Correlation Analysis of Watermelon Price Among Markets in Yobe State, Nigeria

Abstract

The study was aimed at determining the price relationship among major watermelon markets in Yobe State, Nigeria. Three (3) Local Government Areas (lGAs) were purposively selected i.e. Nguru, Bade and Potiskum. The main objective of the study was to calculate the magnitude and direction of the prices of watermelon in the 3 LGAs, this will assist the marketers know which market to supply to for more earnings. The correlation coefficient and Johansen and Juselius co-integration test was employed as the analytical tools. The descriptive result revealed a mean age of 41years, 8 number of person per household, and 18 years of business experience. The Pearson Correlation matrix showed that the prices between Nguru and Bade was 0.097, Nguru and Potiskum -0.012. This expresses clearly that there was a very weak relationship. Also, the Johansson Co-integration test results revealed that the prices were not integrated. The paper concluded that the three watermelon markets were very independent of each other. It was recommended that watermelon fruits should be transformed into other forms to attract better prices and open up more markets for it.

Keywords: Price correlation, Johansen test, Watermelon market, Yobe State, Nigeria.

INTRODUCTION

"Watermelon (*Citrullus lanatus*) is one of the world's most important vegetables as the crop is grown both for its fruits and the vegetative parts which are highly nutritious" (Schippers, 2000). "In Nigeria, the crop has a wide distribution as a garden crop, while as a commercial vegetable; its cultivation is confined to the drier Savanna region of Nigeria" (Daudu, Ajayi & Ndor, 2008). "Nigeria produced more watermelons in 2011 (139,223 tons) than Kenya which is the leading fresh produce of African exporter, with 66,196 tonnes and South Africa that produced 7,993 tonnes" (Alfa-nla, 2012). "The larget production of the crop comes from the Northern part of Nigeria, where the suitable agro ecology is found. However, a reasonable quantity of the crop could still be grown in other agro ecologies with intensive management and is still economically feasible" (Bosede, Olubunmi & Balogun, 2012).

"Watermelon reaches consumers through the marketing system. Marketing is concerned with all stages of operation, which facilitate the movement of the commodities from the farms to the consumers. Marketing has economic value because it gives form, time, and place utility to products and services" (Asogwa & Okwoche, 2012). "Therefore, increase in marketing activity of watermelon would enhance the provision of more and better produce at low price to increased number of people which would enable marketers to generate more income and increase welfare". (Asogwa & Okwoche, 2012)

"It contains rich amounts of beta carotene and vitamin C which help in the reduction of arthritis. It also helps in the cleansing of the kidney and prevents cholesterol formation which reduces heart disease" (Varmudy, 2012). "The idea behind this analysis is to study the degree of co-movement of price in spatially separated three major towns namely, Nguru, Bade and Potiskum in Yobe State. A high degree of markets are "connected", but this connection is neither necessary nor sufficient" (Minot and Goletti, 2000, and Rahman, 2004). Food and Agriculture Organisation (2011) asserted that "like other agricultural goods in many African countries; fruits (which

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watermelon is part of) usually rots in farms due to either poor or unavailable transport facilities". Adegeye & Dittoh (1985) were of the view that "high transport cost accounted for a larger percentage of the total cost in the marketing of watermelon especially in rural areas in Africa". Ebiowei (2013) also noted that "high transport risk, the small sizes of watermelon which also do not attract good prices, high level of perishability and the irregularity of its supply are among some of the major challenges of watermelon marketing in Nigeria".

"Recent report indicated that exotic vegetables production generate higher profit, provide more employment and income to the farmers than those of indigenous vegetables, knowledge of availability of aggregated farm level resources and differences in their productivities are essential in order to enhance productive capacity of the smallholder farmers" (Ajewole &Folayan, 2008). "This will indicate the direction of resource use adjustment and allocation" (Ogubdari and Ojo, 2005). Economic Research Service (1994) reported that "in terms of price, there is considerable variability in watermelon prices within the year due mostly to seasonal changes in the volume of production". According to Ghoshray (2011), "market is generally measured as the price transmission elasticity, which is the percentage change in price of one market to a given percentage change in price in different locations and time. If such relationship between two prices such as the urban and rural prices holds in long-run, the markets can be said to be integrated". "This relationship may not hold in the short-run. On the other hand, the two prices may be completely independent, leading one to conclude that there is no market integration or price transmission. If two prices are found to co-integrated, there is tendency for both prices to co-move overtime in the long-run, where traders benefit of such relationship. In the short-run there may be deviations that can be driven by shocks in one price not being transmitted to the other price" (Ghoshray, 2011). However, arbitrage would make the deviations transitory and prices are brought back to their long-run equilibrium over time. The specific objectives of the study are to:

i. Describe the socio-economic characteristics of the watermelon respondents;
ii. study the different retail prices in different markets in the study areas; and
iii. to offer solution/recommendations.

The significance of the study is to analyse the correlation of watermelon prices in the study area; the findings will help the researchers to unravel the major determinants of marketers. On the central concept of perfect competition is that various individuals and agencies in the economy have perfect information to acknowledge, the necessity of information gathering and communication is cardinal to the current market prices. "Prices play a central role in economic theory in guiding production and consumption" (Tomek and Robinson, 1981).

The importance of these difficulty arises from the simultaneous changes of all the determinants, which make it extremely difficult to assess the influence of each individual factor separately and the causes of this price differentiation in various markets. In an integrated market, prices in different geographical location will move together. It understands then that the bivariate correlation coefficient is the most usual methodological approach to spatial integration. This study shall adopt the bivariate correlation for the analysis. The researcher observed that Yobe State is a major watermelon producing State in the Northern part of Nigeria, which witnesses

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different retail prices in different markets in the State. These call for concern to investigate reasons for the price variation. The hypothesis for the study is:

H_1: That watermelon market in these three major towns are not integrated, in the sense that price formation in one town is not related to the price in other towns.

H_o: That watermelon market in these major towns are integrated, in the sense that price formation in one town is not related to the price in other towns.

MATERIAL AND METHODS

Study Area

The study was carried out in Nguru, Bade and Potiskum Local Government Area of Yobe State, Nigeria. The areas falls within the semi-arid sub Saharan region, the rainfall (350-680mm) is frequently erratic and poorly distributed (Yaro, 2000). The study was conducted in three LGAs, because they form major watermelon producing fringe of Lake Chad agro-ecological zone.

Data Collection: a cross sectional primary data was used for this research. The data was obtained with the aid of well-structured questionnaire which was administered to the selected watermelon respondents in Nguru, Bade, and Potiskum.

Sampling Technique: the multistage procedure was employed to select respondents randomly among the watermelon sellers. Proportionality factor was applied to select the respondent in relation (ratio) to the sample frame obtained from the watermelon sellers association. The target populations for the study were the watermelon farmers, retailers, local assemblers and merchants in Nguru, Bade and Potiskum. A two-stage sampling procedure was used to select the sample for the study.

The first stage involves the purposive selection of three out of the seventeen LGAs of Yobe State which include Nguru, Bade and Potiskum. In the second stage, a simple random sampling technique was used to select 80 respondents from each of the selected LGAs. In all a total of 240 in the areas were interviewed.

Analytical Techinique: Analytical tools employed for the study was the descriptive statistics and two approaches to correlation techniques were adopted; the Pearson Correlation and Spearman's correlation coefficient.

$$r = \frac{\Sigma(x - \bar{x})(x - \bar{y})}{\overline{\Sigma(x - \bar{y})^2 . \Sigma(x - \bar{y})^2}}$$

Where:

r = the correlation coefficient

y = price of watermelon

x = distance of towns

E = Summation

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Johansen and Juselius co-integration test (1990): suggest "maximum Eigenvalue test and the trace test to determine the number of co-integration vectors. The maximum Eigen value statistic tests the null hypothesis of r co-integrating relations against the alternative of r+1 co-integrating relations for r = 0,1,2,…k-1". [11] This test statistics is computed as

$$JMax(r) = -T^{*} In(1-\bar{\lambda}r+1) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 2$$

Where ʎ is the estimated maximum Eigenvalue and T stands for the Sample Size. The trace test conducts a joint test whereas the maximum Eigenvalue test carry out separate test for the individual Eigenvalues.

The decision rule is to reject the null hypothesis of no-co-integration when the absolute value of t-statistics is greater than the critical values at the chosen probability levels.

RESULTS AND DISCUSSION

The socio-economic factors among watermelon respondents used for the study in three major towns of Yobe State (Nguru, Bade and Potiskum) are listed below.

Table 1 revealed that the mean average age of the household is 41 years and the mean average number of persons per household is 8. The respondents have limited level of western education as their mean schooling period is 9 years. The implication is that majority of the respondents stop going to school after the primary education. Majority of them attended Arabic education and no higher school. The implication is that the majority of the respondents can only read and write in Hausa and Arabic but little western education literacy. This has affected the respondents greatly, because illiteracy inhibit respondents from accessing bank loans and instill in them fear of expansion in their scope of business and acquisition of modern overemphasized in this regards a nobody or a nation can grow above his/her level of education. However, the finding shows that the respondents have acquired a lot of trading experience with mean average of 18 years in the business. The economic implication is that the respondents have mastered the skill of taking decision concerning when and how to sell to maximize profit. Virtually, all the respondents are married and the retailing business is solely undertaken by male retailers, so it is gender biased as women are not involved in the trade in the study areas.

Table 1: Socio-Economic Characteristics of Respondents

Variable	Observation	Mean	Std. Dev.	Min.	Max.
Age	240	41.73333	9.733033	1	63
Household size	240	8.51	5.892316	1	46
Level of education	240	9.0256667	4.239607	0	42
Level of experience	240	18.116	7.833181	1	40
Marital status	240	.9916667	.0910959	0	1
Membership of co-operative	240	.3541667	.4792595	0	1
Qtybt	240	452.5542	171.8202	90	1250

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Cone	240	189.75	69.22116	60	350
Levy	240	173.875	290.9406	30	4000
Transport	240	1691.25	2324.296	50	18000
Amount sold	240	13533.75	6392.803	2000	35000
Amount 100k	240	15812.2	9981.531	5500	87000

The correlation coefficient is a scale-free measure of association ranging from -1 for perfectly negatively correlated variables to +1 for perfect positive ones. Zero is the expected result for statistically independent variables.

Using the average retail price of watermelon in the study area, Pearson correlation method was used for this study. Nguru and Bade had a weak positive correlation. The implication is that there is no price relationship in the different markets in the two towns. Also the correlation coefficient between Nguru and Potiskum was a weak downhill (negative) linear relationship. The reason is that the two geographical areas are not close to have common boundary.

Table 2: Pearson Correlation

	Nguru	Bade	Potiskum
Nguru	1.0000		
Bade	0.0973	1.0000	
Potiskum	-0.0121	0.0512	1.000

Source: Field Survey, 2017

Johansen co-integration test result: Co-integration test was conducted; all the variables were not integrated at order 1 (*I*). The results of the co-integration test of Nguru and Bade Local Government of the watermelon prices in Yobe State is presented in Table 2. The result showed that all prices of watermelon were not co-integrated. The criterion for selection is that trace statistic value must be greater in absolute term than the critical value at 0.01 and 0.05 levels of significance.

From the result in Table 3, the null hypothesis of no co-integration i.e. H_o was accepted. This is because calculated trace statistic for null hypothesis is less than in absolute value than the critical values. The implication is that the prices of watermelon in the study area are not tied together in the long-run.

"The co-integration relationship indicates that prices in the no market in the area can be used to predict urban market prices and vice-versa. The economic meaning is that the current prices cannot be transmitted to any markets. The feasible reasons for this are that most of the urban towns in the northeast cultivate watermelon and depend less on rural supply. In addition, a lot of surrounding communities produce watermelon and bring to urban markets which functioned as central collection and disposal markets. The increase of supplies from the seas of communities constitutes market gluts in towns, thereby creating near zero price differentials". [11]

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Table 3: Co-integration Rank Test (Trace) Result [11]

Hypothesized No. of CE(s) Bade	Eigenvalues	Trace Statistics	0.05 critical value	Prob **
None	0.649431	11.58913	15.49471	0.1777
At Most 1	0.104560	1.107151	3.841466	0.2927
Nguru				
None	0.570672	8.455336	14.26460	0.3343
At Most 1	0.127296	1.361583	3.841466	0.2433

Source: Field Survey, 2019. Trace test indicates no co-integration at the 0.05 level and it was stationary at 1 (*I*), at 0.05 level ** Mackinnon-Haug-Michelis (1999) P-values

Conclusion

From the forgoing, it was concluded that the coefficients of watermelon prices between Bade, Nguru and Potiskum was weak and the Johansson test showed no co-integration among the markets. Therefore, each of the market is operating independently.

Recommendation:

It is recommended that the watermelon fruits be processed into other forms to attract more market and to open up other avenues for sale. Marketers should transport their commodity to distant markets where there are price differentials. The government should provide small processing plants for watermelon juice production to assist the marketers increase their earnings and their livelihood system.

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