



LOCAL RICE PRODUCTION TREND ANALYSES AND CONSUMPTION IN BENUE STATE, NIGERIA: 1980 – 2016

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Abstract

The research examined local rice production trends and factors inhibiting the consumption of local rice from 1980 to 2016 in Benue State. Primary data were collected with the aid of questionnaire in Benue State, while secondary data were obtained from Benue Agricultural and Rural Development Authority (BNARDA) in 2017. Multistage random sampling method was employed in selecting respondents. Primary data were collected from one hundred and fifty six (156) respondents. Descriptive statistics, Z – test, Growth model and Kendal's coefficient of concordance were used for the analysis. The results revealed that from 1980 to 2016, a total of 9.5mt of local rice was produced in Benue State. The result also shows that the respondents were all married (99%), with household size of 1 - 10 persons (95%) and mean household size of about 8 persons. The result further indicated that majority of respondents' attained tertiary school level. The result also shows that the respondents had low income (40.3%). The mean quantity of local rice production was 257,333.06mt per year. The instantaneous growth trends of local rice production and price were 0.00122 and 0.01103, and compound growth rate as 3.72 and 3.76 respectively. The result also indicated that many of the respondents were above the age of 41 years (49%) with the mean age of 47 and all respondents male. The presence of stones, poor aroma, impure rice and broken grain were some of the factors inhibiting consumption of local rice in Benue State. The study recommended that the policies that focus on increasing growth rate of local rice in Benue State should be intensified. Breeders and Scientists should make effort in breeding rice with aroma. The processors of local rice should use modern processing mills like rice polisher and des-stoners to mill quality local rice that will be acceptable to consumers.

Keywords: Local rice, Growth trends, inhibiting factors, Quality

Introduction

Rice is an important food crop and major normal food for up to half of the world's population (Dauda *et al.*, 2019). Local rice is all rice, regardless of improved or non- improved varieties that are produced within Nigeria. They are non- refined and non-polished rice that are produced by removing the husk of rice. The rice retains the nutrient in bran during soaking and parboiling (Tonifelix, 2017). It is also the staple food in most African countries, providing dietary energy to the rapid increasing population (Dauda *et al.*, 2019). In Africa, rice provides 715kcal, 27% of nutritional supply of energy, 20% of nutritional protein and 3% of nutritional fat (Dauda *et al.*, *ibid*). Rice occupied fifth major source of energy in diet for mankind, providing 9% of caloric usage (FAO, 2012). Rice is a source of raw material for industries and offers job opportunity for the growing Nigerian population of different forms, from the point of rice cultivation, processing, wholesales and

sales to final consumers (Marlia *et al.*, 2011). The quality of local rice is an essential factor for patronage by Nigerian consumers especially Benue State indigenes. Foreign rice is clean polished shining milled rice, however, even with variation in utility value, higher demand and cost; local rice is more nutritious and has more organoleptic attributes (Opeyemi *et al.*, 2005). Major factors that led to poor quality of local rice may be as a result of poor- processing machines, storage, post-harvest handling, planting and planting materials and agronomic practices. However, reasons for consumers' choice of certain category of locally produced and milled rice is up till today not scientifically investigated (Igboji *et al.*, 2015). It may be because of these problems mentioned that most of rice producers do not know why consumers prefer certain category of rice to others. Knowledge of the reasons why consumers like certain category of local rice is very necessary only not because of rice quality upgrading but also sector planning for

rice producers in Nigerians at large. The objectives of the research are also to examine and rank the inhibiting factors of local rice from the primary data obtained using structural questionnaire and estimate the growth rate of local rice production.

Methodology

The study area was Benue State, created in 1976 and is located in the middle belt. The State is within latitudes 6°25'N and 8°8'N of the equator and longitudes 7°47'E and 10°0'E of the Greenwich meridian (NPC, 2006). Benue State stretches across the transition belt between the forest and savannah vegetation. Much of the area consists of undulating hills or grassy open space on the North and dry savannah on the South. Benue State has a tropical climate which manifests in two seasons; rainy season from April to October, while the dry season is from November to March. Annual average rainfall varies from 1,750mm on the southern part of the State to 1,250mm on the Northern part. The State is a major producer of food and cash crops like yam, cassava, rice, groundnut and maize. Other crops produced in the State include; sweet potatoes, millet, sorghum, sesame soya beans, sugar cane, oil palm, mango, citrus and banana. Irrigation farming along the banks of rivers Benue and Katsina-Ala is a common feature. It is also a common practice to find each farming family keeping one form of livestock or the other. These include; poultry, rabbitry, piggyery, sheep and goat on small scale (BNARDA,

2014). The secondary data used were obtained from Benue Agricultural and Rural Development Authority (BNARDA, 2017). A multi-stage sampling method was used in the selection of respondents. The first stage was selection of two Local Government Areas (LGAs) purposively due to higher concentration of production of local rice, from each agricultural zone. This makes a total of six (6) LGAs in all from the three (3) Agricultural zones in Benue State. Enumeration areas (EAs) were also randomly selected from LGAs. Sampling frame of households was generated using 2006 census enumeration list. The final stage was simple random proportionate sampling of 156 household heads from sample frame of 246,172 respondents from 6 LGAs in the State using Taro Yamane's formula at 8% precision as shown in Table 1. Taro Yamane's formula stated thus; $n = \frac{N}{1 + N(e)^2}$. Sampling frame of each EAs was obtained from enumeration list of 2006 National population census through random sampling given a total of 246,172.

$$n = 1 + \frac{246,172}{1 + 246,172 (0.08)^2} = 156.25$$

Sampling proportion to size of each town =

$$n = 1 + \frac{14,920}{1246,172 (156)} = 9 \text{ for Ayyin and others are}$$

shown in Table 1.

Table 1 Sampling distribution of respondents by zones in Benue State

Zones	LGAs	EAs	Sampling Frame	Sample size
1	Logo	Ayyin	14,920	9
		Ugba	16,510	10
	Kwande	Adikpo	16,507	10
		Ada	14,491	9
		Ushah	15,009	9
2	Gboko	Gboko	20,254	13
		Vende	21,210	13
		Masajeipav	11,950	8
	Makurdi	Gyado	26,107	17
		Nbalah	27,230	17
		Agatu	11,501	7
3	Agatu	Igba	11,501	7
		Obagaji	10,850	9
	Oturkpo	Adikwe	20,420	13
		Okpomoju	19,143	12
Total			246,172	156

Source: 2006 National population census figure

Primary data were collected using structured questionnaire. Information like socio-economic characteristics of consumers, disposable income and factor inhibiting consumption of local rice were obtained.

Analytical Techniques

Data were analysed using both descriptive statistics and non-parametric methods. Descriptive statistics like

percentages and mean were used in describing socio – economic characteristics of household heads. The inhibiting factors of local rice identified were ranked by the respondents thus; most inhibiting factors, inhibiting factors and less inhibiting factors for consumption of local rice. Kendal's Coefficient of concordance was employed to analyse the degree of agreement of the household heads. Growth Model was used to analyse the exponential trend or log –linear trend of local rice. It was

used to model trend in rice production. The exponential or log – linear trend equation for the output of local rice production and price in Benue State is presented thus

$$\text{Lnpro} = \beta_0 + \beta_1 t + e_i \dots\dots\dots (1)$$

$$\text{Lnprice} = \beta_0 + \beta_1 t + e_i \dots\dots\dots (2)$$

Where,

Lnpro= quantity of local rice output (measured in metric tons) at period t (Log of production)

Lnprice= value of quantity of local rice output (measured in million naira) at period t (Log of price)

β_0 = constant in the regression line

β_1 = trend coefficient

t = trend measured in years

e_i = error term

The point in time growth rate (instantaneous growth rate) model is given thus;

$$\text{Growth rate} = \beta_1 \times 100 \dots\dots\dots (3)$$

Where,

β_1 = relative change in quantity of output

t = trend measured in years

Multiplying the relative change in local rice output by 100 gives the percentage change or growth rate in local rice output for change in time. After the estimation of equation 3 at certain point in time growth rate of local rice, the compound rate of growth is computed in line with Onu *et al.* (2015) thus;

$$r = (e^{\beta_1} - 1) \times 100 \dots\dots\dots (4)$$

Where,

e = Euler's exponential constant (2.71828)

β_1 = estimated co efficient in equations (1) (2) and (3) respectively

Kendal's Coefficient of Concordance

Kendal's coefficient of concordance is non-parametric method for analysing set of observations. The frequent use of Kendal's coefficient of concordance is because of its ability of indicating ranks and level of agreement of the set of observation. In its use, each respondent is given the opportunity to mention and rank the inhibiting factors based on the most importance to less important or otherwise. Kendal's coefficient of concordance is given thus;

$$W = 12S/P^2(n^2 - n) - P^t \dots\dots\dots (5)$$

Where,

P = is the number of the observation, n = number of rice inhibiting factors being ranked, S = sum of squares and t = correction for tie. The value of W is tested using the chi square $\chi^2 = P(n - 1)w$. Null hypothesis of agreement in the ranks of inhibiting factors as provided by observation. The rejection or acceptance of the hypothesis is based on significance of the chi square. When the chi square is significant, the null hypothesis is rejected that there is no agreement among the respondents that all the factors mentioned were

inhibiting factors; if otherwise the alternative hypothesis will be true that these factors were inhibiting factors.

Results and Discussion

Socio-economic Characteristics of the Local Rice Consumers in the Study Area

Local rice consumers have different socio-economic characteristics in their various locations. This affects their consumption pattern and quantity required. The result in Table 2 shows that 49% of the respondents were within the age range of 41 - 50 years. This implies that these household heads were married and some with children. This means large family sizes that would need larger quantity of food especially local rice. As the adults get married with children, the family increases. This result corroborates the work of Iweke and Ederewhenbe, (2018) who asserted that as the age of youths increases, they get married and family size also increases, and this can increase the quantity of food consumption, especially local rice. The study also confirmed that it is an advantage in time of production as a source of labour. Large family size may be used for local rice production as a substitute to paid labour. The mean age of the household heads in Benue State was 47. Gender of the respondents in the study area greatly affects the local rice consumption quantity as indicated by Ehiakpor *et al.* (2017). The decisions and income of the head of the family determine the quantity of local rice that will be purchased. The result in Table 2 shows that all the respondents (100%) were male. Males headed households are more prevalent in the North, and could be the influence of the two common religions practised in the Northern part of Nigeria, probably because of the religions belief that only male should be the head of the family. The study corroborates the findings of (Oyinbo, 2014), who noted that males determine the quantity of local rice that should be bought and consumed at a given period. The household size was relatively high among the respondents. Most of the respondents have household size of 1-10 persons, with mean household size of 8 persons. The implication of high household size is probability of spending much income on consumption. This is an indication that majority of the respondents have consumed large quantity of food especially local rice. The implication is that more of local rice will be needed to supplement the increased demand. Most of the respondents were educated with 81% at both secondary and tertiary levels. A well-educated respondent can easily get access to information concerning nutritional value of all kinds of local rice available in the market. This can easily be done from the labels written on their package bags. This information could have positive or negative effects on the use of local rice. This is because quality local rice that is clean may be preferred, while, low quality local rice may be affected negatively. This agrees with the works of Qisthy *et al.* (2018) who noted that literate consumers used labels on packaged bags to identify the products of their choice. There are milling centres where local rice has labels on bags. This enables consumers to read labels on bags to guide their consumption decision.

Income is a factor that determines household food consumption. As income of household increases, the food consumption also increases (Salihu *et al.*, 2017). Although due to low quality of local rice as the income increases, the respondents may change to foreign rice. The result presented in Table 2 shows that 64% of the respondents were low income earners. This may have negative impact on consumption of local rice. This is because consumers will go for food products that are

cheaper than local rice, example *gari* or yam powder. The implication is that there will be low consumption of local rice. This agrees with the studies of Salihu *et al.* (2017), who argued that income may affect the consumption of quality local rice. Increase in income may equally increase quantity of quality local rice consumption. This also affects the local rice supply, because high consumption causes price hike, which on other hand increase income.

Table 2: Socio – economic characteristics of the respondents

Variable	Frequency	Percentage
Age		
20 -30	2	1
31 – 40	32	21
41 – 50	78	49
51 – 60	8	5
Total(mean)	156(47)	100
Gender		
Male	156	100
Total	156	100
Household size		
1 – 10	118	75
11 – 20	38	25
Total(mean)	156(8)	100
Edu. level		
Primary	29	19
Secondary	53	34
tertiary	73	47
Non formal	-	
Total (mean)	156 (39)	100
Annual income		
201,000 -300,000	12	7.5
301,000 – 400,000	3	1.9
401,000 – 500,000	63	40.3
501,000 – 600,000	11	7.4
601,000 – 700,000	7	4.4
701,000 – 800,000	17	10.8
801,000 - 900,000	22	14.2
901,000 – 1,000,000	21	13.4
Total (mean)	156 (489)	100

Source: Field survey, 2017

Results in Table 3 show the inhibiting factors as enumerated by the respondents or rice consumers in Benue State. The transcriptions of the inhibiting factors were explained by respondents as shown in Table 3. The mean scores were ranked as detailed in Table 7.

Table 3: Local Rice inhibiting factors and description by household heads

Inhibiting factors	Household description of inhibiting factors
Impure rice	Dark brown rice due to dust and mud
Presence of stone	Small stone in rice grain
Poor taste	Marshy and tasteless rice
Broken rice	Break into smaller one and powder
Poor aroma	Rice grains that does not give out scent during cooking
Foreign materials	Contain seeds of other grasses
Low swelling ability	Does not increase in pot during cooking
Local rice with debris	Not well winnowed

Source: Field Survey, 2017

Trend in Rice Production and Price in Benue State (1980-2016) (BNARDA, 2017)

Table 4 shows the pattern in rice production and price in Benue State covering the period of 1980 – 2016. Results show that a total of 9.5 million metric tons of local rice was cultivated in Benue State from 1980 – 2016. The quantity of local rice cultivated in Benue State differs from minimum of 69,528.2 in 1980 to maximum of 341,735 metric tons in 1996. The cultivation of rice increased from 69,528.2 metric tons in 1980 to 251,718.4 metric tons in 1982 and declined to 184,277.6

metric tons in 1983. The production in 1984 increased to 241,737.6 mt continuous in 1985 and declined back to 201,960 metric tons in 1997. The production in 1998 witnessed increase of 253,713.6 thousand metric tons and got to the peak of 276,808 in 2002 production period. In 2003 production was less by 808 thousand metric tons but started increasing in 2004 from 272,080 metric tons and got the peak of 341,286 metric tons in 2011. The result also shows that local rice production in Benue State has structural breaks in growth rate from 1980 - 2016.

Table 4: Trend in rice production and value in Benue State within (1980 – 2016)

Year	Qty of production	Change in qty of production	Price per tone	Change in price per tone	% change in qty of production	% change in price per tone
1980	69528.4	-	13169	-	-	-
1981	74,509.03	4980.632	13484	315	5.584864024	0.123014
1982	251,718.4	177209.368	15019	1535	198.7077592	0.599448
1983	184277.6	-67440.8	13146	-1873	75.62247073	-0.73144
1984	241737.6	57460	12830	-316	64.43083665	-0.1234
1985	246848.7	5111.1	15461	2631	5.731159923	1.027457
1986	171198.5	-75650.2	19984	4523	84.82780506	1.766321
1987	174399.3	3200.8	19346	-638	3.589109327	-0.24915
1988	196296	21896.7	20807	1461	24.55312741	0.570549
1989	212390.5	16094.5	37569	16762	18.04702576	6.545892
1990	201390	-11000.5	37100	-469	12.33504035	-0.18315
1991	236694.5	35304.5	36646	-454	39.58751257	-0.1773
1992	252800	16105.5	37100	454	18.05936024	0.177296
1993	323311	70511	38876	1776	79.06513614	0.693563
1994	236601	-86710	35969	-2907	97.22933947	-1.13524
1995	212563.2	-24037.8	37507	1538	26.95397781	0.600619
1996	341735	129171.8	38123	616	144.8424494	0.24056
1997	201960	-139775	39023	900	156.7319908	0.351468
1998	253713.6	51753.6	38976	-47	58.03215711	-0.01835
1999	266759.5	13045.9	36738	-2238	14.62858078	-0.87398
2000	275097.6	8338.1	42969	6231	9.349647738	2.433329
2001	275720	622.4	52638	9669	0.697907287	3.775935
2002	276808	1088	51176	-1462	1.219992173	-0.57094
2003	275900	-908	91438	40262	1.018155233	15.72311
2004	272080	-3820	86315	-5123	4.283428402	-2.00063
2005	274000	1920	98730	12415	2.152927364	4.848303
2006	277729.8	3729.8	105876	7146	4.182285669	2.790654
2007	273880	-3849.8	120323	14447	4.316843629	5.641839
2008	288120	14240	130400	10077	15.96754462	3.935267
2009	288840	720	136138	5738	0.807347762	2.240802
2010	300000	11160	153053	16915	12.51389031	6.605641
2011	341286	41286	153076	23	46.29466623	0.008982
2012	343286	2000	167792	14716	2.242632671	5.746889
2013	345286	2000	169230	1438	2.242632671	0.561567
2014	351286	6000	177017	7787	6.727898014	3.040977
2015	355286	4000	206138	29121	4.485265343	11.37233
2016	356,286	1000	269238	63100	1.121316336	24.6418
Total	9,521,323.2	286,757.50	2,656,521	256,069	321.41	99.96
Mean	257,333.06	7,965.49	75,900.60	7,113.03	36.91	2.78

Source: Benue State Agricultural Development Authority (1980 – 2016)

Growth in Quantity of Local Rice and Prices in Benue State (1980 – 2016)

Table 5 shows the growth in quantity of local rice and price in Benue State. There was significant increase in quantity of local rice and price from 1980 – 2016. The result shows that the coefficient of time variable was significant at 1% for quantity produced and the price of rice within these production seasons. This means time

variable was important in measuring the quantity of local rice produced and price in Benue State. The Table 4 also shows that the coefficient of determination was (R^2) was 0.4962 for local rice production and 0.7054 for the price and were all significant at 1% ($p < 0.000$) during the period. This also indicated that growth was time dependent.

Table 5: Estimated exponential trend equation for quantity produced and price in Benue State (1980 -2016)

Dependent Variable	β_0	β_1	R ²	Adj. R ²	F-ratio
Qty of production	1991.94	0.0000122	0.4962	0.4781	0.000***
Price per tonne	1986.806	0.00011	0.7054	0.6970	0.000***

Source: computed by researcher, *** represent 1% significant level

Rate of Growth of Production and Price in Benue State (1980 – 2016)

The estimated growth rate of local rice produced and price in Benue State within these periods are presented in Table 6. These slope coefficients were multiply by hundred to obtained growth rate. The growth rate of 0.00122% and 0.011% for local rice production and price revealed that over the period of 1980 – 2016, the

production and price of local rice in Benue State increased at a point in time and not period. The compound growth rate (r) was also estimated from point in time growth rates (0.00122 and 0.011). The growth trend of local rice production and price in Benue State per year (point growth rate) were 0.00122% and 0.011%. In a related development, the growth rate from 1980 – 2016 were 3.72% and 3.76% respectively.

Table 6: Point in time growth rate and Compound growth rate for quantity of local rice production and price in Benue State (1980 – 2016)

Variable	β_1	Point growth rate (%)	Compound growth rate (%)
Qty of local rice produced	0.0000122	0.00122	3.72
Price of local rice produced	0.00011	0.011	3.76

Source: Computed by Researcher 2017

Inhibiting factors associated with consumption of local rice in Benue State

The results in Table 7 indicate that 62% of the respondents agreed that local rice inhibiting factors include; presence of stone, poor aroma, poor taste, and broken rice grain, rice with debris, low swelling ability and presence of foreign materials. The result in Table 7 revealed that presence of stone in local rice has mean score of 1.38 and was ranked 1st. This means that it is the first most inhibiting factor for demand and consumption of local Rice. Ranked next is poor aroma and impure rice. These have mean scores of 3.30 and 3.73 respectively. They were ranked 2nd and 3rd most important inhibiting factors for local rice consumption This corroborates the work of Diako *et al.* (2010) who confirmed that local rice without aroma have low demand or are not demanded, as consumers buy local rice because of the unique aroma. This means that local rice with impurities and poor aroma would likely experience very poor patronage. In Table 7 broken local

rice grain and poor taste were ranked 4th and 5th in Benue State with mean rank scores of 4.00 and 5.13 respectively. This revealed that the consumers prefer full grain rice with taste. This work disagree with the findings of Diagne *et al.* (2017) who confirmed that about 77% of the respondents prefer broken rice grain to whole – grain. The presence of foreign materials and low swelling ability were ranked 6th and 7th with mean rank scores of 5.84 and 6.23 respectively. This corroborate the findings Abubakar *et al.* (2015) who confirmed that rice with low swelling ability always have low patronage in the market; this is because consumers prefer small quantity of local rice that will fill the cooking pot. The study also reveals that rice with debris was ranked 8th inhibiting factor with the mean rank score of 6.37. This has positive and significant impact on buying local rice. Better taste and good clean appearance were the two main features of high quality local rice.

Table 7: Inhibiting factors of local Rice in Benue State with mean and rank Scores

Inhibiting factor	Mean scores	Rank scores
Presence of stone	1.38	1 st
Poor aroma	3.30	2 nd
Impure local Rice	3.73	3 rd
Broken grain	4.00	4 th
Poor taste	5.13	5 th
Foreign materials	5.84	6 th
Low swelling ability	6.23	7 th
Local Rice with debris	6.37	8 th

Source: Field survey, 2017

Test of hypothesis

Kendal's coefficient of concordance was used to assess whether or not consumers identify differences between the mentioned local rice inhibiting factors. The result is presented in Table 8. The result is statistically significant at 1%. The calculated Z – statistics for testing of hypothesis was 41.3. The null hypothesis that local rice

characteristics have no significant effect on demand and consumption was not accepted. The Kendal's coefficient of concordance analysis shows that 62% of the sampled consumers were in total agreement with each other in Benue State, that there were different inhibiting characteristics of local rice and these characteristics have significant effect on demand and consumption.

Table 8: Factors Inhibiting Consumption of Local Rice Hypothesis Testing

Test Statistics	Estimated value
N	281
Kendall's W	0.62
Z- calculated	41.3
Z critical	0.000

Source: Field survey, 2017

Conclusion

The study which covers the period of 37 years has shown that local rice consumers were middle aged. The household heads were all male with household size of 8 persons. Majority of the respondents were educated and low income earners. The growth rate of production and price were low. The study also concluded that poor quality associated with local rice was inhibiting factor that limited the consumption. The study recommended that quality of local rice should be enhanced to motivate consumption by providing good processing facilities and de-stoning machines. The breeders and scientists should breed local rice with good aroma and grain tolerant to breakage during milling. This will make local rice to be more acceptable to consumers. The processors on their part should make sure that during parboiling and drying, slabs are kept clean or tan pollens are used to make rice stone free. On the part of milling and producing clean rice, modern milling machines, polishers and de-stoners should be used to produce clean and quality local rice. Quality of local rice is the first thing consumers consider when buying rice. Therefore, making use resources to add value to local rice, especially processing will be a step in the right direction and recommended to attract consumers.

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