INTERNATIONAL CONFERENCE OF AGRICULTURAL ECONOMISTS
IGAE
29th | Milan Italy 2015
UNIVERSITÀ DEGLI STUDI DI MILANO AUGUST 8 - 14
AGRICULTURE IN AN INTERCONNECTED WORLD

Willingness to pay for a differentiated potato applying a choice modelling experiment by socioeconomics levels of Argentinean consumers

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Abstract

Choice Modelling was applied to assess the importance of attributes and willingness to pay for a fresh potato produced with a low environmental impact production system. Among the stated preference methods, this is the most used to study consumer preferences for attributes of goods with little or no market share. We interviewed 402 individuals, aged 18 and over, in super / hypermarkets and grocery stores. Four different attributes of potato: price, agrochemicals content, cooking quality and treatment were selected according to previous research carried out by the authors. For this purpose, a Conditional Logistic Model (McFadden, 1973) was applied. On average, ceteris paribus, the full sample participants were willing to pay between US$ 0.60 and US$0.49 more per 1kg of potatoes with low agrochemical content. In regards to cooking quality attributes, participants were willing to pay between US$ 0.31 and US$ 0.25 more per kg of high quality potatoes

Key words

Choice Modelling, willingness to pay, consumers´ preferences, fresh potatoes

JEL Codes: C90, D1

1. Introduction

To interpret the variety of issues involved in the evaluation and selection of alternative products for consumers allows the bidders to decide what features, presentation or use trademarks or fix what prices to maximize profits. Traditional economic approaches based on revealed preference, were replaced by the theory of stated preference methods, which places emphasis on food choices and environmental and health issues, in the nineties. Among the classification of assessment techniques for stated preference, are Contingent Valuation (CV) and valuation techniques of multiple attributes contained in the Choice Modelling (CM), widely referenced in literature (Bateman *et al.*, 2002; Bennet & Blamey, 2001) and in the Conjoint Analysis (CA). The latter technique dates back to the study by Luce & Tukey (1964), from the field of Mathematical Psychology. Later, in the field of Marketing, Green & Rao (1971) took up the idea and published a paper on consumer behaviour. Since the seventies, it has been widely used due to the need to solve practical problems in market research (Green & Rao, 1971; Cattin & Wittink, 1982 -Louviere *et al*, 2010-.). Meanwhile, through the development of a CM it is possible to present the preferences of consumers for goods that are described in terms of their attribute levels. This approach requires armed blocks (choice tasks) with different product alternatives -according different levels of attributes-including "none" option (opt-out). As in real situations, the individuals choose goods that agree with their ideal profile, but also choose the attribute levels they prefer combined with levels of other attributes. Within the stated preference methods, CM is the most widely used at present to estimate the willingness to pay (WTP) for attributes of goods with little or no market share. Among the papers with practical applications in choice experiments are Carson *et al.* (1994) and Louviere *et al.* (2008) -Louviere *et al.* (2010)-.

The main objective of this research is to examine willingness to pay for fresh potato attributes described by product profiles and presented as a set of alternatives in a choice task experiment to different socioeconomics groups of consumers.

With this study, we provide information about consumers valuation of a staple food product produced with a low environmental impact. Additionally, an analysis of attributes levels and willingness to pay for them explored by this study could guide suppliers to think about offering a healthy food product on the market.

2. General overview of potato consumption and retail outlets in Argentina

Potato is an important staple food and horticultural crop for Argentina and it is included in almost every meal prepared by households. The average annual per capita consumption of potatoes can vary between 30 and 40 kg. Potatoes can be considered as a product positioned between a staple food and a vegetable. Around 24% of all potatoes produced in Argentina (2,3 mln t) are being processed (550,000 t), and another 20% are being sold through other foreign markets or directly shipped to supermarkets. The remaining 50 % is consumed in the domestic market (Huarte, 2014). Potato prices can fluctuate quite heavily, as happened in 2007 and 2012 due to severe weather conditions and government intervention. Previous results indicate that health care, nutritional content and lack of pesticide residues are the main reasons that lead consumers to choose healthy food. The most common place for respondents to purchase fresh potatoes is the fruits and vegetables stores (72%), followed with much lower percentages by supermarket/ hypermarket (15%) and other channels, such as community fairs, wholesaler market, self-production and direct vegetable delivery by producer (12%). The reasons that appear to explain this consumer preference include: a) the habit of purchasing daily fresh vegetables, b) the perception of better quality and c) the personal attention in small shops. In particular, products like red meats, fruits and vegetables and breads are specially valued by Argentines and their freshness is specially appreciated by consumers in this country (Lupín & Rodríguez, 2012).

2.1. Attributes valued by consumers

For some years now, consumers have been concerned about the safety and quality of food. This concern has been accompanied by a growing awareness of intensive farming practices regarding the potential adverse health effects of food processing methods and the use of agrochemicals. This has contributed to an increase in demand for non-conventional foods such as those obtained

from organic and integrated pest management productions, sanitary controls and safety food and quality information. This trend was mainly observed in fruits and vegetables due to the positive perception in relation to health (Ghorbani & Hamraz, 2009; Kuhar & Juvancic, 2010). Even consumers have expressed their willingness to pay a price differential for vegetables and fruits grown through sustainable practices (Batte *et al.*, 2007; Boccaletti & Nardella, 2000; Canavari *et al.*, 2005).

First of all, consumers become aware of a need, which is followed by a stage of information searching and learning about goods that meet that need. During this search and learning process, consumers develop beliefs about products that meet their needs, attributes and values that possess these attributes and consider the uncertainties regarding these aspects. Eventually, individuals will be sufficiently informed about the product categories that form the utility function, which involves evaluating and sharing features that affect their decisions. During the process, they develop a preference ranking and, depending on budget constraints, will make the decision of whether or not to buy . If they decide to purchase the product, they have to choose between one or more alternatives, the amount and shopping time.

According to Steenkamp (1990), the attributes that are based on real consumption are freshness, convenience, and sensory characteristic, among others, as well as attributes that could not be purchased directly: nutritional content, health, environmentally friendly production and animal welfare. Other authors such as Becker (2000) and Grunert (1997) add the search categories which are used as quality indicators at the time of purchasing: price, color, external appearance; etc. (Bernués *et al.*, 2002). Caswell *et al.* (2002) distinguish between intrinsic and extrinsic attributes and signal indicators. Intrinsic attributes are part of the good itself and cannot be modified without altering their physical characteristics, and include: nutritional attributes-carbohydrates, proteins, vitamins, minerals, calories, fibers and fats; those related to food safety: pesticides, fertilizers, preservatives and additives; etc., and those linked to production process like traceability and animal welfare processes, among others. Sensory, organoleptic, and functional attributes are also intrinsic. Certification, labeling, and quality-management systems are indicators shown by price, brand, advertising, country of origin.

3. Methodology

A Choice Modelling (CM) survey was designed and conducted in the city of Mar del Plata, Argentina, during the month of October 2012 to assess consumer preferences and willingness to pay for fresh potato attributes described by product profiles and presented as a set of alternatives in a choice task experiment with different socioeconomics groups of consumers. First, the paper describes how the survey was designed and utilized several potato profiles including price, agrochemicals content, cooking quality and treatment-brushed or washed. Secondly, it presents the econometric methodology and choice model estimation used to analyze the data, and the last part presents results and final thoughts.

The study of food choice and the valuation of goods with little or no participation in the market, such as potatoes produced by friendly environmental farming practices, should be addressed collecting information about what food attributes are and are not noticed during a specifically designed choice experiment. From this perspective, the best methods are the Contingent Valuation (CV) and Multi-Attribute Rating (VMR). The Multi-Attribute Rating (VMR) comprises a family of techniques based on the description of the property in terms of the levels of the attributes. Its conceptual framework contribution was made by Lancaster (1966) for consumer demand. This approach requires that each product is composed of attributes with more than one level; utility is a function of the set of attributes. Consequently, individuals derive satisfaction from the qualities of the goods, not the goods themselves. If price is one of the good´s attributes, we can calculate the WTP by attribute. Louviere *et al.* (2000) point out that these are general paradigms for obtaining preferences. Participants face a number of good alternatives, described by combinations of attributes levels selected by the researcher, that respondents have to rank, rate or choose. In the case of CM, a random utility function is assumed, leading to a number of discrete choice models that can use maximum likelihood estimates. This method is appropriate when the purpose is to explore the determinants of the probability that an individual chooses a set of possible alternatives (Rodríguez Donante & Cáceres Hernández, 2007). These models come from the studies of Thurstone (1927) on individual responses to different levels of psychological stimulation. In some applications, the CM is known as Choice-Based Conjoint Analysis (CBC) (Green *et al.*, 2001; Orme, 2010). Meanwhile, Louviere *et al.* (2008) refer to it as a Discrete Choice Experiments (DCE). As already mentioned, the CM assumes random utility function (RUM) and several authors, such as

Marschak (1960), Manski (1977), Wittink (2011), Phaneuf (2005), Vójaček & Pecáková (2010), have made their contribution in this regard. The utility function is a "latent" construction because individuals have an unobservable direct utility about their choice of attributes. This utility has two parts: a systematic part -observable, explicable- which depends on the alternatives in the choice set and individual´s socioeconomic characteristics- and a random one- not observable, not explainable- including all unidentified factors influencing their elections. Both parts are considered by literature, independent and additive mathematically:

$$\mathbf{U_{in} = V_{in}\,(Z_i, S_n) + \varepsilon_{in}}$$

n = 1, 2, ..., N; i = 1, 2, ..., J

Where: U_{in} = -latent- utility provided by the alternative "i" to the individual "n"; V_{in} = systematic part of the utility that the individual "n" associated with the alternative "i"; Z_i = vector of attributes of alternative "i"; S_n = vector of socioeconomic characteristics of the individual "n"; ε_{in} = random component of the utility corresponding to the alternative "i" and the individual "n". Although latent utility associated with each individual choice might be considered, given the random component, their choices are not deterministic. The model allows us to describe how the probabilities of election respond to changes in the choice set and / or the consumer´s socioeconomic characteristics. An individual will choose a specific alternative if it provides more utility than others.

The probability that the individual "n" choose the alternative "i" is given by:

$$\mathbf{P_{in} = Prob\,[U_{in} \geq U_{jn}] = Prob\,[(V_{in} + \varepsilon_{in}) \geq (V_{jn} + \varepsilon_{jn})] = Prob\,[(\varepsilon_{jn} - \varepsilon_{in}) \leq (V_{in} - V_{jn})]}$$

For any $i \neq j$

If the residues are independent and identically distributed (iid) with a type I extreme-value -Gumbel- that possess a factor scale equal 1, it can be identified as a Logit Discrete Choice Model (Hasan-Basri & Abd-Karim, 2013; Hoyos, 2010). In particular, if the explanatory variables are attributes included in the choice sets, the CLM whose probability of choosing alternative "i" by individual "n" is:

$$P_{in} = \frac{e^{Vin}}{\sum_{j=1}^{J} e^{Vjn}}$$

This model was developed by McFadden (1973) and, although it has various desirable properties, it presents some limitations (Train, 2009: 37, 42). The estimated coefficients of CLM allow calculation of mean WTP for each level of attribute as the negative of a ratio of a given estimated parameter and the price parameter:

$$-\hat{\beta}_{atributo} / \hat{\beta}_{precio}$$

This expression measures the necessary change in price to compensate the change in the attribute under consideration, with the rest of explanatory variables remaining constant (Hensher *et al.*, 2007; Mercadé *et al.*, 2009; Train, 2009). The theoretical framework of the econometric model used in this paper assumes that consumer is rational and will, therefore, make choices in order to maximize their perceived utility, subject to budget constraints. Thus, an individual n faces a set of choices made by Alternative J. From each alternative i, the individual may derive utility (Uin, with i = 1, ..., J). However, given that perceptions are not perfect and considering the inability of researchers to accurately measure all relevant variables, McFadden developed Conditional logistic model (CLM), assuming that the utility is a random function (Random Utility Models -RUM-). (Maddala, 1983; McFadden, 1974). Discrete Choice Models originated in Thurstone´s studies (1927) about individual responses to different levels of psychological stimulus. Meanwhile, Marschak (1960) interprets "stimulus" as "utility" and, using the principle of maximizing utility, formalized the Random Utility Model of Discrete Choice (RUM). When the explanatory variables used to estimate the probabilities associated with levels of endogenous variable are related to alternative attributes to be elected rather than specific characteristics of individuals, the model used in the estimation is called Logit Conditional. Theil (1971) indicates that logistic regression is appropriate in econometric applications when the normality assumption is not very strong. If residues are independent and statistically distributed (iid) with a value of extreme distribution type I -Gumbel- and a scaling factor equal to unity, we can deduce that the best model is the Logistics Model of Discrete Choice. In particular, if the explanatory variables only contemplate characteristics of the

alternatives, the CLM arises, which is the probability of choosing alternative i by the individual n. This model meets various desirable properties but also has limitations (Train, 2009: 37, 42). It also implies the "Independence of Irrelevant Alternatives" (IIA), since chances ratios (odds ratio) for the ith and jth elections are not affected by the elimination or addition of alternatives - which does not always reflect realistic situations (Train, op. cit.) -. It is commonly estimated by maximum likelihood.

4. Choice Modelling Design

4.1. Questionnaire

Since the experiment was conducted at stores where consumer buy potatoes (mall intercept) with face-to-face interviews, and assuming participants do not have much time available, we evaluate a research design that allows quick evaluation of each alternative and its comparison with others, taking care to avoid generating invalid results.

The questionnaire applied was semi-structured and included four sections of information: Section I: recorded information about consumption, frequency of potato purchases and purchase locations.

Section II: presents choice tasks and ask respondents how they would choose given a set of potential offerings.

Section III: recorded information related to price paid per kg of fresh potato, willingness to buy, and willingness to pay for low agrochemical content and other respondent opinions regarding information that labels should provide about a fresh potato produced with low environmental impact.

Section IV: survey data about socioeconomic and demographic characteristics of respondents.

4.2. Attributes, levels and choice blocks

The above process contributed to the design of a CM to obtain the preferences of individuals for different combinations of levels of cooking quality, agrochemical content, treatment and potato prices. Agronomic and market aspects allow us to study consumers´ behavior regarding products obtained sustainably.

COOKING QUALITY

Consumers in Mar del Plata ignore the different varieties and culinary quality of products available in the market. The lack of information about the link among varieties, culinary skills and nutrients, as well as the widespread variety Spunta in the domestic market (Lupin et al, 2010; Lupin, 2011; Rodriguez et al., 2010.), led to the incorporation of this attribute with two levels: "very good" and "bad" culinary aptitud.

AGROCHEMICAL CONTENT

Taking data from a household survey conducted by this paper´s authors in 2009, the econometric estimates presented controversial results regarding the "absence of agrochemicals" with consumers willing to pay more for integrated potatoes than what they pay for a conventional potato (Lupin & Lacaze, 2011; Rodriguez et al., 2010). In order to define the results, we decided to evaluate this attribute again, especially after taking into account the constraints of the VC methodology and limitations of typical household surveys regarding the investigation of perceptions of quality. In the CM, two levels are proposed considering agrochemical content: "little" and "a lot".

TREATMENT

This attribute is related to the visual aspect and was prioritized by consumers when they bought potatoes in previous studies. It was statistically significant in previous research that estimated WTP for integrated potatoes (Lupin & Lacaze, op. Cit .; Rodriguez et al., 2010). Two levels were specified: "brushed / washed" and "dirty".

PRICE

The price variable is relevant and is included to assess a willingness to pay for different attribute levels combined and identified as options of products. This variable takes four price levels: low, medium, high, and zero (opt-out); regarding real attributes selected by consumers when choosing potatoes in the domestic market.

After defining those four attributes and their levels, three choice blocks with three products profile were determined. Three had two levels and the other had three: 2 x 2 x 2 x 3 = 24. This

procedure corresponds to a "full factorial design", but given that the number of alternatives could complicate the election process and evaluation by participants in a place of purchase, the choices tasks were reduced by using a "fractional factorial design" -orthogonal-. The design was performed using SPSS Software. In this case, the algorithm set nine product profiles and included an alternative none (opt-out) that could be selected if none of the products would appeal to the survey respondent. The opt-out allows us to simulate whether respondents would choose from the category at all, given the product characteristics and prices included in the market scenario. If all the products offered have a price too high, many buyers would not purchase any of the presented alternatives. This procedure is suggested by Louviere *et al.* (2000).

Before presenting the different alternatives or choices, respondents were provided with information related to cooking quality, agrochemicals content, and treatment that are present in potatoes sold in the market. Then the interviewer read the following statement as a hypothetical scenario:

"Potatoes available in the market contain the maximum levels of permitted agrochemicals, they are not good for frying, boiling or baking, ie, are of poor quality for cooking".

They were then informed about the possibility of future access to a high- quality potato, which will eventually become available on the market with low agrochemical content and excellent cooking attributes: *"Suppose now that the place where you shop offers fresh potatoes with low agrochemicals content and very good cooking quality. Suppose that these potatoes are well identified by labels and also you are sure that they meet these attributes of quality." Which would you prefer?* The participants had to select one option presented per blocks with 3 tasks and the opt-out. The election in each block was independent of elections in the remaining blocks. The alternatives were presented by a card in order to avoid any interviewer´s influence on individual decisions (unlabeled experiments). In addition, the presentation of different tasks or blocks of choices was randomly rotated in order to avoid bias in the choice of alternatives at the time of selecting them. Figure 1 shows the three blocks choices with 12 alternatives including a no-option.

4.3. Sampling

The survey was carried out in the city of Mar del Plata, Argentina, in October 2012, using a questionnaire based on face to face interviews. Most respondents (402) chose to purchase fresh potatoes in the fruits and vegetables grocery store (72%), with many fewer choosing hyper / supermarket (15%) and other channels, such as community fairs, wholesaler market, self-production and direct vegetable delivery by producer (12%).(Lupín & Rodríiguez, 2012). The sampling covered several neighborhoods, achieving geographical representation and socioeconomic levels of the City of Mar del Plata and, as suggested Hartili *et al.* (2004), it is expected that households from the same neighborhood have similar socio-economic characteristics. Given the non-random nature of sampling, to ensure demographic representation, gender and age quotas were considered to select respondents in accordance with the National Population Census (INDEC, October 2010).

5. Results

5.1. Demographic and socioeconomic characteristics of the sample

The socioeconomic and demographic sample characterization shows that 53% of respondents are female. The average sample age is 45 years old and the highest absolute frequency ranged from 35-59 years old. Regarding income, 30% of respondents have declared a monthly income of no higher than US$ 887.95[1]. It is noteworthy that 19% of respondents did not answer the question regarding income. Concerning educational level, 23% of respondents have middle-low education and 23% completed high school education. Meanwhile, 57% of respondents are employed, 20% are retired and 12 % are housewives. In terms of household composition, 51% have 3 or 4 members and the average household size of the entire sample is three members. It is observed that 49% of respondents with medium low education belong to low socioeconomic level (SEL 1) and this percentage drops to 16% and 8% for middle socioeconomic level (SEL 2) and High socioeconomic level (SEL 3) respectively. It is worth noting that respondents belonging to SEL 3 are of greatest relative importance in terms of high education (36% vs. 25% and 29%). With respect to the occupation of the respondents, 61% of those who are employed belong to the SEL

[1] By october 2012, the nominal exchange rate between US$ and Argentinean Peso was 1 to 4.73

1, while the unemployed represented values of 6% and 4% for SEL1 and SEL 2. Specifically, the SEL3 has the highest proportion of retirees / pensioners (27%) and SEL 2 captures the highest percentages of housewives (15%) compared with SEL 1 (11%) and SEL 3 (8%).

With regard to household size, the largest average amount of household members are in SEL 1 (3.9 members), which also captures the highest percentage of adults, children and teenagers. 17% of respondents with the lowest income reported belonging to SEL 1 versus 4% in SEL 2 and 2% in SEL 3. Meanwhile, 23 % of respondents reporting higher range of income belong to SEL 3 compared to just 13% in SEL 1.

Results from descriptive analysis suggest that the majority of respondents consume potatoes 2 times per week, while individuals in SEL 1 consume potatoes three times per week. A comparison across socioeconomic levels shows that respondents with lower socioeconomic level usually buy more kilograms of fresh potatoes per week (4 kg) than respondents belonging to the other socioeconomic levels, 2.3kg and 2.7 kg per week for SEL 2 and SEL 3, respectively. (Tables 1 and 2)

5.2. Descriptive analysis of the elections by block

The different options of products presented by blocks have the following attributes: Product X: low agrochemicals content, bad cooking quality and dirty, price US$1,69 per Kg.; Product Y: high agrochemicals content, bad cooking quality and dirty, price 1,27/ kg; Product Z: high agrochemicals content, very good quality and dirty, price US$ 1,69/kg; Product M: low agrochemicals content, very good cooking quality and dirty, price US$ 2,11/kg; Product N: high agrochemicals content, bad cooking quality, dirty, price US$1,69/kg; Product O: high agrochemicals content, bad cooking quality, brushed/washed, price US$ 2,11/kg ; Product R: high agrochemicals content, bad quality, brushed/washed, price US$1,27/kg; Product T: Low agrochemicals content, bad cooking quality, brushed/washed; price US$ 2,11/kg; Product S: high agrochemicals content, very good cooking quality, dirty, price US$ 2,11/kg

Regarding the elections per block, the block "XYZ-None", 56% (225 cases) chose potato "X" despite it having have low quality and being dirty. The "Z" and "None" options followed with 19% each (76 cases). Potato "Y" presented a significantly lower percentage of choice, even though its price was the lowest (US$ 1.27). It is noteworthy that 41% of consumers (165 cases),

did not choose other potatoes after choosing the first option; 60% of respondents chose the "X" option first.

Considering the block "MNO-None", we observed that 85% (342 cases) of the participants preferred the "M" potato option. For the rest of the potatoes, the percentage felt sharply. Finally, the block "RTS-None" recorded that 58% of the sample (233 cases) selected the "T" option, while the potato "S" was chosen by 20% of respondents (80 cases). It is noteworthy that for products that have a higher percentage of first choice, the "M", "X", and "T", approximately 50 % of those consumers had higher education levels. Regarding socioeconomic level, option M captures the higher percentages of choices, with 73% for SEL 1, 91% for SEL 2 and 90% for SEL 3.

The “M” potato option has a profile of low agrochemicals content, very good cooking quality, and dirty treatment, with a price of US$ 2.11 per kg

5.3. Descriptive results of willingness to pay for a potato with low agrochemicals

The average price paid by those who "always" buy in fresh grocery stores (US$ 1.25/kg) was lower than the average price paid by those who always buy in super / hypermarkets (US$ 1.32/kg). **Considering the total sample (309 cases)- 77% reported being willing to pay a price premium for a potato with low agrochemical content compared to the price paid for a conventional potato.** On average, the respondents were willing to pay US$ 0.21 more, 16% of respondents indicated they would not pay a premium price for this product and the rest of individuals did not know if they would pay for it. An unusually high price of potatoes during the year 2012 in the city of Mar del Plata could explain this result.

Regarding the elections of alternatives per block, 56% (225 cases) chose the potato "X" despite it being dirty and bad for cooking. The "Y" product presented a significantly lower percentage of choices, even though its price was the lowest (US$ 1.27). It is noteworthy that 41% of consumers (165 cases) did not choose an alternative after choosing the first option.

Considering the block "MNO-None", 85% (342 cases) of the participants preferred the "M" option and the other alternatives felt sharply. Finally, considering the block "RTS-None, 58% of the sample (233 cases) chose first the “T" profile. The potato "S" was chosen by 20% of respondents (80 cases) and only 5% of respondents chose the "R" potato profile.

Among consumers who are willing to pay more for a potato with low agrochemicals content, respondents who choose "X" profile are willing to pay more than those who chose the product "Y" but less than those who chose the alternative "Z" (US$ 1.51 vs. US$ 1.15 and US$ 1.52). In block "MNO", those who prefer the profile "M" are willing to pay more than those who chose the potato "N" or "O" (US$ 1.50 vs. US$ 1.28 and US$ 1.48). As in the previous block ("XYZ-None"), consumers that are willing to pay less preferred product "N", which presents the lowest price in this block of tasks (US$ 1.69 kg).

Finally, considering the block "RTS-None", it is possible to note that those who chose the potato "T" are willing to pay more than those respondents selecting potatoes "R" and "S" (US$ 1.53 vs. US$ 1.23 and US$ 1.39). The potato "R" presents the lowest price (US$ 1.27 kg) in this block of options.

5.4. Empirical analysis based on Conditional Logit Model

A CLM was applied to estimate the attributes that are influencing the choice of potato on the utility of consumers and calculate WTP at different levels of price. The Table 3 describes the variables used in the estimated model.

The full sample consisted of 402 consumers, who were segmented into three socioeconomic levels (SEL1, SEL 2 and SEL 3).

The estimated coefficients have the expected signs of economic theory. A low content of agrochemicals (AC 1) and a very good cooking quality (CQ 1) favor the potato choice having these attributes and they are the main contributors to the consumer´s utility. This is more evident when comparing SEL 3 with the other socioeconomic levels. The fact that potatoes are brushed / washed or dirty (TR 1) was not relevant in any of the models.

We also control for a none alternative of not buying any potatoes (opt-out). Prices (PR 1, PR 2 and PR 3) had a negative effect on the utility function and were statistically significant.

The WTP calculation for the two attributes whose coefficients were statistically significant (AC 1 and CQ 1) was done with the three price levels (PR 1, PR 2 and PR 3). (Table 4)

On average, *ceteris paribus*, **the full sample of participants were willing to pay between US$ 0.60 and US$ 0.49 more per 1 kg of potatoes with low agrochemical content than a potato without this quality attribute**. In regards to good cooking quality attributes, participants

were willing to pay between US$ 0.31 and US$ 0.25 more per 1 kg of potatoes having this attribute.

Regarding socioeconomic levels, the SEL 2 are willing to pay more for both attributes than the remaining SELs. It is worth noting that their higher valuation of quality attributes could be explained by a higher presence of housewives, who are more dedicated to food preparation and cooking. This group showed variables behaving around the mean values of frequency and quantity of consumption and the mean value price paid for the potato available in the market. Additionally, they have also a household size of three or four members representing a typical Argentinean household size. (Table 5)

6. Final remarks

In this paper, early exploratory results about the willingness to pay a potato obtained through sustainable production practice are presented. The econometric models suggest that three attributes evaluated by consumers: agrochemicals content, cooking quality and price, are the most valued in terms of consumer´s utility, identifying heterogeneity in preferences and willingness to pay by Socio-economic Levels(SEL). It is possible to note that consumers are willing to pay a higher premium for potatoes with these attributes.

The design of a CM involves a process that requires a careful selection of quality attributes and their levels to built blocks representing different profiles of potatoes to present to consumers. The layout of survey and sampling should be designed and analyzed in detail, as they need to be adapted to a specific product and to the context of application. These steps are essential to survey data that contribute to determining the structure of consumer preferences and estimating the "partial utility functions" derived from attribute levels. Finally although the results of this research are derived from a representative population sample, given the non-random nature of sampling we must be cautions in generalizing about the conclusions drawn from this research. However, as the research had unprecedented results, it could prove helpful to farmers and suppliers in deciding whether to provide food with low environmental impact valuated by consumers.

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Figure 1: Block of choices

Product	Agrochemicals Content	Cooking Quality	Treatment	Price
X	Low	Bad	Dirty	US$ 1.69/kg
Y	High	Bad	Dirty	US$ 1.27/kg
Z	High	Very good	Brushed / Washed	US$ 1.69/kg
None				

Product	Agrochemicals Content	Cooking Quality	Treatment	Price
M	Low	Very good	Dirty	US$ 2.11/kg
N	High	Bad	Dirty	US$ 1.69/kg
O	High	Bad	Brushed / Washed	US$ 2.11/kg
None				

Product	Agrochemicals Content	Cooking Quality	Treatment	Price
R	High	Bad	Brushed / Washed	US$ 1.27/kg
T	Low	Bad	Brushed / Washed	US$ 2.11/kg
S	High	Very good	Dirty	US$ 2.11/kg
None				

Source: Choice modelling Author´s design Mar del Plata Argentina / October 2012.

Table 1: Demographic and socioeconomic characteristics (full sample)

Variables	Categories	**Relative Frequencies / Mean** -402 cases-
Sociodemographic characteristics of respondent		
Respondent´s **GENDER**	Male	47%
	Female	**53%**
Respondent´s **AGE**	18-34	35%
	35-59	**39.5%**
	More 59	25.5%
	Average age:	45.5
Respondent´s **EDUCATIONAL LEVEL**	Low	2.5%
	Medium-low	23.5%
	Medium-high	**51%**
	High	23%
Respondent´s **OCUPATION**	**Employed**	**57%**
	Retired	20%
	Unemployed	4%
	Housewife	12%
	Student	7%
Household characteristics		
Number of **MEMBERS**	One or two persons	35%
	Three or four persons	**51%**
	More than four persons	14%
	Average member:	3
Household **AGE COMPOSITION**	Adults and children	23%
	Adults and teens	12%
	Adults, children and teens	8%
	Adults	**56%**
Household **INCOME** (per month)	Up to US$ 507.40	7%
	US$ 507.61-US$ 887.95	23.5%
	US$ 888.16- US$ 1,522.20	**34%**
	More than US$ 1,522.20	16.5%
	Non responses	19%

Note: Exchange rate (October 2012): 1 US$ = 4.73 Argentinean Pesos.

Source: Potato Consumption Survey, Mar del Plata Argentina / October 2012.

Table 2: Demographic and socioeconomic characteristics by SEL

Variables	Categories	Relative Frequencies / Mean		
		SEL 1 -111 cases-	**SEL 2** -182 cases-	**SEL 3** -109 cases-
Sociodemographic characteristics of respondent				
Respondent´s **GENDER**	Male	46%	46%	51%
	Female	**54%**	**54%**	**49%**
Respondent´s **AGE**	18-34	**38%**	36%	30%
	35-59	40%	41%	37%
	More 59	22%	23%	**33%**
	Average age:	44.5	44.8	47.9
Respondent´s **EDUCATIONAL LEVEL**	Low	**7%**	1%	0%
	Medium-low	**49%**	16%	8%
	Medium-high	35%	59%	56%
	High	9%	25%	**36%**
Respondent´s **OCUPATION**	**Employed**	61%	55%	54%
	Retired	16%	19%	**27%**
	Unemployed	**6%**	4%	0%
	Housewife	11%	**15%**	8%
	Student	5%	6%	**11%**
Household characteristics				
SIZE of household	One or two persons	22%	37%	**43%**
	Three or four persons	49%	**55%**	47%
	More than four persons	**29%**	8%	10%
	Average size:	3.9	2.9	2.9
Household **AGE COMPOSITION**	Adults and children	29%	28%	**9%**
	Adults and teens	12%	9%	**16%**
	Adults, children and teens	**14%**	7%	5%
	Adults	45%	56%	**70%**
Household **INCOME** (per month)	Up to US$ 507.40	**17%**	4%	2%
	US$ 507.61-US$ 887.95	37%	18%	18%
	US$ 888.16- US$ 1,522.20	23%	40%	38%
	More than US$ 1,522.20	13%	15%	**23%**
	Non responses	11%	24%	19%

Notes:

- Exchange rate (October 2012): 1 US$ = 4.73 Argentinean Pesos.
- Children = 0-11 years old, Teens = 12-18 years old, Adults = More than 18 years old.

Source: Potato Consumption Survey, Mar del Plata Argentina / October 2012.

Table 3: Description of model variables

Dependent variable	**Categories**
V Alternative of choice	1 = Yes 0 = No
Explanatory variables	**Categories**
PR Price	1 = low (US$ 1.27) 2 = medium (US$ 1.69) 3 = high (US$ 2.11) 0 = opt-out (US$ 0)
AC Agrochemical content	1 = low 0 = otherwise
CQ Cooking quality	1 = very good 0 = otherwise
TR Treatment	1 = brushed / washed 0 = otherwise

Table 4: Conditional Logit Estimates

	FULL SAMPLE		SEL 1		SEL 2		SEL 3	
Explanatory Variables	**Coef**	**SE**	**Coef**	**SE**	**Coef**	**SE**	**Coef**	**SE**
PR								
PR 1	-1.067185***	0.181821	-0.8722488***	0.269844	-0.6445821***	0.287474	-2.60997**	0.611725
PR 2	-1.257452***	0.163683	-1.084063***	0.255126	-1.112501***	0.280869	-2.116681***	0.393927
PR 3	-1.298964***	0.188771	-1.173904***	0.292343	-1.033683***	0.311963	-2.364719***	0.483003
AC 1	3.018485***	0.129494	1.79248***	0.19986	3.453377***	0.219445	4.076989***	0.333554
CQ 1	1.55542***	0.131694	1.462832***	0.200510	1.793665***	0.227764	1.720544***	0.318714
TR 1	0.017731	0.096701	-0.0753332	0.163779	-0.0232196	0.148400	0.2582502	0.233076
Wald $\chi^2(6)$	1,017.12		152,87		537.39		323.16	
Prob > χ^2	0.000		0.0000		0.000		0.0000	
Log Likelihood	-1,431.8557		-500,6967		-559.30861		-309.25302	
Cases	402 (100%)		111 (28%)		182 (45%)		109 (27%)	
Observations	4,824		1,332		2,184		1,308	

Note: Three asterisks (***) denote statistical significance at the 0.01 level, two asterisks (**) denote statistical significance at the 0.05 level and an asterisk (*) denotes statistical significance at the 0.1 level.

Software: Stata 12, asclogit command.

Source: Author´s calculation. Potato Consumption Survey, Mar del Plata Argentina / October 2012.

Table 5: WTP Calculation (US$/kg)

	FULL SAMPLE			SEL 1			SEL 2			SEL 3		
Explanatory Variables	**WTP 1**	**WTP 2**	**WTP 3**	**WTP 1**	**WTP 2**	**WTP 3**	**WTP 1**	**WTP 2**	**WTP 3**	**WTP 1**	**WTP 2**	**WTP 3**
AC 1	0.60	0.51	0.49	0.43	0.35	0.32	1.13	0.66	0.71	0.33	0.41	0.36
CQ 1	0.31	0.26	0.25	0.35	0.29	0.26	0.59	0.34	0.37	0.14	0.17	0.15

Source: Author´s calculation. Potato Consumption Survey, Mar del Plata Argentina / October 2012.