academicJournals

Vol. 10(40), pp. 3804-3813, 1 October, 2015
DOI: 10.5897/AJAR12.1037
Article Number: 787585D55656
ISSN 1991-637X

http://www.academicjournals.org/AJAR

African Journal of Agricultural Research

Full Length Research Paper

Understanding the linkage of urban and rural markets of cassava products in Nigeria

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Received 16 April, 2012; Accepted 20 August, 2015

The importance of cassava to the livelihoods of many millions of poor people has made the commodity a target for interventions. The potential of the crop is large because it offers the cheap source of food calories and the highest yield per unit area. It also has multiple roles as famine reserve, food and cash crop, industrial raw material and livestock feed. The objectives of this paper were to describe the traditional cassava trade networks involving the rural (supply) and urban (demand) markets, assess the degree of market integration for traditional cassava products and suggest policy approaches to increase market efficiency. The data was collected in 60 urban markets that were surveyed. About 500 rural markets were also surveyed with key information on the movement of different cassava commodities from the rural market to each urban destination (demand) market. Market integration between rural supply and one urban demand market for the cassava-based products of gari and chips were analyzed. The results showed that eight cassava-based products are traded in two basic (dry and wet) forms in Nigeria. The Kano-Katsina-Maradi axis is a major cassava cross border trade route in West Africa. Gari and chips (flour) are the most important products traded across borders. Improving local cassava production in the south and central regions of Nigeria will therefore help create wealth and also help to reduce risks arising from cyclical drought in the Sahelian countries. The price system can be expected to respond to exogenous shocks and return to equilibrium but market information is not efficient in traditional cassava products markets. A dual policy approach is therefore recommended to encourage additional cassava production for industrial purposes and at the same time support existing smallholder production systems through the introduction of improved inputs.

Key words: Market efficiency, market channels, agriculture, price system.

INTRODUCTION

A staple food for over 500 million people, cassava is a good commercial cash crop and a major source of food. The importance of cassava to the livelihoods of many millions of poor people has made the commodity a target for interventions. The potential of the crop is large because it offers the cheap source of food calories and

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the highest yield per unit area. It also has multiple roles as famine reserve, food and cash crop, industrial raw material and livestock feed. There are also many agronomic (relative resistance to pests and diseases, flexibility in planting and harvesting, etc.) and social (income earner for women, flexible labor requirements) reasons why cassava has become so important (Westby et al., 2004).

As cassava is a highly important element in the Nigerian diet, growing and taking care of the crop are embedded in the daily routine of almost every household, particularly in the rural areas and suburbs of the cities (Bokanga and Tewe, 1996). Until early 2000, production was highest in the middle belt of the country. This was due mainly to land availability (over 40.2 million ha), lower population density (107 people/km^2), satisfactory length of growing season (187 to 270 days), abundant rain-free days for drying, woody grassland vegetation and is thus easy to clear, high insolation (even during the rainy season), and well-drained, coarse-textured, responsive soil (which is good for fertilization, land preparation, and crop growth). The south has a higher population, less land for large-scale farming, higher fragmentation of land (land tenure system), and is more commercial. The north has advantages similar to those in the middle belt but poorer soils, and fewer rainy days. The higher production in the middle belt could also have been attributed to the Federal Ministry of Agriculture's Special Program on Food Security in the 2000s where "production and improvements in the farming systems in its pilot sites in the region were emphasized''. Existing processors in the region claimed that the supply of raw tubers was abundant, and land was still available for cultivation, should farmers need to expand their production.

Nigeria grows more cassava than any other country in the world. According to FAO (2005) total cassava output in Nigeria was estimated at 38 million metric tons. Production increased by 22% between 1995 and 2004. Area cultivated also increased by 40% but yields remained relatively stagnant. The production of cassava is concentrated in the hands of numerous resource poor farmers located primarily in the south and central regions of Nigeria.

About ninety percent of cassava grown in the country is consumed as food (Ugwu, 1996) in several ways, which have broadly been categorized into cooked and uncooked paste, steamed and toasted granules, fermented and unfermented chips and flours (Nweke, 1994). Cassava is processed into several products. Several cassava products are traded in various forms following informal (basic) commodity chains in Nigeria's rural and urban markets. Initiatives to improve the traditional cassava commodity chain and regional trade require understanding of the basic cassava food commodity chain.

The motivation and emphasis of this paper is the fact that there are millions of small farmer and traders producing and trading cassava products in Nigeria. They seem to respond very quickly to changes in prices resulting from supply and or demand fluctuations. These traders also export cassava products to neighboring food deficit countries like Niger, Chad, Bukina Faso and Northern Cameroons. This is particularly extensive especially during the drought/famine years in these Sahelian countries.

Hence, the objectives of this paper were to describe the traditional cassava trade networks involving the rural (supply) and urban (demand) markets and assess the degree of market integration for selected traditional products.

METHODOLOGY

Data for this paper was obtained from a survey carried out in two phases in 2005 with prices collected weekly from the urban and rural markets. This information is still relevant because there were not major increments in production and structural changes in the cassava market in Nigeria from 2005 to 2012 as reported in some publications (Asante-pok, 2013; Nirsal, 2012).

The first phase of the survey involved 27 major cities in Nigeria. About 60 urban markets were surveyed. The list of rural markets that supply cassava to the urban markets were compiled from the survey of urban markets and used for the second phase of the study. The second phase involved a survey of all the listed rural (supply) markets. About 500 rural markets were surveyed. Key informants in the rural markets provided information on the movement (in relative volumes) of different cassava commodities from the rural market to each urban destination (demand) market. These informants also provided information about source markets for cassava products, including: cassava products traded, major source markets, relative volumes by market source, distance of source markets to destination (urban) markets and other specific characteristics of the markets. Supplementary information from rapid appraisal of cross border trade market in Dawanau, Kano provided further information on the nature and character cross border trade in Nigeria.

In this study, it was specified a model relating prices of cassava products in rural or peripheral markets to their respective prices in a central market based on the central market hypothesis of geographical markets. The basic assumption in this model is that rural/peripheral market prices are driven by the prices, which prevail in the central market (Chang and Griffith, 1998). Thus, in effect, a possibility of leading prices from the rural/peripheral markets, although in market integration, was not assumed. As observed by Goodwin and Holt (1999), there were no clear trends as in some cases; there are leading prices, while in others there are not.

It is hypothesized that within the model, the rural market price (RMP) and the central market price (CMP) are jointly determined (that is endogenous to the system) while any other variable is exogenous to the system. Given this condition, the vector auto-regression (VAR) representation of our model involving two endogenous variable, without any exogenous variable, following Sims' (1980) can be specified as:

$$Z_t = \delta + A_1 Z_{t-1} + A_2 Z_{t-2} + ... + A_{P-1} Z_{t-P+1} + U_t \quad (1)$$

Where: Zt is a (n x 1) vector of non-stationary I(1) endogenous variables; δ is a (n x 1) vector of parameters; Ai are (n x n) matrix of parameters; Ut is an (n x 1) vector of random variables, distributed as empirical white noise.

From the above specification,

$$Z_t = [LnRMP_t, LnCMP_t]'$$

Where: LnRMPt is rural market price; and LnCMPt is central market price.

Since, it is wanted to distinguish between stationary by linear combinations and by differencing, the VAR in Equation (1) can be re-written in its vector error correction form thus:

$$\Delta Z_t = \delta + \Gamma_1 \Delta Z_{t-1} + \Gamma_2 \Delta Z_{t-2} + ... + \Gamma_{P-1} \Delta Z_{t-P+1} + \Pi Z_{t-P} + U_t \quad (2)$$

Where: Zt is a vector of non-stationary I (1) endogenous variables; $\Delta Z_t = Z_t - Z_{t-1}$; Π and Γi are (n x n) matrices of parameters with $\Gamma_i = -(I - A_1 - A_2 - ...A_i)$; $(i = 1,...k-1)$ and $\Pi = I - \Pi_1 - \Pi_2 ... \Pi_k$.

From the above specification, the information about the short-run and long-run adjustments to the changes in Zt through the estimates of Γi and Π respectively can be obtained.

Stationary series have a finite variance, transitory innovations from the mean, and tendency for the series to return to their mean value. This mean that a stationary series Yt for example, has a mean, variance and autocorrelation that is constant over time, implying that the error structure is time invariant (Adam, 1992; Tambi, 1999; Niemi, 2003). To carry out the unit root test for stationarity, the Dickey-Fuller (DF) and Augmented Dickey-Fuller (ADF) tests are used to examine each of the variables for the presence of a unit root (an indication of non-stationary). The DF test assumes that the data generating process is a $AR(1)$ process, and so if this is not so the autocorrelation in the error term will bias the test. The ADF was used to avoid such bias in the test since it includes the first difference in lags in such a way that the error term is distributed as white noise.

To test for co-integration, we consider the vector error correction model specification in Equation (2). Information about the number of co-integrating relationships among the variables in Zt is given by the rank of the Π-matrix: if Π is of reduced rank, the model is subject to a unit root; and if 0<r<n, where r is the rank of Π, Π can be decomposed into two (n x r) matrices α and β, such that $\Pi = \alpha\beta'$, where $\beta' Z_t$ is stationary. Here, α is the error correction term and measures the speed of adjustment in ΔZ_t and β contains r distinct co-integrating vectors, that is co-integrating relationships between non-stationary variables, as earlier stated.

The Johansen method uses the reduced rank regression procedure to estimate α and β and the trace test and maximal-eigen value test statistics were used to test the null hypothesis of at most r co-integrating vectors against the alternative that it is greater than r. The interest here is in testing for the presence of a valid relationship. Once this is established, the vector error correction model of the form given below can be estimated.

$$\Delta RMP_t = \delta_{10} + \sum_{i=1}^{n} \delta_{11i} \Delta RMP_{t-i} + \sum_{i=1}^{n} \delta_{12i} \Delta CMP_{t-i} - \alpha(RMP_{t-1} - CMP_{t-1}) + U_t \quad (3)$$

$$\Delta CMP_t = \delta_{20} + \sum_{i=1}^{n} \delta_{21i} \Delta RMP_{t-i} + \sum_{i=1}^{n} \delta_{22i} \Delta CMP_{t-i} - \alpha(RMP_{t-1} - CMP_{t-1}) + U_t \quad (4)$$

Where all the variables are as earlier defined and Δ is the first difference operator while δ11 to δ22 are short-run coefficients and α is the error correction mechanism which measures the speed of adjustment from short-run disequilibria to long-run steady-state equilibrium. Ut is the error term assumed to be distributed as white noise. All the estimations were performed using the Standard Version of Eviews Econometric Software.

RESULTS AND DISCUSSION

The market for cassava in Nigeria can be categorized broadly into two categories. First, the traditional food oriented market for which there also exist a cross border trade and second the emerging market for industrially processed cassava, as showed in Figure 1. Trade in traditional cassava food products is in the hands of small farmers and processors where 62% of the farmers' production is reserved for sale in the local markets while 38% is reserved for home consumption (Ezedinma et al., 2006a). This can be compared to the 1990's, proportion of 45% cassava output produced for sale by small farmers in Nigeria (Nweke, 1998).

Fresh roots are the most important wet form in which cassava is traded in the rural markets suggesting that at least 60% of the rural markets surveyed can also act as raw material supply markets**.** In general, the proportion of markets with wet products in the urban areas was relatively lower than in the case of dry products. The perishable condition of wet products may account for this difference in prices.

Cassava chips are the next important product in the urban markets and come third to fresh roots in relative importance in the rural markets. Fermented flour is also an important cassava product and was found in 68% of the urban markets (Ezedinma, et al, 2005) (Table 1).

In general, product prices differ by region being most expensive in the north and south and least expensive in the central region. Cassava fresh tubers are cheapest in the central region of Nigeria and most expensive in the northern region of the country. At harvest time in the north the price of cassava tubers may equate the prices of fresh tuber in the south and at harvest time in the south the price of fresh cassava tubers may equate prices in the Central region of Nigeria. This is because the harvest season for other cassava competing crops (e.g. maize and sorghum) begins earlier in the far north and influences the price of cassava products downwards.

The same also goes for other competing crops in the

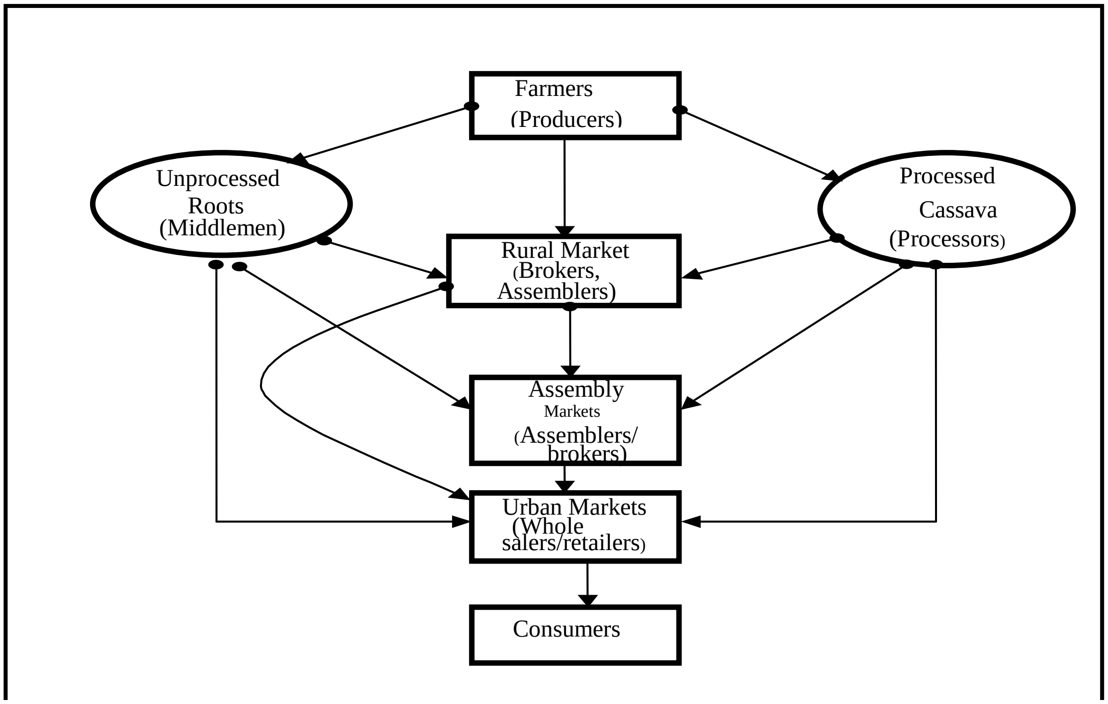

Figure 1. The cassava markets in Nigeria. Source: Ezedinma et al. (2006b).

Table 1. Percentage distribution of dry and wet cassava products at urban and rural markets in Nigeria.

Dry products	Percent	Wet products	Percent
Urban market (n=60)			
Gari	100	Fresh roots	33
Fermented flour (lafun/elubo)	68	Fufu paste	22
Chips	78	Prepared fufu	35
Abacha	42	Edible starch	18
Rural markets (n=512)			
Gari	90	Fresh tuber	60
Fermented flour	33	Fufu paste	37
Chips	40	Prepared fufu	31
Abacha	6	Edible starch	15

Source: Ezedinma et al. 2005.

south (such as yams) that are harvested a little later in the southern region causing the prices of cassava products to decline (Ezedinma, et al, 2006c).

Even though cassava fufu and fufu paste (an intermediate product for prepared fufu) were wet products their emergence in the urban markets suggests that they were desired convenience foods. This implies that a dried form of the cassava fufu flour will improve the quality and quantity of traded fufu flour in the Nigerian market (Oyewole et al 2001). Micro scale technologies for dried fufu flour are available in Nigeria (Sanni et al, 2006) and may help product diversification at the rural cassava processing level. *Gari* is a granulated dry food product processed from cassava roots; it is the most popular cassava product and has gained the status of an urban convenience food in Nigeria. The major gari supply markets in Nigeria are located in Benue, Delta, Edo Ogun and Oyo states. In these states it was observed that between 85 and 240 markets supply gari to major urban cities in Nigeria. Enugu, Kogi, and Osun States in which 55 to 84 markets supply gari to urban cities in the country follow these states. Ekiti, Imo, Kwara and Taraba states with 28 to 54 markets, Ebonyi, Rivers, Ondo, Nasarawa, Kaduna, Kano, and Cross River follow these with 11 to

27 markets. The major urban demand markets for gari are located mainly in Lagos and Oyo states; followed by Benue, Delta, Edo, Enugu, Imo, and Ogun. Next in order of demand are markets located in kwara, Kogi, Ondo, Anambra, Rivers, Kano and Borno States. Other important demand markets are located in Abuja, Cross River, Ekiti, Kaduna, Osun and Plateau States.

Cassava chips are processed in several ways and come in several forms. They may be fermented or unfermented peeled roots that are either sun dried or dried over the fireplace. They may also be cut into pieces and partially fermented before being drying. Chips are intermediate products that are converted into flour by milling. The major sources of cassava chips are the North Central and Western parts of Nigeria. These areas correspond to the major cassava producing zones and fall within the savannah agro ecology. The demand markets for cassava chips are located all over Nigeria.

Abacha is one of the four dry cassava products. Like other products the distribution network for *abacha* consists of rural-urban and rural-assembly-destination markets arrangement. The commodity is found mostly in the southeast States, Delta and Edo States and there is also some production in Kogi State. Sixteen rural markets supply Abacha to four urban areas. Twelve out of the 16 markets were located in Delta State, two in Rivers State and one each in Edo and Imo states respectively.

Fermented cassava flour (also called *lafun* or *elubo*) is a dry cassava product, which is mainly processed by women in the north-central and south-west regions and sold in the rural and roadside markets. Fermented flour, which was found in 68% of the surveyed urban markets in Nigeria, is predominant in the southwest and central States of Nigeria.

Prepared cassava fufu is a fermented product of cassava and until recently was not usually sold in ready-to-eat forms. This phenomenon arose as a result of demand for convenient foods especially in the urban centers. The data suggest that cassava fufu is traded mostly in the southwest and southeast states of Nigeria.

In Delta State southern Nigeria, cassava tubers are traditionally processed into starch for human consumption. Edible starch is an ethnic food found mostly among the Urhobo and Isoko ethnic groups in the State. Apart from its use as a household food security in these areas, wet starch have industrial and other commercial uses in major cities like Onitsha - a major commercial city in southeast Nigeria.

The rural supply markets are located in south and central Nigeria. Kano especially the Dawanau market acts as an assembly market in the movement of cassava chips and gari across the borders to the sahelian countries of Burkina Faso, Chad, Mali, Niger and Northern Cameroon, as shown at Figure 2.

The Kano-Katsina-Maradi axis is a major cassava cross border trade route in West Africa. Gari and chips (flour) are the most important products traded across borders. It has been estimated that the quantity of cassava products that are moved across Nigerian borders through the Kano-Katsina-Maradi axis is about 551,100t or 1.5% of Nigeria's total production in 2004 (Ezedinma et al., 2006c). A major research implication of this observation is that efforts at the dissemination of biologically improved disease resistance and high yielding cassava in the central and southern parts of Nigeria have positive outcomes and impact on the lives of the poor in the sahelian regions of West Africa.

Improving local cassava production in the south and central regions of Nigeria will therefore help create wealth especially for the key actors in the commodity chain for gari and cassava chips and also help to reduce risks arising from cyclical drought in the Sahelian countries (Knipscheer et al, 2004). The cointegration analysis is presented in the next section.

On the other hand, the results of co-integration analysis and the time Series characteristics of data (Unit Root Tests) showed that for all the entire individual price series (except in the price of chips in Benue) the null hypothesis of the presence of a unit root (that is non-stationary) cannot be rejected.

Also, it was found that the critical ADF values were larger in absolute terms than their respective calculated values. On application of the ADF test on their first different terms, they became stationary as indicated by the t-values of the ADF test, which are larger (in absolute) than the standard critical values.

Thus, the null hypothesis of presence of unit root was rejected indicating that all the price variables (except that of chips in Benue) are integrated of order 1 that is, are I(1), suggesting that there is a possibility for their linear combination to be stationary or co-integrated, that is integrated of order 0, that is I(0) (Engle and Granger, 1987). Consequently, the test for co-integrating relationships was performed using the log-level form of the price series. The bivariate co-integrating relations between each of the rural prices and the central market price was done to see how the individual prices co-move in the long-run, since a multivariate system may lead the problem of dimensionality and a loss of information about the speed of price transmission for each of the price series from one market to the other (Johansen and Juselius, 1990).

The Johansen Maximum Likelihood method was used at the co-integrating tests on a pair-wise basis (Table 2). Results of the trace and maximal-eigen value test indicate that co-integration exist among all the bivariate co-integration equations modeled except for Chips between Kano and Benue, White Gari between Kano and Nasarawa, Yellow Gari between Kano and Benue, and Yellow-Gari between Kano and Edo.

This implies that since the prices are co-integrated, the system can be expected to respond to exogenous shocks and return to equilibrium after a while. Prices in any of the rural markets can drift away from the central market price

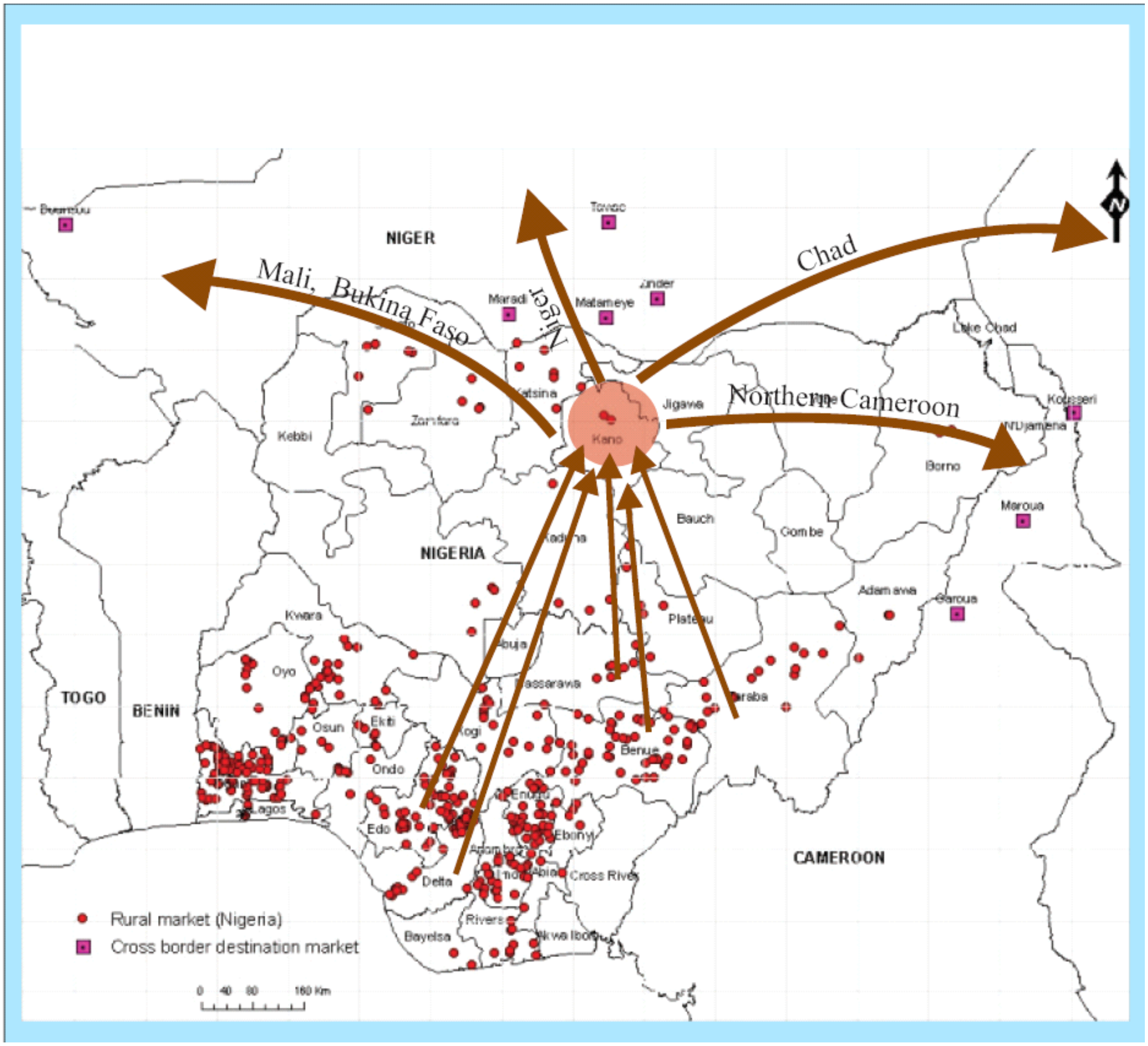

Figure 2. Cross border trade in gari and cassava chips through Dawanau market, Kano, Nigeria. Source: Ezedinma et al. (2006b).

for a while, but would definitely return to equilibrium in the long-run. Specifically, the results for prices of chips between Kano and Benue, white Gari between Kano and Nasarawa, yellow Gari between Kano and Benue, and Yellow Gari between Kano and Edo that show no evidence of co-integration.

This might be an indication that the central market hypothesis has failed in this case, as there may be a possibility of leading prices in the opposite direction, or even between these four rural markets and some other markets that have not been investigated in this study. Thus, it can be inferred that while all other markets are integrated, these four were not. Table 3 shows the summary results of the long-run estimates of price transmission elasticity and speed of price transmission coefficients for each of the pair-wise vector error correction equations.

The estimated price transmission elasticity between Taraba and Kano prices is approximately 1. This shows that the law of one price (LOP) holds because there is full transmission of prices from the central market. Clearly the relative price between these two markets is constant. Thus there is a constant return in prices implying that a 1% increase in Kano prices will lead to a 1% increase in Taraba prices. Furthermore, the speed of adjustment to disequilibrium errors is -0.1146 and indicates a feedback of only about 11.46% of the previous week's disequilibrium from the long-run elasticity of Kano prices for chips. Particularly, this shows that the speed at which Taraba chips prices adjust to changes in Kano prices in

Table 2. Bivariate (pair-wise) co-integration tests between Kano and each of the satellite markets.

Null Hypothesis	Trace statistic	5% critical Value	1% Critical Value	Max-eigen statistic	5%[1]	1%[1]
			Chips			
			Kano and Taraba			
r=0	16.447	12.53	16.31	16.362	11.44	15.69
r≤1	0.0850**	3.84	6.51	0.0850**	3.84	6.51
			Kano and Benue			
r=0	9.8814	15.41	20.04	9.5309	14.07	18.63
r≤1	0.3504	3.76	6.65	0.3504	3.76	6.65
			Kano and Taraba			
r=0	22.425	15.41	20.04	18.842	14.07	18.63
r≤1	3.584**	3.76	6.65	3.584**	3.76	6.65
			Kano and Benue			
r=0	21.508	15.41	20.04	21.506	14.07	18.63
r≤1	0.0019**	3.76	6.65	0.0019**	3.76	6.65
			Kano and Nasarawa			
r=0	29.635*	25.32	30.45	27.099**	18.96	23.65
r≤1	2.536	12.25	16.26	2.536	12.25	16.26
			White Gari			
			Kano and Taraba			
r=0	15.8277	15.41	20.04	12.109	14.07	18.63
r≤1	3.718*	3.76	6.65	3.7186	3.76	6.65
			Kano and Benue			
r=0	24.0049	15.41	20.04	21.588	14.07	18.63
r≤1	2.4162**	3.76	6.65	2.4162**	3.76	6.65
			Kano and Nasarawa			
r=0	8.9167	15.41	20.04	6.6799	14.07	18.63
r≤1	2.2367	3.76	6.65	2.2367	3.76	6.65
			Kano and Edo			
r=0	23.303**	15.41	20.04	21.565**	14.07	18.63
r≤1	1.737	3.76	6.65	1.737	3.76	6.65
			Yellow Gari			
			Kano and Taraba			
r=0	21.006**	15.41	20.04	15.21	14.07	18.63
r≤1	5.7869	3.76	6.65	5.7869	3.76	6.65
			Kano and Benue			
r=0	14.934	15.41	20.04	9.21	14.07	18.63
1 r≤1	5.723	3.76	6.65	5.723	3.76	6.65
			Kano and Nasarawa			
r=0	22.603**	15.41	20.04	19.931**	14.07	18.63
1 r≤1	2.6722	3.76	6.65	2.6722	3.76	6.65

Table 2. (Contd.)

Kano and Edo						
r=0	12.7809	15.41	20.04	9.856	14.07	18.63
1 r≤1	2.9244	3.76	6.65	2.9244	3.76	6.65

(*) and (**) = denote cointegration at 5% and 1% significance levels respectively.

Table 3. Summary results of the estimates of the long-run parameters (price transmission elasticities and speed of price transmission coefficients).

	Estimated ϕs	Estimated αs (ECMs)	Constant
Chips			
T/K	-1.0448**	-0.1146*	1.0457
	(-3.837)	(-2.1197)	
B/K	-3.4694**	-0.0278	10.430
	(-4.5479)	(-1.0170)	
Chips			
T/K	-1.124**	-0.2678**	1.1087
	(-6.5487)	(-3.0663)	
B/K	-0.4348**	-0.4619**	-2.1942
	(-6.5433)	(-4.6303)	
White Gari			
T/K	-0.4301	-0.1457**	-1.625
	(-1.1830)	(-3.4749)	
B/K	-0.5282*	-0.4715**	-1.3347
	(-2.6911)	(-3.8746)	
N/K	-1.5809**	-0.1578*	2.4804
	(-5.8231)	(-2.4165)	
E/K	-0.5627**	-0.1645**	-1.4295
	(-3.4862)	(-4.0705)	
Yellow Gari			
T/K	-0.4376*	-0.1625**	-1.5164
	(-2.011)	(-3.5357)	
B/K	-0.8753**	-0.1553**	0.1196
	(-3.633)	(-2.7352)	
N/K	-1.051**	-0.3287**	1.4004
	(-11.2913)	(-4.0032)	
E/K	-1.0396**	-0.1166*	0.7192
	(-4.7108)	(-2.5751)	

(*) and (**) = denote co-integration at 5% and 1% significance levels respectively.

an effort to achieve long-run static equilibrium is 11.46%.

For chips, the price transmission elasticity between Taraba and Kano, Benue and Kano, and Nasarawa and Kano are respectively -1.1.24, -0.4348 and -1.0823, while the speed of adjustment coefficients are -0.2678, -0.4619 and -1.1012 respectively. These results indicate that while there is full price transmission from Kano to Taraba and Nasarawa, transmission is not full for Benue. Beyond these the ECMs indicate a feed back of about 26.78 and 46.19% respectively of the previous week's disequilibrium from the long-run elasticity of Kano prices for chips in Taraba and Benue respectively.

Conclusions

This study shows that cassava is traditionally traded as a staple food in eight different products either in wet or dry forms in Nigeria. Gari is the predominant cassava based food product. Demand for traditional food commodities from cassava is unlikely to decline given the current rate of population growth, urbanization, and food preferences that is driven by culture and poverty. Local traders play an arbitrage role between rural and urban markets and implicitly govern the basic cassava commodity chain. However, the absence of well-developed organizations implies that small farmers and processors have very little organized marketing power or negotiating ability with product buyers. This problem is trying by several initiatives and projects with main objective of increase yield and production and to improve the number and structure of cassava farmer's organizations (Asante-pok, 2013; Nirsal, 2012).

Cross border trade exists for cassava products and such trade may help to even out food shortages arising from drought in the Sahelian countries but the volume of trade may depend on the intensity of drought in the region. The trade of cassava across borders suggests that multiplication and distribution of improved disease resistant varieties should target major cassava producing areas in order to help alleviate food insecurity in the Sahlian regions.

Results of the trace and maximal-eigen value test indicate that co integration exist among all the bivariate co integration equations modeled except for certain trade routes. This implies that since the prices were co integrated, the system can be expected to respond to exogenous shocks and return to equilibrium after a while. Results of price transmission elasticities and speed of price transmission coefficients for each of the pair-wise vector error correction equations indicates variations in the speed of response to price changes between rural and urban markets for gari and chips suggesting that local market information systems may not be efficient.

The traditional cassava food market is therefore established, vibrant and responsive to price changes. There is some degree of market efficiency in the traditional cassava food market in Nigeria. Since cassava commodity prices were co-integrated the system can be expected to respond to exogenous shocks. Such shocks may be irreversible if they include increases in demand resulting from industrial processing. This may distort the local market economy and lead to food insecurity since the industrial market will compete with the traditional market for the same raw material.

The fact that there is some degree of efficiency in the traditional cassava food market in Nigeria suggests that developments in the cassava industrial sub sector have to be independent of the traditional market. A dual policy approach is therefore recommended in which the government of Nigeria should encourage additional cassava production for industrial purposes and at the same time support existing smallholder production systems through the introduction of improved inputs.

Conflict of Interest

The authors have not declared any conflict of interest.

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