MODELLING THE CONSUMERS' PREFERENCES AND WILLINGNESS TO PAY FOR QUALITY ATTRIBUTES OF SUPERLATIVE MOZAFATI DATE IN IRAN

Abdul Rashid Jamnia (Corresponding author)
Department of Economics , Faculty of Humanities , Higher Education
Complex of Saravan , Saravan , Iran
a.r.jamnia@gmail.com
Emambakhsh Tireheidouzahi
Department of Economics , Faculty of Humanities , Higher Education
Complex of Saravan , Saravan , Iran

نمذجة تفضيلات المستهلكين واستعدادهم للدفع مقابل مزايا عالية الجودة من تمر المضافتي الفائق في إيران

عبد الرشيد جام نيا (المؤلف المسؤول)
قسم الإقتصاد – كلية العلوم الإنسانية ـ مجمع سراوان للتعليم العالي ـ سراوان ـ إيران
امام بخش تيره عيدوزهي
قسم الإقتصاد ـ كلية العلوم الإنسانية ـ مجمع سراوان للتعليم العالي ـ سراوان ـ إيران

ABSTRACT:-

The degree of acceptability of a product depends on the consumer's preferences for the quality attributes and the level of satisfaction that the product can provide. The date is one of the superlative fruit vintages of Iran, which is the second major producer country amongst the principal producing countries in the world. The Mozafati date cultivar is the superlative one among the existence date cultivars in Iran, which holds 28% of date production of the country, and placed in third economic rank. The purpose of this study is to investigate the consumer preferences of Mazafati Date for the different quality characteristics such as size, color, fleshy, juiciness in Iran as a case study, by using the choice experiment method (CEM). The results confirmed that, the most effective attribute for Date consumers' preferences and willingness to pay is fruit size, followed by color, fleshy texture, and fruit juiciness. Finally, based on the outcomes, the effect of different studied characteristics with more details examined on the consumer's preferences and willingness to pay, in line with the decision-making process for producers, traders, planners, and policymakers.

Keywords: Choice Experiment, Consumers' Preferences, Mozafati Date Palm, Quality Attributes.

الملخص:

تعتمد درجة قبول المنتج على تفضيلات المستهلك لسمات الجودة ومستوى الرضا الذي يمكن أن يوفره المنتج. يعتبر التمر أحد أفضل أنواع الفاكهة في إيران، والتي تعد ثاني أكبر دولة منتجة بين الدول المنتجة الرئيسية في العالم. يعتبر صنف التمر المظافتي هو الصنف الفائق من بين أصناف التمر الموجودة في إيران، والتي تستحوذ على ٢٨٪ من إنتاج التمور في البلاد، ويحتل المرتبة الثالثة اقتصادياً. الغرض من هذه الدراسة هو التحقق من تفضيلات المستهلك في تمور مضافتي لخصائص الجودة المختلفة مثل الحجم واللون واللحم والعصير في إيران كدراسة حالة، باستخدام طريقة تجربة الاختيار (CEM). أكدت النتائج أن السمة الأكثر فاعلية لتفضيلات مستهلكي التمور واستعدادهم للدفع هي حجم الثمار، يليها اللون، والملمس السمين، وعصير الفاكهة. أخيراً، بناءً على النتائج، تأثير الخصائص المدروسة المختلفة مع مزيد من التفاصيل التي تم فحصها حول تفضيلات المستهلك واستعداده للدفع، بما يتماشى مع عملية صنع القرار للمنتجين والتجار والمخططين وواضعي السياسات.

الكلمات المفتاحية: تجربة الاختيار، تفضيلات المستهلكين ، نخيل التمر مضافتي، سمات الجودة.

The Islamic University College Journal
No. 66
Part: 2

ISSN 1997-6208 Print
ISSN 2664 - 4355 Online

مجلة الكلية الإسلامية الجامعة
العدد : ٦٦
الجزء : ٢

ABBREVIATIONS

- CEM - choice experiment method

- MJAI - Ministry of Jihad Agriculture of Iran

- JAPOSB - Jihad Agriculture Provincial Organization of Sistan and Baluchestan

- DJAS - Department of Jihad Agricultural of Saravan

- USD - United States Dollar

- cm - Centimeter

- IID - Independent and Identically Distributed

- IIA - Independence Of Irrelevant Attributes

- CLM - Conditional Logit Model

- MNL - Multinomial Logit Model

- WTP - Willingness to Pay

- MWTP - Marginal Willingness to Pay

- AIC - Akaike information criterion

1. INTRODUCTION

From the consumer's point of view, food quality includes the characteristics by which a decision made to make a purchase. These features include external appearance, such as color, size, shape, fleshy and skin textural; and internal characteristics such as nectar (juiciness), etc, which can affect consumer satisfaction. The qualitative characteristics of goods are essential for consumer acceptance. The degree of acceptability of a product depends on the consumer's preferences for the quality attributes and the level of satisfaction that the product can provide (Aizaki 2012; Byrne 2020; Khan et al. 2019).

The appearance of the fruit, including structure, weight, brightness, color, size, and shape, are among the first factors that attract the consumer's attention and influence his/her decision to buy. When the consumer is fascinated by a fruit's appearance, then

The Islamic University College Journal
No. 66
Part: 2

ISSN 1997-6208 Print
ISSN 2664 - 4355 Online

مجلة الكلية الإسلامية الجامعة
العدد : ٦٦
الجزء : ٢

decide to buy, based on the internal attributes such as aroma, taste, and sweetness. The nutritional value of a fruit is another quality attribute, which cannot be seen, tasted, or touched, but they are essential for the growth and needs of the body (Aizaki 2012; Byrne 2020; Khan et al. 2019).

Having information about the price and the implicit value of the goods' characteristics is a guide to the pricing policy of the goods by the manufacturer and directly affects the demand for the goods. Price plays a vital role in exchanging the relationship between retailer and consumer, because the price is one of the most essential variables that determine and influence the decision to buy a product. It can also provide the guideline for producer investment decisions and strategies, and government policies to increase domestic consumption and exports (Aizaki 2012; Khan et al. 2019).

Date palm (Phoenix dactylifera L.) is one of the fruit vintage grown in the dry areas of the North and horn of Africa, the Arabian peninsula, the Middle East, and South Asia. It is a prominent food and income source for native residents, and substantial action roles in the economy, community, and environment in these regions (Alavi 2013; Daiq 2006; Ishag 2017; Ortiz-Uribe et al. 2019; Salah et al. 2019).

Dates have a high nutritional value due to their natural sugars such as glucose, sucrose, fructose, iron, fiber and protein, health benefits, and delicious taste, have a valuable consumption position among the people of the world. Accordingly, because its high consumption and nutritional value, it is considered as one of the strategic and commercially valuable products and non-oil currency (Alavi 2013; Ortiz-Uribe et al. 2019; Salah et al. 2019; Sheikhbahaei et al. 2020).

Date palm is one of the superlative fruit vintages of Iran. This country globally is the second major producer and the fourth exporter of date amongst the principal producing countries. It has annual production rate of dates equal to 1,204,158 tons and annual export equal to 201,597 tons in 2018 (Akrami et al. 2020; Alavi 2013; Ortiz-Uribe et al. 2019).

The critical areas of date palm farms situated from southwest to southeast of Iran, which including Khuzestan, Bushehr, Fars,

The Islamic University College Journal
No. 66
Part: 2

ISSN 1997-6208 Print
ISSN 2664 - 4355 Online

مجلة الكلية الإسلامية الجامعة
العدد : ٦٦
الجزء : ٢

Hormozgan, Kerman, and Sistan and Baluchestan provinces that more than 99 percent of the total annual production of the date associated to areas mentioned above in the country. Besides, more than 400 date's cultivars been known in Iran, yet, and among them, the Piarum, Zahidi, Deiri, Sayer, Mordasang, Hallavy, Shahani, Kabkab, Mozafati, Almehtari, Khasoui, and Barhee are the most important and well known tradable cultivars in Iran. The Mozafati date cultivar is the superlative one among the existence date cultivars in Iran, which holds 28% of date production of the country, and placed in third economic rank (Akrami and Rahimi 2020; Alavi 2013).

The main area under cultivation of Mozafati date in Iran belongs to the Saravan region of Sistan and Baluchestan province, and some areas of Kerman province such as, the historic city of Bam, Shahdad, Jiroft, Kahnooj, and Narmashir (Akrami and Rahimi 2020; Alavi 2013; Sheikhbahaei et al. 2020).

According to the results of the sample census of horticultural products of the Ministry of Jihad Agriculture of Iran (MJAI) in 2019, the area under cultivation of date palm in the country, estimated at 244 thousand hectares, of which 83.8% was fertile, and the other 16.2% was infertile (seedlings). The highest level of fertile date palm cultivation in the country with 17% belongs to Sistan and Baluchestan province. Also, Bushehr, Hormozgan, Khuzestan, Kerman, and Fars provinces, and Jiroft and Kahnooj region with 16%, 15.7%, 13.2%, 11%, 10.1%, and 15.5%, respectively, are in the next positions of fertile date palm cultivation in the country. Therefore, in this study, Sistan and Baluchestan province was selected as a pilot due to having the highest area under date palm cultivation.

Based on the reports Jihad Agriculture Provincial Organization of Sistan and Baluchestan (JAPOSB), the most crucial date palm production area of the province is the Saravan region includes three cities of Saravan, Sib and Suran, and Mehrestan. There are more than 70 varieties of dates in the study area, of which 20 cultivars are widely cultivated and have commercial value. The main commercial variety of dates in the region in terms of cultivation and production is Mazafati dates. The Mazafati dates of the Saravan region are unique in the world in terms of suitable and particular climatic conditions,

The Islamic University College Journal
No. 66
Part: 2

ISSN 1997-6208 Print
ISSN 2664 - 4355 Online

مجلة الكلية الإسلامية الجامعة
العدد : ٦٦
الجزء : ٢

and the dates of Rabi variety have good acceptance and satisfaction in international markets. According to the local reportage of JAPOSB, the provincial fertile date palm cultivated area and amount of date production in the 2019-2020 crop year are 33433.33 hectares and 177999 tons, respectively. The Saravan region's share from provincial cultivated area and production rate is equal to 32% (10694.21 hectares) and 39% (68473) tons, respectively.

The current study seeks to review the following main objectives such as, 1- analysis of Consumer preferences for the quality characteristics of Mazafati dates in the Saravan region, a case study of Iran; 2- Estimating the willingness of consumers to pay for different quality characteristics of Mazafati dates. Knowing the preferences and willingness to pay consumers for different quality characteristics is essential in the decision-making process for producers, traders, planners, and policymakers.

2. MATERIAL and METHODS

2.1. STUDY AREA and DATA COLLECTION

The present study conducted as a case study in the Saravan region, including Saravan, Mehrestan, and Sib and Suran cities located in the easternmost point of Sistan and Baluchestan province of Iran (Figure 1).

Agricultural activity, especially cultivation and production of dates in the Saravan region, is of particular importance, so that most people in the region live in this way. Due to the low-income level of farmers in the region on the one hand and the limited resources and factors of production in the agricultural sector on the other hand, it is necessary to use these resources optimally and provide solutions to improve the situation of farmers in the region. Given the above, studying the preferences and willingness of consumers to pay for the quality characteristics of Mazafati dates using the choice experiment method can provide useful information for producers, traders, planners, and policymakers.

In this research, the required information is mainly through questionnaires and interviews and by referring directly to the statistical sample users selected by multi-stage random sampling in the Saravan region (Saravan, Sib and Suran, and Mehrestan

The Islamic University College Journal
No. 66
Part: 2

ISSN 1997-6208 Print
ISSN 2664 - 4355 Online

مجلة الكلية الإسلامية الجامعة
العدد : ٦٦
الجزء : ٢

counties) for the 2019–2020 crop year. Another part of the information for better results collected through the Department of Jihad Agricultural of Saravan (DJAS), JAPOSB, and the statistical yearbook of MJAI in 2020.

2.2. APPLYING CHOICE EXPERIMENT METHOD

2.2.1. DESIGNING CHOICE EXPERIMENT QUESTIONNAIRE

The questionnaire used in this research has two parts; the first part contains the socioeconomic information of the respondents (Mozafati date consumers), and the second part consists of the questions related to the choice experiment method. For the efficient design of choice sets, the attributes and levels associated with them are of paramount importance (Street et al. 2007). Therefore, the characteristics and related levels have been determined and presented in Table 1, through the opinion and suggestions of experts, specialists, businesspersons, and other experts in the field related to the research topic.

As to be seen in Table 1, to achieve the objectives of the present study, five attributes with three levels were identified.

Based on the defined characteristics and the combination of their different levels, the number of three choices or scenarios determined under the headings of scenario one, two, and three, and its information presented in Table 2.

The choice experiment process used to determine the composition of the choice sets for the questionnaires after identifying the attributes, levels related to them, and scenarios (choices). According to the number of attributes and their different levels according to Table 1, usually the number ($243=3\times3\times3\times3\times3$) of possible combinations can be provided. To have an efficient and workable questionnaire, it makes sense that the number of possible combinations should be reduced through an efficient method. Therefore, based on the orthogonal fraction factor scheme using the combined rotation and matching method in R software, 18 different sets of three choice options, including three scenarios, were created and placed in questionnaires (Aizaki 2012; Aizaki et al. 2014; Street and Burgess 2007). Respondents (Mozafati date consumers) were

asked to choose one of three options based on their personal preferences and interests. Table 3 shows an example of the choice experiment cards used in the questionnaires.

2.2.1. MODELLING of CEM

Since the consumers' utility does not derive directly from the use of commodities, but rather particular attributes of the commodities, which they consume. Therefore, the random utility theory, based on Lancaster (1966), used to extract the Consumers' Preferences and Willingness to pay for Quality Attributes of Mozafati Palm Date in the current study.

The utility function (U_{nij}) of an consumer, n , from consuming a product, i , can be divided into two components, a visible deterministic component (V_{nij}) related to selecting the product, i , from a finite choice set of $j = 1,...l,...J$ alternatives, and a random stochastic component (ε_{nij}) which includes the all unobserved factors that affect the consumers' utility. It expressed as Equation (1) (Street and Burgess 2007; Train 2009):

$$U_{nij} = V_{nij} + \varepsilon_{nij} = \beta_n X_{nij} + \varepsilon_{nij} \qquad (1)$$

Where, the unobserved error random term, ε_{nij} is assumed to be independent and identically distributed (IID) (Gumbel distribution) Li et al. (2016), which implies independence of irrelevant attributes (IIA) and can be tested using the Hausman et al. (1984) test. The V_{nij} , is the deterministic component of utility that can be determined by the level of alternatives' features and socioeconomic characteristics of the consumer, n. Besides, β_n is a vector of parameters to be estimated, X_{nij} stands for an observable vector information of product features' levels from a finite choice set of $j = 1,...l,...J$ alternatives (Street and Burgess 2007; Train 2009).

The probability which a consumer, n, will choose each given alternative from a finite choice set with the most significant utility (U_{ni}), is expressed as follows (Street and Burgess 2007; Train 2009):

The Islamic University College Journal
No. 66
Part: 2

ISSN 1997-6208 Print
ISSN 2664 - 4355 Online

مجلة الكلية الإسلامية الجامعة
العدد : ٦٦
الجزء : ٢

$$Pr\,[U_{nil} > U_{nij} \;\; \forall l \neq j] = \Pr\,[(V_{nil} - V_{nij}) > (\varepsilon_{nil} - \varepsilon_{nij})]; \quad \forall\, j \in j = 1,...,l,...,J; j \neq l \qquad (2)$$

Thus, assuming that the consumer, n, choose the option from a finite choice set, which returns the maximum utility (U_{nij}), the discrete choice models are derived from the choice probability function (Equation (1)) and based on the conditional Logit Model (CLM) (Hausman and McFadden 1984), which refer to as multinomial logit model (MNL), the probability of preferred option can be rewritten as Equation (3) (Street and Burgess 2007; Train 2009):

$$\Pr\,[X_{il} \mid X_{ij}] = \frac{\exp(V_{il})}{\sum_{j=1}^{J} \exp(V_{ij})} \quad;\quad j = 1,...,l,...,J \qquad (3)$$

The model is then estimated using the maximum likelihood procedure, formulated as Equation (4) (Louviere et al. 2000; Train 2009):

$$\log L = \sum_{n=1}^{N} \sum_{j=1}^{J} d_{nj} \log\left[\frac{\exp(\beta X_{nil})}{\sum_{j=1}^{J} \exp(\beta X_{nij})}\right] \quad;\quad j = 1,..l,...,J \qquad (4)$$

Where d_{nj}, is an indicator which takes the value of one if respondents n chooses option j, and zero; otherwise, N is the number of samples.

To estimate the relative importance of each attribute belongs to alternatives, assumed that the degrees of different attributes in the choice set remain the same. Therefore, the marginal willingness to pay (MWTP) for the kth attribute based on the marginal rate of substitution between the estimated coefficient of the respective attribute level (β_k) and the estimated coefficient on the price parameter (β_p) can be calculated by Equation (5) as follow (Louviere et al. 2000; Train 2009):

$$MWTP = -[\frac{\beta_k}{\beta_p}] \qquad (5)$$

The Entire plots, analyses of the choice experiments models, and generalized Hausman and McFadden test to examining the

hypothesis (IIA) (Aizaki et al. 2014; Hess et al. 2019; Hothorn et al. 2014), were assessed using R version 3.6.3 (Team 2018).

3. RESULTS and DISCUSSION

The demographic and economic characteristics of the respondents (Mozafati date consumers) presented in Table 4.

According to results as considered in Table 4, the average age of respondents (Mozafati date consumers) was 40.56. Moreover, the monthly income of respondents was 600 USD. The mean family size of the respondents was 5.72 individuals. Furthermore, more details about the socioeconomic characteristics of studied the respondents shown in Table 4.

The results of choice model estimation based on CLM as a multinomial logit model presented in Table 5.

According to the results of Table 5, the Adjusted McFadden R^2 has a value of 0.4, which based on Hauber et al. (2016) the goodness-of-fit of (CLM) can be confirmed. This indicates the null hypothesis' acceptance of, which is no systematic relationship or independence between the preferred options in the choice sets. Therefore, the CLM is a suitable model for investigating the impact of Quality Attributes of Mozafati Date (independent variables) in the study area on Consumers' Preferences and Willingness to pay. Also, the other statistics values such as the Likelihood ratio test (χ^2), Akaike information criterion (AIC), and Log-likelihood considered in Table 5.

Besides, all five coefficients of the above-mentioned CLM, are consistent in terms of signs and highly statistically significant. The negative sign on the price of each fruit coefficients, suggests that utility falls if a choice set chosen with a higher price. The sign of the color, size, juiciness, and fleshy texture coefficients are positive, suggesting that respondents (Date consumers) prefer and willing to pay more for the higher quality of each attribute.

The most effective attribute for date Consumers' Preferences and Willingness to pay is fruit size attribute, followed by fruit color, fleshy texture, fruit juiciness, and payment (The price of each fruit).

The Islamic University College Journal
No. 66
Part: 2

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ISSN 2664 - 4355 Online

مجلة الكلية الإسلامية الجامعة
العدد : ٦٦
الجزء : ٢

Based on the estimation results of CLM choice models in Table 5, the marginal WTP values with confidence intervals for various four nonmonetary studied-attributes were calculated and presented in Table 6.

According to the results, as shown in Table 6, indicated that the highest marginal willingness to pay of the Date consumers is for the fruit size attribute followed by fleshy texture, fruit color, and Juiciness. Considering other conditions remaining the same, a positive sign of the coefficient of the fruit size, respondents (Mozafati date consumers) would be willing to pay (WTP) about 0.048 USD for a one centimeter increase in fruit size. Besides, Ceteris paribus, respondents' (Mozafati date consumers) WTP about 0.024 USD for a one percent improvement in fleshy texture. Also, by Considering other conditions remaining the same, a positive sign of the coefficient of the fruit color, respondents (Mozafati date consumers) would be willing to pay (WTP) about 0.023 USD for improvement in fruit color toward Dark black. Moreover, Ceteris paribus, respondents' (Mozafati date consumers') WTP about 0.0001 USD for a one percent rise in fruit juiciness.

Based on the above-demonstrated marginal WTP values, it can be resulted that the most essential attribute is the fruit size, which effective on the Consumers' Preferences and Willingness to pay for date purchasing. Therefore, the Mozafati Date consumers are more sensitive about improvement in fruit size than other studied-attributes such as fleshy texture, fruit color, and juiciness located in the next rank, respectively, during their purchasing process.

Furthermore, Figure 2, graphically represent and demonstrate the above-described results regard to Table 6, as the MWTP boxplot Distributions for four different nonmonetary attributes that mostly affect the Date consumers' WTP.

4. CONCLUSIONS

According to the estimated choice experiment model (CLM), the sign of the five examined factor coefficients is consistent in terms of signs and highly statistically significant. The negative sign on the price of each fruit coefficient, suggests that utility falls if a choice set chosen with the higher price. The sign of the color, size, juiciness, and fleshy texture coefficients are positive, suggesting that

The Islamic University College Journal
No. 66
Part: 2

ISSN 1997-6208 Print
ISSN 2664 - 4355 Online

مجلة الكلية الإسلامية الجامعة
العدد : ٦٦
الجزء : ٢

respondents (Mozafati date consumers) prefer and willing to pay more for the higher quality of each attribute. Based on the obtained and above-discussed results, the most effective attribute for date Consumers' preferences and willingness to pay is fruit size, followed by color, fleshy texture, and juiciness.

According to obtained results, to make more profit, producers should follow production improved-methods to produce larger fruits, and improve the color and fleshy texture of the fruit by using better-quality processing and storage techniques. To improve the marketability of date fruit and help increase farmers' incomes, universities and research institutes can play an essential role through research and development in line with improving the size, color, fleshy texture, and amount of date fruit juiciness. Finally, based on the outcomes, the effect of different studied characteristics with more details examined on the consumer's preferences and willingness to pay, in line with the decision-making process for producers, traders, planners, and policymakers.

Based on the present study results on determining the value of qualitative characteristics of date fruit affecting consumer preferences and willingness to pay, various decision-makers related to the production and distribution of dates can make effective decisions for market purposes and improve the welfare of society.

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The Islamic University College Journal
No. 66
Part: 2

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ISSN 2664 - 4355 Online

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الجزء : ٢

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No. 66
Part: 2

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No. 66
Part: 2

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ISSN 2664 - 4355 Online

مجلة الكلية الإسلامية الجامعة
العدد : ٦٦
الجزء : ٢