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Understanding Swiss consumption of plant-based alternatives to dairy products

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ABSTRACT

The current diet with high proportions of animal products contributes significantly to harmful greenhouse gas emissions and ultimately to climate change. A more plant-based diet could counteract this. Thus, a large range of plant-based alternatives to milk and dairy are being developed, and the consumption of these products is increasing. Here, we characterised consumers and non-consumers of plant-based alternatives to milk, yoghurt, and cream, and investigated reasons for and against consumption of these products. We also studied consumers' attitudes towards food shopping behaviour, health aspects, veganism, and sustainability using an online survey administered to 1,204 participants in German- and French-speaking parts of Switzerland. Participants consuming these plant-based products less than 2–3 times per year were assigned to the non-user group (n = 610). Those consuming these products at least 2–3 times per year were assigned to the user group (n = 594). We found that users tended to be young, well-educated urban flexitarians. The most frequently consumed plant-based alternatives were soy, almond, and oat drinks. The most prominent reasons for consumption of these products were taste, health (including allergies and intolerances), and environmental sustainability. Users and non-users of plant-based alternatives differed significantly in their attitudes and beliefs regarding the positive climate impact of a vegan diet (users agreed, non-users disagreed), which can be seen as an indication for cognitive dissonance. These observations have important implications for research and practice, offering a better understanding of the growing group of consumers who use plant-based alternatives for a more sustainable diet.

1. Introduction

With climate change progressing and its ever-increasing impact, there is a need for fast and concrete action. It is estimated that around 20–30% of the total environmental impact caused by humans derives from food production (Tukker & Jansen, 2006). Although animal products contain important nutrients, there is increasing scientific evidence that the production of these products (i.e. meat and dairy) significantly contributes to the emission of greenhouse gases (Beal et al., 2023; FAO, 2006; Willett et al., 2019). To address these challenges, a nutritional transition towards a diet with an increased percentage of plant-based foods is needed (Hartmann & Siegrist, 2017).

1.1. Nutritional transition towards more plant-based foods

Given these global challenges, it is not surprising that the number of people following vegetarian and vegan diets has steadily increased in recent years (Ploll et al., 2020). Whereas vegetarianism is the practice of abstaining from eating meat (see Ruby, 2012 for a review), veganism is the practice of completely refraining from consuming animal-based products. A national survey conducted in Switzerland in 2022 found that 5% of the population indicated that they were following a vegetarian or vegan diet (swissveg, 2022).

One category of plant-based products that has grown markedly in recent years is plant-based drinks (Sethi et al., 2016). According to Sethi et al. (2016), the wide range of available plant-based drinks can be grouped into five categories: 1) cereal-based products (e.g. oat, rice, corn, spelt, 2) legume-based products (e.g. soy, peanut, lupin, cowpea),

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3) nut-based products (e.g. almond, coconut, hazelnut, pistachio, walnut, cashew), 4) seed-based products (e.g. sesame, flax, hemp, sunflower), 5) pseudo-cereal-based products (e.g. quinoa, teff, amaranth).

The plant-based drinks available on the market clearly differ in terms of nutritional composition and impact on sustainability (Geburt et al., 2022; Pointke et al., 2022). A review examined the nutritional profiles of the four most consumed plant-based alternatives worldwide (almond, soy, rice, and coconut) and compared them to cow's milk (Vanga & Raghavan, 2018). Soy drinks are the closest to cow's milk in terms of macronutrients and micronutrients, whereas almond drinks contribute the least to the daily micronutrient requirements of all products studied (Pointke et al., 2022; Vanga & Raghavan, 2018). In terms of nutrient profiles, plant-based drinks, even when supplemented with vitamins and minerals, cannot be considered a real substitute for cow's milk (Walther et al., 2022).

Life cycle assessments showed that oat and organic soy drinks were the most environmentally friendly plant-based drinks (Geburt et al., 2022). The poor environmental performance of milk compared to plant-based beverages is improved when products are compared based on nutrient content rather than volume or weight (Green et al., 2022).

1.2. Motivation to consume plant-based dairy products

The reasons for reducing the consumption of animal products and to consume plant-based alternatives are manifold (Ploll et al., 2020). The first prominent motive is the sustainability or environmental effects of our diet (Fox & Ward, 2008; Hallström et al., 2015). As discussed earlier, plant-based drinks tend to have lower environmental impacts than cow's milk, with a few exceptions (Silva & Smetana, 2022). Not surprisingly, a recent survey revealed that environmental protection is among the main drivers distinguishing consumers and non consumers of cow's milk (McCarthy et al., 2017).

Another frequently cited reason to reduce consumption of animal products is animal welfare or respect for animal life (Fox & Ward, 2008). Together with environmental impact, animal welfare was identified as main motive for individuals not to consume cow's milk (McCarthy et al., 2017). Animal welfare is gaining importance in agricultural policy, with consumers naming it the most important agricultural policy goal in Switzerland (Ammann et al., manuscript submitted). Finally, it is interesting to mention that a quantitative study looking at consumers' perception of sustainability in a food context identified the two underlying factors (1) animal welfare and (2) environmental and social aspects (Van Loo et al., 2017), which clearly supports the notion that animal welfare is an important aspect in sustainability perception.

An additional driver for following a vegan diet or for the consumption of plant-based drinks is health (Glick-Bauer & Yeh, 2014). Especially for persons suffering from lactose intolerance or cow's milk protein allergy, plant-based alternatives to dairy products are a valuable alternative (Silva et al., 2020). Cow's milk allergy is among the most common allergies in infants and children (Vanga et al., 2017). This is also reflected in product perception. Consumers of plant-based drinks rated these products as more digestible and allergy-free (Haas et al., 2019). Generally, plant-based drinks are associated with sustainability and health benefits (Moss et al., 2022). Similarly, for flexitarians, the main motivator for reducing meat consumption is health (Malek & Umberger, 2021). Some studies have even found that health aspects and price are more important than sustainability (Rolfe et al., 2023), whereas others report that health and the environment are universally important for vegans, vegetarians and omnivores (North et al., 2021). Indeed, when asked, consumers seem to indicate that nutritional attributes such as calorie content, protein, fat, vitamins A and D, and price play an important role when choosing milk beverages (Yang & Dharmasena, 2020). In this regard, it is interesting to note that oftentimes, plant-based dairy alternatives are more expensive than cow's milk (Smith et al., 2022).

One of the most important reasons for not consuming plant-based drinks is their sensory characteristics, which often do not match consumers expectations (Cardello et al., 2022; Friedman & Brandon, 2001; Sethi et al., 2016). Overall, cow's milk still has a better product image than plant-based drinks. In a recent study conducted in Austria, it was considered healthier, more natural, and better for bone health (Haas et al., 2019).

1.3. Perception of veganism

With an increasing offer and demand for dairy alternatives, it is important to investigate who consumers of these products are and how they can be characterised in order to optimally adjust factors determining the perception and consumption of these products. It can be assumed that the majority of consumers of dairy alternatives do not plan to change to a strictly vegan diet. Still, a common characteristic with vegans might be the renunciation of the consumption of cow's milk. As mentioned earlier, an important driver for consumers to consume plant-based dairy alternatives was to decrease the consumption of animal products and to promote animal welfare (McCarthy et al., 2017), which is strongly overlapping with the motivation to live vegan (Janssen et al., 2016). Based on the similarity bias, that is, individuals feeling attached to people who share the own beliefs and attitudes, we hypothesised that the behaviour of not consuming cow's milk common to both groups might influence dairy alternative consumers' perception of veganism. Therefore, in the present survey, a specific focus was set on the perception of veganism of users and non-users of plant-based dairy alternatives (in the following referred to as plant-based alternatives).

According to the literature, gender differences were observed, with males being more critical towards veganism and reacting more reluctant to adopt plant-based diets (Hinrichs et al., 2022; Vandermoere et al., 2019). Following a text analytical methodology, Gregson et al. (2022) have found that anti-vegan beliefs are relatively heterogeneous. Among the main arguments were statements that veganism is not healthy, that animals can be killed humanely, and that veganism comes with a moralistic tone (Gregson et al., 2022). Indeed, vegans are often admired for their morality and commitment, but they may also be seen as overcommitted or arrogant, which De Groeve and Rosenfeld (2022) referred to as the "vegan paradox".

1.4. Aims and relevance of the present research

Aiming to provide a more detailed understanding of Swiss consumption of plant-based alternatives to dairy products, the current research had three aims. First, given the fast increase in the number of products and persons consuming dairy alternatives, we aimed to gain an overview of the current situation regarding plant-based dairy alternatives in Switzerland, including the type of products and frequency of consumption. Switzerland is an interesting country for studying these groups, as there is a high percentage of flexitarians (Coop, 2022). Further, a good overview of the current consumption provides a useful and necessary basis to build future studies on. For this, we specifically look at the consumer profiles of users and non-users of plant-based dairy alternatives, as did previous studies (Jaeger & Giacalone, 2021). This data adds to a better understanding how a nutritional transition can be achieved as effectively as possible. Second, we looked into the drivers and barriers of consumption of plant-based alternatives, perception of these products and the characterisation of consumers and non-consumers of these products. Here, we also looked at what role health perception and certain types of food shopping behaviour play for the consumption of plant-based dairy alternatives. This is crucial to gain a better insight why these products are consumed and how consumption may develop in the future. Third, we aimed for deeper insight into the perception of veganism as vegans are among the target groups for consumption of plant-based dairy alternatives. Similarly, we investigated the perception of sustainability, as it is one of the major drivers for changes towards a diet with higher amounts of plant-based products. To

this end, our study aimed to contribute to a more detailed understanding of the growing consumer group using plant-based products Additionally data on the perception of veganism could be used to design optimal communication for the promotion of plant-based products, and thus, to support the transition of the Swiss population to a more sustainable diet.

2. Materials and methods

2.1. Participants

The presented data are based on an online survey. The survey was conducted in the German-and French-speaking parts of Switzerland from June to July 2020. EFS Questback survey software was used for data collection. Participants were recruited using the Intervista Online Access Panel, which is ISO certified (ISO 26362). As a result, anonymity of the participants is ensured as the researchers do not have access to any personal data of the respondents. To ensure a representative sample, a cross-quotation was applied to the initial sample, consisting of 1,678 persons, for the characteristics of age, gender, and language region. Persons who indicated that they consumed plant-based alternatives less often than 2–3 times per year were assigned to the non-user group, while those who consumed these products at least 2–3 times per year were assigned to the user group (n = 594). We chose this differentiation including rare users in the user group assuming that there is a difference between consumers of these products and those who completely oppose its consumption. Within the initial sample, the incidence of plant-based product users was 35%. Care was taken that the two groups had equal sizes for evaluation, therefore, excess interviews with non-users were terminated at an early stage and removed from the data set resulting in 610 complete interviews for the non-user group. The data set obtained was checked for speeding and irregularities (extreme responding), but none were identified. The final sample consisted of 1,204 people who completed the questionnaire.

2.2. Questionnaire

The survey consisted of five distinctive parts. In the first part, relevant sociodemographic information, including age, gender, and place of residence, was collected together with data on type of actual diet (e.g. vegan, vegetarian).

In the second part of the survey, participants were asked about their consumption habits of plant-based drinks, yoghurt, and cream made from soy, oat, almond, rice, cashew, coconut, hemp, lupins, buckwheat, and spelt. For each type of drink, participants reported their frequency of consumption, which was measured using 9 categories ranging from "never" to "daily". Additionally, a "do not know" option was included. This question was also used to group participants into consumers and non-consumers of plant-based alternatives.

In part three of the survey, we investigated the participants' motivations to consume milk or plant-based drinks. The participants were asked to write in free text why they consumed (for those who indicated they did) or why they did not consume (for those who indicated they did not) plant-based drinks. The specific question asked was "What are the reasons why you [do/do not] buy/consume plant-based drinks or plant-based yoghurt alternatives?".

In the fourth part of the survey, participants rated the contribution of cow's milk, as well as soy drink, oat drink, rice drink, and almond drink, to a healthy and balanced diet, and how natural and climate friendly these products are. Each of the three aspects was rated for how much it applies to each of the four products on a scale from −3 (not at all) to 3 (very much). Finally, participants reported their consumption frequency of cow's milk (both as such and as an ingredient) on a scale ranging from 1 (never) to 9 (daily, multiple times per day).

In part five of the survey, individuals' understanding regarding their general shopping behaviour of food, perception of specific health arguments, and a vegan diet were assessed. For shopping behaviour, participants rated 13 statements for their level of agreement on a scale from 1 (do not agree at all) to 6 (agree very much). Assuming that some of the participants were not responsible for grocery shopping in the household, they had the possibility of answering that they did not know or could not answer this question. Examples of the statements include "When shopping, I pay attention that the products are produced in Switzerland" and "Animal products are part of a balanced diet" (see Appendix A1 for a list of all items). Similarly, participants rated five health-related statements for their level of agreement on a scale from 1 (do not agree at all) to 6 (agree very much). The complete list of items can be found in Appendix A2. Perception of a vegan diet was assessed in a similar way using seven items. Examples of the statements include "I can imagine following a vegan lifestyle" and "A vegan diet is not healthy in the long term" (see Appendix A3 for a list of all items). Lastly, individuals' understanding of sustainability was assessed qualitatively. They were asked to describe in one or two sentences what sustainability meant to them. Participants' answers were coded and similar mentions grouped into categories. As a result, a list of 40 different categories was identified. Additionally, a "do not know" category was included.

Table 1
Demographic characterisation of participants and use of plant-based products including significance of group differences for users and non-users (N = 1,204).

		User [%] (n = 594)	Non-user [%] (n = 610)	Sig.
Sex	Female	56.2	45.6	***
	Male	43.8	54.4	***
Language	German	73.7	76.7	ns
	French	26.3	23.3	ns
Age	16–29	25.9	16.4	***
	30–45	32.7	26.7	*
	46–59	26.6	27.5	ns
	60–74	14.8	29.3	***
Place of residence	Urban	73.1	62.1	***
	Intermediate	16.2	21.0	*
	Rural	10.8	16.9	**
Education	Compulsory school, vocational school	41.9	50.5	**
	College, university	57.7	48.7	***
	Not specified	0.3	0.8	ns
Form of diet	Vegan	3.0	0.0	***
	Vegetarian	9.9	1.8	***
	Flexitarian	31.7	15.4	***
	Gluten free	5.6	0.0	***
	Food allergy/food intolerance	3.9	3.3	ns
	Lactose intolerance	8.3	2.8	***
	Weight reduction	8.4	6.6	ns
	No special form	39.4	71.0	***
	Other	7.4	3.1	***

Note. User = participants who consumed a type of plant-based alternative at least 2–3 times per year.
*** *: significantly different ($p \leq 0.001$).*
** *: significantly different ($p \leq 0.01$).*
* *: significantly different ($p \leq 0.05$),* ns: not significant.

2.3. Data analysis

Numerical data of consumer's answers related to their shopping behaviour, and perception of health and veganism was tested whether it followed a normal distribution. Since the different tests used rejected the hypothesis of normally distributed data, a Mann–Whitney *U* test was

Table 2
Frequency of consumption of cow's milk (users (n = 594) and non-users (n = 610) of plant-based dairy alternative products) and frequency of consumption of selected plant-based drinks ($user_{drinks}$, n = 524).[1]

Frequency of consumption	Cow's milk		Almond	Coconut	Oat	Rice	Soy
	Non-user [%]	User [%]	$User_{drinks}$ [%]				
daily	36.9	19.2	3.6	1.0	4.6	1.0	3.1
4–6 times per week	21.3	14.5	4.8	2.1	5.3	2.7	5.0
2–3 times per week	15.6	17.2	8.8	4.8	7.4	5.0	8.2
once per week	8.2	10.8	7.6	5.2	7.1	4.4	5.9
2–3 times per month	6.2	10.4	12.6	7.3	9.4	6.9	8.8
once per month	3.6	7.1	10.1	7.8	9.0	6.9	9.0
2–3 times per year	2.5	5.1	22.0	15.1	16.6	13.9	20.0
<2–3 times per year	3.0	5.4	16.4	20.0	13.9	25.0	14.1
never	2.3	10.3	13.6	35.3	24.8	32.8	25.8
do not know	0.5	0.2	0.6	1.5	1.9	1.5	0.2

[1] In the user group, 70 did not consume drinks, resulting in a lower *n* for the user group of drinks ($user_{drinks}$).

calculated to determine whether there were differences in the level of agreement between users and non-users. To test whether the proportion of users and non-users differs significantly within each of the demographic categories, a X^2 test was used. Data were analysed using SPSS version 25.

3. Results and discussion

3.1. Characterisation of participants

Data of 1,204 people who completed the questionnaire was used for analysis. Table 1 summarises the demographic information collected for the two groups. With a percentage of around 75% compared to 25%, the language distribution between the German and French questionnaires corresponds to the proportions in the population of Switzerland (Bundesamt für Statistik (BFS), 2020).

As could be expected, the percentage of females was significantly higher in the user group than in the non-user group. Further, a higher percentage of users lived in an urban area and had a higher education than non-users. In addition, the percentage of declared flexitarians and vegetarians in the user group was significantly higher than in the non-user group. As anticipated, no vegans were found in the group of non-users (Table 1).

Based on the consumption frequency of cow's milk, we found that both users and non-users consumed milk on a regular basis (Table 2). More than 70% of the non-users and around 50% of the users of plant-based products indicated that they consumed cow's milk at least 2–3 times per week. This result is consistent with the fact that only very few declared vegans participated in the survey (Table 1). Thus, the percentage of participants who fully substituted cow's milk with plant-based alternatives seemed to be small.

Compared to cow's milk, a distinctly lower number of users consumed plant-based drinks on a regular basis. With proportions of around 17%, oat and almond drinks were consumed at least 2–3 times per week, followed by soy drinks with 16%. In general, 60% or more of the users indicated that they consumed this type of drink only once a month or less (Table 2). These results suggest that plant-based drinks still have to be considered niche products, even within the group of

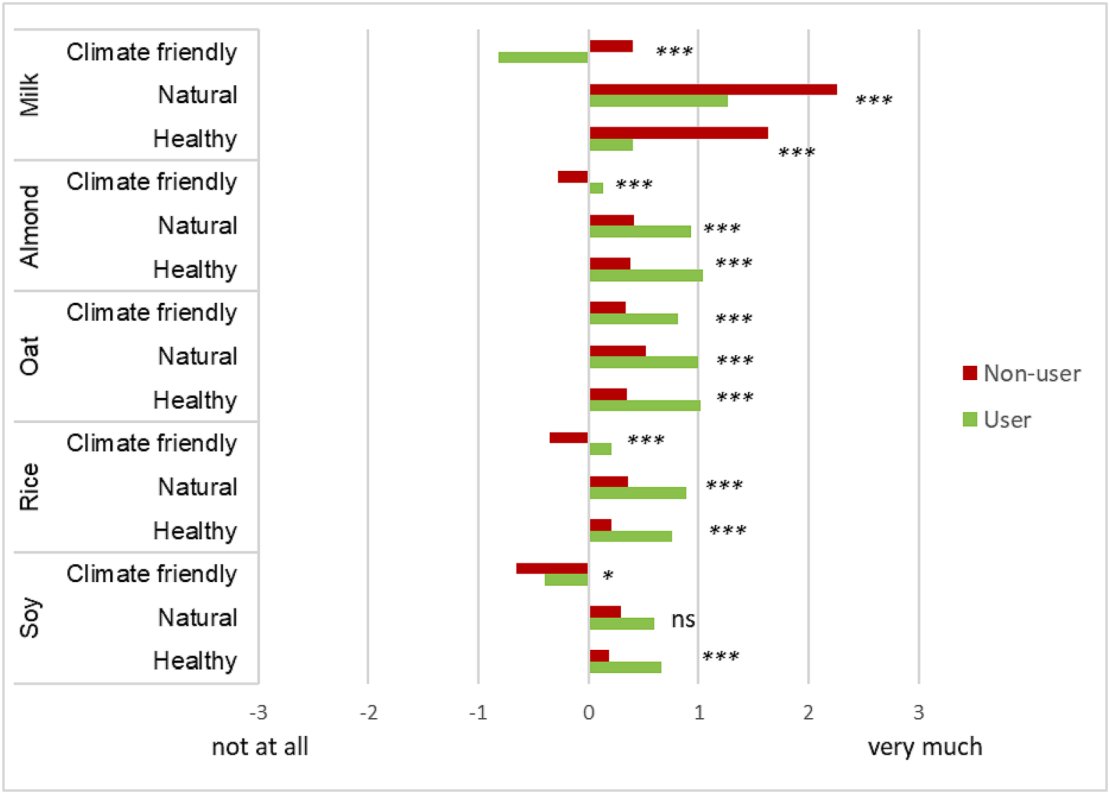

Fig. 1. Perception of climate impact, naturalness, and healthiness of cow's milk and different types of plant-based drinks for users (n = 445) and non-users (n = 343), following the question "Do you perceive this product as …?" ***: Significantly different ($p \leq 0.001$); **: Significantly different ($p \leq 0.01$); *: Significantly different ($p \leq 0.05$).

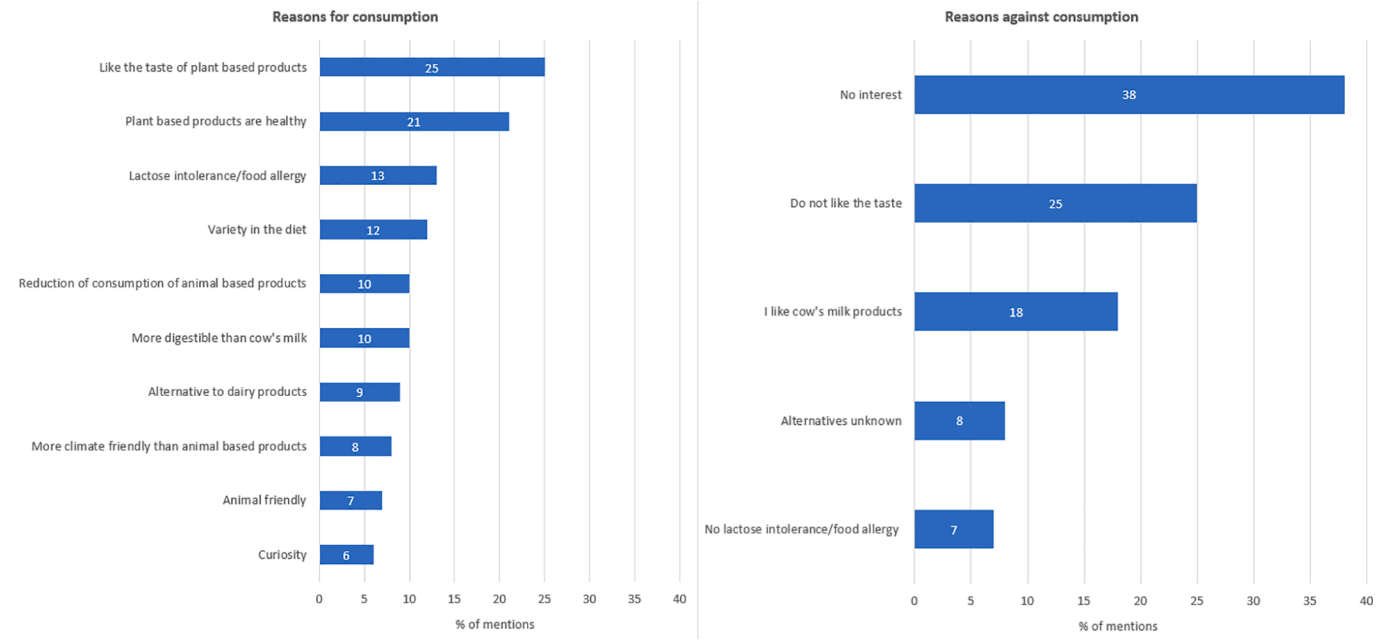

Fig. 2. Reasons for consumption of users (left) and non-consumption of non-users (right) of plant-based alternatives. Only answers that reached 5% of mentions or more are shown.

individuals who reported that they consume plant-based products. This is in line with the Swiss report on the consumption of plant-based alternatives, which indicates that the consumption of these products is growing fast, but consumption currently remains on a niche level ([Federal Statistical Office] Bundesamt für Statistik (BFS), 2022).

For the group of users, the type of plant-based alternative and the amount of consumption of specific drinks were examined in more detail. We found that more than a third of the users (i.e. 37%) consumed only plant-based dairy products in the form of drinks, 21% consumed drinks and yoghurts and 20% consumed drinks, yoghurt and cream.

In terms of duration of use of plant-based alternatives, almost 24% indicated that they had been using these products for more than five years. Another 23% reported a duration of use for 3 to 5 years and 25% indicated a duration of use of around two years. Therefore, approximately two thirds of the users have been consuming these products already for some time. These observed numbers on duration of use were somewhat unexpected. Since results also showed that plant-based products tended to be consumed by younger participants. Thus, we had assumed that these products were consumed only for shorter periods, given that maximum usage time is limited by age.

3.2. Comparison between cow's milk and plant-based drinks

To directly compare cow's milk and plant-based drinks, participants were asked for their thoughts regarding the naturalness of cow's milk and most plant-based drinks available on the market, as well as the impact of the use of these products on climate and health. Both users and non-users perceived cow's milk as more natural than plant-based drinks. As expected, the non-users perceived cow's milk as significantly more natural than the users of plant-based products. Both users and non-users perceived all plant-based drinks as natural, although the user group perceived all plant-based products as significantly more natural than the non-user group.

However, users indicated that the consumption of cow's milk and soy drinks had a negative impact on the climate, while drinks made from almonds, oats, and rice were considered to have a positive effect on the climate (Fig. 1). This is especially interesting, as it opposes experts' opinions rating soy as relatively environmentally friendly, depending on its origin (Green et al., 2022). We further noticed that users generally judged the environmental impact of soy drink to be more positive than non-users. These findings might be the result of cognitive dissonance, which describes that two inconsistent cognitions making individuals uncomfortable (Cooper & Carlsmith, 2001; Festinger, 1957). As a result, they adapt their attitudes or behaviour to make them consistent. For instance, individuals who consume cow's milk are most probably well aware of the impact it has on the environment. As they, however, care for the environment, their attitude follows their behaviour, resulting in them stating that plant-based drinks are worse for the environment. Still, both users and non-users perceived soy as environmentally unfriendly, which is a strong indication of a negative product image.

Similar results were obtained for the perception of impact on health. Both groups indicated that the consumption of cow's milk as well as plant-based drinks had a positive effect on health. It was not surprising that the group of users assessed the influence of plant-based drinks on health significantly more positively than did the group of non-users (Fig. 1), as health is one of the main motivators for consumption for these consumers. Our results are also in line with previous findings that non-users tend to have more negative associations towards plant-based products (Jaeger & Giacalone, 2021).

Our findings are well-aligned with the results of previous studies. In a survey conducted in Austria, plant-based drink consumers evaluated this type of products as significantly better than cow's milk consumers. Specifically, they rated them as having better digestibility and being allergy-free (Haas et al., 2019). In contrast, in an implicit association test conducted with parents, cow's milk was more often associated with positive attributes (e.g., healthy) than plant-based drinks (Schiano et al., 2022). Cow's milk is often considered healthier, more natural, and better for bone health (Haas et al., 2019), a result that is in line with the product perceptions of the non-users in our study.

3.3. Reasons for and against consumption

One of our interests was to obtain more detailed information about the reasons why plant-based alternatives are used or why people refrain from consuming them. The four most important reasons for participants in the user group were that they liked the taste of these products,

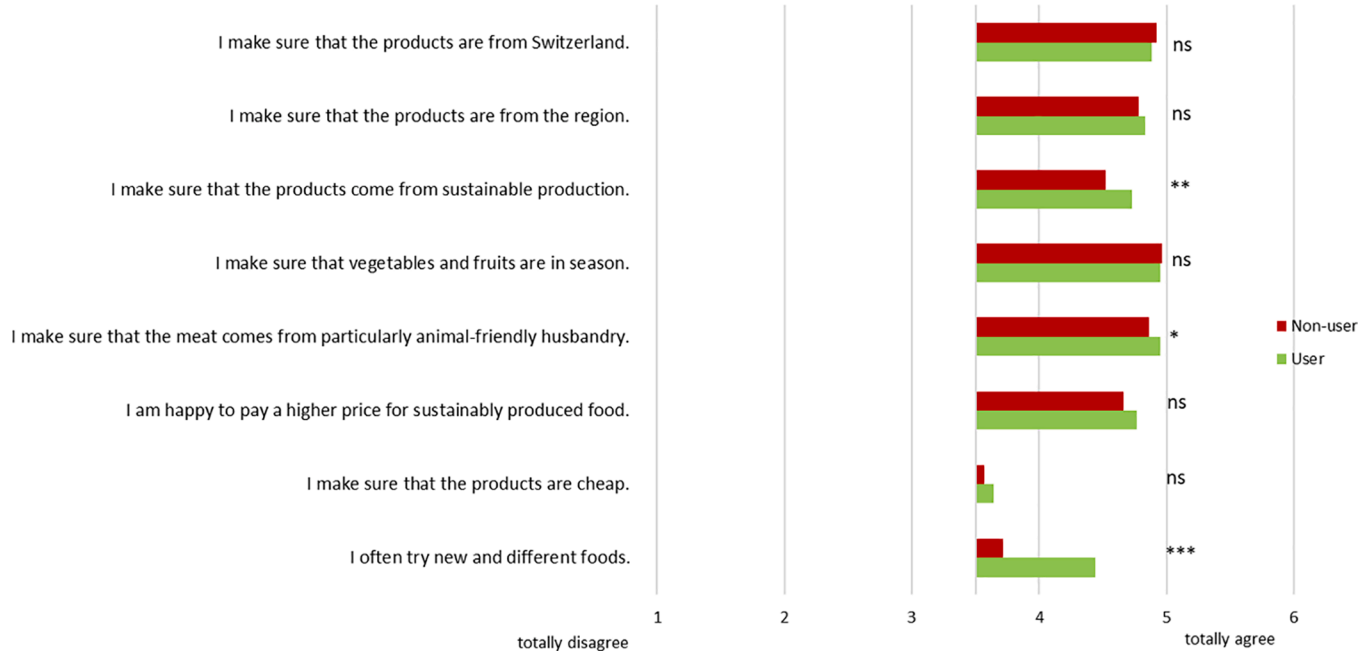

Fig. 3. Average value for agreement/disagreement to different statements related to food shopping issues for users (n = 508) and non-users (n = 559) of plant-based dairy alternatives. ***: significantly different ($p \leq 0.001$); **: significantly different ($p \leq 0.01$); *: significantly different ($p \leq 0.05$).

followed by the statement that these products were healthy. The third most important reason was lactose intolerance or food allergy, which is in line with the literature (Haas et al., 2019; Silva et al., 2020). Not surprisingly, animal welfare was often listed among the most important reasons for consumption of plant-based alternatives. Indeed, animal welfare has become one of the most important agricultural policy goals for the general public in Switzerland (Ammann et al., manuscript submitted). Other often-mentioned reasons were variety seeking and better digestibility of the plant-based products compared to milk (Fig. 2). Non-users, by contrast, indicated a lack of interest in these products as their most important reason for non-consumption. Another 25% mentioned that they did not like the taste. Again, this is well-aligned with other studies that found that taste is a major aspect for food acceptance in general (Ammann et al., 2023) including also dairy alternatives (Collier et al., 2023; Giacalone et al., 2022). In addition, non-users seemed to like cow's milk products in general, so they did not see any reason to adapt their consumption pattern (Fig. 2). This implies that it is crucial that the sensory characteristics of plant-based alternatives fulfil consumer's expectations. Otherwise, these products will not appeal to potential new consumers. Finally, it was interesting to observe that health was mentioned only as a reason for, but not against, consumption of plant-based alternatives.

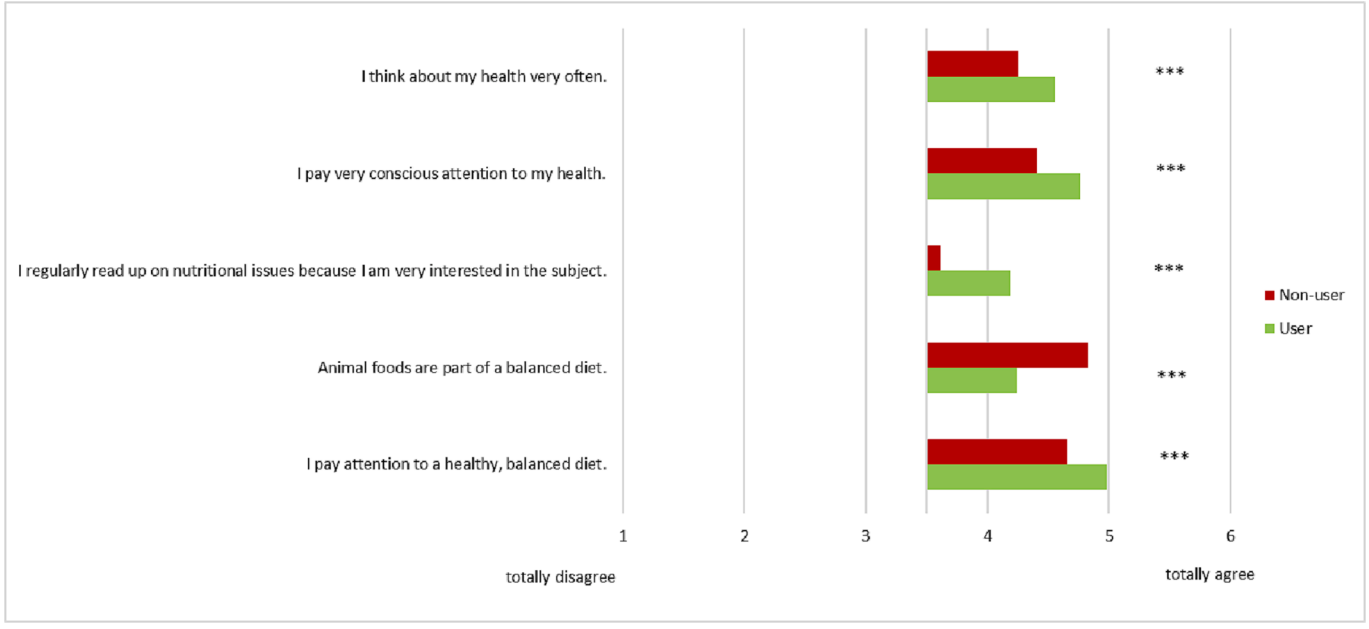

Fig. 4. Average value for agreement/disagreement to different statements related to health for users (n = 508) and non-users (n = 559) of plant-based dairy alternatives. ***: significantly different ($p \leq 0.001$); **: significantly different ($p \leq 0.01$); *: significantly different ($p \leq 0.05$).

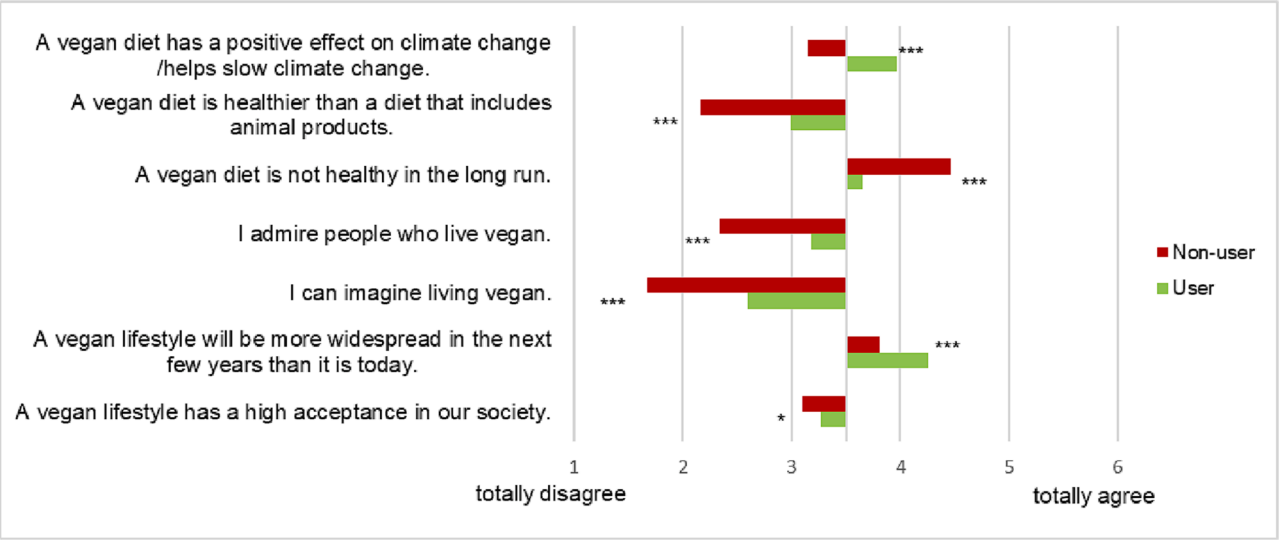

Fig. 5. Average values for agreement and disagreement with different statements related to a vegan diet for users (n = 441) and non-users (n = 459) of plant-based alternatives. ***: significantly different ($p \leq 0.001$); **: significantly different ($p \leq 0.01$); *: significantly different ($p \leq 0.05$).

3.4. Attitudes towards food shopping, health, and vegan diet

The average value for the statements related to shopping behaviour, health aspects and vegan diet was used to compare the attitudes of users and non-users. In general, respondents' attitudes towards the various statements related to food shopping and health aspects did not show any major differences between the group of users and non-users (Fig. 3). With mean values close to zero, both groups were more or less indifferent about buying cheap products, whereas the users, on average, were more willing to pay more for sustainably produced products. In addition, the users agreed at a slightly higher level that foods should be regionally as well as sustainably produced. Moreover, users slightly agreed more that meat should come from animal-friendly production. For the group of non-users, it was important that the foods were produced in Switzerland and that they were in season. The most evident difference between the two groups was the gap between their willingness to try new foods. Users of plant-based products seemed, on average, more open to trying out new products than non-users, a fact that was also supported by the high percentage of participants who were not interested in consuming plant-based alternatives. Fig. 3 further shows that users cared significantly more about sustainability and animal welfare. With sustainability and animal welfare being one of the main reasons for

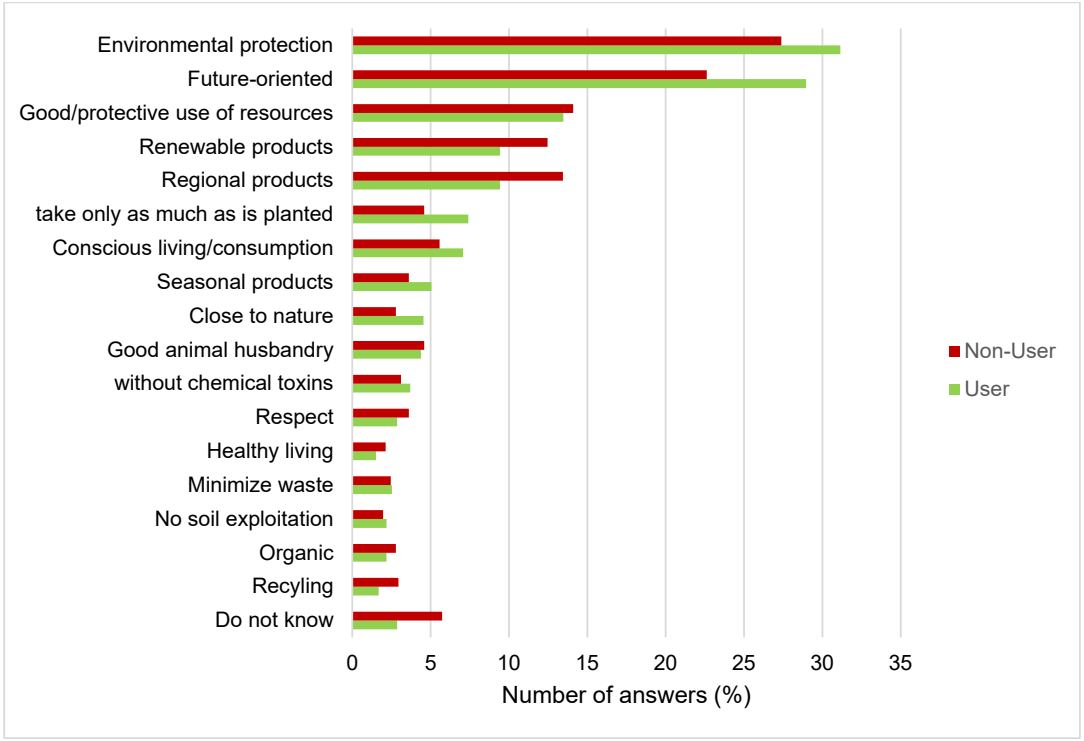

Fig. 6. Associations for "sustainability" mentioned by users and non-users of plant-based alternatives. Only categories that reached 2% of the mentions are shown.

reducing the consumption of animal protein, this finding was not unexpected (Fox & Ward, 2008; Hallström et al., 2015).

In our sample, health issues seem to be more important to users of plant-based products but also concern non-users. This is in line with previous research findings that independent of the diet style, consumers indicated to care for health and environment (North et al., 2021). For instance, with increasing age, participants tend to reduce their milk and dairy consumption for health reasons, such as decreasing lactose digestibility or lowering their cholesterol levels (Chollet et al., 2014). Instead of abstaining from consuming milk, it is feasible for individuals to switch to lactose-free milk or to plant-based alternatives. However, compared to the group of users, non-users agreed more that animal products were part of a balanced diet (Fig. 4), which is not surprising, given the fact that milk is still regarded as good for bone health (Haas et al., 2019).

Regarding the impact of a vegan diet on climate, the perceptions of the two groups were significantly different (Fig. 5). While the mean value of the users indicated that the majority were of the opinion that a vegan diet had a positive effect on climate change, on average, the group of non-users showed the opposite result. Both non-users and users indicated that a vegan diet was not necessarily healthier than a diet that included animal products. Furthermore, non-users agreed with the statement that a vegan diet was not healthy in the long term, whereas users were undecided. In addition, both groups seemed to disagree with living a completely vegan lifestyle and showed little agreement with the statement that they admired people following a vegan lifestyle. Disagreement for these two statements was significantly higher for the non-user group than for the user group. However, both groups agreed that the proportion of people leading a vegan lifestyle would continue to increase in the future. In contrast, neither group was convinced that this form of lifestyle currently enjoyed broad support in society (Fig. 5). Still, users rated the image of vegans significantly better than the non-users in our sample.

In an open-ended question at the end of the survey, participants were asked to describe what they associate with the term “sustainability”. For both the user and non-user groups, the description of sustainability often included terms related to environmental protection, future, and careful use of available resources (Fig. 6). It is worth noting that individuals in the user group mentioned terms related to environmental sustainability (e.g. environmental protection) more frequently than individuals in the non-user group. This is in line with a recent study conducted in the US, where researchers found that consumers who consumed both cow’s milk and plant-based alternatives placed higher importance on sustainability than consumers who only purchased dairy products (Schiano et al., 2020). Both users and non-users mentioned animal welfare as an important aspect of sustainability. However, the relatively low percentage of mentions indicated that the aspect of animal welfare was not among the top associations. These findings are surprising, since current research finds that animal welfare is among the most important agricultural policy objectives, as judged by the Swiss public (Ammann et al., manuscript submitted). However, it is plausible that a relatively high percentage of participants might have subsumed this argument under a more general term, such as “future-oriented”. Finally, it was surprising to see that around 5% of non-users were unable or unwilling to name associations related to sustainability. By contrast, the percentage of users who indicated the “do not know” category was clearly lower, indicating that users knew and cared more about sustainability than non-users.

3.5. Limitations and outlook

The present study was subject to a few limitations. A methodological issue to mention is that we recruited using quotas for age, gender and language region. Only after recruiting, we grouped participants into users and non-users. Future studies could specifically screen for users and non-users and further investigate the group differences. Furthermore, the survey only looked at dairy products. A comparable survey on meat alternatives would allow for identification of potential differences in consumer profiles of plant-based products dependent on whether they are used to supplement dairy or meat. Finally, for future studies, it would be interesting to take a more in-depth look at cultural differences (i.e. between language regions or countries), as consumption of different foods is highly related to culture. For instance, it remains partly unknown whether cow’s milk is substituted or consumed in addition to plant-based alternatives. Further, answers from surveys are known to reflect the behaviour of consumers only to a limited extent (e.g. attitude-behaviour gap, the gap between what consumers say and what they actually do (Carrigan & Attalla, 2001)). Thus, studies collecting data on the actual shopping and consumption behaviours of plant-based alternatives are necessary to obtain an overall view of the use of plant-based alternatives.

4. Conclusion

In this study, we analysed the current consumption patterns regarding cow’s milk and its plant-based alternatives for people living in Switzerland. A particular strength of our study is that it covers a wide range of plant-based dairy alternative products. The survey showed that consumers of plant-based alternatives tended to be young, well-educated urban flexitarians. The reasons for the consumption of plant-based alternatives were numerous, encompassing taste, health aspects (including allergies and intolerances), and environmental sustainability. Beside disinterest, the most important reasons for non-consumption were insufficient sensory properties. Given these results, producers should put a focus on improving and marketing the sensory properties together with an improvement of the nutritional composition of their dairy alternatives. Finally, we found that users and non-users of plant-based alternatives differed significantly in their beliefs about the impact of a vegan diet on climate (users agreed and non-users disagreed), which might point towards a certain bias in perception. Further, similarity bias could contribute to users of plant-based alternatives perceiving vegans more favourably as they share the consumption of plant-based products. Based on these findings, our study has important implications for research and practice, as it contributes to a better understanding of the growing product category of plant-based alternatives and their consumers and to the needed shift to a more plant-based diet, supporting the health of us as individuals and our planet.

CRediT authorship contribution statement

Jeanine Ammann: Project administration, Writing – original draft. **Angela Grande:** Conceptualization, Methodology, Investigation. **Jonas Inderbitzin:** Writing – review & editing. **Barbara Guggenbühl:** Conceptualization, Methodology, Investigation, Writing – review & editing.

Declaration of Competing Interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: J. A. serves as guest editor for the special issue this work has been submitted to.

Data availability

Data will be made available on request.

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Appendix

Table A1
Statements related to food shopping issues, for which participants were asked to indicate how much they agree with each statement on a scale from 1 (totally disagree) to 6 (totally agree).

Statements related to food shopping issues	
1	*I make sure that the products are from Switzerland.*
2	*I make sure that the products are from the region.*
3	*I make sure that the products come from sustainable production.*
4	*I make sure that vegetables and fruits are in season.*
5	*I make sure that the meat comes from particularly animal-friendly husbandry.*
6	*I am happy to pay a higher price for suitably produced food.*
7	*I make sure that the products are cheap.*
8	*I often try new and different foods.*

Table A2
Statements related to health, for which participants were asked to indicate how much they agree with each statement on a scale from 1 (totally disagree) to 6 (totally agree).

Statements related to health	
1	*I think about my health very often.*
2	*I pay very conscious attention to my health.*
3	*I regularly read up on nutritional issues because I am very interested in the subject.*
4	*Animal foods are part of a balanced diet.*
5	*I pay attention to a healthy, balanced diet.*

Table A3
Statements related to vegan diets, for which participants were asked to indicate how much they agree with each statement on a scale from 1 (totally disagree) to 6 (totally agree).

Statements related to vegan diets	
1	*A vegan diet has a positive effect on climate change/helps slow climate change.*
2	*A vegan diet is healthier than a diet that includes animal products.*
3	*A vegan diet is not healthy in the long run.*
4	*I admire people who live vegan.*
5	*I can imagine living vegan.*
6	*A vegan lifestyle will be more widespread in the next few years than it is today.*
7	*A vegan lifestyle has a high acceptance in our society.*

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