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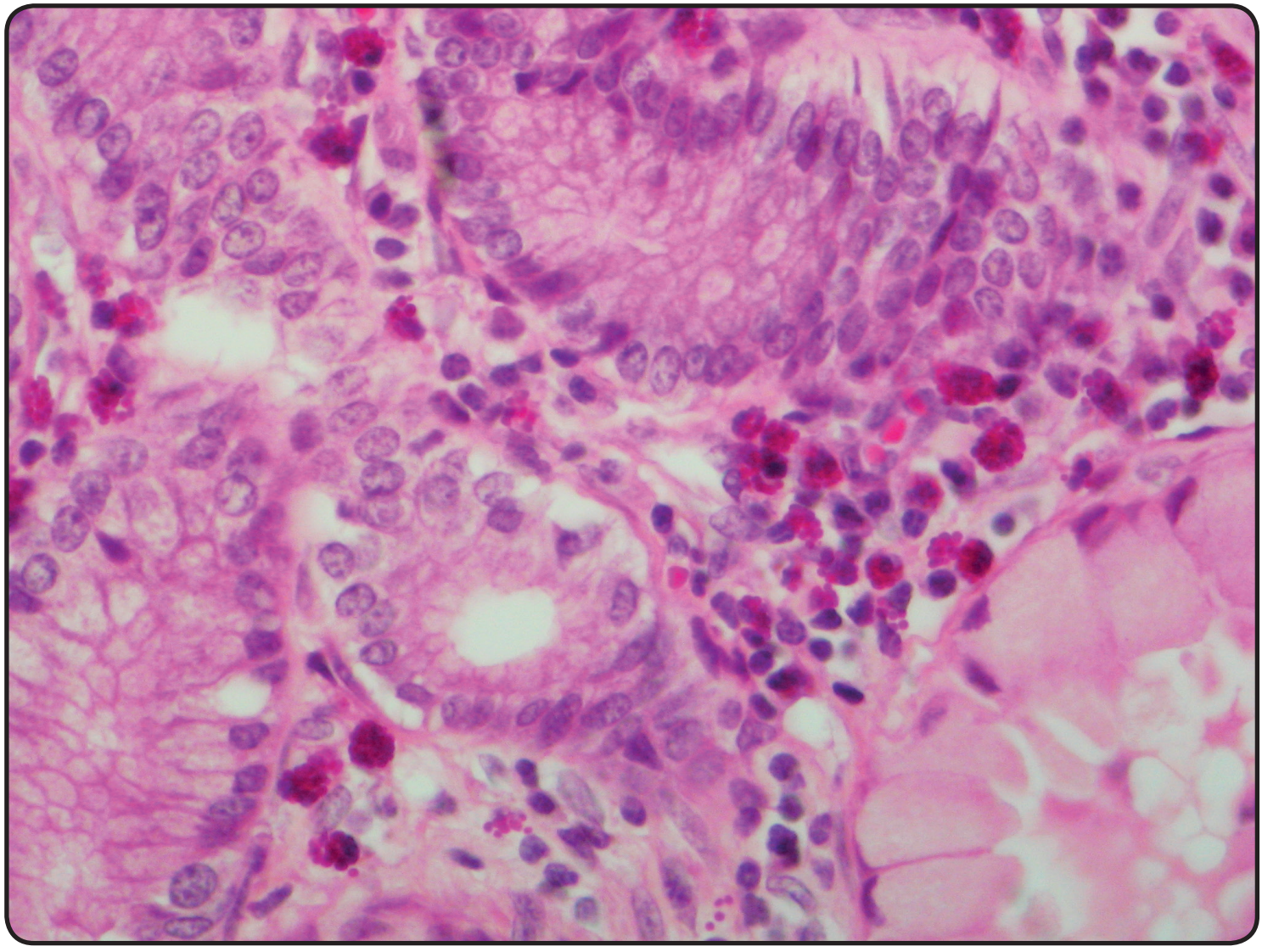

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ATTRIBUTES THAT DEFINE PREFERENCES FOR CHEESE IN SOUTHERN CHILE: DO CONSUMERS VALUE INFORMATION ABOUT THE CARBON FOOTPRINT?

ATRIBUTOS QUE DEFINEN LAS PREFERENCIAS HACIA EL QUESO EN EL SUR DE CHILE: ¿LOS CONSUMIDORES VALORAN LA INFORMACIÓN SOBRE LA HUELLA DE CARBONO?

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ABSTRACT

Considering the negative contribution of the food sector to climate change, a survey was conducted with 400 people in Temuco (Araucanía Region, Chile) to distinguish the preferences for different types of cheese, with different Countries of origin, information about the carbon footprint, packaging, presentations and prices in supermarkets in Temuco. Consumer segments were also distinguished in relation to their aforementioned preferences and characteristics. Using a conjoint analysis it was determined that the type of cheese was more important than origin, packaging, price, presentation, and the information about the carbon footprint. Consumers preferred Chilean cheese and cheese imported from Holland, unpackaged, in slices, at the highest price, with no information about the carbon footprint. A hierarchical cluster analysis identified four market segments: "consumers sensitive to the type of cheese" (Group 1, 22.2%), "consumers sensitive to packaging and Country of origin, who prefer the product with information about the CF" (Group 2, 22.2%), "consumers sensitive to the origin, presentation and type of cheese" (Group 3, 37.3%) and "consumers sensitive to the Country of origin" (Group 4, 18.3%). The segments differed in their degree of satisfaction with food-related life, frequency of purchase of imported food, frequency of cheese consumption, monthly expenditure on food and socioeconomic level. In Temuco, almost 80% of the sample did not yet value having information about the carbon footprint regarding food of animal origin, such as cheese.

Key words: Greenhouse gases; climate change; labels; subjective well-being.

RESUMEN

Considerando la contribución negativa del sector alimentario al cambio climático, se realizó una encuesta a 400 personas en la ciudad de Temuco (Región de La Araucanía, Chile), para evaluar las preferencias hacia diferentes tipos de queso, con diferente país de origen, información de la huella de carbono, envases, presentaciones y precios en supermercados de Temuco, y se diferenciaron segmentos de mercado según sus preferencias y características. Utilizando análisis conjunto se determinó que el tipo de queso fue más importante que el origen, el envase, el precio, la presentación y que la información sobre la huella de carbono. Los consumidores prefirieron el queso chileno e importado desde Holanda, a granel, laminado, al precio más alto y sin información respecto a la huella de carbono. Mediante análisis de conglomerados jerárquicos se distinguieron cuatro segmentos de mercado: "consumidores sensibles al tipo de queso" (Grupo 1; 22,2%), "consumidores sensibles al envase y país de origen, que prefieren el producto con información de la huella de carbono" (Grupo 2; 22,2%), "consumidores sensibles al origen, presentación y tipo de queso" (Grupo 3; 37,3%) y "consumidores sensibles al país de origen" (Grupo 4; 18,3%). Los segmentos difirieron en su nivel de satisfacción con la alimentación, frecuencia de compra de alimentos importados, frecuencia de consumo de queso, gasto mensual en alimentos y nivel socioeconómico. En Temuco, cerca del 80% de la muestra no valoró contar con información referida a la huella de carbono en un alimento de origen animal, como el queso.

Palabras clave: Gases efecto invernadero; cambio climático; etiquetas; bienestar subjetivo.

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INTRODUCTION

Over the last decade, anthropogenic greenhouse gas (GHG) emissions have come to be accepted as the main cause of climate change [29]. The outcome of these calculations is the carbon footprint (CF), which reports the total amount of GHGs emissions caused directly and indirectly by an activity or accumulated over the life stages of a product [31]. Emissions of GHGs arise mainly from the combustion of fossil fuels in energy and transport sectors. However, the food sector has been identified as another major contributor to anthropogenic climate change [5, 20]. On a global scale, agriculture contributes an estimated 17-35% of all GHG emissions, while livestock production alone is estimated to contribute approximately 18-22% of global GHG emissions [20]. Various studies have endeavored to measure GHG emissions in different types of meat [3, 22] and milk [3]. GHG emissions from the food processing industry have recently been estimated and intensity indicators calculated to follow year-on-year efficiency improvements within the food industries such as dairy [29], among others. Vergé et al. [29] estimated the CF of eleven Canadian dairy products, and those with a significantly heavier CF were cheese, butter and milk powder.

Reflecting a growing concern for the fight against the threat of global warming, the term ‘‘carbon footprint’’ has come into wide use across media, governments and the business world. Indication of a product’s CF on its label is expected to help consumers to be aware of how their choice of product or service affects the emission of greenhouse gases, and ultimately to help consumers to contribute in the fight against global warming through product selection [5, 16, 20]. Dietary-related consumer choices can influence environmental impact [3]. However, the effectiveness of CF information, or how consumers behave upon recognizing the CF of a product as indicated on its food package label, remains unclear [16]. This is due to the fact that very few studies have evaluated consumer acceptance and, furthermore, they have only been conducted in developed Countries like the United Kingdom [10, 12, 15, 27], Japan [12, 16], United States [21], and Finland [17]. All studies concluded that there is good consumer acceptance for CF labeling and for products with a lighter CF. However, at the same time, they indicate that, to this date, there is not one deciding factor in the choice to purchase these foods due to consumers’ lack of knowledge on the subject [16, 17], among other things.

In Latin America, a series of initiatives are in progress to quantify the CF. Both local and multinational companies based in Latin America have implemented ways to measure their CF, even, in certain cases, to achieve reduction and compensation processes to be “carbon neutral” [8]. Despite these initiatives, the attitude of the Latin American consumer, and specifically the Chilean consumer, regarding the CF is still unknown. The relevance of climate change for society seems indisputable: scientific evidence points to a significant human contribution in causing climate change, and to effects that will increasingly affect human welfare [30]. However, present-day society is characterized by a growing awareness of the role played by food in improving consumers’ well-being. Recent studies have concluded that food is among the important domains of life that affect the subjective well-being of individuals [11]. It has been reported that there is a relation between satisfaction with food-related life and preferences for foods with different attributes [24, 25]. Therefore, it is expected that the importance assigned to information about the CF will differ according to one’s satisfaction with food-related life.

Against this background, the aims of this study were: to evaluate the importance of CF information in the decision to purchase food of animal origin relative to the other attributes, and to distinguish consumer segments in relation to their preferences, food-purchasing habits, socio-demographic characteristics and degree of satisfaction with food-related life. For this first approach to consumer preferences in Latin America and Chile, the city of Temuco (Region of the Araucanía) was used as a case study. Given the heavy CF of cheese compared to other dairy products [29] and the increasing consumption of this food in Chile [7], the study focused on this product.

MATERIALS AND METHODS

Survey

A personal survey was administered in Temuco to a sample of 400 consumers over 18 years of age responsible for the purchase of food for their household. The number of respondents was obtained using the simple random sampling formula for nonfinite populations (N > 100,000; Temuco: 245,347 inhabitants according to the 2002 census), considering 95% confidence and 5% estimation error with p and q values of 0.5 [9]. The questionnaire used contained closed questions to determine if the respondent had ever received information about the CF and whether they understood its meaning. Then, questions were asked about knowledge of the origin of foodstuffs, monthly expenditure on food, and purchasing frequency of imported foods. For respondents with a high purchasing frequency (always or almost always), the reasons for their preference were asked, and in the opposite case (low purchasing frequency: almost never or never), the reasons for rejection. The weekly frequency of cheese consumption at home was also enquired.

The questionnaire included the SWFL (Satisfaction with Food-related Life) scale. SWFL was proposed and tested by Grunert et al. [11] in eight European Countries (Cronbach’s α: 0.81-0.85); the five items on the scale are grouped in a single dimension: 1. Food and meals are positive elements, 2. I am generally pleased with my food, 3. My life in relation to food and meals is close to ideal, 4. With regard to food, the conditions of my life are excellent, 5. Food and meals give me satisfaction in daily life. The respondents were asked to indicate their degree of agreement with these statements using a 6-level Likert scale (where 1: disagree completely and 6: agree completely). Based on sum scores of the scale, the distribution of the answers over four scale categories

for satisfaction with food-related life were obtained (dissatisfied, somewhat satisfied, satisfied and extremely satisfied). These categories represent the respondents' degree of satisfaction with food-related life. In this study, the Spanish-language version of the SWFL was used, which has shown good levels of internal consistency (Cronbach's α: 0.82-0.88) in previous studies in Chile [24, 25]. In this study, the SWFL presented good levels of internal consistency (Cronbach's α: 0. 85) with a single factor with 64.1% of the explained variance.

These classification questions were included: gender, age, size of family group, area of residence, occupation and studies of the head of the household, and the possession of ten domestic goods. These two last variables help determine the socioeconomic group, which was classified as ABC1 (high and middle-high), C2 (middle-middle), C3 (lower-middle), D (low) and E (very low) [1]. The survey was applied in three supermarkets in Temuco between October and November of 2011 after the questionnaire had been validated by means of a preliminary test with 10% of the sample.

Statistical analysis

A conjoint analysis (CA) was employed to determine the acceptance of cheese with and without information about the CF. A CA is a decompositional method that allows estimating the relative importance of the attributes of a product and the part worth utility values for each level of an attribute. The estimated part worth utility indicates how influential each level of an attribute is in the formation of consumer preferences for a particular combination, i.e., the degree of preference for each level of an attribute [13]. TABLE I shows the attributes and levels defined in the study. In general, attributes were chosen by considering those most commonly seen in supermarkets (type of cheese, packaging, presentation and, price). Country of origin was included as an attribute due to the important increase in cheese imports from 5,750 in 2004 to 18,374 tons in 2012 [7]. Another reason to include origin as an attribute is that transport can be one of the major sources of GHG emissions in any supply chain [15], increasing the CF depending on the distance of the product's Country of origin and the type of transport used [14]. The levels of this attribute included Argentina, because it was the main Country of origin for imported cheese in Chile between 2004 and 2012 [7]. Although consumers normally prefer foods produced in their home country [2, 23] or imported from Countries nearby or with a similar culture [6], New Zealand and Holland were included as levels of this attribute in order to verify the results of the aforementioned studies. For the attribute "information about the carbon footprint" the levels were defined as "without information" and "with information" (compensate for the CF), because studies conducted in developed countries reveal difficulties in public understanding of carbon label information and a preference for simplified labels [27].

TABLE I
DESIGN OF THE CONJOINT EXPERIMENT

Card	Type of cheese	Country of origin	Packaging	Presentation	Information about the carbon footprint	Price (US$ 250 g-1)
A	Mantecoso	Holland	Packaged	Block	Without information	3.0
B	Gouda	New Zealand	Unpackaged	Block	With information	3.5
C	Gouda	Argentina	Unpackaged	Slice	Without information	2.7
D	Chanco	New Zealand	Unpackaged	Slice	With information	3.0
E	Mantecoso	Chile	Unpackaged	Slice	Without information	3.0
F	Chanco	Argentina	Packaged	Block	With information	3.5
G	Mantecoso	Argentina	Packaged	Slice	With information	3.0
H	Gouda	Holland	Packaged	Slice	With information	2.7
I	Chanco	Holland	Unpackaged	Slice	Without information	2.7
J	Mantecoso	New Zealand	Unpackaged	Block	With information	2.7
K	Gouda	Chile	Packaged	Block	Without information	3.0
L	Chanco	Chile	Unpackaged	Block	With information	3.5

The national currency values (Chilean pesos) were converted to dollars using the average 2012 value ($486.49/US$).

The price levels were established based on current prices in the Temuco market for 250 g of cheese at the time of the survey. From these attributes and levels, a total of 288 combinations (3 x 4 x 2 x 2 x 2 x 3) were obtained; however, to facilitate the respondents' answers, it was decided that a fractional factorial design would be used, obtained with the macro MktEx from the SAS Institute [19]. This allowed the number of stimuli to be reduced to twelve with one specification for each attribute. Each respondent ordered the cards with the combination of attributes from most to least preferred, on a scale of 1 to 12 (1: most preferred; 12: least preferred). Prior to asking the respondents to put the cards in order, the following definition was read to them: "the carbon footprint reports the total amount of greenhouse gas emissions caused directly and indirectly by an activity or accumulated over the life stages of a product. Anthropogenic greenhouse gas emissions have come to be accepted as the

main cause of climate change. Emissions of greenhouse gas arise mainly from the combustion of fossil fuels in the energy and transport sectors. However, the food sector has been identified as another major contributor to anthropogenic climate change. The carbon footprint can be minimized by reducing direct and indirect greenhouse gas emissions. Although it is impossible not to emit greenhouse gases, the resulting minimum can be compensated for through mechanisms that "erase" their effect on the CF so that the end result is neutral, negative or positive".

Conjoint analysis was carried out by means of the TRANSREG procedure of SAS 9.3 (SAS Institute Inc., Cary, NC, USA). The relative importance that consumers gave to the different attributes and the utility values obtained for each level of the selected factors were determined. The Root Mean Square Error (RMSE) was calculated to measure the difference between the observed and the predicted data. In addition, the market share of the products was simulated. A RMSE value = 0 indicates perfect fit, thus, the lower the RMSE value, the better the fit of the model. In addition, the market share simulation was carried out using the maximum utility model [19]. A hierarchical cluster analysis was chosen to determine consumer segments according to the partial utility scores of the levels of the attributes. Ward's procedure, which calculates the squared Euclidean distance, was carried out with the SAS CLUSTER procedure. The number of clusters was taken on the basis of the R^2 obtained and from a strong increase produced in the Cubic Criterion of clustering and Pseudo-F values. To describe the segments, Pearson's Chi-squared (χ^2) test was applied for the discrete variables and a one-factor analysis of variance was applied for the continuous variables (99 and 95% confidence levels). Because Levene's test indicated non-homogenous variances, the averages of variables with significant differences ($P \leq 0.001$ or $P \leq 0.05$) were separated according to Dunnett's T3 test for multiple comparisons.

RESULTS AND DISCUSSION

In the sample of surveyed consumers, there were more women, people between 35 and 54 years of age, people from families with three to four members, urban residents, self-employed and employees, and people from socioeconomic group ABC1. Few of those surveyed had received previous information about the CF or understood its significance (TABLE II). The majority of respondents indicated that they knew that some of the food that they ate was imported (95.8%). Most participants indicated that they occasionally or almost never buy imported food. Those with a high frequency of purchasing imported food (n=74) indicated that they prefer them mainly because of a good price-quality ratio (39.2%) and because similar domestic products do not exist (24.3%). By contrast, those with a low-frequency purchase (n=116) indicated that imported food is more expensive (41.4%) or that they simply prefer domestic products (50.0%). The average monthly expenditure on food was US$ 195.4.

TABLE II
DESCRIPTION IN PERCENTAGES OF THE SAMPLE OF HABITUAL SUPERMARKET CONSUMERS IN TEMUCO, CHILE. NOVEMBER, 2011

Sample	Composition	Total sample (n = 400) %
Gender	Female	73.5
	Male	26.5
Age	< 35 years	33.5
	35-54 years	50.0
	55 years or more	16.5
Family size	1-2 family members	38.8
	3-4 family members	44.5
	5 or more	16.8
Residence	Urban	92.5
	Rural	7.5
Occupation	Self-employed	32.5
	Entrepreneur	3.0
	Employee	18.8
	Public employee	36.8
	Retired	5.2
	Unemployed	0.5
	Other situation	3.2
Socioeconomic group	ABC1 (high and middle-high)	55.0
	C2 (middle-middle)	29.0
	C3 (middle-lower) - D (lower)	16.0
Frequency of consumption of imported food	Always	1.3
	Generally	18.0
	Occasionally	51.9
	Almost never	25.8
	Never	3.0
Frequency of cheese consumption	Daily	3.2
	Two or three times per week	32.5
	Once a week	39.8
	Occasionally	24.2
	Other frequency	0.2
Had received information about the CF	Yes	15.5
	No	84.5
Understood the meaning of CF	Yes	5.3
	No	94.7
Satisfaction with food-related life	Dissatisfied	4.2
	Somewhat satisfied	15.5
	Satisfied	67.8
	Extremely satisfied	12.5

Using a conjoint analysis, it was established that in the total sample, the attributes of greatest importance in the purchase of cheese were the type of cheese and the Country of origin, followed by the packaging and price, and finally the presentation and information about the CF. The RMSE of the conjoint analysis was 0.19, which indicated an adequate goodness-of-fit (TABLE III). Carbon labels are expected to provide consumers with the opportunity to make informed choices, considering that the need to reduce GHG emissions has become a global concern [10]. However, despite the literature indicating that an increasing number of consumers is environmentally-oriented when deciding on the products that they intend to buy [26], the results of the conjoint analysis in the total sample showed that having

information about the CF is still of little importance in the decision to purchase. One explanation for consumers' not responding to the carbon label lies in the notion that they may simply purchase goods according to a host of other attributes [14, 15], such as the type of cheese and the Country of origin, according to the results of this study. This is consistent with the results reported in developed countries [10, 12, 15-17, 21, 27]. Although different studies have reported on the importance of Country of origin in the choice of different foods [6, 23], in this investigation the importance of this attribute was secondary, consistent with what has been reported in a previous study [28], which is related to the importance given to the attributes compared to the attribute origin. In this study, the most important attribute in the total sample was the type of cheese, which can be considered an intrinsic attribute because the type of cheese is chosen for its organoleptic characteristics, such as color, flavor and moistness, which differ among the types of cheese included in the study [7]. This is in line with studies that indicate that intrinsic attributes have a greater influence than the extrinsic ones, like Country of origin or respect for the environment, in the decision to purchase food [18].

TABLE III

DISTRIBUTION AND RELATIVE IMPORTANCE OF THE FOUR CLUSTERS AND OVERALL SAMPLE BASED ON PREFERENCES FOR CHEESE

Attribute & Levels	Total sample (n = 400)	Group 1 (n =89)	Group 2 (n = 89)	Group 3 (n = 149)	Group 4 (n = 73)	F	P-value
Type of cheese							
Gouda	0.560	1.486 a	0.584 ab	0.814 a	-1.130 b	17.892	0.000
Chanco	-1.227	-3.303 c	-0.700 a	-1.667 b	-0.089 a	84.952	0.000
Mantecoso	0.667	1.817 a	0.116 c	0.853 b	0.219 c	22.382	0.000
Relative importance (%)	28.8	59.8 a	16.4 c	19.0 b	22.2 b	303.579	0.000
Country of origin							
Chile	0.648	0.187 b	0.174 b	-1.286 c	2.154 a	71.593	0.000
Argentina	-0.538	-0.439 a	-0.340 a	-0.317 a	-0.824 b	3.920	0.009
New Zealand	-0.192	0.213 a	-0.510 b	0.366 a	-0.518 b	7.779	0.000
Holland	0.082	0.039 b	0.676 ab	1.237 a	-0.813 c	46.739	0.000
Relative importance (%)	24.9	14.9 c	20.1 b	24.0 b	34.3 a	63.092	0.000
Packaging							
Unpackaged	0.771	0.328 c	2.127 a	1.247 b	-0.007 d	144.651	0.000
Packaged	-0.771	-0.328 b	-2.127 d	-1.247 c	0.007 a	144.651	0.000
Relative importance (%)	13.9	7.0 c	27.7 a	15.6 b	8.9 c	109.293	0.000
Presentation							
Block	-0.227	-0.164 a	0.210 a	-1.614 b	0.154 a	81.847	0.000
Slice	0.227	0.164 b	-0.210 b	1.614 a	-0.154 b	81.847	0.000
Relative importance (%)	10.4	4.7 c	8.6 b	20.1 a	10.0 b	50.098	0.000
Information about the carbon footprint							
With information	-0.042	-0.103 b	0.592 a	-0.164 b	-0.325 b	17.851	0.000
Without information	0.042	0.103 a	-0.592 b	0.164 a	0.325 a	17.851	0.000
Relative importance (%)	9.2	6.1 b	12.3 a	8.1 ab	9.7 a	11.663	0.000
Price							
Low US$ 2.7 250 g^{-1}	0.168	0.101	0.136	-0.018	0.319	2.446	0.063
Medium US$ 3.0 250 g^{-1}	-0.338	-0.247 a	-0.560 ab	-0.735 b	-0.066 a	9.608	0.000
High US$ 3.5 250 g^{-1}	0.170	0.146 b	0.424 a	0.753 a	-0.253 b	15.574	0.000
Relative importance (%)	13.0	7.5 b	14.9 a	13.2 a	14.9 a	22.648	0.000
Monthly food expense (US$)	195.4	192.4 a	179.5 ab	233.7 a	140.1 b	13.802	0.000

Root-mean-square error (RMSE) = 0.19. Different letters in the same line indicate significant differences according to Dunnett's T3 multiple comparison test (P<0.05). The national currency values (Chilean pesos) were converted to dollars using the average 2012 value ($486.49/US$).

Group 1 "Consumers sensitive to the type of cheese".

Group 2 "Consumers sensitive to packaging and Country of origin, who prefer the product with information about the CF".

Group 3 "Consumers sensitive to the origin, presentation and type of cheese".

Group 4 "Consumers sensitive to the Country of origin".

In the total sample the signs of the utility values of the attribute levels indicated a preference for the types of cheese *mantecoso* and *Gouda* and a rejection of *Chanco* (TABLE III). This finding suggests that the consumer appreciates a product that is perceived to be more natural or artisan (*mantecoso* type). At the same time, the respondents preferred Chilean cheese and

cheese imported from Holland and rejected those from Argentina and New Zealand. Although in the total sample the preference for the domestic product was corroborated [2, 23], the rejection of the cheese imported from Argentina and New Zealand and the positive utility towards the Dutch cheese contradict the studies that indicate that consumers prefer foods imported from neighboring Countries or with a similar culture [6]. A possible explanation for this result may be related to the fact that consumers use origin as an attribute related to the quality of the product [2, 6]. It has even been reported in developing Countries that consuming imported products from certain Countries is associated with high or better quality representing a higher status level to consumer [4]. This would explain the preference for the product from Holland and the rejection of the Argentinean cheese. However, these results will have to be corroborated in future studies with other products and Countries of origin. One remarkable aspect of these results is that consumers did not associate the imported products from distant Countries with a greater CF, in contrast to the reports from studies in developed Countries [14, 15].

Likewise, in the total sample, preference was observed for the product unpackaged, sliced, with no information about the CF, and the low and high price (TABLE III). The preference towards the unpackaged cheese suggest that consumers are in a position to spend time choosing the cheese they want to eat, in contrast to what occurs when time is saved by purchasing the packaged cheese offered on the refrigerated shelves in the supermarkets. The preference for the product with no information about the CF in the total sample contradicts the results reported in developed countries [10, 12, 15-17, 21, 27], which even showed a willingness to pay more for products where the labels indicate a lower CF. In this regard, many consumers are still unfamiliar with carbon footprint information [16, 17, 27], making it difficult for them to evaluate and compare different product offerings [17]. This may explain in part the results of this study, given that the proportion of consumers who had prior information about the CF and understood its significance was low. Likewise, it is possible to hypothesize that the information given to the consumer prior to ordering the stimuli in the conjoint analysis was not understood or considered by the survey participants. In Japan, Kimura et al. [16] measured acceptance of the degree of carbon emission: low (L), medium (M), high (H), or non-display (ND, information on the carbon footprint was not displayed) in different types of candies and juices. Surprisingly, these authors found that ND products were highly valued as those of the L display in a read-only condition, even when additional information provided to the respondents included socially desirable contents such as the CF. These results imply that consumers fail to absorb detailed information about a product, even if the information describes a positive trait [16], as was also the case here. At the same time, and considering the result obtained by these authors, it may be suggested that the respondents may have perceived the notion of "compensate for the CF" negatively and not providing this information positively, in the sense that these products did not have a negative impact on the environment. However, these results should be corroborated and further researched in future studies that indicate the quantity of greenhouse gases emitted during the product's lifecycle. Several authors have suggested carbon labeling as a means for mitigating GHG emissions, as it would serve to educate about climate change [27]. However, the results of this study suggest that the consumer must be first informed and educated for the use of labeling to be effective both from the standpoint of caring for the environment and to add value to the product [16, 27].

A cluster analysis significantly distinguished (P≤0.05) four consumer groups in terms of the importance of the attributes evaluated (TABLE III). The groups also differed in the preferences for most of the levels of the attributes (P≤0.05), except in the case of the lowest price (P>0.05). The groups differed significantly by monthly expenditure on food (TABLE III), frequency of purchase of imported food, frequency of cheese consumption, socioeconomic level and level of satisfaction with food-related life (P≤0.05)

TABLE IV

CHARACTERISTICS WITH SIGNIFICANT DIFFERENCES IN THE GROUPS OF BUYERS IDENTIFIED BY CLUSTER ANALYSIS

Characteristic	Group 1 (n =89)	Group 2 (n = 89)	Group 3 (n = 149)	Group 4 (n = 73)
Frequency of consumption of imported food		**P = 0.035**		
Always	1.1	1.1	2.0	0.1
Generally	25.3	20.6	13.4	19.1
Occasionally	50.1	52.8	58.4	38.4
Almost never	22.3	23.4	22.8	34.2
Never	1.1	2.1	3.4	8.2
Frequency of cheese consumption		**P = 0.004**		
Daily	4.5	0.1	4.7	2.7
Two or three times per week	34.8	32.5	37.6	19.2
Once a week	37.1	53.9	31.5	42.5
Occasionally	22.5	13.4	26.1	35.5
Other frequency	1.1	0.1	0.1	0.1
Socioeconomic group		**P = 0.004**		
ABC1	62.9	67.4	51.7	37.0
C2	23.6	23.6	30.9	38.4
C3-D	13.5	9.0	17.4	24.7
Satisfaction with food-related life		**P = 0.015**		
Dissatisfied	4.8	2.4	4.1	15.4
Somewhat satisfied	6.6	5.1	8.6	14.2
Satisfied	68.5	55.7	70.5	60.0
Extremely satisfied	20.0	36.9	15.7	10.4

P value corresponds to the (bilateral) asymptotic significance obtained in Pearson's Chi squared Test.

Group 1 "Consumers sensitive to the type of cheese".

Group 2 "Consumers sensitive to packaging and Country of origin, who prefer the product with information about the CF".

Group 3 "Consumers sensitive to the origin, presentation and type of cheese".

Group 4 "Consumers sensitive to the Country of origin".

(TABLE IV).

Group 1 "Consumers sensitive to the type of cheese" (n = 89, 22.2% of the survey sample): gave the greatest importance (significantly more than the other groups) to the type of cheese (59.8%). The people in this group preferred *mantecoso* cheese more significantly than people from the other groups. They also showed a high preference for *Gouda* cheese, but did not differ from Groups 2 and 3. Despite the low importance assigned to Country of origin, Group 1 stands out because it was the one that rejected only the cheese imported from Argentina. The preferences for the levels of the attributes had a similar trend to the total sample (TABLE III). Group 1 presented the highest proportion of people who generally buy imported food (25.3%) (TABLE IV).

Group 2 "Consumers sensitive to packaging and Country of origin, who prefer the product with information about the CF" (n = 89, 22.2% of the sample): this group assigned the greatest importance to the packaging of the cheese (27.7%), significantly more than the other groups, showing the greatest preference for unpackaged cheese and the greatest rejection of the packaged product. The second attribute in importance was the Country of origin (20.1%). In addition to preferring domestic cheese, this group preferred the cheese imported from Holland. Group 2 also stood out for the greater preference for cheese in block, it did not differ statistically from Groups 1 and 4 though. Despite the attribute "information about the CF" being of relatively little importance within the preference structure of these consumers, Group 2 was the one that gave it greatest importance (12.3%), it did not differ statistically from Groups 3 and 4 though. In fact, this group was the only one that preferred cheese with information about the CF (TABLE III). Group 2 was made up of the highest proportion of people who ate cheese once a week (53.9%), belonging to ABC1 (67.4%) and who were extremely satisfied with their food-related life (36.9%) (TABLE IV).

Group 3 "Consumers sensitive to the origin, presentation, and type of cheese" (n = 149, 37.3% of the sample): assigned greatest importance to the Country of origin (24.0%), significantly less than Group 4 though. This group was the only one that rejected the domestic cheese, significantly more than the other groups. Just as Group 1, the consumers in Group 3 preferred the cheese imported from New Zealand and Holland, even though the greatest preference was the cheese imported from Holland, even though they did not differ significantly from Group 2. In relative importance, the next attributes were presentation (20.1%) and type of cheese (19.0%), showing a similar trend to the total sample in terms of preferences for the levels of these attributes. However, Group 3 stands out for being the one that showed the greatest preference for sliced cheese, significantly higher than the rest of the groups. It was also the only one that preferred only the highest price, even though it did not differ statistically from Group 2. Group 3 presented the highest average value of monthly expenditure on food, even though it did not differ statistically from Groups 1 and 2 (TABLE III). Group 3 had a greater presence of people who occasionally buy imported food (58.4%) (TABLE IV).

Group 4 "Consumers sensitive to the Country of origin" (n= 73, 18.3% of the sample): assigned greatest importance to the Country of origin (34.3%), significantly more than the other groups. The people in this group showed the greatest preference for the domestic cheese, significantly more than the other groups. It was also the only group that rejected all the imported alternatives. Group 4 stood out for being the only one that rejected the *Gouda* cheese, preferred the packaged product and paying the lower price. It should be emphasized that Group 4 was the one that showed the greatest preference for the cheese with no information about the CF, although it did not differ statistically from Groups 1 and 3. Group 4 presented the lowest average monthly expenditure on food, even though it did not differ statistically from Group 2 (TABLE III). Group 4 presented the largest proportion of people that indicated that they never buy imported food (8.2%), that occasionally eat cheese (35.5%), belonging to socioeconomic levels C3-D (24.7%), and dissatisfied (15.4%) and somewhat satisfied (14.2%) with their food-related life (TABLE IV).

The characteristics with statistical differences among the identified segments are more related to the importance of and preference for the levels of the attributes Country of origin than for the CF information. As in the total sample, "consumers sensitive to the type of cheese" (Group 1), "consumers sensitive to packaging and Country of origin, who prefer the product with information about the CF" (Group 2) and "consumers sensitive to the Country of origin" (Group 4) (62.8% in total), preferred the domestic cheese. In addition, the four groups rejected the cheese imported from Argentina. However, unlike the results from the total sample, "consumers sensitive to the type of cheese" (Group 1) and "consumers sensitive to the origin, presentation and type of cheese" (Group 3) (59.5% in total) showed preference towards the New Zealand cheese. At the same time, "consumers sensitive to the type of cheese" (Group 1), "consumers sensitive to packaging and Country of origin, who prefer the product with information about the CF" (Group 2) and "consumers sensitive to the origin, presentation and type of cheese" (Group 3) (81.8% in total) preferred the Dutch product. In this study the differences were associated with the frequency of purchasing imported food and cheese consumption, which confirms the reports from studies conducted with different foods that relate the importance of the attribute origin to the frequency with which the food is consumed [2] and the frequency with which imported food is purchased [4, 23]. In agreement with these studies, the highest frequency of imported food purchase in "consumers sensitive to the type of cheese" (Group 1) was consistent with the lower preference for cheese of Chilean origin and the preference for cheeses from New Zealand and Holland. By contrast, "consumers sensitive to the Country of origin" (Group 4) gave the greatest importance to the Country of origin and rejected the three imported alternatives, being the one with the highest presence of people that never buy imported food, which may be accounted for by ethnocentric tendencies in these consumers [2, 4]. The greater presence of participants belonging

to socioeconomic levels C3-D in "consumers sensitive to the Country of origin" (Group 4) coincides with the greater importance that people with a lower level of education assign to the origin of food according to previous studies [23, 28].

Regarding preferences for the CF information, contrary to the results of this study, Koistinen et al. [17] found differences in the preference for products with a lighter CF associated with consumers' gender, age and attitude towards the care of the environment. However, in this study, one noteworthy difference was the greater presence of participants extremely satisfied with their food-related life in "consumers sensitive to packaging and Country of origin, who prefer the product with information about the CF" (Group 2), which was the only group that positively valued having CF information. Therefore, as stated in the introduction, this finding allows confirming that there is a relation between satisfaction with food-related life and preferences for food with different attributes [24, 25], in this case, toward cheese with CF information. Although new studies are needed to delve more deeply into the causes of this relation, it is possible to suggest that these consumers experience pleasure by preferring a product that makes concern for the environment an issue during its production process. The greater presence of people dissatisfied and somewhat satisfied with their food-related life in "consumers sensitive to the Country of origin" (Group 4) may be related to the higher proportion of participants from the lower socioeconomic levels [25] and, probably, to their lower monthly expenditure on food, which may be associated with the consumption of lower quality food and, therefore, to less pleasant and satisfactory food.

In relation to the product presentation, "consumers sensitive to packaging and Country of origin, who prefer the product with information about the CF" (Group 2) and "consumers sensitive to the Country of origin" (Group 4) differed from the results of the total sample, given that they preferred cheese in a block. Nevertheless, a significant portion of the sample in "consumers sensitive to the type of cheese" (Group 1) and "consumers sensitive to the origin, presentation and type of cheese" (Groups 3), values the convenience of buying sliced cheese (59.5% in total). It is therefore paradoxical that the segments that showed a greater preference for the *mantecoso* cheese, "consumers sensitive to the type of cheese" (Group 1) and "consumers sensitive to the origin, presentation and type of cheese" (Groups 3), were those that preferred the sliced cheese, because *mantecoso* cheese cannot be sliced [7]. However, it should be remembered that the attributes packaging and presentation had low relative importance in the total sample and most of the groups, except for "consumers sensitive to packaging and Country of origin, who prefer the product with information about the CF" (Group 2) and "consumers sensitive to the origin, presentation and type of cheese" (Group 3), respectively. It was a similar situation with price, with only "consumers sensitive to the origin, presentation and type of cheese" (Group 3) and "consumers sensitive to the Country of origin" (Group 4) preferring exclusively the highest and lowest price, respectively.

TABLE V presents the results of the market share simulation. The largest market share (24.5%) was for the *mantecoso* cheese, of Chilean origin, unpackaged, sliced, with no information about the CF, at the mid-range price. The next largest share (16.0%) was for *mantecoso* cheese imported from Holland, packaged, in a block, with no information about the CF, at the mid-range price. The market participation of *mantecoso* cheese was 51.8%, Chilean cheese reached 49.5%, unpackaged cheese reached 60.1%, in a block 54.6% and for the product with the information referring to the CF 32.7%.

TABLE V
EXPECTED CHEESE MARKET SHARE (MAXIMUM UTILITY MODEL)

Type of cheese	Country of origin	Packaging	Presentation	Information about the carbon footprint	Price (US$ 250 g^{-1})	Market share (%)
Mantecoso	Chile	Unpackaged	Slice	Without information	3.0	24.5
Mantecoso	Holland	Packaged	Block	Without information	3.0	16.0
Gouda	Chile	Packaged	Block	Without information	3.0	14.5
Chanco	Chile	Unpackaged	Block	With information	3.5	10.5
Mantecoso	New Zealand	Unpackaged	Block	With information	2.7	10.0
Chanco	Holland	Unpackaged	Slice	Without information	2.7	8.3
Gouda	Holland	Packaged	Slice	With information	2.7	5.8
Gouda	Argentina	Unpackaged	Slice	Without information	2.7	4.0
Gouda	New Zealand	Unpackaged	Block	With information	3.5	3.5
Mantecoso	Argentina	Packaged	Slice	With information	3.0	2.0
Chanco	New Zealand	Packaged	Slice	With information	3.0	0.8
Chanco	Argentina	Packaged	Block	With information	3.5	0.8

Therefore, the results indicate that the importance of having CF information is even low for the people responsible for purchasing food in the supermarkets in Temuco. In the future, this attribute may become a differentiation factor, add value to the product and contribute to reducing the greenhouse effect, but before that, the consumer must be informed and educated. Attributes that can improve the competitiveness of the domestic dairy industry are the Country of origin and the type of cheese, emphasizing clearly

that the product is domestic. The results obtained also suggest the need to include a wide number of variables to characterize the consumer, taking not just traditional socio-demographic characteristics into account, but also aspects of their purchasing behavior and their degree of satisfaction with food-related life.

One of the limitations of this study is that the sample is not representative of the Country's population distribution. But the consumer distribution in this survey was similar to the samples obtained in previous studies on supermarket consumers in Chile [23-25]. Therefore, although the results and conclusions of the present study may not be applicable to the whole population, they might be valid for consumers that normally purchase food from supermarkets.

CONCLUSIONS

Those responsible for the purchase of food for their household in the Araucanía Region gave low importance to the information about carbon footprint in the decision to purchase food of animal origin, such as cheese. The most important attributes were the type of cheese and the Country of origin. Consumers preferred the *mantecoso* and *Gouda* types of cheese, Chilean cheese and cheese imported from Holland, unpackaged, in slices, at the highest price, with no information about the carbon footprint.

It was possible to distinguish four market segments: "consumers sensitive to the type of cheese", "consumers sensitive to packaging and Country of origin, who prefer the product with information about the CF", "consumers sensitive to the origin, presentation and type of cheese" and "consumers sensitive to the Country of origin". The segments differed in their degree of satisfaction with food-related life, frequency of purchase of imported food, frequency of cheese consumption, monthly expenditure on food, and socioeconomic level. Therefore, almost 80% of the sample does not yet value information about the carbon footprint regarding food of animal origin, such as cheese. Nevertheless, the only segment that preferred the product with information about the carbon footprint had the largest number of people satisfied with their food-related life, which confirms that there is a relationship between satisfaction with food-related life and preferences for food with differential attributes such as information about the carbon footprint.

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