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AUTHORS: **Grobert A Guadalupe, Maria Jesus Lerma-Garcia, Ana Fuentes, Jose Manuel Barat, Maria del Carmen Bas and Isabel Fernández-Segovia**

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Presence of palm oil in foodstuffs: consumers' perception

Grobert A. Guadalupe
Universidad Nacional Toribio Rodriguez de Mendoza de Amazonas, Chachapoyas, Peru and
Programa Nacional de Alimentación Escolar Qali Warma, Ministerio de Desarrollo e Inclusión Social, Chachapoyas, Peru
Maria Jesus Lerma-Garcia, Ana Fuentes and Jose Manuel Barat
Food Technology Department, Universitat Politecnica de Valencia, Valencia, Spain
Maria del Carmen Bas
Departamento de Matemáticas para la Economía y la Empresa, University of Valencia, Valencia, Spain, and
Isabel Fernández-Segovia
Universitat Politecnica de Valencia, Valencia, Spain

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Abstract

Purpose – The purpose of this paper is to determine the presence of palm oil in food products on sale, and to study and compare consumers' opinions about this oil type in Spain (importing country) and Peru (producing country).

Design/methodology/approach – Recent news published in both countries, which could influence consumer perceptions, were analysed. A study on the labelling of foodstuffs in Spain was carried out, as was a survey with Spanish and Peruvian consumers.

Findings – Palm oil was found in a large number of products and in a wide range of foods, especially those from the bakery sector. The percentages of saturated fats varied substantially within the same product type. Spanish consumers showed much more interest in the labelling and information on nutritional properties, especially energy values, saturated fats and sugars, while Peruvians focused more on energy values, and protein, vitamin and mineral contents. In Spain, palm oil was considered the worst quality fat/oil and had a clearly negative effect on both health and the environment. In Peru, palm oil was neither perceived by the majority of respondents as low quality oil nor associated with negative health effects. However, they were aware of the environmental problems that could result from its production.

Originality/value – These results confirm that the food industry should make efforts to reduce or replace palm oil in foods, mainly in Spain, as most consumers believe that palm oil negatively affects their health and the environment.

Keywords Health, Environment, Palm oil, Consumers' opinions

Paper type Research paper

1. Introduction

Palm oil is the most widely produced, consumed and traded vegetable oil worldwide. The main palm oil-producing countries are Indonesia and Malaysia (Pirker *et al.*, 2016), followed by Thailand, Colombia, Nigeria and Ecuador, while main consumers include India, the European Union (EU), China and Pakistan, among others (Codex, 2017).

Palm oil is the only vegetable fat that is solid at room temperature. This oil has higher saturated fatty acid content (45–50 per cent) than other vegetable oils and contains natural antioxidants, which play a major role in oil stability (Ong and Goh, 2002). All these characteristics made palm oil one of the best raw materials for food processing companies thanks to its versatility, good availability, low cost and guaranteed supply.

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Palm oil demand has considerably grown in recent decades and this trend is expected to continue in forthcoming years (OECD and FAO, 2013). In order to meet this increasing demand, palm oil production could reach 78m tonnes by 2020, which means increasing its existing production area by at least half by 2020. As global demand increases and available land becomes scarcer in traditional palm oil-producing countries, the governments of developing and emerging countries, such as Brazil, Peru and Central and Western Africa, promote oil palm cultivation as a major contributor to alleviate poverty and food and energy independence (Basiron and Weng, 2004; Pirker *et al.*, 2016). However, increasing palm oil plantations will have major environmental implications, especially in tropical forests, as its cultivation implies loss of habitat and biodiversity, forest fragmentation, food chain disruption, changes in soil quality, water and air pollution, greenhouse gas emissions, etc. (Butler and Laurance, 2009; Disdier *et al.*, 2013; Wilcove and Koh, 2010). Nevertheless, there are studies where these disadvantages are questioned (Tan *et al.*, 2013).

In April 2017 the European Parliament, concerned about the environmental and human rights problems that derive from palm oil plantations, proposed implementing a common certification system for all EU countries, in which only sustainably palm oil produced could be imported to the EU (European Parliament, 2017). At the same time, non-governmental agencies and the media emphasised the health and nutritional implications of palm oil use for human diet. The formation of some toxic compounds, such as esters of 3- and 2-monochloropropane-1,2-diol (MCPD) and glycidyl esters (susceptible to be carcinogens) during palm oil refining (AECOSAN, 2017) has also been reported. These health issues have triggered alerts among consumers, which have led major distribution companies to urge their suppliers to replace palm oil with other fat types.

This is the state of the art of problems related with the production and use of palm oil, but are consumers aware of these problems? Do they know the large amount of processed foods that contain palm oil as an ingredient? What is their perception of using palm oil? Different studies on consumers' opinions about palm oil have been recently published (Aguiar *et al.*, 2018; Sodano *et al.*, 2018). A study carried out in the UK showed that consumers negatively perceive the effect of palm oil cultivation on the environment and sustainable development of producing areas, but would not stop purchasing products with palm oil (Aguiar *et al.*, 2018). While Sodano *et al.* (2018) showed that Italian consumers are concerned mainly about the negative consequences on their health and the environment, and are less aware of the social consequences. Riganelli and Marchini (2017) stated that palm oil certification and replacement have a positive impact on consumer demand. Could this different perception be influenced by the information that consumers receive? Is this perception the same in palm oil-importing and -producing countries? There are no studies about the influence of the media on consumers' perceptions of palm oil, or on the differences between importing and producing countries.

Thus, the objectives of this work were to: carry out a study on media information about palm oil in Spain and Peru; determine the presence of palm oil in food products; and conduct a cross-country comparison of consumers' perceptions of palm oil in Spain (importing country) and Peru (producing country).

2. Materials and methods

Pilot qualitative study on media information about palm oil in Spain and Peru

A search for information about the environmental, labour and health aspects related to palm oil that have appeared in the main online mass media in Spain and Peru was carried out. Information published by several governmental agencies (European Food Safety Authority (EFSA), Spanish Agency for Consumer Affairs, Food Safety and Nutrition (AECOSAN), Peruvian Ministry of Agriculture and Irrigation (MINAGRI) and Directorate-General for Health), was also considered.

Study of the presence of palm oil in food products

The presence of palm oil in food products was determined by a market study. According to European Regulation No. 1169/2011, it is mandatory to specify the type of vegetable oil or fat contained in products on food labels. This fact could influence the growing interest of consumers and companies in the presence of palm oil in food products. However, the Peruvian Technical Standard for the Labelling of Packaged Foods (NTP 209.038: 2009) only requires the origin of oil (if "vegetable" or "animal"), but not its botanical origin, to be included on the list of ingredients. Thus as detection of palm oil in Peruvian food products based on labelling information was not possible, this part of the study was conducted only in Spain.

The study was carried out on the internet and in several supermarkets in April and May 2017 by checking the presence of palm oil on food labels, considering its possible denominations (palm olein, shortening palm, palm kernel oil, vegetable fat (palm), *Elaeis guineensis*, etc.).

Survey design and target respondents

A comparative study about consumers' perception of palm oil was carried out in Spain (importing country) and Peru (producing country). For this purpose, the survey was designed to collect individual information and consumers' perceptions of palm oil (Figure 1). The first part of the survey collected personal data. The second part included seven questions whose main objective was to determine consumers' opinions about palm oil as an ingredient in food products and to compare it with other oils/fats. The survey was conducted in May and June 2017 in both Spain and Peru. In all, 508 random consumers were surveyed: 338 in Spain and 170 in Peru. The consumers who participated in the study were randomly chosen at the universities and in the streets of both countries, and surveys were conducted face-to-face.

Statistical analysis

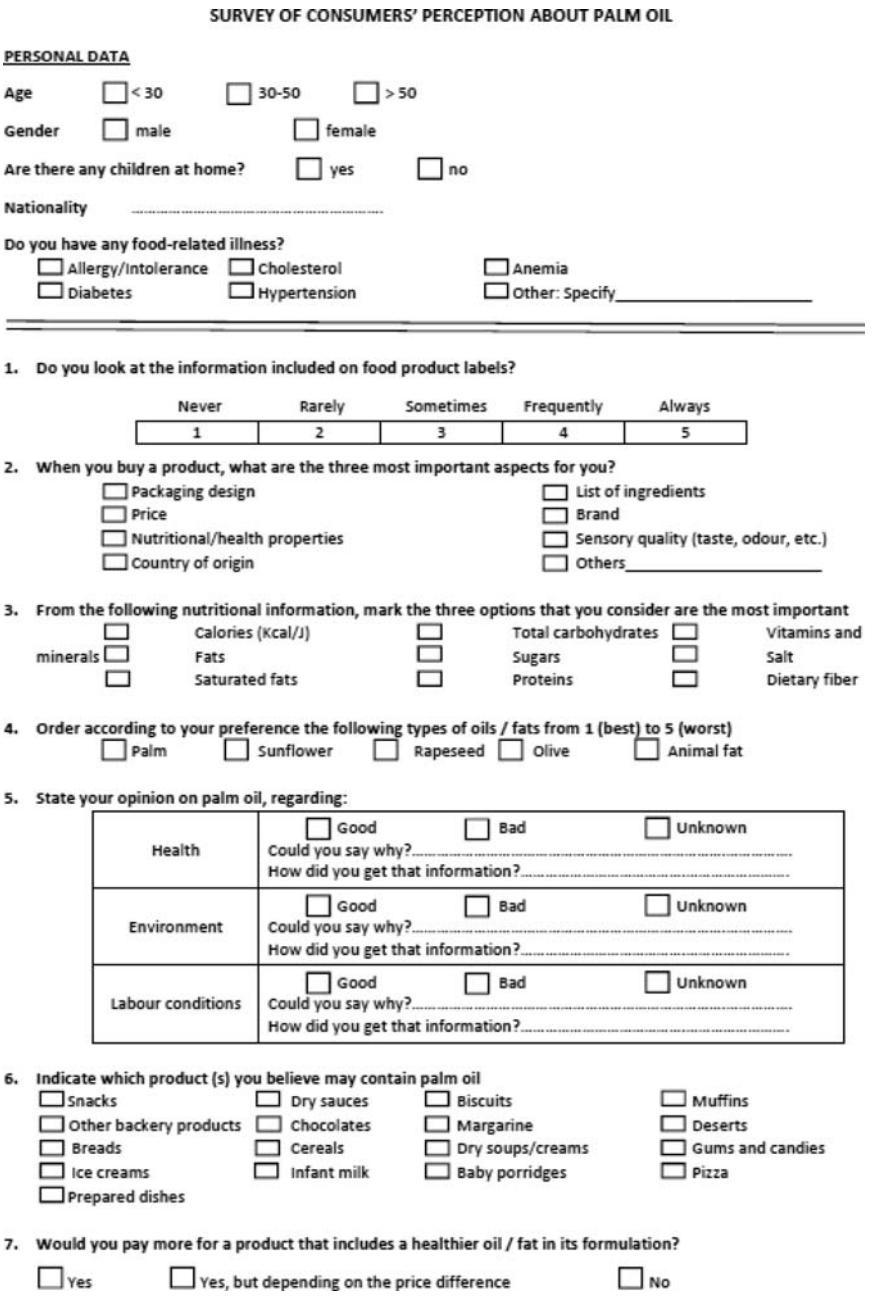
Differences between both country groups relating to age, gender, family structure and food-related illness as well as responses to Questions 1, 5 and 7 were tested by Pearson's χ^2 test. A p-value (against the null hypothesis of no difference) of less than 5 per cent was considered significant. These statistical data were processed with the Statgraphics Centurion X64 software (Statpoint Technologies, Inc., Warrenton, VA, USA).

A multiple correspondence analysis (MCA) was applied to analyse a dataset from the survey of consumer's perception of palm oil in Spain and Peru in order to identify the associations between the variable categories represented by different dimensions. MCA was performed with the version 18 of the PASW Statistics software.

3. Results and discussion

Pilot qualitative study on media information about palm oil in Spain and Peru

Information in Spanish media. Before 2016, only some news on the environmental problems that derive from palm oil cultivation, such as deforestation and its implication on wildlife and climate change, were published in Spain (El Mundo, 2006, 2010). In May 2016, EFSA published a Scientific Opinion, which stated that "glycerol-based process contaminants found in palm oil, but also in other vegetable oils, margarines and some processed foods, raise potential health concerns for average consumers of these foods and for high consumers in all age groups" (EFSA, 2016). EFSA assessed the public health risks of substances, glycidyl fatty acid esters (GE), 3-MCPD and 2-MCPD as well as their fatty acid esters, which might appear while refining vegetable oils at high temperature. The highest levels of GE, 3-MCPD and 2-MCPD (including esters) were found in palm oil



SURVEY OF CONSUMERS' PERCEPTION ABOUT PALM OIL

PERSONAL DATA

Age ☐ < 30 ☐ 30-50 ☐ > 50

Gender ☐ male ☐ female

Are there any children at home? ☐ yes ☐ no

Nationality .....

Do you have any food-related illness?

☐ Allergy/Intolerance ☐ Cholesterol ☐ Anemia
☐ Diabetes ☐ Hypertension ☐ Other: Specify_____

1. Do you look at the information included on food product labels?

Never	Rarely	Sometimes	Frequently	Always
1	2	3	4	5

2. When you buy a product, what are the three most important aspects for you?

☐ Packaging design ☐ List of ingredients
☐ Price ☐ Brand
☐ Nutritional/health properties ☐ Sensory quality (taste, odour, etc.)
☐ Country of origin ☐ Others_____

3. From the following nutritional information, mark the three options that you consider are the most important

☐ Calories (Kcal/J) ☐ Total carbohydrates ☐ Vitamins and minerals
☐ Fats ☐ Sugars ☐ Salt
☐ Saturated fats ☐ Proteins ☐ Dietary fiber

4. Order according to your preference the following types of oils / fats from 1 (best) to 5 (worst)

☐ Palm ☐ Sunflower ☐ Rapeseed ☐ Olive ☐ Animal fat

5. State your opinion on palm oil, regarding:

Health	☐ Good ☐ Bad ☐ Unknown Could you say why?..... How did you get that information?.....
Environment	☐ Good ☐ Bad ☐ Unknown Could you say why?..... How did you get that information?.....
Labour conditions	☐ Good ☐ Bad ☐ Unknown Could you say why?..... How did you get that information?.....

6. Indicate which product (s) you believe may contain palm oil

☐ Snacks ☐ Dry sauces ☐ Biscuits ☐ Muffins
☐ Other backery products ☐ Chocolates ☐ Margarine ☐ Deserts
☐ Breads ☐ Cereals ☐ Dry soups/creams ☐ Gums and candies
☐ Ice creams ☐ Infant milk ☐ Baby porridges ☐ Pizza
☐ Prepared dishes

7. Would you pay more for a product that includes a healthier oil / fat in its formulation?

☐ Yes ☐ Yes, but depending on the price difference ☐ No

Figure 1. Survey about consumers' perceptions of palm oil

and fat. Compound 3-MCPD was classified by the International Agency for Research on Cancer (IARC) as being possibly carcinogenic to humans (Group 2B), while glycidol and its glycidyl esters were classified by IARC as being probably carcinogenic to humans (Group 2A) (AECOSAN, 2017).

A report about exploiting children for palm oil production in Indonesia was published in late 2016 (El Mundo, 2016), but most of the news about palm oil were published between February and May 2017. In February 2017, an article on the low nutritional quality of palm oil and its possible relation with diseases, such as diabetes, obesity or coronary disease, was published. In this article, the deforestation problems in producing countries were also reported (EFE, 2017). In April 2017, two articles announced that an organic supermarket chain had stopped selling products that contained palm oil (El Mundo, 2017a, b). Accordingly, other supermarket chains considered to reduce the presence of palm oil in products and require producers to issue a sustainability certificate (Expansion, 2017; Portafolio, 2017).

Moreover, El Mundo (2017c, d) newspaper focused on the negative effects of palm oil composition on health. Other news (El País, 2017), emphasised the nutritional and environmental problems and the positions that the Administration takes as to its use in the food industry. As a result of this impact on the media, AECOSAN (2017) published an information note about palm oil, which referred to the palm oil's nutritional composition, health problems caused by its high saturated fat content, and also by the presence of the above-mentioned toxic compounds. In some EU countries, governments are working to improve the food composition of processed foods through the EU National Collaboration Plan for the Improvement of Foods and Beverages 2017–2020, which recommends substituting palm oil for other healthier oils (AECOSAN, 2017).

At the end of 2017, the French supermarket chain Système U announced the substitution of the so-called "controversial substances", including palm oil. The French supermarket chain Casino introduced a "palm oil-free" label on its own-brand products by claiming better nutritional quality. Similarly in Spain, representatives of main supermarket chains (Mercadona, DIA, Aldi and Carrefour) announced actions to eliminate palm oil from food products. This trend arrived in the UK in 2018, when the British supermarket chain Iceland announced its decision to eliminate palm oil from all its own-brand products by the end of 2018 (Palm Oil Today, 2018); however, it has continued to sell products containing palm oil (BBC, 2019). Since the first news appeared, only a few food brands have confirmed they have removed palm oil from their products. This is the case of palm oil-free chocolate spreads that appear in Spain (EconomíaDigital, 2018) and Belgium (*The Guardian*, 2019) as an alternative to the most well-known brand of sweetened hazelnut cocoa spread manufactured by an Italian company. In Spain, only a few chocolate and bakery companies have launched campaigns to announce the removal of palm oil.

Information in the Peruvian media. Before January 2017, all news published in Peru mentioned the benefits of palm oil production in economy and employment terms, and deforestation problems (El Comercio, 2016) and how this crop could contribute to small farmers' development (La República, 2014; Gestión, 2016).

The environmental problems (e.g. climate change) involved in palm oil production were first published at the end of 2016 (La República, 2016). Consequently, MINAGRI published the National Plan for the Sustainable Development of Palm Oil promoting its sustainable cultivation (MINAGRI, 2016).

In January 2017, two news items were published about the health problem that could result from consuming a brand of sweetened hazelnut cocoa spread manufactured by an Italian company, due to the presence of palm oil as an ingredient (La República, 2017; RPP, 2017).

As a result of this study, we conclude that there were differences in the information that population from both countries received. While the majority of information in the Spanish media was about the presence of saturated fatty acids in palm oil, along with its related environmental problems, in Peru the news focused on environmental problems. Peruvian news also focused on positive aspects of cultivating palm oil in terms of its profitability for both the economy and employment.

Study of the presence of palm oil in food products

The results of studying the presence of palm oil in packed foods performed in the Spanish market are included in Table I. Palm oil was found in all 257 products, of which 33.5 per cent corresponded to bread, biscuits and bakery products, and it was difficult to find a brand that did not include this ingredient. Finally, 7 per cent of the products that contained palm oil were infant foods.

The total fat and saturated fatty acid contents in the selected products were also collected. Fat content and saturated fatty acid content varied by as much as 17 and 19 per cent, respectively, in the same food product type (Table I). To evaluate if the presence of palm oil in the product revealed a higher percentage of saturated fats, a comparison of the percentage of saturated fats in two different product brands (croissants and potato chips) was made (data not shown). A difference as much as 4 per cent in saturated fats was found between the different croissant brands containing palm oil, but none was higher than the percentage in the product with no palm oil, whose fat source was butter. It is important to point out that the price of products not containing palm oil was 3-fold higher than the price of those with palm oil. With potato chips, one of the brands with palm oil had a similar saturated fat content to one of the brands with olive oil, with 4.1 and 4.7 per cent saturated fats, respectively. However, the other product with palm oil had a considerably higher saturated fat content (16.1 per cent) than the other products (range between 3.6 and 6.6 per cent saturated fats). These data demonstrate that the saturated fat content of a product does not necessarily correlate with the presence of palm oil, but is directly related to product formulation. In food products, palm oil is often used in combination with other fats and oils which, together, determine the fatty acid composition of the product.

Consumers' perception of palm oil

The profile of the 508 consumers who participated in this study is shown in Table II. Differences between both groups were tested with Pearson's χ^2 test. The groups did not significantly differ in gender and age terms. However, significant differences were found for "children at home" and "food-related illness"; 78 per cent of the Spanish respondents stated there were no children at home, while 43 per cent of the Peruvians indicated having children at home. It should be highlighted that 63 per cent of the Peruvians had at least one food-related illness compared to 19 per cent in Spain.

Regarding the population's opinion in both countries, the first question posed to the respondents was about their interest in the information included on food product labels. Significant differences ($p < 0.001$) were observed between both countries. Many Spanish consumers (56 per cent) stated they always, or almost always, read the information on food labels, which agrees with a study carried out on consumers' opinions about the labelling of food products in Spain (Benavent *et al.*, 2015). However, the majority (55 per cent) of the Peruvian group stated only sometimes looking at labels.

Figure 2(a) provides the results of the most important aspects that consumers considered when selecting food products (Q2). Price was the most valued aspect in both countries, which accounted for 78 per cent and 75 per cent of the Spanish and Peruvian respondents, respectively. The next most important items were nutritional/health properties (62 per cent) and list of ingredients (54 per cent) in Spain, and sensory quality (55 per cent) and brand (54 per cent) in Peru. This agrees with the above-mentioned results (Q1) obtained about the interest that consumers show in information on food labels.

Regarding the most relevant nutritional information for consumers (Q3), differences were observed between both countries (Figure 2(b)). Although calories were the most important item for all the respondents, in Spain 60 per cent of respondents chose this option compared with 80 per cent in Peru. The participants in Spain showed considerable interest in saturated fats and sugars, while Peruvians paid more attention to proteins, vitamins and minerals.

Category	No. products	Product	Brand	Fat (g/100 g)	Saturated fatty acids (g/100 g)
Bakery	9	Puff pastry	1 M	17.6–26.6	8.47–12.18
	3	Doughnuts	1 R	20–30	7.9–20
	3	Sweet rolls	1 M, 1 R	14–30	3.5–11
	2	Stuffed rolls	1 M, 1 R	12–22	10–15
	2	Croissants	2 M	27–29	15.1–18
	2	Waffle	1 M	15–16	5.8–6.8
	1	Choux pastry	1 R	26	16
	6	Muffins	1 M	23–26	4.3–5.2
	6	Filled croissants	2 M	21–23	5.73–9.7
	4	Palmier	1 R	37	24
	8	Cakes and pies	5 M, 1 R	11.0–30.1	5–13
Biscuits	17	Biscuits and cookies	8 M, 1 R	9–28	3.5–23.1
	6	Wafers	3 M, 1 R	23–30	10–20
Breads	4	Brioche	2 M, 1 R	7.3–16	3.9–9.1
	1	Gluten-free breadcrumbs	1 M	14	5.8
	2	Crackers	2 M	12.8–13.2	5.2–5.9
	6	Toasted bread	1 M, 1 R	8.9–30	2.1–5.2
	4	Bread sticks, croutons	1 M, 1 R	31–42.35	12–20.9
Cereals	8	Cereals bars	1 M, 1 R	4.5–16	2.8–10
Chocolates	5	Chocolates	3 M	34.5–39.3	17–24.3
	1	Chocolate covered cereals	1 R	24.4	15.3
	2	Wafer chocolate bars	1 M	23.8–25	17.1–18
	2	Chocolate covered nuts	1 R	33.1–33.3	13.9–14.1
	7	Chocolate bar	3 M, 1 R	27.9–35.9	14.4–22.6
	2	Chocolate with cookies	1 R	24–30	15–24
Margarines	8	Margarine	5 M, 1 R	21.9–33.0	7.9–12
Snacks	2	Potato chips	1 M, 1 R	9.5–35.2	4.1–16.1
	4	Corn chips	2 M, 2 R	21–36.5	6.5–18
	2	Tortilla chips	2 R	20–23.4	9–9.9
	8	Microwave popcorn	1 M, 3 R	8–26.7	7–13.8
Infant products	1	Liquid infant milk	1 M	3.2	1.5
	8	Powdered infant milk	3 M	9.5–27.7	3.9–11.9
	2	Milk–based infant formula	1 M	3.1–3.6	0.8–3.6
	6	Baby porridge	2 M	2.6–2.9	1–1.4
	1	Custard	1 M	2.8	1.8
Candies	2	Fruit juice gummy candies gluten free	1 M	5–6.6	2.8–3.9
Deserts	1	Fondant	1 M	5.5	3.8
Ice creams	1	Ice cream mix	1 M	6.1	–
	12	Ice cream	1 M, 2 R	8.8–12	4.3–7
	4	Ice cream bars	1 M, 2 R	19–24.6	10.3–16
	5	Ice cream sandwich	2 M, 1 R	4.9–19.8	2.7–14.1
	10	Ice cream cones	2 M, 2 R	9.7–18	8.1–13
Dry sauces and seasonings	10	Sauces	2 M, 2 R	27.1–9.9	5–5.5
	10	Seasonings	3 M	32–3.9	12.8–2.7
Dehydrated pasta	7	Noodles	3 M	2.9–20.8	2.1–8.7
	4	Dried pasta and sauce	2 M	6–22.1	3–11
Pizzas and doughs	1	Chilled pizza crust	1 R	7.4	2.4
	3	Pie dough	1 R	15.3–19.5	7.5–9.1
	3	Frozen pizza crust	1 R	7.3–9.4	3.1–4.3
	2	Chilled quiche	1 R	13.6–15.4	6.2–15.4
Prepared dishes	2	Wonton soup	1 M	0.4–0.6	0.1

Table I.
Presence of palm oil in packed foods in the Spanish market

(*continued*)

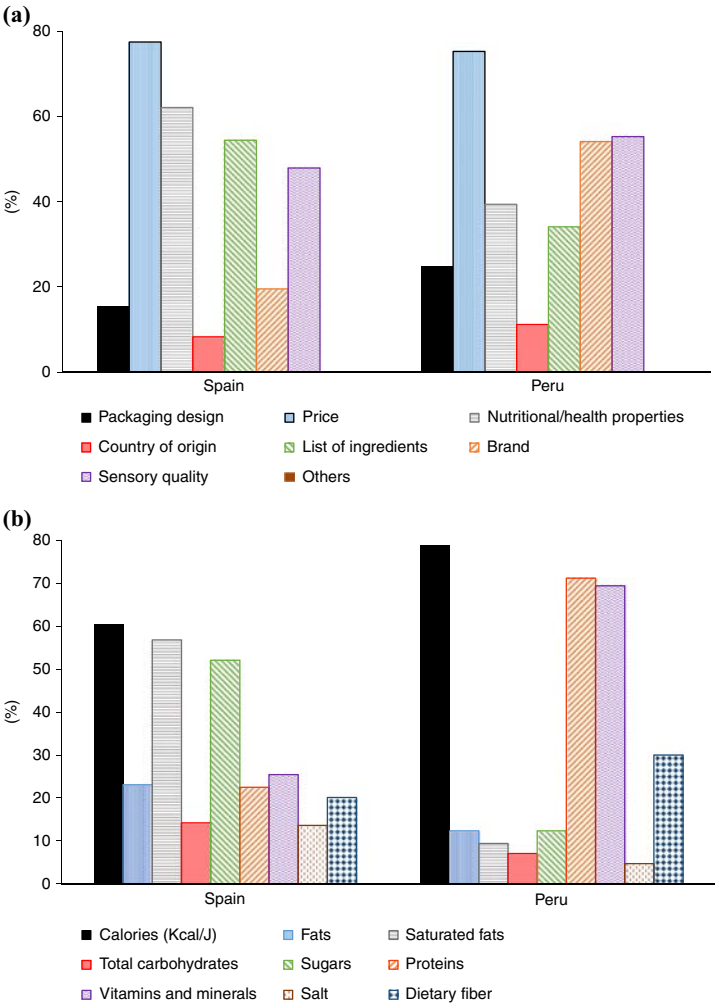
Category	No. products	Product	Brand	Fat (g/100 g)	Saturated fatty acids (g/100 g)
	2	Fried potatoes and sauce	1 R	12	1.4
	3	Sandwiches	1 R	9 –18	2.7–8
Soups and creams	9	Stock cubes	5 M, 1 R	5.7–20	3.52–14.1
	1	Dry mushroom cream	1 R	9.8	6.6
	1	Flake–form instant mashed potatoes	1 M	0.6	0.4
	9	Dry soups	1 R	2.5–13.6	1.4–4.9

Notes: M, manufacturer's brand; R, retailer brand

Table I.

	Spain (%)	Peru (%)	χ^2 test p-value
Age			
< 30	40.24	43.53	
30–50	56.21	49.41	0.122
> 50	3.55	7.06	
Gender			
Male	39.64	39.41	0.96
Female	60.36	60.59	
Children at home			
No	78.69	42.94	< 0.001
Yes	21.31	57.06	
Food-related illness			
1 illness	17.75	61.76	
> 1 illness	1.18	1.18	< 0.001
Any illness	81.07	37.06	
Q1 (Look the labels)			
Never/almost never	12.43	18.82	
Sometimes	31.36	55.29	< 0.001
Always/almost always	56.21	25.88	
Q5 (Health)			
Unknown	25.44	25.29	
Bad	65.09	31.76	< 0.001
Good	9.47	42.94	
Q5(Environment)			
Unknown	33.73	37.06	
Bad	62.13	40	< 0.001
Good	4.14	22.94	
Q5 (Labour condition)			
Unknown	64.5	65.29	
Bad	30.18	12.94	< 0.001
Good	5.33	21.76	
Q7 (Pay more)			
No	4.14	33.53	
Yes, depending on price	43.2	45.88	< 0.001
Yes	52.66	20.59	

Table II.
Comparison of the profile of the 508 consumers (338 Spanish and 170 Peruvians) who participated in this study as well as in the responses to questions Q1, Q5 and Q7



Notes: (a) Percentage of responses to Q2 "When you buy a product, what are the three most important aspects for you?" in each category; (b) percentage of responses to Q3 "From the following nutritional information, mark the three options that you consider are the most important" in each category

Figure 2.
XXXX

Q5

In both countries, salt content was the least valued parameter despite excessive salt intake being harmful for health.

When the respondents were asked to order the five oils/fats according to their quality, all the consumers agreed that olive oil was the best choice, followed by sunflower oil. In Spain, 98 per cent of the respondents selected olive oil, unlike 75 per cent of the Peruvians. This could be due to Spain being a major olive oil-producing and -consuming country.

It is important to highlight the different perceptions of palm oil in both countries. In Spain, palm oil was ranked as the worst (39 per cent), followed by animal fat (30 per cent), while the worst oil/fat was animal fat for Peruvians (74 per cent). In Peru, only 3 per cent of

the respondents considered palm oil to be the worst. These results agree with the previous discussion about the news made available to consumers in both countries: while Spanish news focused on the unhealthy properties of palm oil, in Peru they centred on the impact that cultivating oil palm had on the environment, but also on Peruvians' economy and employment. It is also noteworthy that virgin palm oil is commonly used in Peru as cooking oil, which could be another main reason why Peruvians did not perceive this oil as an unhealthy product.

As for the respondents' perception of the effect that palm oil had on their health and the environment, significant differences in the responses from both countries were evidenced ($p < 0.001$) (Table II). In Spain, most of the participants (> 60 per cent) believed that palm oil was negative for their health and the environment; in Peru, 32 per cent considered palm oil to be unhealthy. Only 40 per cent of Peruvian participants perceived it as harmful for the environment, unlike the ca. 65 per cent of the Spanish. For both countries, ca. 40 per cent of the respondents stated that they are unaware of the effects that palm oil had on the environment. In both countries, 65 per cent of the participants did not know the effect that palm oil had on labour conditions. For the remaining percentage, significant differences ($p < 0.001$) were found between the Spanish (30 per cent considered labour conditions to be bad and only 5 per cent to be good) and Peruvian respondents (13 per cent selected "bad" and 22 per cent "good"). According to Aguiar *et al.* (2018), producing countries perceive the palm oil industry to positively affect local people's lives and economic development. This falls in line with the news in Peru, which could be the reason why Peruvian consumers better perceive palm oil.

The participants indicated that they had received information about palm oil through online articles and other publications, social networks, blogs and news in the written press. The obtained results once again evidence the huge impact that the media have on consumers' perceptions. The increasing concern about healthy diet aspects shown by the Spanish population in recent years could explain why most consumers are informed about the negative nutritional properties of palm oil, but most were unaware of the reasons that led them to make such a statement. The rest indicated that it was due to its high saturated fat content, but no-one mentioned anything about the toxic compounds that derive from palm oil production.

Scarce information about the effect of palm oil on health has been published in Peru. The Peruvian consumers who answered that palm oil was good for health argued that this was due to the presence of omega 3 and because it is an "essential oil". These answers demonstrate that they are misinformed about palm oil.

In order to check if consumers were aware about the products that could include palm oil in their formulations, they were asked to indicate them from a list of 17 products or groups of products that could contain palm oil. In Spain, the "other bakery products" group (any bakery product, save biscuits and muffins, which were separately evaluated), followed by snacks and biscuits (80, 79 and 70 per cent, respectively), were the products that consumers associated the most with the presence of palm oil, and infant milk and baby porridges were the two least selected products (Figure 3). These data fall in line with the results obtained in the previous section (see Table I), which showed that palm oil is present more in bakery products. In Peru, biscuits, margarine and snacks were the most selected products (51, 43 and 41 per cent, respectively), and ice creams, infant milk and baby porridges were the products least linked to palm oil. As mentioned above, information on the specific fat/oil origin does not appear on the labels of the food products marketed in Peru. Therefore, Peruvian consumers cannot identify which product formulations contain palm oil.

Significant differences in price were found between both countries ($p < 0.001$) (Table II). The results indicated that 52 and 20 per cent of the respondents in Spain and Peru, respectively, would be willing to pay more for healthier oils/fats in food formulations;

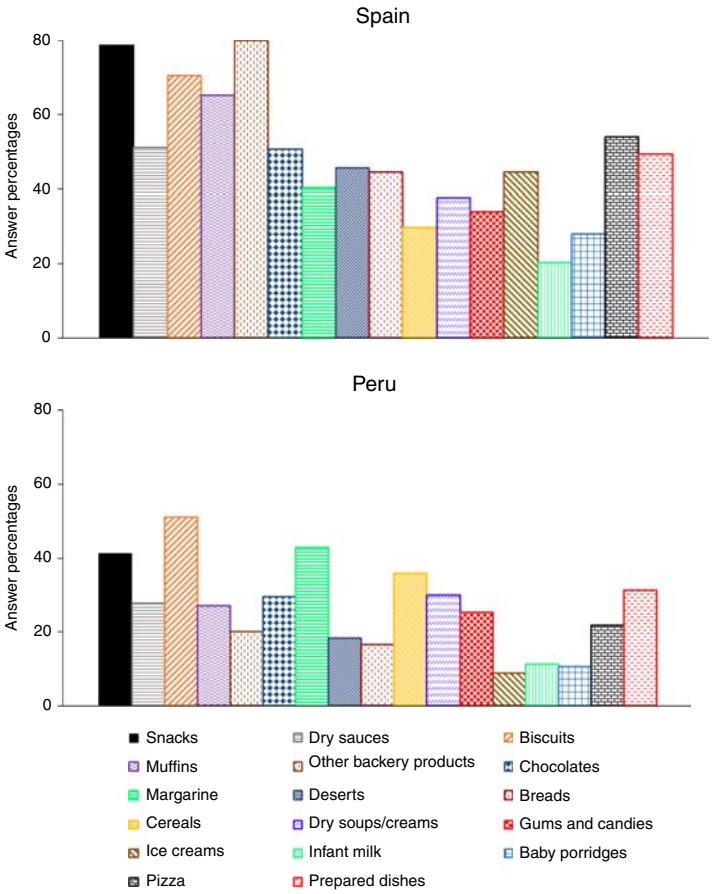


Figure 3.
Identification of the products containing palm oil (Q6)

33 per cent of Peruvians would not pay more, compared to the 4 per cent of Spanish. These data highlight the growing concern among Spanish consumers about a healthy diet, even though this would involve higher household expenditure on food. This result agrees with other studies which have shown that healthy eating is a growing concern in countries like Spain (Díaz-Méndez, 2014). The differences found between Peru and Spain could be due to other aspects, such as purchasing power or food availability, which were not considered in this study.

Multiple correspondence analysis

A MCA was performed in order to analyse the possible relationships linking the following categorical variables: country; palm oil preference; olive oil preference; effect of palm oil on health; effect of palm oil on the environment; and effect of palm oil on labour conditions.

From the MCA analysis, a one-dimension solution was considered the most adequate with a Cronbach's α of 0.765 when considering the criterion of an accepted lower limit for a Cronbach's α of 0.70 (Johnson and Wichern, 2007). The joint plot of categories points is represented in Figure 4. In order to facilitate the interpretation, the results are presented in a two-dimensional chart, even though the analysis was based only on the first dimension.

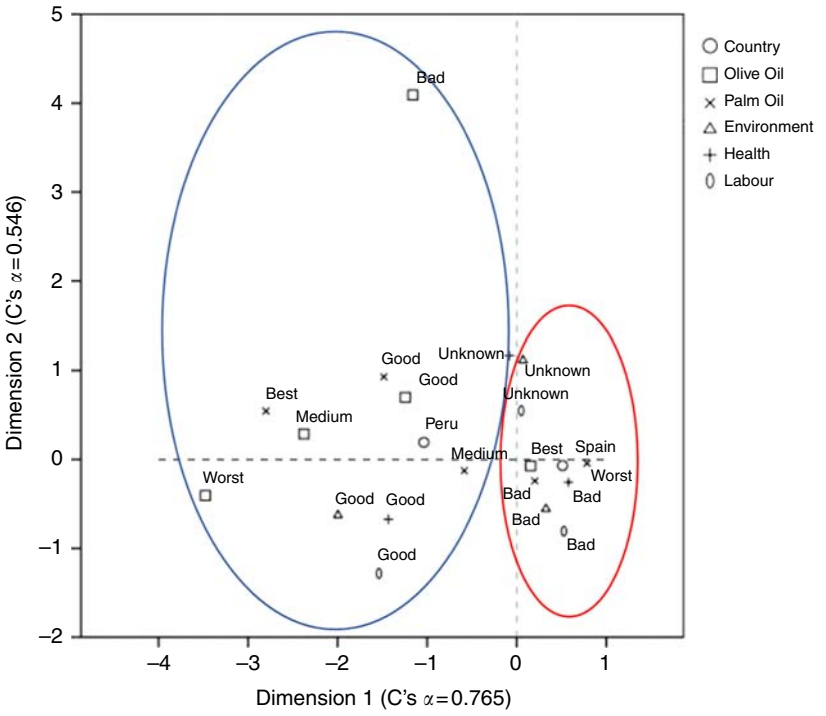


Figure 4.
MCA plot showing the joint distribution of the categories in Dimensions 1 and 2

As seen in Figure 4, Dimension 1 distinguishes two consumer patterns. The first pattern (the categories included in the circle on the right) is characterised by Spanish people with a high preference (best) for olive oil and a low preference (bad and worst) for palm oil. Indeed Spanish consumers consider that palm oil badly affects their health, labour conditions and the environment. The second pattern (the categories included in the circle on the left) is defined principally by Peruvian consumers with a medium-high preference for palm oil (best, good and medium), a heterogeneous preference for olive oil (worst, bad, medium and good) and consumers who consider that palm oil has a good effect on their health, labour conditions and the environment. Food companies should take into account this general public opinion, if they want to maintain or increase their market share. The use of Roundtable on Sustainable Palm Oil (RSPO) certification could be a good option as well as replacing the palm oil with other fat types, as mentioned above.

4. Conclusions

Palm oil is included in the formulations of many different food products. A clear difference exists in the perception of the consumers surveyed in Spain and Peru, which is due mainly to differences in the news issued about the production problems and composition (saturated fats) of palm oil. In Spain, much more interest is shown in the information on food labels and the nutritional properties of foods. The Spanish are more concerned about the amount of saturated fat and sugar contents in food, while the Peruvians seem more interested in protein, vitamin and mineral contents. Regarding consumers' oil preferences, both countries consider olive oil the best oil type, but they do not agree about the worst oil type, which is palm oil for Spain and animal fat for Peru. Most Spanish respondents perceive palm oil as

being bad for both their health and the environment, while the highest percentage of the surveyed Peruvians consider it is good for their health and bad for the environment. The Peruvians' results demonstrate that Peruvian consumers are still unaware of the health problems that can stem from the widespread use of this oil type. This study confirms that the food industry should continue to make efforts to reduce or replace palm oil in foods destined to the Spanish population as the majority of consumers in Spain are convinced that palm oil negatively affects their health and the environment. Another interesting option for companies is to use certified sustainable palm oil in food products.

These findings show the real scenario of the palm oil in the market to policymakers, who could establish new actions to encourage the sustainability commitment of private food companies, promoting the use of RSPO.

The results provided herein entail that the industry can establish appropriate marketing strategies and that administrations are aware of the real knowledge that consumers have to launch campaigns that focus on explaining any misunderstandings, and in such a way that consumers can choose food products based on objective information.

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Corresponding author
Maria Jesus Lerma-Garcia can be contacted at: malerga1@tal.upv.es