

The Socio-Economic Impact of Fraudulent Practices on Agri-Food Products: An Analysis of Dairy Products

Magdalena Bobe¹, Ana-Maria Badea², Maria-Bogdana Necsescu³
and Elena-Beatrice Moroşanu⁴

¹⁾²⁾³⁾ Bucharest University of Economic Studies, Bucharest, Romania.

E-mail: magdalena.bobe@com.ase.ro; E-mail: anamaria.badea@ase.ro

E-mail: necsescumaria19@stud.ase.ro; E-mail: morosanelena19@stud.ase.ro

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Abstract

Dairy fraud, or the intentional deception of consumers by mislabeling or fabricating dairy goods, has become an increasingly frequent practice in the food sector. The study's goal is to expose consumers' perceptions and experiences with food fraud, as well as their degree of knowledge and awareness of the phenomena, through a careful examination of specialised literature and an exploratory study based on a questionnaire distributed to dairy product customers. The study's findings indicate that consumers are very familiar with the notion of food fraud, although they have limited recognition of counterfeit dairy products. The research utilized a quantitative-exploratory methodology, disseminating a questionnaire over social media channels to gather information from Romanian customers. The 115 individuals in the sample, most of whom were urban students and young adults, represented a varied demography in terms of age, occupation, and educational attainment. The results show that consumers are reasonably aware of the fraudulent practices that occur in the dairy industry, more than 70% of respondents said they understand what food fraud is. About 55% of participants were aware of the practice of identifying counterfeit dairy products, however there is still a gap in this regard. This disparity emphasizes the need for improved consumer education to help recognize and comprehend dairy products that are counterfeit. Most customers have never detected buying fake dairy products, demonstrating the complexity of dishonest business tactics and the difficulties in separating real products from fakes. This emphasizes how important it is to safeguard customers with stronger regulatory measures and enhanced detection systems.

Keywords

Fraudulent practices, dairy products, consumer, adulteration of dairy products, detection and prevention.

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Introduction

Fraudulent practices in food have been a practice since the times of Ancient Greece and Rome. For higher economic gain and lower costs, producers modify the product packaging, its ingredient, or the food product itself. By definition, food fraud consists of the deliberate and intentional replacement, fraudulent manipulation, or adulteration of foods, food ingredients, or food packaging (Robson et al., 2021). The increased demand for dairy products and the complexity of supply chains have triggered problems regarding product counterfeiting, especially in countries without well-defined legislation in this area (Ionescu et al., 2023). According to Smaoui et al. (2023) adulteration of dairy products is common due to cost differences between different types of milk and their availability throughout the year. In the study they say that cow's milk is often used to adulterate goat or sheep's milk due to its low price. Adulteration of dairy products often involves the addition of substances such as water, thickeners (starch, urea, glucose, salt), reconstitution agents (oil, sugar, animal fats) or preservatives, which significantly alter the quality and safety products (Smaoui et al., 2023; Ionescu et al., 2023). The paper begins with a review of the specialized literature that allowed the identification of the main themes and trends in food fraud. To achieve the research objectives, we designed and conducted a quantitative exploratory study, using a

structured questionnaire to collect data from a representative sample of dairy product consumers in Romania. The questionnaire was designed to assess the level of awareness and perceptions of consumers regarding food fraud, their experiences with counterfeit dairy products, as well as attitudes towards labelling and food safety. The distribution of the questionnaires was done through social media platforms, ensuring a wide and diverse coverage of the population studied.

Approximately 55% of respondents acknowledged the existence of fraud in dairy products, highlighting an acute need for improvement in consumer education and information. Although most participants did not suspect purchasing counterfeit products, difficulties in distinguishing between authentic and counterfeit products suggest an increased sophistication of fraud and the necessity for more effective regulatory and control measures. The conclusions of the study highlight the importance of improved actions in consumer education and the adoption of competitive pricing strategies for authentic products to discourage the purchase of counterfeit ones. In addition, the paper proposes directions of action for regulatory authorities and producers, in order to strengthen the integrity of the dairy supply chain and protect public health. Through its comprehensive analysis, the study contributes to a deeper understanding of the dynamics of food fraud in the dairy sector and identifies effective solutions to combat this problematic phenomenon.

1. Review of the scientific literature

Food labeling is a complex requirement, with the major obligation for each food label falling on the producers or packagers of food. The goal of food labeling is to guarantee that consumers are well-informed about the food so that they can make sound decisions based on the information provided. Food fraud, including economically motivated adulteration (EMA), is defined as the deliberate substitution, addition, counterfeiting, or inaccurate description of foods, their components, or packaging, as well as false or misleading claims about a product made with the intent to gain an economic advantage (Charlebois et al., 2016; Borma, 2018). Théolier et al. (2020) found that consumers' knowledge of the idea of food fraud is limited, and their comprehension of associated hazards is based on incomplete information. Consumers appear to use an inaccurate methodology for risk analysis, driven by psychological impacts and skewed information. Food fraud can have major consequences for consumer health, resulting in sickness or even death, such as when an allergy is not stated on the label. Fraudulent operations can result in economic losses and reputational damage for directly involved food industry enterprises, as well as professional groups. Furthermore, regulatory authorities responsible for monitoring food safety may experience a reduction in public trust, due to the genuine harm these frauds bring to consumer health (Visciano and Schirone, 2021; Hong et al., 2017).

Some compounds introduced to food as a result of fraudulent operations may also arise naturally or unintentionally (Visciano and Schirone, 2021). Soon and Abdul Wahab's (2021) study, which used data collected from five official food safety sites between 2011 and 2020, found 2,470 occurrences of recalls and alerts attributable to labeling issues, with undeclared allergens being the most common cause of recalls. This conclusion highlights the importance of enhancing labeling practices and control measures. According to Manning (2016) and Borma (2018), EU food safety regulation does not adequately address food fraud, and food safety procedures are focused on accidental food contamination, but food fraud comprises acts that are intended to mislead consumers. Current study estimates that fraud costs the global food business between \$10 and \$15 billion each year, affecting around 10% of all marketed food goods (Johnson, 2014). Marketers are also attempting to improve the image of food, including labels, through the use of various digital approaches, which might result in noncompliance (deliberate or inadvertent) with current food labeling legislation, misleading consumers (Henderikx, 2017).

Food falsification is a global concern, and underdeveloped countries are particularly vulnerable due to a lack of monitoring and policies to prohibit this activity. However, it is one of the most widespread phenomena that has gone unnoticed in many nations. Unfortunately, contrary to popular assumption, milk falsification can pose major health risks, including lethal infections like Salmonella, E. Coli, Listeria, and Campylobacter (Cleveland Clinic, 2023). Food fraud can occur in a variety of items, including fish, beef, olive oil, and honey. The dairy business is also severely impacted. Because goat, sheep, and donkey milk products are quite expensive, combining them with considerably cheaper cow milk can be profitable. Consumers are frequently unable to detect this deceit, especially if these milk mixes are utilized in cheese, curd, yogurt, sour milk, and so on (r-biopharm, 2020). Moreira et al. (2021) and Petrescu et al. (2018) emphasize the importance of implementing education programs to increase consumers' knowledge about food labeling and food fraud, as well as the use of scientific research findings on consumer perception as guidelines by the food industry to improve the design of food labels and increase consumer

understanding and utility. Furthermore, providing appropriate information in a transparent manner helps boost consumer trust during a moment of low confidence in the food business. According to Șerbancea, Belc and Stănescu (2018), it is important to continuously evaluate the quality of dairy products and identify risk factors while assessing conformance.

2. Methodology

For the purpose of conducting the research, several essential objectives were established, including identifying the level of consumer knowledge regarding fraudulent maneuvers, with a particular focus on those applied to dairy products, as well as assessing the prevalence of the consumption of counterfeit dairy products. Furthermore, the study aimed to identify the specifics of the consumed counterfeit dairy products and elucidate the most common methods of their falsification. It was also essential to determine the main reasons why consumers opt for counterfeit dairy products and to identify strategies through which these fraudulent maneuvers can be combated. To ensure the accuracy and reliability of the research, hypotheses were formulated such as over 75% of respondents have consumed counterfeit dairy products, less than 30% of consumers take measures against the consumption of counterfeit products, and over half of them consider price a decisive factor in choosing counterfeit products. This structured approach and the established hypotheses aimed to provide a deep understanding of the issue of fraud in the dairy sector and identify effective solutions to combat it. For the realization of the exploratory quantitative research, the questionnaire was used as the method of collecting responses, representing the most used tool for conducting research, designed from a standard set of questions. The nature and purpose of the questions were established in such a way as to collect the most useful data regarding the consumption of counterfeit dairy products in Romania. The questionnaire was created in Google Forms, a creation tool in which our objectives and ideas were translated into the form of questions. The distribution of the form among Romanian consumers was carried out through the most used social media platforms, such as WhatsApp, Instagram, and Facebook. The completion of the questionnaire took place between March 30 and April 1, 2023. The data was processed through Microsoft Excel, following the export of responses from Google Drive. The form contains a total of 26 questions, of which 6 are of a demographic nature.

3. Results and discussion

The quantitative-exploratory research was conducted among dairy product consumers in Romania. The purpose of the research was to identify the impact of fraudulent maneuvers on dairy products and how these affect the consumer's life in terms of health and food safety. The final sample consisted of 115 study participants, of which 69 were women and 46 were men, these being young people aged between 19-25 years, followed by those over 35 years old, and 10 people aged between 26 and 35 years. In terms of education, 34% of the total 115 people surveyed completed university studies, 27% had middle-level (high school) education, and the remaining 39 percent had completed post-secondary and post-university studies. Regarding the occupation of the respondents, the majority are students, numbering 59, followed by 35 employed persons, 17 unemployed, and 4 retirees. Also, from data processing, it was found that over 60% of the total respondents come from an urban environment, and the remaining 35% from a rural environment, which is why we can deduce a high consumption of dairy products in the country's large cities. Another point of interest was the income of the consumer, so 57% of respondents have a monthly income between 2001 - 5000 lei, 30% below 2000 lei, and the rest of 13% have incomes over 5000 lei.

We wanted to find out the extent to which people specifically know what a fraudulent maneuver entails, and the result was unexpected, over 70% of respondents are aware and know what a fraudulent maneuver entails, and the remaining 27% claim they are unfamiliar with the phenomenon. At the same time, focusing on fraudulent maneuvers committed on dairy products, we wanted to identify the level of consumer information regarding the counterfeiting of dairy products, thus we discovered that there is not a substantial difference between the two categories, with 55% of respondents being aware of this process, and the other 45% not.

The fourth question of the questionnaire refers to the purchase of counterfeit dairy products, with consumers being asked if they have ever suspected that they purchased a counterfeit product, and they had to choose between 3 options. Thus, on average, 68% of respondents claim they have never suspected that they bought a counterfeit product, and the other 32% are evenly divided, half suspecting they made a purchase of a counterfeit product, and the other 16% suspected two or more times that they purchased counterfeit dairy products.

Considering the lower levels of education among dairy consumers in Romania, it is posited that these individuals might struggle to distinguish between authentic and counterfeit products, particularly when the contents are not visible due to the packaging. The investigation revealed that a substantial proportion of the surveyed consumers, approximately 74%, were cognizant of the occurrence of counterfeit dairy products, although their awareness was divided between acknowledging and denying such experiences. Subsequent analysis aimed to ascertain whether the consumption of counterfeit products was deliberate. Among those who acknowledged consuming counterfeit products, a significant majority, representing 45 out of 52 respondents, indicated that their consumption was unintentional, while a smaller segment, 7 respondents, admitted to intentional consumption. This pattern suggests that economic motivations, attributable to the lower cost and broader accessibility of counterfeit products, likely underpin the intentional consumption of such items.

A statement that constitutes an objective of this research is related to the way respondents realized that they consumed counterfeit dairy products, and approximately half, 48% of the total, noticed it was a counterfeit product by its different consistency. On average, 31% and 15% of the total respondents with a positive response realized the consumption of counterfeit products through the strange taste, respectively the inappropriate color of the content, and only 6% noticed due to the inferior quality packaging.

To find out more details about the counterfeit products consumed by the Romanian population and to determine the impact on the economy and society, we need to know the category of dairy products that consumers think is most often counterfeit. Thus, the results can be consulted in figure no. 1, but we are amazed to find that cheeses are most often suspected of counterfeiting (42%).

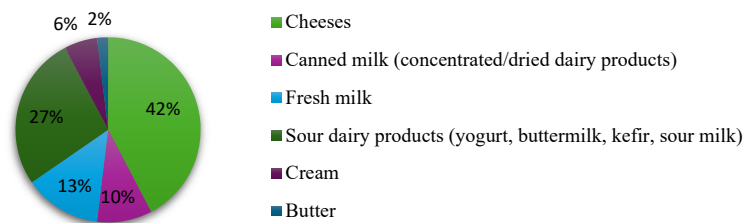


Figure no. 1. Categories of counterfeit dairy products suspected of counterfeiting

Source: Created by the authors

The methods of adulterating dairy products are numerous, so consumers were asked about the ways in which a product can be counterfeited. The most used methods, according to the respondents, are substituting natural ingredients with ones of inferior quality or synthetic; adding foreign substances, unapproved or even dangerous to the consumer's health, and removing a natural component of the product. Consumers also selected other offered options, and a small percentage of 5%, respectively 1%, believe that producers choose to counterfeit products through deceptive labelling and repackaging an expired or depreciated product to hide its defects.

The analysis regarding the purchase locations of counterfeit products enables the identification of vendors distributing these illicit goods to consumers. The findings indicate that a significant portion of respondents, approximately 42%, acquired counterfeit products from supermarkets. Additionally, around 20% of consumers reported purchasing from a variety of sources including hypermarkets, neighborhood stores, farmers' markets, or directly from individual producers, while a marginal 3% obtained such products from specialty stores. This distribution pattern suggests a lack of rigorous inspection or stringent control measures upon the receipt of goods in larger retail outlets and specialty shops. Furthermore, it raises the possibility that individual producers might deliberately engage in the sale of counterfeit products as a strategy to augment their income. Altered products can have serious consequences on consumer health, depending on the quantity of prohibited substances or those of poor quality. The obtained results are encouraging, 29 out of the total 52 people who consumed counterfeit products did not experience unpleasant states after consumption, 17 people had adverse effects, and 6 people do not remember, these results are influenced by the individual's immune system or by association with other consumed products.

Given that some consumers intentionally consume counterfeit products, we wanted to find out what determines them to make this choice. Thus, after processing the data, we found that the low price is very important, with over 90% of consumers choosing this answer option. The ease of purchase, the low level of education and information, the absence or illegibility of label information, and resemblance to the

original are reasons considered to be little or not important at all, concluding that the factor underlying the purchase decision is of an economic nature, namely the price (fig. no. 2).

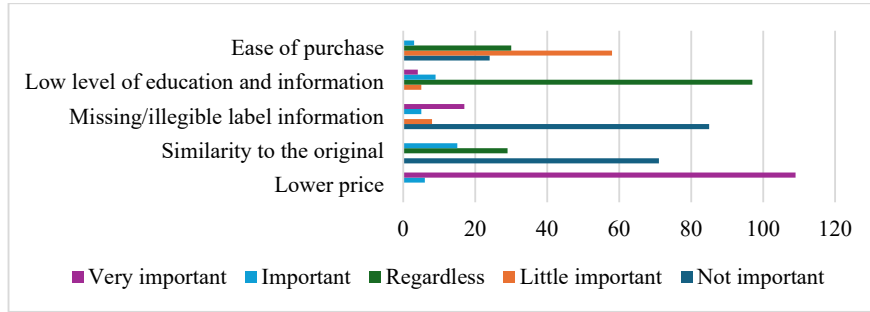


Figure no. 2. Respondents' opinions on the reasons why they choose to consume counterfeit dairy products

Source: Created by the authors

The elements that make a consumer purchase a certain product are numerous, and we have selected five of the most common. As expected, price and manufacturer are very important elements for 84% of the 115 surveyed consumers, and 44% of them consider the psychosensory and physicochemical characteristics of the product to be important. The closure system and packaging are unimportant for the respondents of the research, and the label of the dairy product is indifferent to consumers (fig. no. 3).

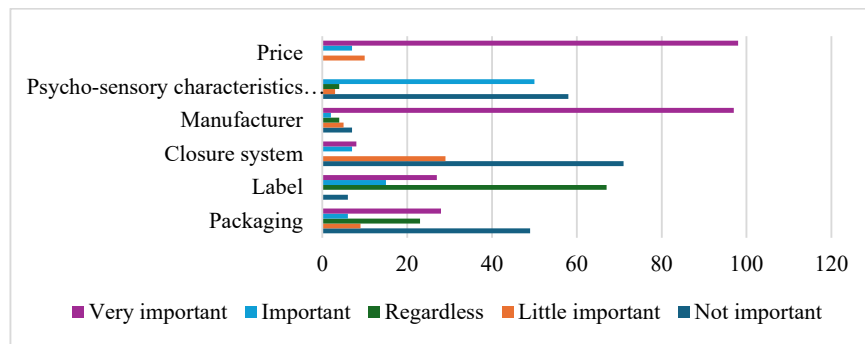


Figure no. 3. Elements that respondents pay attention to when purchasing dairy products

Source: Created by the authors

Consumers were asked, according to figure no. 3, if they read the label and what information follows. On average, 34% of respondents read the label sometimes or always and are mainly interested in the expiration date with 30%, the storage conditions (25%) and consumption recommendations (23%), the country of origin of the milk 13 %, interest in the manufacturer and nutritional information being quite low (below 10%).

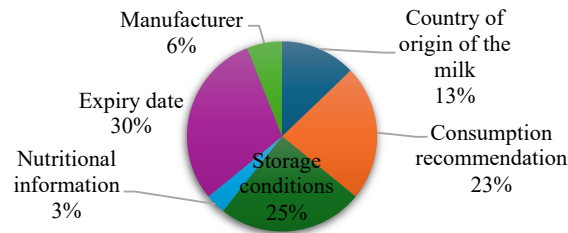


Figure no. 4. The proportion of label information monitored by respondents

Source: Created by the authors

The majority of consumers (90%), after purchasing a product and checking the label, believe that they have not noticed any changes to the information on it. The average of the responses may be influenced by the limited knowledge of respondents about fraudulent maneuvers on dairy products.

Out of 115 respondents, 65% chose the National Authority for Consumer Protection (ANPC) as the national authority responsible for detecting and combating fraudulent maneuvers, 4% believe the General

Inspectorate of Border Police should handle it, and 31% chose the National Sanitary Veterinary and Food Safety Authority (ANSVSA). The choice of consumers is influenced by their education regarding consumer protection, as well as the information that has been provided to them throughout their lives about fraudulent maneuvers and what measures are necessary to combat them.

Counterfeit dairy products are very common, yet unknown to consumers. This ignorance may be due to a lack of attention to the label when purchasing dairy products. "I did not act in any way," responded 77% of respondents, followed by 17% who chose to report to the ANPC, and 6% who first chose to make a complaint to the merchant.

In recent decades, numerous fraudulent maneuvers have been carried out on dairy products. The large profit that producers obtain from this practice is the main reason cited by respondent consumers, being at a rate of 69%. However, 20% believe that due to mild sanctions, the practice of fraudulent maneuvers with dairy products continues. There are respondents (5%, respectively 6%) who believe that other causes of the intensification of this phenomenon are related to low production costs and insufficient controls.

Out of 115 respondents, 60% believe that the solution to combating fraudulent maneuvers on dairy products is the frequent control of producers, while 23% support the fining/strict sanctioning of them. There is also a relatively small percentage of 17% who consider civic engagement of the population a useful method of combating fraudulent maneuvers, which can be done through the power of personal example and sharing experiences with this phenomenon.

After completing the processing of data collected for the realization of this research, the hypotheses stated in the "Research Methodology" subsection can be tested. Thus, the first hypothesis stating the following "over 75% of the surveyed persons have consumed dairy products" is disproved, with the results obtained indicating only a percentage of 45% of respondents who have consumed counterfeit products.

The second hypothesis regarding the measures taken by consumers at the time of consuming counterfeit dairy products is confirmed, with less than 30% filing a complaint with the ANPC or notifying the merchant. The hypothesis that over 50% of respondents consider the price of the product an important factor in the purchasing decision is confirmed.

To highlight the findings of our research, we calculated the Pearson Chi Square correlation coefficient using the Excel application to observe the nature of the relationship between the purchase of counterfeit products and the consumer's choice to report (or not) to the authorities; the unpleasant effects felt after consuming a counterfeit product and the alerting of the authorities and the level of knowledge of consumers regarding the falsification of dairy products.

As a result, we got the following outcomes:

- A Pearson correlation coefficient of -0.52 was found between the purchase of counterfeit goods and the consumer's decision to report the item to the authorities, or not. This shows a moderate correlation between the two examined variables and an inversely proportional relationship, as indicated by the negative sign.

- We determined whether there is a statistical association between the adverse effects of consuming counterfeit dairy products and how consumers reacted to them. From the calculation, the value of 0.57 emerged, which indicates that there is no statistically significant association between the unpleasant effects of consuming counterfeit dairy products and the way consumers reacted, by notifying the responsible authorities.

- Also, when analyzing the statistical relationship between the knowledge of the forgery process and the specific methods of forgery, values greater than 0.05 resulted, indicating that there is no significant statistical relationship.

We may infer that the degree of education has a major impact on the consumer's decision to buy after calculating the Pearson coefficients between the six variables under analysis. This choice is typically influenced by the product's cost. In other cases, the relationship between these two factors is very dependent on the person and their eating patterns.

From an economic standpoint, fraudulent operations can lead to financial losses for both consumers and dairy product companies. Consumers who have purchased counterfeit dairy products may suffer financial losses if they need to discard contaminated products or incur medical expenses due to issues that may arise from consuming the contaminated product. In addition, dairy product companies found to have committed fraud may face legal sanctions, fines, or even bankruptcy.

From a social perspective, fraudulent operations can also affect the trust between consumers and dairy product companies. When consumers are exposed to food fraud, they may lose trust in the safety and quality of the foods they consume, which can lead to a decrease in the demand for dairy products. This can have a negative effect on the dairy product industry, harming farmers, processors, and other stakeholders in the supply chain. Moreover, the consequences of dairy product fraud can be more severe for vulnerable populations who rely on dairy products for their nutrition, such as children, pregnant women, and the elderly.

Overall, fraudulent operations committed on dairy products can have significant economic and social implications, highlighting the importance of ensuring food safety and preventing food fraud.

Conclusions

Dairy product fraud in Romania is a significant problem, with both economic and social implications. The research has highlighted a high awareness of fraudulent maneuvers among consumers, with over 70% of respondents stating they are familiar with these practices. However, there is a significant discrepancy regarding the recognition of counterfeit dairy products, where approximately 55% of participants acknowledged their existence, indicating a need for improved consumer education in this area.

An alarming aspect is that the majority of respondents never suspected they had purchased a counterfeit dairy product, and those who did suspect had difficulties distinguishing between authentic and counterfeit products. This suggests that frauds are sophisticated and that stricter measures are needed to detect and prevent them. Defending against fraudulent maneuvers on dairy products is a phenomenon that cannot be stopped without taking certain precautionary measures or lacking controls that can detect whether producers are correct and do not put consumers' lives at risk.

The consumers' preference for counterfeit dairy products seems to be largely influenced by the low price, with over 90% of participants recognizing this factor as decisive in their choice. This underscores the need for improved actions in consumer education and competitive pricing strategies for authentic products to discourage the purchase of counterfeit ones.

Economically, dairy product fraud can lead to significant financial losses for consumers and dairy companies. The social impact includes diminishing consumer trust in the safety and quality of food, which can negatively affect the demand for dairy products and, by extension, the entire industry.

Another cause, apart from low production costs, is the lack of mandatory standards that these enterprises are required to follow, as well as a shortage of certified auditors to verify dairy products. Increased attention is needed for these dairy product counterfeiting processes because more than half of the global population consumes milk and other products that use milk as a primary raw material, making them vulnerable and potential future victims.

Cases of dairy product counterfeiting are poorly publicized by the media, making it much harder for information to reach the consumer. Without individual documentation, no news related to global problems regarding fraudulent maneuvers on dairy products is published.

Following the analysis based on the questionnaire, it was concluded that in Romania, consumers are not informed about fraudulent maneuvers on dairy products, and the majority of respondents consider that they have not been victims of this phenomenon. Also, they do not pay particular attention to the label or details that could be added or missing from it. However, they are aware of their rights, the authority to which they should report, and how to act in case they are involved in a situation involving fraudulent maneuvers.

The research was conducted on a sample of 115 people, predominantly young people aged 19-25 years and from urban areas. This concentration limits the generalizability of the results to the entire population of dairy product consumers in Romania. The limited variety in terms of age, occupation, and geographical origin of participants may lead to a partial view of the issue. Although the study provides valuable insights into issues related to dairy product fraud, the limitation to this segment does not allow for the exploration of food fraud in a broader context. Similar issues may exist in other sectors of the food industry, which could provide a more comprehensive understanding of the food fraud problem.

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