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THE ESTIMATION OF MARKET INTEGRATION OF YAM MARKETING IN CROSS RIVER STATE, NIGERIA

[1]Tiku, N. E., [2]Inyang, J.O., [2]Ovat, K.E. and [3]Igbodor, F. O.

[1]Department of Agricultural Economics and Extension, Federal University, Gashua, Yobe State
[2]Bioresource Development Centre, Odi-Bayelsa
[3]Department of Agricultural Economics and Extension, Federal University, Wukari, Taraba State
Correspondences: (ejor_tiku@yahoo.com***) 08035859130***

Abstract

The study on "Estimation of Market integration for Yam Marketing in Cross River state" was conducted using four markets, i.e. two local markets and two reference markets. Data were collected using well structured questionnaire administered to 81 yam marketers. Ravallion technique was used to estimate the existence of short-run and long-run integration, to show the existence of market segmentation and also to determine the absence of local factors influencing the market. The findings revealed that short-run integration existed between Edor and Ikom markets and the coefficient of the estimated parameter for local price against the reference market was - 0.457514. This agreed with a prior expectation (if the coefficient is greater than zero, market integration exist). The result also revealed that market segmentation does not exist between Ikom and Edor markets. The study equally revealed that short-run and Long-run integration existed between Ochon and Calabar markets as the error term (Ω)≠ 0 and the coefficient was 0.015862. The study concluded that the influence of local factors, such as level of education and years of trading experience influences the prices of yam in both the local market (Edor and Ochon) and reference markets (IKom and Calabar). Therefore the study recommends a reduction in market distortion by various market intermediaries and government should encourage yam farmers by providing effective storage facilities for yam to allow for price stabilization.

Keywords: *Market segmentation, short-run and long-run, market integration*

INTRODUCTION

Market integration of agricultural products has great importance in developing countries due to its potential applications in policy making (Heman and Faten, 2005). The extent of integration gives the government a direction on how to formulate polices of providing infrastructure and regulating services to avoid markets exploitation. Markets that are not integrated may convey inaccurate price information, distorting the marketing decisions of yam producers and contributing inefficient product movements. An analysis of market integration is useful for studying the degree of co-movement of price in spatially separated market.

The marketing system is seen as an integration of economic, social and environmental development, capable of revitalizing and maintaining the economic wealth of a country (Tiku *et al.*, 2005). Adekanye (1988), held the view that one sure area to seek solution to food shortage is to focus attention on the marketing system with particular emphasis on the movement of agricultural product prices. He maintained that an efficient marketing system will ensure that certain products are directed to area of greater demand.

Yam is a staple food crop, grown in large scale in Cross River state and has some nutritional and economic relevance to mankind (NBS, 2007). Yam belongs to the genus *Dioscorea*. The most important species are the white yam (*Dioscorea rotundata*). The tubers are eaten boiled, roasted, fried, mashed or pounded. It is an important energy in the tropics, (Francis, 2001) and it is also noted for its contribution to the economy (Asiedu, 1999). Yam production in Nigeria contributes an average of 72% of the total yam production of West Africa, and 70% of the world's yam production (FAO, 2008).

In Cross River State, yam is produced in very large quantities in Yakurr, Abi, Obubra, Boki and Ikom in the central senatorial district, while Obudu, Ogoja and Yala are major yam producing local government areas in the Northern senatorial district. This is due to the fertile nature of soils and favourable climatic conditions for yam production. However, several problems affect the movement of yam from the major areas of production to major areas of consumption, consequently impacting on the price system. According to Trotter (1992), Short-run integration was taken by Ravallion, (1986) to mean that a change in the reference market price will be fully passed on to the local prices within one time period. Long-run integration implies there is a long-run equilibrium such that prices are constant with no stochastic effects.

Yam marketing involves intermediaries between the producers and the consumers, who facilitate exchange among trading partners to move yam to consumers, these intermediaries function in an environment constrained by low investment in marketing and poor market infrastructure, shortage of food supply and the limited progression towards more visible market arrangements. This study therefore, is of paramount importance as it tends to estimate market integration for yam marketing in four selected markets in Cross River State. The specific objectives include:(i) to estimate the short-run and long-run integration of the prices of yam between Edor and Ikom, and between Ochon and calabar yam markets. (ii) to determine the existence of market segmentation between the markets and (iii) to estimate the impact of local factors on the market.

METHODOLOGY

The study was conducted in Cross River state, Nigeria. Cross River state is located within the tropical rainforest belt of Nigeria. It lies between latitude 40^0 $28^{'}$ and 60^0 $55^{'}$ of the equator and longitude 70^0 $50^{'}$ and $90^0 28^{'}$ E of the Greenwich meridian. It shares common boundaries with the Republic of Cameroun to the East, Benue state to the North, Ebonyi, and Abia states to the west, Akwa Ibom state to the southwest and Atlantic ocean to the south.

It has a land mass of about 23,000km^2 with a population of 2,892,988 giving a density of 137 per square kilometer, population census, (2006). The state has two distinct seasons namely wet and dry seasons with varied ecological zones which makes it rich in the cultivation of variety of crops such as yam, rice, rubber, cocoa, banana, groundnut and assorted vegetables (Ohen and Abang,2011).

The study adopted a multistage sampling procedure, in the first stage; Cross River State was purposively selected. Secondly, four markets comprising two urban and two rural markets were purposively selected. These selections were based on the fact that the rural markets are located within communities of intensive yam cultivation. Thus, Calabar and Ikom yam markets were used as the reference markets while, Ochon yam market and Edor yam markets were used as local markets. Information for this study was drawn from primary sources, derived basically from Cross sectional and

time series data through literature, Personal interview and well structured questionnaire. In the third stage, 81 copies of questionnaire were issued to yam sellers thus; 22 and 21 copies to the reference markets (Calabar and Ikom) respectively, while 20 and 18 copies were issued for rural local markets (Ochon and Edor) respectively.

The model specifications

In determining the short-run, long-run integration and market segmentation, the Ravallion technique was employed. Ravallion (1986) assumed a radial structure such that there was a single reference market which dominates trade and price information. It is represented implicitly thus;

$R = f(P_0 + P_E + X_1)$……1

$P_1 = f(R_1 X_1)$……2

Where:

R = Reference markets (calabar and Ikom)

P_0 = Price of Yam in Ochon market (₦);

P_E = Price of Yam in Edor market (₦); and

X_1 = other factors affecting the reference market price such as level of education, household size and trading experience.

And;

P_1 = Local market Price (₦);

R = Reference market price (₦); and

X_1 = Other factor affecting local market price.

Thus, the reference market price is then a function of the various local market prices, and a vector of other local factors.

Hence, for short-run integration;

$P_E = R_1 + C_X + \Omega$ ----------3

Where;

P_E = Price of Edor Market (₦);

R_1 = Reference market price (₦), (Ikom);

C = Coefficient of other factors affecting the reference market price (Ikom) and

Ω = Error term for the reference market.

For the second market;

$P_0 = R_c + C + \Omega$ …… 4

Where:

P_0= Price at ochon market (₦);

R_C =Reference market price (₦), (Calabar);

C_X= coefficient of other factors affecting the reference market price (Calaber); and

Ω= Error term of the reference market.

For long –run integration :

$P^* = a^* + (b_o + b_i) R^* + c_x$ ----------5

Where;

P* = price at constant value (₦);

a* = coefficient of price at Constant value;

bo+bi= Intercept and Coefficient ;

R* = Reference market price at constant value (₦); and

C_x= coefficient of other factors affecting the reference market price.

To determine the existence of market segmentation, the model was used specified thus;

$P_{t=\alpha} P_t + C x_t + U_t$----------6

Where;

P_t= local market price at time t (₦);

α = coefficient of the price of the local market at time t (₦);

C = coefficient of other factors affecting reference market at time t; and

X =local factors affecting reference market

U_t = error term at time t,

To determine the index of market connection

$$IMC = \frac{I + d_I}{d_3 + d_I} \quad \ldots\ldots\ldots\ldots\ldots\ldots 7$$

Where:

IMC = index of market connection

1 = constant

d_I = coefficient for the demand of yam at local markets(₦); and

d_3= Coefficient for the demand of yam at reference market (₦).

Thus, the decision rule is that if lagged reference market coefficient is strong then the IMC will be low and if the lagged local market is strong, then the IMC will be high.

RESULTS AND DISCUSSION

D*etermination of the existence of short-run integration between Edor and Ikom markets*

The results in Table 1 revealed that a change in the price of yam at Ikom market (reference market) will be fully passed to the local market (Edor market), since the intercept b_0 is above 1 and the coefficient b_1 = -0.457514. This agrees with Tiku *et al.* (2005) that when short-run integration exists, a change in the reference market price will be fully passed on to the local market within a very short market period. The implication is that there is an effective mobility of market information and intelligence. When there is high demand for yam in the reference market, meaning higher prices, Edor market being the supply base, there will be increase demand leading to higher prices. This condition is created because of the change in demand in the reference market. In the short-run farmers and supplier in the local market cannot adjust their output.

The determination of long-run integration between Edor and Ikom market

The result from Table 2 shows that since the error term $\Omega \neq 0$ (1.51E-15), then there was long-run integration. Hence, over the time, prices would be constant with no stochastic effect. This implies that prices of yam in the local market will have a constant relationship with the reference market over time.

Market segmentation between Ikom and Edor

The result in Table 3 revealed that there was no market segmentation between Ikom and Edor market since the coefficient of Edor price was not equal to zero. Heytens (1986) suggested that if two markets are segmented, the reference market will not influence the local market. Ikom the reference market, had various route in which yam can flow into the market. Yam traders in Ikom also get supply from Nde, Ekukunela, Afi, etc without depending solely on Edor market. However, the prices of yam at Ikom would thus affect the prices of yam at Edor market. This accounted for 0.008 price coefficient between Ikom (reference market) and Edor price (the Local market).

The absence of Local factors in Edor and Ikom Markets

The Table 4 Shows that local factors such as household size, level of education and trading experiences had influence on the yam market in the study area. The result revealed a coefficient of 1196.928 as against zero.

Short-run Integration between Calabar and Ochon

Trotter, (1992) asserts that the change in the reference market price will fully pass on the local price within a time period. It is understandable therefore, that local prices of yam would be influenced by the reference prices (Calabar). This is clearly shown in Table 5 which revealed that short run integration existed between Calabar market and Ochon market. Thus in the short-run, it is not possible to have an independent yam price in the study area. This is revealed by the regression result with the coefficient b_0= 0.015862.

Long – run integration between Ochon and Calabar

Table 6 also showed the long- run Integration between Ochon and calabar markets. It revealed that Long –run Integration existed as the error term is not equal to zero**.** Thus the prices would be constant over time with no stochastic effect.

The results obtained from Table 7 shows that market segmentation does not exist

between Ochon and Calabar markets, since the price coefficient was not equal to zero. Calabar being a reference market can l bargely depend on Ochon yam market for supply. This is because yam producers from other smaller villages and local assemblers under Obubra Local Government Area preferred to carry their commodity to Ochon market for sale and this makes yam abundant in Ochon market, since the market is weekly. Most traders in Calabar yam market preferred buying yam from Ochon because of these relative abundance and cheaper prices.

Absence of Local Factors in Ochon and Calabar markets

Regression results to determine the absence of Local factor in the markets (Table 8) showed that in the absence of local factors such as household size, level of education and trading experience of yam marketers, the coefficient is 1196.928 instead of C = 0. This implies that Local factors influence the price of yam in the study area, for instance the more years of trading experience; the more traders perfect in the business.

Mean price of yam in the study area

Table 9 shows that the mean prices of yam in Calabar, Edor, Okom and Ochon was ₦1679.172, ₦1283.567,₦1425.428 and ₦1190.239per 100kg of yam respectively. This implies that for Ochon which is a Local market, the mean price was lowest as compared to the three other markets. This is so because yam is produced at a higher quantity in Ochon. This agree with the a priori expectation ‘’the higher the supply the lower the price’, further more the mean price in Ikom and Calabar were higher because they served a central disposal markets of yam –and so the price tends to be high in this areas. The demand for yam at the reference markets was higher than that of the Local markets; these influenced prices of yam in the local markets. This agreed with Adekanye, (1988) that an efficient marketing system will ensure that certain products are directed to areas of greater demand.

Timmer Technique (Index of Market Connection)

The index of market connection between Ochon (Local market) and Calabar (reference market) from Table 6 was determined to be 4.94. This is higher than 1, suggesting that the Local markets exert stronger influence in the yam business than the reference market.

CONCLUSION

This study was basically carried out to determine the estimation of market integration for yam marketing in four selected markets of Cross River State**.** The study concludes that Local factors such as Household size, level of education and trading experiences in both the Local and reference market respectively influenced the yam business in the study area. The study also revealed that there was Long-run integration between the aforementioned markets. The study showed that there was no market segmentation between Ikom and Edor markets. Short-run integration existed in both markets. However, market segmentation existed between Ochon and Calabar markets. Short-run and Long-run integration existed between Ochon and Calabar. The index of market connection revealed that Local market prices had greater influence then reference market in the yam business in the study area.

RECOMMENDATIONS

Based on the findings from this study, it is recommended that there should be a reduction in market distortion by various markets intermediaries. The government should encourage farmers by providing effective storage facilities for yam. This will reduce seasonal price variation and stabilize yam market and its prices. Finally,

marketers should be encouraged by government through the rehabilitation of rural roads thereby reducing marketing cost.

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Table 1: Regression result for short –run integration between Edor and Ikom

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1800.935	701.0497	2.568912	0.0233
PI	-0.457514	0.581102	-0.787322	0.4452
HHS	11.85041	30.35344	0.390414	0.7026
LED	-89.76277	80.17500	-1.119586	0.2831
TREX	11.05259	14.64273	0.754818	0.4638

R-squared	0.166947	Mean dependent var	1283.567
Adjusted R-squared	-0.089377	S.D. dependent var	333.5789
S.E. of regression	348.1671	Akaike info criterion	14.77338
Sum squared resid	1575864.	Schwarz criterion	15.02070
Log likelihood	-127.9604	Hannan-Quinn criter.	14.80748
F-statistic	0.651312	Durbin-Watson stat	1.311775
Prob(F-statistic)	0.636078		

Source: Survey data, 2013

Table 2: Regression results for long-run integration Between Edor and Ikom.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.39E-11	4.69E-12	2.968849	0.0117
PEC	1.000000	1.51E-15	6.61E+14	0.0000
PIC	-1.11E-14	3.24E-15	-3.428994	0.0050
HHS	5.21E-17	1.66E-13	0.000313	0.9998
LED	-2.80E-14	4.58E-13	-0.061188	0.9522
TREX	2.15E-13	8.16E-14	2.634992	0.0218

R-squared	1.000000	Mean dependent var	1283.567
Adjusted R-squared	1.000000	S.D. dependent var	333.5789
S.E. of regression	1.90E-12	Sum squared resid	4.32E-23
F-statistic	1.05E+29	Durbin-Watson stat	1.557012
Prob(F-statistic)	0.000000		

Table 3: Regression result for market segmentation between Edor and Ikom Yam market

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1126.068	138.7628	8.115052	0.0000
sPE(-1)	0.008340	0.100617	0.082893	0.9353
HHS	2.663602	11.86876	0.224421	0.8262
LED	1.776690	28.33518	0.062703	0.9510
TREX	3.430458	3.640713	0.942249	0.3646

R-squared	0.182093	Mean dependent var	1209.071
Adjusted R-squared	-0.090543	S.D. dependent var	109.9646
S.E. of regression	114.8350	Akaike info criterion	12.56480
Sum squared resid	158244.9	Schwarz criterion	12.80986
Log likelihood	-101.8008	Hannan-Quinn criter.	12.58916
F-statistic	0.667898	Durbin-Watson stat	1.311981

Prob(F-statistic)	0.626471

Source: Survey data, 2013

Table 4: Result for absence of local factors affecting Edor and Ikom

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1196.928	237.2170	5.045707	0.0002
PE(-1)	0.018382	0.090874	0.202283	0.8428
PI	0.045130	0.119550	0.377501	0.7119
PI(-1)	-0.052996	0.116085	-0.456524	0.6555

R-squared	0.030822	Mean dependent var	1209.071
Adjusted R-squared	-0.192834	S.D. dependent var	109.9646
S.E. of regression	120.1000	Akaike info criterion	12.61685
Sum squared resid	187512.0	Schwarz criterion	12.81290
Log likelihood	-103.2432	Hannan-Quinn criter.	12.63634
F-statistic	0.137810	Durbin-Watson stat	1.441576
Prob(F-statistic)	0.935636		

Source: survey data, 2013

Table 5: Short- Run Integration between Ochon market and Calabar market.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1151.000	243.0785	4.735094	0.0002
PCAL	0.015862	0.136997	0.115784	0.9093
OLED	80.38655	41.28781	1.946981	0.0693
OHHS	1.119569	16.93453	0.066112	0.9481
OTREX	-6.237621	7.245471	-0.860899	0.4020

R-squared	0.229810	Mean dependent var	1212.267
Adjusted R-squared	0.037263	S.D. dependent var	217.0634
S.E. of regression	212.9808	Akaike info criterion	13.76454
Sum squared resid	725773.4	Schwarz criterion	14.01323
Log likelihood	-139.5277	Hannan-Quinn criter.	13.81851
F-statistic	1.193526	Durbin-Watson stat	0.854512
Prob(F-statistic)	0.351454		

Table 6: Long-run Integration between Ochon and Calabar Markets

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.59E-11	4.39E-12	-3.613907	0.0026
POCHC	1.000000	2.92E-15	3.43E+14	0.0000
PCALC	2.35E-15	1.60E-15	1.472261	0.1616
OHHS	-7.21E-14	1.98E-13	-0.364994	0.7202
OLED	-7.13E-13	5.36E-13	-1.331666	0.2029
OTREX	7.05E-14	8.64E-14	0.815392	0.4276

R-squared	1.000000	Mean dependent var	1212.267
Adjusted R-squared	1.000000	S.D. dependent var	217.0634
S.E. of regression	2.48E-12	Sum squared resid	9.26E-23
F-statistic	3.05E+28	Durbin-Watson stat	0.891075
Prob(F-statistic)	0.000000		

Table 7: Market Segmentation between Ochon and Calabar

Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
C	*951.4827*	*266.6889*	*3.567762*	*0.0028*
POCH(-1)	*0.233553*	*0.204075*	*1.144452*	*0.2704*
OHHS	*-0.205691*	*14.79967*	*-0.013898*	*0.9891*
OTREX	*-8.263572*	*6.143507*	*-1.345090*	*0.1986*
OLED	*80.76823*	*36.09756*	*2.237498*	*0.0409*

R-squared	*0.359834*	*Mean dependent var*	*1231.215*
Adjusted R-squared	*0.189124*	*S.D. dependent var*	*204.1071*
S.E. of regression	*183.7957*	*Akaike info criterion*	*13.47784*
Sum squared resid	*506712.9*	*Schwarz criterion*	*13.72678*
Log likelihood	*-129.7784*	*Hannan-Quinn criter.*	*13.52644*
F-statistic	*2.107860*	*Durbin-Watson stat*	*1.653945*

Table 8: Regression Results to Determine Absence of Local Factors

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1332.240	399.7543	3.332648	0.0042
POCH(-1)	0.154778	0.227761	0.679561	0.5065
PCAL	-0.035344	0.134366	-0.263044	0.7959
PCAL(-1)	-0.136232	0.133007	-1.024246	0.3210

R-squared	0.106415	Mean dependent var	1231.215
Adjusted R-squared	-0.061133	S.D. dependent var	204.1071
S.E. of regression	210.2533	Akaike info criterion	13.71136
Sum squared resid	707303.4	Schwarz criterion	13.91051
Log likelihood	-133.1136	Hannan-Quinn criter.	13.75024
F-statistic	0.635132	Durbin-Watson stat	2.184657
Prob(F-statistic)	0.603142		

Source: Survey data, 2013

Descriptive statistics

Table 9 : A table showing the mean prices of yam in the study area

	PCAL	PED	PIK	POCH
Mean	1679.172	1283.567	1425.428	1190.239
Median	1566.600	1233.300	1408.300	1233.300
Maximum	2616.600	2550.000	1916.600	1516.600
Minimum	1167.500	900.0000	1016.600	833.3000
Std. Dev.	394.8888	333.5789	252.5628	191.3799
Skewness	0.795271	3.185039	0.393515	-0.231144
Kurtosis	2.916426	13.06928	2.431375	2.407784
Jarque-Bera	1.902609	106.4762	0.707064	0.423322
Probability	0.386237	0.000000	0.702204	0.809239
Sum	30225.10	23104.20	25657.70	21424.30
Sum Sq. Dev.	2650931.	1891673.	1084395.	622646.7
Observations	18	18	18	18

Source: Survey data, 2013