



**UNIVERSITI PUTRA MALAYSIA**

***ALTERNATIVE POLICY MECHANISM FOR INCREASING  
RICE SELF-SUFFICIENCY IN NIGERIA***

**ABDULSALAM RAKIYA YAKUBU**

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**ALTERNATIVE POLICY MECHANISM FOR INCREASING  
RICE SELF-SUFFICIENCY IN NIGERIA**

By

**ABDULSALAM RAKIYA YAKUBU**

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

**January 2021**

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

## **ALTERNATIVE POLICY MECHANISM FOR INCREASING RICE SELF-SUFFICIENCY IN NIGERIA**

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**January 2021**

**Chairman : Professor Datuk Mad Nasir bin Shamsudin, PhD**  
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Tariffs on rice imports complemented with fertilizer subsidy has been the longstanding instruments of the Nigerian government that was meant to regulate the importation of rice, protect and encourage rice farmers, and support the drive for achieving rice self-sufficiency goal of the country. Unfortunately, despite continuous government's efforts and initiatives, rice production response has been minimal, resulting in unimpressive self-sufficiency levels. If this current trend in rice self-sufficiency level is maintained, the consequences can be far-reaching not only to the rice industry but to the entire economy as well – with important implications to the general welfare and ultimately, food security of the society. Hence, this study was aimed at exploring the effects of alternative policy mechanisms on rice self-sufficiency levels, and on welfare of various stakeholders. Results of this study can assist the government in proactively designing and introducing appropriate policy interventions and investments towards increasing the country's self-sufficiency level in rice. Using time series data for the period 1980 to 2018, a market model was developed to replicate Nigeria's rice market. The model was analysed in a policy framework through a partial equilibrium approach while treating the country as a small rice importing nation. The model consisted of a supply system, a demand system, and a price linkage. Four equations were specified for area harvested, yield, per Capita consumption demand and producer price with three identities representing paddy production, rice production and import demand. The completed market system was econometrically estimated using 'autoregressive distributed lag' ARDL approach for each of the equations and the resulting elasticities were used to project Nigeria's rice industry trends and also to quantitatively evaluate the impact of alternative policy scenarios on rice self-sufficiency. Simulation analysis of four alternative policy scenarios, which consisted of either introduction of a new mechanism or adjustments in the import tariff rates, either in combinations or in isolations were made and their impacts on self-sufficiency levels were examined. Specifically, Scenario 1 involved an increase of 10% import tariff rate; Scenario 2 involved an introduction of a deficiency payment program to the baseline; Scenario 3 was a replacement of the baseline tariff with a deficiency payment program and Scenario 4 was a policy mix of a 10% increase in tariff and an introduction of a deficiency payment program. Results of

the baseline scenario showed a bleak projection for rice self-sufficiency. This unimpressive forecast strengthened the need for a policy reform in the country's rice industry. However, the simulation of alternative policies offered potential prospects. The findings of the study have provided an important policy pathway for designing future rice industry policies: any policy that is aimed at increasing self-sufficiency level must be directly targeted at producers, otherwise, outcomes will be insignificant. The reason is that Nigeria's rice industry is dominated by smallholders and our analysis of an alternative policy of an increase in tariff (Scenario 1) failed to yield the desired self-sufficiency response, most likely because the benefits of tariff are not directly transmitted to producers. Therefore, an alternative policy mechanism that guarantees the desired self-sufficiency response was Scenario 2, which simulated the impact of complementing the current tariff policy with a deficiency payment program. This scenario guaranteed a self-sufficiency level of 87% by 2028, a 12% growth from the baseline estimate. A breakdown of its impact projected annual paddy production growth of 6%, consumption growth remained unchanged at 0.6% annually and import volumes declined by 10% each year for the projected period. The present study concluded that increasing rice self-sufficiency level in Nigeria was possible with a policy of deficiency payment program which resulted in gains in producer surplus while preserving consumer welfare. It was suggested that for the purpose of increasing self-sufficiency levels in rice, Nigeria's policy focus needs to be concentrated towards paddy producers by introducing a deficiency payment program which could encourage a transition from the country's dominant smallholder system to a larger scale, business-oriented system through investments in productivity enhancement inputs and larger area harvested efforts.

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

## **MEKANISMA DASAR ALTERNATIF BAGI MENINGKATKAN SARA DIRI DALAM PENGELUARAN PADI DI NIGERIA**

Oleh

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Tarif import terhadap beras beserta subsidi baja telah menjadi instrumen lama oleh kerajaan Nigeria yang bertujuan untuk mengawal pengimportan beras, melindungi dan mendorong pesawah padi, dan menyokong matlamat dalam mencapai tahap sara diri beras negara. Malangnya, di sebalik usaha dan inisiatif kerajaan yang berterusan, respon pengeluaran beras adalah minimum, menyebabkan tahap sara diri yang tidak menarik. Sekiranya tren tahap sara diri beras ini dipertahankan, kesannya boleh menjangkau bukan hanya kepada industri beras sahaja tetapi juga kepada seluruh ekonomi - dengan implikasi penting terhadap kesejahteraan masyarakat secara umum. Oleh itu, kajian ini bertujuan untuk meneroka kesan mekanisme dasar alternatif terhadap tahap sara diri beras dan juga kebajikan pelbagai pihak berkepentingan. Dengan menggunakan data siri masa untuk bermula dari tahun 1980 sehingga 2018, model pasaran dibangunkan untuk menggambarkan pasaran beras Nigeria. Model ini mengandungi empat persamaan yang ditentukan mengikut kawasan yang dituai, hasil, permintaan penggunaan per kapita dan harga pengeluar, dengan tiga identiti yang mewakili pengeluaran padi, pengeluaran beras dan permintaan import. Sistem pasaran lengkap telah dianggarkan secara ekonometrik menggunakan pendekatan ARDL 'autoregressive distributed lag' dan keanjalan yang diperolehi digunakan untuk meramalkan tren industri padi Nigeria. Selanjutnya, penilaian terhadap kesan senario dasar alternatif terhadap tahap sara diri beras dibuat dengan mensimulasikan empat senario dasar alternatif. Secara khusus, Senario 1 melibatkan kenaikan kadar tarif import sebanyak 10%; Senario 2 melibatkan pengenalan program pengurangan pembayaran pada tahap asas; Senario 3 adalah penggantian tarif dasar dengan program pengurangan pembayaran dan Senario 4 adalah gabungan dasar kenaikan tarif 10% dan pengenalan program pengurangan pembayaran. Unjuran senario asas menunjukkan masa depan yang suram untuk tahap sara diri beras. Ramalan yang tidak impresif ini memperkuat bahawa perlunya reformasi dasar dalam industri beras negara. Walau bagaimanapun, simulasi dasar alternatif menawarkan prospek-prospek yang berpotensi. Penemuan kajian telah memberikan pilihan polisi yang penting untuk merancang dan memperkenalkan secara proaktif dasar dan intervensi industri padi masa depan yang bersesuaian: sebarang polisi yang bertujuan untuk meningkatkan tahap sara diri mesti disasarkan secara langsung kepada pengeluar, jika tidak, hasilnya tidak akan

signifikan. Ini disebabkan oleh industri padi di Nigeria dikuasai oleh pekebun kecil dan analisis dasar alternatif kenaikan tarif (Senario 1) gagal memberikan respons tahap sara diri yang diinginkan, kemungkinan besar kerana faedah tarif tidak diterima secara terus oleh pengeluar. Oleh itu, mekanisme dasar alternatif yang menjamin respons tahap sara diri yang diinginkan adalah Senario 2, yang mensimulasikan kesan melengkapkan kadar tarif semasa dengan program pengurangan pembayaran. Senario ini menjamin tahap sara diri pada 87% pada tahun 2028, pertumbuhan sebanyak 12% dari anggaran awal. Kajian ini menyimpulkan bahawa peningkatan tahap sara diri beras di Nigeria adalah mungkin dengan adanya program pengurangan pembayaran yang mengakibatkan kenaikan surplus pengeluar sambil menjaga kebajikan pengguna. Dicadangkan untuk tujuan meningkatkan tahap sara diri beras, fokus dasar di Nigeria perlu ditumpukan kepada pengeluar padi dengan memperkenalkan program pengurangan pembayaran yang dapat mendorong peralihan dari sistem pekebun kecil yang dominan di negara ini ke skala yang lebih besar, berorientasikan sistem perniagaan sistem melalui pelaburan dalam input peningkatan produktiviti dan usaha penuaian kawasan yang lebih besar.

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## LIST OF ABBREVIATIONS

ADF	Augmented Dickey–Fuller
AFMA	Agriculture and Fisheries Modernization Act
AFTA	The ASEAN Free Trade Area
AGRM	Arkansas Global Rice Model
AOA	Agreement on Agriculture
ARDL	Autoregressive-Distributed Lag
ARIMA	Autoregressive Integrated Moving Average
ASEAN	Association of Southeast Asian Nations
ATA	Agricultural Transformation Agenda
BERNAS	Padi Beras National Berhad
BG-LM	Breusch-Godfrey Lagrange Multiplier
BOLR	Buyer Of Last Resort
BP-G	Breusch-Pagan-Godfrey
BRM	Bumiputera Rice Millers
BULOG	Badan Urusan Logistik
CARD	Coalition for Africa Rice Development
CEPT	Common Effective Preferential Tariff Agreement
CET	Common External Tariff
CBN	Central Bank of Nigeria
CGE	Computational General Equilibrium
CGIAR	Consultative Group for International Agricultural Research
CRDB	Cooperative Rural Development Bank
CUSUM	Cumulative Sum of Recursive Residuals

CVPP	Producer price of cassava
DP	Deficiency Payment
DPP	Deficiency Payment Program
ECM	Error Correction Model
ECOWAS	Economic Community of West African States
FAO	Food and Agriculture Organisation
FAO-GIEWS	Food and Agriculture Organisation-Global Information and Early Warning System
FAOSTAT	The Food and Agriculture Organization Corporate Statistical Database
FAPRI	Food and Agricultural Policy Research Institute
FEWS NET	Famine Early Warning Systems Network
FGN	Federal Government of Nigeria
FMARD-ATA	Federal Ministry of Agriculture & Rural Development-Agricultural Transformation Agenda
FSSR	Food Staples Self-sufficiency Roadmap
GASC	General Authority for Supply Commodities
GMP	Guaranteed Minimum Price
GNIPC	Gross National Income per Capita
GTAP	Global Trade Analysis Policy
IFPRI	International Food Policy Research Institute
IITA	International Institute of Tropical Agriculture
IMPACT	International Model for Policy Analysis of Agricultural Commodities and Trade
IRRI	International Rice Research Institute
JB	Jarque Berra
KRI	Khazanah Research Institute

LPN	Lembaga Padi dan Beras Negara
LSMS-ISA	Living Standards Measurement Study - Integrated Surveys on Agriculture
MAE	Mean Absolute Error
MAGPA	Malaysian Agricultural Policy Analysis
MAPE	Mean absolute percent error
MARDI	Malaysian Agricultural Research and Development Institute
MBS	Marginal Budget Share
MFN	Most Favoured Nation
MITI	Malaysian International and Trade Industry
MMA	Minimum Market Access
MOU	Memorandum of Understanding
NACB	Nigerian Agricultural and Cooperative Bank
NAFAS	National Farmers Organization
NAIVS	National Agriculture Input Voucher Scheme
NBS	National Bureau of Statistics
NCER	Nigerian Currency Exchange Rate
NCRI	National Cereals Research Institute
NFA	National Food Authority
NMB	National Microfinance Bank
NNSC	Nigerian National Supply Company
NRDS	National Rice Development Strategies
NRTD	Nigeria Rice Total Demand
OECD	Organisation for Economic Co-operation and Development

OLS	Ordinary Least Squares
PE	Partial Equilibrium
POP	Population
PP	Phillips-Peron
PYAH	Area Harvested of Paddy
PYMR	Milling Rate of Paddy
PYPN	Production of Paddy
PYYD	Yield of Paddy
RASKIN	Rakyat Miskin
RBDA	River Basin Development Authorities
REIM	Import of Rice
REPC	Rice per Capita consumption
REPNI	Production of Rice
RERP	Retail Price of Rice
REWP	World Price of Rice
RMSE	Root-Mean Squared Error
RMSPE	Root Mean Square Percent Error
SAP	Structural Adjustment Programs
SBC	Schwartz-Bayesian Criterion
SD	System Dynamics
SME	Small and Medium Enterprises
SSL	Self-sufficiency Level
SSR	Self-sufficiency Rate
STE	State Trading Enterprise

TREND	Dummy proxy representing technology growth
TRQ	Tariff-Rate-Quota
UN COMTRADE	United Nations International Trade Statistics Database
UNDP	United Nations Development Programme
USAID	United States Agency for International Development
USDA	United States Department of Agriculture
USDA PS&D	United States Department of Agriculture Production, Supply and Distribution
UN	United Nations
USITC	United States International Trade Commission
VAR	Vector Autoregressive
WTO	World Trade Organisation
WTRP	Retail Price of Wheat



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# CHAPTER 1

## INTRODUCTION

This chapter documents a general background of the rice industry in Nigeria, to establish the context of this study. It consists of sections, each of which details an important component of the rice industry as relevant to this study. The first section discusses the structure of the rice industry disaggregated under supply, demand and price dynamics. Also included is a discussion on policy environment and institutional supports. These are preceded by a statement of the research problem, research questions, research objectives, significance of the study, overview of the thesis structure are outlined sequentially.

### 1.1 Background of the Study

Regional staples are traditionally identified by their abilities to thrive favourably in their native environments. In Nigeria, rice is one of the few crops that thrives in all parts of the country, cultivated under four different systems, making it an important staple in the country. The importance of rice transcends the boundaries of Nigeria to reach world-wide recognition as rice has become the world's most important staple food and will continue to be so in the coming decades. A staple food for some 4 billion people worldwide, it provides 27% of the calories in low- and middle-income countries. Projections show that with expected population growth, income growth, and decline in rice area, global demand for rice will continue to increase from 479 million tonnes of milled rice in 2014 to 536-551 million tonnes in 2030 (International Rice Research Institute (IRRI), 2016).

Over 190 million people across Nigeria eat rice daily, making it an important feature of the dietary and agricultural landscape of the country, both now and far into the foreseeable future. Therefore, ensuring its availability as well as its affordability for everyone, can reasonably be equated to ensuring food security. Though the country is endowed with a significant rice yield gap of more than six million metric tonnes, an annual total rice production of 2.5 million metric tonnes is insufficient to feed its people. To supplement this shortfall, an average of 2.5 million tonnes is imported annually (United States Development Agency - Production Supply & Distribution (USDA-PS&D), 2018), accumulating an annual total consumption that exceeds 5 million metric tonnes. An important factor to consider is that rice demand in Nigeria is strongly linked to population growth, with projections revealing that by the year 2050, an estimated 350 million people in Nigeria will need 36 million metric tonnes of rice (IRRI, 2018). Therefore, feeding these people will require tremendous efforts from the country's agricultural policy environment. In the meantime, heavy reliance on imports is costing the country huge import bills, straining the country's foreign exchange reserves. As a measure, the government of Nigeria decided to pursue policies that could facilitate its drive towards increasing self-sufficiency level (SSL) in rice.

The pursuit of self-sufficiency is justified because of the complex nature of the world rice market. A prominent feature of the world rice market is its high volatility due to a combination of factors including a high degree of protection, geographic concentration, market segmentation, inelastic supply and inelastic demand responses to price and income (Wailes, 2005) and unpredictable supply shock factors like natural disasters and climate change. These factors affect the international rice market because rice is thinly traded as most of the rice is consumed in the country in which it is produced leaving a small fraction for the international market (von Braun & Bos, 2005). For example, in 2010, global trade accounted for only 6.5% of total rice output (Food and Agriculture Organisation (FAO), 2011). Such complexity in the world rice economy, calls for meticulous and reliable policy planning and formulation efforts in rice import-dependent countries like Nigeria.

Recent years have seen a resurgence of interests in the idea of food self-sufficiency in rice dependent countries. The 2007– 2008 food price crisis exemplified how factors including policy failures, market overreactions (Kalkuhl et al., 2016) and production shortfalls in key exporting countries (Ghanem, 2011) primarily instigated soaring (and later, diminishing) prices (Gillson & Fouad, 2015) and hence, increasing volatility of international food market. It especially caused serious problems in the market, for commodities whose production is concentrated in just a few countries, such as rice (Timmer, 2010). The experience thus triggered a lingering scepticism of the reliability on international food market and as a precautionary measure, many countries expressed interests in pursuing policies to bolster their levels of food self-sufficiency (FAO, 2015).

Governments have been prioritizing food self-sufficiency in their agricultural and economic policies as a national security measure because it is viewed as facilitating some important goals. Prominent among them is that ensuring a measure of self-sufficiency in food can provide governments with a contingency against supply disruptions that may arise in the context of factors such as war, a decline in availability of food on international markets, or volatile food prices on international markets (FAO, 1996). In addition, it serves as a politically expedient policy stance, as dependence on others for its food supply can leave a country in a vulnerable position on the world political stage, especially if those countries that export food threaten to withhold it for political reasons (O'Hagan, 1976). Furthermore, countries may also prioritize food self-sufficiency as a means to bolster their domestic farm sectors and support their overall economic growth and development (FAO, 2015). Critics on the other hand, have long argued that food self-sufficiency policies are misguided, on the grounds that policies designed to support it are typically inefficient and trade-distorting (Naylor & Falcon, 2010). Part of the reason for this debate is that although, the phrase 'food self-sufficiency' is often-used, however, a vast number of studies lack its detailed explanation (Clapp, 2017). The general concept of food self-sufficiency is described to mean the extent to which a country can satisfy its food needs from its own domestic production (FAO, 1999). Simply put, it refers to a country producing sufficient food to cover its own needs. Although straightforward, this basic definition falls short of including the trade aspect of food i.e. it fails to indicate whether a country that pursues food self-sufficiency still engages in food trade with other countries. In reality, a rigid policy stance of a country opposing international trade seems impractical because all countries rely on some level of imports for at least some of their food consumption, including large food exporters that produce far more food than they consume. Therefore, the basic definition requires a refinement by determining how trade



fits into the food self-sufficiency policies of individual countries with respect to how it guides government policy choice (Clapp, 2017). This was fulfilled by FAO (2015) who provided a practical application of the concept to mean a country producing a proportion of its own food needs that approaches or exceeds 100% of its food consumption. Noteworthy is the fact that this later definition does not exclude trade as a possibility as food self-sufficiency is defined by the ratio of food produced to food consumed at the domestic level (Clapp, 2015). Understood this way, food self-sufficiency is not necessarily focused on where specific foods are grown, but rather on a country's domestic food production capacity. Therefore, a clear understanding of the concept is relevant for guiding government policy choices.

Following the 2007/2008 world grain market price crisis, Nigeria has employed various policy options and programs targeting production and international trade to facilitate its drive towards achieving self-sufficiency in rice. The recent being the Agricultural transformation agenda (ATA) launched in 2012. Through this agenda, the Federal government of Nigerian set a target to reach self-sufficiency in rice by 2017. Unfortunately, as was the case with similar policies/projects/programs prior to ATA, the agenda failed to induce enough supply-side response to meet self-sufficiency. The ineffectiveness of these past policies as revealed by their outcomes, suggest the need to explore other alternatives. In the exploration process though, it is necessary to understand that certain policies have varying impacts on stakeholders and may involve trade-offs regarding short-term versus long-term impacts on SSLs (FAO, 2014).

## **1.2 Rice Industry in Nigeria**

In the last decade, Nigeria has maintained a position of being at least the second top rice importing country in the global market (USDA PS&D, 2019). The demand for rice has been on the rise because of its importance as a domestic staple. Though the country is endowed with a significant rice yield gap of more than 6 million metric tonnes (Global Yield Gap Atlas, 2018); However, an annual rice production of 2.5 million metric tonnes is insufficient to feed over 130 million people. To supplement this shortfall, an average of 2.5 million metric tonnes is imported annually, accumulating a national consumption that exceeds 5 million metric tonnes annually or about 30 kg/capita per annum. Population growth, preference towards higher grade imported rice in the urban areas and preference for rice due to its relative ease of preparation and its versatility are important factors in the annual consumption growth of about 35%, which has resulted in surging demand.

Domestic production lags behind due to a wide range of supply inefficiencies impeding significant progress in the local industry's productivity and international competitiveness. An important aspect is that 90% of rice farmers in Nigeria are resource-poor smallholder farmers, applying low-input strategy to agriculture, with minimum input requirements and low output (IRRI, 2018). The result of which is a creation of quality differentials relative to foreign rice, ultimately tilting preference and over reliance on imports which cost the government \$157 million annually (FAO, 2017).

A domestic rice price spike by 99% was a devastating lesson from the country's over reliance on imports which was felt during the global rice crises of 2007/08. Those events exposed vulnerable people to the risks of food insecurity prompting Nigeria to seek countermeasures. Considering the high potential for increased production in the country, the government decided to pursue policies aimed at stimulating domestic production thereby increasing rice SSL. Nigeria's current rice self-sufficiency policy aims to expand production and reduce dependence on international imports through the Nigerian National Rice Development Strategy (2009-2018) with various subsidiaries such as the Anchor Borrowers Programme. In light of the aforementioned, the Nigerian Government announced a policy of increasing tariff rates and production subsidies towards achieving the ultimate goal of self-sufficiency in rice. These government's efforts towards achieving rice self-sufficiency has been long standing but has consistently been met with a weak supply response. Key limiting factors identified are preference for imported rice due to quality differentials, poor domestic rice value chain and erratic government policy environment. This has prompted a discussion herein, of key elements of the country's rice industry structure in terms of production systems and processing techniques, as a guide for developing appropriate policy interventions.

Nigeria's dominant production system is characterised by fragmented units managed by smallholder farmers, who produce 90% of domestic rice using traditional methods and techniques with little investments. These smallholder farmers live in rural areas and number 1.43 million (National Rice Development Strategies (NRDS), 2014) compared to a 190.9 million people, compounding the challenges of increasing self-sufficiency. The potential for rice development in Nigeria is largely determined by the availability of agro-ecological conditions in which rice can be produced. This is the endowment for which Nigeria justifies its goals of reaching self-sufficiency owing to a diverse rice production ecology which covers all agro-climatic regions of the country. Table 1.1 presents a breakdown of the production systems.

**Table 1.1: Types of rice production systems in Nigeria**

<b>Production ecology</b>	<b>Area (Ha)</b>	<b>Output (Mt)</b>	<b>Yield (Mt/Ha)</b>	<b>Area share (%)</b>	<b>Production share (%)</b>	<b>Potential Yield (Mt/Ha) *</b>
Upland	675,160.9	778,707.1	2.1	60.1	41.0	3.5
Lowland	203,884.2	798,991.0	3.9	18.2	42.0	5
Irrigation	92,719.1	184,117.0	3.2	8.3	9.7	6-7
Mangrove	150,883.3	138,655.1	0.9	13.4	7.3	4

(Source: \* Ezedinma, 2005; National Rice Survey, 2009)

Upland rice system depends entirely on rainfall and is characterized by a limited use of modern farm inputs, while farm sizes range between 1 to 5 hectares (Erenstein et al., 2003). Although paddy yield is generally low at 2.1 metric tonnes/hectares (Table 1.1), it provides the country with 41% of total domestic rice. Approximately 18.2% of Nigeria's rice area is under lowland cultivation, contributing 42% of the domestic production (Table 1.1). Farm sizes range between 1 to 5 hectares with an average yield

of 3.9 tonnes per hectare. To boost rice production, the federal government established formal irrigation systems under the River Basin Development Authorities (RBDAs) in the 1980s. This system accounts for 18% of cultivated rice land and 9.7% of national rice supply. Being a better organised system, its average yield is 3.2 metric tonnes/hectare (Table 1.1) and offers better accessibility to markets, inputs and other relevant services compared to upland systems. Unfortunately, these formal irrigation (government established) schemes were short-lived, primarily due to lack of maintenance. The mangrove system is the least important and with a yield of 0.9 metric tonnes/hectare, it contributes about 7.3% to the national output. Major challenges for rice development in some of these systems as highlighted by Cleaver, (1993); Cleaver and Schreiber, (1994) include lack of capital which limits the intensification of the system, weed competition which further reduces labour productivity and increases the risk of crop failure, use of long-duration rice cultivars which further limits cropping intensity and a general poor access to markets, inputs and services, and poor water control (Defoer et al., 2002).

An important element in Table 1.1 is the yield potential column, showing that approximately between 25% to 50% are currently met for any of the production systems indicating ample capacity for increasing productivity with appropriate and adequate inputs. Furthermore, several studies have revealed the potential for area expansion. For example, in 1960s, Nigeria invested in dams with potential irrigation capacity of 725,000 hectares, but only about 220,000 hectares was serviced as at 1997 (Baba, 1993). Therefore, the goal of increasing rice self-sufficiency does not seem ambitious considering these opportunities. However, policies should be streamlined in accordance with features unique to each production zone rather than a uniform approach. One option that offers promising results is the irrigation system of which increased investment is a necessary requirement. Perhaps the reason Nigeria has been unsuccessful in achieving its self-sufficiency goal is the lack of technical progress in the formal irrigation systems. Because as was the case with the Asian green revolution, tremendous production growth were realised when production policies were complemented with technical progress.

### **1.2.1 Nigeria's Rice Processing Industry**

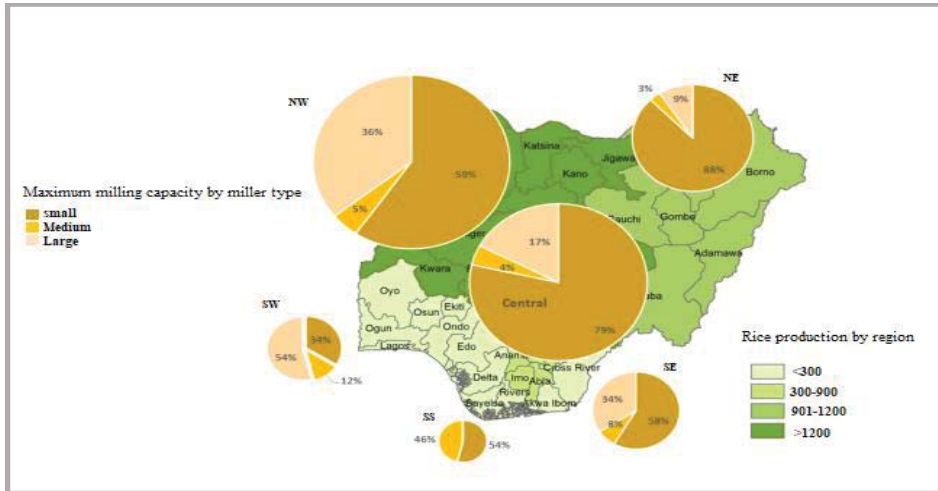
The preference for imported rice over domestically produced rice is due to an inability of the later to meet the international quality standards of processed rice. The country's milling sub-sector was largely a 'cottage industry' in the early-2000s but significant changes occurred in 2012, when the government introduced a new policy of ATA. Part of the policy agenda was the establishment of national large capacity facilities for rice production, processing, and marketing. These investments attracted private investors into the rice sector, so, the country's rice milling sector can be described as comprising primarily of a geographically diverse, small, medium and large-scale operations with a highly segmented and fragmented supply chain.

The small-scale milling companies process about 70% of the total locally produced rice (Johnson & Masias, 2016) and are usually located in proximities of the paddy producing rural areas. Most of the operators along this channel mill paddy rice from smallholder farmers and traders for a fee, either for their own consumption or for rural markets. Available data (National Bureau of Statistics & the World Bank, 2011) shows that the

share of rice milled for own consumption is about 14%, while the rest enters the market - 63% going into rural and 22% into urban markets. This type of milling industry incurs large volume of waste due to their use of inefficient operating methods and equipment. Consequently, locally milled rice is of poor quality which makes it unattractive to urban and higher income households. The principal challenge for the small-scale rice milling sub-sector in Nigeria as highlighted by Johnson and Masias, (2016) is the numerous obstacles such millers face for improving productivity and product quality such as the necessity to deal with many producers, traders, and processors who have variable skills and access to technologies and credit, and who interact only at the point of sale or for servicing. The medium-scale milling category comprise of those millers who process up to 10,000 metric tonnes annually, and industrial clusters of small scale millers, who together process between 3,000 and 10,000 metric tonnes annually.

The government of Nigeria saw the need for private sector's involvement in the rice industry towards fostering self-sufficiency and so decided to encourage large multinational rice companies to invest in rice processing. Therefore, in 2005, the Federal Government of Nigeria (FGN) granted private sectors exclusive licenses to import brown rice for polishing at a preferential tariff rate of 50%. In return, license holders were expected to invest in rice processing and cultivation schemes. Unfortunately, the government abandoned the exclusive licensing scheme a few years after initialisation.

Overall, the performance of the rice value chain has been unimpressive and less competitive compared to international standards, particularly with other major producers in Asia. The modern rice milling sector, as the primary competitor with imports, faces some impediments. In most cases, these large facilities are operationally inefficient due to insufficient supply of high quality paddy. Hence, they must depend on imported brown rice to remain operational, which predisposes them to risks of international supply shocks and price fluctuations. As of 2014, the total number of integrated rice mills in Nigeria was 21, having a combined annual capacity of over 1 million metric tonnes (Sahel newsletter, 2015). Figure 1.1 is a map of regional paddy production and processing capacities across the country.



**Figure 1.1: Regional Paddy Production and Processing Capacity**  
(Source: Sahel newsletter, 2015)

The foregoing discussion on the structure of the rice industry indicates tremendous supply-side inefficiencies in paddy rice which leaves significant room for improvement. The dominant role of the small-scale and medium-scale milling sub-sectors calls for policies towards increasing production of quality rice which will not only help improve the competitiveness of the rice industry, but such efforts will have a broader impact on overall rural (who make up the major share of the industry) welfare and development through employment generation, access to affordable quality rice for food security, waste reduction and infrastructural development.

## 1.2.2 Production and Supply

Latest estimates from the United States Department of Agriculture (USDA) revealed that Nigeria produces 4.9 million metric tonnes of rice which is estimated at 0.99% of the world total. Making it the largest producer of rice in the continent and listed as 14<sup>th</sup> largest producer by global standard. To understand the dynamics, historical figures for production and its indicators are examined.

### 1.2.2.1 Production

Paddy production performance started quite appreciably in the 1980s but reached impressive levels in the period between 1985 and 1989 with an average 35% growth rate to reach 1.827 million metric tonnes (Table 1.2). This growth progressed through 1995 and then picked up post 2005. Main drivers of this modest growth can be attributed to technological progress in the form of heavy investments in formal irrigation system in 1976 to support food security in that period.



**Table 1.2: Selected indicators of rice production**

<b>Year</b>	<b>Harvested Area (‘000 Hectares)</b>	<b>Paddy Production (‘000 Tonnes)</b>	<b>Rice Production (‘000 Tonnes)</b>
1980 - 1984	610.00	883.00	587.20
1985 - 1989	961.60	1827.00	1145.00
1990 - 1994	1560.40	2887.40	1732.40
1995 - 1999	1972.60	3172.40	1903.40
2000 - 2004	2211.80	3085.60	1851.40
2005 - 2009	2377.80	3703.80	2312.00
2010 - 2014	2715.80	5068.80	3193.40
2015 - 2018	3268.00	6938.50	3820.25
<b>Average Growth Rate (%)</b>			
1980 - 1984	11.54	10.48	10.45
1985 - 1989	22.05	34.72	32.44
1990 - 1994	2.84	-4.27	-4.27
1995 - 1999	5.18	6.44	6.44
2000 - 2004	1.45	0.77	0.78
2005 - 2009	-4.05	3.03	4.16
2010 - 2014	11.88	12.06	12.06
2015 - 2018	2.13	4.84	4.84

(Source: IRRI online resource)

The late 1980s has the most exceptional record in the history of paddy production in Nigeria. Following a steady movement (11.54% growth) in the early 1980s, intense varietal development were done by National Cereal Research Institute (NCRI) and International Institute for Tropical Agriculture (IITA) in 1996. At least nine shallow swamp varieties with yield range of 4 - 5 metric tonnes/hectare and two upland varieties with a combined yield range of 2 - 3.5 metric tonnes/hectare were released in that year (Maji et al., 2017). These efforts complemented the irrigation development and together, boosted outstanding performance. Unfortunately, it seems these efforts were not sustained, because the next 15 years were unimpressive considering the 4.3% drop in early 1990s, production failed to pick up at the same level as in the late 1980s. Encouraged by area expansion, paddy production regained in 2010 to reach 6 million metric tonnes in 2018. The growth could be credited to the introduced ‘Anchor ‘Borrowers program’ in 2015, in which paddy farmers were provided access to farm

inputs through linkages with input companies. However, production still fails to meet the growing demand, trailing behind Egypt, Mali, Senegal and Malaysia (World Grain Statistics & Graphics, 2018). This poor performance as revealed in the substantial gap between paddy production and rice production in the period between 2015 (6838.50 metric tonnes) to 2018 (3820.25 metric tonnes) can be attributed to a number of factors among which includes a poor processing technology. As earlier mentioned, the dominance of inefficient cottage-based processing facilities is the primary factor behind the substantial loss in the processing stage of paddy to rice which is revealed in Table 1.2. A comparison of paddy production figures with rice production figures shows that approximately 62% of paddy is converted to rice while the rest probably goes to waste. This is a compounding impediment to the country's goal of achieving the country's rice SSL.

#### **1.2.2.2 Area Harvested**

Although the country is endowed with diverse arable land suitable for rice production, figures in Table 1.2 indicate a nonchalant attitude towards harnessing this favourable resource. This is because there were no substantial growth in area harvested observed in the early 1980s until 1985 when area expanded by 22% by 1989. The formal irrigation system era facilitated this growth because a lot of the systems were mandated to produce rice among other crops, despite the fact that only a fraction of the available land were developed and used for irrigation. Although, growth was quite steady throughout the period examined (1980 to 2018), in comparison, each of the decades have some unique events that may have affected their performances, two of which are worth elaborating. The period between 2000 and 2009 saw a drop of 2.6%, thus harvesting an estimated 2377.80 hectares by 2009. Within that 38 years examined in this study, the year 2009 suffered the greatest loss in harvested area. On average, harvested area shrunk by 23% in 2009 and the only plausible explanation for this is the state of the country in that period. The period coincided with the crisis in a major rice producing region in the country. According to Nigeria's National Bureau of Statistics (NBS) (2009), the northeast supplies about 15% of the country's paddy. However, the crisis which started in 2006, subsequently intensified, stagnating agricultural activities in the area which ultimately depressed the total area harvested for the country. An introduction of the ATA policy post 2010 saw some improvement, with harvested area reaching 3.13 million hectares in 2018. Nevertheless, there is immense scope for expansion, especially when the potential areas are considered. Challenging factors for increasing area harvested at the farmers level include the predominant use of crude techniques and tools peculiar to smallholder farming. Policies that could help improve this situation are price support policies to help farmers purchase modern improved implements and small machineries and also policies that encourage farm consolidations for mechanisation.

#### **1.2.2.3 Yield**

Current national average yield is estimated at 1.88 metric tonnes/hectare which is lower than an estimated average yield of 2.44 t/ha for Africa (Food and Agriculture Organisation Corporate Statistical Database (FAOSTAT), 2018). Available data in Table

1.3 shows that Nigeria is an inefficient rice-producing country: its yields have remained around 2 metric tonnes/hectare between 1980 and 2018.

**Table 1.3: Selected indicators of paddy yield, 1980 to 2018**

Years	Yield (T/ha)	Average growth rate in yield (%)	Fertilizer use (Kg/ha)	Average growth rate in fertilizer use (%)
1980 - 1984	1.45	-1.54	12.31	9.44
1985 - 1989	1.85	12.08	10.37	2.46
1990 - 1994	1.87	-5.85	13.60	-4.07
1995 - 1999	1.62	1.47	4.91	-10.58
2000 - 2004	1.39	-0.86	5.46	2.83
2005 - 2009	1.58	7.39	6.52	13.75
2010 - 2014	1.87	0.86	11.30	36.81
2015 - 2018	1.94	-0.86	8.29	-36.57

(Source: IRRRI Online Resource)

Overall, the figures show that yields have been more or less stagnant, which is a contributing factor for the unimpressive production performance. The period between 1985 and 1994 recorded the best performance most likely due to varietal developments around that period. Attesting to this is a study by Maji (2017) who identified at least 17 new rice varieties released for both deep water and upland production systems between 1974 and 1986. Their yields ranged between 2.5 and 4.0 t/ha for the deep water varieties and 4 to 5 t/ha for shallow swamp varieties. This technological growth most likely influenced the 12% growth in yield between 1985 to 1989. However, this growth was not sustained because post 2000 saw a drop of approximately 0.86%. Possible explanation for this drop could be poor dissemination of the new varieties. Ideally, varietal development efforts should be complemented with effective dissemination efforts to farmers. This can be accomplished through demonstration plots to enhance acceptance by conservative smallholder farmers and seed subsidy to ease affordability. Another contributing factor to Nigeria's poor yield performance is low levels of input use. Fertilizer use, in particular has not been impressive, especially after 1994. Average fertilizer consumption has ranged between 5 kilogram/hectare to 14 kilogram/hectare from 1980 to 2018 while current (2018) average estimate is 9.1 kilogram/hectare. A probable explanation for the unsteady levels of fertilizer use over the years (Table 1.3) could be the inconsistent fertilizer subsidy programs that were implemented. The policy was introduced in the 1970s, but has been inconsistent in terms of implementation, subsidy rates and who bears the subsidy cost. For example, between 1997 and 1999, the FGN discontinued all fertilizer subsidies and distribution programs. Consequently, the growth rate for fertilizer use was -10.58 kilogram/hectare around that period. For a change, the FGN introduced an e-voucher-based fertilizer subsidy program in 2012. The program helped scale up fertilizer use in the country (Wossen et al., 2017; Onyekwena et al., 2018.) but ended in 2016 which could be the reason for a -36.57 change in the growth rate for the period between 2015 and 2018.



### 1.2.2.4 Rice self-sufficiency level in Nigeria

Table 1.4 shows the SSL for the period 1980 to 2018. An important characteristic that stands out is the erratic behaviour of the trend. This makes it difficult to predict the direction of movement at any time due to its rapid changes, especially between 2006 and 2016.

**Table 1.4: Selected indicators of rice self-sufficiency level, 1980 to 2018**

Year	Rice Production (Tonnes)	Total Consumption (Tonnes)	Supply Gap (Tonnes)	Self-sufficiency level (%)
1980 - 1984	587.20	1256.40	-669.20	48.30
1985 - 1989	1145.00	1268.60	-123.60	87.62
1990 - 1994	1732.40	2351.40	-619.00	74.46
1995 - 1999	1903.40	2513.60	-610.20	76.88
2000 - 2004	1851.40	3361.40	-1510.00	55.36
2005 - 2009	2312.00	4102.00	-1790.00	56.42
2010 - 2014	3193.40	5600.00	-2406.60	57.02
2015 - 2018	3820.25	6637.50	-2817.25	66.55
<b>Average Growth Rate (%)</b>				
1980 - 1984	2.34	10.12	23.43	-3.11
1985 - 1989	32.44	5.67	-217.99	24.78
1990 - 1994	-4.27	11.13	-69.53	-4.01
1995 - 1999	6.44	6.54	25.20	1.11
2000 - 2004	0.78	5.59	14.81	-4.65
2005 - 2009	4.16	3.03	6.81	1.01
2010 - 2014	12.06	7.14	3.87	4.79
2015 - 2018	0.03	3.13	7.75	2.57

(Data Source: IRRI Online Resource)

Highlight of rice SSL is the period 1985 to 1989, where it recorded a dramatic 25% surge to reach 88%. Two important factors for the positive performance were a minimal supply-gap and the import policy in place within that period. Between 1985 and 1989, the supply-gap was 1.24 million tonnes, primarily stemming from a higher level of rice production relative to consumption, the ultimate result being an augmented SSL. In addition, between 1986 to 1994, there was a complete ban on rice imports which meant that consumers, regardless of their income status, had to rely on the locally

produced rice as opposed to the better-quality imports. Consequently, the import ban encouraged producers to increase production which ultimately raised SSL. The following year (1989) saw a plunge by 4% which basically shaped the overall erratic behaviour of Nigeria's SSL.

Options for increasing rice self-sufficiency are land area expansion, yield improvement and post-harvest loss mitigation. Over the years, policy options have either been formulated to either target area expansion or yield improvements. Usually, a combination of both approaches have produced positive results. One important aspect necessary for increasing production is to assess if the country possesses the potential to increase production. Van Oort et al, (2015) in their analysis of the feasibility of attaining rice self-sufficiency in eight African countries including Nigeria revealed that achieving self-sufficiency was possible for Nigeria but conditioned on a yield increase of 80% of the biophysical yield potential and a double cropping on the current irrigated area. The yield gap thus presents a reliable potential to increase rice production and attain rice self-sufficiency with the appropriate investments such as improved varieties and irrigation investments.

#### **1.2.2.5 Imports**

Ojo and Adebayo (2012) traced the emergence of Nigeria's mainly import-oriented trade in rice to the aftermath of severe droughts experienced in the Sahel zone of the country between 1972 to 1974. During this period, the country was able to fund large rice importation courtesy of the windfall from oil exploration. Afterwards, rice importation grew sharply as oil exports earnings grew, which consequently led to a neglect of the domestic food production sector and an overreliance on international markets. This importation was further sustained by structural changes, including an overvalued exchange rate, inflation and wage increases, and accelerated rural-to-urban migration (Gyimah-Brempong & Kuku-Shittu, 2016). By the early 1980s, the demerits of the windfall and neglect began to surface with the decline in petroleum prices. Consequently, the country was confronted with food shortages due to low levels of domestic food production, balance of payments problems, and fast-depleting foreign-exchange reserves. Thus, began the evolution of trade policy as the government tried to curb imports through more restrictive import licensing requirements followed by a complete ban on rice imports in 1986. These events shaped the country's protectionist policy which is usually complemented with a series of programs - the first being Structural Adjustment Programs (SAP) (Akpokodje et al., 2001; Adebayo & Ojo, 2012).

The wide domestic supply-demand gap ultimately has an impact in determining the import requirement for the country. So far, massive imports have secured the country's relevant position of a top rice importer on a global scale. Table 1.5 show that at least since the last two decades, Nigeria accounted for an average of 5.9% of world imports. However, being the second largest producing country in Africa, there is a high chance for some level of exports/re-exports of both local and imported rice through the country's porous borders, but official figures are scarce and are difficult to trace because they are mostly via grey-markets.

**Table 1.5: Top ten rice importers in the world, four-year average (milled basis), 1999-2018**

Country	1999-2002		2003-2006		2007-2010		2011-2014		2015-2018	
	Import ('000 Tonnes)	Share of Global import (%)	Import ('000 Tonnes)	Share of Global import (%)	Import ('000 Tonnes)	Share of Global import (%)	Import ('000 Tonnes)	Share of Global import (%)	Import ('000 Mt)	Share of Global import (%)
China	1030.00	1.21	2643.00	2.84	1506.00	1.51	9480.00	7.11	20300.00	13.16
Cote d'Ivoire	2261.00	2.66	3018.00	3.24	3465.00	3.48	3850.00	2.89	5220.00	3.38
Iran	4142.00	4.88	4550.00	4.89	5580.00	5.61	7125.00	5.35	5050.00	3.27
Iraq	4190.00	4.93	3624.00	3.89	4046.00	4.07	4819.00	3.62	4220.00	2.74
Nigeria	5006.00	5.89	6364.00	6.83	6800.00	6.83	11200.00	8.40	9200.00	5.97
Others	59699.00	70.29	61654.00	66.20	67302.00	67.63	84264.00	63.22	96456.00	62.54
Saudi Arabia	3570.00	4.20	4945.00	5.31	4265.00	4.29	5037.00	3.78	5346.00	3.47
Senegal	2901.00	3.42	3270.00	3.51	3368.00	3.38	4025.00	3.02	4420.00	2.87
South Africa	2138.00	2.52	3066.00	3.29	3187.00	3.20	3488.00	2.62	4010.00	2.60
Total	84937.00	100.00	93134.00	100.00	99519.00	100.00	133288.00	100.00	154222.00	100.00

(Data source: USDA PS&D online database)

Although, Nigeria has adopted a tariff import policy at least as early as 1974, historical information in Table 1.6 reveal inconsistent pattern in the instruments used - from outright bans to free trade as well as fluctuating tariff rates. This pattern could be an indication of the government's relentless efforts of suppress importation in favour of domestic production. However, such attitude has far reaching consequences: high import tariffs encourage heavy grey-market trade. For instance, it is estimated that in 2013 alone, nearly 3 million metric tonnes of parboiled rice entered Nigeria through the Republic of Benin (USDA, 2014).

**Table 1.6: A Taxonomy of Nigeria's import policies on Rice (1974 – 2014)**

Period	Policy Measures
Prior to April 1974	66.6% tariff
April 1974-April 1975	20% tariff
April 1975-April 1978	10% tariff
April 1978-June 1978	20% tariff
June 1978-October 1978	19% tariff
October 1978-April 1979	Import in containers under 50kg were banned
Apr-79	Imports under restricted license with no quantitative restrictions
Sep-79	6 month ban on all rice imports
Jan-80	Import license issued for 200,00 tonnes of rice
Oct-80	Rice under general imports license with no quantitative restrictions
Dec-80	Presidential Task Force (PTF) on rice was created and it used the Nigerian National Supply Company to issue allocations to a customers and traders
May-82	PTF commenced issuing allocations directly to customers and traders in addition to those issued by NNSC
Jan-84	PTF disbanded. Rice importation placed under general license restrictions
Oct-85	Importation of rice (and maize) banned
Jul-86	Introduction of SAP and the abolition of Commodity Boards to provide production incentives to farmers through increased producer prices
1995	100% tariff
1996-2000	50% tariff
2001	85% tariff
2002	100% tariff
2003	150% tariff
2004	75% tariff
2005-2006	100% tariff
2007	109% tariff
2008	0-30% tariff – This was 0% Jan-Sept, and 30% by Oct
2009	30% tariff
2010	30% tariff
2011-2012	50% tariff
2013	110% tariff
2014	110% tariff

(Source: Federal Government Budgets of Nigeria for various years; IRRI, 2018)

Available data presented in Table 1.7 shows that rice importation in terms of volume and value into Nigeria has been growing annually since 1980 regardless of the tariff rate in place for the trade year. An estimated annual import of 2.65 million metric tonnes is needed to meet the country's supply shortfall. Import demand between 1980 and 1989 was kept at 5.29 million metric tonnes, growing by an annual 2.5% in that period. Between 2004 and 2011, imports grew by 13% annually which is surprising considering the international rice crisis period of 2007/2008, which saw export price surging by 53% to reach an all-time high of USD650/metric tonne. Imports within that period reached 2.98 million metric tonnes since 1980. Moseley et al., (2010), predicated the surging import demand during that period to the government's removal of input subsidies, price supports and protective import barriers in the aftermath of the Structural Adjustment program, which exposed the lack of competitiveness of local rice production. Overall, the figures maintained a steady growth except for the period 2012 to 2017 which saw an annual decline of 1.2%. This was probably due to higher world prices in 2012 to 2013 (US\$534) period. Since 2010, imports have costed the country at least US\$776 million on average and have always accounted for a significant share of the total food import for the country. Latest figure for 2018 puts import volume at 3 million metric tonnes.

**Table 1.7: Selected indicators of rice imports (milled basis), 1980 to 2018**

Year	Volume of Rice Imports ('000 Tonnes)	Annual Growth Rate in Volume (%)	Value of Rice Rice Imports ('000 Million US\$)	Annual Changes in Value (%)	Value of Food Imports ('000 Million US\$)	Share of Value of Rice Imports (%)	Export Prices (US\$/Metric tonnes)	Annual Changes in Export Price (%)
1980 - 1989	528.9	2.5	156.2	-7.4	1593.80	12.20	440.70	-5.00
1990 - 1999	589.9	23.2	151.5	18.2	713.90	21.80	306.30	-1.50
2000 - 2001	1901.50	-0.47	267.29	58.16	1442.90	18.42	187.62	-14.60
2002 - 2003	1408.50	-14.56	281.92	8.57	2011.08	13.92	194.75	7.00
2004 - 2005	1688.50	9.92	335.63	4.34	NA	NA	261.97	20.36
2006 - 2007	1675.00	6.50	388.16	22.25	5301.21	7.30	315.65	6.78
2008 - 2009	2000.00	5.56	751.17	27.60	3383.39	23.11	602.59	42.27
2010 - 2011	2975.00	30.42	1033.77	31.73	12041.91	12.28	515.97	-0.42
2012 - 2013	2800.00	1.96	1476.61	12.56	8048.92	18.36	534.44	-3.23
2014 - 2015	2100.00	-17.19	556.38	-53.55	7923.11	9.78	404.42	-12.56
2016 - 2017	2550.00	11.52	38.60	-47.10	4812.11	0.81	397.54	1.66
2018	3000.00	15.38	NA	NA	4701.68	NA	420.67	5.45

NA: Not Available

(Data source: IRRRI online database and UN COMTRADE)

The frequent import surges have given cause to wonder if perhaps the international market plays a significant part with prices conducive enough to make this trend feasible for the country. In reality, mounting import bills have prompted policy makers to reconsider self-sufficiency option in favour of its ability to sustain importation. Because export prices have been increasing in par with the country's import volumes, suggesting a combination of factors, for which Abayomi et al. (2010) suggested four economic reasons: First is the insufficient domestic production, due to production and cost inefficiencies along the rice value chain. Second, is the unilateral and frequent changes in government's trade policies which lowers the competitiveness of local producers. Third are frequent changes in agricultural financing policies as there are frequent changes in inputs subsidy policies which demotivate farmers. Fourth is the lingering issue of

quality of local milled rice compared to imported rice. These factors encouraged the increase in both official and unofficial imports.

The huge import demand has attracted several countries' interest to trade with Nigeria and as Table 1.8 shows, these sources are diversified. Asia, in particular has been a reliable source of rice supplies worldwide which is reflective of its dominant role as Nigeria's trading partner. In the Table are import data as reported to the United Nations International Trade Statistics Database (UN COMTRADE) for the period of 2000 to 2018. Nigeria's import sources have consistently been dominated by Asia except in the period 2008 to 2013 which saw a takeover by south America. The period suffered a global grain crisis characterised by restricted exports from large rice exporting countries in Asia. This created opportunities for Americas' sales to pick up 56% in 2008 to 63% in 2013 period. A further breakdown of the Asian region places Thailand as the major source of rice for Nigeria, especially between 2014 and 2018 (68%) followed by India (24%) and China (3%).

**Table 1.8: Share of rice (HS 1006) import sources, 2000 to 2018**

Region	2000-2002	2003-2007	2008-2010	2011-2013	2014-2018
Asia	35.97	74.13	11.96	33.38	96.03
China	1.67	0.63	1.42	1.90	2.81
China, Hong Kong SAR	0.00	0.14	0.31	0.35	0.00
India	3.75	35.82	3.29	19.90	24.25
Rep. of Korea	1.93	0.75	0.01	0.01	0.02
Singapore	1.31	0.70	0.28	2.06	0.00
Thailand	26.92	32.32	5.42	5.43	68.18
Viet Nam	0.02	0.36	0.25	3.60	0.19
Others	0.37	3.41	0.97	0.15	0.58
Asia total	35.97	74.13	11.96	33.38	96.03
Africa	0.65	0.29	2.87	0.13	0.06
Australia, New Zealand and Oceania	0.20	0.02	0.73	0.01	2.12
Caribbean	0.35	0.00	1.18	0.01	0.00
Europe	21.08	6.37	2.27	0.11	0.03
Middle East	37.34	4.42	16.54	0.48	0.03
North America	2.69	6.92	8.07	2.72	0.06
South America	1.72	7.85	56.38	63.15	1.66
Total	100.00	100.00	100.00	100.00	100.00

Note: Data for 2004, 2005 and 2015 are unavailable  
(Data source: UN Comtrade Online)

A scrutiny of the figures some trade policy dynamics in play. For example, India's share plunged drastically between 2008 to 2010, which coincided with the country's export ban period of non-basmati rice (Nigeria predominantly consumes par-boiled rice). The following period (2011-2013) did not record any increments in Thailand's volumes, owing to the country's '2011 Paddy Pledging Program'. The program had the objective of raising the international price for rice by reducing Thai exports. Because the Thai government purchased rice from producers at prices significantly above world prices, huge stockpiles developed, and exports of rice fell by one-third in the first full year of



the 2011 program (Childs, 2012). The foregoing discussion shows that Nigeria's high demand for rice has gained it a reliable export destination for several countries spread across the globe.

### 1.2.3 Consumption

Nigeria's agro-ecological and rich ethnic diversity is central to defining regional food cultures which is why rice consumption is highly concentrated in the northern region. Over time, however, rice has developed into a national staple, with a demand profile transmitting and growing across regional, state and cultural boundaries. It has become one of the most important staples, now ranking first among all staple food items in terms of expenditures and second only to cassava in terms of quantity consumed (Johnson et al., 2013). A number of factors are responsible for Nigeria's rice consumption behaviour which ultimately influences demand. These factors include population growth, increase in per capita income, rapid urbanization and demographic variabilities (Akpokodje et al., 2001; Akande 2002; United Nations Environment Programme, 2005). Urbanisation and demographic variabilities play major roles in rice consumption structure in the country. Household occupational dynamics have caused consumers to favour versatile staples and meal preparations that are time and effort saving - a feature that rice satisfies. Furthermore, economic theory on consumer behaviour suggests a positive relationship between per capita income and per capita food consumption. The theory assumes that consumers allocate limited money income among available goods and services, which is aimed at maximizing utility. Therefore, as income rises, per capita food consumption is expected to increase (MacInnis, 2011). This increasing demand is further explained by income elasticities of demand for rice in Nigeria. Johnson et al. (2013) estimated income elasticities for imported and local rice to be 0.87 and 0.46 respectively, supporting the economic theory and also revealing the preference for imported rice. FAPRI (2018) on the other hand estimated Nigeria's income elasticity of demand for all rice to be 0.25 while own price elasticity. These factors aggregately explain the increasing per capita consumption.

For the most part, demand for rice has maintained an increasing steady growth over the past decades (Table 1.9). Current consumption estimate is 6900 metric tonnes, accounting for 1.44% of world share, which places the country as the top rice consuming country in Africa and 12<sup>th</sup> by global standards since 2011 (USDA, 2018). Rice consumption has been gaining an average of 4.19% annually. The early 80s saw a slight growth which gradually picked up in 1990 through 1994. According to the Federal Ministry of Agriculture and Rural Development– Agricultural Transformation Agenda (2012), demand for rice is expected to reach 36 million metric tonnes by 2050. This stresses the need for pursuing self-sufficiency. The rapid growth in consumption is propelled by a modest growth in per capita consumption. Starting with 12.4 kilogram/capita in 1980, it grew by an average growth rate of 5.2% to reach 28 kg per capita in 2004. Within that period, per capita consumption fluctuated between 15.6 kilogram/capita and 28 kilogram/capita. Afterwards, figures continued to progress and reached 40 kilogram/capita in 2018, equivalent to a 6.3% growth from 2004. The generally increasing trend in per capita consumption reflects rising incomes, urbanisation and population growth. On a broader scale, a 40 kilogram/capita consumption for 2018 is higher than the average estimate for Africa in 2018 (30 kilogram/capita) but far below estimates for Asia (99 kilogram/capita) (World Grain Statistics & Graphics, 2018).

**Table 1.9: Selected indicators of rice consumption, 1980 to 2018**

<b>Year</b>	<b>Total Consumption ('000 Tonnes)</b>	<b>Per Capita Consumption (Kg/Capita)</b>	<b>Population (Million)</b>
1980 - 1984	1256.40	17.26	72.42
1985 - 1989	1268.60	15.48	81.68
1990 - 1994	2351.40	25.28	93.42
1995 - 1999	2513.60	23.58	106.26
2000 – 2004	3361.40	27.98	119.96
2005 - 2009	4102.00	30.34	135.12
2010 - 2014	5600.00	36.74	152.18
2015 - 2018	6637.50	39.88	169.28
<b>Average Growth Rate (%)</b>			
1980 - 1984	10.12	7.83	1.94
1985 - 1989	5.67	3.00	2.66
1990 - 1994	11.13	8.15	2.71
1995 - 1999	6.54	3.91	2.55
2000 – 2004	5.59	3.07	2.41
2005 - 2009	3.03	0.61	2.41
2010 - 2014	7.14	4.61	2.41
2015 - 2018	3.13	1.10	2.39

(Data source: World Rice Statistics and Graphics, USDA PS&D)

A dominant factor for the country's increasing demand is the growing population which is estimated to grow steadily by 2.4% annually. The year 2000 saw a constant growth rate of 2.41% up until 2014. By 2018, the World Grains Statistics and Graphics estimated the country's population at 175.3 million. This figure was projected to 300 million by 2035 (UN, 1997). The general implication of these trends is that they signal the need for the country to intensify its efforts towards increasing rice SSL.

#### **1.2.4 Prices**

The discussion on supply and demand are necessary because in the classical economy theory framework, the average price of a commodity in any particular marketing year represents the equilibrium price determined by the balance of their supply and demand. This section describes trends in producer and retail prices, and further examines probable factors behind these trends with concluding notes on their relationships with import volume. The international rice market is highly segmented with price dynamics differing across several rice types. In Nigeria, parboiled rice is the predominantly



consumed rice with some marginal quantities of sticky rice and basmati rice. However, for homogeneity purposes, this study references the price of Thai 5 % broken rice type as the benchmark world price.

### 1.2.4.1 Producer Prices

In recent years, Nigeria's producer price component has received little or no government regulation. The price structure is shaped by an informal and highly dynamic paddy market, with significant variations across locations, bearing the hallmarks of a smallholder system. This lack of a formal market structure means that often, smallholder paddy farmers sell to dealers who have the dual role of middlemen and 'agent farmers' or paddy dealers. These agents buy from farmers directly, process and then sell to either retailers, wholesalers or both at a profit. The consequence of such a market structure is that farmers are unlikely to receive adequate remuneration for their labour while price of paddy fluctuates uncontrollably. Producer price figures from 2001 to 2018 presented in Table 1.10 show them reaching peak levels in 2009 but immediately crashed by 14%. In 2013, the government introduced a ban on imported rice through its land borders as a way of curtailing grey market trades hereby stimulating production. The effect of this policy change seems to be insignificant on producer price because, since then, producer prices basically depressed intermittently with figures dropping to ₦52943/metric tonne in 2018. Such fluctuating trajectory is a concern for policy makers because producer price has a direct influence on production volumes. Fluctuations in prices creates uncertainty on the part of farmers which could cause a crowding out effect of producers, consequently threatening SSL.

**Table 1.10: Prices of paddy and rice, 2001 to 2018**

Year	Retail Price (₦/Tonne)	Retail Price of Local Rice (₦/Tonne)	Producer Price (₦/Tonne)
2001 - 2003	71883.33	60822.72	40420.97
2004 - 2006	128900.14	85774.77	61188.02
2007 - 2009	210277.93	147955.27	70966.38
2010 - 2012	187415.90	171138.90	57281.85
2013 - 2015	222704.02	170045.77	54840.13
2016 - 2018	318965.51	252700.87	52943.31
<b>Average growth rate (%)</b>			
2001 - 2003	12.14	17.65	1.81
2004 - 2006	19.34	5.72	22.60
2007 - 2009	15.39	29.41	-14.03
2010 - 2012	3.39	-3.32	32.34
2013 - 2015	17.62	-0.97	-4.23
2016 - 2018	2.65	14.37	2.01

(Data source: National Bureau of Statistics (Various Issues), UN COMTRADE)

#### 1.2.4.2 Retail Prices

Retail prices of rice are shaped by the nature of rice marketing in the country. For imported rice, Akpokodje et al. (2001) detailed three marketing phases. In the first phase which existed prior to 1976, importation, marketing and distribution were solely controlled by the private sector. The period was devoid of government intervention in the marketing of imported rice, rather, the government set rules and regulations guiding rice importation such as the licensing of private agents. A major problem of this phase, however, was an uncoordinated pattern of rice importation and distribution that resulted in uncontrollable and haphazard pricing of rice in the country. 1976 ushered in the second phase with the government's establishment of the Nigerian National Supply Company (NNSC) in 1976. The NNSC had the responsibility of importing rice among other food items and distributing them to consumers at wholesale or retail and at tolerable, uniform prices (Oni & Ikpi, 1979). This responsibility continued until 1986 when importation of rice was banned by the federal government. In the third phase, commencing after the lifting of the ban on rice importation in 1995, the importation, distribution and sale of imported rice was handled by the private sector. This has resulted in significant price variation of imported rice across the country. For example, 2017 wholesale prices reported by Food and Agriculture Organisation-Global Information and Early Warning System (FAO-GIEWS), revealed unreasonable regional-specific variations. For a conventional 50Kg bag of imported rice, wholesale prices for Kaduna (North-western), Ibadan (Southwestern), Zamfara (North-western), Lagos (Southwestern) and Maiduguri (Northeastern) states were ₦19151.19, ₦15404.87, ₦15016.60, ₦15934.04 and ₦17120.43, respectively. Similarly, the marketing process of locally milled rice is explained in three phases. During the first phase which terminated in 1976, its marketing was undertaken by private individuals. In the second phase (began in 1977), the government participation in the marketing of rice and other cereals through the establishment of the Nigerian Grains Board. The board purchased milled and paddy rice directly from farmers and provided storage facilities in order to avoid shortages during non-harvest periods. The third phase commenced in 1986, where private individuals had the sole authority of marketing locally produced rice.

Table 1.10 contains retail prices for both local and imported rice. One commonality between the price series is that they both move congruently. Both trends set off with a steady growth in the beginning but then spiked in the period of 2007 to 2009, in response to the international rice price crisis of 2007/2008. Average retail price for imported rice rose by 15% in the period, while average price of local price increased 29% in between 2007 and 2009. Post 2009, the prices diverged with retail price maintaining an increasing direction while price of local rice dropped by 4.2% up until 2015. The domestic rice price spikes of 2007/2008 were in response to the international rise crisis in that period. This is expected due to price transmission effects of global rice market to domestic markets. Depending on the trade instrument in use, international price changes could be fully transmitted to domestic markets in relative terms. In the case of tariffs, a proportional increase in the international price will result in an equal proportional increase in the domestic price, at all points in time, provided the tariff levels remain unchanged. However, in the case of prohibitively high tariffs, changes in the international price would be only partly, if at all, transmitted to the domestic market, as domestic prices may be close to the autarky price level, thus obliterating opportunities for spatial arbitrage and resulting in the two prices moving independently of each other, as if an import ban

was implemented (Rapsomanikis et al., 2006). For local rice, the high price of imported rice, must have caused a shift in demand towards local rice causing its price to rise.

Given the vulnerability of Nigeria's dependence on rice imports, examining the dynamics, frequency and magnitude of sudden and unexpected price changes is crucial as they ultimately affect import bills and food security. Understanding these price trends could provide insight into the most appropriate form of policy instruments that could cushion the possible negative consequences of future price spikes.

### **1.3 Policy Environment**

As a way of stimulating domestic production and to reduce imports, the Nigerian government has introduced a number of policies and investment strategies. At the macro level, Nigeria's government has a history of adjusting import restrictions depending on market conditions, ranging from outright import bans to a complete elimination of import tariffs (Obi-Egbedi et al., 2013). Trade policy instrument, mainly tariff increases are intended to protect the domestic rice sector while it undergoes improvements in paddy production with the support of public-sector reforms such as input subsidies, guaranteed minimum price support and innovative financing mechanisms for supplying credit to farmers. For effective implementation, multiple policy instruments facilitated by projects at International, regional or national levels have been introduced. At the regional level, projects such as The Coalition for Africa Rice Development (CARD) initiative sets out National Rice Development Strategies (NRDS) with the aim of doubling rice production between 2008 and 2018. A list of notable national level projects are organised in Table 1.11. Unfortunately, despite the variety of programmes and multiple policy package strategies, average and stagnant self-sufficiency figures reveal the overall ineffectiveness of the policies. Undeterred, the government of Nigeria set a target to be self-sufficient in rice by the end of 2016, with a plan to ban all imports (USDA, 2014).

**Table 1.11: Summary of Various Federal Government's Projects Towards Rice Production in Nigeria**

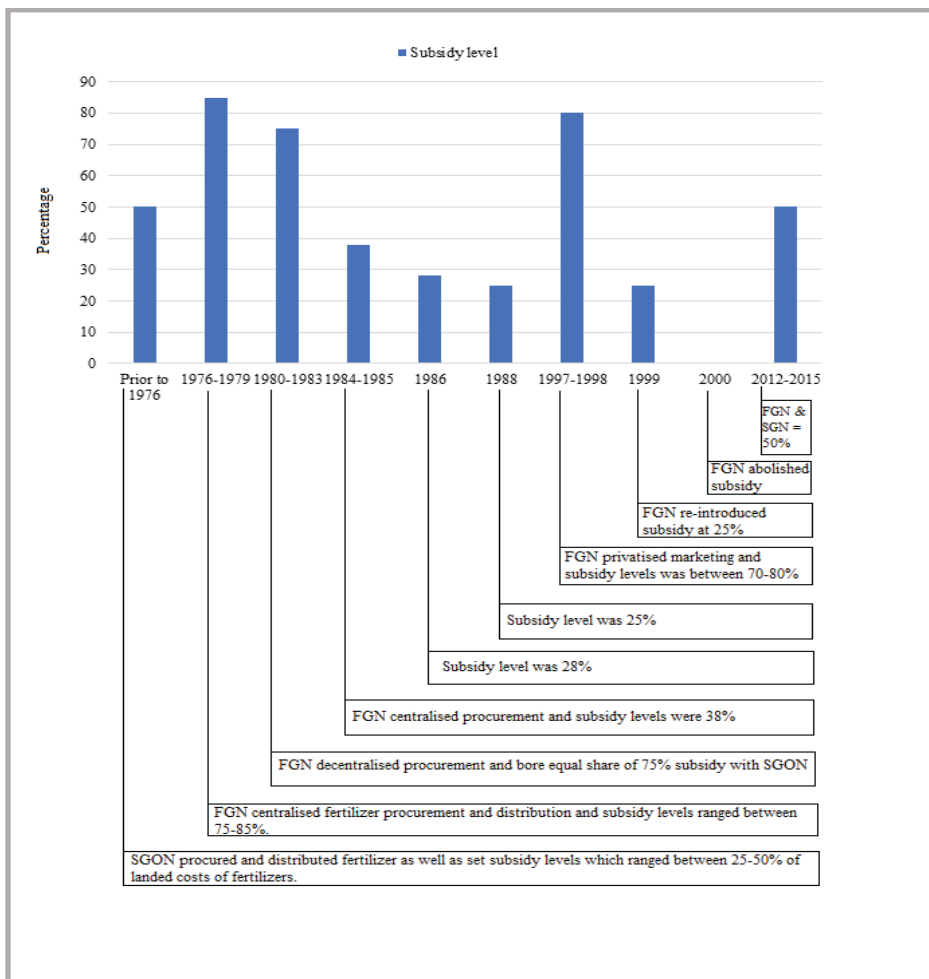
<b>Date</b>	<b>Institution/Project</b>	<b>Mandates</b>	<b>Policies/Process</b>
1988	Nigerian Agricultural and Cooperative Bank (NACB)	Special credit schemes to boost rice production	NA
2002-2007	The Presidential Initiative on increased Rice Production	Reversing the import bill, Meeting domestic demand by 2006 and reach export capacity by 2007	NA
2009-2018	Nigerian National Rice Development Strategy (NRDS)	Raise paddy output from 3.4 million tonnes in 2007 to 12.8 million tonnes in 2018	50% subsidy for seeds and 25% for fertilizer. Reduced custom tariff on imports of specific agricultural machineries (such as tractors and processing equipment).
2011	Agricultural Transformation Agenda	Rice transformation agenda is to reduce the import bill and make Nigeria self-sufficient within a 5 years' timeframe.	Policies to support both milled and parboiled rice, and enhanced irrigation and mechanization systems, through private sector involvement.
2011	The Rice Intervention Fund	₦13.6 billion rice and Cassava fund. The rice part of the mandate involves the establishment of ten medium scale Rice Mills of about 36,000 metric tons of paddy per annum	NA
2015	The Anchor Borrowing Loan Scheme for Rice farmers	Intended to create a linkage between anchor companies involved in the processing and small holder farmers of the required key agricultural commodities such as rice	Provision of farm inputs in kind and cash to small holder farmers to boost production of the commodities, stabilize inputs supply to agro processors and address the country's negative balance of payments on food

(Source: Emodi and Madukwe, (2008); CBN, (Various issues)

Much effort has been put towards encouraging domestic production with an overriding goal of realising incremental benefits in SSL. This goal is being facilitated mainly through various policy instruments targeting production improvements. Currently, the existing production incentives include a Guaranteed Minimum Price scheme, input subsidy and credit scheme.

**Guaranteed Minimum Price scheme (GMP).** Introduced in 2010, GMP was deemed necessary since Nigeria does not have a comparative advantage in rice production. Therefore, to protect farmers' interests the government strategically maintains rice price higher than the world price. In so doing, the government ensures that domestic paddy price remains above the GMP or at the GMP level in the worse-case scenario and acts as a "buyer of last resort" if the farm price falls below the GMP. Starting off in 2010, the GMP was revised to ₦60000/metric tonne so as to accommodate escalating production costs and assure farmers fair margins for their outputs. Subsequent figures were ₦65000/metric tonne, ₦65000/metric tonne and ₦74000/metric tonne in 2011, 2012 and 2013 respectively.

**Fertilizer subsidy.** Agricultural productivity growth depends on adequate and timely access to quality production inputs. In recognition of the high cost of rice production and as a way to encourage farmers, the government introduced a series of input subsidies whose broad objective is to ensure farmers' timely access to affordable quality and adequate fertilizers. To facilitate the subsidy scheme, various efforts were initiated including promotion of state monopoly for fertilizer imports and distribution, institution of price controls and subsidies at the fertilizer retail markets, provision of fertilizer-specific credits to farmers, institution of fertilizer import tariffs, decentralization of procurement and distribution, and deregulation of markets. Over the years, the fertilizer policy has undergone a series of modifications and may rightly be described as an erratic input policy system. Figure 1.2 highlights the evolution of this policy. The consequence of this attitude is two-fold. Firstly, the low levels of fertilizer usage as reflected in the earlier Table 1.3, where it shows the beginning of a decline in growth rate of fertilizer usage coinciding with the period of subsidy abolishment. Secondly, it has a crowding-out effect on farmers owing to the intensive nature of rice production heightened by low levels of subsidy. These factors affect productivity and ultimately lowers rice SSL.



**Figure 1.2: Evolution of Fertilizer Subsidy Policy in Nigeria, 1976 to 2015**

**Agricultural Credit Guarantee Scheme Fund.** The hope for a reliable domestic production largely depends on the ability of smallholder rice farmers to financially sustain production. Unfortunately, this comes with heavy costs - an aspect that is a major challenge for these farmers due to poor capital base and lack of collateral to secure loans from commercial banks. In view of this, the government developed special interests in agricultural lending to rice farmers. In 1976, the Agricultural Credit Guarantee Scheme Fund was established, and micro finance schemes were developed to provide such services. The scheme was aimed at providing credit covers to commercial banks' lending to the agricultural sector and is jointly sponsored by the government and the Central Bank of Nigeria.

**Membership to Trade Organisations.** As a member of The World Trade Organisation (WTO), Nigeria maintains a Most Favoured Nation (MFN) tariff structure, applied on *ad valorem* basis and 16.6% for all agricultural products as per the WTO definition. The



bound tariff rate was 150% for agricultural products in 2017. As a way of attracting investment, customs duty exemptions and concessions are provided for agricultural inputs such as fertilizer, seeds and machinery in order to improve agricultural productivity. In addition to WTO membership, Nigeria is a founding member of the Economic Community of West African States (ECOWAS), established in May 1975. The objective of ECOWAS is to promote cooperation and integration within the West African sub-region and to harmonize trade and investment practices for its 15 member states and ultimately achieve a full customs union. Between 2006 and 2009, the commission adopted a common external tariff (CET) with five tariff bands of 20% on consumer goods. The CET was approved in October 2013 and Nigeria began implementation in April 2015 for a five year period. Under the regional free trade agreement agenda, a regional instrument known as ECOWAS Trade Liberalization Scheme was put in place in 1990 to achieve an effective Free Trade Area within ECOWAS. Members of the organisation have been implementing this scheme since 1990.

#### **1.4 Institutional Support**

Institutions play crucial roles in the development of the rice industry. Among them is the National Cereals Research Institute (NCRI). The Institute was established in 1975 with a research mandate relating to issues of cereals, legumes and sugarcane as well as those of farming systems throughout Nigeria. In 1987, the institute's mandate was extended to genetic improvement of rice among other crops as well as farming Systems Research and Extension in all ramifications of Agriculture within the Central Zone of the country. The institute's research activities are in collaboration with both national and international agricultural research institutes such as the IITA and Consultative Group for International Agricultural Research (CGIAR), non-governmental organization and private organizations. In 1986, IITA initiated a rice research program of varietal development and release of pioneer varieties like FAROs 35 to 37. Other milestones worthy of mentioning is a collaboration of Africa Rice Center (AfricaRice) with Nigeria's national research institutions on different areas of rice research spanning from breeding to natural resources management, and economic studies groups, which later developed into Reseau Quest et Centre Africain du Riz (ROCARIZ). These collaborative activities led to the release of FAROs 38 to FARO 57. Exceptional varieties like FAROs 35, 36, 37, 44 and 52 varieties revolutionized rice production in the shallow swamps and irrigated ecologies in Nigeria (Maji et al. 2017).

#### **1.5 Problem Statement**

The Nigerian rice market remains a key sub-sector, with significant production potential, which if harnessed appropriately, could not only propel the country to achieve SSL but also, establish the country's position as a regional rice exporter. Yet, rapid rise in rice consumption influenced by rising incomes against a slower growth of production has left at least 40% gap to be met by imports. This constitutes a critical challenge for Nigeria, given the status of rice as an essential staple. Indeed, this level of dependency on imports brings the enormity of the supply constraint faced by the country into perspective. Such import dependency exposes the country to external shocks of a volatile global rice market



which could ultimately threaten national food security. This concern highlights the necessity for Nigeria to take relevant steps to increase its SSL in rice, especially considering the country's favourable paddy production environment. On the positive side, the demand surge presents an opportunity to transform the country's rice market from its current smallholder-based to having a much needed vibrant commercial focus, as doing so—in addition to other measures, such as investment in technology and skills—will greatly increase SSL.

It has been argued that pursuing self-sufficiency in staple foods is essential in building resilience against international market shocks. Recognising this reality, the government has over the years, invested in numerous efforts in the form of policies, projects, and interventions towards stimulating domestic production. The latest of these efforts features heavily on the 2012 Agricultural Transformation Agenda. The agenda's commitment to double rice production from 14 million tonnes in 2008 to 28 million tonnes as well as reach export potential by 2018 was popularised as a reliable initiative that could accelerate the progress of the nation's rice industry, in addition to a potential trickle down of benefits from such an expansion in rice production to other sectors of its economy. However, this goal has not been met and the resulting demand-supply imbalance has led to soaring rice importation that could eventually drain the country's foreign exchange earnings with associated socio-economic implications such as high consumer prices and low producer incomes. This trend will likely persist into the future given that Nigeria's population growth rate is at least twice the global average. Most importantly, these trends' undermine the reliability of the current domestic policy environment to sufficiently raise supply to meet the requirement of the growing population. Whereas boosting production may be readily attainable owing to the vast production potential, the goal of being self-sufficient on the other hand, has drawn some scepticism. The reason is that prominent consumption growth factors viz rising income and population growth may overwhelm production stimulation efforts. Thus, a more reasonable policy option of increasing self-sufficiency to an appreciable level that can be sustained may be a more feasible policy goal to pursue.

Seeking alternative policies for increasing SSL rather than achieving self-sufficiency in rice should be considered given that previous and on-going series of investment portfolios in the country's national rice development strategies have shown that the ultimate goal of achieving self-sufficiency seems to be an ambitious drive. The unresponsive domestic supply efforts and rising demand in its staple food (rice), along with ineffective policies, raises concerns for the future of the country's overall food security situation. Projections from the ATA (2011), have revealed that Nigeria's population is expected to reach 300 million by 2035. Feeding these people will require the greatest efforts in the country's agricultural food system. Failure of which will subject the country to a considerable and continued dependence on imports. Such a situation could cause a crowding out of paddy producers which could lead to a further deceleration of the domestic production efforts. Given the current circumstances, a desirable policy option is one that balances the pressures of increasing self-sufficiency, increasing farmers' incomes, reducing import dependency, and maintaining consumer prices.

In view of the foregoing concerns, this study sets to investigate alternative policy mechanisms for increasing rice self-sufficiency in Nigeria. Although, the Nigerian rice

industry has experienced a history of interventions, the question remains – why the irresponsive supply effect? Recent trends of rice SSL so far have been inconsistent despite these tremendous efforts, buttressing the need for a review. What is imperative therefore, is to seek feasible alternatives that would be reliable in providing sustainable results. As a net importer, Nigeria is a price-taker, which makes it particularly critical for it to anticipate future directions of the world rice market. For example, the impact of trade policy on paddy production in Nigeria is largely influenced by the price of imported rice. Thus, any changes in the price of imported rice caused by the trade policy will have broad impacts on producers, consumers, government revenue earnings, and the balance of trade. Which is why understanding the market behaviour of rice market is essential to policy makers to facilitate in designing and simulating feasible price and producer support policies as well as for other essential investments that could favour all stakeholders in the hope of streamlining the progress and prosperity of its rice market. However, presently in Nigeria, policy analysts and planners lack a necessary tool in the form of a model framework that can facilitate such efforts. Consequently, current rice market policy decisions may not be guided by relevant empirically-backed information on potential consequences or successes of policies. Thus, the need to model the Nigerian rice market is crucial as scenario simulations of policy options will highlight the country's potential of increasing production thereby steering the country's direction towards achieving a reasonable goal of increasing its rice SSL.

## **1.6 Research Questions**

Given the best policy circumstances, does Nigeria have the potential to increase its rice SSL? Bearing this in mind, this study seeks to provide answers to the following research questions:-

1. What is the model framework of Nigeria's rice industry?
2. What are the impacts of alternative production and trade policies on rice SSL in Nigeria?
3. What are the welfare impacts of the alternative production and trade policies?

## **1.7 Objectives of the Study**

The objective of this study is to evaluate the impact of rice industry-specific policies on SSL so as to identify alternative policy mechanisms for increasing Nigeria's SSL in rice. To accomplish this, the specific objectives are:-

1. to develop a market model that represents Nigeria's rice industry;
2. to examine the impact of alternative policies on rice SSL in Nigeria; and
3. to measure the welfare impacts of these alternative policies.

## **1.8 Significance of the Study**

Nigeria's rice economy plays a crucial role in its agricultural model and food security policy. In line with this role, it is timely to examine the impact of alternative policy mechanisms on rice SSL. Though the general concept of food self-sufficiency is controversial, this study approaches it from a practical perspective - it simulates the impacts of a multiplicity of policy instruments, both individually and in combinations, that would best address the extent to which Nigeria can meet its rice demand. This approach seems appropriate because a single instrument has a slim chance of capturing the complexity that exist in the country's rice industry. In this regard, this study intends to adopt a partial equilibrium model which is suitable for monitoring the complex interdependence of variables in the rice industry. In terms of contributions; firstly, the findings of this study could serve as inputs to the government and policy makers for which pathways to focus policy-wise. Secondly, the conclusions of this study are expected to be of interest to policy makers in a broader regional setting who might have similar backgrounds and issues by adopting it as a reference point to develop and revise for effective policy options. Thirdly, in terms of contributions to knowledge, the study will provide researchers on the methodology of agricultural commodity market modelling and policy analysis.

## **1.9 Organisation of the Thesis**

The thesis is organized as follows: the first chapter began with some insight on Nigeria's rice industry structure. The second chapter presents a theoretical framework behind policy analysis as it relates to food self-sufficiency including a review of previous studies comprising their methodologies used as well as their policy implications on both local and international rice market. Included in chapter 2 are other countries' policy responses towards achieving rice self-sufficiency. The methodology is contained in the third chapter, it covers topics such as conceptual framework as it provides some guidance to which the study objectives are analysed. Chapter four reports the study's findings and chapter five summarises the results as well as the main conclusions drawn from the research, highlighting relevant policy implications, limitations of the study and identified areas for future research opportunities.

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## LIST OF PUBLICATIONS

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