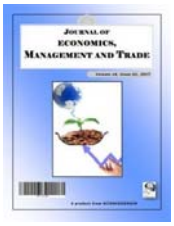

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Factors Affecting Local Tomato Preference in Comprison with Imported Tomato in Benin Republic

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Authors' contributions

This work was carried out in collaboration between both authors. Author MA retrieved the data on the field, performed the statistical analysis, and wrote the first draft of the manuscript. Author RFC designed the study, wrote the protocol, managed the analyses and literature searches of the study and prepared the final draft of the manuscript. Both authors read and approved the final manuscript.

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ABSTRACT

Aims: Tomato is a major vegetable that is being produced and consumed almost all over the world. Consumer preference from imported to local tomato was analysed for Benin Republic within this study. The main objective was to determine factors affecting consumers' willingness to pay for locally grown tomato in exchange of imported tomato.
Study Design and Place: It was intended to measure consumer reflections via a face to face survey. Therefore, a structured consumer survey was prepared and applied in Cotonou, the economic capital of Benin Republic.
Methodology: Hedonic pricing methodology was applied to the data retrieved from 223 consumers in Cotonou of Benin Republic in 2017. The main stance of hedonic pricing was to estimate impact of relevant consumer and market related factors on purchasing decision of tomato consumers.
Results and Conclusion: It was understood that 65 % of the sample had willingness to pay more to local tomato than the imported one. The average accepted premium was 0.30 Dollars. The price

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climbs up to 0.66 Dollars for 250 grams of tomato, with addition of the standard packed imported tomato price, which was 0.36 Dollars. When all factors were held constant, households accepted to pay 0.12 Dollars to local tomato. Local tomato preference, being employed and having aged between 18 and 45 affected the willingness to pay positively. However, medium-size and hard tomato preference were deterrent factors. When the income effect was considered, it was understood that local tomato price is income inelastic and consumers would be paying 11 % more in response to 100 % rise in their income. This confirms the normal good characteristic of tomato.

Keywords: Benin Republic; tomato; hedonic pricing; income; consumer preference.

ABBREVIATIONS

exp : exponential (e: 2.718)
FCFA – XOF : West African Franc for Benin Republic
FFVs : Fresh Fruits and Vegetables

1. INTRODUCTION

Fresh fruits and vegetables are accepted as healthy globally. In accordance with this, fresh fruits and vegetables (FFVs) have great effects on socio-economic development of developing and underdeveloped countries and impact welfare of both producers and consumers. FFVs have significant roles in reduction of rural poverty, increasing rural employment and economic development for Benin Republic. As an instance, 15 % of agricultural GDP in Benin was constituted of only four types of vegetables, namely tomato, pepper, onion and okra with 80 million Dollars in 2007 due to the data retrieved from National Institute of Statistics and Economic Analysis of Benin Republic [1].

Vegetable farming is strategic both for rural and urban districts of Western Africa. Yet, tomato is an agricultural crop that is being produced and consumed all over the world permanently. It is also very important for nutrition of the society both as a raw crop or processed food depending on the supplies [2]. Tomato production in Benin has been rising as there is an increasing demand from the urban population of the country. Tomato, being ranked as the most produced agricultural crop, has been produced widely in the southern regions of Benin. The southern regions of Benin contributes 80% to the national supplies [3]. Due to the FAO statistics, 335412 tonnes of tomato was produced in 40177 hectares in Benin by 2016.

There are many studies surveying the factors affecting price of main crops or products. Price composition is not completely attached to demand and supply of the product. The product quality features, consumer demographics and different socio-economic and seasonal conditions also affect the price. Accordingly, these market features, product and consumer characteristics and seasonal fluctuations should be measured respecting their effects on the price composition. With this perspective, it was aimed to portray whether a price premium appeared and accepted by tomato consumers in Benin respecting a choice from imported to local tomato. Accordingly, a face to face survey was conducted in Benin in 2017 in order to determine the price premium and to disaggregate the factors affecting the accepted local tomato price.

There have been studies focused on determination of willingness to pay for food and agricultural products. Local products are being preferred by the consumers due to their health and taste assessment and awareness of the product origin. Besides, consumers value local products more in order to support local producers as well. Accordingly, it was considered as important to evaluate the choice between local and imported crops and acceptance of the price for tomato consumption in Benin Republic. Available literature refers to willingness to consume local crops and products and acceptance of a positive price premium comparatively [4, 5, 6, 7, 8, 9, 10, 11]. As an instance Thilmany and his friends indicated that consumers prefer and pay more for local products due to their assessment on food security and rising environmental conscious [12].

In addition to the wide literature based on willingness to pay, there have been limited studies focused on analysing effects of accepted market price including the accepted premium. Price is an important criterion affecting purchasing decisions in the scope of food and agricultural marketing and it is important in explaining consumer behaviours and attitudes. With a negative point of view, while high price represents the amount of product that should be

abandoned, it refers to quality [13, 14] and social status [15] with a positive point of view.

2. MATERIALS AND METHODS

2.1 Material

Price is a measure for usability as it rises in response to declining supplies and declines for increasing supplies with an available level of demand and it signs the abundance of a product [16]. Agricultural prices contribute both in direction and pace of development and they act as signal provider in managing agricultural resources. As prices vary throughout the year, understanding the reasoning behind variations is considerably important for producers, consumers but for policy makers and researchers. Accordingly, the tendency of consumers for consuming local tomato is measured via utilisation of survey data in this study with hedonic pricing methodology. The method is based on using primary consumer data to evaluate factors affecting the willingness to pay for economic products. This methodology was applied for local tomato with addition of a price premium to the standard market price of imported tomato.

Primary data was collected from Cotonou province of Littoral region in 2017 through a field survey. Cotonou was selected as it is the economic and commercial capital of Benin Republic. Also, being a cosmopolitan city, Cotonou hosts various consumption attitudes. Heckman's random sample selection criteria was applied [17] with reference to 95% confidence interval in determining the overall sample [18].

$$n = \frac{t^2}{E^2}\, P * Q$$

The main material of the research was collected from 223 individuals in 13 towns of Cotonou via simple random sampling with 95 % confidence interval. The sample was distributed to towns of Cotonou on a ratio basis respecting their population.

2.2 Methodology

The factors that affect purchasing price of local tomato was interpreted via hedonic pricing analysis. Hedonic pricing was first implemented in agriculture by Waugh (1929). Waugh analysed the effects of product characteristics (colour, size, variety) on vegetables and he found that the accepted price changes due to quality features of vegetables [19]. The initial research on hedonic pricing analyses focused on measuring effects of consumer characteristics on the price formation [20-22]. Different applications of hedonic pricing can be noted as the price analysis of wheat [23], apple [24], cottonseed [25] and tomato [26, 27].

The recent hedonic pricing methodology incorporates linear and log-linear models that enable valid interpretation of parameter estimates. Accordingly, double log-linear estimation was used in this study to estimate local tomato price for Benin following Diewert [28].

$$\mathrm{LN}(PL_i) = a + b \times Local_i + \sum_k \beta_k \times MF_{ki} + \sum_n \gamma_n \times QF_{ni} + \sum_r \theta_r \times S_{ri} + \sum_s \delta_s \times SD_{si} + e_i$$

Here the dependent variable is a varying willingness to pay for locally grown tomato. Yet, the price was calculated with addition of a premium to the standard market price of $ 0.36 (200 FCFA) of 250 grams of packaged imported tomato. Therefore, the price referred to the price accepted for local tomato in exchange of imported tomato. The explanatory variables are categorised due to average responses retrieved from survey participants.

The variables can be explained accordingly:

PL_i: Accepted market price for **local tomato** by i^{th} consumer, with addition of price premium to standard price of imported tomato – (250 grams) (Dollar - $)

$Local_i$: Local tomato choice of i^{th} consumer (1-local, 0-imported)

MF_{ki}: Market related factors that incorporate four sub-factors.

a. Purchasing place (1 - bazaar & district bazaar, 0 - supermarket & peddler)
b. Preferred package (1 - basket, 0 - plastic bag & cardboard)
c. Preferred size (1 - medium, 0 - small & big)
d. Purchasing frequency (1 - more than once per week, 0 - once or less than once per week)

QF_{ni}: Product quality related factors that incorporate four sub-factors

a. Hardness (1 - most preferred quality feature is hardness, 0 - not)

b. Shape (1 - most preferred quality feature is shape, 0 - not)
c. Colour (1 - most preferred quality feature is colour, 0 - not)
d. Freshness (1 - most preferred quality feature is freshness, 0 - not)

S_{ri}: Dummy variable indicating seasonal fluctuations (1 - more consumption in local supply/peak season, 0 -more consumption in other seasons)

SD_{si}: Socio-demographic features of the household giving the purchasing decision incorporates five sub-factors

a. Age (1 - if between 18 and 45, 0-other)
b. Job (1 - employed, 0 - unemployed)
c. Gender (1 - female, 0 - male)
d. Education (1 - secondary and above, 0 - primary and below)
e. Income (Household income in Dollars-$)

3. RESULTS AND DISCUSSION

3.1 Socio-Demographic Outlay and Consumption Preferences

Major socio-demographic findings of 223 survey attendants need to be interpreted firstly. Most of the households surveyed were female with 81 %. The mean age of the group was 44, while the age of 60% of the group ranged between 25 and 45. While 17% of the participants were unemployed or non-employed, income generating activity of 37% was small-scale sales businesses as street vending. 25% of participants were working with payroll in public or private sectors. 51% of the respondents had secondary or above degree, with 17% (37 participants) holding Bachelor's degrees.

When the income distribution is considered, it was understood that 210 participants indicated that they have personal income with an average of $ 152.39[1] (84471.43 FCFA) per month. The average household income was $ 275.55 (152741.94 FCFA) and 46% of participants declared that they have monthly family income below $ 180.4 (100000 FCFA).

In addition, consumption preferences with regards to the choice between local and imported tomato was questioned with the survey. 64% of the participants declared that they consider the origin of tomato in their purchases and 77% could differentiate between local and imported tomato. The participants were asked to indicate their choice when the unit prices of local and imported tomato were equal. The finding was significant that 79% (176 people) indicated that they would prefer local tomato, if the prices are equal. Yet, the reasoning behind this choice was also significant. The findings are demonstrated in the below Table 1.

Table 1. Local tomato preference criteria

Local Tomato Characteristics	% of the participants
Quality (better quality)	73
Taste (better taste)	39
Freshness	34
Supporting local producers	30
Colour	9

Therefore, even though the consumers were asked to indicate more than one reason, quality considerations counted as the most emphasized characteristic. The other reasons were shape of the tomato, availability, less-chemical content, long supply period, long preservation duration, thick-shell and nutritious value. The mostly valued quality features appeared as nutritious value and hardness followed by freshness and taste. Besides, 90% of participants indicated acceptance of the interrelation between quality and price of tomato as for all other normal goods.

86% of participants indicated that they buy tomato from local bazaar or district bazaar. Frequency of purchases was high as 53 % buys tomato more than once per week and 45 % indicated that they prefer medium-sized tomato. Even though sellers prefer selling tomato with plastic bags, 144 consumers used to prefer traditional sales with baskets.

Therefore, analysis of the correlation between willingness to pay for local tomato is considered as important for the given demographic and preferential characteristics of the sample. Especially the relationship between level of income and specific characteristics of the participants need to be considered for this case. However, prior to proceeding to the analysis, it is essential to mention that 65 % of participants declared potential acceptance of a premium price for local tomato as demonstrated in Fig. 1.

These participants were also asked the potential premium that they can bear for local tomato in addition to 200 FCFA ($ 0.36), which was the standard price of 250 grams packed, imported

[1] *24.11.2017: 1 $ = 554.31 FCFA XOF*

tomato. The average response was 164 FCFA or 0.30 Dollars. This means that for those who value local tomato, acceptable price for 250 grams of packed tomato can be $ 0.66. Therefore, analysis of this willingness to pay more for local tomato became more important.

3.2 Hedonic Pricing Model Findings for Local Tomato

Prior to proceeding in the analysis of local tomato price, it was essential to decide whether the estimation needs a modification. Therefore, distribution characteristics of the dependent variable was analysed, as the data was on level. The findings of normally tests of local tomato price for 250 grams under the assumption of normal distribution are indicated in the Table 2.

Depending on the p-values below 0.05 with 95% confidence interval, local tomato price does not have a normal distribution. Accordingly, the dependent variable and household income, which was on level as well, was normalised with logarithmic transformation. Therefore, local tomato price, which includes the premium with the standard market price for 250 grams of packed, imported tomato, was estimated against above mentioned explanatory variables. The findings are indicated in the below Table 3.

It needs to be noted firstly that the variation explained by the dependent variables was found out as 27%. Yet, single significance and inference quality of the parameters should be considered. Income, local preference, quality_shape and employment status of the respondents were found as statistically significant factors with 95%. Yet, even if the joint significance was high due to F-test with 5,182 (0.00*), there are non-interpretable factor estimates and a possible problem of overestimation. Accordingly, it was considered as essential to check the linear relationship between the local price and independent variables. As most of the variables are dummy variables representing categories attached, it is essential to check the correlation between variables to infer on the linear relationship [28]. There appeared a positive correlation for local preference, education, employment status and level of income with local tomato price while the relationship is inverse for quality_shape. These correlations are statistically significant for 95% confidence level. Therefore, the possible overestimation problem was overcome with reduction of inefficient parameters and local tomato price was re-estimated with correlated and economically interpretable variables [28]. The findings are demonstrated in the Table 4.

Table 2. Normality test for local tomato price

Kolmogorov-Smirnov		Shapiro-Wilk	
Statistics	***P-value***	**Statistics**	***P-value***
.243	.00*	.758	.00*

Table 3. Estimation output for local tomato price

Dependent variables	β	t	*P-value*
Constant	2.505	7.531	.000*
ln Income	.110	3.455	.001*
Local Preference	.317	5.288	.000*
Purchasing Place	-.077	-.894	.373
Packaging	-.043	-.868	.386
Size	-.053	-1.023	.307
Frequency	.023	.460	.646
Seasonal effect	.054	.931	.353
Quality _ hardness	-.071	-1.185	.237
Quality _ shape	-.191	-2.351	.020*
Quality _ colour	-.086	-.859	.391
Quality _ freshness	.050	.665	.507
Age	.081	1.510	.133
Employment Status	.174	2.785	.006*
Gender	-.028	-.375	708
Education	.051	1.006	.316

Table 4. Estimation output for local tomato price with selected variables

Dependent Variables	β	t	*P-value*
Constant	2.481	8.277	.000*
ln Income	.114	3.893	.000*
Local Preference (Local)	.330	5.667	.000*
Quality _ shape (QS)	-.208	-2.707	.007*
Employment Status (E)	.169	2.760	.006*
Age	.085	1.709	.089*
Quality _ hardness (QH)	-.080	-1.419	.157
Purchasing Place (PP)	-.098	-1.189	.236

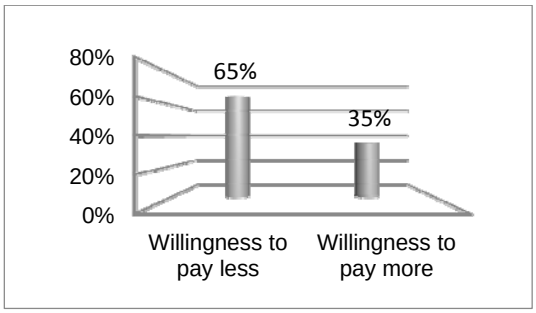

Fig. 1. Willingness to pay a premium for locally grown tomato

The variation in local tomato price explained by the dependent variables is 27 % for the selected indicators. Yet, the correlated variables indicated above seemed to have statistical significance by 99 %, leaving age aside with a significance of 90 %. However, the high joint significance with F-statistics of 14,568 (0.00*) enabled us to interpret the insignificant hardness and purchasing place variables.

Therefore, the final estimation of the local tomato price equation can be summarised below.

$$ln(PL_i) = 2{,}481 + 0{,}330 * Local_i - 0{,}208 * QS + 0{,}169 * E + 0{,}85 * Age + 0{,}114 * ln(Income) - 0{,}08 * QH - 0{,}098 * PP$$

When we shift to evaluation of parameter estimates, it is important to emphasize some critical points. In order to reach a sound interpretation, the dependent and independent variables on level were inserted in the equation after multiplication with 100 due to their considerably low nominal values. In addition, these level variables, namely local tomato price and income in Dollars were utilised after their natural logarithms were taken. Accordingly, the rational change of estimates of these transformed variables will be explaining the local tomato price on the level [27]. On the other hand, while level estimation of dependent variable (Y or lnPL for this case) respecting Minimum Least Squares provide arithmetic mean of expected dependent variable, logarithmic estimation produces geometric mean.

Therefore, estimated constant of 2.481 provided the expected unconditional mean. Accordingly, anti-logarithm of this estimate is exp (2.481)=11.950. However, as the level variables are multiplied by 100, the mean value for local tomato price is $ 0.12, when all other factors were held constant. In the local currency, consumers accepted to pay 67 FCFA for local tomato excluding all other factors.

For categorical variables as 'local preference' the anti-logged parameter estimate gives the geometric mean of the difference between local and imported tomato preferences. Accordingly, parameter estimate exp(0.330)=1.39 can be inferred as local tomato preferring consumers are willing to pay 39% more than the imported tomato preferring ones. This means $ 0.05 or 26 FCFA higher price.

For employment status, anti-log of the parameter (0.169) is 1,184. Therefore, the consumers who were employed or who held jobs would be willing to pay 18% more to local tomato. This means acceptance of $ 0.02 or 12 FCFA more than the average price. For consumers, of whom the age varies between 18 and 45, accepted price may increase by 9% (exp(0.085)=1.089), meaning acceptance of $ 0.01 or 6 FCFA more for 250 grams of local tomato.

However, there found factors that affect the price inversely. These are quality characteristics of tomato as shape and hardness and purchasing place as a market factor. If shape was the first quality preference, the consumer declared that

she/he accepted to pay 19 % less than average (exp(-0.208)=0.81). This means paying $ 0.02 or 13 FCFA less than the accepted $ 0.12 of average price. Secondly, for those who do perceive hardness as the first quality preference, price can be accepted with a 8% reduction (exp(-0,08)=0,92). This refers to paying $ 0.01 or 5 FCFA less. For purchasing place, when the consumer buys local tomato in bazaar or district bazaar, he/she accepts to pay 9% less (exp(-0.08)=0.91) meaning $ 0.01 (6 FCFA) reduction in the average price.

Yet, the most significant interpretation comes up with the parameter of income. Without any requirement of anti-log transformation, a 100 % rise in average family income of the consumer leads to 11% more payment willingness for local tomato. Therefore, even though there is a positive relationship between local tomato price and household income, the relationship is inelastic and this may lead us to refer normal good characteristic of tomato as expected.

In addition, similar studies revealed similar price acceptance schedules. As an instance, strawberry purchasers in Ohio, the USA indicated that they are willing to pay more to locally grown strawberries and the premium rises if the outlet is consumer markets rather than grocery stores [7]. Yet in a multi-country study, it was understood that food consumers prefer locally grown or produced products and have willingness to pay more and they do not value labelling with a high conscious [4]. Even though most of the contemporary studies focus on consumer valuation for food labelling, these research also indicated a preference towards local food and willingness to pay more to local food [8-10]. Besides, willingness to pay for locally grown FFVs was 11.68% more in South Carolina and households with high level of income indicated that they would pay higher [30].

4. CONCLUSION

Tomato is being consumed as either raw or processed in Benin Republic. Main supply channels for tomato are local or district bazaar. A significant consideration of consumers in tomato purchases is the origin of tomato. Consumers mostly prefer local tomato depending on their quality assessment. This outcome coincides with some research findings indicating the relationship between quality assessment and preference of local products [8,12]. Another reason of local preference is the motivation to support local producers. This is specifically valid for developing and underdeveloped countries. However, this is also a reason behind consumers' choice in developed countries like Finland [31] and Spain [32].

With this study, it was aimed to undermine the choice between local and imported tomato for consumers in Cotonou, Benin Republic. The effects of consumer characteristics and market-related and tomato quality attributes on tomato price acceptance were analysed. Accordingly, a hedonic pricing analysis approach was used to determine the effective factors. Hedonic pricing analysis was used to understand emotional and personal reflections on willingness to pay more. The main intention was to understand whether the consumers were willing to pay more than 200 FCFA or 0.36 Dollars to a standard packed local tomato weighing 250 grams.

It was understood that consumers could differentiate local and imported tomato via its shape and size. When there is no further incentives, the surveyed households accepted to pay $ 0.12 for local tomato. Yet, for those whose consumption preference was towards local tomato, a 39% premium could be accepted with regards to average price. This finding also coincides with the Ulupono Initiative's report on Hawaiian consumers' preferences towards accepting a positive price premium for local tomato purchases as 2.50 Dollars per kg [3]. For the choice between local and imported tomato, in addition to employment status and age group, there were awaited tomato quality characteristics that influence the choice. The inverse relationship between consumers perceiving shape and hardness and accepted price including the premium indicated that consumers do value quality characteristics of imported tomato rather than local tomato. In other words, consumers preferring hard and round shape tomato did not want to pay more for local tomato and the accepted price for 250 grams of local tomato declined for these consumers. This was also valid for the purchasing place. For consumers who do make vegetable purchases in district bazaars, there is no positive price premium acceptance for local tomato. This confirms income effect on consumption of normal goods. Consumers were willing to pay more to local tomato with rising income, even if in an inelastic rate with 11 %. Therefore, let's say for consumers with lower income levels that make purchases in bazaars, local tomato preference is not a valid reason to pay more for local tomato.

To summarise, consumers do mostly prefer making daily purchases of packed tomato of 250 grams from bazaars or district bazaars. Most of the consumers with 66 % indicated that they pay attention on the origin of the tomato and can differentiate local and imported tomato by checking its shape, size and colour. 65% of consumers indicated that they were ready to pay more for local tomato due to quality perceptions and with an orientation to support local producers. Given a standard price for 250 grams of imported tomato as 0.36 Dollars (200 FCFA), consumers may accept 0.30 Dollars (164 FCFA) premium payment which sums to 0.66 Dollars. Yet, when the accepted prices were estimated against consumer characteristics and product and market factors, the societal interpretation fell short of this indication. However, tomato consumption in Benin with an example from Cotonou province, confirmed the inelastic income effect. A potential 11 % rise in price including the premium was accepted in exchange of 100 % rise in household income. Therefore, it was understood that being a non-compulsory but a normal consumer good, tomato preferences do not alter with regards to rising income.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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