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SEEKING AN OPTIMAL CLASSIFICATION SYSTEM FOR THE COMMERCIAL CATEGORIES OF OLIVE OILS

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ABSTRACT

The ultimate goal of food classifications systems (FCS) is to inform in an adequate way to the different agents of the market and mainly to consumers about the different categories, characteristics and quality of a food product. In particular, in this paper we focus on the olive oils classification systems. This system is formed by three product categories divided according to the objective quality of each one. Its main function is to help the consumers to distinguish and understand the distinctive characteristics of each category, motivating their learning to ensure that they can make informed decisions, avoiding confusion or mistakes. However, in many cases, the classification systems show important deficiencies that increase the confusion and hinder the consumer learning. For this reason, the objective of this work is to offer some orientations for the design of effective FCS. To analize the usefulness of diverse elements such as the length of the categories (short-long) and a series of visual signs (colours, numbers and images), in relation to the learning results, we conducted an experimental study with 840 spanish participants during November and December, 2014. The results allow us to provide a series of recommendations that can help to enhance the current classification system for olive oils.

Keywords: *food classification, food categorization, consumer orientation, agricultural policy.*

INTRODUCTION

Nowadays, consumers deal with a wide offer of products, varieties and quality levels in the market, making the choice processes relatively complex and requiring adequate levels of knowledge about the different options offered to consumers. However, reality shows that, in many cases, consumers are not able to choose in an adequate way; either due to a lack of informative campaigns, a consumer's lack of implication, the frequent changes that are produced in food classification systems (FCS) or the limitations of classification systems that are used. Indeed, problems such as the use of similar terms, ambiguous descriptions of the products included in

each category or the use of confusing or excessively technical descriptors are some of the factors that, instead of helping or facilitating the selection and purchase process, sometimes may confuse consumers and lead them to erroneous beliefs (Aydinoğlu and Krishna, 2011; Dörnyei and Gyulavári, 2015; Grunert et al., 2010; Hall and Osses, 2013; Mackey and Metz, 2009; Malam et al., 2009; Sharf et al., 2012). A typical case occurs in the olive oil sector, in which many consumers do not know the different types (and levels of quality) of olive oils and the characteristics of each level. The problem of the inadequacy of the categories of olive oils has been considered an important obstacle for the effective commercialization of the product, both in academic (Cabrera et al., 2015; Marano and López-Zafra, 2009, Marano et al., 2015; Navarro et al., 2010; Torres et al., 2012, 2015; Parras, 1996, 2000) and business levels[7]. Generally, it is argued that the similarity between the terms used and the ambiguity of the descriptors hinder an effective learning for the consumer. In addition, this problem aggravates since there is not only a lack of knowledge but confusion and erroneous beliefs as well. For instance, in the case of Spain, the top world olive oil producer and a country where this is one of the most emblematic products in the diet, over 60% of consumers think that "olive oil is pure olive juice, without manipulation", only 30% know that "olive oil is a mixture of virgin and refined olive oils, and over 70% think that "the main factor in differentiating between qualities is the acidity" (Torres et al., 2015). This could explain that the most consumed oil in Spain is olive oil (not virgin), in spite of its lower quality and healthiness and even though the difference in price is barely € 0. 3/litre according to the Ministry of Agriculture, Food and Environment Food Consumption Panel Data (2015). Furthermore, many producers face with difficulties to sell quality oils. In short, the official classification system does not incentive quality, production levels or consumption, in opposition to the guidelines of the Common Agricultural Policy and the efforts of the Spanish Government.

Our objective is to analyze to what extent does the current classification system limits or interferes in the effective commercialization of olive oils. Based on the idea that any food classification system must help consumers to distinguish between products, to facilitate the choice process, and to suggests (or invoke) them useful information, different options are compared in this study in order to determine (1) if the classification system really affects the consumer behaviour (and, therefore, to the commercialization of the oil) (2) which characteristics should a classification system have and (3) if this one is better than the current classification system.

MATERIALS AND METHODS

In order to address the objective of the present study, first we need to focus the framework, and to clearly establish some fundamental principles based on the present characteristics of agrifood purchases. Thus, within the scope of food

[7] Some producers of quality virgin olive oils think that "Premium" olive oils should be differentiated from the rest of extra virgin olive oils (a new category).

products, purchasing decisions tend to be routine (Schiffman & Kanuk, 2005), with a low level of involvement (Hamlin, 2010), and are characterised by a lack of cognitive processing of information[8], which leads consumers to simplify their decision and to misuse heuristics (Hamlin, 2010; Scheibehenne et al., 2007). Additionally, consumers are exposed to a great amount of information (Dunbar, 2010; Hall & Osses, 2013; Mackison et al., 2008), which they must process and make decisions in crowded places, such as supermarkets or hypermarkets, where it is difficult to reflect upon the information the product bears. Furthermore, consumers are also pressured by the time limit to process all this information (Loebnitz et al., 2015; Pieniak et al., 2007; Reutskaja et al., 2011; Suri & Monroe, 2003). Thus, this environment encourages the use of simplification mechanisms by the consumer, who, rather than reflecting upon the information provided, resorts to visual elements that act as heuristics to associate certain attributes to the product. That is, images or symbols are used to simplify the decision-making process, provided that these signs have previously been learned (Hoek, Roling, & Holdsworth, 2013; Sütterlin & Siegrist, 2015). Considering that olive oil is usually purchased on a self-service basis, an experiment has been suggested that intends to emulate the basic mental processes attached to shopping at a supermarket centered on the recognition of the product exposed. In this sense, three recognition indicators of the categories have been used to compare the classification systems. In particular, to design proposal of categories. the length (number of words of the categories, distinguishing between short and long) and the type of sign (colours, images and numbers) are the variables used. In relation to the length it is necessary to take into account that the labelling espace is limited and, therefore, introducing more text implies a smaller size of the font and consequently, less probability of perception (although it is more informative); in relation to the signs, the numbers have the advantage of producing an intuitive hierarchy, and have been used previously in the systems of classification (Cronley et al., 2005; Gunasti & Ross, 2010; Yan & Duclos, 2013). Moreover, the colours are easily identifiable and are also frequently used (Becker et al., 2015; Drescher et al., 2014; Olstad et al., 2015; Siegrist et al., 2015), similarly to images (McQuarrie & Mick, 2003; Schlosser, 2006; Schmitt et al., 1993). Considering the combinations of two variables, a balanced experiment was performed with six different classifications, plus a control group which receives the current system that is used in products (treatment 7). The seven treatments were randomly administered to an online panel sample of 840 subjects, at a rate of 120 per treatment. The interviewees were residents of the following Spanish areas: Santa Cruz de Tenerife, Cádiz, Barcelona, Madrid, Almería, Islas Baleares, Burgos, A Coruña, Guipúzcoa, Huesca, Navarra, Asturias, Las Palmas, Pontevedra, Cantabria, Tarragona, Valladolid, Vizcaya and Zaragoza. Likewise, in each treatment the composition of the sample was equal, in relation to the variables of age, level of studies and sex. The field work was performed between November 26th and December 4th 2014.

[8] With the exception of wine (Hamlin, 2010).

Through an online questionnaire composed by successive pages, in which participants could not go back, the subjects were submitted for one minute to the information of the treatment of their condition, which appeared reflected in the computer screen (Table 1), referred to the category used and the information associated with each category. After a few questions, recognition was measured through two suggested recall questions. All the categories of all treatments were displayed on the computer screen and it was requested to remember which of them they had viewed and to indicate an order of quality (from highest to lowest). In both cases, the number of successes of each interviewee was calculated. Finally, previous knowledge about olive oils was also measured through an 11-item scale.

Table 1. Information presented to each experimental group on the computer screen

Treatment 1(n=120) (short-images)	
Category	Category description
Olive oil 	Maximum quality oil obtained from pure olive juice and only through mechanical procedures, which preserve all the flavour, odour and properties of the natural fruit.
Olive oil 	Olive oil obtained from pure olive juice and only through mechanical procedures, which preserve all the flavour, odour and properties of the natural fruit.
Olive oil 	Olive oil obtained through a mixture of oils subjected to a chemical rebore treatment and oils obtained from pure olive juice.
Treatment 2 (n=120) (short-numbers)	
Category	Category description
Olive oil 1ª	Maximum quality oil obtained from pure olive juice and only through mechanical procedures, which preserve all the flavour, odour and properties of the natural fruit.
Olive oil 2ª	Olive oil obtained from pure olive juice and only through mechanical procedures, which preserve all the flavour, odour and properties of the natural fruit.
Olive oil 3ª	Olive oil obtained through a mixture of oils subjected to a chemical rebore treatment and oils obtained from pure olive juice.
Treatment 3 (n=120) (short-colors)	
Category	Category description
Olive oil 	Maximum quality oil obtained from pure olive juice and only through mechanical procedures, which preserve all the flavour, odour and properties of the natural fruit.
Olive oil 	Olive oil obtained from pure olive juice and only through mechanical procedures, which preserve all the flavour, odour and properties of the natural fruit.

Olive oil	Olive oil obtained through a mixture of oils subjected to a chemical rebore treatment and oils obtained from pure olive juice.
Treatment 4 (n=120) (long-images)	
Category	Category description
Olive oil superior quality natural juice 	Maximum quality oil obtained from pure olive juice and only through mechanical procedures, which preserve all the flavour, odour and properties of the natural fruit.
Olive oil natural juice 	Olive oil obtained from pure olive juice and only through mechanical procedures, which preserve all the flavour, odour and properties of the natural fruit.
Olive oil natural juice mixed with rectified olive oils 	Olive oil obtained through a mixture of oils subjected to a chemical rebore treatment and oils obtained from pure olive juice.
Treatment 5 (n=120) (long-numbers)	
Category	Category description
Olive oil superior quality natural juice 1st	Maximum quality oil obtained from pure olive juice and only through mechanical procedures, which preserve all the flavour, odour and properties of the natural fruit.
Olive oil natural juice 2nd	Olive oil obtained from pure olive juice and only through mechanical procedures, which preserve all the flavour, odour and properties of the natural fruit.
Olive oil natural juice mixed with rectified olive oils 3rd	Olive oil obtained through a mixture of oils subjected to a chemical rebore treatment and oils obtained from pure olive juice.
Treatment 6 (n=120) (long-colors)	
Category	Category description
Olive oil superior qua-lity natural juice 	Maximum quality oil obtained from pure olive juice and only through mechanical procedures, which preserve all the flavour, odour and properties of the natural fruit.
Olive oil natural juice 	Olive oil obtained from pure olive juice and only through mechanical procedures, which preserve all the flavour, odour and properties of the natural fruit.
Olive oil natural juice mixed with rectified olive oils	Olive oil obtained through a mixture of oils subjected to a chemical rebore treatment and oils obtained from pure olive juice.
Treatment 7 (n=120) (current classification)	
Category	Category description
Extra virgin olive oil	Maximum quality olive oil obtained directly from olives and only through mechanical procedures.
Virgin olive oil	Olive oil obtained directly from olives and only through mechanical procedures.
Olive oil contains-exclusively refined olive oils and virgin olive oils	Oil containing exclusively olive oils which have been exposed to a refining treatment and oils obtained directly from olives.

RESULTS AND DISCUSSION

Selection of the most adequate system.

A MANCOVA with length and sign independent variables was performed. As dependent variables we considered the two related to the suggested recall or recognition (expressed in number of hits over 3) and previous oils knowledge have been introduced as a co-variable. In a first phase, the hypothesis of homogeneity of slope, including the interaction between the co-variable and the treatment in the model has been corroborated. Since the interaction is not significant (the lowest level corresponds to Roy's larger root, with 0, 362) the model has been suppressed. In tables 1, 2 and 3 the MANCOVA, ANCOVA and means of each treatment for each dependant variable are displayed.

Table 1. MANCOVAeffect of the use of signs and length of categories

Effects		**Value**	**F**	**P**
Length	Pillai's Trace	. 018	6. 570	. 001
	Wilk's Lambda	. 982	6. 570	. 001
	Hotelling's Trace	. 018	6. 570	. 001
	Roy's largest Root	. 018	6. 570	. 001
Type of sign	Pillai's Trace	. 065	11. 975	. 000
	Wilk's Lambda	. 935	12. 134	. 000
	Hotelling's Trace	. 069	12. 293	. 000
	Roy's largest Root	. 066	23. 762	. 000
Length*type of sign	Pillai's Trace	. 011	1. 907	. 107
	Wilk's Lambda	. 989	1. 907	. 107
	Hotelling's Trace	. 011	1. 907	. 107
	Roy's largest Root	. 009	3. 215	. 041
Previous knowledge	Pillai's Trace	. 009	3. 291	. 038
	Wilk's Lambda	. 991	3. 291	. 038
	Hotelling's Trace	. 009	3. 291	. 038
	Roy's largest Root	. 009	3. 291	. 038

Table 2. ANCOVA effect of the use of signs and length of categories over the dependant variables

Origin	**Dependent variable**	**Type III sum of squares**	**F**	**P**
Length	Recognition	4. 482	3. 895	. 049
	Order or Hierarchy	11. 231	9. 919	. 002
Type of sign	Recognition	51. 007	22. 165	. 000
	Order or Hierarchy	30. 071	13. 279	. 000
Length*type of sign	Recognition	5. 384	2. 340	. 097
	Order or Hierarchy	2. 619	1. 157	. 315
Previous knowledge	Recognition	7. 282	6. 589	. 010
	Order or Hierarchy	5. 993	5. 293	. 022

Table 3. Marginal Means (number of right answers)

Length			**Sign**	
Recognition	Short	. 861	Image	1. 278
	Long	1. 019	Number	. 628
			Colour	. 913
Order or Hierarchy	Short	. 594	Image	. 992
	Long	. 844	Number	. 502
			Colour	. 663

The results show an additive and meaningful effect of length and symbol in the recognition of categories and order of quality. Also, the inclusion of the co-variable in the model is correct, that is, the recognition is affected by the previous knowledge. Considering the marginal means estimated, in general, the long systems have a higher hit rate than the short systems wheras regarding symbols, the image has a higher level of success than the number or the colour. From the two explicative variables, the type of symbol image has a greater effect than length either for the case of recognition of categories (eta2=. 058 and eta2=. 005 respectively) and the case of quality order or hierarchy (eta2=. 036 and eta2=. 014 respectively). In sum, the most appropriate system for recognition purposes, is the one includinglong categories and images (in this case olives) (treatment 4).

Comparison of the proposed classification with the current classification system.

To analyse if the proposed system is better than the current one, a MANCOVA – tables 4, 5, 6 and 7- has been performed in which the selected treatment (4) is compared with the current classification (7), considering, the previous knowledge as a co-variable. After accepting the homogeneity hypothesis of slope, the interaction between the co-variable and the treatment has been suppressed.

Table 4. MANCOVA effect of the interaction between the co-variable and the type of system (4&7)

Effects		**Value**	**F**	**P**
Treatments 4&7* Previous knowledge	Pillai's Trace	. 005	. 573	. 564
	Wilk's Lambda	. 995	. 573	. 564
	Hotelling's Trace	. 005	. 573	. 564
	Roy's largest Root	. 005	. 573	. 564

Table 5. MANCOVA effect of the type of system

Effects		**Value**	**F**	**P**
Previous knowledge	Pillai's Trace	. 005	. 540	. 584
	Wilk's Lambda	. 995	. 540	. 584
	Hotelling's Trace	. 005	. 540	. 584
	Roy's largest Root	. 005	. 540	. 584
Treatments 4&7	Pillai's Trace	. 030	3. 616	. 028
	Wilk's Lambda	. 970	3. 616	. 028
	Hotelling's Trace	. 031	3. 616	. 028
	Roy's largest Root	. 031	3. 616	. 028

Table 6. ANCOVA effect of the type of system over the dependant variables

Origin	**Dependent variable**	**Type III sum of squares**	**F**	**P**
Previous knowledge	Recognition	. 989	. 921	. 338
	Order or Hierarchy	. 471	. 380	. 538
Treatments 4&7	Recognition	4. 808	4. 477	. 035
	Order or Hierarchy	1. 143	. 922	. 338

Table 7. Estimation of the values

Dependent variable	**Values**	**B**	**Typ. Err**	**t**	**P**
Recognition	Intersection	1. 379	. 127	10. 865	. 000
	Previous knowledge	. 017	. 017	. 960	. 338
	(Treatment 4&7=4. 00)	. 283	. 134	2. 116	. 035
	(Treatment 4&7=5. 00)	0			
Order or Hierarchy	Intersection	1. 164	. 136	8. 533	. 000
	Previous knowledge	. 011	. 019	. 617	. 538
	(Treatment 4&7=4. 00)	. 138	. 144	. 960	. 338
	(Treatment 4&7=5. 00)	0			

The results show that, for recognition, the current classification is higher than the proposed; but when determining the order of quality within each system of categories, there are no differences between both systems.

CONCLUSIONS

In light of these results, we can conclude that the use of one system of categories has important implications on consumer's behavior and, consequently, in the commercialization of oils in the market. In this sense, before developing or modifying a classification system, it is very important to plan and carry out studies to determine the adequacy of the FCS, since its development may affect the whole sector.

Secondly, in the specific case of olive oils, and under the hypothesis of using a system that have an impact on the visual recognition of its categories, and specially of a hierarchical organization of their quality levels, a system with images (in this case olives) seems to be superior to a system based in colours or numbers. Additionally, a minor superiority of long systems (with more terms than shorter systems) is appreciated.

Finally, it remains open the question of whether the recommendations made to develop a classification system on olive oils, from the point of view of consumer recognition activity, would result in a better system than the current one. According to our results and considering that the proposed system has only been exposed during one minute, whereas the current one has already been several years in the market and it has been object of news, publicity, kitchen shows, public administration informative actions, interprofesional of the olive oils, etc (as well as the same minute), they are what it might be expected: better recognition levels. In other words, people bring it to mind and recognize the olive oil terms: virgin, extra virgin; but its knowledge does not go any further than that. Surprisingly, it gets the same hits than the system of signs (only exposed during a minute) when organizing the quality of categories hierarchically, proving the deficiency of the current system.

In this context it is possible to conclude that the lack of knowledge and confusion regarding olive oils, in part due to the shortcomings of the current classification. Therefore, we defend the need to make some modifications in this system in order to make it much more intuitive, evocative of the quality and transparent towards consumers. The ideal system would be one that allows consumers to learn easily the qualitative differences between the categories and to choose accordingly which one they consume.

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