



**AgEcon** SEARCH  
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

*The World's Largest Open Access Agricultural & Applied Economics Digital Library*

**This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.**

**Help ensure our sustainability.**

Give to AgEcon Search

AgEcon Search  
<http://ageconsearch.umn.edu>  
[aesearch@umn.edu](mailto:aesearch@umn.edu)

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

# **Evaluation of consumers' lifestyles and willingness to pay for dates: A hybrid choice model approach**

Fadi Abdelradi\*, Khaled Abdu\*

E-mails: [Fadi.abdelrady@agr.cu.edu.eg](mailto:Fadi.abdelrady@agr.cu.edu.eg), [kabdouh@yahoo.com](mailto:kabdouh@yahoo.com)

\* Department of Agricultural Economics, Faculty of Agriculture,  
Cairo University, Giza, Egypt



Paper prepared for presentation at the EAAE-AAEA Joint Seminar  
‘Consumer Behavior in a Changing World: Food, Culture, Society’

March 25 to 27, 2015

Naples, Italy

## **Abstract**

Palm Date is one of the largely produced fruits in Saudi Arabia, different varieties of Palm Date are produced, the most commonly consumed varieties are Khalas, Raziz and Shishi. The aim of this paper is to assess consumers' preferences towards Palm Date through using a Hybrid choice model that involves the use of choice experiment and structural equation modeling. Surveyed data were collected by means of face-to-face interviews for 335 respondents in Al-Ihsaa governorate of the eastern district. The Structural Equation model results suggest that consumers' attitudes, social pressure and perceived control are found to be relevant in explaining the individual's purchase intention to consume Date Palm and religiosity is also found to have a relevant positive effect. Results of the choice experiment showed that the price and the processing attributes didn't have a strong effect; however, the production location has the biggest effect. Observed heterogeneity was considered by including socio-demographic variables and found to be relevant. The effects of the latent variables are also found to have a significant effect on consumers' utilities.

**Keywords:** Hybrid choice model, Palm Date, personality traits, choice experiment, TPB

## **Introduction**

Palm Date is one of the major perennial crops produced in the Kingdom of Saudi Arabia (KSA) and is considered the second world producer after Egypt representing 17% of world production. KSA and Algeria are the biggest countries in planting Palm Date representing 15.8% and 15.6% of the world cultivated area respectively. The total cultivated area of Palm Date in KSA is 156 thousand hectares with production of 992 thousand tons in 2011 (FAOSTAT, 2013). Palm Date production in KSA is of considerable importance for its nutritive values and religious significance to Muslim consumers. In general, Palm Date is a commonly consumed fruit in the Mediterranean area. Many studies have shown that religion can affect consumer behavior and the buying decision (Mullen et al. 2000; Blackwell et al. 2001; Pettinger et al. 2004). Additionally, the support given from the KSA government to the industry through subsidies, interest-free loans and reducing freight costs has been a vital factor in the development of the industry (Aleid, 2004).

The eastern district of KSA is considered the biggest industrialized cluster for processing Palm Date. The number of Palm trees in the KSA is estimated by 23,7 million trees and around 400 different Palm Date varieties are cultivated (SAMA, 2013). Fresh or dried dates are eaten directly, or may be processed to different products like stuffed, chopped, cubes, paste, spread, powder, jam, jelly, juice, syrup, vinegar or alcohol. Al-Abbad et al. (2011) conducted a survey of 30 questionnaires to farmers and traders in Al-Ihsaa governorate using a feasibility study and SWOT analysis. Results indicate that 23% of the respondents sell their production at the farm gate due to the low prices offered from Palm Date manufacturers, 40% sell their output in the markets and 37% sell to manufacturers. The SWOT analysis results have identified problems of supply chain logistics that can be solved through marketing cooperatives and exploitation of government subsidies. El-Sabea (2010) proposed a way to increase exports of dates through creating marketing cooperatives that develop export strategies that gives better opportunities like targeting the EU market.

The KSA government advocates for the increase of Palm Date production by providing high quality varieties and extension services for the benefits in protecting the environment and increasing food security. The marketed Palm Date has two channels; one is freshly sold to consumers, the second way is going to processing plants which represents 29% of the total production of Palm Date in 2011 (SAMA, 2013). In 2011, the KSA Palm Date industry has

reached 145 processing plants; governmental policies that promoted processing of Palm Date have been relevant effect on the agricultural sector through creating jobs and solving many marketing problems that occur from the traditional marketing approach (SAMA, 2013). Al-Shareed et al (2012) investigated the KSA Palm Date in the international market based on demand analysis of the importing countries. Results have showed that the European Union (EU) is the largest importer of Palm Date representing 10% of the world's imports volume, as the EU import prices is higher than the world average.

The objective of this paper is to evaluate consumers' preferences towards Palm Date Khalas variety using a Hybrid Choice Model (HCM). The HCM model has the advantage of merging classic choice models with structural equations models (SEM). Additionally, the application of HCM in agro-food marketing remains scarce. We use the Random Parameter Logit (RPL) to estimate the choice experiment; furthermore, we incorporate in the RPL the effect of consumers' psychological factors using the Theory of Planned Behavior (TBP) of Ajzen (2005). The contribution of this work to the literature is twofold; first is the application of HCM that combine classic choice models with SEM where the inclusion of latent variables improve the model fit through capturing consumer's preference heterogeneity. Second it focuses on the KSA Palm Date market that has not received much research attention.

The remainder of this paper is organized as follows. Section 2 presents a review of the literature on the hybrid choice model in food markets. Section 3 presents the conceptual framework. Section 4 presents the methodological approach. Section 5 reports the empirical results. Section 6 presents the concluding remarks.

## **Previous literature**

Empirical studies in consumer behavior towards food products literature has focused on the use of choice experiments where products can always be regarded as its attributes rather than the product itself. However, the attention on incorporating the consumer's psychology has been widely ignored. In the following lines, we focus on choice experiment studies, to then review some articles using HCM.

Gracia et al. (2009) used RPL model to assess 400 European consumers for two types of nutritional information; the nutritional facts panel label and a nutritional claim. Results indicate that nutritional facts panel label is more valued than a specific nutritional claim, as consumers' WTP is almost twice for a box of breakfast cookies with a nutrition label compared a breakfast

box with a nutritional claim. Loo et al. (2011) assessed consumers' WTP for organic chicken using RPL model for a sample of 976 food shoppers. Results suggest those consumers are willing to pay a premium for the organic label and a higher premium for the USDA organic label, moreover, the WTP premiums were found to be increasing from non-buyers to occasional buyers to habitual buyers. The USDA organic label was found more valuable than the general organic label indicating that consumers have more trust in USDA organic products than a general organic label.

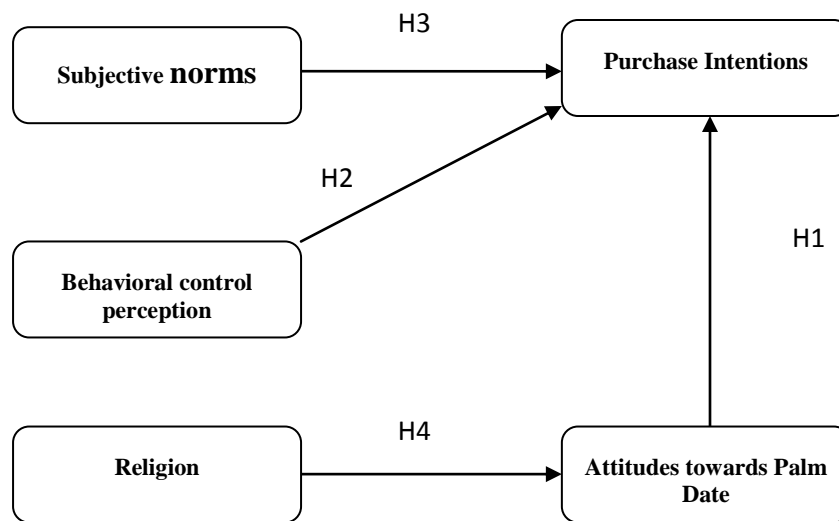
For the general link between food and health, the recent previous literature showed that consumers' are interested in the nutrition properties of food products they eat and its relation to health (Armstrong, et al. 2001; Mannell, Brevard et al. 2006). Respondents express agreement that one should eat less food with sugar and fat and more fruits and vegetables (Food Standards Agency, 2002). A recurrent structure is that particular demographic groups have a greater concern in nutrition information, though; young women may be concerned with nutrition for motives of weight control (Food Standards Agency, 2002).

In the following lines, we review the scarce literature using HCM in consumer behavior towards food products. Palma et al. (2013) studied consumers' preferences towards wine products using an online stated choice and estimated a random parameter logit model for a sample of 273 respondents to measure the effect of wine attributes (price, grape variety, label design, alcohol content, type of wine, advice and discounts) and incorporated the effect of consumer psychology through measuring sociability, sophistication and price-quality latent variables. Results suggest that grape variety is the main driver of preference. The price attribute found to be an important factor in creating the expected quality of the product by the consumer before tasting it. Additionally, preference for higher alcohol content was also found relevant. Yangui (2013) studied consumers' preferences towards extra virgin olive oil in Spain using an extended HCM through estimating a random parameter logit model in a panel data context for a sample of 401 respondents. Results indicate that the price has the strongest effect on consumers' utility, additionally, different consumer personality characteristics and lifestyles are found to be relevant like healthy lifestyles, cooking styles, quality involvement.

## Conceptual framework

The objective of HCM is to better explain the formation of the choice process (Rungie et al., 2011). Therefore, to understand the behavioral decision process for the Palm Date, we have developed a simple conceptual model based on the TPB theory presented in figure 1. Ajzen (2005) has showed that TPB behaviors can be predicted with high accuracy from attitudes towards the behavior, subjective norms and perceived behavioral control. The following hypothesis will be tested;

**Figure 1:** A conceptual model to understand Palm Date purchase intention.



Hypothesis 1. As the consumer show a positive attitude towards Palm Date, his intention to purchase it increases. Ajzen (2005) has indicated that many factors can affect people' attitudes toward food like personality traits, emotion and mood. Chen (2007) showed that food related personality traits, defined as food involvement (the level of importance of food in a person's life), exert a positive effect on the consumer's attitude towards organic food products. Bell and Marshall (2003) argued that the level of food involvement was a significant discriminating factor between food items in sensory evaluations.

Hypothesis 2. When consumers perceive more behavioral control over purchasing food, the intention to purchase will increase. Perceived behavioral control is the perception to the extent to which the behavior is controllable. Additionally, perceived behavioral control is considered more important that actual control as it reflects the degree of simplicity of doing a behavior of

particular interest (Verbeke and Vackiere, 2005). Ajzen (2005) has also argued that Food habits can simplify behavioral decision as many decisions become routine and can be adopted with minimal conscious control. However, this is not an easy factor to measure.

Hypothesis 3. Subjective norms have a positive effect on consumer’s purchasing intention related to Palm Date. Subjective norms constitute the perceived social pressure to engage in a behavior which is affected by a set of normative beliefs.

Hypothesis 4. Religion will positively affect the attitudes regarding the consumption of Palm Date.

### **Methodology approach**

To achieve our objectives a Hybrid Choice Model HCM is used which involves two steps estimation. First, the latent variables are estimated from the SEM, and then the results of the SEM are integrated in the RPL as explanatory variables (Ashok et al., 2002; Ben Akiva et al., 2002; Johansson et al., 2006; Yáñez et al., 2010). For this reason we adopt the RPL model considering the latent variables as random parameters (Yáñez et al., 2010). In the following lines we describe the SEM and later the RPL models adopted.

Lobb et al. (2007) have indicated that SEM allows for a multivariate modeling of key consumers’ behaviors which cannot be measured directly, like attitudes, social pressure and lifestyles. Jöreskov and Sörbomm (1996) have showed that SEM consists of three types of interactions; first, a measurement model is specified where the identification of latent variables through the definition of observed indicators presented as questions in the stated preference survey using a confirmatory factor analysis as shown in equation (1):

$$x = \Lambda_x \xi + \delta \tag{1}$$

where  $x$  is a  $q \times 1$  vector of observed exogenous variable;  $\Lambda_x$  is a  $q \times n$  matrix of coefficients of the regressions of  $x$  on  $\xi$ , which is an  $n \times 1$  random vector of latent independent variables, and  $\delta$  is a  $q \times 1$  vector of error terms. Furthermore, it is assumed that  $\delta$  is uncorrelated with  $\xi$ . . Second, the outcome relates observed indicators with the exogenous latent variables as shown in equation (2)

$$y = \Lambda_y \eta + \varepsilon \tag{2}$$



where  $y$  is a  $p \times 1$  vector of observed indicators,  $\Lambda_y$  is a  $p \times m$  matrix of coefficients of the regressions of  $y$  on  $\eta$ , which is an  $m \times 1$  random vector of latent dependent variables; and  $\varepsilon$  is a  $p \times 1$  vector of error terms in  $y$ . Furthermore, it is assumed that  $\varepsilon$  is uncorrelated with  $\eta$ . Third, the causal relations that exist among both exogenous and endogenous latent constructs in equation (3),

$$\eta = \beta\eta + \Gamma\xi + \zeta \quad (3)$$

where  $\beta$  is an  $m \times m$  matrix of coefficients of the  $\eta$  vector of dependent variables in the structural relationships,  $\Gamma$  is an  $m \times n$  matrix of coefficients of the  $\xi$  vector of independent variables in the structural relationship, and  $\zeta$  is a  $m \times 1$  vector of errors. The Full Model is estimated with Weighted Least Squares (WLS), due to potential non-normality.

The use of the hybrid choice model involves building a choice experiment, which is based on both the random utility theory (RUT) (McFadden, 1974) and the Lancaster consumer theory (Lancaster, 1966). The random utility theory assumes that the individual's utility from an option can be expressed as follows

$$U_{ij} = V_{ij} + \varepsilon_{ij}, \quad (4)$$

where,  $V_{ij}$  is a deterministic component, which is a function of alternative product characteristics and  $\varepsilon_{ij}$  is the non-observed component. The probability that consumer  $i$  chooses alternative  $j$  in the total set of options is:

$$P_{ij} = \text{Prob}[U_{ij} > U_{ik}] = \text{Prob}[V_{ij} + \varepsilon_{ij} > V_{ik} + \varepsilon_{ik}] \forall j \neq k \in C_n \quad (5)$$

where  $C_n$  is the choice set and the observed component  $V_{ij}$  is presented as:

$$V_{ij} = \sum_k \beta_{ik} X_{kj} + \beta_p P_j + \sum_l \beta_{il} \eta_{il} \quad (6)$$

where  $\beta_k$  represent the marginal utility coefficient of the attribute  $X_{kj}$ , and  $\beta_p$  is the marginal utility of the price  $P_j$  of alternative  $j$ , and  $\beta_{i1}$  the marginal utilities of the latent variables for consumer  $i$ .

The RPL model assumes that the probability that individual  $i$  chooses the alternative  $j$  in a particular choice set  $C_n$  is given by:

$$\text{Prob}_{ij} = \int L_{ij}(\beta_{ij})f(\beta_i/\theta) d\beta_i, \text{ with } j \in C_n \quad (7)$$

where  $f(\beta_i/\theta)$  is the density function of the coefficients  $\beta_i$  and  $\theta$  refers to the moments of the parameters distribution that takes a specified form such as normal, lognormal, triangular, uniform, etc., and

$$L_{ij}(\beta_{ij}) = \frac{e^{V_{ij}(X_{ij}, \eta_{i1}, \beta_i)}}{\sum_{k=1}^J e^{V_{ik}(X_{ik}, \eta_{i1}, \beta_i)}} \quad (8)$$

As the model is specified to include both fixed and random coefficients and latent variables, the simulated maximum likelihood technique is faster and easier to estimate the individual choice probabilities (Ben Akiva et al., 2002). According to Train (2003) the simulation consists of three steps for any given value of  $\theta$ . First, draw a value of  $\beta_i$  from  $f(\beta_i/\theta)$  and label it  $\beta_i^r$  with  $r = 1 \dots R$ . Then, calculate the logit formula  $L_{ij}(\beta_i^r)$  with this draw. Finally, repeat steps 1 and 2 many times and average the results. This average is the simulated probability:

$$\hat{P}_{ij} = \frac{1}{R} \sum_{r=1}^R L_{ij}(\beta_i^r) \quad (9)$$

where  $R$  is the number of draws. The simulated probabilities are inserted into the log-likelihood function to give a simulated log-likelihood (SLL):

$$\text{SLL} = \sum_{i=1}^I \sum_{j=1}^J d_{ij} \text{Ln} \hat{P}_{ij} \quad (10)$$

---

<sup>1</sup> Halton draws are used because they have been shown to provide more efficient distributions for numerical integration compared to random draws (Bhat, 2003; Train, 2003).

where  $d_{ij}=1$  if  $i$  choose  $j$ ; and zero otherwise. The maximum simulated likelihood estimator (MSLE) is the value of the  $\theta$  that maximizes SLL.

Now we turn to the choice experiment design, three attribute were found relevant based on a pilot study of 35 face to face interviews and previous literature to identify consumption patterns and attitudes towards Date Palm. The first attribute is the production location which is considered an important factor in purchasing, the second attribute is the processing of Palm Date, and lastly is the price which is the main attribute identified in the previous literature for determining consumer’s choices and also found to be relevant in our pilot survey, these attributes are used in the choice set with two levels. We have fixed the weight to one kilogram (kg) and variety of Palm Date (Khalas) in the stated choice experiment. We have followed the strategy proposed by Street et al (2005) to get a 100% efficient main effects design, (table 1) shows attributes and attribute levels in the Choice Experiment. (Table 2) shows one of the choice sets offered to respondents.

**Table 1.** Attributes and attribute levels in the Choice Experiment

Attributes	Levels
Production location	Al-Ihsaa governorate Kharg governorate
Processing	Processed Unprocessed
Price	15 SR/kg 20 SR/kg

**Table 2.** Example of a choice set of the experiment

Alternative “A”	Alternative “B”	Alternative “C”
Process : unprocessed Location : Al-Ihsaa Price : 15 SR <input type="checkbox"/>	Process : processed Location : Al-Ihsaa Price : 20 SR <input type="checkbox"/>	Process : processed Location : Kharg Price : 15 SR <input type="checkbox"/>

In spite of the common use of the WTP for specific attributes, recent literature shows some explicit concern about the hypothetical nature of the experiment, which can generate biased results. More precisely, individuals tend to overstate their willingness to pay in the hypothetical choice experiments (Lusk and Schroeder 2004; Alfnes and Steine 2005). Nonetheless, when one thinks through the marginal WTP, the evidence is mixed in relation to the presence of hypothetical bias.

On one hand, previous studies failed to reject the hypothesis that marginal WTP is real and hypothetical settings were the same (Carlsson and Martinsson 2001; Cameron et al. 2002; Lusk and Schroeder 2004). On the other hand, the hypothesis of equivalency between hypothetical and real WTP was rejected in (Carlsson, et al., 2005; Olof and Henrik, 2008).

Furthermore, the best practice recommendation found in the literature to moderate the effect of the hypothetical bias was the inclusion of "opt-out alternative", rather than forcing the choice (Hensher, 2010; Menapace, et al. 2011). There is also a possibility to mitigate the hypothetical bias by incorporating financial incentives by randomly drawing a bidding choice scenario (Alfnes, et al. 2006; Chang, et al. 2009) or using a cheap talk script that explicitly describes the hypothetical bias problem to participants (Carlsson, et al. 2005). The paper used the cheap talk script.

The questionnaire consists of four major blocks. The first block derives information on respondents' purchasing and consumption habits about Palm Date. The second block is the major block that includes the stated choice experiment. The last block gets information about socio-demographic characteristics, consumers' personality traits and consumer's lifestyles. Most of the scales used have been taken from previous studies (Chen, 2007; Gil et al, 2000; Mtimet and Albisu, 2006). All indicators have been measured through five-point Likert scales (from 0 to 5, where 0 indicates total disagreement, 5 total agreement and 3 indicates indifferent)<sup>2</sup>.

## **Empirical results**

This study uses surveyed data of a representative sample of 336 out of 350 surveyed food shoppers in Al-Ihsaa governorate in KSA. Data were collected during February-April 2013 at different shopping hours and different types of food retail stores; this time period doesn't include seasonal effects of Islamic occasions. We used a stratified random sample based on gender. Descriptive statistics for the sample socio-demographic characteristics is provided in (table 3). In line with (CDSI, 2013) 52% of the respondents are males and 48% are females, while the educational level 50% of the sample have a university degree and 35% have secondary education and 15% have primary education, around 24% of the sample have household income between SR5000 and SR7000 per month and 44% more than SR7000. In terms of occupation level 57% of the sample is full time worker while 21% is part time worker and 13% are housewives. Finally,

---

<sup>2</sup> This scale is familiar to the respondents as in Saudi Arabia grading system at school is based on it.

60% of the sample is married and the average household size is between 3 and 5 members. The variables are defined in (table 4).

**Table 3.** Socio-demographic characteristics of the sample

<b>Gender</b>		<b>Household income</b>	
Male	52%	Below 3000 SR	17%
Female	48%	Between 3000 and SR5000	15%
		Between 5000 and SR7000	24%
<b>Age</b>		More than SR7000	44%
18-35	68%	<b>Employment status</b>	
36-more than 45	32%	Part time worker	21%
		Full time worker	57%
<b>Education level</b>		Retired	9%
Primary education	15%	Housewives	13%
Secondary education	35%		
University education	50%		
		<b>Sample size</b>	334

**Table 4.** Definition of explanatory variables

Attributes	Levels
Production Location	1 = Al-Ihsaa governorate; -1 = Kharg governorate
Processing	1 = processed; -1 = unprocessed
Price	15 SR/kg and 20 SR/kg
Gender	1 = female; 0 = male
Age	1 = "36-more than 50"; 0 = "18-35 years old"

In the following lines we present the results of the hybrid choice model that consists of two sub-models; the SEM model and the RPL model. We start with interpretation of the SEM model. The first step in the SEM is the CFA for the latent variables: intentions, attitudes, subjective norms, behavioral control and religion. The results of the weighted least squares estimation of the proposed model and the goodness of fit measures are presented in (table 5). The model goodness of fit measures are approximately 0.9 which meets accepted level based on the previous literature (Marcoulides and Schumacker, 1996; Hair et al., 1999; Kline, 2005; Costa-Font and Gil, 2009). Results of the SEM model indicates that the hypotheses from 1 to 4 are all supported by the data and the consumers' attitudes, subjective norms which represent the social pressure and the perceived behavior control have a positive effect on the consumers' intentions to purchase Palm Date which meets the proposed hypothesis of theoretical model. We also find a strong effect of religion to affect indirectly consumers purchase intentions toward Palm Date.

**Table 5.** The results of the structural model and goodness of fit measures

Structural relationships	Parameter Estimate	R <sup>2</sup>
Purchase intention → Attitude	0.357***(0.080)	0.335
Purchase intention → Subjective Norm	0.293***(0.079)	
Purchase intention → Behavioural Control	0.128**(0.062)	
Attitude → Religion	0.539***(0.065)	0.291

\*\*\* (\*\*) [\*] denotes statistical significance at the 1 (5) [10] % level

Standard error in parenthesis

**Table 5 (continued).** The results of the structural model and goodness of fit measures

Goodness of fit measures	
$\chi^2 = 214.52, df = 55$	
NC = 3.9	NC = $X^2/df = 1-5$ (Schumacker and Lomax, 2004)
RMSEA = 0.0	RMSEA = 0,00, 0,05-0,08 (Batista Foguet and Coenders, 2000)
NFI = 0.87	NFI $\geq 0,9$ (Bollen, 1989; Marcoulides and Schumacker, 1996)
NNFI = 0.86	NNFI $\geq 0,9$ (Bollen, 1989; Marcoulides and Schumacker, 1996)
CFI = 0.88	CFI $\geq 0,9$ (Bollen, 1989; Marcoulides and Schumacker, 1996)
GFI = 0.98	GFI $\geq 0,9$ (Bollen, 1989; Marcoulides and Schumacker, 1996)
AGFI = 0.97	AGFI $\geq 0,90$ (Bollen, 1989; Marcoulides and Schumacker, 1996)

\*\*\* (\*\*) [\*] denotes statistical significance at the 1 (5) [10] % level

Standard error in parenthesis

Now we turn to the interpretation of the RPL results. All variables in the estimation are effect-coded with two levels. We have estimated three different models and the results are presented in table 6. In the first model, the parameters are all considered random and normally distributed, under this specification we cannot calculate the willingness to pay since the ratio of two normally distributed variable doesn't have defined moments (Hole, 2007), and cause a problem of singularity as the dominator becomes zero (Hensher and Greene, 2003). We use this model for comparison purposes (Ortúzar and Sillano, 2005). The second model we fix the price and allow for interaction with the socio-demographic factors. The third model we incorporate the estimated latent variables from the SEM model.

The results of the first model indicate that all the parameters are found to be statistically significant with the expected sign. The price attribute has a significant negative effect which is consistent with demand theory, indicating an increase in the price cause a decrease in consumers utility (Gracia et al., 2009; Menapace et al., 2011). The parameters estimates of the production location and processing have the indicated sign and show that the utility obtained from one kilo of processed Khalas variety of Palm Date and produced in Al-Ihsaa governorate is higher than the

opposite case. The highest utility comes from the production location of Khalas variety. The processing attribute found to have a small effect on utility. Also, our results are in line with Aleid (2004), who found evidence that a small size of the sample prefer processed Palm Date. The standard deviations are found significant which justifies the use of the random parameter logit that takes into account the unobserved heterogeneity of consumers' preferences.

In the second model we followed Revelt and Train (2000) and have fixed the price and allowed other coefficients to vary to calculate the WTP. The WTP for each attribute will follow the distribution of the attribute's coefficient. The WTP for the attributes are calculated from the RPL estimation results in (table 6). Results show that both attributes have positive premiums. Consumers are willing to pay 8.6SR per kilo of Khalas variety produced in Al-Ihsaa governorate while the WTP for the processed Khalas variety is 1.5SR per kg. Additionally we have allowed for interaction with socio-demographic characteristics. The production location attribute has the largest positive effect on consumer's utility indicating that consumers gain more utility from locally produced Palm Date in Al-Ihsaa governorate rather than produced in Kharg governorate. The processing attribute has the expected effect but is statistically significant at 10% indicating that processed Palm Date increases consumer's utility compared with unprocessed Dates.

The interaction term age and production location shows a significant effect at 10% indicating that adult consumers gain more utility when purchasing locally produced Palm Date from Al-Ihsaa governorate. The effect of interaction between gender and location was not found to be relevant. The standard deviations for the attributes and interactions with socio-demographic characteristics is statistically significant indicating the presence of unobserved preference heterogeneity regarding these attributes which justifies the use of the RPL model to take into account this heterogeneity.

**Table 6.** Random Parameter Logit model results

Attributes	Model 1	Model 2	Model 3
Price	-0.046***(0.011)	-0.042***(0.009)	-0.042***(0.010)
Process : mean	0.067*(0.038)	0.063*(0.036)	0.061*(0.037)
Location : mean	0.462***(0.040)	0.360***(0.053)	0.454***(0.036)
<b>Interaction terms</b>			
Age-location : mean		0.151*(0.086)	
Gender-location : mean		0.096(0.077)	
<b>Latent variables</b>			
Purchase intentions – location			0.101***(0.034)
Subjective norms – location			-0.136***(0.040)
Behavioral control – processing			0.104***(0.052)

<b>Parameters' distributions standard deviations</b>			
Price	0.121***(0.014)		
Process	0.554***(0.042)	0.531***(0.040)	
Location	0.535***(0.044)	0.394***(0.060)	
Age – location		0.376**(0.143)	
Gender – location		0.396***(0.114)	
Purchase intentions – location			0.221***(0.076)
Subjective norms – location			0.254***(0.057)
Behavioral control – processing			0.208**(0.094)
<b>Model diagnostics</b>			
Log likelihood	-2661.8087	-2677.5967	-2663.683
Chi-square test	280.18***	245.80***	243.41***

\*\*\* (\*\*) [\*] denotes statistical significance at the 1 (5) [10] % level  
Standard errors in parenthesis

The results of the third model show that the integration of consumer's personality characteristics and lifestyles to the model is relevant. The effects of consumers' intentions, social pressure and behavioral control were found has the expected sign in affecting the consumer decision making process for choosing food products. Regarding the models fit, the chi-square tests for the three models were significant which suggests that the parameters estimated for each model are jointly significant and affecting the consumers' utilities.

## Conclusions

The objective of this paper is to assess consumers' preferences towards Palm Date through using a Hybrid choice model in Al-Ihsaa governorate in KSA, considering specific attributes identified by a pilot study of 35 respondents that are production location, processing and the price. Our work is the first to apply a HCM model to understand consumers' preferences towards two major varieties of Palm Date in KSA. Results indicate that consumers are receiving more utility and willing to pay more for locally produced Palm Date from Al-Ihsaa governorate compared with Kharg governorate. The processing attribute and the interaction between age and location are also found to be relevant in increasing consumers' utility. Furthermore, consumers personality traits are found to be relevant, moreover, religion is found to play a relevant effect in the behavioral decision making process. Results also suggest that consumers are willing to pay more for processed Palm Date for its property of long shelf life. The standard deviation for the attributes and interactions with socio-demographic characteristics is significant indicating the presence of heterogeneity in consumers' preferences and justifies the use of the RPL model.



The KSA government advocates for increasing Palm Date production by providing high quality varieties and extension services as an instrument for increasing food security and its role in protecting the environment. Policies encouraging farmers have had a relevant effect on the industry through encouraging the processing of Palm Date which helps creating jobs and solving many marketing problems that occur from the traditional marketing approach. Additionally creating extension programs to increase farmers' awareness about different available governmental subsidies programs and how they can exploit it.

## References

Ajzen, I. (2005). *Attitude, personality and behavior* (Second edition). Berkshire, England: Open University press.

Al-Abbad, A., Al-Jamal, M., Al-Elaiw, Z., Al-Shareed, F., Belaifa, H. (2011). A study on the economic feasibility of date palm cultivation in the Al-Hsaa Oasis of Saudi Arabia. *Journal of Development and Agricultural Economics*, 3, 463-468.

Aleid, M.S. (2004). Studing consumption patterns of dried and fresh dates in the eastern region in Kingdom of Saudi Arabia. *Arabic Journal of Food and Nutrition*, 9:31-40.

Alfnes, F., Guttormsen, A.G., Stein, G., Kolstad, K. (2006). Consumers' willingness to pay for the color of salmon: a choice experiment with real economic incentives. *American journal of agricultural economics*, 88, 1050-1061.

Alfnes, F., Steine, G. (2005). None-of-these bias in hypothetical choice experiments discussion paper DP-06/05. Department of economics and resource management norwegian university of life sciences.

Al-Shareed, F., Al-Jamal, M., Al-Abbad, A., Al-Elaiw, Z., Ben Abdallah, A., Belaifa, H. (2012). A study on the export of Saudi Arabian dates in the global market. *Journal of Development and Agricultural Economics*, 4, 268-274.

Ashok, K., Dillon, W., Yuan, S. (2002). Extending discrete choice models to incorporate attitudinal and other latent variables. *Journal of Marketing Research*, 39, 31- 46.

Armstrong, P. M., Garrido, R. A., Ortúzar, J. D. (2001). Confidence intervals to bound the value of time. *Transportation Research*, Part E 37, 143-161.

Bell, R., Marshall, D. W. (2003). The construct of food involvement in behavioral research: Scale development and validation. *Appetite*, 40, 235-244.

Ben-Akiva, M., McFadden, D., Train, K., Walker, J., Bhat, C., Bierlaire, M., Bolduc, D., Börsch-Supan, A., Brownstone, D., Bunch, D.S., Daly A., De Palma, A., Gopinath, D., Karlstrom, A., and Munizaga, M.A. (2002). Hybrid choice models: Progress and challenges. *Marketing Letters*, 13, 163-175.

Bhat, C. R. (2003). Simulation estimation of mixed discrete choice models using randomized and scrambled Halton sequences. *Transportation Research Part B: Methodological*, 37, 837–855.

Blackwell, R. D., Miniard, P. W., Engel, J. F. (2001). Consumer behavior. Harcourt Inc., Orland, FL.

Bolduc, D., Boucher, N., Alvarez-Daziano, R., (2008). Hybrid choice modelling of new technologies for car choice in Canada. *Transportation Research Record*, 2082, 63-71.

Bollen, K. A. (1989). Structural equations with latent variables, Wiley Series in Probability and Mathematical Statistics.

Cameron, T. A., Poe, G. L., Ethier, R. G., Schulze, W. D. (2002). Alternative non-market value-eliciting methods: are the underlying preferences the same? *Journal of Environmental Economics and Management*, 44, 391-425.

Carlsson, F., Martinsson, P. (2001). Do hypothetical and actual marginal willingness to pay differ in choice experiment? *Journal of Environmental Economics and Management*, 41, 179-192.

Carlsson, F., Frykblom, P., Lagerkvist, C. J. (2005). Using cheap talk as a test of validity in choice experiments. *Economics letters*, 89, 147-152.

Chang, J.B., Lusk, J.L., Norwood, F. B. (2009). How closely do hypothetical surveys and laboratory experiments predict field behavior? *American Journal of Agricultural Economics*, 54, 513-530.

Chen, M. F. (2007). Consumer attitudes and purchase intentions in relation to organic foods in Taiwan: Moderating effects of food-related personality traits. *Food Quality and Preference*, 18, 1008-1021.

Costa-Font, M., Gil, J. M. (2009). Structural equation modeling of consumer acceptance of genetically modified (GM) food in the Mediterranean Europe: Across country study. *Food Quality and Preference*, 20, 399 – 409.

Cummings, R. G., Harrison, G. W., Rutström, E. E. (1995). Homegrown values and hypothetical surveys: Is the dichotomous choice approach incentive compatible? *American Economic Review*, 85, 260–266.

El-Sabea, A. (2010). A comparative study for competitiveness of dates from the Kingdom of Saudi Arabia and the United Arab Emirates in the world markets. Proceedings (Ed. Zaid A and Alhadrami G) Fourth International Date Palm Conference, Abu Dabhi, United Arab Emirates 15-17, March 2010, p. 715.

Food and Agriculture Organization statistics (FAOSTAT), 2013. Available at: <http://faostat.fao.org/site/567/default.aspx#ancor> (Last accessed July 2013).

Food Standard Agency, 2002. Consumer attitudes to food standards. Available at: [http://www.food.gov.uk/multimedia/pdfs/consatts\\_scotland.pdf](http://www.food.gov.uk/multimedia/pdfs/consatts_scotland.pdf) (Last accessed May 2013).

Gracia, A., Loureiro, M. L., Nayga Jr, R. M. (2009). Consumers' valuation of nutritional information: A choice experiment study. *Food Quality and Preference*, 20, 463-471.

Hair, J. F., Anderson, R. E., Tatham, R. L., Black, W. C. (1998). Multivariate Data Analysis. *International Journal of Pharmaceutics*.

Hensher, D. A., Greene, W. H. (2003). The mixed logit model, the state of practice. *Transportation*, 30:133-176.

Hensher, D. A. (2010). Hypothetical bias, choice experiment and willingness to pay. *Transportation Research, Part B* 44, 735-752.

Hole, A. R. (2007). Modelling heterogeneity in patients' preferences for attributes of a general practitioner appointment. *Journal of Health Economics*, 27, 1078-1098.

James, S., Burton, M. (2003). Consumer preferences for GM food and other attributes of the food system. *Australian Journal of Agricultural and Resource Economics*, 47, 501-518.

Jöreskov, K. and Sörbom, D. (1996). Lisrel 8: User's Reference Guide. Scientific Software.

Johansson, M. V., Heldt, T., Johansson, P. (2006). The effect of attitudes and personality traits on mode choice. *Transport research, Part A*, 40, 507- 525.

Kline, R.B. (2011). Principles and practice of structural equation modeling, Methodology in the social sciences. Third edition.

Lancaster, K. (1966). A new approach to consumer theory. *Journal of Political Economy*, 74, 132-157.

List, J. A., Gallet, C. A., (2001). What experimental protocol influence disparities between actual and hypothetical stated values? *Environmental and Resource Economics*, 20, 241–254.

Lobb, A. E., Mazzocchi, M., Traill, W. B., (2007). Modelling risk perception and trust in food safety information within the theory of planned behaviour. *Food and Quality Preference*, 18, 384–395.

Loo, E. J. V., Caputo, V., Nayga, Jr. R. M., Meullenet, J-F., Recke, S. C. (2011). Consumers' willingness to pay for organic chicken breast: Evidence from choice experiment. *Food Quality and Preference*, 22, 603-613.

Loureiro, M. L., Gracia, A., Nayga, Jr. R. M. (2006). Do consumers value nutritional labels? *European Review of Agricultural Economics*, 33, 249-268.

Loureiro, M. L., Umberger, W. J., 2007. A choice experiment model for beef: what US consumer responses tell us about relative preference for food safety. Country-of-origin and labeling and traceability. *Food Policy*, 32, 496-514.

Lusk, J. L., Schroeder, T., (2004). Are choice experiment incentive compatible? A test with quality differentiated beef steaks. *American Journal of Agricultural Economics*, 86, 467-482.

Mannell, A., Brevard, P., Rodolfo Nayga, Jr. R. M., Combris, P., Lee, R., Gloeckner, J. (2006). French consumers' use of nutrition labels. *Nutrition and Food Science*, 36, 159-168.

Marcoulides, G. A., Schumacker, R. E., (1996). *Advanced Structural Equation Modeling: Issues and Techniques*. Lawrence Erlbaum Associates.

McFadden, D. (1974). Conditional logit analysis of quantitative choice behavior. In: Zarembka, P(ed.), *Frontiers in Econometrics*, 21, 227-244.

Menapace, L., Colson, G., Grebitus C., Facendola, M. (2011). Consumers' preferences for geographical origin labels: evidence from the Canadian olive oil market. *European Review of Agricultural Economics*, 38, 193-212.

Morrison, M., Bennett, J., Blamey, R., Louviere, J. (2002). Choice modeling and tests of benefit transfer. *American Journal of Agricultural Economics*, 84, 161–170.

Murphy, J., Allen, P., Stevens, T., Weatherhead, D., (2005). A meta-analysis of hypothetical bias in stated preference valuation. *Environmental and Resource Economics*, 30, 313–325.

Mullen, K., Williams, R., Hunt, K. (2000). Irish descent, religion and food consumption in the west of Scotland. *Appetite*, 34, 47-54.

Pettinger, C., Holdsworth, M., Gerber, M., (2004). Psycho-social influences on food choice in southern France and central England. *Appetite*, 42, 307-16.

Phanikumar, C.V., Maitra, B. (2007). Willingness-to-pay and preference heterogeneity for rural bus attributes. *Journal of Transportation Engineering*, 133, 62–69.

Olof, J.S., Henrik, S. T. (2008). Measuring Hypothetical Bias in Choice Experiments: The Importance of Cognitive Consistency. *The b.e. Journal of Economic Analysis and Policy*, 8, 1-10.

Ortúzar, J. D., Sillano, M. (2005). Willingness-to-pay estimation with mixed logit models: some new evidence. *Environment and Planning A*, 37, 525-550.

Revelt, D., Train, K. (1998). Mixed logit with repeated choices: households' choices of appliance efficiency level. *Review of Economics and Statistics*, 80, 647-657.

Revelt, D., Train, K., (2000). Consumer-specific taste parameters and mixed logit: households' choice of electricity supplier. WP E00-274, department of economics, University of California, Berkeley, CA.

Rungie, C. M., Coote, L. V., Louviere, J. J. (2011). Structural Choice Modelling: Theory and Applications to Combining Choice Experiments. *Journal of Choice Modelling*, 4, 1-29.

Schumacker, R. E., Lomax, R. G., (2004). A Beginner's Guide to Structural Equation Modeling, Volume 2.

Silva, A., Nayga, Jr. R. M., Campbell, B. L., Park, J. (2007). On the use of valuation mechanisms to measure consumers' willingness to pay for novel products: A comparison of hypothetical and non-hypothetical values. *International food and agribusiness management review*, 10, 165–180.

Street, D. J., Burgess, L., Louviere, J. J. (2005). Quick and easy choice sets: Constructing optimal and nearly optimal stated choice experiments. *International Journal of Research in Marketing*, 22, 459-470.

Saudi Arabia Ministry of Agriculture (SAMA), (2013). Palm cultivation and dates production in Saudi Arabia. Available at: <http://www.moa.gov.sa> (Last accessed May 2013).

Saudi Arabia Central Department of Statistics and Information (CDSI), (2013). Demographic research bulletin. Available at: <http://www.cdsi.gov.sa> (Last accessed May 2013).

Temme, D., Paulssen, M., Dannewald, T. (2008). Incorporating latent variables into discrete choice models: a simultaneous estimation using SEM software. *Business Research*, 1, 220-237

Train, K. (2000). Halton sequences for mixed logit. Department of Economics, Institute for Business and Economic Research, UC Berkeley.

Train, K. (2009). Discrete choice methods with simulation, second edition. Cambridge university press.

Verbeke, W., Vackiere, I. (2005). Individual determinants of fish consumption: application of the theory of planned behavior. *Appetite*, 44, 67-82.

Yañez, M. F., Raveau, J., Ortúzar, J. D. (2010). Inclusion of latent variables in Mixed Logit Models: Modelling. *Transport Research, Part A*, 744-753.

Yangui, A., Costa-Font, M., Gil, J. M. (2013). The effect of food related personality traits and lifestyle orientation on consumer's behavior related to extra virgin olive oil: estimation of an extended hybrid choice. Invited paper presented at the 4th International Conference of the African Association of Agricultural Economists, September 22-25, 2013, Hammamet, Tunisia.