

**THE NIGERIAN RICE ECONOMY IN A COMPETITIVE WORLD:
CONSTRAINTS, OPPORTUNITIES AND STRATEGIC CHOICES**

**Rice Prices And Market Integration
In Selected Areas In Nigeria:
A Study Report¹**

By

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1 Introduction

Although rice has been a traditional food in Nigeria, it was only recently it assumed a prominent role in the diet of the majority of Nigerians, following a structural shift in the consumption of traditional coarse grains to rice. The demand for traditional cereals such as millet and sorghum has fallen by 12kg per capita, and their share in cereals used as food decreased from 61% in the early 1970s to 49% in the early 90s. In contrast, the share of rice in cereals consumed has grown from 15% to 26% over the same period. In addition, the per capita rice consumption has risen from 3kg in 1960-69 to 23kg in 1990-98. Two major factors appear to be responsible for this structural shift. These include population growth and urbanization, of which the latter appears to be the more important factor. To the urbanites, the major edge of rice over other traditional cereals is its relative ease of preparation thereby reducing the task of food preparation and fitting more easily into the urban lifestyles of rich and poor alike. Rice indeed is no longer a luxury food in Nigeria but has become a major source of calories for the urban poor. For example, the poorest third of urban households obtain 33% of their cereal-based calories from rice, and rice purchases represent a major component of cash expenditures on cereals (World Bank, 1991). Stylized facts from several states in Nigeria demonstrate that rice availability and rice prices have become a major welfare determinant for the poorest segments of the country's consumers who also are least food secure. From this perspective, rice marketing assumes an important place.

Rice marketing is the performance of all business activities in the flow of paddy and milled rice, from the point of initial rice production until they are in the hands of the ultimate consumers at the right time, in the right place and as convenient as possible, at a profit margin so as to keep the farmer in his farming operations (Iheme, 1996). The marketing of local rice in Nigeria involves four stages with a change of product ownership occurring between each pair of stages (see Aderibigbe (1997)). The first stage is production through harvesting. Stage two concerns movement from the farms to processing centers while stage three involves moving the milled rice from processing areas to urban consumption centers. The fourth stage encompasses wholesaling and retailing in the urban centers.

The marketing of locally milled rice in Nigeria has undergone three phases. During the first phase terminating in 1976, the marketing of locally milled rice was undertaken by private individuals. But during the second phase commencing in 1977, a limited form of government participation in the marketing of rice and other cereals was introduced through the establishment of the Nigerian Grains Board. The board purchased milled and paddy rice directly from farmers and provided storage such that rice could be available in the market outside the harvest periods. In the third phase commencing in 1986, private individuals were in charge of the marketing of locally produced rice.

Marketing flows begin from the farmers to the assemblers and processors. The assemblers are commissioned agents who assist in purchasing rice paddy from the individual farmers either on behalf of the millers or to sell to them. They serve as the main link between the farmers and the processors. Rice paddy also flows in the main from the farmers directly to the manufacturers of livestock feed. From the processors, milled rice flows to the wholesalers, from wholesalers to the retailers who now sell directly to the final consumers.

Prices are key signals in the resource allocation process that takes place through markets. The ability of free markets to allocate resources in a way suitable to allow the whole economy to reach an optimal equilibrium is a fundamental result of the economic theory. Moreover, free markets via price adjustment allow the economy to reach a new optimal mechanism at domestic level and, in case of free trade between countries, at international level. The promotion of free trade all over the world is hinged on the belief that

free trade will engender an optimum equilibrium among the countries of the world, and consequently induce a higher global welfare.

However, a great divergence exists between this theoretical construct and the experience of most developing countries. This is the result of the existence of institutional imperfections, imperfect information and missing markets. Often, interventionist policies in these countries have been justified on this ground.

Most countries in the world have intervened in the agricultural market in one form or the other with mitigated successes. However, controversies still surround the usefulness of such an interventionist policy. As a result, the understanding of price formation process is very important to enable definition of efficient policies and to evaluate cost and sustainability of it ex ante.

Despite the importance of prices in the allocation of resources, it is not too clear what role prices play in the allocation of resources in Nigeria's agriculture and in particular the rice economy. Furthermore, the factors that explain rice price levels and variations in time and space are generally unclear. In addition, the relationship between the rice prices both at the farm gate and retail levels is also not clear. Moreover, the connection between rice prices both at the rural and urban markets remains to be explored. And, the role imported rice plays in domestic price formation is yet to be fully explored. Some of these issues constitute the focus of this study.

1.1 Objectives

The overall objective of the study is to examine the extent and degree of price integration in the Nigerian rice markets. The specific objectives are to:

1. characterize the behavior of price in Nigeria's rice markets;
2. determine the degree of market integration between different spatial markets;
3. identify the structural factors which tend to inhibit or enhance the integration of rice markets in Nigeria; and,
4. proffer appropriate policy measures to enhance the role of the market mechanism in the price transmission and rice distribution in Nigeria

2 Analytical Framework And Methodology

2.1 Analytical Framework: Cointegration Technique

Research in the 1980s has led to important developments in the analysis of dynamic structures and the development of optimal dynamic specification, particularly amongst non-stationary series. It has been observed recently that virtually, the entire body of statistical estimation theory is based on asymptotic convergence theorems which assume that data series are stationary. However, econometric tools are increasingly being brought to bear on non-stationary data which are not even asymptotically consistent with these notions of convergence. Furthermore, far from being a special case, non-stationarity is extremely common in macroeconomic time-series such as income, prices and trade data..

The contrast between stationary and non-stationary series can be illustrated by the following model:

$$y_t = \alpha y_{t-1} + u_t; y_0 = 0 \dots\dots\dots(1)$$

A stationary series is one where the absolute value of α is less than 1. Stationary series have a finite variance, transitory innovations from the mean, and a tendency for the series to return to its mean value. In contrast, the non-stationary series is one where the absolute value of α is greater or equal to 1. Non stationary series have a variance which is asymptotically infinite; the series rarely cross the mean (in finite samples), and innovations to the series are permanent.

The essence of the problem lies with the presence of spurious regression which arises where the regression of non-stationary series, which are known to be unrelated, indicates that the series are correlated. This has led to the introduction of a more comprehensive treatment of the time-series characteristics into econometrics modeling and the development of the notion of cointegration.

Cointegration is a special case within the analysis of the order of integration. Formally, if $y_t \sim I(d)$ and $x_t \sim I(b)$ and the linear combination of the two, namely $z_t = y_t - kx_t \sim I(d-b)$, then x_t and y_t are cointegrated. In general, it deals with cases where y_t and x_t are $I(1)$. Thus, if their linear combination (or alternatively, the residuals from the regression of y on x) is $I(0)$, then we have cointegration. Cointegration analysis thus provides a powerful discriminating test for spurious correlation: conducting cointegration analysis between apparently correlated $I(1)$ series and finding cointegration confirm the regression. Failing to find cointegration is an indication that spurious correlation may be present, and thus the invalidity of inference drawn from such correlation.

An important aspect of the cointegration analysis concerns the specification of processes of dynamic adjustment. Engle-Granger representation theorem (Engle and Granger, 1987) states that if two series are cointegrated, then they will be most efficiently represented by an error-correction specification, and furthermore, if the series are cointegrated, this dynamic specification will encompass any other dynamic specification, including the partial adjustment model.

Market price formation efficiency has been assessed in recent times employing price integration analysis. This approach determines whether two price time series are evolving around a common trend or whether they have own trends. If the two series are co-integrated, it can be concluded that in spite of observed variations, the two prices are on the long-term part of a common price formation system. But if the test

shows that prices time series are not co-integrated, it can be inferred that these prices are drifting apart on the long run. This would imply that the price formation system is not unique and that e of market imperfections exist.

This recent development in econometrics was taken into consideration during the estimation process of this study. In view of the fact that most economic variables such as inflation, exchange rate depreciation, etc. are affected by trends generated by the global dynamics of economic systems and that these trends in turn affect price levels, it is necessary to clean up the time series analyzed from any “exogenous” trend. Two major options are available for doing this. An option is that of deflation. This option, however, is constrained by the challenging task of the selection of an appropriate deflator. In addition, the transformation of a time series with a deflator may add new difficulties in interpreting price evolution. Another option consists in transforming the time series into a stationary time series through differentiation or integration. This is the option adopted in this study.

Testing the co-integration of two price time series requires regressing one price time series in market 1 (p_{m1t}) on the other in market 2 (p_{m2t}) as follows:

$$\log p_{m1t} = \alpha_1 + \alpha_2 \log p_{m2t} + \delta \dots\dots\dots(2)$$

where δ is the residual. This is the part of the variations of p_{m1t} that is not explained by the variations of the other price time series p_{m2t} . This residual is tested employing the Augmented Dickey-Fuller (ADF) test statistics. If δ is I(0), this means that there is no trend in the unexplained part of the p_{m1t} price variation. In other words, the two price time series may temporarily diverge but in the long term, they tend to evolve around a common equilibrium path. But if δ is I(1), then there is a trend in the unexplained part of the variation meaning that the two price series are drifting apart and that the two markets are not cointegrated.

2.2 Methodology

2.2.1 Area of Coverage

Rice is cultivated in virtually all the agro-ecological zones in the country while the commodity is consumed in both rural and urban areas. Ideally, all of these areas should be covered in the study. But due to limitation of resources and time constraint, it was necessary to select some producing and consuming states. Amongst the various producing states in the country, the major ones namely Kaduna, Benue, Niger and Taraba states were selected. However, Ondo State was included as a major producing area to represent the South-West zone. The consuming centers were selected on the basis of the size of the consumption of the commodity in the country. These include Abuja, Calabar, Enugu, Ibadan and Lagos, where huge urban populations reside.

2.2.2 Data and Sources

Although rice prices occur at wholesale and retail levels, however, due to the dearth of data on wholesale only the retail price data were collected. These are monthly series and run from January 1992 to June 2001. It should be recognized that most of the states did not have consistent data series running through the entire period of coverage. It should also be noted that these data series were actually collected from

the urban centers of the various areas covered in this study. As such, retail prices for the producer areas are only a proxy.

Various sources are recognized for the generation of data in Nigeria. These include the following:

1. Federal Ministry of Agriculture and Rural Development, Abuja
2. Federal Office of Statistics, Lagos and Abuja offices
3. Central Bank of Nigeria, Lagos and Abuja offices
4. National Agricultural Extension Research and Liaison Services
5. National Data Bank, Lagos

However, for consistency reasons, data employed in this study came mainly from the Federal Ministry of Agriculture and Rural Development, Abuja. This source was chosen because of the consistency of its data and the long period of coverage of such data.

2.2.3 Data Analysis

The data collected were reviewed and examined for consistency and reliability before being subjected to analytical process involving the determination of patterns, variations and differences in magnitude of prices. Empirical analyses using correlation and cointegration analytical techniques were also conducted.

3 Discussions Of Results

3.1 Trends in Retail Prices of Local and Imported Rice

The trend in retail prices of local and imported rice is discussed by examining movements in the following:

- Annual average of retail prices as derived from the average of the monthly series
- Period average of retail prices, that is, the average of the monthly series over the entire period of observation
- Growth rates of the annual average of retail prices.

In addition, trend equations from the actual data are estimated in order to give a clearer picture of the movement of prices. Graphs and tables are employed in displaying the results.

3.1.1 Local Rice

The behavior of the average monthly retail prices of local rice can be assessed from the data in Table 1. From the table, it could be seen that in Abuja, prices ranged from an average of about N13.3/kg in 1992 to a peak of N60.8/kg in 1997. In Lagos, prices ranged from N11.4/kg in 1992 to N50.9/kg in 1999 while retail prices of local rice in Enugu ranged from N10.5/kg in 1992 to N51.4/kg in 1996. The lowest average price in Benue was N7.2/kg in 1992 while the highest was N46.6/kg in 2001. Taking the entire period of study into consideration, Table 1 shows that Benue had the lowest period average price (N34.3/kg) while Ondo had the highest (N44.6/kg). In general, retail prices were slightly higher in the producing areas than in the consuming areas. While the average period price of local rice was N39.3/kg in consuming centers, it was N41.0/kg in the producing areas, a development which might be traced to the competition posed by imported rice which enjoys priority patronage of educated consumers in such cities.

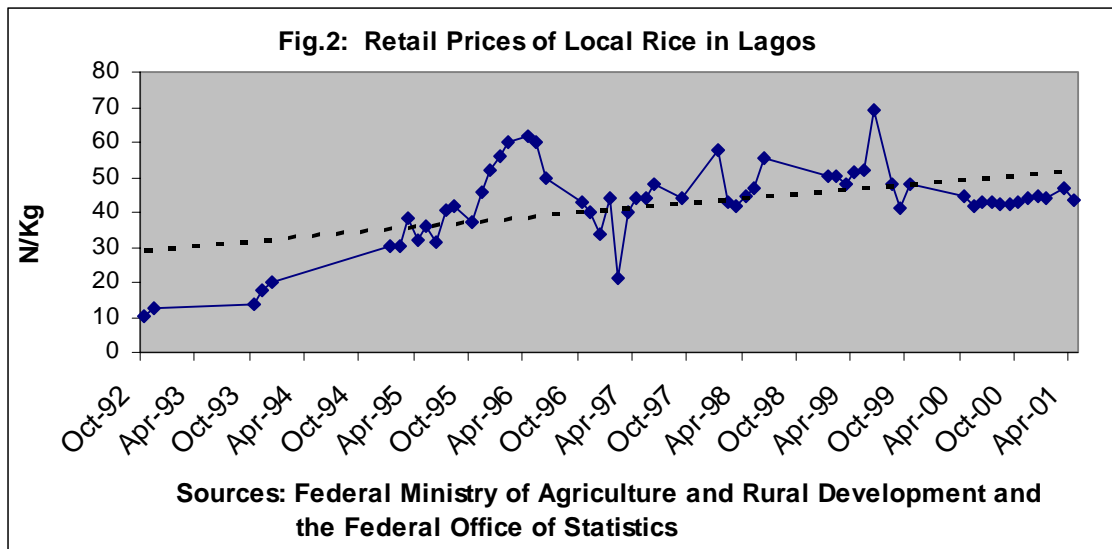
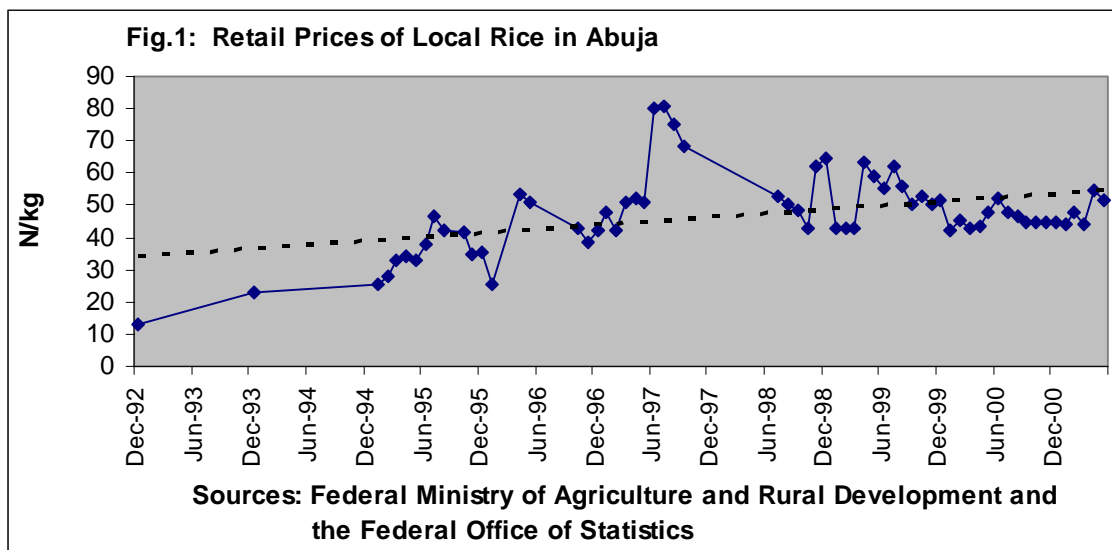
Table 1: Average of Monthly Retail Prices of Local Rice in Selected Centers (N/Kg)

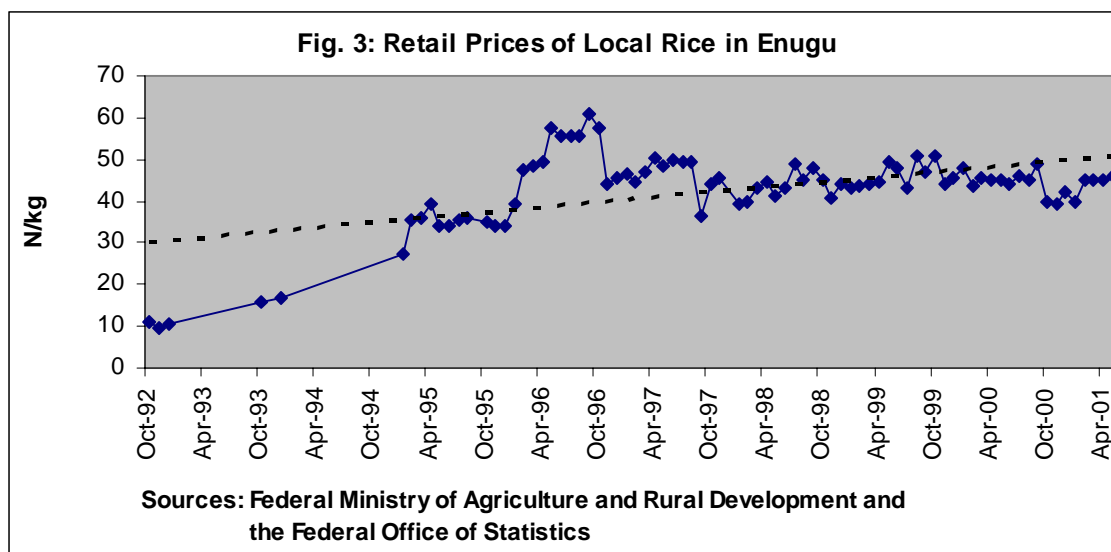
Period	Abuja	Calabar	Enugu	Ibadan	Lagos	Kaduna	Niger	Ondo	Benue	Taraba
1992	13.3	14.0	10.5	n.a	11.4	n.a	10.1	14.6	7.2	n.a
1993	22.9	15.3	16.4	16.5	17.3	n.a	12.5	n.a	12.2	n.a
1994	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a
1995	35.6	37.9	34.6	37.4	36.3	38.0	38.5	45.2	32.4	44.1
1996	42.1	51.8	51.3	48	50.7	n.a	39.3	46.9	37.3	30.0
1997	60.8	48.5	46.4	48.1	40.6	44.7	46.8	46.0	39.5	49.2
1998	53.4	44.5	43.5	45	48.2	45.0	53.4	51.2	42.9	n.a
1999	52.3	44.2	46.2	48.3	50.9	56.6	47.7	55.5	45.9	45.7
2000	45.4	43.9	44.3	46.1	43.2	45.8	42.1	49.3	45.3	43.9
2001	46.4	45.5	43.5	40.6	44.3	46.2	38.4	48.6	46.6	49.2
Period Average	41.3	38.4	37.4	41.2	38.1	46.0	36.5	44.6	34.3	43.6

n.a = not available

Source: Computed employing data of Federal Ministry of Agriculture and Rural Development.

Focusing specifically on the movements in the monthly price series, three major phases could be observed in the behavior of prices. First, there was a general rising pattern during the 1992-1996 period in Abuja, Lagos, Enugu, Ibadan, Niger and Benue. Second, retail prices in the 1997-1998 period were largely characterized by fluctuations. Third, in the 1999-2001 period, retail prices of local rice were relatively more stable. For example, Figure 1 shows that in Abuja, retail prices of local rice rose from N11/kg in 1992 to N50/kg in 1996. Between 1997 and 1998, prices general fluctuated, rising to N80/kg in August 1997, but declining to N39 in November 1998. During the 1999-2001 period, prices in Abuja were relatively more stable, remaining in the range of N42/kg in December 1999 and N45/kg in June 2001. In Lagos, Figure 2 shows that retail prices shot upwards from N11/kg in 1992 to N60/kg in 1996, vacillating between 1997 and 1998, but fairly stable in the 1999-2001 period as prices remained in the range of N35/kg in September 1999 and N30/kg in March 2001. In Enugu, a rising pattern could be observed in the 1992-1996 period, but relative stability in the movement in prices during the 1998-2001 period (see Figure 3).





Though three major phases are observable in the behavior of the monthly prices of local rice in a majority of the selected areas, the trend curve fitted indicates that generally, the pattern of behavior of local rice prices is an increasing one (see broken lines on figures). Indications are that prices of local rice rose more in Lagos (with a slope of 0.2253) than in Abuja and Enugu with slopes of 0.2044 and 0.2022 respectively.

Further analysis of the data on prices of local rice indicates that the growth in retail prices of local rice was highest in 1995 in most of the selected centers. Table 2 shows that growth was highest in Niger (104%), followed by Benue (82.5%) and Calabar (73.9%). In 2000, growth in retail prices was negative in all cases with the least growth occurring in Kaduna (-19%), followed by Lagos (-15%) and Abuja (-13%). The average growth rate of retail prices for the entire period of observation was highest in Benue (23.8%), followed by Enugu (18.1%) and Lagos (17.3%) but least in Ondo (1%).

Table 2: Average Growth Rates of Retail Prices of Local Rice (%)

Period	Abuja	Calabar	Enugu	Ibadan	Lagos	Kaduna	Niger	Ondo	Benue	Taraba
1993	72.2	9.3	56.2	na	51.8	na	23.8	na	69.4	na
1994	na	na	na	na	na	na	na	na	na	na
1995 ²	27.7	73.9	55.5	63.3	54.9	na	104.0	na	82.8	na
1996	18.3	36.7	48.3	28.3	39.7	na	2.1	3.8	15.1	-32.0
1997	44.4	-6.4	-9.6	0.2	-19.9	na	19.1	-1.9	5.9	64.0
1998	-12.2	-8.2	-6.3	-6.4	18.7	0.7	14.1	11.3	8.6	na
1999	-2.1	-0.7	6.2	7.3	5.6	25.8	-10.7	8.4	7.0	na
2000	-13.2	-0.7	-4.1	-4.6	-15.1	-19.1	-11.7	-11.2	-1.3	-3.9
2001	2.2	3.6	-1.8	-11.9	2.5	0.9	-8.8	-1.4	2.9	12.1
Period Average	17.2	13.4	18.1	10.9	17.3	2.1	16.5	1.5	23.8	10.0

na = not available

Source: Computed employing Federal Ministry of Agriculture and Rural Development data

² 1995 data is the average of a two-year period since 1994 data is missing. This is in order to maintain average annual growth rates.

Comparing prices in the producing areas with those in consuming areas, the indications are that growth in retail prices was higher in the consuming areas than in producing ones. For example, while the average growth rate was 15.3% in the consuming areas, it was 10.8% in the producing ones.

When consideration is given to the average growth rate in retail prices, there appears to be some danger given the high growth rates of the retail prices of rice, the relatively stable wages and the overall inflationary trend in the country. This could erode the purchasing power of Nigerians, thereby reducing the welfare of the people. However, this may not really be the case, particularly if prices in recent years are taken into cognizance. The indications are that growth in prices has not been too rapid especially in the 2000-2001 period as most of the growth rates are negative. If prices remain at these levels, then the welfare of rice consumers may be secured. But this would be at the expense of rice producers who are experiencing little or no increase in the prices of their products. This could serve as a disincentive to further investment in rice farming activities. The implication of this is a reduced level of local rice output. This could trigger increases in the prices of local rice, and may engender further increase in rice importation, thereby depleting further the foreign exchange earnings of the country. It should be stressed that the negative growth in rice prices in recent years is a reflection of deliberate government policies geared towards securing cheap food items for urban dwellers.

3.1.2 Imported Rice

The average monthly retail prices of local rice is depicted by Table 3. It could be seen from the table that in Abuja, prices ranged from a low of N20.3/kg in 1992 to a peak of N76.3/kg in 1996. In Lagos, prices ranged from N15.3/kg in 1992 to N59.7/kg in 1996 while retail prices of local rice in Enugu ranged from N17.1/kg in 1992 to N62.7/kg in 1996. The lowest average prices of imported rice in Ondo and Niger were N22.8/kg and N10.5/kg respectively in 1992 while the highest were N74.6/kg in 1995 in Ondo and N80.6/kg in respect of Niger in 2000. Taking the entire period of study into consideration, Table 3 shows that Lagos and Enugu had the lowest period average price of imported rice (N44.9/kg and N47.6/kg respectively) while Taraba had the highest (N63.7/kg). In general, retail prices were highest in the producing areas than in the consuming areas. While the average period price of imported rice was N49.5/kg in consuming centers, it was N56.4/kg in the producing centers. This finding may not be entirely surprising. Imported rice enters into the country through the major ports and borders which are situated mostly in the major rice consuming areas. From these areas, the commodity is transported to other centers including the producing ones. The additional cost of transportation which is transferred to the final consumer reflects in the relative high cost of imported rice in the producing areas. In addition, the high level of competition in the sale of imported rice prevalent in the major consuming areas which thus accounts for the relative low price of imported rice in these areas is virtually absent in the producing areas. Most producing areas will rather consume more of local rice than imported rice.

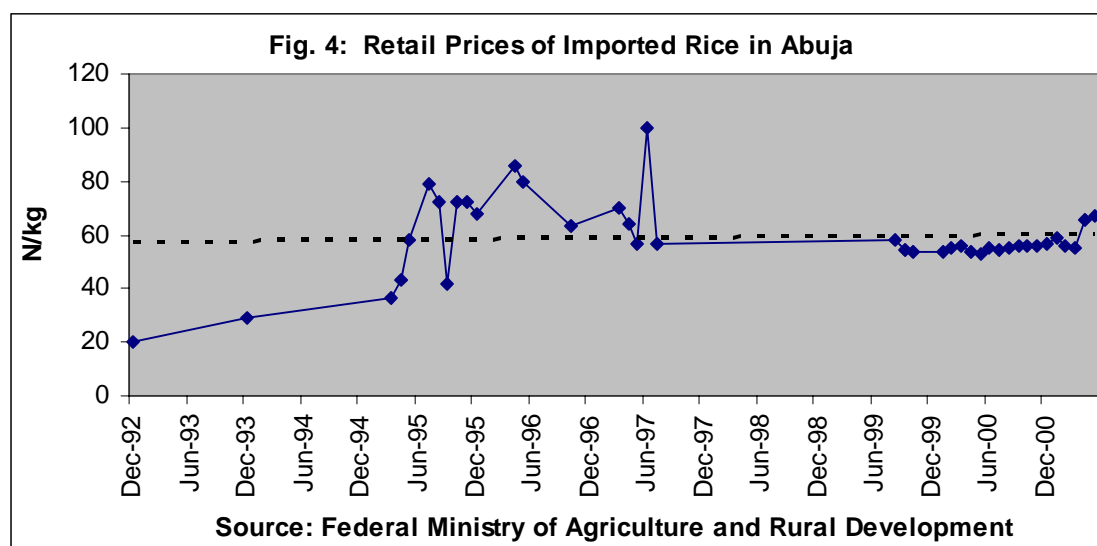
The movements in the monthly imported rice price series depict two major patterns. First, a rising trend in rice prices characterized the 1992-1996 period. Second, retail prices were relatively constant during the 1997-2001 period. More specifically, Figure 4 shows that in Abuja, retail prices of imported rice rose from N20/kg in 1992 to N76/kg in March 1996. In contrast, retail prices in the city virtually remained at N58/kg between July 1997 and March 2001. In Lagos, Figure 5 reveals that prices rose from N17/kg in October 1992 to N65/kg in July 1996. But during the January 1997 and January 2001 period, retail prices ranged between N42/kg and N45/kg. Figure 6 demonstrates increase in retail prices in Enugu during the 1992-1996 period, as prices soared from N18/kg in 1992 to about N70/kg in 1996. In contrast, prices varied between N50/kg and N55/kg during the 1999-2001 period.

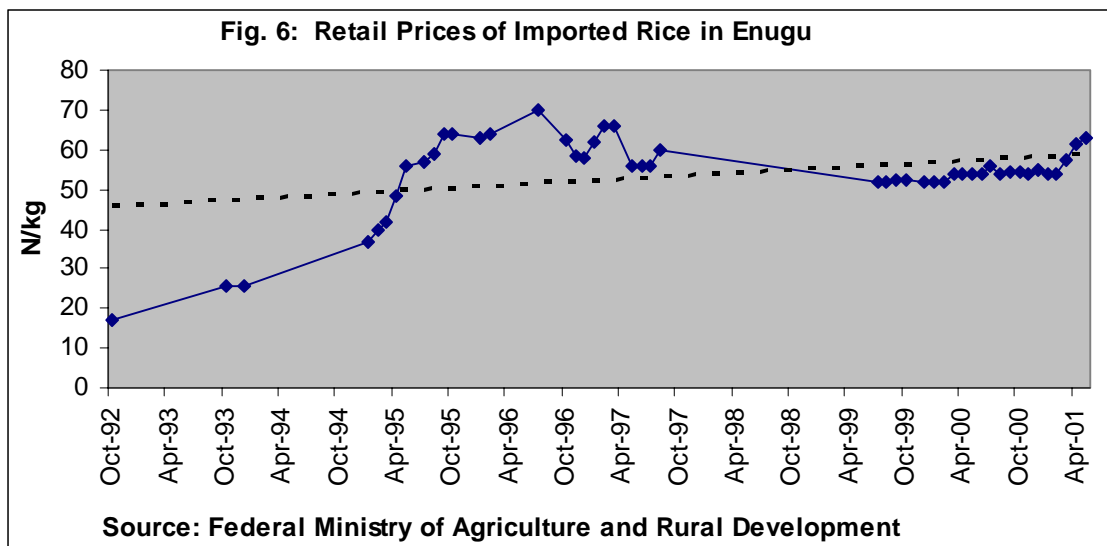
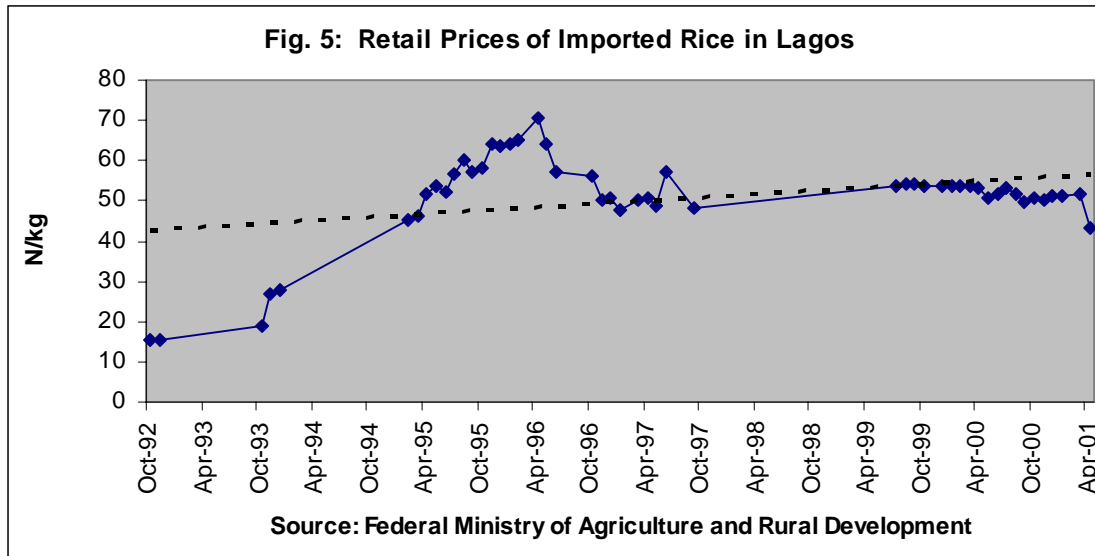
Table 3: Average Monthly Prices of Imported Rice in Selected Areas (N/Kg)

Period	Abuja	Calabar	Enugu	Ibadan	Lagos	Kaduna	Niger	Ondo	Benue	Taraba
1992	20.3	20.3	17.1	na	15.3	na	10.5	22.8	na	na
1993	28.9	22.5	25.6	25.2	24.6	na	na	40.0	na	na
1994	na	Na	na	na	na	na	na	na	na	na
1995	60.3	59.4	51.9	50.2	55.2	55.1	66.6	74.6	31.6	na
1996	76.3	69.1	62.7	58.4	59.7	48.9	na	68.5	na	55.8
1997	72.7	60	60.3	59.5	50.4	60.3	56.4	91.0	49.0	67.2
1998	na	Na	na	na	na	na	na	na	na	na
1999	55.7	47.4	52.1	57.7	53.8	57.0	59.4	50.0	51.0	69.7
2000	55.2	53.2	53.9	53.9	51.9	60.0	80.6	54.1	55.0	54.3
2001	60.4	61.6	57.9	58.6	48.6	60.0	58.0	58.8	58.7	71.8
Period Average	53.7	49.1	47.6	51.9	44.9	56.8	55.2	57.4	49.0	63.7

na = not available

Source: Computed employing Federal Ministry of Agriculture and Rural Development data





Another major noticeable behavior of prices of imported rice is the general drop in retail prices in the 1996-1997 period in comparison with previous years. This may be the result of the liberal policy on rice imports put in place after 1995. It should be noted that up till 1995, rice import was banned. The lifting of the ban on rice imports engendered an increased importation of the commodity in the periods following the lifting of the ban. The implication was the flooding of the markets with the imported rice and the consequent drop in the prices of the commodity.

Supplementary analysis of the data on prices of imported rice indicates that the growth in retail prices was highest in 1995 in all the selected centers. Table 4 shows that growth was highest in Calabar (82%), followed by Lagos (62.6%) and Abuja (54.38%). In more recent years (i.e., 2000 and 2001), growth in retail prices was virtually positive. The average growth rate of retail prices was highest in Enugu (17.4%), followed by Abuja (16.5%), and Calabar (16.2%) but least in Kaduna (2.9%). Comparing prices in the producing areas with those in consuming areas, the indications are that growth in retail prices was higher in the consuming areas than in producing ones. For example, while the average growth rate was 15.4% in the consuming areas, it was 7.1% in the producing ones.

Table 4: Average Growth Rates of Retail Prices of Imported Rice (%)

Period	Abuja	Calabar	Enugu	Ibadan	Lagos	Kaduna	Niger	Ondo	Benue	Taraba
1993	42.4	10.8	49.7	na	60.8	na	na	75.4	na	na
1994	na	na	na	na	na	na	na	Na	na	na
1995 ³	54.3	82.0	51.4	49.6	62.2	na	na	Na	na	na
1996	26.5	16.3	20.8	16.3	8.2	-11.3	na	-8.2	na	na
1997	-4.7	-13.2	-3.8	1.9	-15.6	23.3	na	32.8	na	20.4
1998	na	na	na	na	na	na	na	Na	na	na
1999 ⁴	-11.7	-10.5	-6.8	-1.5	3.4	-2.7	2.7	-22.5	2.0	1.9
2000	-0.9	12.2	3.5	-6.6	-3.5	5.3	35.7	8.2	7.8	-22.1
2001	9.4	15.8	7.4	8.7	-6.4	0.0	-28.0	8.7	6.7	32.2
Period Average	16.5	16.2	17.4	11.4	15.6	2.9	3.4	15.7	5.5	8.1

na = not available

Source: Computed employing Federal Ministry of Agriculture and Rural Development and Federal Office of Statistics data

3.2 Variability in Retail Prices of Imported and Local Rice

A major attribute of most price data is their characterization by variability. This has important implications for policy and the welfare of the nation. In order to determine the degree of variability in the prices of rice, the coefficient of variation was computed for both types of rice (imported and local) in the various centers. Table 5 presents the results obtained and it indicates that retail prices of imported rice are most volatile in Niger (42.8%), followed by Ondo (36.7%) and Calabar (37.2%). Imported price variability is least in Kaduna (7.8%). Comparing producing with consuming areas, retail prices are on the average more volatile in the consuming areas (33.6%) than in the producing areas (24.3%). This may be attributed to the fact that it is easier for producing centers to quickly register variations in production, which is also promptly transmitted to price variation. For local rice, prices are more volatile in Benue (43.0%). This is followed by Niger (41.5%), Enugu (38.3%) and least in Kaduna (13.0%). Overall, prices are more volatile in the consuming centers (35.0%) than in producing centers (28.4%).

When variability in the prices of imported rice is compared with those of local rice, indications are that the retail prices of local rice are more volatile (31.7%) than those of imported rice (29.0%). Thus, the prices of imported rice are relatively more stable than those of local rice. However, it should be noted that the difference between the level of variability in prices of local rice and those of imported rice does not appear to be very huge.

In general, the relatively low level of price variability in both local and imported rice implies that rice consumers can effectively plan their expenditure pattern on price with a fairly high degree of expectation that prices are not likely to substantially deviate from their prevailing levels. On the part of policy, this makes for effective planning.

³ 1995 data is the average of a two-year period since 1994 data is missing. This is in order to maintain average annual growth rates.

⁴ 1999 data is the average of a two-year period since 1998 data is missing. This is in order to maintain average annual growth rates.

Table 5: Coefficient of Variation in Retail Prices (%)

Area	Imported	Local
Abuja	36.5	36.7
Calabar	37.2	36.4
Enugu	35.3	38.3
Ibadan	23.6	26.0
Lagos	35.5	37.6
Kaduna	7.8	13.0
Niger	42.8	41.5
Ondo	36.7	28.2
Benue	21.3	43.0
Taraba	12.8	16.3

Source: Computed employing annual data series

3.3 Price Differential Between Imported and Local Rice

Retail prices of imported rice have generally been understood to be higher than those of local prices. In order to verify this, the difference between imported and local rice was computed. The results, indicated by data in Table 6 generally support the view that retail prices of imported rice are relatively higher than retail prices of local rice. Price difference was highest in 1995, 1996 and 1997. In 1995, price difference was as high as 55% in Kaduna. In 1996 and 1997, price difference was as high as 34.2% in Abuja and 43% in Ondo respectively. Niger and Calabar also had high price differential in 1995 and 1996 respectively. Price difference was relatively low in Lagos in most of the period. This may be accounted for by the high influx of both local and imported rice into the area. Furthermore, the table shows that average price differential during the period of focus was highest in Kaduna (21.5%), followed by Ondo (19.9%), Abuja and Enugu (14.5% each) and least in Benue (-4.2%).

Table 6: Price Differential Between Imported and Local Rice in Nigeria (%)

Period	Abuja	Calabar	Enugu	Ibadan	Lagos	Kaduna	Niger	Ondo	Benue	Taraba
1992	7.1	6.3	6.6	na	3.8	na	0.4	8.1	-7.2	na
1993	6.0	7.2	9.2	8.7	7.2	na	-12.6		-12.2	na
1994	na	na	na	na	na	na	na	na	na	na
1995	24.7	21.5	17.3	16.5	16.3	55.1	28.0	30.5	0.8	-37.6
1996	34.2	23.4	24.7	15.2	9.2	11.3	-42.7	26.8	-37.7	9.7
1997	14.4	12.3	24.9	4.5	9.7	21.7	17.5	43.0	7.6	18.0
1998	na	na	na	na	na	na	na	na	na	na
1999	8.0	4.5	9.3	8.7	7.4	12.9	13.3	9.1	na	24.0
2000	9.8	11.0	10.1	11.0	7.5	16.2	25.1	12.3	10.6	10.4
2001	12.0	15.3	13.7	17.4	4.0	11.8	22.0	9.2	8.8	19.3
Period Average	14.5	12.7	14.5	11.7	8.1	21.5	6.4	19.9	-4.2	7.3

Source: Derived from tables 1 and 3, that is, $((\text{Imported price} - \text{Local price})/\text{Local price}) * 100$

3.4 Correlation Analysis

The purpose of correlation analysis is to determine the extent to which two variables move together, either in the same direction or in the opposite. Accordingly, attempt is made to establish the degree to which the prices of rice in different markets correlate. Two levels of correlation analysis were carried out using simple correlation analytical technique applied to monthly data series. First, the price of a particular kind of rice in a specific center was correlated with the price of a similar type in another center. In the second level of analysis, the prices of the two types of rice (local and imported) in the same center were correlated. The results are contained in Tables 7 to 9.

Table 7 presents the results of the analysis of the correlation between retail prices of local rice in various centers. The table generally reveals that the retail prices of local rice in the various centers are correlated. This is irrespective of whether the centers are producing or consuming. For example, the table shows that the correlation between retail prices of local rice in Lagos (a consuming area) and Benue (a producing area) was 61% while that between prices in Enugu and Abuja (both consuming areas) was 66%. The correlation between Niger and Benue (both producing areas) was 75%. However, most of the correlation found between prices in Taraba and those in other areas were insignificant. Perhaps, this may be due to the limited data set for these centers.

Table 7: Correlation Between Retail Prices of Local Rice in Selected Centers

	Calabar	Enugu	Ibadan	Lagos	Kaduna	Niger	Ondo	Benue	Taraba
Abuja	0.43**	0.66**	0.54**	0.41**	0.30*	0.49**	0.27*	0.56**	0.13
Calabar		0.84**	0.54**	0.74**	0.41**	0.61**	0.38**	0.68**	0.07
Enugu			0.60**	0.67**	0.37**	0.61**	0.47**	0.78**	0.16
Ibadan				0.57**	0.47**	0.66**	0.45**	0.75**	0.40*
Lagos					0.40**	0.66**	0.48**	0.61**	0.26
Kaduna						0.43**	0.21	0.48**	0.17
Niger							0.44**	0.75**	0.38*
Ondo								0.55*	0.38*
Benue									0.29

Source: Computed.

Table 8 presents the results of the analysis of the correlation between retail prices of imported rice in various areas. Generally, the results indicate some level of correlation between the prices of imported rice in the different areas. For example, the correlation between the retail prices of imported rice in Enugu and Cross River (both consuming areas) was 87% while that between Enugu and Niger (Consuming and producing areas respectively) was 69%. That between Benue and Niger (both producing areas) was 51%. Also, it was found that there was virtually no significant correlation between the retail prices of imported rice in Taraba and those in the other areas. Again, this could be due to data constraints.

Table 9 gives the highlight of the correlation between the retail prices of local and imported rice in a specific area. The results generally suggest a highly significant correlation between the prices of the two kinds of rice in the same area. The coefficients are higher for Calabar (77%), Enugu (67%), Ibadan (72%) and Lagos (78%). This could be suggestive that the imported rice market is leading while in the other areas where local rice is available, the relation is weaker.

Table 8: Correlation Between Retail Prices of Imported Rice in Selected Centers

	Calabar	Enugu	Ibadan	Lagos	Kaduna	Niger	Ondo	Benue	Taraba
Abuja	0.47**	0.62**	0.57**	0.64**	0.14	0.45*	0.68**	0.52*	0.25
Calabar		0.87**	0.66**	0.85**	0.37*	0.76**	0.60**	0.44	-0.00
Enugu			0.80**	0.91**	0.40*	0.69**	0.63**	0.64**	0.29
Ibadan				0.81**	0.46**	0.56**	0.55**	0.58**	0.32
Lagos					0.33	0.75**	0.67**	0.52**	0.22
Kaduna						0.14	0.01	0.21	0.31
Niger							0.60**	0.51**	-0.15
Ondo								0.55*	0.10
Benue									0.59*

Source: Computed

What can be deduced from the correlation analysis is that retail prices in one market tend to be correlated with similar prices in another market. In addition, retail prices of a category of rice seem to correlate with the retail prices of another category of rice in the same center. This implies that movements in retail prices irrespective of their centers, tend to move with changes in retail prices in other centers. Consequently, it is pertinent that policy makers take into cognizance the fact that policy measures that are put in place, probably to effect prices in a particular center or on a particular category of rice, are likely to be felt in the prices of rice in other centers.

Table 9: Correlation Between Retail Prices of Local and Imported Rice in Same Center

Imported Local	Abuja	Calabar	Enugu	Ibadan	Lagos	Kaduna	Niger	Ondo	Benue	Taraba
Abuja	0.13									
Calabar		0.77**								
Enugu			0.67**							
Ibadan				0.72**						
Lagos					0.78**					
Kaduna						0.47**				
Niger							0.54**			
Ondo								0.52**		
Benue									0.52*	
Taraba										0.21

Source: Computed.

3.5 Cointegration Analysis

This section focuses on the level of market integration employing the cointegration technique fitted to monthly data series. The analysis was conducted for three categories. First, retail prices of local rice in two different centers were tested for cointegration. Second, the test was carried out for imported rice. Third, the degree of cointegration between imported and local rice was tested.

The cointegration test results for local rice are presented in Table 10. The results give indication of the level of integration of retail prices in the selected centers. Generally, they indicate price cointegration in the centers. For example, prices of local rice in Abuja are found to cointegrate with those in other centers

(excluding Ondo and Taraba). Cointegration is also found between prices in Calabar and the prices of local rice in other centers (excluding Kaduna and Taraba). Prices of local rice in Enugu were found to cointegrate only with those in Ibadan. Prices in Lagos cointegrate with those in Abuja, Calabar, Ibadan and Niger. The table further shows that retail prices of local rice are more integrated among areas that are designated as consuming and within producing areas than among producing and consuming areas.

What can be deduced from these results is that prices and markets are generally integrated as far as local rice is concerned. This implies that excluding transportation and risk factors, retail prices of local rice in one center do not substantially differ from prices of the same commodity in other centers. This is occasioned by the free flow of information on prices within and across the centers.

Table 10: Cointegration Test of Retail Prices of Local Rice in Two Centers

	Calabar	Enugu	Ibadan	Lagos	Kaduna	Niger	Ondo	Benue	Taraba
Abuja	3.525*	3.652*	2.917*	3.114*	3.226*	3.098*	2.636	3.102*	2.506
Calabar		4.084*	3.456*	3.289*	2.712	3.249*	3.014*	3.106*	2.403
Enugu			3.078*	2.576	2.685	2.806	2.640	2.450	2.527
Ibadan				3.187*	3.028*	4.570*	3.354*	2.885	3.196*
Lagos					2.462	3.508*	2.812	2.618	2.373
Kaduna						4.560*	3.948*	4.111*	3.227*
Niger							2.504	2.938*	2.370
Ondo								5.363*	4.777*
Benue									3.153*

Source: Computed.

* indicates significant. Critical value at 5% is 2.906

Table 11 gives indication of the degree of cointegration of prices of imported rice in two centers. What can be gleaned from the table is the low level of cointegration between the prices of imported rice in different centers. While prices in Abuja were found to be cointegrated with prices in other centers, most of the other centers were discovered not to be cointegrated. For example, Calabar was cointegrated only with Enugu and Niger. Enugu and Niger are cointegrated with no other area. Ibadan is cointegrated only with Lagos. Apart from this, Lagos is cointegrated with no other area. Ondo is cointegrated only with Abuja and Kaduna while Benue is cointegrated with Kaduna and Taraba.

Table 11: Cointegration Test of Retail Prices of Imported Rice in Two Centers

	Calabar	Enugu	Ibadan	Lagos	Kaduna	Niger	Ondo	Benue	Taraba
Abuja	3.983*	4.201*	3.938*	3.572*	3.217*	2.554	4.616*	2.630	3.018*
Calabar		3.575*	2.138	2.915	1.873	3.041*	2.190	1.785	2.146
Enugu			2.084	2.908	2.033	2.447	2.392	1.733	2.026
Ibadan				3.143*	2.616	2.737	2.613	2.043	2.754
Lagos					2.159	2.183	2.101	1.562	2.225
Kaduna							5.294*	3.114*	4.044*
Niger							1.715	2.445	2.721
Ondo								2.511	2.730
Benue									3.177*

Source: Computed.

* indicates significant. Critical value at 5% is 2.976

The low level of price integration of imported rice indicates rice market imperfection. This, in part, could be due to the poor transportation network between the different centers. In Nigeria, most imported rice comes into the country through the major ports situated in Lagos and Port Harcourt and through land borders, with Lagos area being the most prominent. From Lagos, for example, such rice is transported to other parts of the country. Ibadan is the closest rice consuming center to Lagos. The level of integration between the Lagos and Ibadan rice markets could be attributed to the closeness of the markets, good transportation network and the free flow of information between both markets. This is however not the case with other centers such as Taraba, Benue and even Niger that are very far from the major points of entry. The poor deplorable conditions of the feeder roads linking these centers could be a major factor in the observed non-integration of some of these centers. Also, it could be that some of these centers are secondary markets. For example, Ondo may be a secondary market to Ibadan while Niger may be a secondary market to Abuja and Kaduna. However, a special case is Taraba which could be integrated with the neighboring Cameroon Republic.

The degree of cointegration between imported and local rice in the same center is indicated by Table 12 which shows that imported and local rice prices are only integrated in Abuja, Kaduna and Taraba. Imported and local rice markets are not integrated in the other centers covered in the study. This implies that for most of the centers, there is less interaction between the imported and local rice markets.

Table 12: Cointegration Test of Retail Prices of Imported and Local Rice in Same Centers

Imported Local	Abuja	Calabar	Enugu	Ibadan	Lagos	Kaduna	Niger	Ondo	Benue	Taraba
Abuja	3.429*									
Calabar		2.603								
Enugu			2.154							
Ibadan				2.686						
Lagos					2.756					
Kaduna						4.164*				
Niger							2.655			
Ondo								2.516		
Benue									2.443	
Taraba										4.059*

Source: Computed.

* indicates significant. Critical value at 5% is 2.976

4 Findings, Recommendations And Conclusion

4.1 Findings

A number of findings emanate from this study. First, the retail prices of local rice generally had an upward trend during the period of coverage. Retail prices appear to be rising faster in Lagos than in any another center. Indications are that prices of local rice rose more in Lagos (with a slope of 0.2253) than in Abuja and Enugu with slopes of 0.2044 and 0.2022 respectively.

Second, the high average growth rates of retail prices during the period of study appear to portend some great danger as this has the implication of eroding the purchasing power of rice consumers. This is particularly grievous when cognizance is taken of the fact that wages remain constant over a considerable period of time and inflation has been rising unabated. But it should be noted that in more recent years (i.e., 2000-2001), the growth rates have been negative. If prices remain at these levels, then the welfare of rice consumers may be secured. But this would be at the expense of rice producers who are experiencing little or no increase in the prices of their products. This could serve as a disincentive to further investment in rice farming activities. The implication of this is a reduced level of local rice output. This could trigger increases in the prices of local rice, and may engender further increase in rice importation, thereby depleting further the foreign exchange earnings of the country. It should be stressed that the negative growth in rice prices in more recent years is a reflection of deliberate government policies geared towards securing cheap food items for urban dwellers.

Third, price variability levels are generally and relatively low, which on the average is less than 30%, with variability higher in the prices of local rice than in imported rice. However, the difference between this variability does not appear to be very huge. The relatively low level of price variability in both local and imported rice implies that rice consumers can effectively plan their expenditure pattern on price with a fairly high degree of expectation that prices are not likely to substantially deviate from their expectations. On the part of policy, this makes for effective planning.

Fourth, retail prices in one market tend to be correlated with similar prices in other market. In addition, retail prices of a category of rice seem to correlate with the retail prices of another category of rice in the same center. This implies that movements in retail prices irrespective of their centers, tend to move with changes in retail prices in other centers. The implication of this is that policy makers need to take into cognizance the possible effects that policy measures put in place, probably to effect prices in a particular center or on a particular category of rice, are likely to have on the prices of rice in other centers.

Fifth, the markets for local rice are generally integrated. This implies that excluding transportation and risk factors, retail prices of local rice in one center do not substantially differ from prices of the same commodity in other centers.

Sixth, markets for imported rice are generally characterized by imperfections. This could be due to the poor transportation network between the different imported rice marketing centers. Price integration was only discovered between centers that are close to the source of imported rice. Perhaps, most of these other markets are serving as secondary markets, hence the non-integration of those markets.

Seventh, imported and local rice markets generally do not interact in the same center. It appears that the markets are high segregated, implying that they function independently.

4.2 Recommendations and Conclusion

Two major recommendations emanate from the findings of this study. These are designed towards an effective functioning of the rice markets in Nigeria.

First, there is the need for the development of a comprehensive and public price information system. The dissemination of price information may contribute to developing a common base of information for all economic agents involved in food crop chains. This is an indispensable tool for policy makers to efficiently monitor marketing issues which are vital in the assessment of the effects of specific agricultural policies.

Second, there is the need for an urgent rehabilitation of the feeder roads in the country. Such an enhancement to the transportation infrastructure is a necessary condition to ensure a better flow of price information and rice products and thereby further reduce transaction costs.

Conclusively, rice has assumed a prominent role in the consumption patterns of the majority of Nigerians. This has aroused the interest of government in the development of the rice economy of the country. However, prices play a prominent role in the allocation of resources in the economy at large, but more specifically in the rice economy. Local rice markets are generally integrated though there is still room for improvements. Imported rice markets are generally not integrated. The dearth of information on prices is highlighted in the study as gaps are noted in the data series employed.

References

- Abdulai, A. (2000) "Spatial Price Transmission and Asymmetry in Ghanaian Maize Market". *Journal of Development Economics*, Vol.63, pp.327-349
- Aderibigbe O.T. 1997. An Economic Analysis of Rice Processing and Marketing in Osun and Ogun States, Nigeria. Ph.d Thesis, Obafemi Awolowo University, Ile-Ife, Nigeria.
- Akande, S.O. (1993) "Periodic Rural Markets in Oyo State", NISER Monograph Series No. 4, The Nigerian Institute of Social and Economic Research, Ibadan
- Akande, S.O. and Femi Olokesusi (2001). "Market Integration and Efficiency in the Domestic North-South Livestock Trade in Nigeria". A Research Proposal under Preparation
- Akpokodje, Godwin; Frederic Lançon and Olaf Erenstein (2001). "Nigeria's Rice Economy: State Of The Art", Paper Presented At The Workshop On "The Nigerian Rice Economy In A Competitive World: Constraints, Opportunities And Strategic Choices" Held At The Nigerian Institute Of Social And Economic Research (Niser), Ibadan, Nigeria, 8-9th November, 2001
- Engle, R.F. and C.W.J. Granger (1987), "Cointegration and Error Correction: Representation, Estimation and Testing", *Econometrica*, Vol.55, No.2
- Iheme, D.A. 1996. The Marketing of Staple Food Crops in Enugu State, Nigeria: A Case Study of Rice, Maize and Beans. An M.Sc. Thesis Submitted to the Faculty of Agriculture, University of Nigeria, Nsukka.