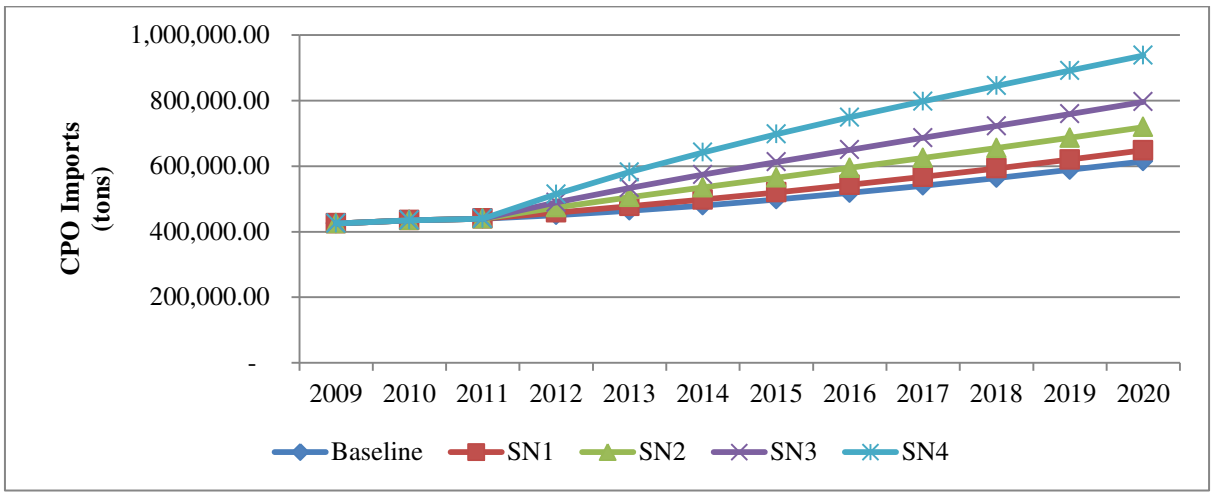

Figure-7. CPO import demand under the baseline and scenarios.

The drastic increase in CPO imports is attributable to a combination of the decline in domestic production and a rise in domestic consumption. In Figure-8, a 10% reduction in import tariff (SN1) will result in an increase in palm oil domestic demand to 1.68 million tons in 2020, which is 1.93% greater than the baseline level. Similarly, the simulation results indicate that palm oil domestic demand increases by about 4.88%, 8.91% and 14.93% higher than the baseline level in 2020 under the respective scenarios. The noticeable increase in palm oil domestic demand is caused by a sharp fall in domestic prices.

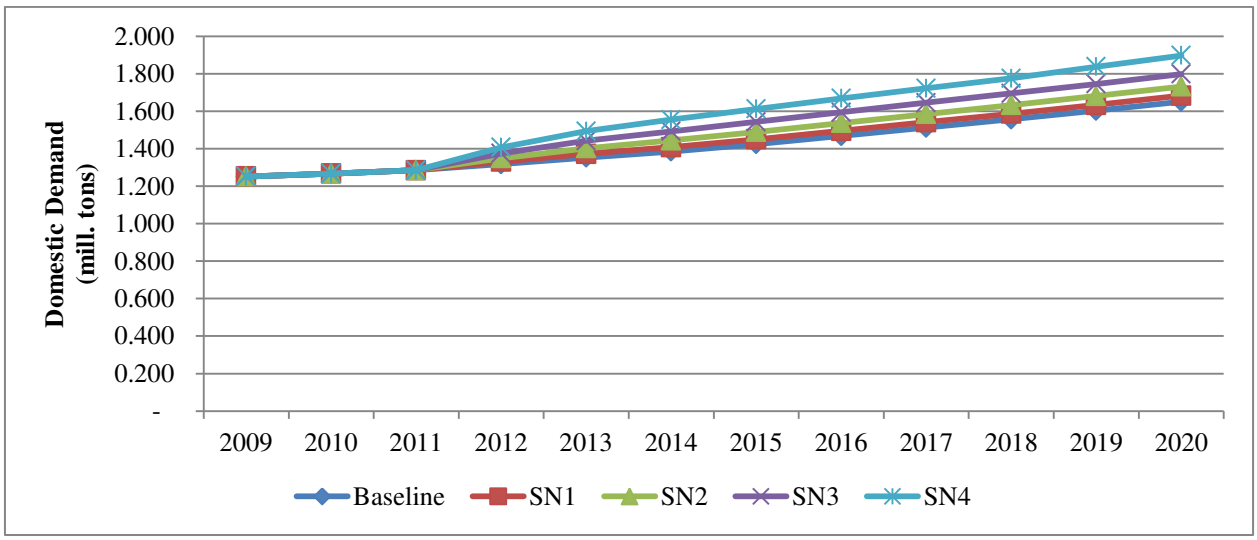

Figure-8. Palm oil domestic demand under the baseline and scenarios.

When import tariff is reduced by 10%, the domestic price of palm oil decreases to about 349 thousand Naira/ton in 2020, which is approximately 2.59% less than the baseline level (Figure-9). With a reduction in import tariff by 30%, 50%, and 100%, however, the domestic price of palm oil falls respectively to a level of about 7.78%, 12.96% and 25.93% less than the baseline level throughout the forecast period. The decrease in price occurs due to the reduction in import price that is connected to import tariff. Import tariff reduction closes the differential between domestic and world prices of palm oil. In addition, the domestic price of palm oil in Nigeria falls because of the increase in palm oil supply following a rise in imports.

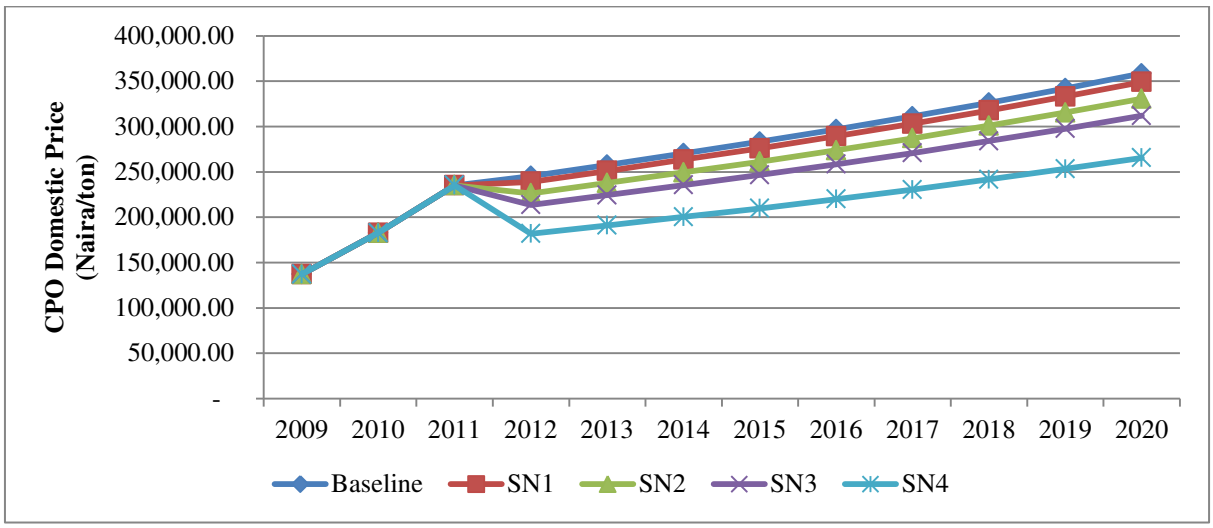

Figure-9. Palm oil domestic price under the baseline and scenarios.

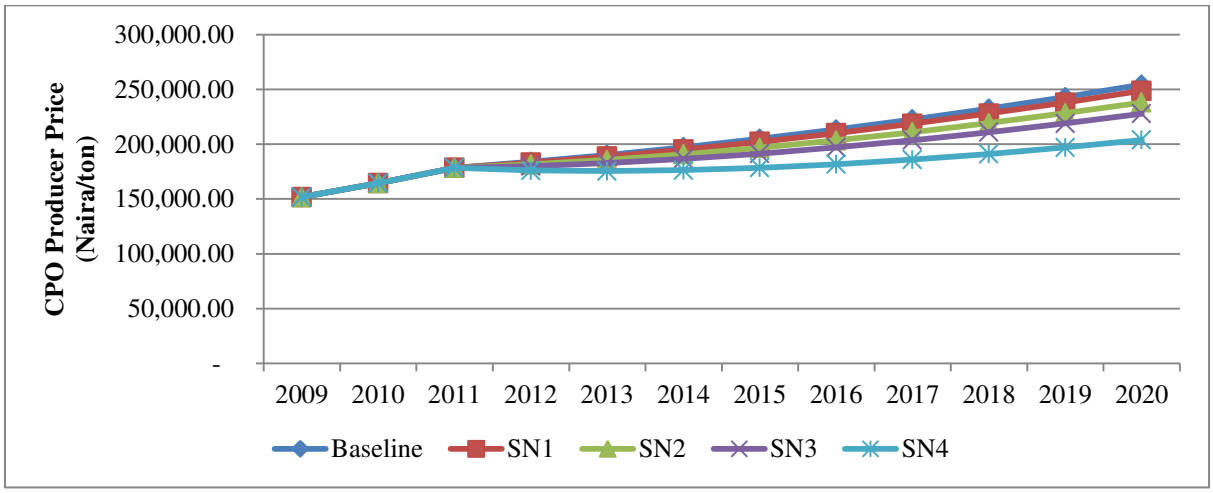

Figure-10. Palm oil producer price under the baseline and scenarios.

Figure-10 presents the effect on producer price of palm oil following different levels of import tariff reduction. The result reveals that with a 10% reduction in import tariff, the producer price declines from the baseline projection by about 2.16% in 2020. Likewise, the producer price of palm oil under SN2, SN3, and SN4 is projected to decrease respectively by about 6.35%, 10.39% and 19.82% in relation to the baseline level in 2020.

Taken as a whole, the Nigerian palm oil industry exhibits similar patterns under the four scenarios. The simulation results based on the cuts in import tariff show that the percentage change in area harvested, FFB yield, CPO production, import demand, domestic demand, and prices of palm oil varies with the percentage reduction in import tariff: higher percentage reductions in import tariff yield more significant change in the endogenous variables. The impact on area harvested, FFB yield, production, and price of palm oil of a reduction in import tariff is negative while the effect on domestic demand and import demand is positive. Moreover, the reduction in import tariff results in marginal changes in area harvested FFB yield and palm oil production. On the other hand, the impact of import tariff reduction on palm oil price, imports, and domestic demand is substantial (see Table-2).

Table-2. Percentage changes in endogenous variables from the baseline (year 2020).

	SN1 (%)	**SN2** (%)	**SN3** (%)	**SN4** (%)
Area Harvested	-0.139	-0.418	-0.696	-1.388
FFB Yield	-0.043	-0.129	-0.214	-0.428
CPO Production	-0.182	-0.546	-0.908	-1.810
Import Demand	5.424	16.983	29.543	52.597
Domestic Demand	1.928	4.883	8.910	14.926
Domestic Price	-2.593	-7.778	-12.963	-25.926
Producer Price	-2.157	-6.350	-10.386	-19.821

Note: SN1, SN2, SN3, and SN4 are respectively 10%, 30%, 50% and 100% reduction in import tariff.

CONCLUSIONS

The reductions and elimination of import tariff in the Nigerian palm oil market yield different effects on critical endogenous variables. The simulation results disclose that import tariff liberalization induces a downward effect on the price of palm oil in the Nigerian market. As a result of the decrease in palm oil price, the area harvested, yield and CPO production would decrease. On the other hand, reduction and elimination of import tariff have been shown to have a positive effect on domestic and import demand for palm oil. The simulation results based on partial and complete import tariff liberalization show that the percentage change in area harvested, FFB yield, import demand, domestic demand and prices of palm oil varies in proportion to the percentage reduction in import tariff: higher percentage reductions in import tariff produce more significant effects in the endogenous variables. Besides, the reduction in import tariff yields only marginal changes in area harvested FFB yield and CPO production. By contrast, the effect of import tariff reduction on palm oil price, imports and domestic demand is quite substantial.

Clearly, any attempt to pursue a policy of import tariff liberalization by the government of Nigeria in line with the requirement to honor her commitments as a member of international organizations will impact negatively on domestic output, and hence, theincome of palm oil producers. This study, therefore, recommends that governments' support to the palm oil industry should be increased. This support could take the form of increased investment in infrastructures such as transportation facilities, provision of input subsidies, and the application of indirect production support schemes such as subsidized credit and low-interest loans.

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