SOCIAL VALUE OF CONSERVATION OF THE APPLE ORCHARDS LANDSCAPE: APPLICATION OF THE CONTINGENT VALUATION METHOD TO THE LANDSCAPE OF THE GOVERNORATE OF KASSERINE

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This paper proposes a contingent valuation of the value of the apple orchards landscape in the Governorate of Kasserine; we are interested especially in the landscape of the region of Sbiba (the 1st producer of apples with 45% of regional production). Survey was conducted on a sample of 100 people; willingness to pay (WTP) was revealed on the basis of creating an agricultural mutual to maintain and develop the apple orchards space. Attributes selected correspond to the degree of citizens' attachment to this crop (the origin of the product, terroir ...), But also the willingness to pay may varies depending on the socioeconomic characteristics of the interviewees. We have evaluated the factors that increase the probability of giving a positive willingness to pay. Our results show that landscape amenities sought by respondents differ. In the first scenario, only the standard of living encourages the questioned to participate, whereas, in the second, an appreciation of the project and the not trade value of the apple orchards crops can be also envisaged.

Keywords: landscape amenities, apple orchards, durability, contingent valuation, willingness to pay.

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1. Introduction

Agricultural activity in the governorate of Kasserine; Centre-west Tunisia occupies 789,000 hectares, or about 95% of the entire territory. This governo1rate imposes itself as the largest area of apple in Tunisia (6923 ha), and the most-productive region of the apples with 45% of the national production (Khedhri and *al.*, 2012). The exploitation of these agricultural areas also generates multiple environmental, societal and cultural externalities both positive and negative. In the positive aspect, the production of agricultural landscapes is one of the most-important positive externalities of agricultural practices directly affecting them and maintains them.

These agricultural landscapes extend continuously over the whole territory, but their quality is dependent on biophysical conditions and production systems practiced.

Apple orchards are an important potential and a great opportunity for the development of truly sustainable development for the region (Ilahi et *al.*, 2014), consideration of the landscape dimension of this agricultural activity is of considerable importance in public decisions. Taking into account the landscape dimension of this agricultural activity is of immense importance for public decisions. Firstly, while highlighting the existence of a positive territorial externality bound to the land occupation, the environmental performance of the agriculture will be more strengthened, what will incite to the implementation of the agri-environmental measures in favour of the activity and its joined products. Secondly, in relation to the spatial planning policy, the production function of agricultural landscapes will be consolidated and integrated as an important dimension in the planning and management of space.

From this perspective, the search for an economic measure of the value of agricultural landscapes and terroir products is a preliminary step that can generate relevant indicators needed for better decision-making in public policy planning and management space. Since monetary values for use and non-use of agricultural landscapes are not taken into consideration, the use of valuation techniques based on survey techniques seems to be the only way that could fill this gap.

It is in this context that the present contribution is to assess monetary greatness that citizen's of Kasserine are willing to pay to preserve the apple orchards landscape. Two complementary and specific objectives are pursued and consist of:

- Analysis of the preferences and motivations of citizens to conserve the agricultural landscape;

- Assessment of the willingness to pay for city dwellers continue to have the agricultural landscape.

2. Methodology

The point of departure of our study is that individuals attribute undoubtedly a value to conservation apple orchards landscape based on material and immaterial advantages they derive from the use and non-use. The revelation of this value is possible to the extent that individuals would be asked to express their willingness to pay a sum of money to maintain and improve this landscape.

This evaluation exercise requires that the subject assessment is clearly and well defined and that the method of evaluation is appropriate and best suited to the context and the target population.

Conceptually, the apple orchards landscape or the terroir product "Apples Sbiba" -subject of this evaluation-is defined by both objective and subjective components. The first is related to the ecological dimension and considers the landscape as a spatial structure resulting from the interaction between natural processes and human activities. The second at sensory character and identity and is primarily interested in the sensitivity of individuals and their degree of attachment to that culture.

There are three types of vision: formed and informed insider. The trained view is a translation of cultural references and involves the sociocultural dimension in landscape appreciation by individuals. Informed vision appeals to specific and general knowledge of individuals on the landscape. The introduced vision is confidentially connected to the nature of the direct uses and includes much more the utility in connection with the offer and the quality of the landscape. The advantage of taking into account both objective and subjective components is evident in so far as it provides a better analyze the social construction of demand conservation apple orchards landscape particularly its explanatory factors.

As far as evaluation, the contingent valuation method is the methodological support the most appropriate to meet the main objective of the study. Indeed, applications relating to the agricultural landscape become widespread during the past decade in different countries whose works is cited in Halstead (1984) and Bergstrom and *al.* (1985) the United States; Drake (1992) in Sweden; Redies (1992) Switzerland; Willis (1994) in the United States; Pruckner (1995) in Austria; Bonnieux and *al.* (1995); Colson and Stenger-letheux (1996) and Noublanche (2000) in

France. In Tunisia, no application has been attempted so far, which gives this work an opportunity to test the relevance of the method in the context of a developing country.

The implementation of the contingent valuation method to the landscape of apple orchards and the terroir product "apple of Sbiba" need a specifying related to landscape attributes and preferences of citizens appreciations, developing a survey and a contingent scenario, and mobilization of econometric techniques to calculate the mean WTP.

2.1. Contingent Survey

This is the method recommended by the NOAA Panel (1993). It is called dichotomous doubled if two values are proposed by the contingent ranking (Arow et al., 1993). The survey was conducted in May-April 2013 during the spring season. The database is submitted on XLSTAT about thirty variables. 100 people were interviewed in more than a delegation in the Governorate of Kasserine.

The data collected in accordance with survey questionnaires show three types of information: the socio-economic information for consumers; information about their behaviors perception of local products; information about the revelation of the WTP.

Place of progress of the survey: the progress of the survey took place to Sbiba (35 % between farmers and citizens), Foussana (35 %) and the other delegations: Kasserine Nord, Kasserine Sud, Feriana and Sbitla (35 %), to have a representative sample and with the aim of presenting various categories of the target population.

3. Results

3.1. Socio-economic profile of respondents

The socio-economic profile of those surveyed is established on the basis of criteria that have direct or indirect influence on the preferences and consumption patterns of the agricultural landscape. These included age, education, occupation and income.

- **age:** the distribution of the sample is balanced between the number of women and men (50 % women and 50 % men). On the other hand, the distribution of the age is diversified well (figure 1). Indeed, the important part of the investigated (45 %) concerns people between 40 and 60 years old, followed by the adults between 30- and 40 years (26 %). While only 7 % of the questioned are people older than 60 years old.

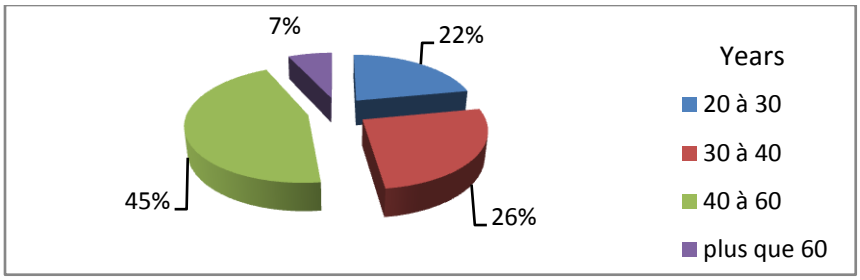


Figure 1. Distribution of the sample by age

-Level of Instruction: about the level of education of the respondents, 51% of them have pursued higher education, 29% have a secondary education, and only 20% who have completed primary education (Figure 2).

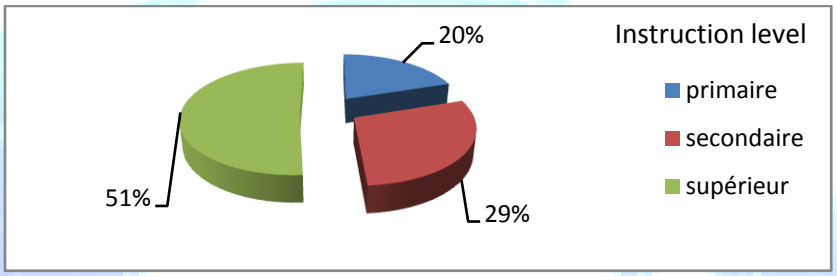


Figure 2. Sample distribution by level of education

-Socio-professional classes: the distribution of the sample by professional category (Figure 3) shows that the majority (36%) is represented by professionals followed by those who have a profession (24%), manual workers (17%) and retirees (15%), while the rest are student or unemployed with 7% and 10% respectively.

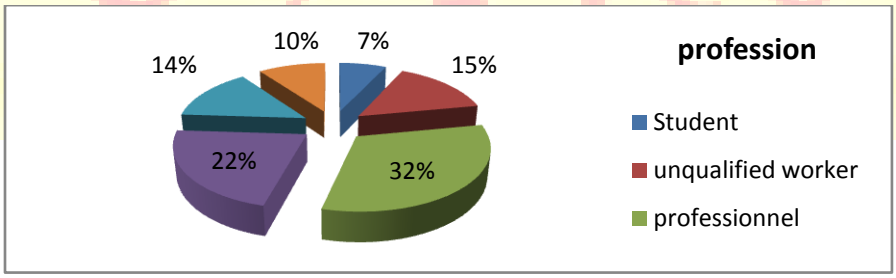


Figure 3. Distribution of the sample according professional category

- Income of respondents surveyed: (Figure 4), the majority of respondents have a higher income than DT 800 / month (34%), respondents with incomes less than 200 DT / month represent 19% of the all interviewed.

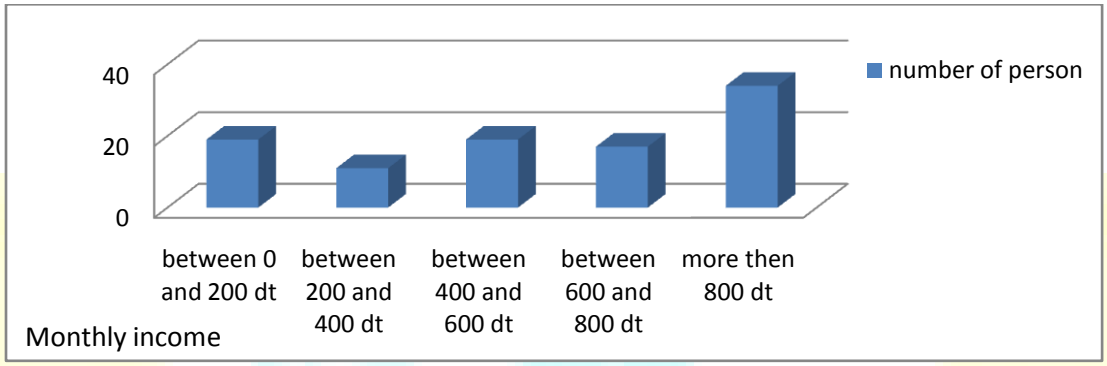
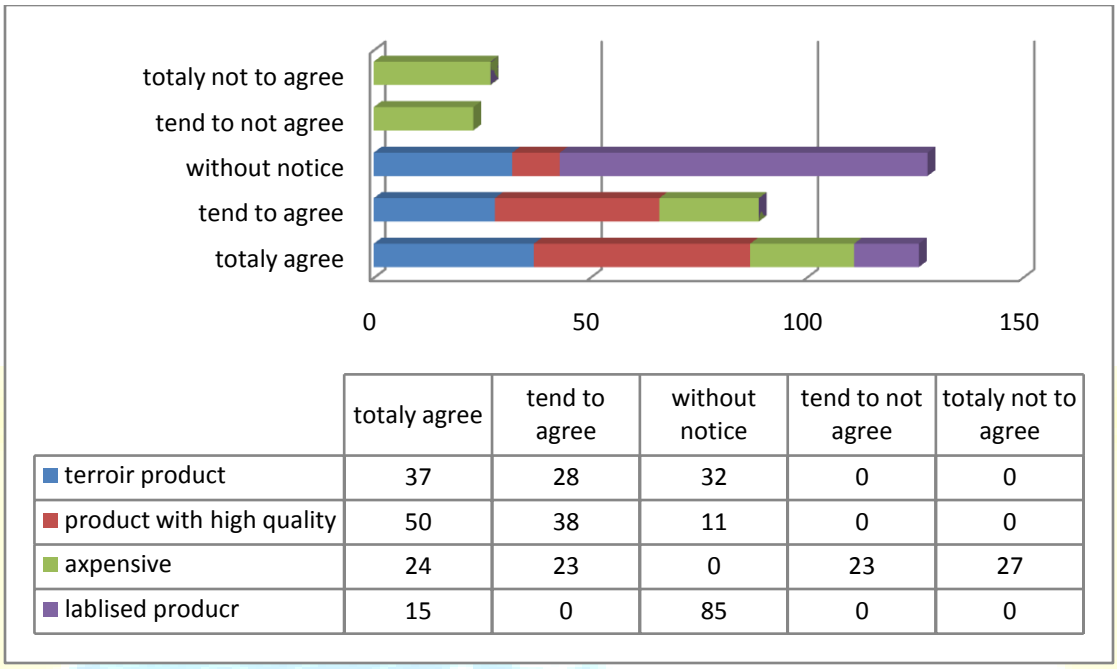


Figure 4. Distribution of the interviewees according to their monthly income

The socioeconomic characteristics indicate that the preferences regarding the agricultural landscape and the willingness to pay which will be afterward revealed and calculated, will be representative of a rural population, relatively aged, academic level relatively high, and with an average income.

3.2. Product Definition 'Apple Sbiba' according to interviewees

The question of how interviewees perceive the apple product Sbiba (Figure 5). Is it a product: with a good quality, expensive, well known, represents the region...



	totaly agree	tend to agree	without notice	tend to not agree	totaly not to agree
terroir product	37	28	32	0	0
product with high quality	50	38	11	0	0
axpensive	24	23	0	23	27
lablised producr	15	0	85	0	0

Figure 5. Product Definition 'Apples Sbiba' according to interviewees

We note that 67% of interviewees are aware that apples Sbiba is a terroir product when is that 85% do not yet know that it is a product labeled by the state.The majority of respondents agree that this product is expensive, but it have a very good quality.

3.3. Distribution of respondents according to the criterion of the source of the apple product:

We asked respondents to give their opinion about the effect of the criterion source of the product in making their decision when they buy apples, without noting that apples are representative products of our study sites (and Sbiba Foussana), the results of the survey show very favorable for local products distribution and show that 67% of respondents believe that the apple product Sbiba as crucial choice, the choice to buy apples Foussana is second (Figure 6).

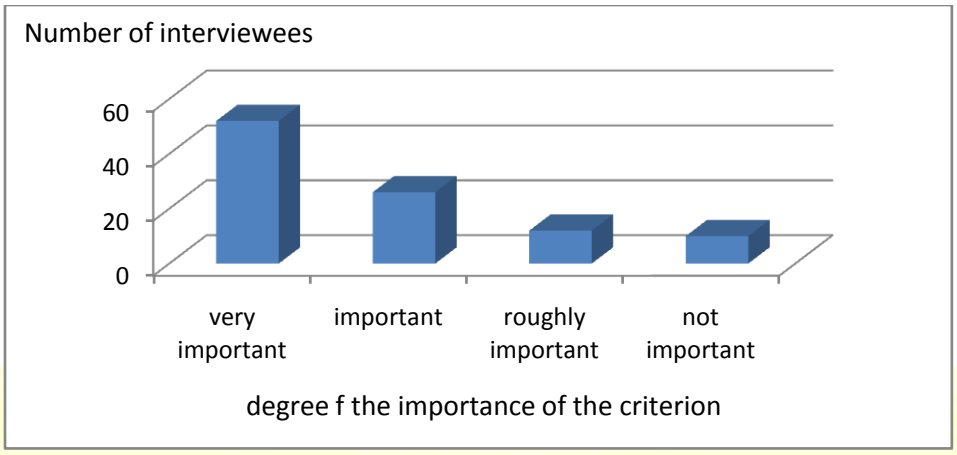


Figure 6. Importance of criterion 'source of the product' for the Tunisian consumer

The reasons for which interviewees make this selection of products are:

1. Their knowledge of the label 'Apples Sbiba': 15% of respondents;

2. 65% they have chosen thanks to the origin: Sbiba, since it is a well known for apple production at national scale region;

3. The rest is not interested in the source of consumed product.

According to the question, "the origin of the product is it a determining factor when buying the product apples." We find that 56% regards it as an important criterion, 21% consider it Most to Least important and 23% do not consider it as a criterion when buying.

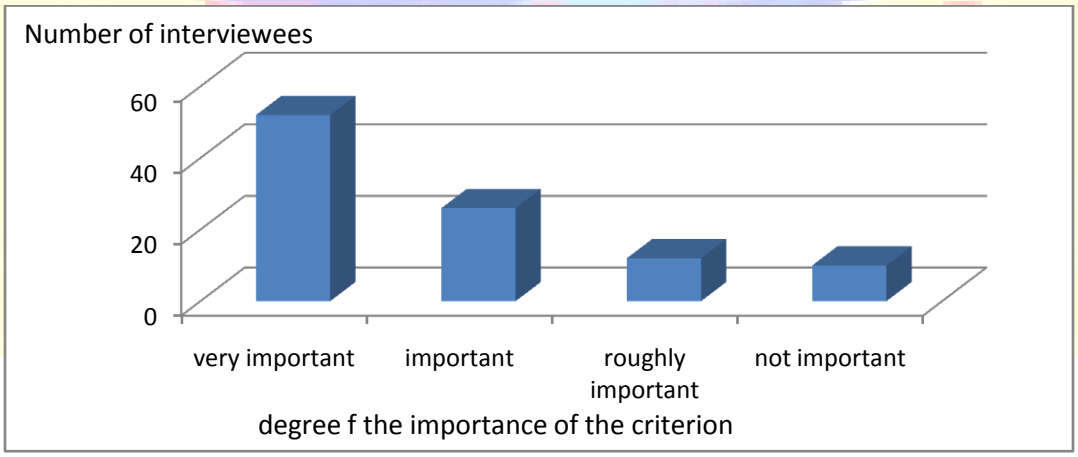


Figure 7. Importance of criterion 'labeled product' for the Tunisian consumer

3.4. Determination of DAP (WTP)

Our goal in this study is to create an agricultural mutual to encourage new farmers who intend to install apple orchards in the region of Kasserine. The association's main aims are to protect traditional apple orchards in the region, preserve this agricultural activity as a representative activity in the region as well the preservation of local varieties.

This mutual has several objectives to complete, but it must be supported with the understanding and commitment of farmers that will make their inscriptions:

- Mutual is committed to leading the apple producer during these first years, to facilitate having the opportunities to commercialize its products in local and international markets depending on the quality of its product. It is committed to facilitating access to fridges to farmers for conservation of their products and to offer financial and technical support for new farmers;
- The farmer undertakes to reserve his farming to apples crops, keep an area exceeding 1 ha for local varieties to preserve some local species that are declining face to introduced varieties and hybrids.

We asked the following question:

'How much are you willing to contribute for creating an agricultural mutual' and set the value of consent to 5 DT paid every month according to the choice.

Analyzing the data from our survey, we conclude that:

Figure 8 shows that 23% of respondents are willing to contribute by 10% of the proposed consent, 12% are willing to pay between 10 and 20%, 15% have pay more attention to the project by paying in the range 20 to 30%, 20% are willing to pay between 30 and 40% of consent and 30% of respondents are willing to pay more than 40% of the proposed consent. This result shows that 77% of respondents are willing to participate with a consent for the conservation the apple orchards in the governorate of Kasserine.

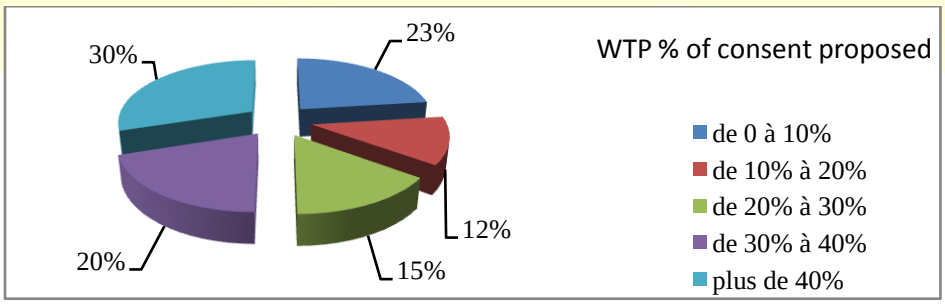


Figure 8. Distribution of interviewees according to their willingness to pay (WTP)

3.5. Willingness to pay and preferences

If respondents indicated a preference for apples Sbiba, the price issue was raised: Suppose now that the two products do not have the same price: apples Sbiba costs 4.5dt kilo and apples Foussana 3.50.

Which do you choose?

We note that 17% of respondents favoring apples Sbiba changed their opinion to buy apples Foussana, 78% buy apples Sbiba at any price.

Apples Sbiba remain overwhelmingly chosen by respondents.

3.6. Analysis of the behavior of the interviewees vis-à-vis the local produce: Apples Sbiba

In this section, we present the results obtained in two phases interpreting estimations:

• First step: to analyze various economic and statistical results obtained using the logit model on the determinants of the choice of apple product;

• Step Two: Analyze the demand behavior of different attributes of the apples that have already been analyzed and the various elasticities.

4. Estimated logit model

Using this model, we can measure the degree of influence of various socioeconomic variables on the probability of having respondents who are opting for the label Apple as a determining factor in the time of purchase (Table 1).

The variables involved are: socioprofessional category, age, income, number of children, and the place of purchase. It is assumed that these variables certainly affect the choice. The results obtained are shown in the following table.

Table 1. Estimation results of logit model

Model / variables / Explanatory	Coefficient	Z-statistic	Marginal effect
Socioprofessionnel Categorie	0.261	1.14	0.047
Age	0.094	0.29	0.017

Income	0.007	3.33	0.001
Number of Children	-1.389	-1.93	-0.251
Place of purchase.	-2.541	-0.99	-0.103
Constante	-2.54 (-1.47)		
R^2	0.30		
Log of vraisemblance	-44.50		

Significant at 1% (*) and 5% (**)

The above table shows that the model is statistically significant as a whole.

The coefficient of determination R^2 (0.30) is quite low,

4.1. Explanation of the low R^2 in the logit model:

It can be seen that the signs of socio-economic parameters are consistent with our expectations. Indeed, the socio-professional category variables, age and income have all positive coefficients, that is to say, they positively affecting the quality choice when buying apples and the probability of choosing the quality increases with the importance of these variables.

Explaining the influence of age on choice, we can say that more the interviewee is older the more he becomes aware and more demanding in terms of quality for health reasons. Both occupational status and income increase the purchasing power and thus the willingness to pay is in an increase for the quality.

An increase of one unit of socioprofessional category, age and income gives respectively 0.261, 0.094 and 0.007 times higher the chance to opt for quality as a criterion of choice when buying apples.

For the other two variables; the number of children and the place of purchase, there are coefficients that have negative signs, this can be explained as follows:

The more people in the household increases, the more the householder will opt for other criteria when buying as the price of the product in order to meet demand.

Reaching the statistical significance, we find that the independent variable that best explains the dependent variable is returned with a Z-statistic = 3.33.

The third column of the table shows the marginal effects of the model. Occupational status was the most-important factor: a passage from one class to another 4.7% higher increases the

probability that a person chooses quality as a determining factor when buying apple. The income records the least effect, or 0.1%.

5. Results of the hedonic method

Admitting the hypothesis of income as the decisive criterion for the orientation of the respondents to the quality of apple, demonstrated by estimating a logit model, we have segmented the respondents into two groups of respondents:

• Class A, Class disadvantaged (R 600);

• Class B, favored class (R> 600).

Determination of the hedonic price of the attributes of apples quality

We began by applying the WTP (dependent variable), obtained from the survey, processing Box Cox. The estimation results are given in Table 2:

Table 2. Estimation results of the "Box Cox" transformation

Classes		**Classe A**			**Classe B**	
Explanatory **Variables**	**Coefficient**	**Hedonic Prices**	**% of WTP**	**Coefficient**	**Hedonic Prices**	**% of WTP**
Sourcee of apples **(**Apples of Foussana (**FA)**	-0,675	58,666	***13,43***	7.601	123.665	**22.54**
Product of **terroir (Sbiba** Apples SA**)**	0,320	27,857	***6,38***	-1.999	32.533	**5.93**
Labeled **Product**	0,724	62,965	***14,42***	-0.690	11.242	**2.05**
Constant	14,255	-	-	43.551	-	-
Log de la vraisemblance		-348.380			-351.469	
Σ		2.819			20.062	
λ		0.271			0.565	

The table 2 shows that the three selected attributes are statistically significant at different thresholds for both classes.

The value with which the dependent variable is transformed, equals 0.271 for class A, and class B. 0565 for a value = 1 gives a linear model while a value = 0 gives a logarithmic model.

This estimate allows us to get implicit prices of different attributes. Hedonic price shown above are the average implicit price observations. The share of the implicit price of each attribute in the WTP was also calculated by averaging ratios Price / WTP for each observation.

The choice of Foussana's apples holds important positions for the lower class (class A). The first attribute the source of apples has a hedonic price of 58.66 Millimes (M) / Kg or 13.43% of the WTP for Class A against 123.66 M / Kg or 22.54% of the WTP for class B. 'terroir product attribute has an average price of 62.96 hedonistic M / Kg or 14.42% of the WTP for Class A, which is five times greater the price given by the favored class (class B).

However, the label is still the best attribute appreciated by the class B for an average price of 32.53 hedonistic M / Kg corresponding to 5.93% of the WTP against 27.85 M / Kg (6.38% WTP) for Class A.

6. Study of the application of quality attributes of apple.

Table 3. The price and income elasticities of demand for different quality attributes

Attributes / Elasticity	Labeled product		Terroir product		Origine de la pomme	
	Classe A	Classe B	Classe A	Classe B	Classe A	Classe B
Elasticity-Price	-0.315***	0.10	0.228**	0.419**	0.187	0.255
Income elasticity	0.050	0.35**	0.063	0.574**	0.054	0.658**
R^2	0.70	0.35	0.33	0.29	0.45	0.12
$\overline{R^2}$	0.68	0.31	0.29	0.24	0.42	0.06
Test Fisher	37.23	8.26	7.99	6.26	13.23	2.19

Student test significant at the threshold: *** 1% (2.576), 5% ** (1.96) * 10% (1.645)

For class A, a variation of 10% income causes a change in demand about 0,063 for the criterion Source of product, 0054 and 0050 respectively for terroir products and the label.

By cons, for Class B, a change in income of 10% results in a variation of 0.658 for the source of the product, 0574 for the criterion terroir product and 0.35 for the labeled product.

Regarding the direct price elasticities, there they are positive, this is explained by Thorstein Veblen. Indeed, if the product is not expensive enough, that is to say, its price does not reflect its premium positioning and therefore its demand is still weak. This paradox is explained because the low price reflects an image of lower perceived quality, and / or does not allow the product to

be a status symbol. By cons, when its price increases, its demand is also increasing. This positive demand response to higher prices is called "demonstration effect" or "Veblen effect" and the property is well known as Veblen that is a kind of luxury good.

4. Discussion

The empirical results show that citizens released - Governorate Kasserine- have had behavior applicant for the conservation of the landscape of apple orchards in Sbiba. In view of the stated preference categories; all socioprofessionel categories are willing to pay a consent the maintain their landscape. This study is considered as the first estimate of the social value of preserving the agricultural landscape in Tunisia.

Analysis of the factors that exert a significant influence on the WTP has helped to highlight the important role of socioeconomic characteristics, and qualitative assessments of individual motivations in the process of evaluation of the agricultural landscape. Thus, the positive effect of income reflects the close relationship between the financial resources of and participation in the conservation of landscape resources. Similarly, the fact that the individual has been informed, trained and instructed about the agricultural landscape encourages more acceptance quota scenario and the proposed higher values. All the opinions are trained and informed related to educational level of the person, its general and specific knowledge on the agricultural landscape and the moral responsibility that he thinks have within the society about to conservation landscape. As for the insider view, it is the interaction between the objective component of the landscape and visual pleasure of individuals associated with aesthetic and recreational benefits. All of these effects show that the average WTP calculated encompasses both aesthetic and psychological benefits generated by the agricultural landscape.

The mutual agricultural is a project to ensure the sustainability of the landscape of apple orchards in the central-west of Tunisia. This project will no doubt encouraged by citizens and farmers in the region. This mutual incentive to conservation management of apple orchards space in the Governorate of Kasserine, in agreement with current farming practices in both study sites, and in an effort to reduce the harmful effects of agriculture on plant biodiversity we believe it is possible to propose alternative culture, as new methods of sustainable agriculture (integrated farming, organic farming) (Glaeser, 1997), multifunctional, competitive economically acceptable to farmers and environmentally (Heywood, 2000). These measures must be initiated and

managed by the actors and authorities, local. To help farmers make the transition and to abandon unsustainable practices, incentives related to sustainable agricultural practices can be considered.

6. Conclusion

The main objective of this study is to contribute to the economic assessment of landscape externalities of irrigated agriculture; it was mostly the apple culture in Kasserine. The objective sought is to monetize that landscape and to identify its importance for the citizens who are willing to pay to preserve their landscape of apple orchards and improve the quality of the local product. The results produced were used to draw conclusions both methodological and analytical and practical.

The consequences of the application of the contingent valuation method to agricultural landscape are numerous. First, the net gains would extend classical analyzes "cost-benefit" in agricultural projects through the integration and evaluation of landscaping non-market services, establish separate accounts for the services aesthetic and recreational landscape function and strengthen the analytical capacity of the positive environmental impacts of agriculture. On the other hand, the calculated values are the baselines for future studies to understand the economic value of the agricultural landscape and to inform policy decisions in favor of the agricultural sector. Finally, the internalization of the social value of preserving the agricultural landscape would probably be an irrefutable proof to hoist on the development of the most-important environmental roles of agriculture.

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