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Exploring the Market Potential for Tomato Cultivated from Local Landraces: A Segmentation Approach using an Inferred Non-Attendance Choice Experiment

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CENTRO DE INVESTIGACIÓN Y TECNOLOGÍA
AGROALIMENTARIA DE ARAGÓN

Introduction

The literature on consumers preferences for tomatoes corroborates that **there is a tomato consumer segment** that **prefers traditional/local varieties** to commercial ones (Pérez-Caselles et al., 2020).

This segment is characterized by:

* Having higher income level

* Giving greater importance to the organoleptic properties of the tomato than to its price

* Values positively the local origin of the production

* Buys more frequently in greengrocer shops and open markets.

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Objective

- To investigate the market potential for tomato cultivated from Local Landraces

- To examine consumer attitudes and their willingness to purchase and pay for these local tomatoes

- To segment consumers into homogenous groups depending on their attendance to the price and/or the local origin.

Local Landrace = Local Variety

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A landrace is a local variety of a plant or cultivar species that has evolved largely through selection by farmers in an unstructured way and become adapted to the agroecologies where it thrives (Nass and Paterniani, 2000).

Local landraces are cultivated in restricted regions and have been adapted over the years to specific growing conditions (soil and climate characteristics).

Material and Methods

Online survey to consumers of vegetables in Aragon in 2021.

Data collected: 571 respondents stratified by gender, age and province.

Fieldwork: 15-27 December 2021

Questionnaire:

- Personal characteristics of respondents (age, family size, income and education level, residence province)

- Vegetable purchase and consumption habits

- Information on vegetables

- Local vegetable (current purchase, intention to purchase, preferred place of purchase and **willingness to pay (Choice experiment**)

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CHOICE EXPERIMENT

To explore the market potential for tomate from local landraces

We segment consumers in homogenous groups based on their attribute non-attendance (ANA) for two tomate attributes: Price and Local Variety using:

- Choice Experiment method (to assess consumer preferences and willingness to pay)

- Inferred approach (Constrainted Latent Class)

Following **Scarpa et al., (2012):** *"This approach allows researchers to identify the fraction of respondents that are in the market for an attribute from those that are not"*

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CHOICE EXPERIMENT: Design

- **Two attributes:** Price (1.5, 3, 4.5 and 6) and Local variety (yes and no)
- **The choice sets design**: Burgess and Street (2007).
- **Three alternatives**: two designed + non-buy option
- **Main effects**: 8 choice tasks (2 blocks). 4 choice sets by respondent.

Option A   Option B

NO Local variety   1,5 €/kg

Variedad local — Conserva la biodiversidad agrícola — Local variety   3 €/kg

I would not buy neither option A nor Option B

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Non-Attendance: Segmentation

Inferred Equally Constrained Latent Class (ECLC) – 2^k (k=number of attributes)

A **Latent Class model** imposing restrictions on the utility coefficients depending on the assumptions on different combinations of ANA (4 classes):

  * Class 1: **Full attendance**: Price and Local Variety

  * Class 2: **Only Local Variety attendance** (coefficient for the Price restricted to 0)

  * Class 3: **Only Price attendance** (coefficient for the Local Variety restricted to 0)

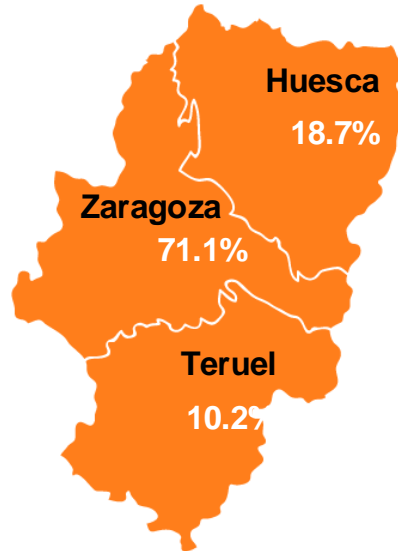 * Class 4: **Full non-attendance** (coefficient for the Price and Local Variety restricted to 0)

The coefficients no restricted to zero are assumed to be the same for the 4 classes.

Sample characteristics

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Gender

- **50,4%** Female
- **49,6%** Male
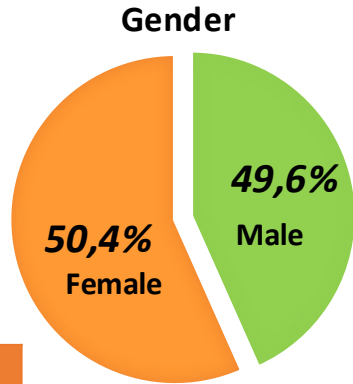
Age (average and standard deviation)	46.6 (12.0)
Less than 24 years old	3.5
Between 25 and 34 years old	14.4
Between 35 and 44 years old	25.6
Between 45 and 54 years	30.5
Between 55 and 64 years old	19.0
More than 65 years old	7.0

Education level	
Mandatory	16,6
Secondary	41,3
Higher education	42,1

Huesca 18.7%

Zaragoza 71.1%

Teruel 10.2%

Household size (average and standard deviation)	2.8 (1.1)
Kids less than 18 years old	
None	60.2
1	21.5
2	15.0
3 and more	3.2

Urban area of residence	82.1
Rural area of residence	17.9

Net monthly income per household	
Less than 1,000€/month	5.43
Between 1,001 and 1,500€/month	12.3
Between 1,501 and 2,500€/month	27.8
Between 2,501 and 3,500€/month	22.1
More than 3,500€/month	8.9
I do not want to respond	23.5

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Inferred Equally Constrained Latent Class (ECLC) – 2^k (k=number of attributes)

Table 2. Estimation results of the inferred ECLC-2^k model

Attributes	Estimations		WTP	
	Mean Estimation	Z-ratio	Mean Estimation	Z-ratio
ASC	3.942***	21.23		
PRICE	-0.925***	-19.55		
LOCAL VARIETY	2.885***	17.30	3.11***	13.95
Prob: Full attendance	0.635***	15.88	Segment 1	
Prob: Only local variety attendance	0.117***	3.04	Segment 2	
Prob: Only price attendance	0.247***	7.37	Segment 3	
Prob: Full non-attendance	0	---		

Number of observations: 2,284

Log likelihood: -280.17; McFadden Pseudo R-square: 0.349

WTP = willingness to pay

*** = significance at 1%

We detected 3 segments of consumers:

- **Segment 1: the largest segment (63%)** who considers both the **Price and the Local Variety** making trade-off between them and with a marginal **Willingness to Pay (WTP) of 3.11 €/kg**.

- **Segment 2: The smallest segment (12%)** who ignores the price considering only the **Local Variety**. Then, they **are willing to purchase the Local Variety regardless of his price.**

- **Segment 3: The medium-sized segment (25%)** who considered only the **Price** but ignores the Local Variety. They **do not care about the Local Variety.**

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The 3 segments of consumers are profiled using ANOVA-Bonferroni and/or Chi-square tests by:

- Socio-demographic characteristics

- Vegetables consumption behaviour (i.e. daily consumption, place of purchase)

- Importance given when shopping to different vegetables characteristics

- Knowledge about the place and the method of production of the vegetables they buy

- Purchase of local vegetables and attitudes towards vegetables from local landraces

- Intention to purchase local vegetables

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Segmentation results: socio-demographics

Only income was statistically different among segments.

Considered	Local Price S1	Local S2	Price S3	Total Sample
Segment size (%)	63	12	25	571
Income (%) [11.61 (0.071)][1]				
≤ 1500 €/month	19.53	25.58	**33.99**	23.11
1501–2500 €/month	**37.04**	32.56	36.08	36.38
2501–3500 €/month	**30.30**	25.58	25.77	28.83
> 3500 €/month	13.13	**16.28**	5.15	11.67

Segment 1 (Price and Local Variety): higher proportion of middle-income households.

Segment 2 (Local Variety): higher proportion of higher income households.

Segment 3 (Price): higher proportion of lower income households.

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Segmentation results: vegetables consumption behaviour

Considered	Local Price S1	Local S2	Price S3	Total Sample
Segment size (%)	63	12	25	571
Vegetables place of purchase:				
In grocery stores (%) [11.15 (0.00)][1]	**73.55**	**74.55**	57.98	70.40
In hypermarkets (%) [6.42 (0.04)][1]	33.75	25.45	**43.70**	35.03
Eats vegetables every day (%) [4.95 (0.08)][1]	63.48	**70.91**	54.62	62.35
Eats recommended daily vegetables (2 or 3) (%) [9.16 (0.01)][1]	38.79	**47.27**	**26.05**	36.95

Segment 1 (Price and Local Variety): Higher proportion of households shopping in grocery stores.

Segment 2 (Local Variety): Higher proportion of households shopping in grocery stores, more frequent consumers of vegetables and higher proportion eating the recommended daily portions of vegetables (2 or 3).

Segment 3 (Price): Higher proportion of households shopping in hypermarkets and lower proportion eating the recommended daily portions of vegetables (2 or 3).

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Importance given when shopping fresh vegetables to:

Considered	Local Price S1	Local S2	Price S3	Total Sample
Segment size (%)	63	12	25	571
Importance given when shopping to* (average):				
External appearance [3.79 (0.02)]^2	**4.08 a**	4.41 b	4.16 b	4.13
Smell and taste [7.15 (0.00)]^2	4.38 a	4.52 a	**4.13 b**	4.35
Place of production [25.93 (0.00)]^2	3.60 a	**3.96 b**	2.88 c	3.48
Price [5.16 (0.00)]^2	3.76 a	3.61 a	**4.00 b**	3.80
Organic [20.21 (0.00)]^2	2.74 a	**3.34 b**	**2.30 c**	2.71
Designation of Origin [31.03 (0.00)]^2	2.94 a	**3.54 b**	**2.29 c**	2.87

Segment 1 (Price and Local Variety): Lower importance to the external appearance.

Segment 2 (Local Variety): **Higher importance to the place of production**, organic and designation of origin.

Segment 3 (Price): Lower importance to the smell and taste, organic and designation of origin and **higher importance to the price**.

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Segmentation results: knowledge

Considered	Local Price S1	Local S2	Price S3	Total Sample
Segment size (%)	63	12	25	571
Knowledge on the origin of production of the vegetables they buy (%) [44.27 (0.00)][1]				
Never or hardly never*	23.68	**9.09**	**50.42**	27.85
Almost always or always	27.46	**38.18**	20.17	26.97
Knowledge on the method of production of the vegetables they buy (%) [24.29 (0.00)][1]				
Never or hardly never*	42.07	29.09	**62.18**	45.01
Almost always or always	16.12	27.27	**14.29**	16.81

*Sometimes was dropped but summed to 100

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Segment 2 (Local Variety): Higher proportion of households states knowing always or almost always the origin of production.

Segment 3 (Price): Higher proportion of households states knowing never or hardly never the origin and the method of production.

Segmentation: Attitudes towards local vegetables

Considered	Local Price S1	Local S2	Price S3	Total Sample
Cluster size (%)	63	12	25	571
In the last year, **have you bought local vegetables?** (%) [30.27 (0.00)][1]	69.27	**85.45**	**47.06**	66.20
Attitudes towards vegetables from local landraces ** (average):				
Are produced closed to my house [8.21 (0.00)][2]	4.00 a	3.92 a	**3.60 b**	3.91
Are tasty [7.33 (0.00)][2]	4.10 a	4.11 a	**3.73 b**	4.02
Are sold closed to my house [7.25 (0.00)][2]	3.77 a	3.84 a	**3.38 b**	3.70
Are better for the environment [7.94 (0.00)][2]	3.84 a	3.59 a	**3.55 b**	3.69
Help to obtain higher benefits [14.07 (0.00)][2]	3.74 a	3.81 a	**3.20 b**	3.64
Are fresh [4.37 (0.01)][2]	4.13 a	4.00 a	**3.85 b**	4.06
Are expensive [3.14 (0.04)][2]	3.27 a	3.00 a	**3.40 b**	3.27
Maintain the biodiversity [6.70 (0.00)][2]	3.75 a	3.83 a	**3.39 b**	3.69
Are healthy [7.28 (0.00)][2]	4.02 a	4.13 a	**3.67 b**	3.95

Segment 2 (Local Variety): Higher proportion of households shopping local vegetables.

Segment 3 (Price): Lower proportion of households shopping local vegetables and lower attitudes towards vegetables from local landraces considering to higher extent that are expensive.

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Considered	Local Price S1	Local S2	Price S3	Total Sample
Cluster size (%)	63	12	25	571
Intention to purchase vegetables from local landraces in the future (%) [44.75 (0.00)][1]				
Not or probably no	1.76	**0.00**	7.56	2.80
I do not know	15.87	9.09	**36.13**	19.44
Yes or probably yes	82.37	**90.91**	**56.30**	77.76
Intention to purchase vegetables from local landraces in the future **if not available in the vegetables store, they used to purchase** (%) [41.35 (0.00)][1]				
Not or probably no	14.86	0.00	27.73	16.1
I do not know	31.74	27.27	**43.70**	33.8
Yes or probably yes	53.40	**72.73**	**28.57**	50.1
Intention to purchase vegetables from local landraces in the future **if more expensive** than the conventional ones (%) [94.15 (0.00)][1]				
Not or probably no	7.05	0.00	33.61	11.91
I do not know	35.52	25.45	**44.54**	36.43
Yes or probably yes	57.43	**74.55**	**21.85**	51.66

The intention to purchase decreases if the vegetables from local landraces are more expensive and no available in stores.

Segment 2 (Local Variety): Higher proportion of households states their intention to purchase these vegetables regardless of the scenario.

Segment 3 (Price): Lower proportion of households states their intention to purchase these vegetables regardless of the scenario.

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Conclusions

We detected 3 segments of consumers:

* **Segment 1**: **63%** of consumers considering both the **Price and the Local Variety** when shopping and **willing to pay 3.11 €/kg** more for the local vegetables.

Middle income households given more importance to the external appearance of the vegetables and more frequent consumers.

* **Segment 2**: **12%** of consumers considering only the Local Variety and therefore, they **are willing to purchase the Local Variety regardless of his price.**

Higher income households given more importance when shopping to the place of production, organic and designation of origin, shopping in grocery stores, more frequent consumers and more knowledgeable on the origin and method of production. Higher consumers of local vegetables and more prone to purchase local vegetables in the future.

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Conclusions

* **Segment 3**: **25%** of consumers considering only the **Price.** They **do not care about the Local Variety.**

Characterized by almost the contrary to segment 2 (Local variety).

Lower income households given importance when shopping to the price, shopping in hypermarkets, less frequent consumers, less knowledgeable on the origin and method of production.

Lower consumers of local vegetables and less prone to purchase local vegetables in the future.

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Thank you for your attention

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