UNIVERSITI PUTRA MALAYSIA

*EFFECTS OF CHANGES IN IMPORT TARIFF ON NIGERIAN PALM OIL INDUSTRY*

HENRY EGWUMA

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EFFECTS OF CHANGES IN IMPORT TARIFF ON NIGERIAN PALM OIL INDUSTRY

By

HENRY EGWUMA

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfillment of the Requirements for the Degree of Doctor of Philosophy

August 2016

DEDICATION

To My Wife

Abimbola Mastina Uredo Egwuma, Blessed are you among women

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfillment of the requirement for the Degree of Doctor of Philosophy

EFFECTS OF CHANGES IN IMPORT TARIFF ON NIGERIAN PALM OIL INDUSTRY

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August 2016

Chairman   **: Professor Datuk Mad Nasir Shamsudin, PhD**
Faculty   **: Agriculture**

The palm oil industry has played a major role in the Nigerian economy in terms of its contribution as a source of food and an employer of labor. However, its contribution has dwindled over the years. While there has been a significant increase in domestic consumption, the production of palm oil has been rather sluggish giving rise to an increase in imports. Thus, a major policy thrust of the government in the palm oil industry is to enhance production to meet domestic demand while at the same time reducing reliance on imports and ensuring the competitiveness of the industry in the international market. As a step to protect domestic producers and stimulate production, the government in 2005 applied an import tariff of 50% which was reduced to 35% since 2008. With the help of this trade policy, local producers are shielded and local palm oil is able to compete with imported palm oil. 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. The main objective of this study, therefore, is to determine the effects of changes in import tariff structure on the Nigerian palm oil industry.

The Nigerian palm oil market model was first developed, consisting of five behavioral equations for area harvested, yield, import demand, domestic demand and producer price of palm oil and four identity equations. Annual time series data from 1970 to 2014 was utilized and the model was estimated using the autoregressive distributed lag (ARDL) modeling technique. A number of economic and statistical criteria were used to evaluate the estimated equations. Specifically, the estimated equations were evaluated based on the size and signs of the coefficients, coefficient of multiple determination (R^2), t-statistics, and diagnostic tests including a test for serial correlation, normality, misspecification, and parameter stability. Further, the performance of the model was validated using the root mean square percentage error and Theil's inequality coefficient. The model was then used to generate baseline projections for the Nigerian palm oil industry from 2012 to 2020, a period of nine years, and to simulate the effects of changes in import tariff on the levels of supply and demand as well as prices.

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Four scenarios are considered including a 10%, 30%, 50%, and 100% reduction in import tariff. The results from the simulation analysis reveal that all the scenarios would result in a decline in palm oil production, an increase in imports and domestic consumption of palm oil, and a decrease in domestic and producer prices of palm oil. In addition, import tariff reductions would lead to a net welfare gain to the society attributable to the gains in consumer surplus arising from lower prices and efficient allocation of productive resources. The fall in producer prices would result in a net loss of producer welfare. Given an exchange rate of ₦199.05 to 1 US dollar, the results indicate that a 10% import tariff reduction yielded a net gain of ₦2.95 billion to the society by 2020, which can be attributed to the sufficiently large gains in consumer surplus as a result of the reductions in consumption distortions and inefficiencies in production associated with the imposition of import tariff. By 2020, the gain in Nigerian consumer surplus was estimated at ₦15.85 billion while the loss in producer surplus was ₦9.98 billion. Also, the reduction in import tariff resulted in loss in government revenue because final government revenue was less than the initial government revenue from imports. The loss in government revenue was estimated to be ₦2.92 billion by the end of the forecast period. The numerical values of these welfare measures increased along with the increase in the percentage reduction in import tariff.

Further analysis shows that Nigerian palm oil producers can be compensated through a deficiency payment scheme as an alternative policy measure. The results indicated that when import tariff is reduced by 30% and combined with a policy of deficiency payment to producers, the output and income of palm oil producers are maintained and no additional fiscal burden is transferred to the government. Specifically, the net welfare effect of this scenario was positive and increased during the forecast period. Thus, by 2020, the net gain to the society increased by ₦3.89 billion. This outcome was possible because the final revenue from a 30% import tariff reductions was more than sufficient to cover the costs of deficiency payments to Nigerian palm oil producers. The findings suggest that this policy option is superior in that it allows for output, and hence income of domestic producers, to be maintained at baseline levels. In this way, domestic producers are compensated for welfare loss, consumer welfare is preserved and government budget does not suffer additional burden.

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Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk Ijazah Doktor Falsafah

KESAN PERUBAHAN TARIF IMPORT TERHADAP INDUSTRI MINYAK SAWIT NIGERIA

Oleh

HENRY EGWUMA

Ogos 2016

Pengerusi : **Profesor Datuk Mad Nasir Shamsudin, PhD**
Fakulti : **Pertanian**

Industri minyak sawit Nigeria memainkan peranan penting dalam pembangunan ekonomi Nigeria berdasarkan sumbangannya kepada sumber makanan dan sumber pekerjaan. Namun begitu, sumbangannya telah berkurangan dalam beberapa tahun kebelakangan ini. Pada masa yang sama, terdapat peningkatan yang ketara dalam penggunaan tempatan. Namun, oleh kerana pengeluaran minyak sawit tempatan agak perlahan, ianya telah menyebabkan berlaku peningkatan dalam jumlah import. Sehubungan itu, satu teras dasar kerajaan di dalam industri minyak sawit ialah untuk meningkatkan pengeluaran bagi memenuhi permintaan tempatan dan pada masa yang sama mengurangkan kebergantungan terhadap import serta menjamin daya saing industri di pasaran antarabangsa. Pada tahun 2005, kerajaan telah mengenakan 50% tarif import yang kemudiannya telah dikurangkan kepada 35% pada 2008 sebagai langkah untuk melindungi pengeluar tempatan dan merangsang pengeluaran. Dengan adanya bantuan daripada dasar perdagangan ini, pengeluar tempatan dilindungi dan minyak sawit tempatan mampu bersaing dengan minyak sawit yang diimport. Dalam erti kata lain, petani tempatan diberi insentif melalui dasar penggantian import kerajaan apabila harga minyak sawit tempatan dinaikkan berbanding dengan harga minyak sawit dunia. Dasar ini walau bagaimanapun tidak mengubah tahap pengeluaran minyak sawit tempatan kerana kos pengeluaran yang tinggi menyebabkan pengeluaran minyak sawit tempatan tidak mampu untuk bersaing. Justeru itu, objektif kajian ini adalah untuk menentukan kesan perubahan struktur tarif import terhadap industri minyak sawit Nigeria.

Model pasaran minyak sawit Nigeria dan empat persamaan identiti telah dibangunkan melalui persamaan-persamaan kawasan dituai, hasil, permintaan import, permintaan tempatan dan harga pengeluar minyak sawit. Data siri masa tahunan dari tahun 1970 hingga 2014 digunakan dan model dianggarkan menggunakan teknik permodelan autoregresif lat teragih (*autoregressive distributed lag - ARDL*). Beberapa kriteria ekonomi dan statistik digunakan untuk menilai persamaan yang dianggarkan. Secara spesifik, persamaan yang dianggarkan dinilai berdasarkan saiz dan tanda koefisien, koefisien penentu berganda (R^2), t-statistik, dan ujian diagnostik termasuklah ujian korelasi bersiri, ujian normaliti, spesifikasi dan kestabilan parameter. Seterusnya, prestasi

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model dinilai menggunakan ralat peratusan punca kuasa dua dan koefisien ketidaksamaan Theil. Model tersebut kemudiannya digunakan untuk menjana unjuran garis dasar bagi industri minyak sawit Nigeria mulai 2012 hingga 2020, bagi tempoh sembilan tahun dan mensimulasi kesan perubahan tarif import pada peringkat permintaan dan penawaran serta harga.

Empat senario dipertimbangkan iaitu penurunan tarif import sebanyak 10%, 30%, 50% dan 100%. Hasil daripada analisis simulasi menunjukkan kesemua senario tersebut akan menyebabkan penurunan dalam pengeluaran minyak sawit, peningkatan import serta meningkatkan penggunaan minyak sawit tempatan, dan penurunan harga pengeluar dan minyak sawit tempatan. Di samping itu, pengurangan tarif import akan memberi keuntungan kebajikan bersih kepada masyarakat, hasil daripada keuntungan dalam lebihan pengguna yang terjadi apabila harga yang lebih rendah dan peruntukan sumber produktif yang cekap. Manakala, kejatuhan harga pengeluar pula akan menyebabkan kerugian bersih kebajikan pengeluar. Dengan kadar pertukaran ₦199.05 bersamaan dengan 1USD, keputusan menunjukkan bahawa setiap pengurangan 10% tarif import telah meningkatkan ₦2.95 bilion keuntungan bersih kepada masyarakat pada tahun 2020, di mana keputusan ini telah menunjukkan keuntungan yang cukup besar dalam lebihan penggunaan yang disebabkan oleh pengurangan gangguan penggunaan dan tidak kecekapan dalam penggunaan yang berkaitan dengan tarif import. Pada tahun 2020, keuntungan dalam lebihan penggunaan di Nigeria dianggarkan ₦15.85 bilion manakala kerugian dalam lebihan penghasilan adalah ₦9.98. Pengurangan tariff import juga telah menyebabkan kerugian kepada kerajaan kerana keuntungan akhir kerajaan adalah kurang daripada keuntungan awal. Kerugian kerajaan dianggarkan sebanyak ₦2.92 bilion menjelang akhir tempoh ramalan. Ini menunjukkan bahawa keuntungan kebajikan (*welfare*) meningkat dengan peningkatan peratusan pengurangan tarif import.

Analisis seterusnya menunjukkan, sebagai alternatif, pengeluar minyak sawit Nigeria boleh diberi pampasan melalui skim pembayaran kekurangan. Keputusan ini menunjukkan bahawa apabila tarif import dikurangkan pada 30% dengan penggabungan dasar pengurangan pembayaran kepada pengeluar, maka pendapatan pengeluar minyak sawit dapat dikekalkan dan tiada tanggungan tambahan dipindahkan kepada kerajaan. Khususnya, kesan keuntungan kebajikan (*welfare*) bersih berdasarkan situasi ini adalah positif dan meningkat sepanjang tempoh ramalan. Oleh itu, pada tahun 2020, keuntungan bersih kepada masyarakat meningkat sebanyak ₦3.89 bilion. Hasil kajian ini adalah berkemungkinan kerana keuntungan akhir daripada pengurangan 30% tarif import adalah lebih daripada mencukupi untuk menampung pengurangan kos pembayaran kepada pengeluar minyak sawit di Nigeria. Keputusan yang diperolehi mencadangkan supaya dasar ini dapat membantu dalam meningkatkan pengeluaran minyak sawit tempatan dan mengekalkan pendapatan pengeluar tempatan di tahap dasar. Dengan cara ini, kerugian kebajikan pengeluar tempatan akan mendapat pampasan, kebajikan pengguna terpelihara dan belanjawan kerajaan tidak mengalami beban tambahan.

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I certify that a Thesis Examination Committee has met on 12 August 2016 to conduct the final examination of Henry Egwuma on his thesis entitled "Effects of Changes in Import Tariff on Nigerian Palm Oil Industry" in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Doctor of Philosophy.

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LIST OF ABBREVIATIONS

2SLS	Two-Stage Least Squares
3SLS	Three-Stage Least Squares
ADF	Augmented Dickey-Fuller
AIC	Akaike's Information Criterion
AoA	Agreement on Agriculture
ARDL	Autoregressive Distributed Lag
ATA	Agricultural Transformation Agenda
BG-LM	Breusch-Godfrey Lagrange Multiplier
BLUE	Best Linear Unbiased Estimator
BP-G	Breusch-Pagan-Godfrey
CBN	Central Bank of Nigeria
CE	Consumption Effect
CET	Common External Tariff
CGE	Computable General Equilibrium
CIF	Cost, Insurance and Freight
CISS	Comprehensive Import Supervision Scheme
CLRM	Classical Linear Regression Model
CPO	Crude Palm Oil
CS	Consumer Surplus
CU	Customs Unions
CUSUM	Cumulative Sum of Recursive Residuals
CUSUMSQ	Cumulative Sum of Squares of Recursive Residuals
DDA	Doha Development Agenda
ECM	Error Correction Model

ECOWAS	Economic Community of West African States
ED	Excess Demand
ETLS	ECOWAS Trade Liberalization Scheme
EPU	Economic Planning Unit
ES	Excess Supply
EU	European Union
FAOSTAT	Food and Agriculture Organization of the United Nations Statistics
FFB	Fresh Fruit Bunches
FGN	Federal Government of Nigeria
FOB	Free on Board
FTA	Free Trade Area
GATT	General Agreement on Tariffs and Trade
GDP	Gross Domestic Product
GOVEX	Nigerian Government Expenditure on Agricultural Development
GR	Government Revenue
GTAP	Global Trade Analysis Project
ha	Hectares
H-O	Heckscher-Ohlin
IFPRI	International Food Policy Research Institute
IPI	Industrial Production Index
IR	Nigerian Average Lending Rate
ISI	Import Substitution Industrialization
JB	Jarque Berra
KE	Kernel Extraction
Kg	Kilogram

MAE	Mean Absolute Error
MAgPA	Malaysian Agricultural Policy Analysis
MAPE	Mean Absolute Percentage Error
MFN	Most-Favored-Nation
MLE	Maximum Likelihood Estimation
MPOB	Malaysian Palm Oil Board
MPP	Crude Palm Oil Import Price
MSE	Mean Square Simulation Error
mt	Metric Tons
NBS	National Bureau of Statistics
NDP	National Development Plan
NGPCAH	Oil Palm Area Harvested in Hectares
NGPCES	Nigerian Crude Palm Oil Ending Stock
NGPCFP	Nigerian Producer Price of Crude Palm Oil
NGPCQC	Nigerian Crude Palm Oil Domestic Demand
NGPCQM	Nigerian Crude Palm Oil Import Demand
NGPCQP	Nigerian Crude Palm Oil Production
NGPCQU	Oil Palm Fresh Fruit Bunch Production
NGPCYD	Oil Palm Fresh Fruit Bunch Yield
NGPPC	Nigerian Producer Price of Cocoa
NGXR	Nigerian Currency Exchange Rate
NIFOR	Nigeria Institute for Oil Palm Research
NTBs	Non-Tariff Barriers
NWE	Net Welfare Effect
NWEDPAY	Net Welfare Effect with Deficiency Payment

NWF	National Wildlife Federation	
OER	Oil Extraction Rate	
OLS	Ordinary Least-Squares	
PCDP	Domestic Price of Palm Oil	
PCOER	Nigeria's Oil Extraction Rate	
PCWP	World Price of Palm Oil	
PE	Production Efficiency	
PFERT	Price of Fertilizer	
PITC	Presidential Initiative on Tree Crops	
PKO	Palm Kernel Oil	
PP	Phillips-Perron	
PS	Producer Surplus	
RAIN	Rainfall	
RBD	Refined Bleached Deodorized Oil	
RED	Renewable Energy Directive	
RESET	Ramsey Error Specification Test	
RMSE	Root-Mean-Square Simulation Error	
RMSPE	Root-Mean-Square Percentage Error	
ROW	Rest of the World	
SAM	Social Accounting Matrix	
SAP	Structural Adjustment Program	
SBC	Schwartz-Bayesian Criterion	
SEM	Spatial Equilibrium Modeling	
SPO	Special Palm Oil	
SUR	Seemingly Unrelated Regression	

SYWP	World Price of Soybean Oil
TPO	Technical Palm Oil
U.S.	United States
UK	United Kingdom
UR	Uruguay Round
US$	United State Dollar
USDA	United State Department of Agriculture
VAR	Vector Autoregressive
VAT	Value Added Tax
WTO	World Trade Organization

CHAPTER 1

INTRODUCTION

Over the last four decades, the palm oil industry has witnessed phenomenal success to become the global leader in the oils and fats economy. In 2014, palm oil and palm kernel oil accounted for 6% of global land use for cultivation, but produced 33% of world output of oils and fats higher than the next in line, soybean oil, which accounted for 23% (Oil World, 2015). Owing to its superior attributes for a number of food and industrial uses coupled with attractive economic and technological advantages, investments in the oil palm industry have witnessed a global growth. The rapidly thriving global biofuels industry is expected to push further the world demand for palm oil, as palm oil is foreseen to become the major feedstock for biodiesel generation because of its relative price advantage (Carter et al., 2007; Shri Dewi et al., 2011). In 2009, the European Union (EU) under the Renewable Energy Directive (RED) mandated that by the year 2020, 20% and 10% of all energy usage and all energy usage in the transport sector, respectively, be produced from renewable sources of energy (Gómez et al., 2011). This regulation is additionally anticipated to act in favor of the palm oil industry as oil palm is used as fuel for biomass plants. Furthermore, the growth in per capita income and population in some Asian nations contribute to the demand for packaged food which has a higher content of palm oil: 50% of packaged foods and cosmetics use some form of palm oil as inputs (National Wildlife Federation (NWF), 2010).

Historically, the palm oil industry contributed substantially to the Nigerian economy. However, its contribution has dwindled over the years owing to the over-reliance on traditional production methods, and by 2006, it accounted for only a meager 1.5% of the national agricultural gross domestic product (GDP) (Nwafor et al., 2010). Nevertheless, the Nigerian palm oil industry still plays an important role in the economy providing employment for about 4 million people, directly and indirectly, both in the upstream and downstream sectors (Gourichon, 2013; Olagunju, 2008).

This chapter contains an overview of the palm oil industry in Nigeria and begins with the historical background in section one. Section two presents an overview of the Nigerian palm oil industry in the light of the production, demand, trade and price of palm oil. This is followed by a brief discussion of the policy environment in section three. The problem statement is presented in section four while section five lists the objectives of the study. In section six, the significance of the study is highlighted while the structure of the thesis is outlined in section seven.

1.1 Historical Background

Agriculture plays a major role in the growth and survival of the Nigerian economy and is the largest sector providing a livelihood for two-thirds (112.5 million) of the population. In the early 1960s, agricultural production alone contributed about 61.1% (US$2.19 billion) of the total GDP (Table 1.1). Although agriculture has continued to play a

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significant role in the economy of Nigeria, by 2013, however, the sector's contribution to GDP declined to an estimated 34.69% (US$85.54 billion)[1]. In terms of composition, the sector is marked by substantial crop and livestock diversity which include tree and food crops, forestry and wildlife, livestock and fisheries. Also, smallholder and subsistence farmers with farm holdings of less than 2 hectares account for over 90% of agricultural output (National Bureau of Statistics (NBS), 2015).

With the discovery of oil and the subsequent oil boom of the mid-1970s, the Nigerian economy became heavily reliant on the oil sector while agriculture was downgraded and relegated to the background and became synonymous with poverty and subsistence.

Government expenditure in the agriculture sector dwindled over the years and made investment in agriculture unattractive. Also, the level of support advanced by the government to smallholder farmers was reduced (Dada, 2007) and total bank credit to the sector declined substantially (Table 1.2). In addition, inefficient and poor technology, undeveloped and weak institutions, poor infrastructure, fragmented land area, inconsistent and poorly implemented government policies, political instability and civil war all effectively contributed to the continued decline in the performance of the sector.

A major agricultural commodity that suffered as a result of the simultaneous actions of the aforementioned factors and long-standing neglect is the oil palm. This is because, relative to the oil and gas sector, investment in oil palm was seen as less attractive and less economically profitable. The 1950s until mid-1960s saw Nigeria as the largest producer and exporter of palm produce accounting for over 40% of world total production. However, Nigeria has ceased to contribute to the world's export of the commodity since the 1970s due to the use of out-of-date techniques and over-aged trees. Nigeria lost her position to Malaysia as the world's leading producer and exporter in 1966 and 1971, respectively. According to the United States Department of Agriculture statistics (USDA, 2015), Nigeria is currently the 5th largest producer of palm oil after Indonesia, Malaysia, Thailand and Colombia. Total production is put at 970,000 metric tons per year while domestic consumption per annum is about 1,495,000 metric tons. Consequently, a once largest producer has turned to a net importer of palm oil sourcing around 525,000 metric tons (that is, about 35% of total domestic consumption) of the commodity from the international market to meet its local demand. Without a doubt, the Nigerian palm oil sub-sector is one of the dismally failed economic opportunities in Africa.

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[1] As in other developing economies, the contribution of agriculture to GDP is declining, but the volume and values are increasing.

Table 1.1 : Sectoral Contribution to Gross Domestic product, Nigeria (1960-2013)

Year	Agriculture (billion US$)	Industry (billion US$)	Services (billion US$)	GDP (billion US$)	Agriculture (% of GDP)	Industry (% of GDP)	Services (% of GDP)
1960-1964	2.19	0.27	0.52	3.60	61.13	7.50	14.37
1965-1969	2.30	0.52	0.71	4.32	53.27	11.93	16.46
1970-1974	4.89	3.93	2.09	14.13	39.69	25.14	14.90
1975-1979	11.74	16.16	7.40	50.04	23.80	31.59	15.08
1980-1984	24.19	24.31	13.65	78.36	31.30	30.62	17.64
1985	29.79	20.39	13.80	75.98	39.21	26.84	18.17
1986	15.89	9.34	7.67	39.41	40.33	23.71	19.46
1987	9.76	8.58	3.62	26.20	37.26	32.77	13.83
1988	12.77	9.08	3.69	30.66	41.65	29.62	12.04
1989	9.47	12.17	2.89	29.44	32.16	41.33	9.81
1990	10.49	14.38	3.41	33.28	31.52	43.20	10.25
1991	9.84	13.79	3.16	31.50	31.22	43.77	10.05
1992	8.40	15.88	2.56	30.79	27.27	51.59	8.30
1993	10.51	12.79	2.76	30.99	33.90	41.28	8.90
1994	15.88	12.89	4.47	40.91	38.81	31.51	10.93
1995	28.31	39.91	6.93	88.29	32.06	45.20	7.85
1996	38.45	59.09	8.91	123.50	31.13	47.85	7.21
1997	43.57	55.56	10.12	128.03	34.03	43.39	7.90
1998	48.32	40.30	13.68	123.75	39.05	32.57	11.06
1999	12.21	12.77	4.05	34.59	35.31	36.93	11.70
2000	11.73	23.20	4.64	45.06	26.03	51.49	10.30
2001	14.34	16.85	5.15	42.48	33.75	39.66	12.12
2002	27.84	16.94	5.74	57.33	48.57	29.55	10.01
2003	28.05	23.51	6.53	65.68	42.71	35.79	9.94
2004	29.38	34.69	9.38	85.87	34.21	40.40	10.93
2005	36.36	46.43	12.34	111.01	32.76	41.83	11.12
2006	46.17	58.21	16.66	144.30	32.00	40.34	11.55
2007	53.72	64.27	19.89	164.20	32.71	39.14	12.12
2008	67.33	81.99	23.50	204.95	32.85	40.00	11.47
2009	61.69	54.20	20.86	166.51	37.05	32.55	12.53
2010	68.60	101.10	22.86	226.12	30.34	44.71	10.11
2011	74.92	103.61	25.48	241.76	30.99	42.86	10.54
2012	85.54	100.92	28.57	258.56	33.08	39.03	11.05
2013	93.50	93.08	32.61	269.51	34.69	34.54	12.10

Source: Computed from Central Bank of Nigeria Statistical Bulletin (various issues)

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Table 1.2 : Sectoral Distribution of Commercial Bank's Credit, Nigeria (1970-2013)

Year	Agriculture (Million US$)	Manufacturing (Million US$)	Bank Credit (MillionUS$)	Agriculture (% of total)	Manufacturing (% of total)
1970-1980	207.55	1,042.68	3,903.75	3.84	23.79
1981	956.11	4,305.92	13,894.75	6.88	30.99
1982	1,168.00	4,510.43	15,257.45	7.66	29.56
1983	1,298.16	4,214.60	15,314.40	8.48	27.52
1984	1,372.55	4,022.69	15,007.42	9.15	26.80
1985	1,465.92	3,616.35	13,616.64	10.77	26.56
1986	1,043.19	2,550.66	8,949.21	11.66	28.50
1987	604.35	1,235.35	4,365.47	13.84	28.30
1988	675.94	1,339.66	4,311.52	15.68	31.07
1989	471.23	905.90	2,988.29	15.77	30.31
1990	525.16	980.77	3,234.53	16.24	30.32
1991	505.85	1,101.10	3,159.21	16.01	34.85
1992	403.44	890.48	2,470.56	16.33	36.04
1993	487.32	1,047.37	2,975.94	16.38	35.19
1994	807.31	1,583.16	4,281.86	18.85	36.97
1995	1,154.53	2,653.12	6,602.78	17.49	40.18
1996	1,519.99	3,300.89	7,742.36	19.63	42.63
1997	1,276.58	3,784.29	17,616.27	7.25	21.48
1998	1,241.92	4,419.84	12,468.95	9.96	35.45
1999	336.22	1,253.65	3,495.47	9.62	35.87
2000	403.44	1,389.37	4,998.19	8.07	27.80
2001	502.07	1,859.99	7,157.74	7.01	25.99
2002	496.36	1,936.29	7,917.10	6.27	24.46
2003	480.59	2,277.54	9,363.96	5.13	24.32
2004	509.74	2,499.20	11,432.50	4.46	21.86
2005	369.92	2,681.70	15,057.87	2.46	17.81
2006	383.93	3,465.11	19,621.18	1.96	17.66
2007	1,188.94	3,875.55	38,260.56	3.11	10.13
2008	897.15	7,868.67	65,792.17	1.36	11.96
2009	911.35	6,671.90	59,852.51	1.52	11.15
2010	854.34	6,571.22	51,274.33	1.67	12.82
2011	1,649.25	6,806.33	47,258.06	3.49	14.40
2012	1,849.54	6,903.90	49,529.92	3.73	13.94
2013	2,213.05	7,034.19	57,924.47	3.82	12.14

Source: Computed from Central Bank of Nigeria Statistical Bulletin (various issues)

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Currently, oil palm is mainly cultivated in 26 out of 36 states of Nigeria over a land area a little over 3 million hectares. However, the total land available and ideal for oil palm cultivation is 24 million hectares. Also, about 80% of production is attributed to scattered smallholdings spread over an estimated 1.6 million to 2.4 million hectares of land. In contrast, estate plantations occupy only about 169,000 to 360,000 hectares, most of it coming up over the last decade with private sector investment. A number of the plantations were set up by the Nigerian government in an effort to promote large-scale farming, most of which did not yield significant success.

However, economic reforms initiated since the return of democracy in 1999 were undertaken with the aim of reversing the declining trend in the agricultural sector and helped to poke the palm oil industry out of stagnation. The Presidential Initiative on Tree Crops (PITC) was set up to stimulate vegetable oil production through: the cultivation of one million hectares of oil palm capable of producing 2.25 tons of palm oil; the production of five million tons of groundnuts per annum; the production of one million tons of cottonseed per year; and the production of 0.68 million tons of soybean oil per annum. This goal was to be pursued over a five-year period beginning from 2003 (Dada, 2007). Hence, between 2001 and 2008, palm oil production expanded from 760,000 metric tons to 850,000 metric tons while recording a corresponding rise in local utilization. Much of the rise in production can be attributed to a ban imposed by the government in 2001 on the importation of palm oil and related products. However, this was reversed in 2005, evoking great apprehension about the growth and sustainability of the industry, impact on local production and pricing. Inconsistent, ineffective and often misguided policies like this are largely to blame for the fact that the performance of the Nigerian oil palm industry continues to dwindle despite the marked resurgence in agriculture over the last decade. What is more, these policies and programs have failed because they were designed and formulated without an in-depth research.

Following the failure of past policies to achieve significant success in the agricultural sector and particularly, the Nigerian palm oil industry, the government in 2012 again unveiled a number of initiatives under the Agricultural Transformation Agenda (ATA) with the aim of revamping the sector. This includes the launching of an oil palm value chain to recapitalize the oil palm plantation. The government also approved 4 million sprouted nuts of high-yielding oil palm seedlings to farmers across the oil palm growing states in the country; about 1.3 million of these seedlings capable of establishing 9,300 hectares were distributed to 18 private estates at no cost to the farmers. In addition, a number of oil press machines were distributed to farmers to enhance the harvesting of fresh fruit bunches (FFB) (Osagie, 2014; Oyeleye, 2013).

Although as laudable as these initiatives may be, there is a growing concern that without a model to capture the complexities of the enterprise dynamics in the palm oil industry, the potential for palm oil production and the resultant boosting of the Nigerian economy would remain unachieved. The huge potential that exists in the palm oil industry is suggested by the current and future global demand for oil palm products and can stimulate the diversification of the economy. This, in turn, will shield the economy from shocks, create jobs for the teeming population of unemployed youth, raise income, and improve

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the welfare of farmers, guarantee domestic self-sufficiency and substantially increase export earnings.

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 environment, the need for making the right decisions and strategies become very apparent. Modeling and forecasting provide quantitative forecasts which enhance better policy formulation through a better understanding of the relationships between key variables within a 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.

1.2 Palm Oil Industry in Nigeria

Historically, the Nigerian palm oil industry has played a prominent role in the Nigerian economy. Together with other key agricultural oil seeds like cotton and groundnut, the palm oil industry has generated considerable foreign exchange which has facilitated a number of national development programs. It is estimated that palm oil production provides direct jobs and incomes for about 4 million Nigerians in addition to those involved in processing and marketing (Olagunju, 2008). In view of the strategic importance of the palm oil industry, the government has over the years initiated a series of programs and policies aimed at increasing production. This section gives a brief overview of the Nigerian palm oil industry.

1.2.1 Production

1.2.1.1 Area Planted and Production Systems

Palm tree grows predominantly in the wet rain forests in the southern part of Nigeria and also in the savannah region, implying that 26 states are involved in palm oil production. According to Potter (2015), Nigeria has approximately 24 million hectares of land that can be used for oil palm plantation. However, current land utilized for oil palm plantation is about 3 million hectares suggesting the existence of a huge potential for increasing oil palm production by increasing the area under cultivation and improve yield per unit area.

Basically, there are three systems of oil palm production in Nigeria; small holding, medium size plantation and, large scale or estate plantation. However, a substantial proportion of oil palm production in Nigeria exists in the wild groves which together with the small holdings account for over 90% of the total palm oil production. Under the wild groves, oil palm trees are rented by farmers from the landowners. Although annual data on oil palm area under cultivation is not available, data on area harvested indicates an unimpressive trend. As seen in Figure 1.1, 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. Assuming area harvested is equal to the total area under oil palm cultivation, this implies that of a total of 24 million

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hectares available for oil palm cultivation in Nigeria only about 13.5% is currently under cultivation. This presents a huge opportunity for oil palm expansion in Nigeria.
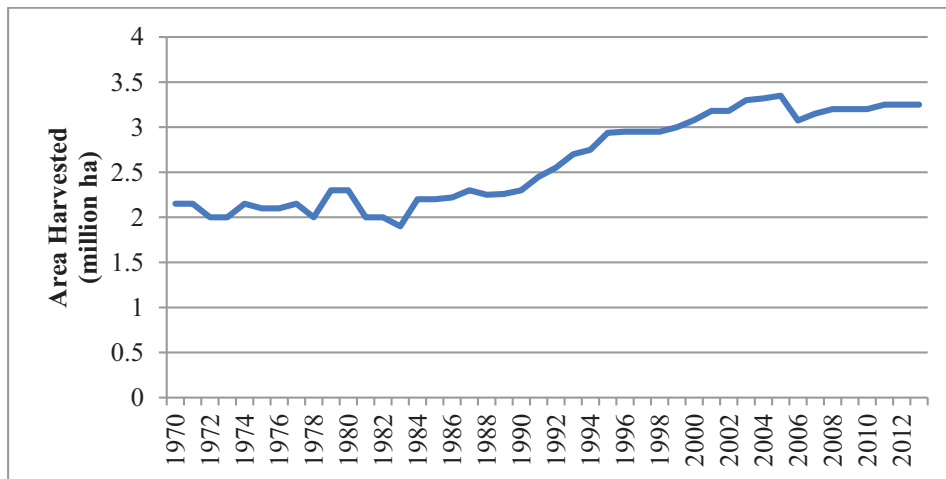
Figure 1.1 : Oil Palm Area Harvested (million hectares) in Nigeria, 1970-2013
Source: FAOSTAT, 2015

1.2.1.2   Production Growth

Palm oil has emerged as the most important vegetable oil produced and consumed in Nigeria. 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. In 2013, Nigeria's output of palm oil stood at a meager 1.6% compared with Indonesia and Malaysia with 51.4% and 33.9% respectively of world market share (USDA, 2015). While Indonesia and Malaysia have recorded phenomenal increases in palm oil production over the last four decades, it has been a rather dismal performance for the Nigerian palm oil industry. Between 1970 and 2013 palm oil production sluggishly increased from 432,000 metric tons to 970,000 metric tons in 2013 (Figure 1.2). 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).

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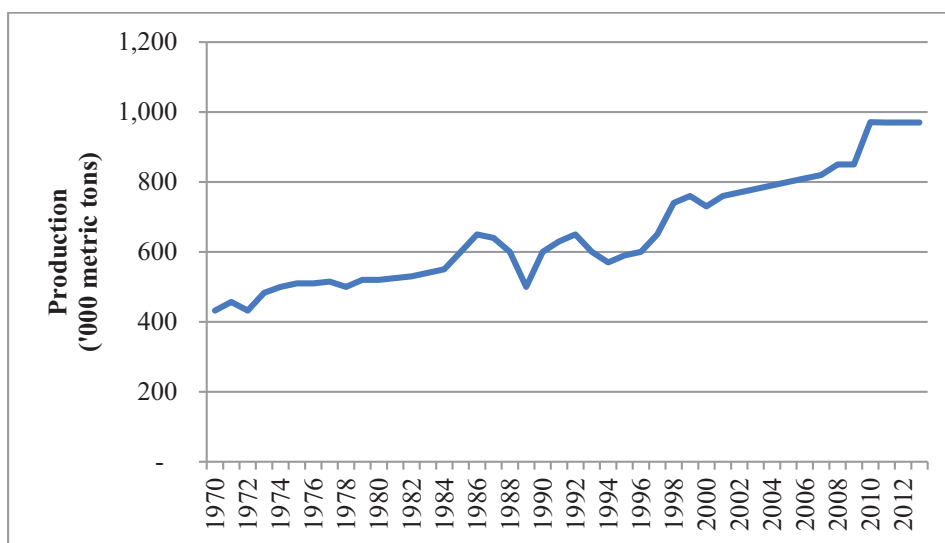
Figure 1.2 : Palm Oil Production ('000 metric tons) in Nigeria, 1970-2013
Source: FAOSTAT, USDA 2015

Although both productions of palm oil and palm kernel oil have been increasing over the years, these increases are only marginal and fall far behind the domestic demand. Consequently, there is a production deficit of over 500,000 metric tons which is sourced from the international market. However, there is a huge potential to increase production through an increase in area cultivated and the use of improved seedlings and improved processing methods (Olagunju, 2008).

1.2.1.3 Yield

The yields from the wild grove are very low at about an average of 1.5 tons of FFB per hectare due to the use of the Dura variety. On the other hand, the Tenera variety which is a crossbreed between Dura and Pisifera varieties is preferred by the plantations and yields in the plantations are on average about 5 tons of FFB per hectare (Table 1.3). The Tenera variety produced and provided by the Nigeria Institute for Oil Palm Research (NIFOR), yields about 30% more oil than the equivalent fruit weight of Dura (Thomas et al., 2011). The small scale and medium scale farms have acreages of between 1 and 25 hectares and rely on the use of the Tenera variety. Production in the small scale farms is informal and characterized by traditional methods with the use of manual processing equipment. The medium scale farms, however, use improved methods and technologies. The majority of the estates are privately owned with the exception of a few that are still owned by the government. Production techniques in the estates are dominated by the use of large-scale processors.

In order to regain its position in the global palm oil industry and remain competitive, the low FFB yield has to be improved as the current average annual yield of FFB stands at about 2.67 tons per hectare, representing about 18% of the world average. Overall, the

Nigerian palm oil industry is faced with a low yield of oil palm relative to other major producers of oil palm. Figure 1.3 shows that oil palm yields in Nigeria have remained stagnant and even declining over the years eliciting concerns about the sustainability of the sector. Low yields of oil palms result mainly from the use of low yielding varieties of oil palm seedlings, old age of trees, poor management practices and agronomic factors. However, the provision of improved variety of oil palm seedlings is one of the major policy thrusts under the ATA and this is expected to substantially increase yield.

Table 1.3 : Yields per Production Systems in Nigeria

Production Systems	Hectares	Yields
Wild grove	n.a	1.5 FFB tons/ha/year
Small scale farm	1-10 ha	3 FFB tons/ha/year
Medium scale farm	10-25 ha	3 FFB tons/ha/year
Estate	≥ 100 ha	5 FFB tons/ha/year

Source: Thomas et al., 2011
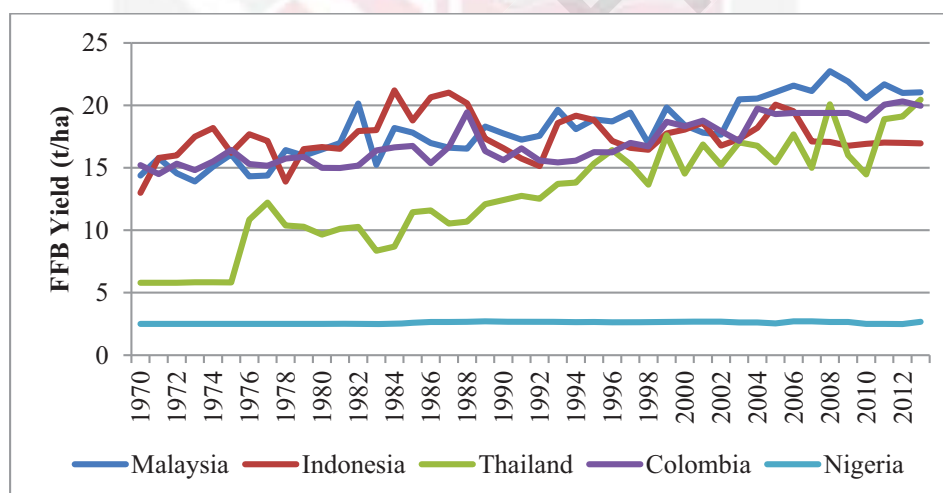
Figure 1.3 : Average Annual Yields of Fresh Fruit Bunches in the Five Largest Producers of Palm Oil, 1970-2013 (Source: FAOSTAT, 2015)

According to Corley and Gray (1976), biological factors influence the production of FFB per hectare and the subsequent production of oil and kernels from these bunches. The first 3 to 4 years is the establishment period and requires due care, maintenance and standard practices that will guarantee high production potential of the oil palms. At the productive stage (from the 4th or 5th to the 25th or 30th year), production is characterized by variation with respect to the main yield components (Table 1.4). Climatic factors, management practices and input (mainly fertilizer) use also considerably influence yield. Fresh fruit bunches produced per hectare increase from 11.1 tons/ha in the 4th year to 24.7 ton/ha in the 10th year after which there is a gradual decline in FFB yield. Similarly, oil and kernel

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production increase from 1.3 tons/ha and 0.4 tons/ha in the 4th year to about 5.1 tons/ha and 1.0 tons/ha respectively in the 10th year. This is followed by a decline in oil and kernel production.

Table 1.4 : Yields, Yield Components and Production of Palm Oil

Year of Planting	Yield Production FFB (tons/ha)	Yield Component (%)		Production (tons/ha)	
		OER	KE	Oil	Kernels
1	-	-	-	-	-
2	-	-	-	-	-
3	-	-	-	-	-
4	11.1	12.0	4.0	1.3	0.4
5	17.3	12.0	4.0	2.1	0.7
6	21.0	16.5	4.0	3.5	0.8
7	23.5	18.0	4.0	4.2	0.9
8	24.2	19.0	4.0	4.6	1.0
9	24.7	20.0	4.0	4.9	1.0
10	24.7	20.5	4.0	5.1	1.0
11	23.7	20.5	4.0	4.8	0.9
12	23.0	20.5	4.0	4.7	0.9
15	22.2	20.5	4.0	4.5	0.9
20	21.0	20.5	4.0	4.3	0.8
25	19.8	20.5	4.0	4.1	0.7

Note: OER=Oil Extraction Rate, KE=Kernel Extraction
Source: Williams and Hsu (1970) cited in Lubis (1994)

1.2.1.4 Domestic Supply

Total palm oil supply in Nigeria is a function of domestic production and palm oil import. The domestic production of oil palm is determined by several variables including the area planted and harvested, climatic conditions, farm management practices, and government policies. Table 1.5 shows that domestic supply has increased from 622 metric tons in 1980 to about 1.5 million tons in 2013 as a result of an increase in production and import of palm oil. In 2013, domestic production represented about 61% of total supply while imports accounted for around 33%.

Table 1.5 : Palm oil Production, Imports, and Stocks, 1980-2013

	1980	1990	2000	2010	2013
Production ('000 mt)	520.00	600.0	730.00	850.00	970.00
Imports ('000 mt)	102.00	20.0	158.00	435.00	518.00
Beginning Stocks ('000 mt)	0.00	50.00	30.00	98.00	100.00
Domestic Supply ('000 mt)	622.00	670.0	918.00	1504.0	1588.00
Production as % of Domestic Supply	83.60	89.55	79.52	56.52	61.08
Imports as % of Domestic supply	16.40	2.99	17.21	28.92	32.62

Note: Domestic Supply = production + imports + beginning stocks
Source: USDA, 2015

1.2.2   Demand

1.2.2.1   Domestic Demand

As the main vegetable oil in Nigeria, palm oil is considered an important and strategic commodity in the country. Four dominant palm oil products in Nigeria are: Technical Palm Oil (TPO), which is of low quality and consumed mainly by households; Special Palm Oil (SPO), used by industries because of its high quality; Palm Kernel Oil (PKO), which is obtained from the kernel of the fruit and also utilized by industries; and Refined Bleached Deodorized Oil (RBD), which is produced by removing smells and colors from the oil. Domestically, palm oil and palm kernel oil are used for both food and non-food (technical) purposes owing to their relative qualities (Table 1.6). Palm oil, on average, provides 9 kilocalories per gram compared to the 4 kilocalories each for carbohydrates and proteins. Palm oil consists of about 53% saturated fatty acids while palm kernel oil contains about 85% saturated fatty acids. In contrast, other vegetable oils such as groundnut oil, soybean oil, coconut oil, rapeseed oil, etc all contain higher proportions of unsaturated fatty acids (Lubis, 1994).

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Table 1.6 : Food and Non-food Uses of Palm Oil Products

Food uses	Non-food uses
Cooking oil	Cosmetics and personal care
Deep frying oils	Soaps
Margarine and spreads	Candles
Bakery fats	Pharmaceuticals
Cocoa butter alternative fats	Lubricants and grease
Confectionery fats	Surfactants
Ice cream fats	Industrial chemicals
Infant nutrition fats	Agrochemicals
Other food application	Coatings
	Paints and lacquers
	Electronics
	Leather
	Biodiesel

Source: Thomas et al., 2011

Figure 1.4 shows the trend in the consumption of palm oil in Nigeria. The trend indicates that total domestic consumption (food and industrial 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 1,470,000 metric tons by 2013. The increase in consumption can be attributed to the rapid increase in population (which is growing at 2.55%) suggesting that palm oil production must be increased to meet the increase in domestic demand.

Demand for palm oil is concentrated in the southern part of Nigeria where most of the industries are located. However, owing to the inadequate development of the industry for the processing and transformation of palm oil, demand in the traditional market is three times higher than the industrial demand (Thomas et al., 2011; Gourichon, 2013).
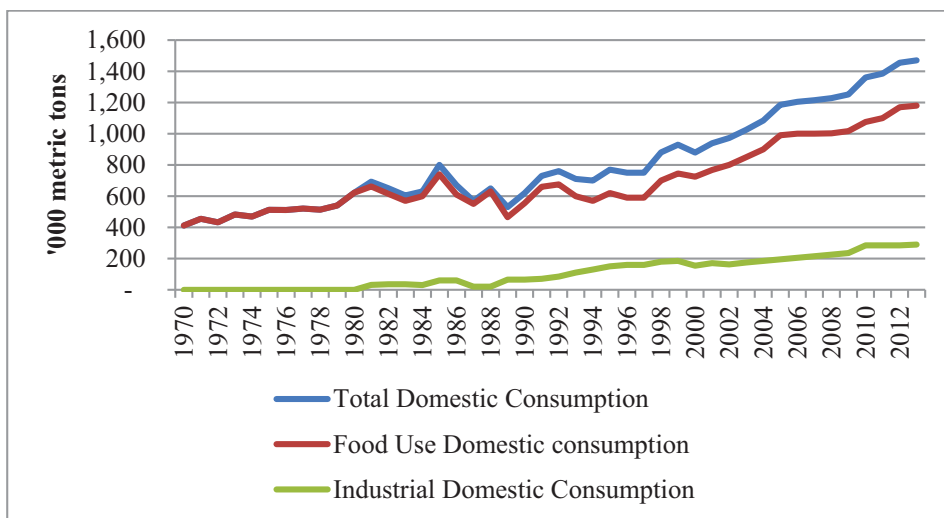
Figure 1.4 : Total Consumption of Palm oil ('000 metric tons) in Nigeria, 1970-2013
Source: USDA, 2015

1.2.2.2 Export Growth

Generally, palm oil production in Nigeria is low and cannot meet the domestic demand. This, coupled with the low quality of palm oil, makes Nigerian palm oil uncompetitive in the international market. Thus, palm oil export in Nigeria is very low, accounting on average for less than 1% of the total domestic supply between 2005 and 2009 (Gourichon, 2013). Figure 1.5 below shows that from a peak of about 31,000 metric tons in 1974, the quantity of palm oil exports from Nigeria has shrunk to about 18,000 metric tons in 2013.
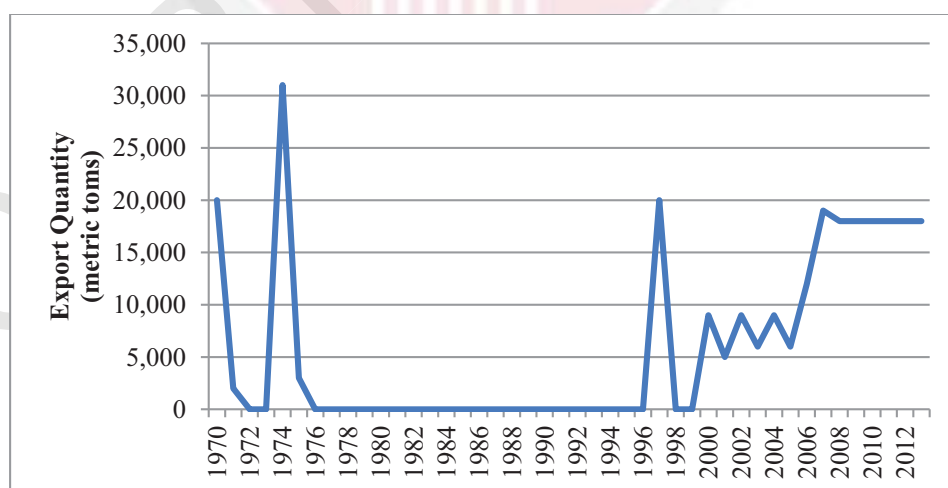
Figure 1.5 : Palm Oil Exports from Nigeria, 1970-2013
Source: USDA, 2015

1.2.2.3 Import Demand

Due to the low levels of productivity at the production and processing stages, 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. Total imports of palm oil have increased at a steady pace from about 5,000 metric tons in 1975 to 518,000 metric tons in 2013, growing at an average rate of 8.5% in the last decade (Figure 1.6). 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).
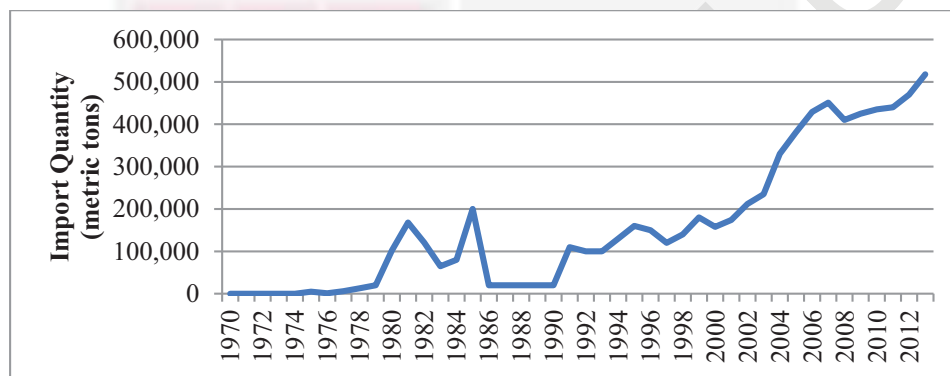
Figure 1.6 : Annual Crude Palm Oil (CPO) Import Quantity in Nigeria, 1970-2013
Source: USDA, 2015

1.2.3 Price

The price fixing dynamics in the Nigerian palm oil market is difficult to understand. Because of the existence of inefficiencies and imbalance in the distribution chain, there is price variation between the different states and regions. For example, the average price of palm oil in 2010 varied from 160 Naira/kg (1.06 US$/kg) in Yobe state to 290 Naira/kg (1.93 US$/kg) in Bauchi state (NBS, 2015). As expected, prices are higher as one move northward because palm oil is mainly produced in the southern part of Nigeria.

Generally, both the producer prices and world prices of palm oil have been very inconsistent, fluctuating quite considerably from year to year. Figure 1.7 shows that the local producer prices of Nigerian palm oil somewhat follows the trend in the prices of the world palm oil market. However, domestic prices were substantially higher for most of the period. This is expected as the production cost of palm oil in Nigeria is relatively very high (Thomas et al., 2011). In addition, the depreciation of the Naira (local currency) in the 1990s coupled with international sanction on Nigeria during the same period contributed significantly to the rapid increase in producer prices of palm oil. For example, from about 9 Naira/US$ in 1991, the exchange rate depreciated to about 92 Naira/US$ in

1999. The government has imposed a 35% duty, which in addition to the high costs of transportation of imported palm oil from the ports to the domestic markets, helps local production to compete.
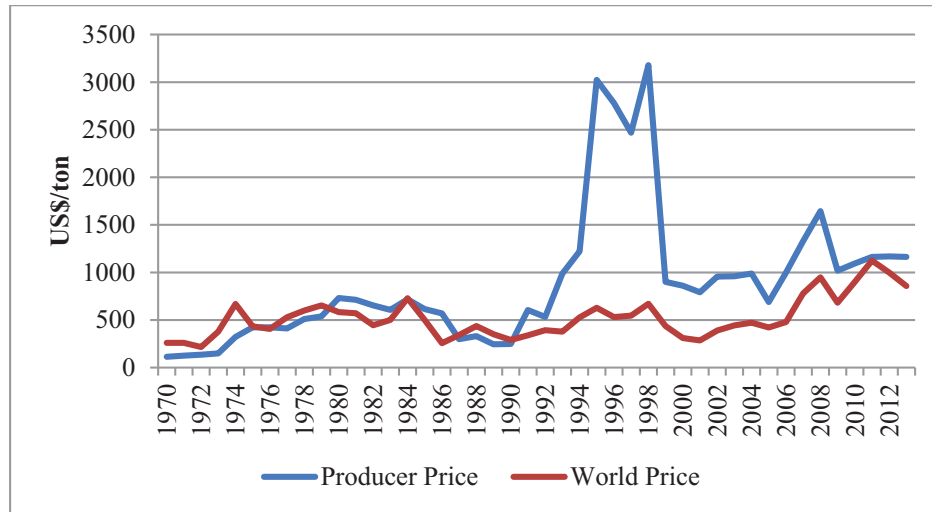
Figure 1.7 : Trend in producer price and world price* of palm oil (US$/ton), 1970-2013 (*World price is proxied by Northwest Europe Market)
Source: FAOSTAT, 2015; Oil World, 2015; NBS, 2015; CBN, 2015

In addition, Figure 1.7 also suggests the existence of instability in the prices of Nigerian and world palm oil. The average producer price increased from 606 US$/ton in 1991 to 3,179 US$/ton in 1998, decreased to 791 US$/ton in 2001 after which it again increased to 1,645 US$/ton in 2008. By 2013, the producer price of palm oil in Nigeria stood at approximately 1,163 US$/ton. A similar trend can be noticed with respect to world prices of palm oil for the same period.

1.3   Policy Environment

A major policy thrust of the government in the palm oil industry is to enhance production to meet domestic demand while at the same time reducing reliance on imports and ensuring the competitiveness of the industry in the international market (Gourichon, 2013). Accordingly, a number of policies and programs related to the palm oil industry have been reeled out over the decades. The first National Development Plan (NDP) of 1962 to 1968 was aimed at the expansion of oil palm plantation and grove rehabilitation (Ugbah & Nwawe, 2008). The civil war in the late 1960s disrupted activities in the palm oil industry, which caused the plantations to be abandoned and the attention to smallholder and oil palm groves declined (Dada, 2007). Consequently, in the second NDP (1970-1974) improved varieties were provided to replace low-yielding palms. The third NDP (1975-1980) focused on the expansion of area under cultivation with the replanting and setting up of plantations of 50,000 hectares as measures that were adopted.

In the 1960s and up to the early 1970s, the Federal Government of Nigeria (FGN) set up commodity marketing boards with the aim of organizing the buying and selling of selected export crops including palm oil and palm kernel. Under this system, producers of agricultural commodities received predetermined prices for their products regardless of the costs of production. Through these boards the government envisaged the stability of producer prices by paying farmers guaranteed prices for their products, thus shielding domestic farmers from competition in the international market and fluctuations in world prices. In addition, it was designed to encourage farmers to increase production by cultivating marginal lands since they had full knowledge of the price they would receive for their products at the start of every production season. However, the operation of these boards was marred by irregularities and inefficiencies prompting their dissolution and replacement with seven National Commodity Boards in 1977 (Akanni et al., 2005). The pricing policies adopted by the marketing boards were not consistent which further aggravated the fluctuation in the prices of palm oil and also reduced the prices producers received relative to the world prices. This was because producers were heavily taxed by the commodity boards through the exercise of monopoly power in the buying and selling of export crops. The new commodity boards, including the palm produce board, were also abolished in 1986 owing to inefficiency thus paving the way for a shift towards an open economy. By abolishing these boards the pricing system became market-based and domestic prices were influenced by the international markets. Notwithstanding the past failure the FGN in 2012 initiated plans to reintroduce the commodity marketing boards but, this time, to be driven by the private sector (Ibrahim and Yusuf, 2014; Iroegbu-Chikezie, 2015). Policy summersaults like this have largely been attributed to account for the market instability and poor performance that has plagued the agricultural sector in Nigeria.

The establishment of NIFOR was another measure taken by the government to support domestic production. As a research institute, the mandate of NIFOR includes the production and provision of improved seeds to farmers and rendering extension services. However, low level of funding has limited the capacity of the institute to promote and deliver its products to farmers (Thomas et al., 2011).

Traditionally, the Nigerian government has been involved in the regulation of palm oil prices and marketing through the use of marketing boards. However, with the dissolution of these boards and the economic reforms under the Structural Adjustment Program (SAP) in the 1980s, there has been a steady move towards a more liberalized economy where prices are determined by supply and demand dynamics. In addition, to strengthen regional integration Nigeria in 2005 adopted the Common External Tariff (CET) of the Economic Community of West African States (ECOWAS). The CET is a move towards a common or uniform tariff for ECOWAS economies where the most-favored-nation (MFN) rates are applied to all goods and services entering the sub-region. However, within the ECOWAS sub-region, intra-regional trade is regulated by ECOWAS Trade Liberalization Scheme (ETLS) of the Free Trade Area (FTA). The ETLS aims to enhance trade integration within ECOWAS member states through the free flow of goods and services. Accordingly, preferential tariffs for trade within the sub-region are set at zero percent in principle under the ETLS and cover all goods and services of community origin.

To protect domestic producers and stimulate production, however, the government has adopted the use of import tariff as a trade policy instrument. The imposition of import tariff is designed to keep palm oil prices high so as to encourage domestic production, albeit, at the cost of potential benefits from trade. 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. The imposition of an import tariff on palm oil imports began in 2005, with a 50% MFN ad valorem tariff applied. However, the duty decreased to 35% in 2008 and the government has maintained this rate with the aim of stimulating the palm oil sector. Although the principal tariff is 35%, a collection of other fees and taxes were included in 2009 thus increasing the reference price to around 50% (Table 1.7).

Table 1.7 : Taxes and Fees on Palm Oil Import

Type of Cost	Definition
MFN Tariff	35% of Cost, Insurance and freight (CIF)
Tax	7% of Import Duty
Surcharge	1% of Free on Board (FOB)
CISS Fee	0.5% of CIF
ECOWAS Charge	5% of CIF and all charges
Value Added Tax (VAT)	2.5% of CIF plus VAT

Note: CISS = Comprehensive Import Supervision Scheme
Source: Thomas et al. (2011)

The imposition of import tariff notwithstanding, growth in domestic production has relatively remained sluggish as high costs of production make domestic palm oil production unable to compete. Prior to the imposition of tariff, production was growing at an average rate of 2% per annum between 2000 and 2004, which slightly increased to an average rate of 3.5% between 2009 and 2013 (Table 1.8). On the other hand, Nigeria's trade policy of imposing import tariff has helped to slow down the growth of imports considerably. From an average of 20.8% between 2000 and 2004, growth in palm oil import has slowed to an average of 5.1% post import tariff imposition. Over the same period, domestic consumption has been rising, although, at a lower average growth rate of 4.1% between 2009 and 2013 compared to 5.4% between 2000 and 2004. In the same vein, the domestic price of palm oil has increased significantly, growing at an average rate of 9.5% per annum post import tariff trade policy. Overall, the governments' objective of stimulating domestic production through the protectionist trade policy of import tariff has not improved the performance of the palm oil industry in any significant way as production still lags behind demand for palm oil. The price-raising effect of the tariff, on the other hand, confers adverse effects on the welfare of consumers. Hence, there is a need to seek alternative policy options that will improve the net welfare of the economy and without jeopardizing the interest of producers, consumers, and the government. Evaluating alternative policy measures and their effects is the primary objective of this study.

Table 1.8 : Nigerian Palm Oil Industry Pre and Post Import Tariff

	Average Growth Rate (%)	
	Pre-tariff (200-2004)	**Post-tariff (2009-2013)**
Production	2.0	3.5
Import	20.8	5.1
Consumption	5.4	4.1
Price	9.4	9.5

Source: Computed from CBN, USDA (2015)

1.4 Competing and Substitute Crops for Palm Oil

In Nigeria, several crops such as cashew, rubber, and cocoa compete with oil palm production for land and other inputs. Over the decades, however, the cocoa sector has posed the greatest competition, pulling away resources from the palm oil sector. Similarly, soybean oil has increasingly become a major edible cooking oil and thus a substitute for palm oil in the diets of Nigerians due to its nutrition and health benefits. In light of the above, this section briefly discusses the cocoa and soybean oil sectors in Nigeria in terms of their production, consumption, and trade.

1.4.1 Cocoa Sector

About two-thirds of the world's production of cocoa is from West Africa with Nigeria being the fourth largest producer after Cote d'Ivoire, Ghana, and Indonesia. As a cash crop, cocoa is critical to the Nigerian economy and the main agricultural export generating foreign exchange earnings for the country (Cadoni, 2013). It also provides direct and indirect employment opportunities for a significant number of people and serves as an important source of raw material (Adeyeye, 2012).

Over the years the performance of the Nigerian cocoa sector has been somewhat mixed. As reflected in Table 1.9, total cocoa area harvested expanded from 700,000 hectares in 1980 and peaked at 1,360,000 hectares in 2007. However, the increasing trend in harvested area was turned around in 2008 and as at 2013 cocoa area harvested stood at 1,200,000 hectares (FAOSTAT, 2015). In terms of average growth rate, area harvested grew modestly at 0.13% annually in the 1980's, increasing slightly during the 1990's at 0.49% and significantly at 4.06% in the 2000's. On the other hand, cocoa yields have been low and declining over the decades owing to ageing of trees, the incidence of disease, pest attack, and lack of adequate agricultural mechanization (Cadoni, 2013).

Despite the gain in area expansion, cocoa production has not been impressive primarily due to low productivity. Total production of cocoa increased by 67.32%, from 153,000 tons in 1980 to 256,000 tons in 1989 at an average annual growth rate of 7.91%. The growth in production slowed drastically during the 1990's and 2000's at 2.97% and 1.40% respectively. Although total cocoa consumption has increased in Nigeria, there has been a decline in the average growth rate of consumption. This phenomenon is due to the fact

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that only 3% of cocoa is consumed as food and the activities of the processing industry in Nigeria are limited (Cadoni, 2013). Consequently, Nigeria is a net exporter and exports her cocoa mainly in the form of beans, with exports dominated by few companies in a liberalized cocoa market. Cocoa export increased by 10.83% per annum in the 1980's, by 6.39% in the 1990's, and by 8.23% in the 2000's. In 2013, exports of cocoa beans accounted for about 50% of total production.

Table 1.9 : Cocoa Production, Consumption, and Trade in Nigeria, 1980-2013

Year	Area Harvested (1000 ha)	Yield (t/ha)	Production (1000 t)	Import (t)	Export (1000 t)	Consumption (1000 t)
1980	700	0.22	153	-	134	3
1981	700	0.25	174	-	195	3
1982	700	0.22	156	-	137	3
1983	700	0.20	140	50	206	3
1984	700	0.23	161	-	131	2
1985	700	0.23	160	-	93	2
1986	700	0.21	148	-	148	3
1987	700	0.21	150	-	106	4
1988	700	0.36	253	-	212	10
1989	708	0.36	256	-	139	11
1990	715	0.34	244	-	148	74
1991	726	0.37	268	-	156	112
1992	730	0.40	292	152	108	183
1993	735	0.42	306	2,567	152	151
1994	751	0.43	323	-	142	178
1995	788	0.26	203	427	133	66
1996	739	0.44	323	-	170	141
1997	739	0.43	318	-	140	169
1998	743	0.50	370	-	128	230
1999	745	0.30	225	-	196	20
2000	966	0.35	338	-	139	186
2001	966	0.35	340	-	175	159
2002	1,030	0.35	362	966	181	180
2003	1,002	0.38	385	-	231	153
2004	1,062	0.39	412	-	255	150
2005	1,089	0.41	441	-	268	163
2006	1,104	0.44	485	-	190	286
2007	1,360	0.27	361	-	175	171
2008	1,349	0.27	367	55	227	121
2009	1,354	0.27	364	427	247	100
2010	1,272	0.31	399	499	227	154
2011	1,240	0.32	391	500	219	100
2012	1,196	0.32	383	510	200	92
2013	1,200	0.31	367	550	183	94
Average Growth Rate (%)						
1980-1989	0.13	7.78	7.91	-	10.83	26.39
1990-1999	0.49	3.15	2.97	-	6.39	14.47
2000-2009	4.06	-1.64	1.40	-	8.23	-2.32

Note: t denotes tons, ha signifies hectares

1.4.2 Soybean Oil Sector

Government support programmes and attention has been directed to the soybean sector in Nigeria over the last few years due to the economic and nutritional importance of the crop. Soybean oil supplies about 25% of Nigeria's consumption requirement of vegetable oil while the processing of soybean has yielded a number of products used for both human and livestock consumption (Nzeka, 2014). Further, soybean improves the fertility of the soil by means of nitrogen fixation and thus plays an important role in increasing the sustainability of intensified crop production systems.

Table 1.10 shows the trend in production, consumption, and trade of soybean oil in Nigeria from 1980-2013. Soybean production in Nigeria is not mechanized and is carried out on smallholder farms with an average size of about one hectare. Soybean area harvested expanded from 270,000 hectares in 1980 to 750,000 hectares in 1989, at an average annual growth rate of 16.69%. However, this trend was reversed in the 1990's with a growth rate of -2.56% per annum before increasing slightly at 1.57% during the 2000's.

In addition, the production of soybean in Nigeria is constrained by low yield levels. From an annual growth rate of 5.01% in the 1980's, soybean yields increased rapidly during the 1990's at 12.93% per annum and then declined at -1.06% per annum during the 2000's. In parallel with the low yield, soybean oil production has been dismally low and lagging behind domestic demand. Thus, Nigeria has had to rely on import of soybean oil to bridge the supply-demand gap. In particular, production of soybean oil increased at 6.94%, 11.43%, and 6.57% during the 1980's, 1990's, 2000's respectively. On the other hand, demand for soybean oil as a good source of vegetable oil has witnessed a significant rise over these periods growing at 33.44%, 13.79%, and 6.62% respectively. To meet the rising demand in the face of low production, import of soybean oil has exhibited significant growth at 9.49%, 18.25%, and 20.37% during 1980's, 1990's, and 2000's respectively.

Table 1.10 : Soybean Oil Production, Consumption, and Trade in Nigeria, 1980-2013

Year	Area Harvested (1000 ha)	Yield (t/ha)	Production (1000 t)	Import (1000 t)	Consumption (1000 t)
1980	270	0.28	-	26	26
1981	300	0.26	-	62	62
1982	350	0.23	-	44	44
1983	200	0.21	-	9	9
1984	200	0.22	-	5	5
1985	205	0.29	8	10	18
1986	210	0.32	1	-	1
1987	324	0.33	1	-	1
1988	442	0.34	2	-	2
1989	750	0.40	3	-	3
1990	729	0.30	10	-	10
1991	468	0.31	5	-	5
1992	513	0.30	5	-	5
1993	543	0.30	6	-	6
1994	593	0.30	7	-	7
1995	617	0.47	11	-	11
1996	502	0.64	12	-	12
1997	543	0.66	12	2	14
1998	550	0.74	18	7	25
1999	513	0.80	18	1	19
2000	517	0.83	24	1	25
2001	519	0.84	24	1	25
2002	540	0.86	26	2	28
2003	555	0.89	35	2	37
2004	587	0.90	36	1	37
2005	601	0.94	37	1	38
2006	630	0.96	39	-	39
2007	638	0.91	41	1	42
2008	609	0.97	41	3	43
2009	592	0.72	41	1	43
2010	282	1.30	32	3	35
2011	599	0.82	40	3	43
2012	668	0.97	46	1	47
2013	680	0.76	50	1	51
Average Growth Rate (%)					
1980-1989	16.69	5.01	6.94	9.49	33.44
1990-1999	-2.56	12.93	11.43	18.25	13.79
2000-2009	1.57	-1.06	6.57	20.37	6.62

Note: t denotes tons, ha signifies hectares

1.5   Problem Statement

In the 1960s and 1970s, Nigeria had a very flourishing palm oil sector which contributed substantially to its economy. Nigeria gained an enviable level of development becoming the largest producer and exporter of palm oil. However, despite Nigeria's huge agricultural potential, this prosperous trend has since been reversed with a noticeable decline in palm oil productivity. Thus, Nigeria has been displaced from her position by other countries such as Malaysia and Indonesia that took advantage of the green revolution and significantly improved palm oil productivity. Government policies and the economic setting in Nigeria have been largely responsible for the slowdown in the palm oil industry. With low and unstable yields coupled with fluctuating palm oil prices, investment in oil palm in Nigeria has become unattractive. Consequently, growth in palm oil production has remained rather sluggish and even stagnant, heightening grave concerns with regards to the future of the palm oil industry.

The palm oil industry in Nigeria has been characterized by a long history of government intervention and market instability. Following a decline in oil palm production over time 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 predominance of smallholders with small farm size. From being the world's largest producer and exporter of palm oil in the 1960s it 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 has become a major objective of the government. Consequently, the government has embraced a protectionist policy designed to help keep domestic prices high in favor of local producers but at the expense of potential benefits from trade. Thus in 2005, the government applied a palm oil import tariff of 50% which was subsequently reduced to 35% since 2008. Although import tariff has been applied by the government to stimulate the upstream palm oil sector, local production still falls short of domestic demand with an increase in the cost of local production relative to other palm oil producing countries like Indonesia and Malaysia.

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, governments' attempt at poverty alleviation is effectively undermined. 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 ECOWAS and the World Trade Organization (WTO). In line with her 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, large volumes of palm oil are imported into Nigeria using these countries as gateways under the ECOWAS Trade Liberalization Scheme that allows for zero duty between the 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. Thus, the imposition of import tariff meant to protect domestic producers turns out to be counterproductive: importers benefit, domestic consumers are penalized, government revenue is eroded and local production is not stimulated.

In designing and implementing any policy in the palm oil industry, the interests of various actors and stakeholders are usually considered. The task of the government is that of policy optimization by striking a balance amongst the interests of different groups which, almost always, are conflicting. In an attempt to shield palm oil producers, government intervention could make Nigeria's oil palm products uncompetitive in the international market. By the same argument, a policy of import tariff liberalization will result in the influx of low-priced imports thereby depressing the domestic price of palm oil. Although decreases in palm oil price would benefit domestic consumers, the welfare of domestic producers would be adversely affected. Accordingly, a policy of trade liberalization inevitably introduces complexity into the palm oil sector as the government is faced with the choice of protecting domestic producers as opposed to consumers. The policy option chosen by the government is likely to have significant effects on both cropping and consumption patterns in the Nigerian palm oil industry. While the conceivable direction of the impacts of tariff reduction or a tariff-free era on the Nigerian palm oil market can be easily established, the size of the changes and their distributional outcomes are unknown.

In view of the foregoing concerns, this study strives to develop a quantitative model for the palm oil industry in Nigeria to examine the relationship between a number of important market variables and to investigate the likely impacts of changes in import tariff on Nigerian palm oil industry. Econometrics and time series modeling in the Nigerian agriculture sector is relatively unexplored. In addition, no in-depth research has been found that surveys and captures the complex relationships in the palm oil industry of Nigeria. To revamp the Nigerian palm oil industry largely depends on the ability of the government to adopt appropriate policies that can improve the competitiveness of the industry. However, a grounded understanding of the palm oil market is required in order for government's intervention to produce fruitful outcomes. Thus, it is important to conduct a research on the estimation of a model that would both highlight the potential in the industry and also provide a framework for crucial agricultural policy analysis and simulation. It is envisaged that this model will provide the tool for anticipating and evaluating the likely impact of changes in government policies and decisions on the palm oil industry.

1.6 Objectives of the Study

The general objective of this study is to determine the effects of changes in import tariff structure on the Nigerian palm oil industry. The specific objectives are:

a) To develop a market model of the Nigerian palm oil industry;
b) To determine factors which affect production, demand, price and trade in the Nigerian palm oil market;
c) To investigate the effects of import tariff liberalization on production, demand, price and trade in the Nigerian palm oil industry; and
d) To measure the welfare effect of import tariff liberalization.

1.7 Significance of the Study

To enhance the evaluation and selection of policy alternatives, policy decision-makers must be equipped with a complete and balanced understanding of the dynamics of the relationships between the supply, demand, trade and price of palm oil. The purpose of this study is to provide a framework that would aid such understanding. Thus, the results of this study will be of immense benefit, not only to policy makers but also to the various actors in the upstream and downstream sectors of the Nigerian palm oil industry. It will also provide guidance to international investors who may desire to participate in the Nigerian palm oil market. Nigeria is of great interest because (1) historically, it played a major role in the global palm oil market as a leading producer and exporter; (2) it presents an example of a country where the palm oil sector could not sustainably contribute to economic advancement due to inappropriate government policies and programs.

The study will furnish the government and decision-makers with the groundwork for making future plans bordering on the necessary actions needed to be taken to revamp the deteriorating state of the Nigerian palm oil industry. By evaluating the effects of changes in import tariff on the Nigerian palm oil industry, it is hoped that this study will provide significant information that will aid policy formulation capable of reviving the competitiveness of the palm oil industry in Nigeria. Moreover, the model developed in this study will serve as a reference for future investigations of the same nature. It will provide adequate information that future researchers and students can rely on to compare with their own study.

1.8 Organization of the Study

The layout of this thesis is as follows. Chapter one is the introduction and provides the background information on the Nigerian palm oil sector as well as examines principal aspects of the industry. Chapter two presents a detailed survey of existing relevant literature on agricultural commodity models and their application in policy analysis. It attempts to analyze the relationship between supply, demand and price and how they respond to different policy variables. In addition, the theoretical and empirical literature on import tariff liberalization is captured in this chapter.

In chapter three, the model framework is presented. This chapter discusses the analytical framework adopted in this study and also provides an examination of the different concepts used in agricultural commodity modeling. This chapter is also concerned with the methodology utilized in this study and covers the description of variables and sources of data used in the study. The empirical results of the study constitute the focus in chapter four. Econometric results and model specification tests, as well as the analysis of policy changes, are also delineated in the same chapter. Finally, the conclusion of the study and conceivable opportunities for additional research are presented in chapter five. The important empirical findings together with their policy implications are highlighted in this concluding chapter.

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