1. Introduction

Nigeria is the largest rice producing country in West Africa. Rice production rose gradually over the years to surpass major rice producing countries in the sub-region. Nigeria also accounted for nearly 44% of the total rice output and 57% of the total rice producing area in West Africa (WARDA 1996). The country produces about 3.8 MMT of rice and consumes about 6.2 MMT. On the other hand, Nigeria is also a major player in the world rice market and the largest importer in Africa, accounting for 25% Africa’s rice import [4].

Over the years, rice imports into the country have been used to offset domestic shortfalls and domestic rice supply prospects could depend largely on the sustained growth for imported rice. However, based on the population growth rate, rural-urban migration and rising income, the consumption of rice will continue to grow. The immediate question is how will this growth be met? The simple answer is that rice consumption growth can only be met through increased domestic supply or through import, and both have different ramifications for the economy. If rice import growth should continue, it means, proportion of imported rice consumed in the country will be greater than domestic supply. This will not only decrease self-sufficiency, but will also reduce research initiatives and farmers’ enthusiasm to give national research breakthroughs a trial.

A worrisome phenomenon is that Nigeria has comparative resource advantage in rice production at
least to self-sufficiency, but the continuous growth of import and value over the recent years remains a great concern, particularly how demand and supply changes in the near future. However, in response to the continuing demand for imported rice, the Nigerian government has embarked on several policy reforms, ranging from quantity restriction, ban, tariff, and liberalization. Similarly, prior to 1997, the government strategy to maintain rice self-sufficiency level has been through direct support to producers by providing fertilizer subsidies to farmers and consumers through price controls, now having complied with WTO trade agreements, these subsidies have been dismantled, and the country faces new challenges of sustaining a viable rice industry to meet national self-sufficiency targets.

Furthermore, while trade liberalization is considered as an important stimulus for the expansion of smallholder based on productions targeting global markets, an increasing attention has been given to its impact on small holders’ competitiveness in domestic markets [16]. In the same way, OXFAM [17] has viewed rice import expansion in many West African countries to have adverse effects on small holders’ livelihoods. The economic reform policy is expected to have an effect on imports, as a part of the strategy to restore external balance, this policy decision is harmful to agricultural development in many developing countries and Nigeria in particular.

In Nigeria, several studies have been undertaken to examine import demand for food products; Olayide [18] estimated the determinants of imports of selected food commodities in Nigeria and found that terms of trade, real income and the index of trade restriction are good parameter estimates. Udoh et al. [9] estimated the demand for food commodities in Nigeria using OLS estimation method. Their results revealed that domestic production; Gross Domestic Product; terms of trade; external reserves and Structural Adjustment Programme (SAP) were the major demand shifters and each factor had inelastic relationship with the quantity of import demand. In this context, and despite the importance of rice sector to Nigeria’s economy, the demand behavior for imported rice is not well understood. The joint effects of price changes, urbanization and other policy related issues have not been empirically investigated.

However, the recent rice import demand studies have been undertaken by Nkang et al. [15] providing good insights on the effect of conventional factors, such as import value and nominal GDP, external reserve on rice import demand in Nigeria. However, the current study departs from the previous study by incorporating share of population living in the urban areas, real prices of imported rice and other policies related issue particularly the possible impact on Subsidy Compliance Policy (SCP) implemented in 1997. The article adds to the current understanding on how subsidy policy and the increasing rural urban migration have affected the country’s rice import demand behavior. It also contributes to the debate on the impact of subsidy removal policy on the escalation of rice import demand in many West African countries. More also, is the increasing concern about the country’s population growth rate and future food security, understanding rice import behavior would clarify the underlying demand parameters affecting this growing import and will aid in policy targeted toward food security, producers’ income and market shares for domestically produced rice. For instance, where rice import demand responds positively to domestic production, efforts to increase its production will not reduce import demand.

The structure of this paper is organized as follows. Next section; A snapshot of Nigeria rice economy, section 3, discusses theoretical and empirical models. The estimated results and discussion are presented in section 4. Section 5 summarizes the conclusion drawn from the study.

2. Snapshot of Nigeria Rice Economy

(1) Relevance of Rice to the Economy

The Nigerian food sub-sector comprises a large array of staple crops, made possible by the diversity of agro-ecological production systems. The most important food crops are; cereals (sorghum, maize, millet, and rice); tubers (yam and cassava); oil crops, pulses and others (fruits and vegetables). These commodities
are important for food security, expenditures and incomes of households. However, among all these food commodities, rice has risen to a position of preeminence [19]. This is because it is the most consumed crop in Nigeria today. Contrarily, in the 1960s, rice was considered as a luxury food consumed mostly in affluent homes and also during religious festivities, now a staple, accounting for more than 25% of cereal consumption in Nigeria.

Table 1 shows changes in per-capita food consumption pattern in Nigeria from 1960–2005 (kg)

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td><strong>Grain crops</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maize</td>
<td>13</td>
<td>9</td>
<td>17</td>
<td>30</td>
<td>21</td>
</tr>
<tr>
<td>Millet</td>
<td>39</td>
<td>36</td>
<td>30</td>
<td>35</td>
<td>34</td>
</tr>
<tr>
<td>Sorghum</td>
<td>55</td>
<td>37</td>
<td>39</td>
<td>41</td>
<td>40</td>
</tr>
<tr>
<td>Rice</td>
<td>3</td>
<td>11</td>
<td>24</td>
<td>31</td>
<td>35</td>
</tr>
<tr>
<td>Wheat</td>
<td>3</td>
<td>10</td>
<td>11</td>
<td>9</td>
<td>17</td>
</tr>
<tr>
<td><strong>Tuberous crops</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cassava</td>
<td>93</td>
<td>93</td>
<td>85</td>
<td>148</td>
<td>117</td>
</tr>
<tr>
<td>Yams</td>
<td>44</td>
<td>44</td>
<td>35</td>
<td>70</td>
<td>73</td>
</tr>
<tr>
<td><strong>Others food crops</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oil crops</td>
<td>7</td>
<td>5</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Pulses</td>
<td>6</td>
<td>6</td>
<td>5</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>Vegetables</td>
<td>50</td>
<td>47</td>
<td>42</td>
<td>50</td>
<td>57</td>
</tr>
<tr>
<td>Fruits</td>
<td>67</td>
<td>69</td>
<td>63</td>
<td>65</td>
<td>62</td>
</tr>
</tbody>
</table>

Source: Originated from FAO and USDA data.

In West Africa, Nigeria cultivates and produces more than half of the cultivated area and output of rice. Nigeria equally imports rice more than the other countries combined. With rising income and increasingly rural urban migration, the average growth rates in per capita rice consumption are bound to rise. According to Diagana et al. [2], Kennedy and Reardon. [10] and Reardon [20], rice diet transition was supported by income growth and urbanization. The diet transition has shifted urban consumer’s preferences in favor of a product that can be easily cooked, to the expense of coarse grains and tuber crops that required more time to be prepared, thus making rice a strategic commodity in West Africa. Similarly, Lançon [11], argues that the rapid increase of rice import are more related to structural changes in consumers’ behavior induced by a continuous increase of per capita income in a society that become radically more urban in its way of living and left gradually behind a diet inherited from rural areas. The combination of increasing rural urban...
migration, income growth in synergy with the increasing availability of imported rice could have brought the average urban population to pass a threshold and to accelerate their transition to a rice diet. Rice is easy to prepare when compared to traditional food crops, thereby reducing the chore of food preparation and fitting easily the urban lifestyles of rich and poor alike.

Similarly, the World Bank cited in FAO report, that rice is no longer a luxury food in Nigeria, and that it has become a major source of calories for the urban poor. Adding also that the poorest third of urban households obtained 33% of their cereal-based calories from rice, and rice purchases represent a major component of cash expenditures on cereals. Consequently, the Nigerian government has been concerned with rice, for good reasons. First Nigeria’s rice self-sufficiency is low, imported rice dominates the urban markets. Secondly, rice is perceived as a food security crop because it is the fastest growing and widely consumed food in Nigeria. The per capita consumption is expected to continue to grow in the coming years. This makes it imperative for the government to show interest on how to make this commodity readily available and affordable.

(2) Domestic Rice Production Policy

The Nigerian rice policy is motivated by many factors, such as the restriction on unfair competition with imported rice; the pursuit for self-sufficiency and national food security. It also based on poverty alleviation and to raise farmers’ income, to reverse the high foreign exchange flows from imported rice; and the desire to raise the nutritional level of the average Nigerian by making rice available at affordable prices. However, these objectives seem unassailable, but government policies on the sector had been incoherent. In many cases, government policies have worked against the nationalistic move for self-sufficiency.

Similarly, the slow growth in domestic rice production cannot only be associated with increasing rice imports. The government has actively interfered on the rice sector over the last three decades; rice policy has not been steady, oscillating between high import tariffs, import restrictions, and outright ban. For instance, between 1986 and 1994, rice imports were illegal. In 1995, imports were allowed at 100% tariff. In 1996, the tariff was reduced to 50% and in 2002, the tariff was returned to 100%. With these various policy measures, domestic rice production has responded but not sufficiently to meet local demand.

Figure 1 show that rice output growth rate increased in the early 1970s, however, between 1975 and 1976 there was a negative growth rate of both area and output.

Both area and output picked again in 1977 and
declined in 1990. Another significant decline was observed in 1994, when rice import ban was removed, output and area growth rate declined to 24% and 27% respectively. In 2001 rice output rate declined, then increase again in 2002 and remains virtually stagnant until 2005. The stagnant growth rate and the increasing demand for this commodity justifies the overarching need to intervene proactively in domestic production, quality improvement and its competitiveness in the domestic markets.

Another constraint beside policy instability is the rising cost of labor due to rural urban migration. Labor accounts for 50–55% of the rice production cost. Similarly Ezedinma and Kormawa [4] reported that the most important factor that led to the collapse of farm agribusiness linkages in the major rice producing area of Abakiliki, Southeast Nigeria was the high cost of labor for rice production. Labor became more expensive as a result of massive rural urban migration. The attraction to the cities is due to the discovery of a new lucrative enterprise and alternative off farm employment. Also lack of farm subsidy, no complimentary agricultural policy to support rice farmer and the increasing rice importation has eroded the profit margin of rice farmers.

(3) Rice Import Demand and Growth

Figure 2 shows that between 1976 and 1984 rice imports increased rapidly, self-sufficiency dropped as a result of high consumption growth rate could not match with domestic production growth rate; rice imports resumed again in 1996. Between 1996 and 2005, rice imports increased rapidly at an average annual rate of 26%.

Changes in rice import levels after 1996 can be characterized on the bases of the concept of “imports surge” as defined by De Nigris [14], whereby a surge occurs if the import volume for a given year is 30% higher than the average volume recorded in the three previous years. Applying this definition, the first rice imports surge was observed in 1997 when quantity imported increased to 102% from the previous year. The second was observed in 2001 with 125% increase and was triggered by several factors. On the domestic side, major staple food supply declined, which caused a rapid increase in the price of traditional staples. Consumers shifted toward rice in order to mitigate the effect of other major staple price increase [21]. More also imported rice was more competitive because of its low price. On the other hand, local rice market share has been decreasing since late 90s, showing that the

![Fig. 2. Importations, production trends index and self reliance ratio (1972–2005; 1995=100)](image_url)

Source: FAO 2009.
bulk of rice consumption had been covered by imports. However, rice imports expansion did not cause a fall in domestic production as shown in Figure 2. The import ban during SAP period, initially stimulated production increase, but has not been efficient to maintain a steady and long-term demand growth. Rice self-sufficiency ratio is the ratio of domestic rice supply to the total demand. Self-sufficiency was adversely affected between 1977 and 1985. In addition, since 1997 self-sufficiency ratio has been on decline implying that import substitution policy has failed to ameliorate rice self-sufficiency in the country.

Furthermore, there is the need to ascertain implications of implementing of the subsidy removal policy in agreement with WTO with the view of generating appropriate domestic policies to promote rice production. However, given the competitive and liberalized world economy, the demand for economic, social and political stability as well as meeting the challenge of food security, Nigeria faces strategic choices in relation to the rice sector development.

3. Methodology

(1) Theoretical and Empirical Models

Various models have been developed to estimate import demand of agricultural commodities; Rosson et al. [5] estimated import demand determinants for apples, poultry, and tobacco; Lanclos et al. [7] investigated import demand for U.S. frozen potatoes; and Le et al. [6] studied import demand for U.S. red meat products into four Pacific Rim countries. Most of these studies shows that a negative and significant relationship exist between import quantities and trade barriers. Export promotion programs for agricultural commodities often end up in fostering higher levels of imports particularly non-traditional staples.

This study therefore, assumes that rice-import demand function can be specified as follows:

\[
Q_I = e^{\delta_0} \left( \frac{P_f E_t}{P_d t} \right)^{\delta_1} PGDP_t^{\delta_2} PDS_{t-1}^{\delta_3} URB_t^{\delta_4}
\]  

(1)

Where \( Q_I \) represents per-capita quantity of rice imported in metric tons (MT). \( P_f \) is the foreign price in US dollars, \( P_d \) is the index of consumer prices. \( E \) is the nominal exchange rate and \( RGDP \) is real per-capita Gross Domestic Product measured in Naira. \( PDS_{t-1} \) is one year lagged per capita domestic rice supply, and \( URB \) is urban share of the total population and \( t \) is time trend. \( \delta_0, \delta_1, \delta_2, \delta_3 \) and \( \delta_4 \) are the coefficients to be estimated.

The natural logarithm of the above equation is express as follows;

\[
\ln Q_I = \delta_0 + \delta_1 \ln P \cdot \frac{E_t}{P_d t} + \delta_2 \ln PGDP_t + \delta_3 \ln PDS_{t-1} + \delta_4 \ln URB_t
\]  

(2)

Where \( RP \) is the real import prices \( \frac{P_f E_t}{P_d t} \) \( \delta_0 \) represent the coefficient of intercept, \( \delta_1, \delta_2, \delta_3 \) and \( \delta_4 \) are the short run elasticities, \( \mu_t \) is the error term assumed to have a mean of zero and constant variance.

Furthermore, one of the main features of this study is to measure possible changes in the import demand during SAP and the possible impact of the subsidy removal policy on rice import growth in Nigeria by the use dummy variable. SAP was adopted to reduce disequilibrium arising from food importation in the country and to strengthen the domestic food production capacity. During SAP period, it was illegal to import rice into the country. This was done to encourage domestic rice production. Similarly, while implementing the structural adjustment programs in the late 1980s, many developing countries particularly Nigeria started the process of phasing out subsidies for two reasons: failure of the subsidy scheme to “mature” into efficient behavior as directed by the world Trade Organization and unsustainable budgetary cost of subsidies. The SCP was implemented in the early 1997 and since then rice-import growth increased rapidly as shown in figure 2. In 2003, the Nigerian government passed a bill authorizing 50% subsidies on inputs to alleviate food shortage. The impact of SAP and SCP are hypothesized to carry over for a period of time, it is plausible to model rice-import demand function that allows the impact of SAP and SCP. In this study, \( DSAP \) is a dummy for SAP, which takes one during the adjustment period and zero otherwise. \( DSCP \) is a dummy variable for SCP, which
takes a value of one when subsidy was removed and zero otherwise.

Using the import demand model, presented in equation 2, the rice import function that also allows for the effects of these two dummies on rice-import demand in Nigeria can be expressed as:

\[ \ln Q_{I_t} = \delta_0 + \delta_1 \ln P_{R_t} + \delta_2 \ln P_{GDP_t} + \delta_3 \ln P_{DS_{t-1}} + \delta_4 \ln U_{RB_t} + \delta_5 D_{SA_P} + \delta_6 D_{SCP} + \mu_t \]  

Although the direct estimation of the equation (3) is not the main purpose of this paper, just in case, the estimated result is shown in the left side of Table 3. Furthermore, the import demand specified in equation 3, may be incorrect in several ways. First, past import levels may affect future import patterns. Secondly, shift in consumer’s tastes may affect the slope and the position of the rice-import demand curve. Thirdly, time lags and logistic delays in production, importation and distribution may affect its availability.

Thus, to overcome these limitations, lagged dependent variables are added to the ordinary rice-import demand function, which can be extended to Partial Adjustment Model. The Partial Adjustment Model assumes that the economic agent partially corrects the gap between the desired and actual values in the previous year. The equation defining the desired values is defined as follows:

\[ \ln Q_{I_t} = \delta_0 + \delta_1 \ln P_{R_t} + \delta_2 \ln P_{GDP_t} + \delta_3 \ln P_{DS_{t-1}} + \delta_4 \ln U_{RB_t} + \delta_5 \ln Q_{I_{t-1}} + \delta_6 D_{SCP} + \mu_t \]  

The coefficient of each explanatory variable directly gives short run elasticities. The long-run elasticities can be calculated by dividing \( \delta_1 \) \( \ldots \) \( \delta_5 \) by one minus the coefficient of lagged per-capita quantity of rice import demand (1-\( \delta_5 \)). The assumption underlying this model is that all the long run elasticities exceed short run elasticities. Given the importance of elasticities for policy analysis and the fact that no distinction can be made between the long run and the short run in the ordinary import demand model, the Partial Adjustment Model is used to estimate these parameters in the next section.

(2) The Data and Sources

Data come from different sources. Rice import price and quantity imported are sourced from the FAO and United States Department of Agriculture (USDA). The nominal exchange rates (Naira) per US dollar, per-capita GDP, index of consumer’s prices and demographic variables are obtained from International Financial Statistics. Rice imported quantity comprised (milled, broken and husked). The sample period covers
yearly data from 1972 to 2005. The descriptive statistics are presented in table 2.

4. Estimation Results and Discussion

Table 3 presents result from the estimated of rice import demand equation. The 1st-3rd columns show the estimates from the original import demand model. The 4th-6th columns show the estimates obtained from Partial Adjustment Model. The $R^2$-adjusted (goodness-of-fit measure) explain about 0.77 in both estimated results. The Hypothesis testing for overall significance of the regression using the F-test indicated that there is a significant relationship between per capita rice import quantity and the explanatory variables for both models. The Durbin h-statistic values suggest the acceptance of the hypothesis that there is no serial correlation. All the estimated parameters have sign consistent with economic theory and priori expectations. Almost all parameters were statistically significant at 10% level except $DSAP$ and $PDS_{t-1}$ in the Partial Adjustment Model. However, $PDS_{t-1}$ is statistically significant at 10% in ordinary import demand equation.

The coefficient of lagged per-capita rice import quantity is positive and statistically significant at 10%; the coefficient of adjustment ($\gamma$) is 0.81. This value indicates that there is a high adjustment process between the current per-capita import quantity demand and desired long run per-capita import demand. Given the relatively high adjustment process, the difference between the short-run and long run elasticities can be justified. In general, the long-run elasticities are larger than the short-run elasticities by reasonable proportion.

Coefficient of relative price of rice is significant at 1% but inelastic. This suggest that an increase in the import price of rice, holding price constant, would lead to a decrease in import demand for rice but at a lesser magnitude. This results support the findings by the several previous studies that have estimated inelastic price elasticities of import demand for agricultural commodity. The elasticity of the real per-capita GDP variable is 0.428, positive and significant at a 10% level, this elasticity suggests that a 10% increase in real per-capita GDP will increase import demand for rice by 4.3%. A negative coefficient of per-capita domestic rice supply suggests that rice imports adjust in with changes in per-capita domestic rice supply. As has been pointed out in the literature, substitution relationship between domestic supply and imports will mean that measures to decrease or reduce the imports will lead directly into increase demand for domestic rice. The coefficient of urbanization variable is statistically significant at 5% with a
very high magnitude, indicating that the variable has
an overwhelming impact on rice import growth in
the country. The significant positive sign of urbanization
is consistent with the findings reported by Diagana et al. [2], Kennedy and Reardon [10], and Reardon [19]
previous studies on rice import demand growth in
West Africa.

The coefficient of DSAP has expected negative sign,
but not statistically significant. The reasons for non-
significance could be that the policy time frame is
short. The coefficient DSCP is statistically significant
at 5% level; indicating that implementations of subsidy
removal policy positively contributed to the rice import
growth during the study period.

This study was further compared with the related
study conducted by Nkanga et al. [15], firstly the
current study attach weight in the model by using per
per-capita import quantity and domestic supply, as opposed
to total import quantity and domestic supply used by
the previous study. Secondly, real import price and real
per-capita GDP is used as opposed to import value and
nominal GDP used by the previous study, thereby
reflecting the standard of living and the effects of
inflation is factored in. Thirdly, urbanization is used to
capture diet transition, declining labor force and changes
in life style. The study also explores the impact of
subsidy removal policy implemented in 1997 on rice
import growth in Nigeria and larger sample size.

5. Conclusion and Policy Implication

This study examined the behavior of rice import
growth in Nigeria by particularly examining the factors
The model specification is based on the ordinary
import demand model and is extended to Partial
Adjustment Model. Equation 3 and 5 were performed
respectively with Generalized Least Squares with
first-order autoregressive error term (AR (1)) and
Partial Adjustment Lag Model. The explanatory
power of both equations explains about 77% variation
and the results shows that real per-capita GDP, real
import price, urbanization and subsidy removal policy
impacted rice-import demand behavior in Nigeria
during the studied period.

Although real import price is highly significant, it is
inelastic with small magnitude. This implies that,
policy actions to reduce rice imports in the short-run
could not be feasible by reducing import price. The real
per-capita GDP elasticities have the expected sign and
are statistically significant implying that imported rice
is a normal good, but when compared to many Asian
countries, it is relatively high. It also indicates that rice
import is related to per-capita GDP growth, and as long
as income rises, rice consumption will increase which
may lead to increase in rice import. Here, ultimate
policy objective should not be confined in containing
rice imports but should seek simultaneously to improve
economic growth in which rice imports depends upon.

The positive and significant sign of urbanization
implies that urbanization has a strong impact on
imported rice consumption in the country and as long
as urban population increases, all things remaining the
same, rice imports are likely to follow the similar trend.

The magnitude of the short run and long-run elastic-
ities indicates that the demand for imported rice will
continue to increase in the near future.

The study also examined the impact of import policy
on rice import growth. One of the indicators used to
assess the impact of policy on rice import growth in
Nigeria during the study period is the SAP. It was found
that DSAP though not significant at any reasonable
level but has expected negative sign indicating that
the policy has a negative impact on rice import growth.

Secondly, the response of rice import growth to farm-
subsidy removal policy does not come as a surprise, in
the light of policy practiced in before undertaking the
policy reform. Fertilizer subsidies became popular
for both political and economic reasons. Politically, they
became an instrument of pleasing farmers in the rural
sector, and economically, benefits outweighed the costs
of fertilizer subsidies in terms of foreign exchange sav-
ings resulting from import substitution. It was found
that subsidy compliance policy dummy is statistically
significant at 5%. The increases in per-capita income;
urbanization and subsidy compliance policy are impor-
tant factors affecting rice import demand behavior in
Nigeria during the investigated period.

The major implication here is that if rice import growth is faster than total agricultural export growth in the ongoing process of trade liberalization, an important issue is the sustainability of the trade account deficit that depends on the strength of real exchange rates as a balance of payments adjustment mechanism, and the inflows of foreign capital.

Finally, the food security implication, available data from FAO shows that domestic food production contributes more than 90% food consumption in Nigeria, and to enhance the country food security, it is imperative to promote policies that will accelerate domestic food production growth particularly rice. Increasing rice production would translate to gradual increase in rice supplies, which will be sufficient for domestic demand and could act as a buffer mechanism against the thinness and volatility of world rice market.

References