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Exploring Cashew Nuts Consumption in Poland. Prospects for Tanzania

Keywords: cashew nuts; consumer perceptions; food quality and safety; sustainable and healthy diet; agri-food sector

JEL: E21; P46; Q13; Q17

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Abstract

Theoretical background: Consumers often rely on the perceived country-of-origin image as an indication of food safety and quality. The consumption of cashew nuts in Poland and other European countries has increased strongly in recent years due to socio-economic factors influencing consumers' dietary behaviour. This is a chance for Tanzania – a key global producer and exporter of cashew nut kernels – to increase its revenues from the agri-food sector.
Purpose of the article: The aim of this study is to explore cashew nuts consumption in Poland and consumer perceptions regarding nuts of African origin.
Research methods: Empirical research was conducted using a web-based survey questionnaire among consumers originated from Europe, Africa and other continents, and residing in Poland (n = 244). The ordered Probit model was used to examine the impact of socioeconomic/demographic characteristics on the perception of quality/safety of nuts produced in Africa.
Main findings: Most respondents recognize the health benefits of nuts. The vast majority of consumers surveyed perceive the quality and safety of nuts of African origin as average or above average. These products are rated more highly in terms of quality by representatives of Generation Z compared to Millennials which represents a potential for development of the market. High prices prevent every other consumer surveyed from buying cashew nuts. The development of cashew nut processing in Africa could contribute to the decrease in the prices in the importing countries and to further sustainable economic growth in producer countries, including Tanzania. If consumers in developed-countries appreciate the health benefits of cashew nuts and trust the quality and safety of nuts produced in Africa, efforts should be made to speed commodity-based industrialization in cashew-growing countries.

Introduction

Cashew is a perennial nut crop originating from Brazil which was brought to Africa during the 16th century by Portuguese traders (Assenga et al., 2020). Over the past years, the increase in the global market for cashew nuts has been stimulated by a rapid expansion of cashew nuts cultivation, mostly by smallholder farmers across the tropics and a growing interest of consumers living in the Northern hemisphere. For the period of 1980 and 2020, total land under cashew cultivation grew over thirteen times and was over 7.1 million ha in 2020; global harvest increased over five times over this period (Mighty Earth, 2023). This decrease in land productivity regarding the global production of cashew nuts could be caused by climate change issues and sustainable agricultural system changes.

In 2022, Africa was the main producer of raw cashew nuts (RCNs) in the world and was responsible for 58% of RCNs produced globally, followed by Asia with 38% share (FAOSTAT, 2023b). Cashew nuts production generates relatively high revenue in many African countries compared to other crops. The top countries producing cashew nuts in Africa include Ivory Coast, Tanzania, Benin, Mali and Burkina Faso (Lukurugu et al., 2022). In Tanzania, cashew nuts are one of the most important agricultural export crops, followed by tobacco and coffee; the country is now the world's 5th largest producer of cashews. After harvesting the government oversees all

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trading through the farmers cooperatives and warehousing system which is regulated by the Cashew nut Board of Tanzania (CBT), which sets prices. The vast majority of Tanzanian cashews' production has been exported (93.5% in 2022) (CBT, 2023). The country's share in global export value was 63% in 2022 and Tanzania was the top exporter of cashew nuts (in nutshell) followed by Mozambique, the Netherlands (acting as a trading hub), Benin and India (Statista, 2023b). The world's top five exporters of cashew nuts in shell were Ivory Coast (778.7 thousand tonnes), Tanzania (234 thousand tonnes), Ghana (225.4 thousand tonnes), Guinea-Bissau (130.4 thousand tonnes), and Burkina Faso (118 thousand tonnes), while taking into account export quantity in 2022 (FAOSTAT, 2023a).

An important issue regarding cashew nut production and trading in Tanzania is that only 10–15% of the harvest is processed locally due to automatic equipment shortages (CBT, 2023), while ca. 80% of Tanzanian cashew nuts are exported as RCNs to Vietnam and India for processing before entering the global market (Chelmer Foods, 2023). Adding value to RCNs within the country would have a positive impact on the economy of Tanzania.

The demand in the global cashew nut market has increased significantly in recent years. The global consumption of cashew nuts increased by ca. 61% over the period 2012–2021 (Statista, 2023a). European cashew nut imports volumes grew by 6.7% annually over the period 2017–2021. About 28% of RCN kernels are traded internally. A part of it is processed (roasted, salted and retail packed) in a European country (most often in Germany and the Netherlands). The Netherlands is the largest European importer and trade hub on cashew nut kernels. Germany, the United Kingdom, the Netherlands, France, Italy and Poland are the main European consumers of cashew nuts. The consumption of these nuts in Poland roughly doubled between 2017 and 2021 (CBI Ministry of Foreign Affairs, 2022). The consumer surveys conducted with the use of a single 24-h recall method in Poland over two periods of time, 2003–2005 and 2013–2014, showed that the percentage of participants who consumed various nuts increased from 1.8 to 3% (Witkowska et al., 2019). This was explained by social and economic changes, improvement of knowledge regarding health benefits of nuts and changing nutritional recommendations.

The popularity of cashews has been growing in Europe in the last few years because of the changes in consumption patterns (CBI Ministry of Foreign Affairs, 2022). The demand for healthier snacks and plant sources of protein has increased in Europe and other parts of the world along with promoting healthy diet and negative media exposure for red meat production. The environmental footprint of red meat is particularly large compared to plant sources of proteins (legumes and nuts) (Parlasca & Quaim, 2022; Poore & Nemecek, 2018; Willett et al., 2019). Since the global food system is facing more and more health and environmental challenges, nutritionally balanced diets which are low in animal-based foods and high in plant-based products such as fruits, vegetables, whole grains, legumes and nuts have been proposed as a critical measure to support environmental sustainability, while improving human

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health (Springmann et al., 2018; Willett et al., 2019). Springmann et al. (2021) have shown that healthy and sustainable dietary patterns including flexitarian, pescarian, vegetarian and vegan diets are lower in costs than current diets in upper- to high-income countries but higher in costs than current diets in lower-middle- to low-income countries. Although, healthy and sustainable diets are less costly than western diets in lower-middle- to low-income countries. This finding is important regarding the goal of ensuring food and nutrition security for all. To the best of the authors' knowledge, this is the first study of consumers in cashew nut market in Poland.

The aim of this study is to explore cashew nuts consumption in Poland and consumer perceptions regarding nuts of African origin.

Literature review and conceptual framework

The perception of food safety is a factor which influences food choices (Brown et al., 2022). All foodstuffs which are placed on the European market have to be safe. Despite this, food safety risks still exist, and new ones are emerging, which can be observed from the Rapid Alert System from Food and Feed (RASFF) data (Kowalska & Manning, 2022). Furthermore, the potential risk of contamination differs among individual agri-food products. Tree nuts do not provide sufficient moisture to support pathogenic growth, so the risk of foodborne illness is relatively low. Some pathogens such as Salmonella may develop due to the ability of surviving in low moisture environment for an extended period (Swinehart & Feng, 2023). Nuts and seeds are particularly vulnerable to mycotoxin contamination which cannot be eliminated along the supply chain (Kowalska & Manning, 2021; Zhang et al., 2021). It should be noted that there is always a possibility of nuts to be contaminated at multiple stages of value addition from the harvest to consumption and during food handling at home.

Food quality dimensions encompass intrinsic and extrinsic aspects of the foodstuff such as the product itself (including packaging) vs. its price (Oude Ophuis & van Trijp, 1995), whereas the intrinsic dimensions include sensory aspects, health-related issues (food safety and nutritional benefits), convenience and/or process quality (Grunert, 2005). There are also characteristics of food products that can be both intrinsic and extrinsic, for instance, quality cues (Grunert, 2005). Szczucki (1970) indicated the following main determinants of consumer perception of food quality: sanitary conditions related to safety of food; sensory attractiveness, which determines organoleptic quality; availability and convenience. Aboah and Lees (2020) assumed that consumers make decisions based on experience and credence quality cues that act as informational stimuli. The authors indicated that the five most important quality cues for meat purchase were extrinsic and related to credence attributes which require consumers to rely on trust; the cues include country-of-origin, food safety certification, price, production system and quality certification label. Wu et

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al. (2021) reported in their critical review that consumers often rely on the perceived country-of-origin image as an indication of food safety and quality. Czernyszewicz and Wiśniewska (2023) found out that country-of-origin is one of the most important determinants of building Gen Z trust in food safety. The overall impression about the country-of-origin creates a "halo effect" of positive or negative feelings towards products which are produced in the country. The core of the matter is that the consumers' perception of food quality is very subjective, full of criticism and emotions (Kowalska, 2011). Nevertheless, previous studies showed that consumer perception of food safety and quality may be influenced by age, gender, ethnicity, belonging to a community, educational background and/or income (Aschemann-Witzel et al., 2018; Swinehart & Feng, 2023). The recent studies which were conducted among Polish consumers have shown that they consider themselves aware of food safety and quality when making purchasing decisions, but they pay attention mostly to brands, long best before dates and promotions, whereas food safety and quality determined by the list of ingredients and/or product cues do not really matter to them in the buying process (Stoma et al., 2017). This calls for further research and gives rise to the first question: What are the consumers' perceptions regarding the safety and quality of nuts produced in Africa? Additionally, what socioeconomic and demographic factors shape these perceptions? (RQ1)

From a nutritional standpoint, consumption of cashew nuts has different nutritional benefits and several studies have shown and proved this. Cashew kernels have a high energy value with important nutrients including proteins, essential fatty acids (especially linoleic acid) and some minerals (calcium, phosphorus, iron). They also have a good antioxidant activity (Dumbrava et al., 2023). From a health standpoint, consumption of cashew nuts helps in preventing and reducing the risk of various diseases including diabetes, obesity and gallstones (Sempore et al., 2023). Cashew kernels can be consumed as a snack (raw, fried and/or salted), used for cooking purposes and can be used in making cookies, pastry and yoghurt in the form of powder, granulated or whole cashew nuts (Dendena & Corsi, 2014).

Cashew nuts and cashew protein isolates have recently started to be used in vegan foods to replace milk, cheeses and even in plant-based alternatives to meat products (Liu et al., 2018; Chen et al., 2020; Lima et al., 2021; Short et al., 2021; Maciel et al., 2022; Dumbrava et al., 2023), and this could be important to achieving a healthy, sustainable and balanced diet. A sustainable diet could be defined as diet combining all three dimensions of sustainability (economic, social and environmental). Thus, it should have lower environmental impact, and also be accessible, affordable, safe and equitable (FAO & WHO, 2019). The EAT-Lancet Commission has promoted a planetary diet which is good for environmental and human health; Willet et al. (2019) have recommended in the report to double the consumption of fruits, vegetables, legumes and nuts and significantly reduce consumption of red meat and added sugars. Polleau and Biermann (2021) found out that German consumers underestimate the environmental and health-benefits of meat-free diets (vegetarian, vegan, pescatarian)

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and perceive regional, seasonal, and organic food products as particularly healthy and environmentally friendly. With regard to the research topic, the second question needs to be answered: To what degree are consumers aware of the role of nut consumption in supporting a healthy and sustainable dietary pattern? (RQ2)

Although replacing animal-based proteins with plant-based proteins is widely promoted in Europe, low awareness and not enough knowledge regarding healthy and sustainable diet might be an obstacle preventing consumers from eating cashews and other nuts. Furthermore, people can have low awareness of health benefits coming from consuming nuts, including cashew nuts. Data on tree nuts consumption suggests that most individuals do not meet current requirements for nut intake; the common barriers that discourage people from consuming nuts include high caloric value, high fat content, high price, having allergies and/or dentition issues. The monthly unitary price of cashew nuts averaged annually (customs paid upon arrival in Europe) was USD 7.1 per kg in 2022/2023 and was higher than the price of almonds, hazelnuts and walnuts by 35, 17 and 13%, respectively (INC International Nut and Dried Fruit Council, 2023). The point is that the final price of cashew nuts is several times higher than the farm gate price, so it is beneficial for farmers and the economy of producing countries to process them internally. It was reported before that the value-adding process increased the farm gate price of cashews in Indonesia by 12–20 times (Kurniawan, 2016).

The demographic characteristics of consumers influence the consumption of nuts. People with higher income, high educational background and healthier lifestyle consume much more nuts (Neale et al., 2020). People presenting higher than others allergic reaction such as anaphylaxis usually avoid consuming any kind of nuts including cashew nuts which are among products causing allergies and intolerances enumerated in Annex II of Regulation (EU) No 1169/2011 on the provision of food information to consumers. Also, people who take medicines for type 1 and type 2 diabetes are advised not to consume cashews unless they are allowed by their doctor to do so because cashew nuts may interact with the drugs (Ertuğrul et al., 2020). Considering the growth potential of the production of cashew nuts in Tanzania (including growing, harvesting, drying and processing), the third research question needs to be answered: What are the obstacles that prevent consumers in Poland from buying and/or consuming cashew nuts? (RQ3)

Research methods

A quantitative research design was employed to explore cashew nut consumption in Poland. Data were collected in January 2024 through an online questionnaire survey using MS Forms. We used a snowball sampling method where existing study subjects recruit other respondents from among their acquaintances. This procedure is appropriate when the population is "hidden" which means that it is difficult to get

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access to its members (Babbie, 2003). Since it was crucial for us to recruit volunteers originated from Europe, Africa and other continents, and staying in Poland, snowball sampling seems to be justified. A total of 244 people residing in Poland voluntarily participated in the study. The data were analysed using the R statistical software package.

The questionnaire was designed in Polish and English. All the scales were of our authorship. We conducted a pilot survey to assess the questionnaire under survey conditions. Finally, the structured questionnaire comprised twenty questions, with eighteen closed-ended and two open-ended questions; the questions related to consumption and buying behaviour towards nuts including cashew nuts, preferences regarding country-of-origin, perception of quality and safety of nuts produced in Africa, consumer awareness of benefits and challenges associated with nut consumption, barriers discouraging people from consuming cashew nuts, and demographic characteristics of the sample. The questions were carefully constructed and piloted to gain a comprehensive understanding of the topic while minimizing bias. The study considered particular demographic and social characteristics as some studies, including the study done by (Grzymisławska et al., 2020), showed that food choices, eating behaviour and nutritional strategy are influenced by intra-individual (biological or psychological) and extra-individual (socio-economic and cultural) factors.

The demographic characteristics of the surveyed consumers were assessed through questions about gender, age, declared financial status, education level, nationality, residence area, and language. The sample consisted of 130 females (53%) and 114 males (47%). In terms of age, 64% of the respondents were between 18 and 24 years old, 24% of them were between 25 and 40 and only 12% of the respondents were between 41 and 60. The majority of respondents fell into middle-income categories. A little over half of the total number of respondents had at least a graduate degree. Similar proportions of participants of the survey live in a big city. Only 17% of the respondents live in rural areas. Almost 68% of the participants used Polish to fill in the questionnaire, and 27% of them used English (5% of the participants preferred not to mention the language used). The vast majority of respondents come from Europe, 17% – from Africa, 6% – from Asia, and only one person – from America.

Table 1. Demographic characteristics of the sample

Variable category	No. of respondents	Percentage (%)
Age		
18–24	156	64
25–40	59	24
41–60	29	12
Gender		
Male	130	53
Female	114	47

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Variable category	No. of respondents	Percentage (%)
Financial status		
Lower income	6	2
Lower-middle income	36	15
Middle income	93	38
Higher-middle income	87	36
High income	22	9
Education level		
Primary/Vocational	7	3
Secondary	103	42
Graduate degree	70	29
Postgraduate degree	32	13
Academic degree/title	32	13
Region		
Europe	186	76
Africa	41	17
Asia	15	6
America	1	0.5
Prefer not to mention	1	0.5
Area		
Big/Very big city	138	56
Small/Medium town	65	27
Rural	41	17
Language		
Polish	166	68
English	66	27
Prefer not to mention	12	5

Source: Authors' own study.

Five-point Likert scales were used to measure perceptions regarding the quality and safety of nuts produced in Africa and awareness regarding the role of consumption of nuts in supporting a healthy and sustainable dietary pattern. To test whether differences in perceptions or awareness can be partly attributed to underlying socioeconomic/demographic characteristics (measured in nominal or ordinal scales), one could use the Mann–Whitney *U* test (Mann & Whitney, 1947) when the number of categories of the independent variable is equal to two or the Kruskal–Wallis test (Kruskal & Wallis, 1952) when the number of categories is greater than two. Because the Kruskal–Wallis test is a generalization of the Mann–Whitney *U* test in the sense that it collapses to it when the independent variable has only two categories, we use the former test throughout. In short, the Kruskal–Wallis test is used to infer whether the mean ranks of the data grouped by the values of the independent variable are the same. The test can be viewed as a non-parametric alternative to one-way ANOVA and its use becomes necessary in settings where the dependent variable is ordinal, where the assumption of normality cannot hold. The test is based on the statistic:

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$$H = (N-1)\frac{\sum_{g=1}^{G} n_g\left(\overline{r}_{g.} - \overline{r}\right)^2}{\sum_{g=1}^{G}\sum_{i=1}^{n_g}\left(r_{gi} - \overline{r}\right)^2}$$

where N is the total number of observations and n_g is the number of observations in group g (out of G groups in the independent variable), r_{gi} is the rank of observation i (in the dimension of the dependent variable), $\overline{r}_{g.}$ is the average rank of observations in group g and $\overline{r} = (N+1)/2$ the average overall rank. Rejection of the null hypothesis leads to the conclusion that the mean ranks (and, therefore, the distributions) of the dependent variable differ between groups. If one is willing to assume that the distributions in the response variable differ between groups only in terms of location, then the null hypothesis can be expressed as equality of medians in the value of the dependent variable among the groups. We use the Kruskal–Wallis test to infer whether perceptions are affected by the variables mentioned in Table 1, i.e. age group, gender, financial status, educational level, continent of origin and place of residence.

In the Kruskal–Wallis test the dependence of perceptions on each dimension of the socioeconomic/demographic characteristics is examined marginally with respect to other dimensions. An ordered Probit model is used to examine the impact of each socioeconomic characteristic on the perceptions conditional on the values of the remaining independent variables. In particular, the ordered Probit model assumes that the socioeconomic characteristics in vector x_i have a linear impact on the value of the latent variable y_i^*:

$$y_i^\star = x_i'\beta + \varepsilon_i, \varepsilon_i \sim N(0,1)$$

In turn the observed value of the dependent variable, y_i, is determined by the following correspondence:

$$y_i = \begin{cases} 1 \text{ if } y_i^* \le \gamma_1 \\ 2 \text{ if } \gamma_1 < y_i^* \le \gamma_2 \\ 3 \text{ if } \gamma_2 < y_i^* \le \gamma_3 \\ 4 \text{ if } \gamma_3 < y_i^* \le \gamma_4 \\ 5 \text{ if } \gamma_4 < y_i^* \end{cases}$$

In this model, the βs are parameters to be estimated along with the γs, which represent cut-off points between categories (for example, γ_2 represents the point in the scale of the latent variable below which a respondent gives an answer of 2 and above which, an answer of 3). Because the impact of the independent variables on the observed value of the dependent variable is non-linear, we estimate and interpret marginal effects. Given that all independent variables in our application are nominal or ordinal, these marginal effects are calculated in terms of discrete changes: $prob(y_i = j|x_1) - prob(y_i = j|x_0)$, where x_0 is a vector that contains the values

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of the independent variables at the mean of the observations except for a zero in the place of the variable for which we are calculating the marginal effect and in x_1 this zero is replaced by one. One additional advantage of the order Probit model is that the results remain valid in non-random sampling, as long as the selection mechanism does not depend on the value of the dependent variable.

Results

The vast majority of the respondents (90.6%) report that they buy and/or consumer any kind of nuts. Few consumers (7 out of 244) admit they are allergic to cashew nuts. The nuts which are most frequently consumed by the participants of the survey include: peanuts, almonds, cashews, walnuts, and hazelnuts (Figure 1). Over 10% of the respondents eat cashew nuts (alone or with other food products) several times a week, and almost 28% of the participants consume cashew nuts several times a month. Only about 17% of the consumers surveyed never eat cashew nuts, while about 59–68% of the respondents never consume macadamias, Brazilian nuts, pecans, pine nuts or pistachios (Figure 1). This probably means cashew nuts are relatively popular among consumers in Poland. The survey shows that 40% of the participants eat cashews as a snack and 18% of the participants use them for muesli. It can therefore be assumed that people who eat cashews most often use them for preparing healthy snacks and meals. Every fourth respondent use cashew nuts for cooking and baking. Only 13% of the respondents claim that there are no cashews in their cuisine. Over 74% of the consumers surveyed declare they do not usually pay attention to the country from which the nuts originated. We expect that most consumers are not aware that of the particular origin of the nuts and, therefore, we opt to ask the question in terms of the quality/safety of nuts produced in the African continent.

The analysis of the data reveals that just over half of the respondents perceive the quality (including safety) of nuts produced in African countries as average, while every third respondent claims this quality is above average or excellent. Only 3% of the participants perceive this quality as very poor. To answer the research question regarding socioeconomic and demographic factors that shape these perceptions, we begin by conducting the Kruskal–Wallis *H* test where the dependent variable is the answer given by the respondent to a question concerning the perception of the quality of nuts produced in Africa.[1] Table 2 presents the distribution of responses on the five-point Likert scale by category in the respective independent variable, along with the value of the test statistic and the *p*-value. From these results it is evident that all socioeconomic and demographic characteristics have an impact on

[1] The question is phrased as: "How do you perceive the quality (including safety) of nuts produced in African countries?" and the possible answers are *very poor*, *below average*, *average*, *above average* and *excellent*.

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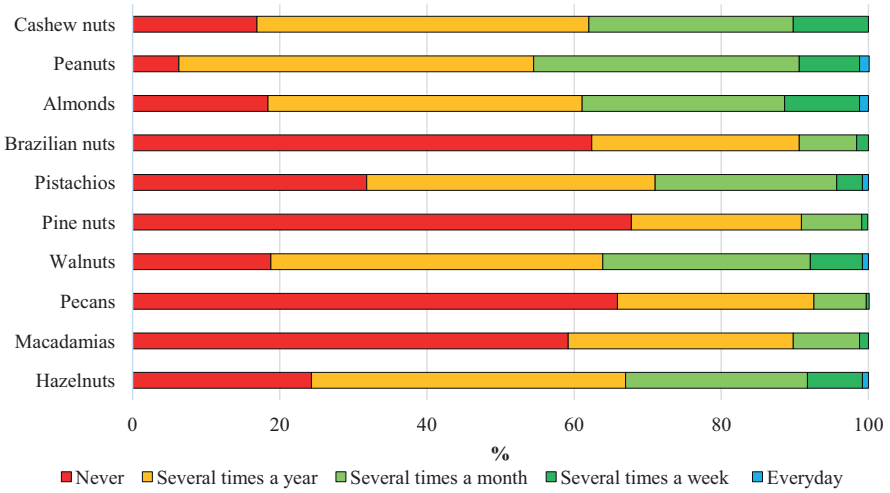


Figure 1. Frequency of consumption of nuts from the selected groups in the research sample (n = 244)

Source: Authors' own study.

the perceptions regarding quality/safety of nuts coming from Africa as we reject the hypothesis of similar distributions across groups for all independent variables at the 10% significance level. Area of residence is the only variable for which we fail to reject the null hypothesis at the 5% significance level. However, the Kruskal–Wallis test cannot detect in what way an independent variable affects the distribution of responses. For this reason, we turn to the ordered Probit model. Table 3 presents the marginal effects from the estimation of the model which has the response to the question regarding quality and safety of nuts produced in Africa as the dependent variable and binary variables indicating category for all six independent variables. The base category is a female respondent in the age group 18–24, with lower income and primary/vocational education, originating from Europe and residing in a big/very big city. From Table 3 we can see that respondents originating from Africa are, *ceteris paribus*, much more likely to perceive nuts coming from Africa as being of e*xcellent* or *above average* quality (about 30% higher probability of responding "5" compared to a respondent from Europe and about 13.7% higher probability of responding "4"). Other patterns that appear in the results are that respondents in the age group 25–40 are less likely to perceive this quality as *below average* and more likely to perceive the quality as *above average* compared to the younger cohort, while increased income tends, in general, to affect quality perceptions negatively.

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Table 2. Kruskal–Wallis tests of association of socioeconomic/demographic characteristics with perception of quality/safety of nuts produced in Africa

Response		1	2	3	4	5	Median	Kruskal–Wallis test
Age	18–24	4	17	89	35	11	3	H = 20.65 p-value: 3.281e-05
	25–40	1	3	22	13	20	4	
	41–60	0	5	19	3	2	3	
Gender	Male	2	8	56	27	21	3	H =7.1296 p-value: 0.007582
	Female	3	17	74	24	12	3	
Financial status	Lower income	0	0	2	1	3	4.5	H = 12.73 p-value: 0.01267
	Lower-middle income	0	4	16	9	7	3	
	Middle income	0	6	53	22	12	3	
	Higher-middle income	3	12	46	15	11	3	
	High income	2	3	13	4	0	3	
Educational level	Primary/Vocational	1	1	5	0	0	3	H = 10.099 p-value: 0.03879
	Secondary	2	12	54	27	8	3	
	Graduate	1	8	37	15	9	3	
	Postgraduate	1	2	13	4	12	3.5	
	Academic degree/title	0	2	21	5	4	3	
Region	Africa	0	1	13	5	22	5	H = 34.101 p-value: 3.937e-08
	Asia	1	2	8	3	1	3	
	Europe	3	22	109	43	9	3	
Area	Big/Very big city	3	9	75	27	24	3	H = 5.0872 p-value: 0.07858
	Small/medium town	0	12	37	10	6	3	
	Rural	2	4	18	14	3	3	

Results were recalculated into the five-point answer format. Subsequently, five-point Likert scale was used where 1 denotes *very poor*, 2 – *below average*, 3 – *average*, 4 – *above average*, 5 – *excellent*.

Source: Authors' own study.

Table 3. Impact of socioeconomic/demographic characteristics on the perception of quality/safety of nuts produced in Africa (marginal effects from ordered Probit model)

Marginal effect of variable	on				
	Pr(y=1)	Pr(y=2)	Pr(y = 3)	Pr(y = 5)	Pr(y = 5)
Age					
25–40	-0.0085	-0.0508**	-0.1007	0.0765*	0.0835
41–60	-0.0003	-0.0015	-0.0023	0.0021	0.0019
Gender					
Male	-0.0032	-0.0174	-0.0262	0.0248	0.0221
Financial status					
Lower-middle income	0.0310	0.1160	0.0669***	-0.1296	-0.0842*
Middle income	0.0150	0.0724	0.0880	-0.0959	-0.0795
Higher-middle income	0.0227	0.1014	0.1071*	-0.1283	-0.1029
High income	0.0763	0.2019*	0.0101	-0.1867**	-0.1017***
Educational level					
Secondary	-0.0115	-0.0624	-0.1006	0.0890	0.0856
Graduate	-0.0049	-0.0277	-0.0469	0.0406	0.0389
Postgraduate	-0.0024	-0.0133	-0.0219	0.0194	0.0182
Academic degree/title	-0.0013	-0.0072	-0.0114	0.0104	0.0095

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Marginal effect of variable	on				
	Pr(y=1)	Pr(y=2)	Pr(y = 3)	Pr(y = 5)	Pr(y = 5)
Region					
Africa	-0.0153*	-0.1006***	-0.3259***	0.1372***	0.3046***
Asia	0.0078	0.0367	0.0386	-0.0474	-0.0357
Area					
Small/medium town	0.0080	0.0395	0.0480*	-0.0529	-0.0426*
Rural	-0.0050	-0.0292	-0.0538	0.0436	0.0443

Note: "***" indicates rejection of the hypothesis that the marginal effect is equal to zero at the 1% significance level, "**" rejection at the 5% significance level and "*" rejection at the 10% significance level.

Source: Authors' own study.

The analysis of the collected data shows that the respondents are particularly aware of the fact that cashews and other nuts are an important source of vitamins, minerals and trace elements (ca. 70% of them agree or strongly agree with this statement) (Figure 2). About 60% of the participants are also aware of other health benefits coming from consuming nuts, which are an important source of proteins and fibre and whose use reduces the risk of heart disease. Meanwhile, over half of the respondents are not aware of the fact that production and consumption of nuts contribute to sustainable development as nuts are alternative sources of proteins to meat products whose production is controversial regarding the environment, animal welfare and animal rights (Figure 2).

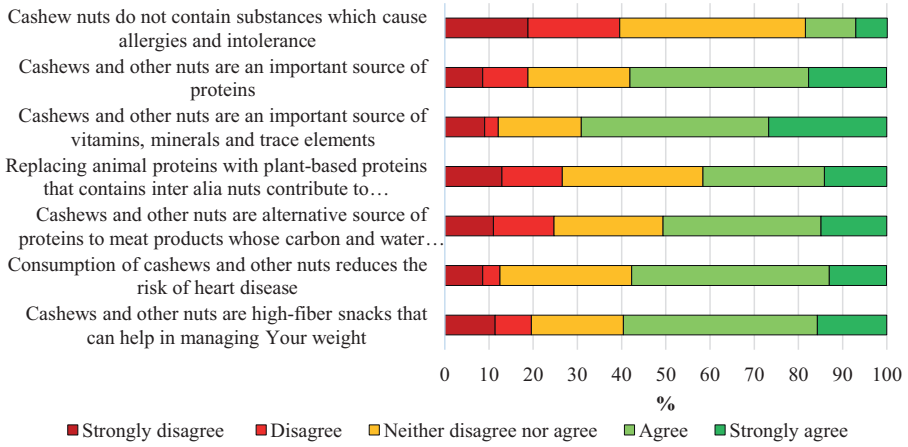


Figure 2. Consumer awareness regarding the role of nuts in a healthy and sustainable diet

Source: Authors' own study.

The participants of the study were also asked about the obstacles that prevent them from buying and/or consuming cashews; they were allowed to choose as many answers as they wanted. Over 40% of the consumers claim that there is nothing to

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prevent them from buying and/or using cashew nuts. However, at the same time, almost 48% of the respondents state that cashews are too expensive (Figure 3). Other obstacles mentioned in Figure 3 are much less frequently reported by the respondents.

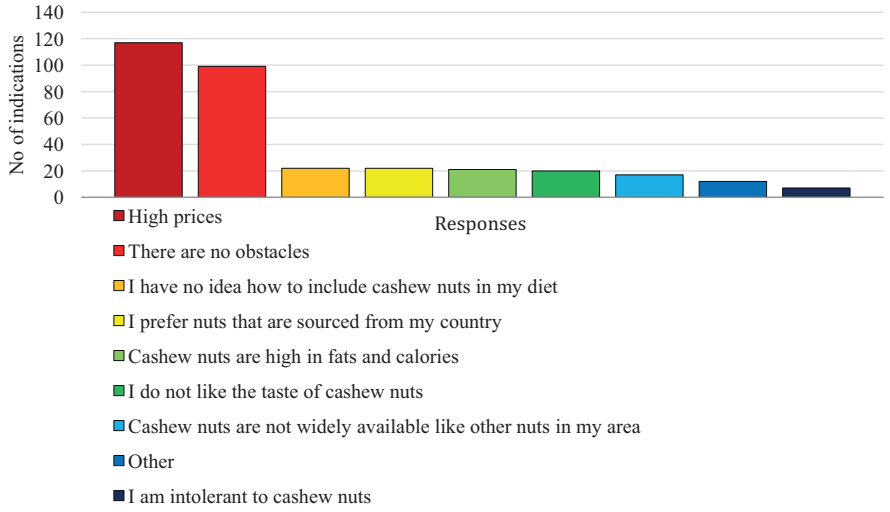


Figure 3. The obstacles that prevent the participants from buying and/or consuming cashew nuts (n = 244)

Source: Authors' own study.

Discussion

Tanzania is the main producer and exporter of cashew nuts in the world, but only a small part of the harvest is processed within the country. The harvest takes place in the part of the year when the global harvesting is at its lowest and demand is at peak (Krepl, 2016). This might be an incentive to further increase the production of these crops in Tanzania. High growth rate of cashew nut consumption in Europe, including Poland, provides an opportunity to develop production and processing of RCNs in African countries. Consumers' trust in nuts produced in Africa and their perception of quality and safety of this food are key to the competitiveness of Tanzanian produce. A prerequisite for this industry to be competitive is also consumers' awareness of the health and sustainability benefits that nuts bring. Our survey has revealed that the majority of respondents residing in Poland recognize the health benefits of nuts. The participants are more aware of the health benefits coming from consuming nuts than of the positive impact of replacing animal proteins with plant-based proteins on the environment and animal welfare which is the answer to RQ2 regarding the role of nut consumption in supporting a healthy and sustainable consumption patterns. It could be raised in the future studies that the use of cashew nut by-products in non-agricul-

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tural sectors contribute to ensuring sustainable production patterns as cashew shells can be processed and used in peculiar ways in chemical, pharmaceutical and cable industry or can be transformed into bioenergy (Costa, 2019). It can be added that consumer perceptions of food safety are not necessarily reasonable and rarely based on scientific evidence. Thus, it is important that governments develop food safety education programs including school education which provide adequate knowledge about food safety (Mosimann et al., 2023; Sameshima & Akamatsu, 2023).

Only a dozen or so percent of consumers surveyed perceive the quality and safety of nuts of African origin as *below average*. Furthermore, it turned out that these products are rated more highly in terms of quality by representatives of Generation Z compared to older Millennials which informs about socioeconomic and demographic factors shaping these perceptions (RQ1). This might be considered as the possible social basis for further development of cashew nut market in Poland, particularly that quite a large proportion of consumers surveyed state that nothing prevent them from buying and/or consuming cashew nuts. Concurrently, almost half of the respondents indicate that high prices of cashews constitute a barrier to get them. This finding addresses RQ3 regarding the obstacles that prevent consumers in Poland from buying and/or consuming cashew nuts. The development of cashew nut processing in Africa could contribute to the decrease in cashew nut prices in the importing countries. Furthermore, adding value to RCNs within the cashew-growing country could create jobs (especially for women and youth) and contribute to further economic growth in Tanzania. Foreign direct investment inflows and net domestic credit drove the growth of manufactured value added in Tanzania over the period 1970–2017, as shown by Lugina et al. (2022). Despite the fact that the Tanzania Five-Year Development Plans (2011/2012–2015/2016 and 2016/17–2020/21) prioritized manufacturing growth and promoted the export of finished products (Lugina et al., 2022), the manufacturing value share in GDP in Tanzania was half of the world's average in 2022 and the manufacturing share in Tanzanian export was only 30% of the world's average (UNIDO, 2023). Expanding access to credit in cashew-growing countries would accelerate the adoption of new production and process technologies (Lukurugu et al., 2022); consequently, better access to finance would have a positive impact on productivity and competitiveness of the produce.

Conclusions

There is a great challenge in Tanzania and other African countries to add more value to cashew nuts exports. The improvement of added value should bring considerable economic and social benefits in developing countries. If consumers in developed-countries appreciate the health benefits of cashew nuts and trust the quality and safety of food items produced in Africa, efforts should be made to speed commodity-based industrialization in Tanzania and many other developing countries. We also

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recommend to amend the EU food law and make it obligatory to provide information on the place of origin for plant-based food regarding the producing country and the processing country. This could enhance trust in African nuts.

Future studies could be conducted on a representative sample of consumers in Poland in order to confirm the research findings. Another research may address the issue of cashew nut by-products use in non-agricultural sectors which should contribute to creating a circular value chain.

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