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# LOCAL BUT UNKNOWN: EVALUATING THE ACCEPTABILITY AND SENSORY ASPECTS OF A TRADITIONAL LOCAL FRESH POTATO VARIETY

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**Abstract**

We studied consumers' acceptance and willingness to pay for a locally grown potato variety in two experiments. Experiment 1 (*shopping stage*), consumers rated the visual appearance, and expressed purchase intent, and WTP. Experiment 2 (*consumption stage*) involved sensory rankings at home. Consumers valued the visual appearance and were more likely to buy, especially women. Age and income affected WTP. After taste, participants' rating of the product remained unchanged, but the odor received the lowest sensory rating.

**Keywords:** Fresh potato, Spain, visual appearance, sensory rating, willingness to pay

## 1. Introduction

Lately, the interest in locally grown food has increased and the number of local farms supplying local fresh produce has also expanded. Evidence from previous research shows that consumers are increasing demand and are willing to pay (WTP) more for local fresh produce (Enthoven & Van den Broeck 2021). Some reasons relate to the perceived benefits of high-quality food, nutritional value, and low environmental impact (Fernqvist & Ekelund, 2014). However, the term "local" is determined by the "credence" nature of attributes.

Most previous research explores the influence of "local" as a credence quality cue on consumer food choices. However, considering the credence aspects of the product has limitations because it is demonstrated that search and experience attributes influence consumers' purchase decisions. Search attributes help consumers determine the quality of a product before purchase. Experience attributes remind consumers of the positive/negative characteristic from a previous purchase (e.g., the taste). Combined, search (e.g., appearance) and experience (e.g., taste) affect consumers' food purchase and re-purchase decisions (Caswell & Modjuszka, 1996). However, consumers cannot experience "taste" before purchase. Therefore, it is crucial to investigate the impact of various food product characteristics at different purchase stages where information on multiple attributes is presented. The main objective of our research is to explore consumers' acceptance and the sensory evaluation of a local fresh potato variety and measure WTPs.

## 2. Methodology

*2.1 Participants*

The experiments were conducted in Zaragoza in 2018. A total of 141 participants were recruited in experiment 1 (*shopping stage*). Out of these 141 consumers, only 104 provided responses to experiment 2 (*consumption stage*). Table 1 presents the descriptive statistics from the experiments and compares the sample with the general population of the region.

*2.2 Experimental design and implementation*

The selection of the product is driven by the interest of local producers who wanted to launch the potato variety in the local market. A bag of 3 kg of potatoes was selected as the reference packaging after a market analysis in the local market. The lowest market price for 3kg of potatoes was 2.4€, and the highest was 3.6€. Besides the local potato, five other potatoes sold in the market with different characteristics were selected (Table 2). Potatoes were displayed in 3 kg bags with all the extrinsic information (e.g., price, brand, origin, potato variety, producer).

*Experiment 1:* Participants visually inspected six different potatoes, rated their visual liking and chose their preferred bag. As some bags did not allow for visual observation, small bulk displays were set up near the packaged potatoes to allow visual inspection. Next, the participants received information on the origin of the local potato: "This potato is locally produced in Aragón in different counties (several counties were mentioned). The potato has been traditionally produced in the region". Then, the participants rated again

the visual liking, but preferences were examined only for the local potato. All ratings were measured using a 9-point hedonic scale from 1 "dislike extremely" to 9 "like extremely". Third, consumers declared their intent to purchase the local potato using a scale from 1 "very unlikely" to 5 "very likely". A Becker–DeGroot–Marschak (BDM) hypothetical auction mechanism measured WTPs. The participants submitted their maximum WTP (bid) for the local potato and a random price was drown. They were informed that no transaction would occur due to the lack of product availability. Finally, participants responded to several questions regarding sociodemographic characteristics, purchase, and consumption habits.

*Experiment 2:* Participants received two pieces of the local potato to fry and taste at home. After taste, participants rated the overall liking, appearance (color), odor, texture, and the overall taste (e.g., "Please rate the overall liking of this local potato. How much do you like it?"). A 9-point hedonic scale was used to measure all sensory attributes.

**Table 1**. Sample demographic characteristics (%, unless stated)

| Characteristics | Experiment 1 (n=141) | Experiment 2 (n=104) | Population [1,2] |
|---|---|---|---|
| **Gender**[1] | | | |
| Male | 24.3[a] | 22.1[b] | 49.1 |
| Female | 75.7[a] | 77.9[b] | 50.9 |
| **Age (average, standard dev)**[1] | 54.5 [a] (14.4) | 54.7 [b] (13.2) | N/A |
| 18–34 | 6.8[a] | 4.8[b] | 22.8 |
| 35–44 | 16.7[a] | 18.5[b] | 20.2 |
| 45–54 | 28.0[a] | 28.2[b] | 19.0 |
| ≥ 55 | 48.5[a] | 48.5[b] | 38.0 |
| **Level of education**[2] | | | |
| Primary | 21.3[a] | 19.2[b] | 23.0 |
| Secondary | 25.7[a] | 26.9[b] | 48.7 |
| Higher | 53.0[a] | 53.8[b] | 28.3 |
| **Household income range** | | | |
| ≤ 1500 €/month | 24.3[a] | 25.9[b] | N/A |
| 1501–2500 €/month | 23.5[a] | 22.1[b] | N/A |
| 2501–3500 €/month | 19.8[a] | 22.1[b] | N/A |
| > 3500 €/month | 10.3[a] | 9.6[b] | N/A |
| Do not know/refuse to answer | 22.1[a] | 20.2[b] | N/A |

Note:[1, 2] (INE, 2017), [a,b] Different superscripts indicate statistically significant similarities based on one sample t-test.[1]

### 2.3 Specification and estimation

All the statistical analyses were conducted in STATA 10.1 (StataCorp L.P., 2007). Mean visual appearance liking scores and percentage of respondents choosing each package are reported in Table 2. The average of the visual appearance liking, purchase intention, and WTP for the local potato was calculated following Ginon et al. (2014). Overall liking scores directly measure the sensory characteristics of the product, reflecting sensory preferences. Consumers' willingness to buy and WTP reflect purchase preferences and are influenced by the overall liking of the product. WTP is assumed to be directly explained by purchase intent, which is determined by overall liking. This is expressed in the following two-equation models:

$$IP = \varphi + \mu OL + \eta X + \gamma \qquad (1)$$
$$WTP = \alpha + \beta IP + \lambda X + \varepsilon \qquad (2)$$

IP is the purchase intent and OL is the overall liking and WTP is the participants' WTP. In addition, X is the set of sociodemographic, purchase and consumption habits of consumers, $\varepsilon$ and $\gamma$ are the error terms. We assume that these two errors are correlated following a joint normal distribution N (0, $\Omega$). Then, a recursive system with correlated errors was estimated (Table 3). Table 4 reports the mean, standard deviation, and Pearson correlation results for different sensory likings. Statistical differences were measured using t-tests. Four single regressions were estimated using overall liking scores as endogenous variables to measure the contribution of each sensory liking to consumers' overall liking. The different sensory liking scores were the explanatory variables in each of them. The adjusted $R^2$ is an indication of how much each of the sensory liking scores explains the overall likings. A higher value indicates a higher explanation, and the estimated coefficient for each sensory liking score measures its marginal effect on overall liking. The higher the marginal effect the higher the influence on the overall liking.

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[1] T-test results are available upon request.

### 3. Results

*3.1 Experiment 1: Shopping stage*

The results in Table 2 show that the overall visual liking hedonic score is higher for Potatico (local potato) and Potato (regional wholesaler). Conversely, Denifrie received the least visual liking score. Results provided the same level of acceptability in the choice questions.

Table 2. Visual appearance liking and purchase intention.

| Name (potato variety) – Origin | Visual appearance Mean (St. Dev.) | Potato choices (%) |
|---|---|---|
| 1. Potato del Terruño (Agria) – Castilla y Leon [a] | 5.61 (1.83) | 9.4 |
| 2. Denifrie (Agria) – La Rioja [b] | 4.33 (1.72) | 0.7 |
| 3. Potato Freir (Agria) – Spain [c] | 4.93 (1.86) | 4.4 |
| 4. Potatico (Agria) – Aragón [d] | 6.78 (1.57) | 39.1 |
| 5. Cachelos (Kennebec) - Galicia [a] | 5.61 (1.90) | 14.5 |
| 6. Potato (Monalisa) – Spain - France [d] | 6.48 (2.09) | 31.9 |

Note: [a,b,c,d] Superscript letters indicate that visual appearance liking means are different using the t-test

The average purchase intention for the local potato variety was 3.88 with a mean WTP of 2.89 €/package or 0.96€/kg (Table 3).

Table 3. The recursive system with correlated error estimates - purchase intention and WTP models.

| | Purchase intention (PI) | | WTP | | |
|---|---|---|---|---|---|
| Average (St. dev.) | 3.88 (0.89) | | | 2.89 (0.63) | |
| *Variables* | *Coefficient* | *t-ratio* | *Variables* | *Coefficient* | *t-ratio* |
| Constant | 2.37 | 7.03*** | Constant | 2.27 | 10.20*** |
| Visual appearance | 0.14 | 3.38*** | PI | 0.20 | 3.77*** |
| Female | 0.40 | 2.41** | Age55 | -0.14 | -1.64* |
| Vegetarian | -1.06 | -2.57** | Low Income | -0.28 | -2.84*** |
| Shop_super | 0.44 | 3.08*** | | | |
| Adj $R^2$ | | 0.20 | Adj $R^2$ | | 0.15 |
| Adj $R^2$ model - appearance in PI | | 0.14 | Adj $R^2$ model - intention in WTP | | 0.06 |

Note: Visual appearance liking for the local potato: mean=6.70 and St. dev. = 1.64. ***, **, * denotes statistical significance at 1%, 5%, and 10%.

Estimations for the PI equation indicate that visual liking positively influences the purchase intent increasing the intention to purchase. Women (FEMALE) and participants who purchase in supermarkets (SHOP_SUPER) are more likely to buy local potatoes. Surprisingly, vegetarian consumers are less likely to buy local potatoes. The intention to purchase local potatoes positively influenced the WTP but consumers older than 55 years (AGE55) and households with low monthly incomes (LOWINCOME) (less than 1,500 €) are less willing to purchase the local potato.

*3.2. Experiment 2: Consumption Stage*

Table 4 presents the average sensory evaluation scores for the local potato in the second column. The overall liking of the local potato is the highest among all the evaluations and statistically higher than the visual appearance in experiment 1 (t-test=3.35) (table 2).

Table 4. Mean, correlation estimates of sensory and overall liking evaluation scores.

| | Mean (St. dev.) | Correlations | Estimation | | Adj $R^2$ |
|---|---|---|---|---|---|
| | | | Constant (t-ratio) | Beta (t-ratio) | |
| Overall liking [a] | 7.51 (1.26) | | | | |
| Appearance [b] | 6.93 (1.74) | 0.46** | 5.17 (10.75)*** | 0.33 (9.99)*** | 0.20 |
| Odor [c] | 6.52 (1.62) | 0.50** | 4.93 (10.49)*** | 0.39 (5.53)*** | 0.25 |
| Texture [b] | 7.05 (1.53) | 0.59** | 4.13 (8.33)*** | 0.48 (6.97)*** | 0.34 |
| Taste [a] | 7.47 (1.36) | 0.66** | 3.00 (5.67)*** | 0.60 (8.62)*** | 0.44 |

Note: ***, ** denotes statistical significance at 1%, and 5%. [a,b,c,d] Different superscripts indicate t-test significant differences between means.

The t-test among different sensory evaluations indicated that the overall liking and taste are statistically similar. However, appearance (color) and texture were similar but statistically lower than the overall liking and taste. The odor of the local fried potato receives the lowest score. The third column shows that the correlation between the overall liking and the sensory evaluations are statistically different from zero with taste being the most correlated attribute. The contribution of the different sensory in the overall liking scores are presented in the following columns. The highest adjusted $R^2$ and estimated beta coefficient correspond with taste and the lowest, with appearance.

## 4. Conclusions

These results can have several implications for local potato producers and vendors. Promoting the local origin on food labels seems a promising labeling strategy to boost sales, however, our results show that consumers associate the local origin label with observable (e.g., appearance of color, shape) and unobservable (e.g., taste, smell, texture) attributes. Therefore, in addition to promoting the local origin of the food and the benefits of purchasing and consuming local food, further consideration should be given to featuring physical quality aspects such as the sensory properties of the food that are important to consumers.

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