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Palm oil and the Roundtable of Sustainable Palm Oil (RSPO) label: Are Swiss consumers aware and concerned?

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ABSTRACT

Palm oil is commonly and increasingly used in many products, despite its association with various problematic ecological, social, and health-related issues. The international Roundtable of Sustainable Palm Oil (RSPO) label is intended to guide consumers toward more sustainable palm oil product purchases. Unfortunately, it is often the case that consumers profess concern for specific food sustainability issues, yet fail to translate this into sustainable action, for example, by avoiding foods with unsustainable ingredients or by using ecolabels. To investigate the factors associated with this discrepancy in the case of palm oil, the current study explores Swiss consumers' ($N = 1076$) associations with, perceptions, and awareness of palm oil and the RSPO label through an online survey. Analyses of variance revealed that our participants had mostly negative associations with palm oil, viewed palm oil more negatively than other oils and fats, and lacked acceptance of palm oil in various products; consumers' negative perceptions of palm oil mostly concerned sustainability aspects of the fat. Despite this, only 9 % of the participants were even aware of the RSPO label. Surprisingly, a regression analysis showed that this discrepancy was also evident among sustainability-concerned consumers. These results indicate that consumers' awareness and knowledge of (unsustainable) ingredients in products and corresponding ecolabels need improvement. To address this, targeted awareness and knowledge-raising interventions and effective marketing could be used. Furthermore, certification organizations should uphold and provide transparency to their sustainability standards.

1. Introduction

Palm oil is the most widely produced, consumed, and traded vegetable oil in the world (Statista, 2021), as it has many beneficial qualities. Due to palm oil's versatility, it is an ingredient in every fifth product on the Swiss market (Bundesamt für Umwelt, 2015), most commonly in edible products (e.g., chocolate, margarine) and in non-edible products (e.g., soaps, washing detergents, cosmetics). First, it has natural preservative effects, and thus can help extend the shelf life of products (Inanç & Maskan, 2012). Second, it can be inexpensive and sustainable in comparison to other vegetable oils (e.g., soy, coconut, rapeseed, sunflower), as it is the most efficient oilseed crop in terms of land footprint (Basiron & Weng, 2004; Corley & Tinker, 2008; Gunstone, 2011; Schmidt, 2015) and energy input (e.g., for fertilizing or milling) (Wood & Corley, 1991). For example, the production of soybean oil takes up to eight times as much land and four times as much input energy as the production of the same amount of palm oil (Organisation for Economic Co-operation, 2016; Wood & Corley, 1991). Therefore, the production of palm oil can entail less greenhouse gas emissions, deforestation, and biodiversity loss, as well as higher yields compared to the production of other vegetable oils (Basiron & Weng, 2004; Corley & Tinker, 2008; Gunstone, 2011; Schmidt, 2015; Wood & Corley, 1991). As a result of these benefits, the demand for palm oil, which has increased eightfold in the past decades, is expected to grow (Organisation for Economic Co-operation, 2016).

Despite palm oil's importance in the world market, it is associated to various negative ecological, social, and health-related issues. First, even though palm oil plantations need less space and energy compared to other oilseed crop plantations, they cause a high degree of environmental degradation (e.g., deforestation, loss of biodiversity) (Butler & Laurance, 2009; Reijnders & Huijbregts, 2008; Wilcove & Koh, 2010). Second, the palm oil industry has a negative reputation regarding exploitative and inhumane plantation labor conditions, as well as the "land grabbing" and eviction of locals from their traditional lands

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Table 1
Characteristics of the study sample ($N = 1076$).

		Possible range	Mean	SD	item no.	alpha
Sociodemographic variables						
	Age	20–70	46.53	14.25	1	
	Women (%)		51.2		1	
	Education	1–7	4.51	1.79	1	
	Low (%)		8.8			
	Middle (%)		55.8			
	High (%)		35.4			
Concern about food related issues						
	Sustainability concern	1–7	5.93	1.07	14	0.94
	Health concern	1–7	5.31	1.17	4	0.86
Information-seeking on food packaging						
	Sustainability information-seeking	1–5	2.99	0.80	5	0.85
	Health information-seeking	1–5	2.98	1.06	5	0.81
Variables related to palm oil						
	Affect of the associations with palm oil[1]	1–11	3.38	2.56	1	
	Perception of palm oil as:					
	Unhealthy vs healthy	1–7	2.70	1.67	1	
	Unsustainable vs sustainable	1–7	4.75	2.22	1	
	Low quality vs high quality	1–7	3.05	1.71	1	
	Not tasty vs tasty	1–7	5.62	1.73	1	
	Unfamiliar vs familiar	1–7	3.58	1.86	1	
	Expensive vs inexpensive	1–7	4.96	1.77	1	
	Ordinary vs exquisite	1–7	5.09	1.73	1	
	Foreign vs domestic	1–7	1.78	1.34	1	
	Awareness about palm oil in products (%)[2]	1–20	51.47		20	
	Acceptance of palm oil in products (%)[3]	1–20	13.70		20	
Variables related to the RSPO label						
	Awareness about the RSPO label (%)[4]	1–2	9.40		1	

Note. [1]How positively participants rated the affect of their association to palm oil. [2]Percentage of products for which participants correctly indicated palm oil as an ingredient. [3]Percentage of products for which participants deemed palm oil an acceptable ingredient. [4]Percentage of participants who reported to have seen the RSPO label before.

(Carrere, 2001; Obidzinski et al., 2012). Finally, palm oil has a high concentration of saturated fat as compared to most other vegetable oils, and its consumption is associated with high blood cholesterol levels and an increased risk of cardiovascular disease (Sacks et al., 2017; Sun et al., 2015).

In recent years, these detriments have become central to the public's perception of palm oil. Specifically, multiple studies show that many consumers view palm oil very negatively—especially in terms of its associated environmental issues—and want to reduce their intake of it (Aguiar et al., 2018; Disdier et al., 2013; Guadalupe et al., 2019; Reardon et al., 2019; Sodano et al., 2018; Verneau et al., 2019).

However, addressing consumers' concerns by banning palm oil could be problematic in several ways (Ostfeld et al., 2019). First, the livelihoods of millions of people—many of whom are from developing countries—could be endangered by an abrupt palm oil ban (European Sustainable Palm Oil (ESPO) (2017)). Second, alternative vegetable oils are not only less versatile but also more expensive and less sustainable than palm oil, at least in terms of land and energy use (Basiron & Weng, 2004; Corley & Tinker, 2008; Gunstone, 2011; Schmidt, 2015). In turn, a shift away from palm oil production in favor of alternative crop seed production could entail: (a) lower yields, which potentially pose a food security and poverty threat, and (b) the need for more agricultural land, which could cause more damage to the environment (ESPO, 2017).

Therefore, a more viable approach to addressing palm oil production-associated problems could be to strive for improved palm oil production standards, for which ecological and social damage is held at a minimum as much as possible. With this goal in mind, various stakeholders from throughout the palm oil supply chain, investors, and non-governmental organizations established the RSPO in 2004. This international non-profit organization introduced a certification scheme that aims to signal that a product contains legal, economically viable, environmentally friendly, and socially beneficial palm oil. These standards are set and reviewed every five years by the RSPO General Assembly, which consists of 850 representatives of the global palm oil and food industry. Palm oil producers are certified through strict verification against these standards by accredited certification bodies. Since the RSPO is the largest palm oil certification scheme, its standards are more specific to palm oil production than those of organizations such as the *Rainforest Alliance*, which, for example, has a broader scope concerning general agriculture topics.

Although there is extensive literature documenting consumers' palm oil concerns (Aguiar et al., 2018; Disdier et al., 2013; Guadalupe et al., 2019; Reardon et al., 2019; Sodano et al., 2018; Verneau et al., 2019), only a few studies so far have also investigated consumers' perspectives on palm oil-related labels, such as the RSPO label. These studies show that consumers claim to be interested in a food label that addresses the problems of palm oil (Borrello et al., 2019; Riganelli & Marchini, 2017) and have a medium (Capecchi et al., 2019; Disdier et al., 2013; Hartmann et al., 2018; Reardon et al., 2019) to high (Bateman et al., 2010) willingness to pay for such labeled products. Furthermore, past research indicates that the recognition of the RSPO label appears to be very low (Ostfeld et al., 2019), at least in comparison to other ecolabels such as the highly recognized Swiss organic label *BioSuisse* (introduced in 1981) (Stolz et al., 2013), or the international *UTZ* label (introduced in 2002) (Delmas & Clements, 2017), which promises sustainably farmed coffee and cacao products. Piecing together findings from past research gives a general picture on how these topics—consumers' perceptions of palm oil, the RSPO label, and other ecolabels (as reference point)—intersect.

With the current study, we wish to combine all these topics in order to reveal the interactions between them and thus understand the broader context.

Thus, this study aims to explore consumers' associations with, perceptions, and awareness of palm oil and the RSPO label. Specifically, we assessed consumers' associations with palm oil, compared the perceptions of palm oil vs other fats/oils (butter, canola oil, coconut fat), assessed the perceptions of palm oil in various edible and non-edible products, and assessed awareness of the RSPO label in comparison to other ecolabels (UTZ and the BioSuisse label). To embed our findings into a broader context, we also discuss our results concerning palm oil and the RSPO label in relation to consumer behavior regarding ecolabels in general.

2. Methods

2.1. Participants

Data were collected in 2019 through an online survey in the German- and French-speaking part of Switzerland. Participants were recruited through the Internet Panel of Respondi Aktiengesellschaft (AG) and received a small amount of compensation for their participation. Quotas were set on gender (50 % female) and age (age range 20–70 years), with the same number of participants in each age category.

The sample characteristics of the included 1076 participants are displayed in Table 1. About half of the sample (57 %) came from the German-speaking part of Switzerland. The participants were 51 % female, with a mean age of 47 years. Educational level was measured and grouped into three categories: low (primary and secondary school or no education), coded as 1; medium (vocational school, high school), coded as 2; and high (applied university, university), coded as 3. The average educational level was medium to high (applied university, university).

2.2. Survey questions

The questionnaire was developed in German and was also translated into French by a professional agency.

2.2.1. Concern about food-related issues

Concern about sustainability-related food issues (abbrev. "sustainability concern") was measured with 14 items (Grunert et al., 2014). Participants were asked, "How concerned are you with the following issues?" An example item was "Deforestation of the rainforest." Responses were given on a 7-point scale ranging from "only slightly concerned" (1) to "extremely concerned" (7).

Concern about health-related food issues (abbrev. "health concern") was measured with four items taken from the general health interest subscale (Roininen et al., 1999). Participants were presented with four statements, such as, "It is important to me to have a healthy diet," and were asked to indicate their level of agreement with each statement on a 7-point scale from "I disagree strongly" (1) to "I agree strongly" (7).

2.2.2. Information seeking on food packaging

Two subscales of the *information seeking on food packaging* scale (Grunert et al., 2014) were used. Participants were asked, "When buying food and drink products, how often do you look for the following information on food packaging?" To measure sustainability information seeking, the five answer options were as follows: 1) ingredient list, 2) country of origin, 3) organic status, 4) environmental labels, and 5) environmental impact (e.g., through transportation of the product). To measure health information seeking, the four answer options were as follows: 1) ingredient list, 2) nutrition facts label, 3) nutritional characteristics (e.g., low-fat, protein-rich), and 4) impact on health (e.g., impact on cholesterol levels or the bones). Responses for both subscales were given on a 5-point scale ranging from "never" (1) to "always" (5).

2.2.3. Palm oil and the RSPO label

The *affect of associations with palm oil* was assessed by asking participants the question, "When you think of palm oil, what is the first association (word, image, or thought) that comes to mind?" They were asked to name two such associations. Participants were then asked to rate each association on an 11-point scale from "extremely negative" (1) to "extremely positive" (11).

The *perception of palm oil* in a semantic differential format was assessed by asking participants to rate palm oil and three other fats (butter, canola oil, and coconut fat), each with regard to eight adjective pairs. These fats were chosen for the following reasons: in comparison to palm oil, coconut fat oil is a similarly foreign fat, whereas canola and butter are fats produced in Switzerland, with the first two being plant-based and the latter being animal-based. Responses were given on a 7-point scale for the following adjective pairs: unhealthy (1) vs healthy (7), unsustainable (1) vs sustainable (7), low quality (1) vs high quality (7), not tasty (1) vs tasty (7), unfamiliar (1) vs familiar (7), expensive (1) vs inexpensive (7), ordinary (1) vs exquisite (7), and foreign (1) vs domestic (7). These adjectives were chosen because we perceived them to be the most relevant characteristics of consumers' perceptions of palm oil.

Awareness of palm oil in products was measured by presenting participants pictures of 20 edible and non-edible products currently available in Swiss supermarkets that either contain or do not contain palm oil. For each product, participants indicated if they expected palm oil in the product with the responses "yes," "no," or "I don't know." If a participant gave the correct "yes" or "no" answer for a specific product, this was counted as having the correct awareness of palm oil in this product.

Acceptance of palm oil in products was measured by presenting participants with the same list of 20 edible and non-edible products. For each product, participants indicated whether they perceived palm oil in the product to be acceptable with the responses "not acceptable," "acceptable," or "I don't know." If a participant answered "acceptable" for a specific product, this was counted as having an acceptance of palm oil in this product.

Awareness about the RSPO label was measured with the item "Have you ever seen this label before?" with the response options "yes," "no," or "I don't know." If a participant answered "yes," this was counted as a participant having awareness of the label. Participants were asked this same item for the ecolabels BioSuisse (a Swiss organic label for a wide variety of products) and UTZ (an international label for coffee, cocoa, and tea signaling sustainable farming), which was used to compare consumer perceptions of the RSPO label with two well-established ecolabels in Switzerland.

2.3. Data analysis

All analyses were performed using the SPSS statistics software package version 26 (SPSS Inc., Chicago, IL). In the online survey, consumers had indicated their associations with palm oil in an open-ended question. These answers were coded and categorized manually, and frequencies were assessed. A significance level of alpha = .05 was used in the present study. Pearson correlations were calculated between all study variables. The rating of the fats regarding the eight adjective pairs occurred in a between-subject design to reduce the number of items shown to the participants. Thus, between-subject analyses of variance were conducted to assess how the perceptions of fats differed regarding the eight adjective pairs. Finally, regression analyses were conducted to predict *the (positive) affect of association with palm oil* (Model 1) and *awareness about palm oil in products* (Model 2), both with the following predictors: age, gender, education, sustainability concern, health concern, sustainability information seeking, health information seeking, and (only for Model 2) affect of the association with palm oil.

Table 2
Association categories and the affect of the associations with palm oil.

Association category	Association example	Frequency	%	Affect of association M	Affect of association SD
1. Negative environmental impact	Deforestation, pollution	439	40.8	3.38	2.56
2. Unspecific negative evaluation	bad, awful	159	14.78	2.65	2.07
3. Edible product	Nutella, chocolate	92	8.55	3.07	2.34
4. Nature	Orangutan, palm tree	93	8.64	3.55	2.80
5. Unhealthy	Unhealthy, poisonous	86	7.99	2.86	1.93
6. Vegetable oils or fats	Oil, fat, cold-pressed	45	4.18	5.68	2.96
7. Cultivation	Monoculture, plantation	36	3.35	3.00	1.95
8. No association	Don't know, nothing	36	3.35	–	–
9. Geographic location	Tropics, Asia	16	1.49	5.31	3.07
10. Unspecific positive evaluation	Good, good quality	15	1.39	8.07	2.46
11. Trade	Inexpensive, cheap	14	1.3	4.93	1.94
12. Topic relevancy	Negative media image, WWF	14	1.3	5.14	1.91
13. Healthy	Healthy, healthy fat	8	0.74	7.75	2.65
14. Other	Cosmetics, exploitation, beach, fuel	18	1.67	–	–
Sum or Mean		1076		3.21	2.52

Note. The absolute frequency and the frequency in relation to the other category groups (in percentage) is given. The affect was measured on an 11-point scale from "extremely negative" (1) to "extremely positive" (11). No affect for "no association" and "other" was shown, as the associations within these categories were too heterogeneous.

3. Results

3.1. Associations with palm oil

All associations elicited by the term "palm oil" were classified into 14 categories according to their meaning (Table 2). Forty-one percent were categorized into the category "negative environmental impact". In comparison, social and health-related detriments were mentioned less frequently. Unsurprisingly, only very few participants named positive associations, which were categorized into the categories "healthy" and "positive evaluations." The mean affect of the association ($M = 3.21$, $SD = 2.52$) was significantly lower than the midpoint of the affect-rating scale ($t(1075) = 33.53$, $p < .001$). Thus, the affect evoked by the association was rather negative.

3.2. Perception of palm oil in relation to other fats

The ratings for palm oil, butter, canola oil, and coconut fat for the eight adjective pairs are displayed in Fig. 1. The exact values of the mean ratings and the ANOVA results can be found in the Appendix (Table A1). As can be seen in Fig. 1, the results of the ANOVA indicate that there were statistically significant differences between the ratings for every adjective pair. Regarding pairwise differences, none of the 95 % CIs of the palm oil means overlapped with those of the other fats. Thus, the participants' ratings of palm oil differed significantly from their ratings of the other fats for each adjective pair. Specifically, palm oil always received the highest or the lowest rating for each adjective pair in comparison to the other fats; palm oil was perceived as the least healthy, the least sustainable, the lowest in quality, the least tasty, the least familiar, the least expensive, the least exquisite, and the most foreign.

Canola oil and butter were rated similarly by participants for most adjectives; for the adjectives "sustainable" and "tasty," participants gave these two fats the same rating, and for all other adjectives, participants' ratings differed only by 0.5 at most (on a rating scale of 1–7). Coconut fat was rated similarly to palm oil regarding its unfamiliarity and foreignness.

3.3. Awareness and acceptance of palm oil in products

Table 3 shows the participants' awareness and acceptance of palm oil in various products. Participants were more aware of palm oil in edible products than in non-edible products. However, the reverse was true when it came to the acceptance of palm oil. Participants were more accepting of palm oil in non-edible products than in edible products. Overall (i.e., across all products), the awareness of palm oil as an ingredient was greater than the acceptance of it as an ingredient.

Regarding edible palm oil-containing products, Nutella was the product that most participants were aware and accepting of palm oil as an ingredient. Regarding the non-edible palm oil-containing products, cream and candles were the products for which most participants were aware of palm oil as an ingredient.

3.4. Variables related to the RSPO label

Participants were shown the three labels (RSPO, UTZ, and BioSuisse) and were asked to indicate if they had ever seen them before (Fig. 2). Only 9 % ($N = 105$) of the participants knew the RSPO label. In contrast, 64 % ($N = 695$) and 93 % ($N = 1021$) of the participants recognized the UTZ and BioSuisse labels, respectively.

3.5. Consumer characteristics associated with palm oil and RSPO label variables

One interesting finding in Table 4, which shows the correlations between the study variables, was that high concern for sustainability, negative affect, and low acceptance of palm oil in products did not correlate significantly with awareness about palm oil in products and the RSPO label. This is surprising because one would expect consumers who care about the environment and who are critical of palm oil to be more aware of which products contain palm oil and of a sustainable palm oil label like that of the RSPO.

To investigate this association further, two linear regressions were conducted (Table 5). In the first regression model, the dependent variable *(positive) affect of the association with palm oil* corresponded to how positively participants rated the affect of their association on a scale from "extremely negative" (1) to "extremely positive" (11). The variance of this variable was explained by 30 % ($R^2 = 0.30$), $F(7, 1063) = 14.718$, $p < .001$. In the second regression model, the dependent variable was *awareness about palm oil in products;* participants were asked to indicate for 20 products whether they did or did not contain palm oil—the variable indicated how many correct answers participants gave across all the products, on a scale from 1 (no correct answers) to 21 (all answers correct). The variance of this variable was explained by 17 % ($R^2 = 0.17$), $F(8, 1062) = 3.874$, $p < .001$. Participants who had a more positive affect toward their association with palm oil were male ($\beta = -0.09$, $p = .004$), had a lower education ($\beta = -0.08$, $p = .005$), and were less concerned about food-related sustainability ($\beta = -0.26$, $p < .001$) than participants who had a more negative affect toward their association with palm oil. Interestingly, while participants who sought out health information on food packaging were more likely to have a positive affect toward palm oil ($\beta = 0.14$, $p = .005$), participants who sought out sustainability information on food packaging were more likely to have a negative affect toward their association with palm oil ($\beta = -0.11$, $p = .036$). Participants who had a greater awareness of palm oil in

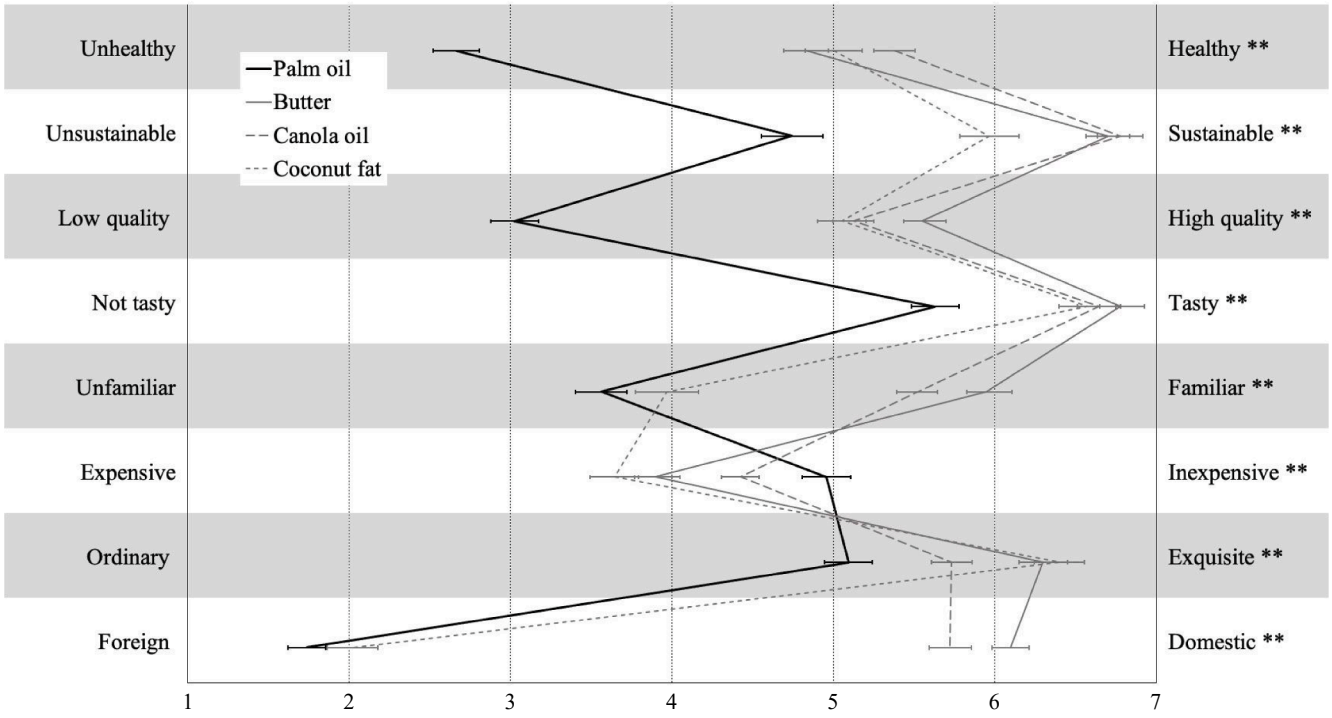

Fig. 1. Participants' evaluation of different fats in respect to eight adjective-pairs in a semantic differential format. Means and 95 % CIs for each mean rating are shown. Non-overlapping CIs between means indicate significant pairwise mean differences. ** indicate significant overall mean differences at $p < .001$ (as shown in Table A1).

Table 3
The awareness and acceptance of palm oil in various products.

	Awareness of palm oil	Acceptance of palm oil
	% of participants who were correctly aware that palm oil is or is not an ingredient	% of participants who perceived palm oil as ingredient acceptable
Edible products		
Spaghetti	91.8	6.7
Nutella+	90.6	21.7
Wiener sausages	84.1	6.7
Ready-made «Spätzli»	68.5	9.9
Dark chocolate	67.1	10.8
Margarine+	58.6	18.6
Paprika chips	58.2	13.8
Ice cream	54.3	10.3
Pastries «Spinatplätzli»+	52.1	13.2
Cookies+	47.9	11.5
Mailänderli dough	44.0	11.4
Chocolate with Nougatfilling	42.3	14.4
Babyfood spelt biscuits+	27.6	7.2
Vegetable bouillon+	24.2	13.6
Muesli cereals+	22.7	6.70
Non-edible products		
Cream+	53.3	16.9
Candles+	52.0	25.7
Shower gel+	45.0	15.7
Biodiesel fuel+	29.6	19.9
Washing detergent+	15.5	13.7

Note. +Indicates that the product typically contains palm oil.

products had higher education ($\beta = 0.14$, $p = .04$).

To check for interaction effects between independent variables, the same two regression analyses were conducted again (i.e., with the same dependent and independent variables) but with the interaction terms "sustainability concern * sustainability information seeking" and "health concern * health information seeking" as additional predictors (Table A2). None of these interaction terms was significant, and the explained variance of neither model (Model 1: $R^2 = 0.09$, $F(9, 1061) = 11.84$, $p < .001$; Model 2: $R^2 = 0.02$, $F(10, 1060) = 2.214$, $p = .015$) was improved through their addition.

4. Discussion

In summary, our results demonstrate that although consumers have concerns about and low acceptance of palm oil, they have insufficient awareness about which products contain palm oil and about the RSPO label. Surprisingly, this was also observable for consumers who were highly critical of palm oil, as well as those with high sustainability concerns and sustainability information seeking.

4.1. Consumers are highly critical of palm oil

4.1.1. Associations with palm oil

Our results confirm that consumers are indeed highly critical of palm oil (Aguiar et al., 2018; Disdier et al., 2013; Guadalupe et al., 2019; Reardon et al., 2019; Sodano et al., 2018; Verneau et al., 2019) since most elicited associations had a "negative" affect. The associations revealed the detriments of palm oil that were most relevant to participants. Environmental detriments of palm oil (e.g., deforestation, forest fires) were by far the most frequently elicited type of association, followed by health detriments. There were only a few social and ethical associations, confirming consumers' preoccupation with environmental and health-related issues in comparison to the social issues of palm oil (Reardon et al., 2019; Sodano et al., 2018).

The regression analysis confirmed past findings that particularly

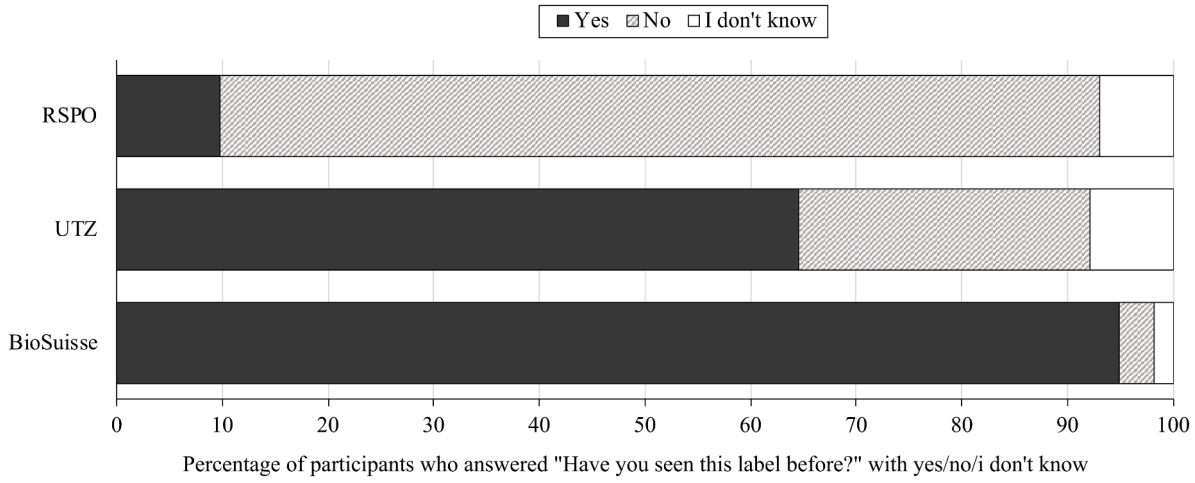

Fig. 2. The awareness of the different labels.

Table 4
Inter-correlations among study variables.

		1	2	3	4	5	6	7	8	9	10	11
1	Age		−0.03	−0.14***	−0.04	0.13***	0.24***	0.16***	−0.07	−0.02	−0.07	0.10*
2	Gender (Female)			−0.12***	−0.14***	0.09*	0.11***	0.12***	−0.11***	−0.03	−0.05	−0.03
3	Education				0.31***	0.01	0.01	0.03	−0.05	0.09*	0.02	0.04
4	Sustainability concern					0.47***	0.46***	0.35***	−0.26***	0.02	−0.26***	0.02
5	Health concern						0.49***	0.46***	−0.10*	0.08	−0.18*	0.08
6	Sustainability information-seeking							0.81***	−0.10*	0.05	−0.23***	0.05
7	Health information-seeking								−0.05	0.05	−0.18*	0.05
8	(Positive) affect of the association with palm oil									−0.04	0.42***	0.07
9	Awareness about palm oil in products										0.01	0.04
10	Acceptance of palm oil in products											0.06
11	Awareness about the RSPO label											

Note. * p <.05. *** p <.001.

Table 5
Regression analyses predicting the affect of the association with palm oil, and the awareness about palm oil in products.

	(Positive) affect of association with palm oil[1]			Awareness about palm oil in products[2]		
	B	95 % CI	β	B	95 % CI	β
Constant	8.01***	[6.89, 9.12]		10.57	[8.92, 12.21]	
Age	0.00	[−0.01, 0.01]	−0.01	−0.01	[−0.02, 0.01]	−0.02
Gender (female)	−0.44***	[−0.74, −0.13]	−0.09	−0.24	[−0.65, 0.17]	−0.04
Education	−0.12*	[−0.20, −0.03]	−0.08	0.14*	[0.03, 0.26]	0.08
Sustainability concern	−0.63***	[−0.79, −0.46]	−0.26	−0.07	[−0.30, 0.17]	−0.02
Health concern	0.04	[−0.11, 0.19]	0.02	0.20	[−0.01, 0.41]	0.07
Sustainability information seeking	−0.36*	[−0.69, −0.02]	−0.11	0.10	[−0.36, 0.55]	0.02
Health information seeking	0.41*	[0.12, 0.69]	0.14	0.02	[−0.37, 0.41]	0.01
Affect of associa-tion with palm oil				−0.05	[−0.13, 0.03]	−0.04

Note. [1]How positively participants rated the affect of their association to palm oil [2]Percentage of products for which participants correctly indicated palm oil as an ingredient. * *p* <.05, *** *p* <.001.

sustainability-oriented consumers are critical of palm oil (Borrello et al., 2019; Ostfeld et al., 2019). First, while high sustainability concerns predicted a negative affect toward palm oil associations (hereby being the strongest predictor of the model), health concerns did not. Second, while high sustainability information seeking predicted a negative affect toward palm oil associations, health information seeking did not. Thus—although palm oil is associated with both sustainability- and health-related detriments and one would therefore expect that it would be viewed equally critically by both sustainability- and health-oriented consumers—it appears that mainly sustainability-oriented consumers, more so than health-oriented consumers, are concerned with palm oil.

4.1.2. *Perception of palm oil compared to other fats and products*

When comparing participants' perceptions of palm oil to those of butter, canola oil, and coconut oil, we found that palm oil is viewed as inferior in comparison to these other fats. Specifically, we found that palm oil received the most "negative" rating for most adjective pairs, being rated the least healthy, the least sustainable, the lowest in quality, the least tasty, and the least exquisite. These results are in line with those of Guadalupe et al. (2019) and Ostfeld et al. (2019), who also compared the perception of palm oil to other fats/oils. This shows that participants have a negative perception of palm oil on a holistic, general level. It is possible that our participants' negative associations with palm oil—which were mostly related to sustainability- and health-related detriments—influenced their overall judgment of palm oil, an effect

referred to as the negative halo effect (Nisbett & Wilson, 1977). Specifically, our participants' impressions of palm oil being unsustainable and unhealthy could have "tainted" their perception of palm oil regarding unrelated traits (i.e., they also perceived palm oil to be the least qualitative, the least tasty, and the least exquisite oil). Second, in accordance with Ostfeld et al. (2019), we found that consumers inaccurately perceive palm oil to be less sustainable than other oils, even though palm oil is one of the most sustainable and inexpensive oils in terms of land, energy, and yield efficiency (Basiron & Weng, 2004; Corley & Tinker, 2008; Gunstone, 2011; Schmidt, 2015; Wood & Corley, 1991). Interestingly, participants rated butter, which has a significantly higher environmental impact than most plant-based fats (Liao et al., 2020), as the most environmentally friendly fat (together with canola oil).

4.1.3. Palm oil in different products

Notably, our Swiss participants were by far the most aware and accepting of palm oil in one particular product—Nutella—the notorious media "poster child" of palm oil products (Cova & D'Antone, 2014; Pace et al., 2016). This sweet hazelnut spread could have acted as a cognitive prototype (Rosch & Lloyd, 1978) for foods containing palm oil, as participants were more aware of palm oil in chocolate and sweet bakery goods (i.e., products highly associated with Nutella) than in savory products (e.g., vegetable stock). This perception was also found in a Spanish and Peruvian sample (Guadalupe et al., 2019), indicating that consumers all over the world have a low awareness of the extent to which palm oil is part of their daily diets. While consumers are aware of the presence of palm oil in sweet snacks and desserts (Hartmann et al., 2018), consumers are less aware that it is also in savory foods. Regarding non-edible products, palm oil was less accepted in products to be put in direct physical contact with the skin (e.g., shower gel, cream, washing detergent) vs non-direct physical contact (e.g., candles, fuel). It is possible that consumers' low acceptance of and highly negative affect toward palm oil made them subconsciously view palm oil as a "harmful substance" with which they would rather not come into direct physical contact. Across all products, the awareness and acceptance of palm oil as an ingredient was low. Reardon et al. (2019) confirmed this and showed that UK and Singaporean participants were less aware than Malaysian participants of palm oil in everyday products. Seeing that Malaysia is the second-largest palm oil producer in the world, it makes sense that citizens of this country would have a greater awareness of which products contain palm oil compared to citizens of non-palm oil-producing countries like the UK, or in our case, Switzerland.

4.2. Consumers are unaware of palm oil in products and the RSPO label

Considering the results of the first part of this study—which suggest that consumers are highly skeptical of palm oil, especially in terms of its environmental detriments—the following two findings were surprising.

First, even though consumers with high sustainability concerns and sustainability information-seeking behavior had the most negative associations toward palm oil, they were not more likely to have a heightened awareness about palm oil in products in comparison to "average" consumers (i.e., consumers with lower sustainability concerns and sustainability information seeking). As a result, it is unlikely that this segment can translate their pronounced palm oil concerns into more sustainable palm oil product choices, as they are not even aware of which products contain palm oil.

Second, even though all participants viewed palm oil negatively concerning various aspects, only 9 % of them were aware of the RSPO label. In contrast, 64 % and 93 % of the participants were aware of the UTZ and BioSuisse labels, respectively. Ostfeld et al. (2019) reported similar findings in a UK sample. Specifically, they found that the recognition rate of the RSPO label (5 %) was the same as that of the fictitious label invented for the study. Therefore, they concluded that the "recognition of the RSPO label (was) essentially zero in the sense that its recognition was indistinguishable from the fictitious ecolabel" (Ostfeld et al., 2019, p. 5). In contrast, the majority of participants in that study (82 %) recognized more established labels, such as the Fairtrade ecolabel.

4.3. The Concern–behavior gap regarding the use of ecolabels

Consumers are highly critical of palm oil. However, they don't know which products contain palm oil, and nor do they know of the RSPO label. This discrepancy may be connected to the *concern–behavior gap* in the case of food labels (Dunlap & Jones, 2002), i.e., the phenomenon that many consumers report substantial concern for specific food issues (Van Loo et al., 2015, 2014) but do not show this in their actions by purchasing labeled products (Grunert et al., 2014; Horne, 2009; Pedersen & Neergaard, 2006). For example, Grunert et al. (2014) found that their participants claimed to care quite highly about food sustainability but at the same time reported to hardly ever use ecolabels (they were asked about *Fair Trade, Rainforest Alliance, Carbon Footprint,* and *Animal Welfare*) for their food purchases. Grunert et al. (2014) suggested that this gap between concern and purchase behavior was most likely influenced by the fact that their participants had a low understanding of what the labels meant. Similarly, we argue that if consumers don't know which products contain (unsustainable) ingredients (e.g., palm oil) and do not recognize the ecolabels (e.g., the RSPO label), then it is unlikely that they will be able to make more sustainable purchases.

4.4. Limitations

A limitation for all self-reported instruments, such as surveys, is their susceptibility to socially desirable responding—i.e., the tendency to give answers that make the respondent look good (Martin & Nagao, 1989). Since this has been shown to be especially relevant for research topics on pro-environmental attitudes and behavior (Milfont, 2009), this issue is likely relevant for the current study.

The nationality of consumers has been shown to impact their perception of palm oil and palm oil-related labels (Guadalupe et al., 2019; Reardon et al., 2019). In particular, consumers of industrialized and Western countries seem to be less aware of, but more willing to pay for, free-from or sustainable palm oil products compared to Malaysian consumers (Reardon et al., 2019). Our results therefore have limited generalizability, especially concerning consumers of palm oil-producing countries. Therefore, when evaluating the effectiveness of ecolabels, researchers ought to take into account country-specific differences (Zepeda et al., 2013).

The current study does not take cognitive factors into account, such as consumers' visual attention to labels on food products (Graham & Jeffery, 2012; Graham et al., 2012; van Herpen & van Trijp, 2011; Visschers et al., 2010). More research is needed on how these cognitive factors interact with the attitudinal and behavioral variables investigated in the current study to optimize consumers' label utilization.

The current research presents the use of the RSPO label as an approach to address the negative aspects of palm oil production and consumption. However, there are several limitations to the label in this function. First, although the health detriments of palm oil are frequently referred to throughout this paper, these are not addressed by the RSPO label. There are hardly any labels that combine environmental, ethical, and health-related aspects in one. Therefore, future research should investigate how different informational cues can be effectively represented in a single label without overwhelming consumers (Sirieix et al., 2013; Van Loo et al., 2015). Second, it is questionable to what extent the RSPO and its actors can uphold their standards of sustainability (Laurance et al., 2010). For example, although RSPO-certified plantations, in comparison to non-certified plantations, have lower greenhouse gas emissions (Schmidt & De Rosa, 2020), less forest-fire activity, and less deforestation (Cattau et al., 2016), they negatively impact orangutan populations (Morgans et al., 2018). Regarding the RSPO's sociopolitical

goals, Pye (2019) argues that certification represents merely a "technical fix which neglects underlying dynamics of power, class, gender, and accumulation" (Pye, 2019, p. 219); its impact on ensuring fair land rights, worker's rights, and the reduction of poverty is therefore limited. As the last example, the RSPO has been criticized for granting certification to large-scale plantations but not to smallholder plantations, even though the latter contribute to 40 % of the current palm oil production (Azhar et al., 2017). It should be noted that shortcomings regarding standard monitoring are allegedly a prevailing problem for most ecolabeling schemes (Herrup, 1999; Van Amstel, Driessen & Glasbergen, 2008).

In conclusion, a shift toward more sustainable palm oil consumption not only requires a change in consumer behavior but also improvements from the RSPO concerning stricter monitoring, enhanced transparency, goal setting, and membership granting (Godar et al., 2015).

4.5. Implications

Palm oil is associated with environmental, social, and health-related detriments. However, banning palm oil would be problematic because it sustains the livelihood of millions of people and can be cheaper and more sustainable than alternative vegetable oils. Therefore, it is important that the sustainability of palm oil production is improved and ensured—a goal that the RSPO seeks to address. However, even though the public appears highly critical of palm oil, they are not aware of the presence of palm oil in many products, nor do they know about the RSPO label. Without this knowledge, it is unlikely that consumers will consciously make sustainable palm oil purchases. Surprisingly, even the highly sustainability-concerned consumers—the ones we found to be most critical of palm oil—lacked awareness of palm oil in products and failed to recognize the RSPO label. These findings may be connected to a problem that has been limiting the success of many ecolabeling schemes: Even though consumers report substantial concern for specific food issues, this does not always translate into their use of ecolabeled products (Grunert et al., 2014; Horne, 2009; Pedersen & Neergaard, 2006)—our results suggest that the lack of awareness and knowledge regarding ecolabels may be the limiting factor hereby.

The current study highlights the importance of increasing consumers' awareness and knowledge about which products contain potentially unsustainable ingredients (e.g., palm oil) and about ecolabels associated with these ingredients (e.g., the RSPO label). Moreover, consumers should be made aware of the complexities of the topic. In the case of palm oil, for example, consumers tend to focus on the environmental damages of palm oil production but appear unaware of the oil's sustainability in comparison to other oils. As a result, some consumers are in favor of boycotting palm oil, even sustainable palm oil. Public campaigns aiming to increase consumer awareness and knowledge about palm oil and the RSPO label ought to address such widespread misconceptions and deliver unbiased, science-based messages.

Targeting information communication to a specific group can be more effective than untargeted information communication (Farahat & Bailey, 2012). Our results imply that this target group for increasing awareness and understanding of (unsustainable) ingredients and ecolabels could be sustainability-oriented consumers, since the "bridging" of their concern–behavior gap holds the most potential, seeing that "the more motivated consumers are, the more they are willing to put effort into understanding the labels and using them" (Grunert et al., 2014, p. 178). Thus, we suggest that producers, policymakers, and public educators target this segment through their informational campaigns aimed at raising awareness and understanding of ecolabels. Hopefully, the positive behavioral change that may occur for these consumers will then be mimicked by or spill over to other consumers in the form of a "contagion effect," which has been shown to contribute to the spread of various kinds of pro-environmental behavior (Loschelder et al., 2019; Zorell, 2020).

Apart from increasing public awareness and knowledge, effective marketing can further contribute to the public's uptake of sustainable and ecolabeled products. For example, a study by Bateman et al. (2010) showed that Western consumers were willing to pay a premium price for products containing palm oil that was "tiger-friendly," whereas their willingness to pay for "sustainable" certified palm oil—which in theory also promises biodiversity conservation—is not always as pronounced (Capecchi et al., 2019; Reardon et al., 2019). This suggests that marketing strategies highlighting specific sustainability benefits may be more likely to convince consumers to buy sustainable/ecolabeled products than "general" sustainability claims. Various other approaches to improving consumers' ecolabel use have been discussed in past literature, such as incentivizing consumers to buy ecolabeled products through payback schemes, establishing consumer accountability frameworks, or nudging consumers through different label framings (Codagnone et al., 2016; Horne, 2009; Pedersen & Neergaard, 2006).

Maximizing sustainable consumption through ecolabels not only requires a change in consumer behavior but also efforts from certification scheme organizations and policymakers. Using the RSPO as an example, Ostfeld et al. (2019) suggested that the organization could address its criticism (Azhar et al., 2017; Laurance et al., 2010; Pye, 2019) by implementing stricter monitoring and transparency of RSPO members that are upholding sustainable standards, as well as focusing on addressing the underlying social inequalities of the palm oil industry (e.g., by granting certification to smallholder plantations). They also suggest that national policies aiming to increase companies' sourcing of certified sustainable palm oil would be beneficial. In conclusion, to ensure that consumers' ecolabel purchases have a positive impact, it is important that certification organizations maintain their sustainability standards, and policymakers provide support as well.

CRediT authorship contribution statement

Bianca Wassmann: Formal analysis, Writing – original draft, Visualization. **Michael Siegrist:** Conceptualization, Writing – review & editing, Funding acquisition. **Christina Hartmann:** Conceptualization, Investigation, Writing – review & editing, Funding acquisition.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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Appendix A

Table A1
Participants' evaluation of different fats (Mean values and standard deviations) in respect to eight adjective-pairs, as well as the omnibus ANOVA and post hoc test results.

	Palm oil	Butter	Canola oil	Coconut fat	Omnibus Test ANOVA
	M (SD)	M (SD)	M (SD)	M (SD)	F(df1, df2)
Unhealthy – Healthy	2.70 (1.67)	4.83 (1.61) [a]	5.37 (1.5)	5.00 (1.56) [a]	(3, 1073) 10.973 **
Unstainable - Sustainable	4.75 (2.22)	6.68 (1.58) [a]	6.75 (1.67) [a]	5.95 (1.61)	(3, 1033) 165.507 **
Low quality – High quality	3.05 (1.71)	5.54 (1.34) [a]	5.12 (1.5) [a]	5.05 (1.31) [a]	(3, 1070) 9.771 **
Not tasty – Tasty	5.62 (1.73)	6.35 (1.81)	6.62 (1.57) [a]	6.55 (1.53) [a]	(3, 1017) 33.452 **
Unfamiliar – Familiar	3.58 (1.86)	5.93 (1.38)	5.51 (1.47)	3.98 (1.72)	(3, 1073) 135.788 **
Expensive – Inexpensive	4.96 (1.77)	3.91 (1.48)	4.43 (1.36)	3.66 (1.33)	(3, 1075) 30.016 **
Ordinary – Exquisite	5.09 (1.73)	6.28 (1.75) [a]	5.72 (1.48) [a]	6.38 (1.35)	(3, 1060) 59.129 **
Foreign – Domestic	1.78 (1.34)	6.08 (1.32) [a]	5.71 (1.54) [a]	2.06 (1.39)	(3, 1073) 709.848 **

Note. ** p <.001. Different (or no) letters indicate significant differences (p <.001) according to *Dunnett* post hoc test.

Table A2
Regression analyses predicting the affect of the association with palm oil and awareness about palm oil in products.

	(Positive) affect of association with palm oil[1]			Awareness about palm oil in products[2]		
	B	95 % CI	β	B	95 % CI	β
Constant	10.00***	[6.92, 13.06]		12.96***	[8.68, 17.24]	0.00
Age	0.00	[−0.01, 0.00]	−0.01	0.00	[−0.01, 0.01]	−0.02
Gender (female)	−0.44**	[−0.74, −0.13]	−0.09	−0.29	[−0.71, 0.13]	−0.04
Education	−0.12**	[−0.20, −0.03]	−0.09	0.15*	[0.02, 0.26]	0.08
Sustainability concern (SC)	−1.11***	[−1.65, −0.56]	−0.46	−0.39	[−1.13, 0.36]	−0.12
Health concern (HC)	0.21	[−0.23, 0.65]	0.10	0.16	[−0.44, 0.76]	0.06
Sustainability information seeking (SS)	−1.40*	[−2.58, −0.21]	−0.44	−0.56	[−2.18, 1.06]	−0.13
Health information seeking (HS)	0.74	[−0.12, 1.60]	0.26	−0.11	[−1.28, 1.07]	−0.03
Affect of association with palm oil				−0.06	[−0.14, 0.02]	−0.04
SC × SS	0.17	[−0.01, 0.36]	0.46	0.11	[−0.14, 0.37]	0.22
HC × HS	−0.06	[−0.21, 0.08]	−0.17	0.03	[−0.18, 0.23]	0.05
	R^2 = 0.09, F(9, 1061) = 11.84, p <.001***			R^2 = 0.02, F(10, 1060) = 2.214, p =.015*		

Note. [1]How positively participants rated the affect of their association to palm oil [2]Percentage of products for which participants correctly indicated palm oil as an ingredient. * p <.05, *** p <.001.

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