Are Supermarket Prices of Fruits Highest? A Comparison of Prices at Four Types of Retail Outlets in Trinidad and Tobago

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Abstract

This study examined the retail prices for watermelon, papaya, and pineapple at farmers' markets, roadside markets, public markets, and supermarkets over the period 2011 to 2015 in Trinidad and Tobago in an attempt to identify the outlet with the highest prices. The results of the study suggest that for the three products across the four retail outlets, the highest price was for pineapple in October 2012 at the supermarket, while the lowest price was for watermelon in April 2014 at the farmers' market. Using ANOVA, there was statistical evidence to support the view that there is a difference between the various mean prices–supermarket, public market, roadside market and farmers' market. The Dunnett post hoc multiple comparison test confirms that the supermarket does have the highest prices with all test being significant at the 5% level. It is hoped that further research in this area would take place in an effort to help identify the outlet with the highest price of other fruits and vegetables in an attempt to direct consumers to outlets with cheaper nutritious sources of fruits and vegetables in an endeavor to increase their consumption in Trinidad and Tobago.

Keywords: Market prices, Papaya, Pineapple, Watermelon, One-way Analysis of Variance, Dennett's test, Trinidad and Tobago.

JEL Codes: G39, H83, M41, M42

1. Introduction

Healthy eating has been promoted in Trinidad and Tobago (T&T) in the recent past in direct response to the rising levels of non-communicable diseases (NCDs). Table 1 illustrates the top five causes of death in T&T as reported by the World Health Organization (WHO) in 2014. As observed in this table, cardiovascular diseases top the list while injuries come in at number 5. Of the 13,000 deaths reported, 80% was attributed to NCDs. Fruits are rich in fiber, antioxidants and photochemical that have beneficial health effects, such as aiding in the prevention of many chronic diseases, including type 2 diabetes. Increasing their consumption is one means of reducing the level of NCDs in many developing countries.

Today a notable feature of fruit and vegetable retailing in T&T is the emergence of numerous roadside stands/markets carrying not only a wide array of locally grown tropical produce, but also beautiful displays of grapes, apples and other temperate fruits (Martinez, 2015). How the contemporary shopper decides, where to purchase his/her fruits with so many outlets remains a puzzle.

Table 1: Top five causes of death in Trinidad & Tobago

Diseases/injuries	Percent of total deaths
Cardiovascular	32
Cancers	16
Other NCDs	15
Diabetes	14
Injuries	11

Source: WHO Non-Communicable Diseases Country Profiles, 2014

Consumers choose different retail outlets because of numerous factors such as: store attributes - location, ease of access, ease of parking, and assortment of goods carried; price and consumer income; neighborhood environment (e.g. Binkley and Connor, 1998; Leszczyc et al., 2000; Weatherspoon and Reardon, 2003; Prashar, 2013; Zameer and Mukherjee, 2013; Wheeler et al., 2014; and, Surkan et al., 2016; among others). Perhaps the most obvious factors in choosing a retail outlet is the quality and variety of wares on offer and their relative price. However, consumer-specific factors such as income, employment status, and educational level attained and social class are also relevant. In T&T, and the wider Caribbean generally, there appears to be little interest by researchers as to why customers patronize different retail outlets. This study takes an exploratory look at the prices of a selected number of locally produced fruits across the common retail outlets in T&T – public markets, roadside stands, farmers' markets and supermarkets.

Recently in T&T, the concept of farmers' markets has been introduced in an attempt to get consumers to eat more local produce and provide farmers with an opportunity to get a larger share of the consumers' food dollar. These markets are temporary locations that farmers are permitted to use on selected advertised days to sell their produce direct to the consumer. The success of this venture has not been analyzed to date, to the best of our knowledge. This study included them in the analysis since they are supposed to contribute to the healthy eating trend.

Schmit and Gomez (2011) suggested that farmers' markets provide numerous benefits including a local affordable source of fresh nutritious foods in rural communities, a mechanism to improve farm sales and provide opportunities for local municipalities to address broader community objectives. Despite the positive contributions made by farmers' markets, they are not without their challenges. Coster and Kennon (2005) highlighted the following as some challenges facing Australian New Generation Farmers' Markets in rural communities:

● maintain grower commitment to the market;
● overcoming a lack of product diversity;
● achieving a year-round supply of produce;
● securing adequate marketing infrastructure and
● addressing funding and costs issues.

Lyon et al. (2009) in a study titled "Shopping at the farmers' market: consumers and their perspectives" state "While farmers' markets are a colourful addition to urban shopping, they are periodic, relatively expensive and provide for a very limited range of consumer requirements. One school of thought is that small food retailers cannot match the efficiency and cost advantages of the supermarkets and as such eventually lose market share. In societies that place a high value on convenience and ease of access, farmers' markets are not rated highly as the outlet of choice for home food shopping.

Gunderson and Earl (2010) examined specialty crop price relationships between farmers' markets and grocery stores in Florida. A major focus of their study was to identify the average percent savings a consumer will achieve by purchasing produce at a given farmer's market in Florida, when compared to purchasing the same "basket" of produce at surrounding grocery stores. They found that in general, a one-unit increase in the average price of produce at a grocery store caused less than a one-unit increase for the same produce at the farmer's market. They concluded that there were cost savings to be had from purchasing produce from the farmer's market. Further, that the average grocery store price and average cost savings at farmers' markets did influence how produce was priced.

Swenson (2012) compared the prices of a number of selected produce items at farmers' markets and supermarkets in San Luis Obispo County, California. The six produce items for which data was collected over a five-week period are sweet onions, broccoli, Romaine lettuce, butternut squash, vine ripened tomatoes and Navel oranges.

She concluded, "The hypothesis that farmers' markets would have lower prices on average than their paired supermarkets was proven to be correct through intensive price analyses". Based on the six chosen commodities, the average price at the farmers' markets were 25 cents lower than at the supermarkets.

Iton (2015) in a study titled "Factors Influencing Retail Outlet Choice of Women Purchasing Fresh Fruits in Trinidad and Tobago" found that Bananas (39%), Apples (29%) and Watermelon (9%) were the top three fruits purchased. He found that traditional outlets were the preferred place to purchase fruits with 67% of the sample purchasing the fruits from traditional outlets compared to 33% purchasing at supermarkets.

The current study focuses on the differences between the traditional outlets and supermarket prices as a possible motive for patronage. The rest of the paper is organized as follows. The next section provides a statement of the problems addressed in the study. Thereafter, the analytical approach and data used in the study are described. This is followed by the results, and finally the discussion and conclusions.

Research Problems

Based on the brief review provided above, the problems that will be addressed in this study are as follows:

   (1) To compute the average prices for the common retail outlets for papaya, pineapple and watermelon for 2011 to 2015 and identify the outlet with the highest prices;

   (2) To test the following hypothesis: The supermarket prices are the highest.

Ho_1: *The supermarket mean prices are equal to the mean farmers' market, public market and roadside market prices for the selected fruits;*

H_{A1}: *The supermarket mean prices are higher than the farmers' market, public market and roadside market mean prices for the selected fruits;*

Analytical Approach and Data

To investigate the stated hypotheses, data collected by the National Agricultural Marketing and Development Corporation (NAMDEVCO) was utilized. NAMDEVCO, a State Agency, manages the wholesale markets in T&T and is best positioned to collect the prices for a selected range of products in these markets regularly. To complement the data from the wholesale markets, their trained data enumerators also collect data at other strategic points in the distribution channel for agricultural products. This study uses monthly price data (TT$/kg) for the period January 2011 to December 2015 from the National Agricultural Marketing Information Systems (NAMIS). The NAMDEVCO manages NAMIS, which was launched in January 2007. The vision of NAMIS was stated then as "To use NAMIS as the tool to provide reliable Market Information and Market Intelligence, on a real-time basis, to all stakeholders by accurately gathering and organizing data using modern methods and techniques to accurately reflect the production status; cost of inputs; sale of produce at the primary/secondary wholesale and retail markets for Sea and Agri-Food products." The objectives of NAMIS can be succinctly stated as follows:

(1) To provide the fresh produce sector and relevant policymakers in T&T with reliable, timely and independent information.
(2) To improve agribusiness development, with greater focus to the development of non-traditional agricultural exports (NTAEs).
(3) To help meet foreign demand for fresh produce and seafood, which is growing rapidly in the developed markets of Europe and North America?
(4) To provide domestic and international prices, freight costs and supply and demand statistics, plus market access information for the main target markets, crop production issues and a contacts database.
(5) Align all agricultural departments of NAMDEVCO to help provide all stakeholders with accurate and timely information as well as to improve the Corporation's overall policies and department processes.

The objectives as stated, like many of the other Market Information System (MIS) in the Caribbean appear laudable, but the use in empirical analysis has been minimal to date.

The fruits were selected based on their year-round availability, presence in the different outlets in similar forms such as variety and are primarily locally produced (Shepherd, 2007). The relevant data was analyzed using SPSS version 21.

One-way analysis of variance was used to test if there was a statistically significant difference in the mean prices (Gujarati and Porter, 2009). Thereafter, the Dunnett post hoc test was conducted to test if the supermarket prices were greater than the farmers' market, public market and roadside stall.

Results

Figure 1 illustrates the four mean outlet prices over the period January 2011 to December 2015 for the selected fruits. As is observed in the chart, supermarket prices were the highest with average price for pineapple exceeding that of the farmers' markets by $5.26/kg. The watermelon mean prices are lowest per kilogram at all outlets. From the chart in descending order from highest to lowest mean prices, it appears to be supermarket, roadside market, public market, and farmers' market respectively.

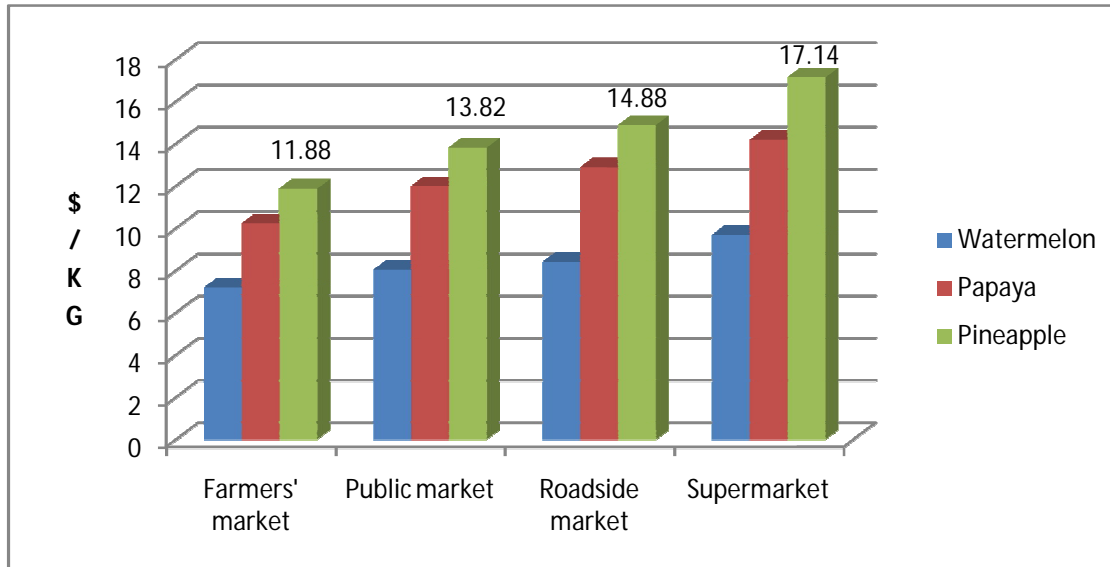**Figure 1: Mean prices January 2011 to December 2015 for selected fruits**

Table 2: Watermelon, papaya, and pineapple retail market prices for the period 2011 to 2015 descriptive statistics

Retail market price spreads	Mean ($/kg)	Std. Deviation	Std. Error
Watermelon			
Farmers' market	7.19	1.12383	0.14509
Public market	8.03	1.48027	0.19110
Roadside stand	8.41	1.39866	0.18057
Supermarket	9.69	1.32297	0.17079
Papaya			
Farmers' market	10.23	1.50722	0.19458
Public market	11.99	1.69191	0.21843
Roadside stand	12.89	1.96798	0.25407
Supermarket	14.18	1.96632	0.25385
Pineapple			
Farmers' market	11.88	1.85857	0.23994
Public market	13.82	1.54024	0.19884
Roadside stand	14.89	2.04659	0.26421
Supermarket	17.14	2.71785	0.35087

Table 2 illustrates the descriptive statistics of the various prices. As can be observed from this table, pineapple at the supermarket had the highest price while farmers' market for watermelon had the lowest mean price. Looking at the price differences (supermarket – roadside, roadside, – public market and public market – farmers' market) the largest difference was for pineapple between supermarkets and roadside market ($2.26/kg), while the smallest difference was for watermelon between roadside market and public market ($0.38/kg).

The standard deviation is a measure that is used to quantify the amount of variation of a set of data values.A low standard deviation indicates that the data points tend to be close to the mean of the set, while a high standard deviation indicates that the data points are spread out over a wider range of values.It is worthy to note that the standard deviation of the farmers' market mean price for watermelon was the lowest standard deviation, while the supermarket mean price for pineapple had the highest standard deviation.

Table 3 shows the results of the Levene's Test for equality of variances for watermelon, papaya and pineapple. As is observed the *p*-values of the test statistic obtained were greater than 0.05 for watermelon and papaya, 0.288 and 0.418 respectively; thus, the null hypotheses cannot be rejected. We can therefore proceed for the ANOVA test on the assumption of equality of variances. In the case of pineapple, the *p*-value obtained was 0.003 and as such the null hypothesis is rejected and we therefore should work with the assumption of inequality of variance for pineapple.

Table 3: Levene Test for homogeneity of variances of selected fruits

Levene Statistic		df1	df2	Sig
Watermelon	1.261	3	236	.288
Papaya	0.948	3	236	.418
Pineapple	4.830	3	236	.003

The ANOVA is an analytical procedure that uses the variance to determine whether means are significantly different, by apportioning the variances between the groups of means versus the variance within the groups (the null hypothesis Ho: $\mu1 = \mu2 = \mu3 = \ldots = \mu k$, where k = the number of groups). Table 4 illustrates the ANOVA results for the selected fruits. The F-statistics obtained are all statistically significant at the $P<0.05$ level. The null hypothesis that there is no significant difference between the prices is therefore rejected. The analyses of the data suggest that there is a statistically significant difference between the mean prices for the four retail outlets.

Table 4: ANOVA test results

	Sum of squares	df	Mean Square	F	Sig.
Watermelon					
Between Groups	194.219	3	64.740	36.164	.000
Within Groups	422.480	236	1.790		
Total	616.699	239			
Papaya					
Between Groups	495.958	3	165.319	51.367	.000
Within Groups	759.547	236	3.218		
Total	1255.505	239			
Pineapple					
Between Groups	865.091	3	288.364	66.283	.000
Within Groups	1026.710	236	4.350		
Total	1891.801	239			

The Dunnett's test is one of several *a posteriori* or *post hoc* tests, run after a significant one-way analysis of variance (ANOVA) to determine which differences are significant (Maddala, 1988).It is a special case of the multiple comparison procedures. In the general case of multiple pair wise comparisons where we compare each of the pairs we make K(K-1)/2 comparisons (where K is the number of groups), but in the case of the Dunnett's test (K-1) comparisons are made. It is well known and widely used in multiple comparison procedure for simultaneously comparing a number of groups to a referent group, in this case supermarket prices. Table 5 illustrates the comparisons made in this study and the null and alternative hypotheses.

Table 5: Dunnett's test comparisons

Comparison	H_0	H_1
Public market vs Supermarket	$H_0: \mu_{PM} = \mu_{SM}$	$H_1: \mu_{SM} > \mu_{PM}$
Roadside market vs Supermarket	$H_0: \mu_{RM} = \mu_{SM}$	$H_1: \mu_{SM} > \mu_{RM}$
Farmers' market vs Supermarket	$H_0: \mu_{FM} = \mu_{SM}$	$H_1: \mu_{SM} > \mu_{FM}$

Where:

PM = Public market; RM = Roadside market; FM = Farmers' market; SM = Supermarket

The results of the Dunnett's post hoc multiple comparison test suggest that the supermarket prices are statistically higher than the farmers' market, public market and roadside stand, as is seen in Table 6 where all *p* values obtained were less than 0.05. The following alternative hypothesis is therefore accepted:

H_{A1}: *the supermarket's mean prices are greater than the farmers' market, public market and roadside market for the three fruits analyzed.*

Table6: Dunnett's post hoc Multiple Comparisons test for watermelon, papaya and pineapple

(i)Markets (j)Markets	Mean Difference(i-j)	Std. Error	Sig.
Watermelon			
Farmers' market Supermarket	-2.49717*	.24428	.000
Public market Supermarket	-1.65550*	.24428	.000
Roadside stand Supermarket	-1.27667*	.24428	.000
Papaya			
Farmers' market Supermarket	-3.95183*	.32754	.000
Public market Supermarket	-2.18633*	.32754	.000
Roadside stand Supermarket	-1.29067*	.32754	.000
Pineapple			
Farmers' market Supermarket	-5.25850*	.38081	.000
Public market Supermarket	-3.31700*	.38081	.000
Roadside stand Supermarket	-2.25083*	.38081	.000

*The mean difference is significant at the 0.05 level

Discussion and Conclusions

The importance of the inclusion of an adequate supply of fruits and vegetables in the diets of Caribbean people today cannot be overemphasized as many of the islands are experiencing increasing levels of NCDs. The purpose of this study was to examine the retail prices for three products – watermelon, papaya, and pineapple – in the common retail market outlets in T&T. Long et al. 2013 point out several of the difficulties associated with price comparison studies of farmers' markets and other retail outlets. Notwithstanding this, information from such studies can improve decision-making capacity for consumers and inform the business models of small-scale direct-market producers. Based on this study, one can safely conclude that the retail prices analyzed are different. For the three products, the highest individual price was for pineapple at the supermarket in October 2012 ($22.51/kg), while the lowest was for watermelon in April 2014 at the farmers' market ($4.81/kg). Looking at the average prices at the four outlets they were supermarket $13.67/kg, roadside market $12.06/kg, public market $11.28/kg and farmers' market $9.76/kg, which does suggest the supermarkets have the highest price.

The Dunnett's test results do confirm that the supermarket's prices are higher than the three other retail outlets. If the low prices observed by the results of this study are coupled with high quality produce, then farmers' markets might provide access to cheaper nutritious source of fruits when compared to supermarkets. Being able to help shoppers to identify relatively cheap sources of nutritious food is of paramount importance as the food business today is a global business.

In many developed and some developing countries, the locus of 'power' in the distribution channel now is thought to lie with retailers. One school of thought suggests that some retailers, especially supermarkets, exploit their position and purchase products at low prices and sell at high prices. The data used in this study does suggest that the supermarket prices for the fruits analyzed are higher than the farmers' markets, public markets and roadside markets. Further examination of other produce groups, for example vegetables, would be helpful as policy makers try to increase the consumption of fruits and vegetables in an attempt to reduce the health care costs from NCDs. As McGuirt et al. (2011) stated, "One barrier to fruit and vegetable consumption is financial cost". Hence, being able to point consumers to a cheap source of nutritious fruits and vegetables should help to boost their consumption and improve the nation's health.

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