

## Willingness to Pay of Consumers for Improved Couscous Made with Corn in Southern Benin

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**Abstract:** This study evaluates the willingness of Southwestern Benin's consumers to consume and pay (WTP) the improved Yêkê-yêkê, a couscous made with corn, and the determining factors via the contingent analysis approach. The data was collected from 95 consumers recruited in major markets and shops in urban and peri-urban areas. According to the results, the average WTP predicted from the weighted least squares (WLS) model is estimated at about 130 FCFA/kg (or 0.11 Euros per kilogram) or a 130% surplus of the average price of the traditional Yêkê-yêkê which costs 100 FCFA/kg (0.15 Euros per kg). The explanatory factors of this WTP are mainly related to gender, the area of residence expressing that urban consumers, especially women, were more inclined to grant a high WTP. Other factors, related to the perception of participants about the characteristics of the improved product, namely cleanliness/absence of insects or pebbles, cooking time, presentation/packaging, product availability and importance of the product. The importance of Yêkê-yêkê in household food was also determinant. The results could be useful for processors and policymakers in the ongoing effort to improve the quality and sale of maize products in West Africa at an acceptable price.

**Key words:** Zea mays, contingent analysis, premium price, weighted least squares model, Benin

**JEL codes:** O32; O31

### 1. Introduction

In Benin, maize has always been a priority sector in policy documents such as the past Strategic Plan for Agricultural Sector Recovery and the new Government Action Plan. Indeed, maize ranks first in the current national food system and remains the most consumed cereal far ahead of rice and sorghum. It is the main staple of the entire southern part of Benin, accounting for 2/3 of the national population (PSRSA, 2010, PAG, 2016). Most of the traditional products derived from corn are very perishable and low competitive because they come from poorly performing and non-standardized processing techniques. It then appears necessary to develop appropriate technologies that will lead to improved products that meet quality standards and are competitive in the national and regional markets. It is in this perspective that the project "Improvement of the quality and technologies of processing of products derived from corn in Benin" is elaborated and financed by the West African Agricultural Productivity Program (WAAPP) through the National Center of Specialization on Maize (NcoS-Maize) to allow a

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better valorization of the maize and an improvement of the income of the beneficiaries, especially the processors. For this purpose, a traditional corn product has been improved by the Agricultural and Food Technology Program of the National Institute of Agricultural Research in Benin, namely corn couscous (Yêkê-yêkê in local language). Taste testing and product profitability analyzes were performed (Adegbola et al., 2015). However, these tests are not really enough to help predicting the acceptance of a product by consumers, therefore by the market. Consumers' willingness to pay for products and setting prices according to consumers' minimum purchasing power are essential data in the field of marketing (Le Gall-Ely, 2009). Thus, the present study aims to assessing the willingness to pay for improved Yêkê-yêkê in southwestern Benin.

## 2. Methodology

### 2.1 Study Zone

The study was conducted in Benin Republic, a West African country with a population of approximately 10.32 million (World Bank, 2010). Precisely, it was in urban areas and peri-urban areas of southwestern Benin which are areas of high production and great consumption of Yêkê-yêkê.

### 2.2 Sampling

The minimum sample size to be surveyed for this study was determined using Dagnelie's formula (1998) with a 95% confidence level and a 10% margin of error:

$$n_1 = \frac{U_{1-\frac{\alpha}{2}}^2 P(1 - P)}{d^2}$$

where:

$n_1$  is the required sample size, expressed in number of consumers

$U_{1-\frac{\alpha}{2}}^2$  is the factor to attain a 90% confidence interval  $U_{1-\frac{\alpha}{2}} = 1.96$

P is the expected or anticipated prevalence for the key indicator to estimate. When P is unknown, we use  $P = 0.5$ ; and

$d^2$  is the desired margin of error. In this case,  $d = 10\%$

$$n_1 = \frac{1.96^2 * 0.5 * 0.5}{0.10^2} = 96.04$$

Given that this more of a quantitative survey within a finite parent-population then  $n_1$  is corrected by the following formula:

$$n_2 = \frac{n_1 * N}{n_1 + N}$$

With  $N =$  Total population size of the area of study ( $N = 1178268$ )

Thus  $n_2 = 97$

A total of 97 consumers were surveyed for this study.

### 2.3 Theoretical Frame

Lancaster's theory (1966) allows a better understanding of the behavior, the demand or the preferences of an economic agent in the face of a given good. This theory posits the hypothesis of choice that maximizes the utility

of the consumer under budgetary constraints. However, the utility  $U$  is a function of the intrinsic characteristics ( $x$ ) of the good or attributes and the individual characteristics ( $z$ ) of the agent. The linear expression is in the form:

$$U = f(x, z)$$

where  $x$  is the set of product characteristics and  $z$  is the set of characteristics related to the economic agent.

Theoretically, two approaches are used to economically evaluate the increase in the well-being of an individual, caused by the introduction of a given product. These are the declared preference methods where individuals declare their preferences on goods that do not exist yet, and thus are expressed in a context of experimental choice (hypothetical situation), and the revealed preference methods that make possible the confrontation of individuals to a real situation and the observation of their behaviors. In this study, the declared preference method was used because the improved Yêkê-yêkê is not yet known to consumers in the study area, following Donfouet (2013) who states that this approach is used for new and unknown products.

To operationalize this approach, the most commonly used data gathering methods are, among others, joint analysis, contingent valuation, and so on. The contingent valuation method, based on the direct questioning of contingent willingness to pay for the presentation of a fictitious scenario of provision of goods (Mitchell & Carson, 1989), is particularly well suited for ex-post evaluation. Bradford et al. (2004) insist that it is for new goods that have not yet found commercial opportunities. Contrary to the joint analysis method, it limits the evaluation difficulties related to improved goods, which present intangible and really new characteristics, and this by giving priority to evaluation, a global approach of the supply and its potential benefits (Gal-Ely, 2003; Bradford et al., 2004). The contingent valuation was used by Durand (2009) in the ex-ante evaluation of the RFID service provided to the library. It was also used by Kertous (2012) in the analysis of the willingness to pay of Algerian subscribers to improve the quality of drinking water service.

Various econometric models can be used to identify the determinants of WTP. The most commonly used models for WTP studies are Tobit, Logit, Probit, Ordinary Least Squares (OLS) regression, Heckman's selection model (Koné, 2010, Kertous, 2012, Donfouet, 2013, Gbinlo, 2014). The application of the Probit and Logit models takes into account the dichotomous nature of the explained variable. The Tobit model is a statistical model used to describe a relationship between a censored dependent variable and one or more independent variables (Yovo, 2010). Kah (2003) asserts that Logit models were initially introduced as an approximation of Probit models allowing simpler calculations. Ami and Desaignes (2000) argue that the application of censored variable models to data from a contingent valuation survey does not yield satisfactory results. The main reason is that the null values recorded are not censored values, but correspond to values having an economic significance, that of a lack of variation of the function of well-being or a null marginal availability to pay. Therefore, it is irrelevant to use the Tobit model because null values cannot be treated uniformly as censored values.

The Heckman model is used in the contingent valuation method when there are protest responses (Gbinlo, 2014; Ami & Desaignes, 2000). Thus, the values of willingness to pay for these observations appear as missing data. This is the case of this study. A common practice in contingent valuation studies is to suppress protest responses in the sample. However, this can skew the results. The selection model developed by Heckman (1979) makes it possible to test whether there is a selection bias and to correct it.

### 2.3.1 Implementation of the Contingent Approach

Willingness to pay (WTP) can be obtained using several methods: either with an opened or closed question, or with an auction system (Terra, 2005). The choice of one or the other of these procedures determines the data processing. The opened question coupled with the auction system provides the most accurate estimate of the value

given to the property (Terra, 2005, Kertous, 2012). However, with the closed question, some respondents tend to accept the product regardless of the amount they are offered. This problem, termed “yea-saying”, gives rise to a biased estimate of the willingness to pay. Therefore, the open-question approach coupled with the auction system, inspired by the one suggested by Terra (2005), was used in this study. The improved product was presented to the respondents who were first asked if they were ready to eat, and then the premium price they were willing to offer for the improved yêkê-yêkê compared to its traditional counterpart of 1 kg whose average price is set at 100 FCFA/kg. It should be noted that several pre-tests were conducted to refine the individual questionnaire drawn up on the basis of information from the literature and informal interviews with certain experts in the field, for the collection of quantitative data.

### 2.3.2 Application of Analysis Models

Heckman’s model uses two equations: a participation equation and an equation for the amount of willingness to pay if accepted. Based on the studies of Donfouet (2013) and Gbinlo (2014), the model can be formalized as follows for each respondent  $i$ .

Selection equation: willingness to pay for improved Yêkê-yêkê

The selection equation is estimated by a Probit model. For the selection equation, the respondent  $i$  answer yes if the utility  $U_i$  that he associates with the improved Gambarilifin exceeds his current utility. The variable to be explained in this case is called discrete with two modalities. Let  $Y_i = 1$  if the individual has a willingness to pay for the improved Gambarilifin and  $Y_i = 0$  if otherwise. Indeed,  $U_{i1}$  corresponds to the value of the utility derived from the choice of the improved product and  $U_{i0}$  that derived from the alternative choice. For a rational individual, the decision to choose is made as follows:

$$Y_i = \begin{cases} 1 & \text{si } U_{i1} \geq 0 \\ 0 & \text{si } U_{i1} \leq U_{i0} \end{cases} \quad (1)$$

$U_{ik}$  is not observable. It is noted by the subscript  $Id$  (utility or profit).

$$Id = \sum \beta_i X_{ik} \quad (2)$$

$X_{ik}$  is the value of the variable  $k$  that can determine the choice made by  $i$ . So,

$$P_i = F(X_i' \beta_i) \quad (3)$$

with the symbol of an appropriate probability function; Yekê-yêkê;  $0 \leq P_i \leq 1$ .

Mathematically, the Probit model is represented by the theoretical model as follows:

$$\Phi(\beta X_i) = \int_{-\infty}^{\beta X_i} \frac{1}{\sqrt{2\pi}} \exp\left(-\frac{t^2}{2}\right) \quad (4)$$

$(\beta X_i)$  follow the normal distribution law, the probability that a respondent  $i$  pays for improved Gambarilifin.  $\beta$  is a vector of coefficients to be determined.  $X_i$  is a vector of the individual characteristics of  $i$ .  $t$  is a random variable following the normal distribution law and  $exp$  is an exponential function.

The second equation is a linear regression model.

Substantial equation: estimation of the forecasted WTP (observable only if  $U_i = 1$ )

$$Y_i = \beta X_i + \sigma \lambda_i + v_i \quad (5)$$

$Y_i$  is the WTP of the consumer  $i$ .  $\beta$  and  $\sigma$  are parameters of the model to estimate;  $X_i$  is the same as in equation (2);  $v_i$  is the error term;  $\lambda_i$  is the inverse Mills’ ratio.

If  $\lambda_i$  is not significant, it can be concluded that there is no selection bias. The non-existence of selection bias was subsequently corrected by applying the ordinary least squares (MCO) general linear regression model (Ami & Desaignes, 2000, Heckman, 1979). However, the results of the Breusch-Pagan test (Novalés, 1993) indicate the

rejection of the null hypothesis that the error terms were homoscedastic (93.71 while the critical value at the 1% significance level is 6.63). Therefore, the weighted least squares (WLS) model was used to analyze the factors determining the amount of WTP. The general form (Willett and Singer, 1988) of the WLS linear regression model can be written in matrix form:

$$WTP = \alpha + \beta_i X_i + \varepsilon_i \quad (6)$$

WTP reflects the value of the willingness to pay which is the variable to explain;  $\alpha$  is a constant;  $\beta_i$  the estimated coefficients of the explicative variables ;  $X_i$  a set of explicative variables and  $\varepsilon_i$  the error term.

Interviewees were asked to declare their consent to consume and pay a premium price for Yêkê-yêkê improved against its traditional counterpart which costs 100 FCFA/kg. According to studies conducted by researchers (Coulibaly et al., 2006; Angulo & Gil, 2007; Kertous, 2012; Durand, 2009), the potential explanatory variables of the Willingness To Pay (WTP) are related to the socio-economic characteristics of the consumer and his perception of some attributes of the product. These variables are among others:

- Gender: the sex of the consumer which is a binary variable that takes the value 1 when the respondent is a man and 0 if a woman. Women are the main actors in consumer-related activities in households. However, they will tend to pay more for products derived mainly from processing, since it would be easier for them to recognize the value added to the improved product. As a result, the expected sign of the coefficient of the variable is the negative sign;
- Age: Young people have an attraction for new products (Valli & Traill, 2004). They will tend to sniff this product compared to older people. As a result, the expected sign of the coefficient of the variable is the positive sign;
- Professional status: the professional status is also a binary variable which takes the value 1 when the respondent is an employee of a company or civil servant, and 0 if applicable. The correlation matrix showed that the income variable at the education level was correlated with the variable characterizing being an employee/employee as a source of income. These variables were not included in the model. It is generally accepted that people with a high level of consent are those with a high level of income and/or a stable source of income and a high level of education (Kostakis & Sardianou, 2011; Wu et al., 2012). Being a company employee or administration employee is a stable source of income and/or evidence of educational attainment. This variable is therefore expected to positively affect the WTP in this study;
- Household size: the number of people eating is a continuous variable that measures how to feed the household. The higher this number is, the individual would tend not to grant a high WTP in view of his charges. This variable is therefore likely to negatively affect the WTP;
- Area: the area of residence is a binary variable that expresses the dwelling place of the consumer. It takes the value 1 if it is in an urban area and 0 if not. This variable is supposed to positively affect the WTP, as consumers in urban areas are more able to appropriate and consume new products (Gil & Sanchez, 1997);
- Price: those who value prices will tend to want to pay less (Kertous, 2012). This variable would have a negative influence on the reported amount. Polyzou (2011) shows that price is a revealer of quality. It could therefore be inferred that they will be ready to buy the expensive product provided that it has one or more other characteristics more important than the price.
- Consumer perception: It is captured by the binary variables related to the importance of Yêkê-yêkê in

the household food, the importance of the price, the presentation/packaging of the product, the duration of cooking and the cleanliness (absence of pebbles and insects) during the purchase.

- the importance of Yêkê-yêkê in the food's habits: The perception of the importance of Yêkê-yêkê in the food of the consumer would influence his willingness to pay, because the more he likes to consume the Yêkê-yêkê, the more he would be willing to pay more if his quality is improved. This variable is therefore expected to positively affect the WTP in this study.
- Product's cleanliness: the absence of pebbles or insects at the time of purchase would be a source of intrinsic motivation certain to lead the consumer to be interested in the quality of the product put on the market. It would be positively associated with the WTP proposed by consumers.
- Presentation: the packaging would be a motivating factor for the purchase of the product (Limayem & Rowe, 2006), so it would be positively associated with the WTP proposed by consumers. New consumer products on the market are more appealing to young people when they are well packaged (GreenFacts, 2012). Therefore, a positive sign is expected from the interaction between age and presentation of the package.
- Duration of the cooking : the relatively short cooking time of the improved Yêkê-yêkê compared to that of the traditionally cooked product would contribute to its acceptability, so to a high WTP, because a long cooking time generates a high consumption of energy, and returns households (Harmim et al., 2008). Public servants should give priority to this attribute given the lack of time and varied and numerous activities (Chaudière-Appalaches, 2003). Therefore, a positive sign is expected from the interaction between professional status and cooking time.

The empirical model is as follows:

$$WTP_i = \alpha + \beta_{1i} \text{Gender} + \beta_{2i} \text{Age} + \beta_{3i} \text{Civil servant/office employee} + \beta_{4i} \text{Size} + \beta_{5i} \text{Importance of Yêkê-yêkê in the household diet} + \beta_{6i} \text{Cleanliness} + \beta_{7i} \text{Duration of cooking} + \beta_{8i} \text{Availability of Yêkê-yêkê} + \beta_{9i} \text{Zone} + \beta_{10i} \text{Product look/Packaging} + \beta_{11i} \text{Interaction Age* Product look/Packaging} + \beta_{12i} \text{Interaction office employee * Duration of cooking} + \varepsilon_i \quad (7)$$

with WTP = the value of the willingness to purchase being the variable to be explained.  $\alpha$  = constant;  $\beta_i$  = the estimated coefficients of the explanatory variable;  $X_i$  = a set of explanatory variables and  $\varepsilon_i$  = the error term;

Variables included in the models are summarized in Table 1 below:

**Table 1 Description of the Variables of the Model**

Variable	Form	Expected sign
WTP	Numerical variable	
Gender	1 = Male et 0 = Female	-
Age	Numerical variable	-
Household size	Numerical variable	+
Civil servant / Office employee	1= Yes et 0= Otherwise	+
Importance of Gambarilifin in household diet	1= Yes et 0 = Otherwise	+
Importance of Yêkê-yêkê in household food	1= Yes et 0 = Otherwise	-/+
Product look/packaging	1= Yes et 0 = Otherwise	+
Cooking duration	1= Yes et 0 = Otherwise	+
Cleanliness (Absence of pebbles and insects)	1= Yes et 0 = Otherwise	+
Zone	1 = Urban area et 0 = Otherwise	+
Interaction Age* Product look / Packaging	1 = Yes et 0 = Otherwise	-

Once the parameters  $\beta, \lambda$  of the model are estimated, a WTP indicator can be determined (Jeanty, 2007; Durand, 2009) using the following formula:

$$WTP = \frac{\hat{\alpha} + X \hat{\gamma}}{\beta} \quad (8)$$

where WTP = Willingness To Pay ; X is the vector of the average of the characteristics, behaviors and significant preferences.  $X_i$ , et  $(\hat{\alpha}, \beta, \hat{\gamma})$  are the estimated parameters of the model;  $\alpha$  being a constant of the latter.

### 3. Results

#### 3.1 Sociodemographic Characteristics of the Respondents

The socio-demographic characteristics of the respondents are presented in Table 2. The table showed that the number of respondents in urban areas (41.05%) was lower than those in peri-urban areas (58.95%). The proportion of men surveyed (26.32%) is clearly and statistically lower than that of women (73.68%) regardless of the area. This is explained by the fact that women are the main actors in food-related activities in households in Benin. The average age (40 years) for all respondents highlights their relative experience of those responsible for the daily management and in the purchase of food products of the household ( $p < 0.01$ ).

The average household size of consumers was 3 people. The statistical differences show that those in peri-urban areas (4 persons) had a larger household size than urban areas (2 persons) ( $p < 0.01$ ).

As regards the profession, it appears that there was a significant difference according to the zones ( $p < 0.01$ ). In fact, the proportion of civil servants (20.51%) and traders (23.85%) in urban areas was higher than that of respondents in peri-urban areas (1.79% of civil servants and 46.43% of tradespeople). As a result, public servants and traders were mostly concentrated in urban areas. Processors were more concentrated in urban areas in a proportion of 2.56%. Regarding the importance of Yêkê-yêkê in the diet, it was more important in the food of peri-urban households (89.29%) ( $p < 0.01$ ).

**Table 2 Socio-Demographic Characteristics of the Respondents**

Characteristics	Urban zone	Peri-urban zone	Together	Test
<b>Relative Frequency (%)</b>	41.05	58.95	100	-
<b>Sex</b>				
Men (%)	28.21	25	26.32	$\chi^2 = 0.12$
Women (%)	71.79	75	73.68	
<b>Age (years)</b>	43.41 (10.87)	36.98 (12.40)	39.62 (12.15)	t = -2.61***
<b>Profession</b>				
Office Employee (%)	20.51	1.79	9.47	F = 2.97 ***
Trader (%)	53.85	46.43	49.47	
Craftworker (%)	2.56	14.29	9.47	
Farmer (%)	0.00	7.14	4.21	
Processor (%)	2.56	0.00	1.05	
Housewife (%)	15.38	16.07	15.79	
Others (retired, school boys, students, etc.) (%)	5.13	14.29	10.52	
<b>Household size</b>	2 (0.98)	4.39 (1.79)	3 (2.13)	t = 11.78***
<b>Importance du Yêkê-yêkê in household diet (%)</b>	30.77	89.29	65.26	$\chi^2 = 34.72***$

(..): Standard deviation; F: Fisher test (Anova)

### 3.2 Relative Importance of the Choice Attributes of Yêkê-yêkê

Table 3 presents the results from the Principal Components Analysis of the attributes of choice according to their degree of importance. Table 4 shows that the Kaiser-Meyer-Olkin index (KMO) is 0.85 and that the significant Bartlett sphericity test ( $p < 0.01$ ) determines the validity of the component factor analysis conducted (Benzecri, 2012). The matrix of the components after rotation made it possible to identify two (02) components, thus expressing the main attributes related to the choices of Yêkê-yêkê namely the physical properties perceivable with the purchase, the organoleptic and culinary properties, the presentation of the product and finally the price.

The first component related mainly to organoleptic and culinary properties accounted for 41.52% of the total variance. The weights of the factors at the component level show that the ability to give a consistent dough, the availability of the product, the white color, the taste, the duration of cooking and the very fine particle size represented, in order of priority, the organoleptic and culinary determinants in the choice of Yêkê-yêkê.

The second component mainly related to physical properties accounted for about 32.25% of the total variance. The factor weights at the component level show that ease of preservation, presentation/packaging, price, cleanliness (absence of insects and/or pebbles), represented in order of priority the physical properties choice of Yêkê-yêkê. Therefore, the packaging/presentation of the product was more critical than the price and cleanliness of the product.

**Table 3 Principal Components Analysis of Yêkê-yêkê Choice Attributes**

		<b>1</b>	<b>2</b>
Ability to give a consistent dough	Taste	<b>0.845</b>	0.073
Product Availability		<b>0.824</b>	0.351
White color		<b>0.798</b>	332
Taste		<b>0.780</b>	0.184
Cooking time		<b>0.726</b>	0.440
Very fine particle size		<b>0.695</b>	0.467
Ease of conservation		0.214	<b>0.929</b>
Presentation / Packaging		0.323	<b>0.816</b>
Price		0.190	<b>0.814</b>
Cleanliness (Absence of insects and or pebbles)		0.595	<b>0.591</b>
% of the total variance		41.52	32.25
Test Bartlett Chi <sup>2</sup> (45)		758.07***	
Index KMO		0.85	

### 3.3 Econometric Results

The estimation of the Heckman selection model using the Stata software gave results which are summarized in Table 4. The probability associated with the coefficient of the lambda and Rho estimator is equal to 0.37 (Table 4). This value being much greater than the theoretical value ( $p < 0.05$ ), it appears that the two equations are independent. So, there is no selection bias. The selection equation does not matter. An estimate with the OLS regression model was therefore appropriate (Ami & Desaignes, 2000, Heckman, 1979). However, the results of the Breusch-Pagan test (Novalés, 1993) indicated the rejection of the null hypothesis that the error terms were homoscedastic (4.28 while the critical value at the 5% level of significance is 3.84). Therefore, the weighted least squares model was used to analyze the factors determining the WTP of Yêkê-yêkê.



Table 4 Estimation of Two-Stage Models of Heckman and WLS

Variable	Model Heckman	Model WLS	
<b>Value of the willingness to pay (substantial equation)</b>			<b>Marginal Effects</b>
Sex	-81.51 (52.19)	-67.93 (30.17) **	-67.93 (30.17) **
Age	173.68 (144.53)	53.51 (48.25)	53.51 (48.25)
Professional Status	142.97 (209.45)	57.55 (69.69)	57.55 (69.69)
Household size	31.17 (57.32)	34.84 (33.54)	34.84 (33.54)
Importance of Yêkê-yêkê in household diet	7.81 (91.47)	75.98 (37.26) **	75.98 (37.26) **
<b>Cleanliness/Absence of insects or pebbles</b>	<b>123.98 (77.70)</b>	<b>135.63 (43.04) ***</b>	<b>135.63 (43.04) ***</b>
<b>Duration of cooking</b>	<b>-171.86 (69.52) ***</b>	<b>-201.75 (36.38) ***</b>	<b>-201.75 (36.38) ***</b>
<b>Presentation/Packing</b>	<b>336.23 (120.64) ***</b>	<b>309.60 (67.03) ***</b>	<b>309.60 (67.03) ***</b>
<b>Availability of the product</b>	<b>132.58 (96.47)</b>	<b>180.66 (49.22) ***</b>	<b>180.66 (49.22) ***</b>
<b>Zone</b>	<b>218.38 (117.56) **</b>	<b>269.89 (60.76) ***</b>	<b>269.89 (60.76) ***</b>
<b>Age*Presentation/Packing</b>	<b>-51.91 (16.39) ***</b>	<b>-41.69 (8.25) ***</b>	<b>-41.69 (8.25) ***</b>
Professional Status * Duration of cuisson	-98.08 (212.57)	-67.09 (82.51)	-67.09 (82.51)
Constant	-497.59 (359.68)	-281.97 (167.61) **	-281,97 (167.61) **
<b>Consent to consume (Equation of selection)</b>			
Sex	-0.01 (0.45)		
Age	-1.98 (0.80)		
Professionnel Status	-2.23 (1.97)		
Household size	-0.06 (0.59)		
Importance of Yêkê-yêkê in household diet	1.18 (0.61)		
<b>Cleanliness/Absence of insects or pebbles</b>	0.28 (0.80)		
<b>Duration of cooking</b>	-1.71 (1.21)		
<b>Presentation/Packing</b>	0.79 (1.19)		
<b>Availability of the product</b>	0.25 (1.01)		
Zone	0.69 (1.10)		
<b>Age*Presentation/Packing</b>	0.16 (0.13)		
Professional Status * Duration of cuisson	1.63 (2.05)		
Constante	6.31 (3.14)		
<b>Mills</b>			
Lambda	-187.13 (210.26) 0.05 < p < 0.37		
Rho	-1.00		
Sigma	187.13		
Nombre d'observations	95	95	
Nombre d'observations censurées	17		
Number of uncensored observations	78		
Chi-squared (15)	80.30 ***		
F-Statistic		22.95 ***	
Adjusted R <sup>2</sup>		0.73	

The results from the weighted least-squares model estimate are presented in Table 4. The model is globally significant ( $p < 0.01$ ), indicating that the explanatory variables introduced into the model are not simultaneously

equal to zero. The pseudo  $R^2$  is relatively high at 73%, which shows that approximately 73% of the variations in the WTP of the consumers interviewed is explained by the explanatory variables included in the model. This shows a good fit of the estimated model to the data, and therefore a good explanatory power of the estimates.

The majority of respondents (82.10%) declared themselves ready to consume the improved Yêkê-yêkê. A minority (17.90%) do not want to consume because they feel they were not used to it. Alternatively, they preferred a natural product that they themselves can produce or buy at the expense of an improved product.

The coefficient associated with the variable “sex” was significant ( $p < 0.05$ ). Therefore, sex determines the willingness to pay for the improved Yêkê-yêkê. The negative sign of the variable indicates that the female target group showed a tendency to pay more for improved Yêkê-yêkê than men. The premium price was estimated at 70 FCFA/kg (0.11 Euros at a fixed exchange rate of 1 Euro = 655 FCFA) or a surplus of 70% of the price of the traditional Yêkê-yêkê which costs 100 FCFA/kg (0.15 Euros per kg).

The age of the consumers did not impact the WTP. Nevertheless, the positive sign of the coefficient of the age-related variable shows that older people were more likely to give a higher premium estimated at 55 FCFA (or 0.08 Euros).

The positive sign of the professional status variable expresses the willingness of civil servants to pay a high WTP, which was estimated at 60 FCFA/kg (0.09 Euros per kilogram), a surplus of 70% of the price of traditional Yêkê-yêkê.

Household size also has no impact on willingness to pay, but the positive sign of the variable shows that consumers are willing to pay an estimated surplus of 35 FCFA/kg (0.05 Euros per kilogram) even though their household size is high.

The positive sign of the coefficient of the zone-related variable determined the predisposition of urban consumers to pay a surplus of 270 FCFA/kg (or 0.41 Euros per kilogram) over the average price of the traditional Yêkê-yêkê.

The WTP expressed by the consumers surveyed was also positively influenced by the place occupied by the product in their diet, as well as by the availability of the product ( $p < 0.01$ ). The positive and significant influence of Yêkê-yêkê’s place in food stipulates that the more important it is in food, the consumer is willing to pay a 75% increase in the price of traditional Yêkê-yêkê. Regarding the availability of the product, they were willing to pay a 180% increase.

The positive and significant influence of the perception variable related to presentation or packaging would mean that, the better the product is presented, the more they are willing to pay a higher price, which is in line with our prediction ( $p < 0.01$ ). The negative coefficient of variable related to the interaction term between age and presentation/packaging expresses an increase in the likelihood of younger consumers to pay for the improved Yêkê-yêkê which has good packaging.

The influence was also positive and significant ( $p < 0.01$ ) of the cleanliness variable shows that, respondents who appreciated the cleanliness, that is to say a product devoid of pebbles or insects, were ready to pay a high positive WTP estimated at 135 FCFA/kg (or 0.21 Euros per kilogram).

Finally, the cooking duration was decisive ( $p < 0.01$ ). The negative and significant influence of the variable related to the duration of cooking is contrary to our prediction and states that it is the consumers giving less importance to the cooking time of Yêkê-yêkê who were ready to pay a positive WTP (200 FCFA/kg, or 0.36 Euros per kilogram) for the improved Yêkê-yêkê. The negative sign of the interaction variable between professional status and cooking time shows that it was the civil servants who gave less importance to cooking time who were

willing to pay a positive WTP.

Using the estimated parameters of the WLS model, average Willingness To Pay (WTP) was predicted and the results are presented in Table 5. This premium is the best estimate of the maximum amount that a consumer from the sample of respondents was willing to pay for the improved Yêkê-yêkê. The premium price is set at 130 FCFA/kg (or 0.20 Euros per kilogram) or a 130% surplus of the average price of traditional Yêkê-yêkê which costs 100 FCFA/kg (0.15 Euros per kg).

**Table 5 WTP Estimated from WLS Model**

	Observation	Average WTP	Confidence interval	
			Minimum	Maximum
WTP (FCFA)	95	128.24 (192.16)	0.00	586.21

#### **4. Discussion**

The exploitation of the results obtained from the questions on the WTP to benefit the improved Yêkê-yêkê of 1kg proposed against the traditional one which costs 100FCFA/kg, brings additional information as to the behavior of the individuals. Consumers' WTP has been affected by two categories of factors, namely the socio-economic characteristics of the consumer and his perception of certain attributes of the product.

Women proposed a higher WTP than men. This result is contrary to that expected and is explained by the fact that women are the main actors in consumer-related activities in households. However, they believe that the purchase of an improved product allows them to guarantee household food security. This result is consistent with those of Laroche et al. (2001) show that women, being more concerned about the quality of food, are more likely to pay more than men.

Seniors were more likely to give higher premiums compared to younger people. This seems normal in view of the experience of the elderly in the consumption of holy products in order to safeguard their health.

Public servants, who are more educated and have a stable source of income and/or a high income level, had higher WTP than the least educated respondents. It is generally accepted that employees of a company or civil servant of the administration are educated (Kostakis & Sardianou, 2011; Wu et al., 2012), which justifies their willingness to pay a high WTP. In the same vein, Yousfi (2002) argues that educated people have an attraction for new products given their awareness of quality resulting from improved methods and processes of product manufacture.

Household size also has no impact on willingness to pay, but the positive sign of the variable shows that consumers are willing to pay a surplus even though their household size is high. This result seems surprising, but it is in line with the results of Polyzou et al. (2011) and Djemaci (2010) on the determinants of WTP.

The area of residence was decisive in consumers' willingness to pay. In fact, consumers living in urban areas are more able to appropriate and consume new products compared to those in peri-urban areas, especially when they are presented on supermarket shelves. In addition, the WTP was also influenced by product packaging or presentation, specifically at the younger consumer levels. These results are consistent with those of GreenFacts (2012), which show that new consumer products on the European market are more attractive to young people when they are well packaged. Lagerkvist et al. (2013) as well as Rungsaran et al. (2016) also found that the presence of products in supermarkets alongside products usually presented in cartons such as couscous or pasta, has a positive influence on consumer buying behavior. Thus, the presence of Yêkê-yêkê improved packaged well,

on supermarket shelves, would reassure consumers that the product is of quality. Given that supermarkets are more prevalent in large cities, the accessibility difficulties of the new improved product could prevent its acceptability and hence its large-scale consumption in the study area.

Those whose frequency of consumption of traditional Yêkê-yêkê is high in their household, were willing to pay more to benefit from the improvement in quality. In the same vein, those who have an attraction for the Yêkê-yêkê quality, that is to say, a clean product, devoid of pebbles or insects were ready to pay a high positive WTP. This result is consistent with those of Couvreur and Lehuédé (2002), then Beneke et al. (2013).

Consumers were not ready to give a premium price for a food that would be expensive in cooking time and especially in energy costs. This result is similar to the results of Coulibaly et al. (2006) and Homburg et al. (2005) who proved that the effectiveness of products positively influences consumers' WTP. On the other hand, the cooking time of the improved Yêkê-yêkê was not of particular importance in the eyes of the officials. This result was contrary to that of Chaudière-Appalaches (2003) and Dabat et al. (2008) which showed that Canadian officials are buying more fast foods to prepare due to lack of time, and varied and numerous activities.

The premium price predicted from the least squares weighted model is higher than the usual average price of the traditional product. It is justified by the advantage that consumers give to improved Yêkê-yêkê, which is distinguished by qualities that make it unique to them. The explanatory factors of this WTP are mainly related to the sexes, to the zone, to the availability of the product. The absence of insects and pebbles and the presentation/packaging and the cooking time of the improved Yêkê-yêkê are the attributes of the product that have been decisive.

In short, consumers are therefore willing to buy the improved Yêkê-yêkê at a price higher than the price of the traditional product. These results are consistent with those of Angulo and Gil (2007) who demonstrated that the willingness to pay for labeled beef is higher than that of traditional meat.

## 5. Conclusion

This study carried out according to the approach of the contingent approach, made it possible to understand that the majority of the urban and peri-urban consumers more willingly give a consent to consume the improved Yêkê-yêkê. The premium price predicted from the least squares weighted model is higher than the usual average price of traditional product. Indeed, this premium price is estimated at about 130 FCFA/kg (or 0.20 Euros per kilogram) or a surplus of 70% of the average price of traditional Yêkê-yêkê which costs 100 FCFA/kg (0.15 Euros per kg).

It is justified by the advantage they grant to the improved Yêkê-yêkê, which is distinguished by qualities that make it unique to them. Women express their willingness to pay more for the product compared to men. The explanatory factors of this WTP are mainly related to gender factors, to the area of residence. Other factors related to the perception of the participants to know: the cleanliness/absence of insects or pebbles, the duration of cooking, the presentation/packaging, the availability of the product and the importance of Yêkê-yêkê in the diet household, were also decisive. In sum, the characteristics of the product determining the WTP must be standardized. Other attributes that might strengthen the WTP should be explored.

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