agriculture

MDPI

Article

Comparative Assessment of the Nutritional and Sanogenic Features of Certain Cheese Sorts Originating in Conventional Dairy Farms and in "Mountainous" Quality System Farms

Vasile Maciuc [1], Claudia Pânzaru [1], Maria Ciocan-Alupii [1], Cristina-Gabriela Radu-Rusu [2,*] and Răzvan-Mihail Radu-Rusu [1]

1 Department of Animal Resources and Technologies, Faculty of Food and Animal Sciences, "Ion Ionescu de la Brad" University of Life Sciences, 8 Mihail Sadoveanu Alley, 700489 Iasi, Romania; vmaciuc@uaiasi.ro (V.M.); panzaruclaudia@uaiasi.ro (C.P.); secr_firaa@uaiasi.ro (M.C.-A.); radurazvan@uaiasi.ro (R.-M.R.-R.)

2 Department of Control, Expertise and Services, Faculty of Food and Animal Sciences, "Ion Ionescu de la Brad" University of Life Sciences, 8 Mihail Sadoveanu Alley, 700489 Iasi, Romania

* Correspondence: cradurusu@uaiasi.ro

Abstract: In order to highlight the influence of cattle farming systems on dairy products, assessments were carried out on certain varieties of cheese—marked with the "Mountain product" quality label in comparison with those conventionally produced ones not bearing the quality label. The study was carried out using products obtained from raw milk issued from seven farms and transformed into cheese in four small dairy factories from the mountainous area of Dornelor Basin, Suceava County, Northeastern Romania. The analyzed cheese issued from the "mountain" production system were "Călimani" Schweizer, "Călimani" Cașcaval, "Călimani" smoked Cașcaval, and "Călimani" Telemea—salty brined cheese. Both the "Mountain cheese" and conventional cheese samples produced throughout the same shift were collected and kept under refrigeration conditions until laboratory analysis in order to compare the production systems. The physico-chemical analysis revealed higher amounts of minerals (2.8 to 10.7% Ca; 2.8 to 9.5% P; 12.3% to double the amount of Fe, $p < 0.001$) and polyunsaturated fatty acids (+5.6 to +13.7%), in mountain cheeses versus the conventionally processed ones. Also, the sanogenic indices had higher values in the "Mountain cheese", such as the polyunsaturation index (+4.3 to 7.8%) and hypocholesterolic/hypercholesterolic fatty acid ratio (+1.8 to 3.7%), while the atherogenic index and the thrombogenic index had lower values (−1.9 to −4.3%) compared to the conventionally produced cheese, thus revealing healthier properties for consumers. The *Enterobacteriaceae* family species were identified in "Mountain cheese", while they were absent from conventionally processed cheese, knowing the raw matter milk is thermally treated at ultra-high temperatures in the latter ones. In the "Mountain cheese", such microorganisms were found within the safety regulation limits and contributed to providing flavor, taste, color, and specific texture, making it superior in terms of sensorial quality compared to the conventionally produced cheese.

Keywords: mountain cheese; conventional cheese; sanogenity; quality; microorganisms

check for updates

Citation: Maciuc, V.; Pânzaru, C.; Ciocan-Alupii, M.; Radu-Rusu, C.-G.; Radu-Rusu, R.-M. Comparative Assessment of the Nutritional and Sanogenic Features of Certain Cheese Sorts Originating in Conventional Dairy Farms and in "Mountainous" Quality System Farms. *Agriculture* **2024**, *14*, 172. https://doi.org/10.3390/agriculture14020172

Academic Editors: Antonio Natalello and Yangdong Zhang

Received: 16 November 2023
Revised: 19 January 2024
Accepted: 22 January 2024
Published: 24 January 2024

1. Introduction

The present research was carried out in the Dornelor Basin, a mountainous region with high tourism and agro-tourism potential due to its own varied gastronomy, traditions, culture, and hospitality of the inhabitants, and also due to the herds of cattle raised in the area [1,2]. In the studied area, there are generally cattle breeds with innate disease resistance and suitable adaptability, namely the breeds Pinzgau of Transilvania, Brown, Romanian Spotted, Romanian Spotted with Black, and crossbreeds of these breeds [3–6].

Studies on consumer perception of dairy cow welfare in traditional mountain farms and also the integrated system approach have shown that mountain products are healthier because of their geographical origin, farm locations, and small-scale production systems [7–12].

In the mountainous areas of Europe, with a humid and cold climate [13–15], as in the mountainous area of the Dorna Basin, rearing dairy cattle is an important agricultural activity, and the milk obtained here is often processed into cheeses, according to the specifications of origin protected (PDO) or with the mention of quality "mountain product" in Romania, thus bringing added value to the farmer's household. The registration of products under the "mountain product" quality label scheme is fully carried out by the National Agency of the Mountain Zone, is free of charge, and represents support granted by the Romanian state to producers in the mountain area. The conditions for obtaining the optional quality mention "mountain product" are the raw materials, but the animal feed must come mainly from mountain areas, and in the case of processed products, their processing must also be performed in mountain areas [16–18]. Dairy products obtained in mountain areas are healthier for human consumers due to better fatty acids profile and sanogenic indices than those obtained in lowlands, related to many influential factors: altitude and geographical area [19] maintenance system (grazing free roaming on alpine pastures vs. confined cattle) [20], predominance of pasture or of haystack and concentrates in diet [21], different floral composition of pastures [22], and metabolism of cattle breeds adapted to highlands [23]. The products that can be certified as "Mountain product" are processed or unprocessed animal products (milk; fermented milk beverages; cheese; meat; meat products; eggs; bee products) and processed or unprocessed vegetable products [24–26]. The benefits of capitalizing on dairy products with the quality label "mountain product" include a reduction of value-added tax to 5% from 9%; superior utilization of products; recognition of the quality of products obtained from less-polluted areas; promoting producers on the "mountain product" platform; and joining the "Produs Montan" Association [27–30].

In the National Register of Mountain Products (RNPM), 1081 dairy products are registered, which represent 30.88% of all mountain products registered under the logo "mountain product" (animal, vegetable, beekeeping products). Out of these, 214 are also registered as traditional milk products, and 3 products are fully registered under the Protected Geographical Indication system. The mountain products recorded in the period 2018–2021 indicated an increased trend. Considering the small number of studies in the mountainous area on milk production and the quality of dairy products, the aim of the research was to follow the influence of conventional and "mountain" production systems on the microbiology and quality of some dairy products. The utility of our findings resides in the fact that results can be taken as a reference for future research and can serve as a suitable recommendation for consumers regarding the quality and sanogenity of products obtained in the mountain area compared to the conventionally produced ones.

2. Materials and Methods

The study area is located within the Local Action Group, Suceava County, North-eastern Romania (geographical area comprised between the coordinates 47°08′–47°47′ Northern latitude and 24°94′–25°83′ Eastern longitude). To carry out this study, 7 local producers were taken into account (farms and small-size family dairy processing workshops). The farms hosted lactating cows from multiple breeds adapted to the mountainous area: Pinzgau of Transilvania, Brown, Romanian spotted, and less Romanian black spotted [31].

European Union legislation has allowed the member states considerable flexibility in the implementation of the disadvantaged areas helping scheme. These proposals were included in Regulation (EC) no. 1698 of 2005 with reference to support for rural development [17]. In Romania, the disadvantaged mountain area mostly overlaps the Carpathian area and comprises administrative-territorial units (UAT) located at average altitudes higher than or equal to 600 m (Regulation (EC) no. 1257 of 1999) [17].

The mountain area of the Dornelor Basin looks like a flat relief with an average altitude of 800 m. It presents a higher step of hilly type with altitudes between 800 and 1000 m located at the contact with the forested mountain area and a lower step consisting of terraces and meadows along the river basins.

The farms that provided the raw milk for developing the studied "Mountain" cheese are located at an average altitude of 800 m and have a minimum herd of 21 heads, 19 ha of permanent grassland, and a maximum herd of 66 heads and 100 ha of permanent grassland. The cattle are maintained indoors throughout the winter, while in the summer, the maintenance is free-moving in summer camps at altitudes above 1000 m. In the farms studied, milking is performed mechanically, using mobile individual milking devices. Cows are fed on a seasonal basis, in winter from stock: mountain hay, clover hay, timothy semi-hay, hay, fodder pumpkins, fodder beet, potatoes, corn fodder flour, wheat bran, dicalcium phosphate, and semi-dehulled sunflower meal, and in the summer, feeding is performed ad libitum on pastures composed of mountain meadows gramineas, "ottava" (2nd scythe hay), corn feed flour, wheat bran, rye bran, dicalcium phosphate, and salt.

No animals were used for experimental purposes, but the dairy products developed from their milk bear the quality label "Mountain product" in comparison with the conventionally manufactured products. Dairy products labelled "Mountain product" are obtained from raw materials originating from the mountain area and processed in the same area. These products offer consumers access to healthy food originating from a territory with low pollution levels and surrounded by natural reserves. It is relevant to notice that the milk used in manufactured conventional cheese products is collected from multiple small-scale family-size producers, and the heterogeneity of the raw matter is quite high, while the feeding of dairy cows is not provided in a homogeneous manner, hence the hypothesis that the nutritional and sanogenic quality of the cheese is expected to be different between the "Mountain"-labeled products and the conventional ones. The commercial names of the analyzed products are "Călimani" Schweizer, "Călimani" Cascaval, "Călimani" smoked Cascaval, and "Călimani" Telemea—brine-salted cheese (Figure 1). The "Călimani" particle in all these cheeses' commercial names is given by the mountain massif patronizing the area and from the national park bearing the same name, an emblematic symbol for the area. Cascaval is the Romanian type of stretched-curd cheese, with no fermentation eyes and hard edible crust, light to intense yellow colored, close in sensorial and nutritional traits with the Italian cheese type Caciocavallo (hence the name Cascaval, pronounced *cashkahvahl* in Romanian, bore by this sort of cheese across the whole Mediterranean and Balkan countries). Schweizer is a locally prepared version of the Emmentaler Swiss-type cheese (hence the name Schweizer), a light-yellow semi-hard cheese with fermentation eyes (holes) the size of a grape berry or of a cherry. Telemea is a sort of semi-soft salt-brined cheese produced traditionally in Romania and belonging to the Feta cheese family.

In accordance with the County Sanitary-Veterinary Authority analysis, the raw milk used to manufacture the two categories of cheese ("mountain product" and conventional) presented the commodity quality, freshness, and sanogenity traits according to compositional quality safety regulations (total germs count—TGC and somatic cells count—SCC):

- Raw milk for "mountain product": density = 1.298 g/cm^3, pH = 6.53; fat = 4.1%, protein = 3.42%, out of which casein = 33.7%; lactose = 5.82%; TGC = 87,000 CFU/cm^3 (vs. max. admitted limit of 100,000 CFU/cm^3), SCC = 112,300 cells/cm^3 (vs. max. admitted limit of 400,000 cells/cm^3);
- Raw milk for conventional cheese: density = 1.282 g/cm^3, pH = 6.61; fat = 3.9%, protein = 3.27%, out of which casein = 28.3%; lactose = 4.92%; TGC = 67,000 CFU/cm^3 (vs. max. admitted limit of 100,000 CFU/cm^3), SCC = 83,700 cells/cm^3 (vs. max. admitted limit of 400,000 cells/cm^3).

In brief, the technological flow of cheese manufacturing has several stages: (a) raw milk reception; (b) milk filtering; (c) temporary refrigerating storage; (d) thermization—low pasteurization ("mountain product") or high pasteurization—UHT treatment (conventional); (e) normalizing for fat content; (f) rennet enzymes and coagulating salts inoculating; (g) heating for coagulating; (h) clotting and clot cutting; (i) whey removal; (j) pressing; (k) cutting of crude curd; (l) boiling and salting of curd; (m) filtering; (n) putting into molds;

(o) inoculating with probiotic lactic cultures; (p) maturation (ripening); (q) packaging; (r) storage prior to marketing.

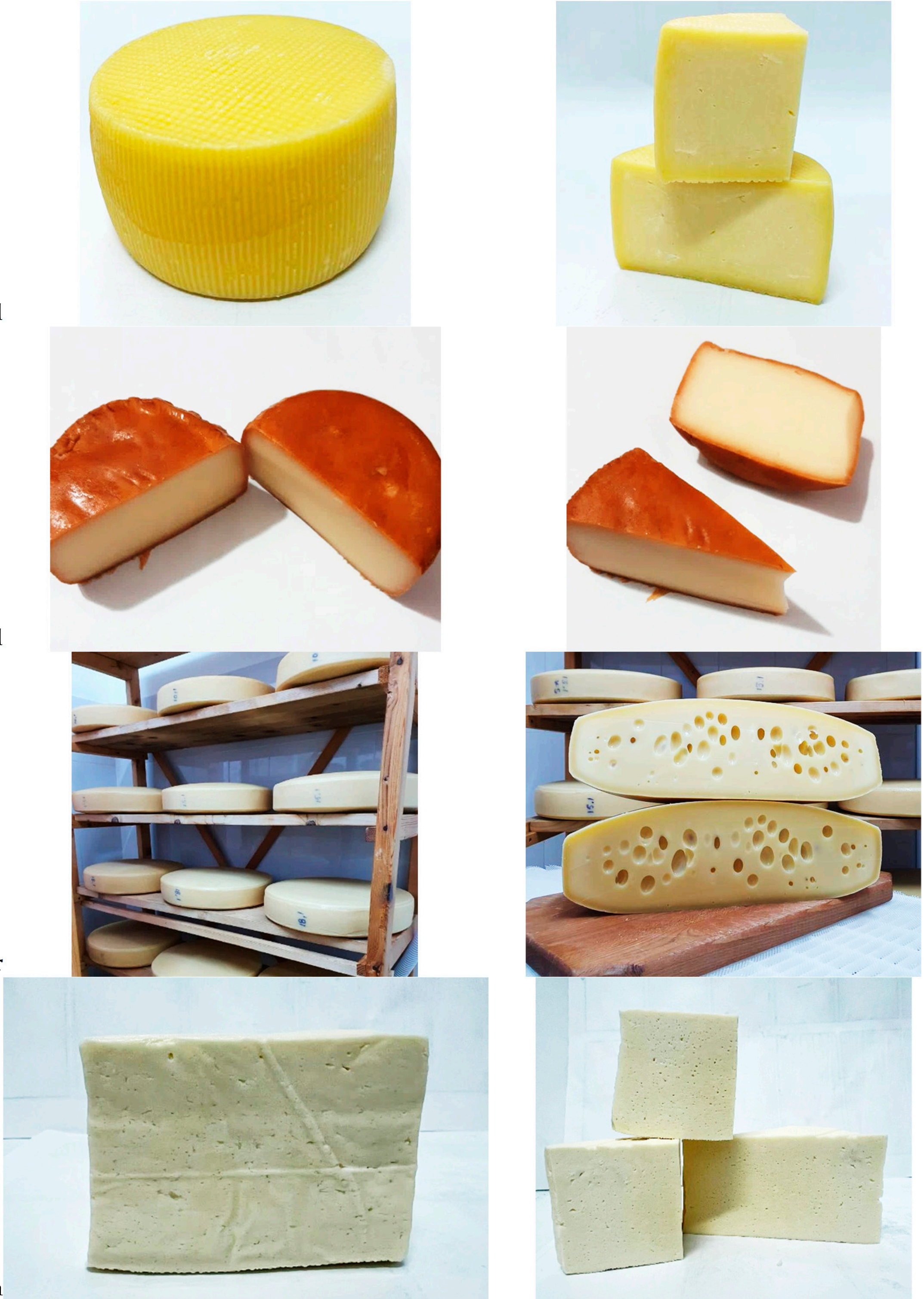

Figure 1. Photographs of analyzed Mountain cheese types (original captures).

In the rennet enzymes inoculating stage, naturally harvested rennet (abomasum content of youth calves, dried or lyophilized) is used for the "Mountain product", while the conventional cheese types are inoculated with biotechnologically originated commercial products enzymes for clotting. Temperature ranges between 30 and 33 °C in the clotting recipient. Coagulating salts usually consist of calcium chloride solution, 25%, introduced at 50–70 mL/100 L milk. Calcium chloride is used in conventional cheese manufacturing only.

In smoked Cascaval, stage (p) is followed by smoking, then the flow is resumed. In Telemea cheese, the flow modifies from (j) pressing, and the rectangular pressed curd is transferred into barrels with saline (brine) solution 18–20%, which is stored upon marketing.

The maturation (ripening) stage lasts 12–24 h in Cascaval-type cheese and at least 60 days in Schweizer, at room temperature (15–20 °C) and in relative humidity conditions ranging between 70 and 80% in Cascaval and 80–90% in Schweizer.

Samples of these cheese types, both "Mountain product" labeled and conventionally produced, were collected at 7 days after the ripening period ended from 4 small dairy factories in Dornelor Basin (500 g/type/processor). Each processor produces both mountain-labeled products and conventional products, using milk from different sources:

- Raw milk for "Mountain product" produced in the study area, collected from 7 dairy farms in Calimani National Park, with cows grazing on the mountain meadows and fed mostly haystack harvested from the same area. Cows were not provided herbs or maize silage throughout the cold season;
- Raw milk for conventional products, collected from many small-size producers in the whole of Suceava County, both from mountain areas and hilly-plain regions, whose feeding was not traced, but, usually, the smallest farm holders use local pastures, complete with corn silage and alfalfa hay, bought from all Northeast Romania, upon availability.

2.1. Cheese Sampling

Four local producers (small local dairy workshops) were used to sample the cheese for multiple reasons:

- They use, on a daily basis, the same raw matter procured from the farmers raising dairy cows in the specific study area;
- Only one set of samples for analysis, from only one producer (local dairy workshop) would have been very subjective and narrow as data collected, considering there could be differences due to workshop influence;
- The workshops use the same recipe to prepare each type of cheese and the same raw matter.

The four types of cheese were chosen to be studied due to the high demand existing in conventional distribution chains (retailers, small shops) and farmers' markets. They are one of the most consumed cheeses in Romania (Cascaval types, both regular and smoked; Schweizer-type cheese and white cheese preserved in salted brine—Telemea cheese).

Samples were issued from the cheese batches that were produced on the very same day, using the same batch of raw matter milk. Milk typical analysis prior to transformation into cheese was unique, both for the locally produced milk transformed into mountain products and for the county-collected milk transformed into conventional products.

Collection of cheese samples was carried out on the matured finished product in accordance with the AOAC 920.122-1920 Cheese—Collection of Samples Procedure [32], i.e., 4 × 500 g in sealed plastic bags from each cheese type from each producer.

The labelled sealed bags were introduced into a refrigerating container for 8 h while they were transported from the study area to the university, then transferred into a laboratory refrigerator and kept between 1 and 4 °C and 30–50% relative humidity for 12 days until they were submitted to analysis to investigate composition, fatty acids profiling, and microbiological features.

Prior to analysis, for each type, the cheese was minced in small shards of approximately 1–2 mm each, and the samples from the 4 different producers were mixed together (4 × 500 g/cheese type/production system) in order to obtain a homogeneous bulk sample that could depict, on average, the mean value of the products.

The analytical samples were randomly collected from the bulk homogenized sample (2000 g/cheese type/production system) and weighed:

- 3–5 g/repetition in proximate composition investigations;
- 5 g/repetition in fatty acids profiling;
- 3 g/repetition in mineral micronutrients analysis;
- 50 g/repetition in the microbiological investigations.

Considering these sampling conditions and the analytical sample preparation, the external factors that could interfere with cheeses' stability and sanogenity were reduced to the greatest extent.

2.2. Chemical Proximate Composition and Gross Energy Content

Sample analyses were carried out at the Milk and Dairy Products Inspection Laboratory, part of the Centre for Quantitative and Qualitative Monitoring of Animal Productions and Food Research Infrastructure, Faculty of Food and Animal Sciences, Iasi University of Life Sciences, Romania (https://eeris.eu/ERIF-2000-000P-1926, accessed on 15 November 2023).

The chemical composition of dairy products refers to the water (moisture) content (g/100 g product) as well as to the dry matter compounds (g/100 g product). Several standardized methods proposed by AOAC International (www.aoac.org, accessed on 15 November 2023) were used as analytical protocols. For each element of chemical proximate composition and for gross energy content as well, 25 analytical repetitions/calculations have been carried out.

Water and dry matter (total solids) contents were assessed through sample drying (AOAC Method 926.08-1927) [33] in a MEMMERT UF110 + air convection oven (manufacturer: Memmert GmbH, Germany) throughout two successive stages: (1) 24 h at 60 °C; (2) minimum 6 h at 103 °C or until reaching the constant mass.

Crude ash (total minerals) was assessed through calcination in NABERTHERM B180 furnace (manufacturer: Nabertherm GmbH, Lilienthal, Germany), where the sample was burned at 550 °C, throughout 24 h, in accordance with AOAC Method 935.42-1935, ash of cheese, gravimetric method [34].

Total nitrogen and Total proteins were assessed through the AOAC Method 920.123-1920, nitrogen in cheese [35], applied on devices BEHR K8 digester, BEHROSOG 3 fume evacuator (digestion stage), BEHR S5 module (distillation—titration stage) (manufacturer Behr GmbH, Germany). The values achieved via the titrimetric procedure were input into calculation using the initial sample mass and other volumes of reagents, and the total protein content in edible products was obtained.

Total lipids in cheese products were assessed by AOAC Method 920.125-1920 [36], using a Behrotest 6er Probe extractor (manufacturer Behr GmbH, Stuttgart, Germany).

Nitrogen-free extract (NFE-total carbohydrates) content was calculated by difference, using the relation (1) [37].

$$\text{NFE (g/100 g)} = 100\ \text{g} - [\text{W (g/100 g)} + \text{TM (g/100 g)} + \text{TP (g/100 g)} + \text{TL (g/100 g)}] \quad (1)$$

in which NFE = nitrogen-free extract; W = water content; TM = total minerals; TP = total proteins; TL = total lipids.

Gross energy was calculated using the Atwater relation (2) proposed by FAO [38]:

$$\text{GE (Kcal/100 g)} = 4.36\ \text{Kcal} \times \text{g TP} + 8.79\ \text{Kcal} \times \text{g TL} + 3.87\ \text{Kcal} \times \text{g NFE} \quad (2)$$

in which GE = gross energy; TP = total proteins; TL = total lipids; NFE = nitrogen-free extract.

2.3. Lipid Profile (Fatty Acids, Cholesterol)

Fatty acid profile and cholesterol content were investigated within the laboratories of the National Institute of Research and Development for Biology and Animal Nutrition Balotesti, Ilfov County, in 6 analytical repetitions per sample.

Fatty acids profiling was realized using a method comprising two consecutive stages: (1) preparation of methyl esters (ISO/TS 17764-1:2002 method) [39] and (2) gas chromatographic method (ISO/TS 17764-1:2002 method) [40].

In order to better depict the sanogenity of the compared products, based on the fatty acids analysis, certain nutritional-sanogenic indices were calculated using the equations compiled from the literature by Simeanu et al. [41]: polyinsaturation index (PI)—Equation (3); atherogenic index (AI) (Equation (4)); thrombogenic index (TI) (Equation (5)); and hypocholesterolic/hypercholesterolic ratio (h/H) (Equation (6)):

$$PI = C18{:}2\ n-6 + (C18{:}3\ n-3 \times 2) \quad (3)$$

$$AI = (C12{:}0 + C16{:}0 + 4 \times C14{:}0)/[\Sigma MUFA + \Sigma(n-6) + \Sigma(n-3)] \quad (4)$$

$$TI = (C14{:}0 + C16{:}0 + C18{:}0)/[0.5 \times \Sigma MUFA + 0.5 \times \Sigma(n-6) + 3 \times \Sigma(n-3) + \Sigma(n-3)/\Sigma(n-6)] \quad (5)$$

$$h/H = (C18{:}1 + PUFA)/(C12{:}0 + C14{:}0 + C16{:}0) \quad (6)$$

Cholesterol content was assessed via the gas chromatograph—direct saponification method in accordance with the AOAC 994.10 protocol [42].

2.4. Mineral Micronutrients Analysis

The concentrations of Ca, P, and Fe were investigated within the laboratories of the National Institute of Research and Development for Biology and Animal Nutrition Balotesti, Ilfov County, in 6 analytical repetitions per sample. Calcium content was assessed using a complexometric–titrimetric method with EDTA derived from AOAC Method no. 968.31-1969 [43]. Iron content was measured through flame atomic absorption spectrophotometry using a method indicated by Singh et al., 2015 [44]. Phosphorus was assessed in accordance with the methodology specified by the EU Regulation 152/2009 (European Commission, 2009) [45].

2.5. Microbiological Analysis

Microbiological assessments have been carried out in the Microbiology and Biosecurity Laboratory, Sanitary-Veterinary and Food Safety Directorate, Iasi County, Romania, in 6 analytical repetitions per sample. Certain microorganisms' detection was pursued, and quantification proceeded: *Enterobacteriaceae*—most probable number method, according to SR EN ISO 21528-1/2017 [46]; *Staphylococcus aureus* and other species—DIN-EN ISO 6888-2/A1:2021 method [47]; *Escherichia coli* betaglunoridase positive—ISO 16649-2:2001, 2007 method [48]; *Listeria monocytogenes*-ISO 11290-1/2017 method [49].

2.6. Statistical Analysis

The analytical data were statistically processed for main descriptors (mean, standard deviation, coefficient of variation) via GraphPad Prism 9.4.1 (673) software; then, the data were compared for the significance of differences between the analytical means of conventional and "Mountain"-labeled dairy products, using the unpaired *t*-test followed by Welch's correction. Also, relative (%) differentiations have been calculated and presented within the discussion chapter [50].

3. Results

3.1. Proximate Chemical Composition and Gross Energy

Table 1 shows the statistical descriptors resulting from the 25 replications of each analytical investigation related to proximate chemical composition, table salt content, and calculation of the gross energy content, carried out on the "Călimani" Cascaval samples of both origins ("Mountain" labeled and conventional).

Table 1. Gross composition and gross energy content of "Călimani" Cascaval and of the corresponding conventional product (n = 25).

Cascaval Type	Statistics	Water (g/100 g)	Dry Matter (g/100 g)	Total Minerals (g/100 g)	NaCl (g/100 g)	Total Proteins (g/100 g)	Total Lipids (g/100 g)	Nitrogen Free Extract (g/100 g)	Energy (Kcal/100 g)
"Mountain"	Mean ± StDev	$56.54^{a} \pm 0.40$	$43.46^{a} \pm 0.40$	$1.62^{a} \pm 0.60$	$0.77^{a} \pm 0.11$	$22.55^{a} \pm 0.32$	$19.04^{a} \pm 0.73$	$0.25^{a} \pm 0.16$	$264.58^{a} \pm 5.96$
Conventional	Mean ± StDev	$45.26^{d} \pm 0.62$	$54.74^{d} \pm 0.62$	$4.38^{d} \pm 0.91$	$2.88^{d} \pm 0.18$	$22.95^{d} \pm 0.37$	$25.84^{d} \pm 0.85$	$1.57^{d} \pm 0.18$	$331.22^{d} \pm 6.37$

Student test results: analytical means with different superscripts per column differ significantly for $p < 0.001$ when ^{a} vs. ^{d} superscripts were used.

Data issued from the chemical analysis of "Călimani" smoked Cascaval were processed statistically and presented in Table 2.

Table 2. Gross composition and gross energy content of "Călimani" Smoked Cascaval and of the corresponding conventional product (n = 25).

Smoked Cascaval Type	Statistics	Water (g/100 g)	Dry Matter (g/100 g)	Total Minerals (g/100 g)	NaCl (g/100 g)	Total Proteins (g/100 g)	Total Lipids (g/100 g)	Nitrogen Free Extract (g/100 g)	Energy (Kcal/100 g)
"Mountain"	Mean ± StDev	$56.39^{a} \pm 0.50$	$43.61^{a} \pm 0.50$	$1.52^{a} \pm 0.65$	$0.78^{a} \pm 0.13$	$22.50^{a} \pm 0.30$	$19.16^{a} \pm 0.80$	$0.43^{a} \pm 0.23$	$266.11^{a} \pm 6.33$
Conventional	Mean ± StDev	$47.19^{d} \pm 0.61$	$52.81^{d} \pm 0.61$	$2.80^{d} \pm 1.18$	$1.60^{d} \pm 0.27$	$23.86^{d} \pm 0.36$	$25.62^{d} \pm 1.65$	$0.54^{b} \pm 0.08$	$329.18^{d} \pm 14.31$

Student test results: analytical means with different superscripts per column differ significantly for $p < 0.05$ when ^{a} vs. ^{b} superscripts were used; $p < 0.001$ when ^{a} vs. ^{d} superscripts were used.

Table 3 reveals the statistically processed data derived from the analyses and computations run on the "Călimani" Schweizer samples of both origins.

Table 3. Gross composition and gross energy content of "Călimani" Schweizer and of the corresponding conventional product (n = 25).

Schweizer Type	Statistics	Water (g/100 g)	Dry Matter (g/100 g)	Total Minerals (g/100 g)	NaCl (g/100 g)	Total Proteins (g/100 g)	Total Lipids (g/100 g)	Nitrogen Free Extract (g/100 g)	Energy (Kcal/100 g)
"Mountain"	Mean ± StDev	$36.38^{a} \pm 0.50$	$63.62^{a} \pm 0.50$	$4.03^{a} \pm 0.45$	$1.95^{a} \pm 0.11$	$26.52^{a} \pm 0.27$	$27.46^{a} \pm 0.27$	$5.61^{a} \pm 0.51$	$376.33^{a} \pm 2.99$
Conventional	Mean ± StDev	$43.69^{d} \pm 0.68$	$56.31^{d} \pm 0.68$	$2.29^{d} \pm 0.26$	$3.76^{d} \pm 1.65$	$22.86^{d} \pm 0.49$	$26.09^{d} \pm 0.32$	$5.00^{d} \pm 0.44$	$346.28^{d} \pm 3.03$

Student test results: analytical means with different superscripts per column differs significantly for $p < 0.001$ when ^{a} vs. ^{d} superscripts were used.

Another studied mountain product was the "Călimani" Telemea—brine-salted cheese. Table 4 presents the data with reference to this "Mountain product", analyzed from a chemical and energetic point of view, along with the values measured for a similar conventionally processed product.

Table 4. Gross composition and gross energy content of "Călimani" Telemea and of the corresponding conventional product (n = 25).

Telemea Type	Statistics	Water (g/100 g)	Dry Matter (g/100 g)	Total Minerals (g/100 g)	NaCl (g/100 g)	Total Proteins (g/100 g)	Total Lipids (g/100 g)	Nitrogen Free Extract (g/100 g)	Energy (Kcal/100 g)
"Mountain"	Mean ± StDev	$61.80^{a} \pm 0.51$	$38.20^{a} \pm 0.51$	$5.39^{a} \pm 0.17$	$3.57^{a} \pm 0.25$	$16.09^{a} \pm 0.36$	$15.45^{a} \pm 0.36$	$1.27^{a} \pm 0.70$	$209.34^{a} \pm 2.53$
Conventional	Mean ± StDev	$63.66^{d} \pm 0.50$	$36.34^{d} \pm 0.50$	$4.91^{d} \pm 0.17$	$4.22^{d} \pm 0.28$	$17.09^{d} \pm 0.39$	$12.96^{d} \pm 0.52$	$1.39^{d} \pm 0.67$	$192.25^{d} \pm 3.23$

Student test results: analytical means with different superscripts per column differ significantly for $p < 0.001$ when ^{a} vs. ^{d} superscripts were used.

3.2. Fatty Acids Profile

Table 5 shows the results issued from the gas chromatographic analysis of lipids profile in the cheese, expressed as fatty acids methyl esters (FAMEs) (g FAME/100 g total FAME), the ratios between various groups of fatty acids, as well the cholesterol content and the sanogenic indices calculated on the basis of fatty acids profile (polyunsaturation atherogenic index, thrombogenic index, and hypocholesteromic/hypercholesterolemic ratio).

Table 5. Fatty acids profile and sanogenic indices in the "Călimani" Mountain products investigated in comparison with the conventional ones (n = 6).

Fatty Acid	Cheese Type (Fatty Acids Methyl Esters Content, Expressed as g FAME/100 g Total FAME)							
	Cascaval		Smoked Cascaval		Schweizer		Telemea	
	M *	C **	M	C	M	C	M	C
Butyric acid	0.12	0.14	0.18	0.22	0.14	0.19	0.25	0.28
Caproic acid	1.43	1.49	1.61	1.69	1.45	1.47	0.18	0.19
Caprylic acid	1.36	1.38	1.36	1.42	1.32	1.41	1.32	1.38
Nonanoic acid	0.07	0.10	0.21	0.12	0.02	0.04	0.02	0.03
Capric acid	2.92	2.95	2.83	2.89	2.90	2.95	2.78	2.85
Undecanoic acid	0.35	0.34	0.34	0.42	0.35	0.42	0.33	0.39
Tridecanoic acid	3.43	3.48	3.28	3.31	3.48	3.54	3.31	3.41
Lauric acid	0.10	0.12	0.10	0.11	0.10	0.11	0.11	0.12
Myristic acid	12.78	12.81	12.68	12.74	13.18	13.25	12.75	13.01
Myristoleic acid	1.49	1.51	1.52	1.48	1.61	1.58	1.55	1.42
Pentadecanoic acid	0.73	0.76	0.80	0.85	0.82	0.84	0.91	0.95
Pentadecenoic acid	1.90	2.10	1.88	1.74	2.02	1.98	2.15	2.08
Palmitic acid	33.93	34.22	33.73	33.92	33.81	33.85	33.93	34.03
Palmitoleic acid	1.95	1.97	2.13	2.08	1.96	1.92	2.25	2.14
Heptadecanoic acid	0.55	0.62	0.57	0.62	0.56	0.62	0.62	0.69
Heptadecenoic acid	0.98	0.97	0.99	0.87	1.00	0.97	0.99	0.95
Stearic acid	8.71	8.82	8.34	8.41	8.12	8.24	8.05	8.06
Oleic cis acid	21.19	21.08	21.83	21.79	20.89	20.74	22.50	22.30
Linoleic trans Ω-6 acid	0.32	0.26	0.29	0.25	0.35	0.31	0.25	0.21
Linoleic cis Ω-6 acid	1.79	1.68	1.71	1.68	1.73	1.68	1.79	1.73
Arachidic acid	0.05	0.06	0.05	0.04	0.10	0.14	0.09	0.12
Gamma linolenic Ω-3 acid	0.15	0.11	0.15	0.13	0.17	0.15	0.16	0.12
Alpha linolenic Ω-3 acid	1.51	1.41	1.32	1.28	1.46	1.38	1.35	1.29
Conjugated linolenic acid	0.60	0.51	0.65	0.61	0.67	0.61	0.63	0.58
Eicosadienoic Ω-6 acid	0.10	0.08	0.13	0.11	0.11	0.09	0.12	0.09
Eicosatrienoic Ω-3 acid	0.11	0.05	0.13	0.12	0.15	0.11	0.11	0.08
Eicosatetraenoic Ω-3acid	0.26	0.17	0.19	0.15	0.14	0.10	0.21	0.19
Arachidonic Ω-6 acid	0.11	0.10	0.13	0.12	0.10	0.08	0.09	0.06
Other fatty acids	1.01	0.71	0.87	0.83	1.29	1.33	1.20	1.25
Total SFAs	66.53	67.29	66.08	66.76	66.35	67.07	64.65	65.51
Total UFAs	32.46	32	33.05	32.41	32.36	31.7	34.15	33.24
Total MUFAs	27.51	27.63	28.35	27.96	27.48	27.19	29.44	28.89
Total PUFAs	4.95	4.37	4.70	4.45	4.88	4.51	4.71	4.35
SFAs/UFAs	2.05	2.10	2.00	2.06	2.05	2.12	1.89	1.97
PUFAs/MUFAs	0.18	0.16	0.17	0.16	0.18	0.17	0.16	0.15
Omega 3 FAs	2.03	1.74	1.79	1.68	1.92	1.74	1.83	1.68
Omega 6 FAs	2.92	2.63	2.91	2.77	2.96	2.77	2.88	2.67
Omega 6/Omega 3	1.44	1.51	1.63	1.65	1.54	1.59	1.57	1.59
Polyunsaturation index	5.13	4.76	4.64	4.49	5.00	4.75	4.74	4.52
Atherogenic index	2.62	2.67	2.56	2.62	2.68	2.74	2.49	2.59
Thrombohenic index	0.55	0.59	0.55	0.57	0.54	0.56	0.53	0.54
Hypocholesterolemic/hypercholesterolemic ratio	0.56	0.54	0.57	0.56	0.55	0.53	0.58	0.57
Cholesterol content (mg/100 g sample)	28.99	31.24	35.76	38.25	43.54	45.19	16.37	17.84

* M = "Mountain product"-labeled cheese samples; ** C = conventional cheese samples.

3.3. Content of Calcium, Phosphorus, Iron

The certain macro- (calcium, phosphorus) and trace- (iron) minerals in the analyzed samples are presented in Table 6.

Table 6. Calcium, phosphorus, and iron in the analyzed "Mountain" and conventional cheeses (n = 6).

Cheese Type		Statistics	Ca (g/100 g)	P (g/100 g)	Fe (mg/100 g)
Cascaval	"Mountain"	Mean ± StDev	0.65 0.04	0.63 0.04	2.46 ^{a} 0.16
	Conventional	Mean ± StDev	0.62 0.04	0.64 0.03	2.19 ^{c} 0.18
Smoked Cascaval	"Mountain"	Mean ± StDev	0.74 0.09	0.72 0.06	2.49 0.16
	Conventional	Mean ± StDev	0.72 0.07	0.71 0.07	2.31 0.20
Schweizer	"Mountain"	Mean ± StDev	0.73 0.05	0.74 0.05	5.87 ^{a} 0.25
	Conventional	Mean ± StDev	0.74 0.06	0.72 0.05	2.27 ^{d} 0.20
Telemea	"Mountain"	Mean ± StDev	0.72 ^{a} 0.07	0.69 ^{a} 0.05	2.19 ^{a} 0.18
	Conventional	Mean ± StDev	0.65 ^{b} 0.04	0.63 ^{b} 0.04	2.46 ^{c} 0.16

Student test results: analytical means with different superscripts per column within each cheese type differ significantly for $p < 0.05$ when ^{a} vs. ^{b} superscripts were used; $p < 0.01$ when ^{a} vs. ^{c} superscripts were used; $p < 0.001$ when ^{a} vs. ^{d} superscripts were used.

3.4. Microbiological Assessment

Table 7 reveals the results on the microorganisms' identification and/or quantification in the analyzed "Mountain products" in comparison with the conventionally produced ones.

Table 7. Microorganisms in the analyzed dairy "Mountain" versus conventional cheese (n = 6).

Cheese Type		*Enterobacteriaceae* MPN/g	*Staphylococci* CFU/g	*Escherichia coli* CFU/g	*Listeria monocytogenes* CFU/25 g
Cascaval	"Mountain" Conventional	1.6 0	<10 <10	- -	- -
Smoked Cascaval	"Mountain" Conventional	4.3 0	<10 <10	- -	- -
Schweizer	"Mountain" Conventional	4.3 0	<10 <10	- -	- -
Telemea	"Mountain" Conventional	9.3 0	<10 <10	- -	- -

MPN—most probable number; CFU—colony-forming units.

4. Discussion

4.1. Chemical Composition and Gross Energy

Water content in the "Călimani" Cascaval was 56.54 g/100 g, while dry matter reached 43.46 g/100 g. Total proteins per raw sample reached 22.55 g/100 g, total minerals was 1.62 g/100 g, salt (NaCl) content was 0.77 g/100 g, and lipids were quantified at 19.04 g/100 g. The gross energy content per 100 g of product was calculated at 264.58 kcal (Table 1). The conventionally processed product of the same type was much richer in salt (up to the maximum admitted inclusion level, 3 g/100 g) and lipids (26.00 g/100 g, +46.47% compared to the "Mountain product"). It also had slightly more proteins (22.95 g/100 g, +1.99%, compared to the "Mountain product") while the gross energy content was 25.2% higher (331.22 kcal/100 g, vs. 264.58 kcal/100 g in "Mountain product" samples). Therefore, the mountain product was less caloric and lighter in terms of fat content, so healthier and dietetic, especially for consumers facing cardiovascular risks and metabolic syndrome [51,52]. In all run comparisons of proximate composition compounds, the differences between "Mountain product" and conventional samples were found to be statistically significant for $p < 0.001$.

Samples of "Călimani" smoked Cascaval (Table 2) had a water mean proportion of 56.39 g/100 g, while total solids reached 43.61 g/100 g. Total minerals accounted for 1.52 g/100 g, salt (NaCl) 0.78 g/100 g, total proteins 22.50 g/100 g, total lipids 19.16 g/100 g, and the nitrogen-free extract reached 0.43 g/100 g. The gross energy content per 100 g edible portion was 266.11 kcal. The conventionally obtained equivalent product had more than double salt content (1.60 g NaCl/100 g), 33% more fat (25.62 g/100 g), and 6.7% more proteins (23.80 g/100 g). Due to the higher concentration of organic matter, caloric content was higher as well (329.18 kcal/100 g). In most of the comparisons, the "Mountain product"-labeled samples differed significantly from the conventional ones ($p < 0.001$).

Analyzing the results obtained for the two Cascaval-type "Mountain products" ("Călimani" Cascaval and "Călimani" smoked Cascaval), no significant differences could be observed between them. In fact, it is about the same product that is marketed as it is primarily obtained or in its smoked form. Smoking is an effective and relatively simple preservation method practiced in the mountain area in order to maintain dairy and meat products' quality and stability throughout storage, therefore prolonging shelf life or improving the sensorial appeal of such products.

In Italy, a study was carried out on hard cheeses bearing the Protected Designation of Origin (PDO) label. The chemical composition revealed a crude fat of 27.89% in Grana Padano cheese, 29.90% in Montasio cheese, 30.21% in Asiago cheese, 31.37% in Parmigiano Reggiano cheese, and the highest crude fat of 36.16 for Cheddar cheese. Correspondingly, for the same types of cheese, crude protein was 34.21% for Grana Padano cheese, 27.67% for Montasio cheese, 30.46% for Asiago cheese, 34.01% for Parmigiano Reggiano cheese, and 26.59% for Cheddar cheese [53–56]. In comparison, the hard cheese labeled with the "Mountain product" quality logo originating in the mountainous area of the Dornelor Basin in Romania presented a crude fat of 20.17% and a crude protein of 22.55%, values that are lower than the cheese produced in Italy.

In "Călimani" Schweizer samples (Table 3), water content reached 36.38 g/100 g, while dry matter was calculated as 63.62 g/100 g. Total minerals reached 4.03 g/100 g, salt (NaCl) 1.95 g/100 g, total proteins 26.52 g/100 g, total lipids 27.46 g/100 g, and the nitrogen-free extract 5.61 g/100 g. Due to the highest proportion of fat and lactose (nitrogen-free extract), the gross energy content of this cheese type reached 376.45 Kcal/100 g edible portion (about 39% in excess of the caloric content, in comparison with the Cascaval-type analyzed products, that have less lipids and lactose). The conventional equivalent product presented less salt (1.70 g/100 g), less proteins (23 g/100 g), and also less lipids (26 g/100 g), a situation that led to a lower caloric content (328 kcal/100 g), in accordance with the producer statement on the label. In all comparisons, the results of gross chemical composition elements differed significantly ($p < 0.001$) in relation to the production system ("Mountain product" or conventional).

Research on Emmentaler cheese, the equivalent of Schweizer cheese from Romania, produced in six regions of Europe: Allgau in Germany, Brittany in France, Switzerland, Finland, Savoie in France, and Vorarlberg in Austria highlighted Emmentaler cheese from Vorarlberg Austria with the highest crude fat content of 34.2% and the lowest crude fat content of 30.0% in Emmentaler cheese produced in Bretagne, France. If we compare with the Schweizer, a "Mountain product" from Romania, the value for crude fat was 27.46%, lower than the types of Emmentaler cheese from Western Europe. Regarding protein, the highest value of 28.87% was identified in Emmentaler cheese from the Savoie region of France, and the lowest value of 26.81% was recorded in Emmentaler cheese from the Vorarlberg region of Austria. Mountain-produced Schweizer cheese from Romania had a protein value of 26.52%, close to that of the Austrian Emmentaler-type cheese. It should be noted that the types of surveyed Emmentaler cheese have protected origin (PDO) [53–56].

The originality of cheeses depends on several factors, such as milk- and cheese-making processes (including microbiology and technology), which are both dependent on geographical origin. Climate, geology, feed, and the cattle breed itself influence the quality of the milk, while local, regional, or national traditions influence the making of the cheeses.

In "Călimani" Telemea (Table 4), total solids content reached 38.20 g/100 g, while water content was measured at 61.80 g/100 g. Total minerals were found in 5.39 g/100 g quantity and salt at the level of 3.57 g/100 g. Total proteins reached 16.09 g/100 g, lipids 15.45 g/100 g, and nitrogen-free extract 1.27 g/100 g. The average gross energy content reached 209.34 kcal/100 g. The conventionally processed Telemea had higher salt content, was slightly richer in proteins (17.09 g/100 g), and had lower total fat content (12.96 g/100 g), hence the lower gross energy content (192.2 kcal/100 g).

Comparing the "Călimani" Telemea, which is a soft cheese with 16.09% protein, 15.44% fat, and nitrogen-free extract of 1.22%, with other types of soft cheese such as Mozzarella with crude fat 16.11% and crude protein 18.23%, Casatella with 24.69% crude fat and 15.66% crude protein, Gorgonzola with 27.65% crude fat and 18.69% crude protein, and Taleggio with 26.73% crude fat and crude protein of 19.73%, we note that in terms of protein, Telemea cheese has a close value to Casatella cheese, and as crude fat, it is close to Mozzarella cheese. The total minerals in Telemea cheese were, on average, 5.39%, and in the rest of the literature-surveyed cheeses, the limits were between 4.77 and 5.34% [53–55].

If we analyze the chemical composition of dairy products, we can see that the highest protein content was found in "Călimani" Schweizer (26.52 g/100 g), followed by "Călimani" Cascaval (22.55 g/100 g), "Călimani" smoked Cascaval (22.50 g/100 g), and "Călimani" Telemea (16.09 g/100 g). The highest energy content occurred in "Călimani" Schweizer (376.33 kcal/100 g), while the lowest one was in "Călimani" Telemea (209.34 g/100 g). Concerning total minerals content, higher values were measured in the "Mountain product"-labeled cheese, in comparison with other data reported in the literature for conventional equivalent sorts of cheese [57–62].

In "Călimani" Schweizer, total proteins reached 26.52 g/100 g, slightly lower than the same organic compound reported for the Emmental cheese, a similar type produced in the Switzerland mountain area [63]. On the contrary, a similar type of cheese (Emmental family) produced conventionally in Ireland had different total protein values, varying within the limits of 22.78 and 23.48 g/100 g, thus underlying the higher quality of the "Mountain products" [64].

4.2. Fatty Acids Profile and Sanogenic Indices

The fatty acid content of the "Mountain product"-labeled and conventional cheese is presented in Table 5. Thus, palmitic acid varied between 33.93 g FAME/100 g total FAME in the "Mountain" Cascaval and 34.22 g FAME/100 g total FAME in the conventional samples (+0.8%). In "Mountain" smoked Cascaval, it was measured at 33.73 g FAME/100 g total FAME versus 33.92 g FAME/100 g total FAME in the conventional product. In both Schweizer samples, the values were pretty similar, between 33.81 and 33.85 g FAME/100, while in Telemea samples, they varied between 33.93 and 34.03 g FAME/100 g total FAME.

Myristic acid was found in amounts between 12.78 and 12.81 g FAME/100 g total FAME in the Cascaval samples, with lower values in the "Mountain"-labeled ones. The highest value (13.25 g/100 g FAME) was found in the conventionally produced Schweizer.

Oleic acid was found in variable proportions, between 20.74 g FAME/100 g total FAME in the "Mountain product"-labeled Schweizer and 22.50 g FAME/100 g total FAME in the "Mountain product" Telemea. Stearic acid was found with close values in all dairy products, between 8.05 and 8.82 g FAME/100 g total FAME.

Table 5 shows that saturated fatty acids (SFAs) were predominant in all samples (64.65–67.29%), while monounsaturated fatty acids (MUFAs) reached 27.19–29.44%, and the polyunsaturated fatty acids (PUFAs) were found in a proportion of 4.35–4.95%. In all comparisons, the "Mountain product"-labeled samples were richer in MUFAs and PUFAs and lower in SFAs than their conventionally corresponding samples, suggesting the influence of animals feeding on the quality of the lipidic profile. Also, the ratio of saturated fatty acids to total unsaturated fatty acids (SFAs/UFAs) varied between 1.89 and 2.11 in the analyzed products. The proportion of unsaturated fatty acids was higher [65,66] in other equivalent cheese types produced locally in the mountains. Moreover, if a comparison is made between the analytical findings and the nutritional statements on the conventionally produced equivalent sorts of cheese, we found the SFAs/UFAs ratios lower in "Mountain products", meaning that the level of lipids unsaturation is better and healthier in the "Mountain product" samples (values between 1.89/1 and 2.05/1 in analyzed products, compared to the conventionally produced cheese, bearing SFAs/UFAs ratios between 1.97/1 and 2.12/1).

In Italian hard cheese (Asiago, Grana Padano, Montasio, Parmigiano Reggiano, and Cheddar), SFAs had values, between 17.72 and 22.80%, UFAs had values between 8.63 and 11.37%, MUFAs had values between 7.36 and 9.87%, and PUFAs had values between 1.25 and 1.70% [53–56].

In the analyzed cheese products, the content of Ω-6 fatty acids was 1.5-fold richer than the content of Ω-3 fatty acids (between 2.63% and 2.96% for Ω-6 FA and between 1.68% and 2.03% for Ω-3 fatty acids).

The polyunsaturation index was in all situations higher in the "Mountain product"-originating sample (5.13 in Cascaval, 4.64 in smoked Cascaval, 5.00 in Schweizer, and 4.74 in Telemea) compared to the conventionally produced equivalent samples (4.76 in Cascaval, 4.49 in smoked Cascaval, 4.75 in Schweizer, and 4.52 in Telemea), revealing a 3.3%-7.7% better polyunsaturation in "Mountain product"-labeled cheese. The same trend was observed in the hypocholesterolemic/hypercholesterolemic fatty acid ratios, which varied between 0.55 and 0.58 in the "Mountain product" cheese and between 0.53 and 0.57 in the conventionally produced cheeses. Therefore, consumption of "Mountain product"-type cheese with such an h/H fatty acids ratio will most likely reduce the cholesterol neosynthesis in consumers' hepatocytes [67,68].

Both vascular sanogenic indices were found with 1.9–4.0% lower values (atherogenic index) and with 1.8–7.2% lower values (thrombogenic index) in the "Mountain product" samples than in the conventionally produced ones, suggesting that consumers may have lower probability in developing atherosclerosis and thrombogenesis if they choose to consume "Mountain product"-labeled cheese against opting out for the conventionally produced one.

On the cholesterol content, the found levels varied between the upper limit of 43.54 mg/100 g (Schweizer) and the lowest one of 16.37 g/100 g (Telemea) in the "Mountain product"-labeled cheese (Table 5) compared with the 17.84 g/100 g (Telemea)–45.19 g/100 g (Schweizer) interval found in the conventionally produced cheese. The data revealed that conventionally produced cheese was 3.7–8.9% richer in dietary cholesterol than the "Mountain product"-labeled one, probably due to dairy cattle dietary intake of more saturated fatty acids or with a lipid profile richer in hypercholesterolic fatty acids [69,70].

4.3. Content of Calcium, Phosphorus, Iron

Among the "Mountain product" samples, the smoked Cascaval had the highest calcium content (0.74 g/100 g), while the lowest one occurred in Cascaval (0.65 g/100 g). In conventionally produced equivalent sorts of cheese, calcium content varied between 0.62 and 0.64 g/100 g product, suggesting slightly better levels of such macro minerals in the "Mountain product"-labeled samples. Telemea cheese was the only product whose samples differed significantly ($p < 0.01$) for calcium content, with the "Mountain product" having a higher content of this macroelement (0.72 g/100 g) vs. the conventionally produced cheese (0.65 g/100 g).

The phosphorus content in the analyzed samples varied within the 0.63–0.74 g/100 g range within the "Mountain product" category and between 0.63 and 0.71 g/100 g limits in the conventionally produced cheeses. The highest values were found in both Schweizer samples, while the only significant difference ($p < 0.05$) occurred, again, in Telemea cheese, which had 7.8% more phosphorus in the "Mountain product" sample than in the conventional one.

The iron content presented the larger variations, in relation to the analyzed product category, between 2.19 mg/100 g (conventional) and 2.46 mg/100 g ("Mountain") ($p < 0.01$) in the Cascaval sort; 2.39 mg/100 g (conventional) and 2.49 mg/100 g ("Mountain") in the smoked Cascaval sort; 2.27 mg/100 g (conventional) and 5.87 mg/100 g ("Mountain") ($p < 0.001$) in the Schweizer sort; 2.46 mg/100 g (conventional) and 2.19 mg/100 g ("Mountain") ($p < 0.05$) in the Telemea sort.

Usually, such dairy products have higher contents of calcium (1.48% of dry matter) and phosphorus (1.17% in dry matter) and the lowest content of iron, 2.69 mg/100 g dry matter [71,72]. Our findings were close to those in the literature for Fe and lowest for Ca and P, probably due to different salt mixtures used in the coagulation process, along with enzymatic products.

4.4. Microbiological Assessment

The microorganism content of the analyzed "Mountain product"-labeled cheeses (Table 7) varied, in the case of *Enterobacteriaceae,* between 1.6 MPN/g (Cascaval) and 9.3 MPN/g (Telemea). A study on six types of Emmentaler cheese, the equivalent of Schweizer cheese from Romania, produced in six regions of Europe: Allgau from Germany, Brittany from France, Switzerland, Finland, Savoie from France, and Vorarlberg from Austria highlighted the microorganism content of the analyzed products: 5.18 MPN/g was found in Emmentaler cheese produced in Allgau, Germany, 3.3 MPN/g was found in cheese produced in Bretagne, France, 2.1 MPN/g was found in cheese produced in Switzerland, 3.7 MPN/g was found in cheese produced in Finland, 6.3 MPN/g was found in cheese produced in Savoie, France, and 5.51 MPN/g was found in cheese produced in Vorarlberg, Austria. In the hard cheese produced in the Dornelor Basin, Romania, we found values of 1.6–4.3 MPN/g in the "Mountain product"-labeled smoked Cascaval and Schweizer of 4.3 MPN/g, a value close to that of cheese produced in Finland and cheese produced in Allgau, Germany [53–56].

A possible explanation for the microorganism content and color of the cheese can be found in the geology of the production region, in the feed ingredients composition and diet formulations involved in the production of Protected Designation of Origin (PDO) or of the "Mountain cheese". Most locally produced feedstuffs are allowed in cattle diets, and they are usually richer in antioxidants and pigment molecules and in a specific beneficial microflora [72–74]. Also, the usage of predominant roughages and green pasture biomass in diet structure over concentrated feedstuffs affects the above-mentioned traits. The microorganisms belonging to the *Enterobacteriaceae* group were lacking from the conventional products due to the ultra-thermal treatment applied to the raw milk. In the "Mountain product", such bacteria, not totally destroyed through a low-temperature thermization will develop specific flavor, color, and taste, thus improving the sensorial quality in comparison with the conventionally produced cheese [75,76].

The European Union and national regulations on the microbiological quality and sanitation of milk and dairy products [76] specify as compulsory for cheese the assessment of *Staphylococcus aureus*, with a legal threshold of up to 10 CFU/1 g product (samples were negative for both "Mountain product" and conventional cheese). Also, all tested samples issued from both production systems tested negative against the occurrence of *Escherichia coli* and *Listeria monocytogenes*, proving the observance of hygienic and good practices of production in all situations.

5. Conclusions

Cheese types bearing the quality label "Mountain product" provide consumers with healthier food originating from a territory with low pollution and have better nutritional quality than conventionally produced similar cheese types while complying with the microbiological norms of sanitation. The sanogenic indices, such as the polyunsaturation index and hypocholesterolic/hypercholesterolic fatty acid ratio, had higher values in the "Mountain cheese", while the atherogenic index and the thrombogenic index had lower values compared to their corresponding conventionally produced cheese.

The studied products proved they met all the quality conditions to be cataloged and marketed, both on the national and the European market, under the title of "Mountain product". The opportunity to register such products under this quality and origin label system will strongly influence dairy farmers to orientate toward local, sustainable businesses, to use mostly local inputs as feed resources, and to process their raw milk within short-chain, locally transforming dairy plants. Also, consumers have become more and more aware of the quality and sanogenity of dairy products issued from mountainous areas because they tend to be safer, healthier, and even bear better sensory properties than the conventionally produced cheeses issued from big players in the dairy industry.

As research follow-up, "Mountain" and conventional cheese types should be investigated for amino acid contents and protein quality to better depict the nutritional value and sanogenity and also to identify the factor of variation affecting their nutritional and dietetic quality.

Author Contributions: Conceptualization, V.M. and M.C.-A.; methodology, V.M. and R.-M.R.-R.; software, C.-G.R.-R. and R.-M.R.-R.; validation, C.P. and C.-G.R.-R.; formal analysis, M.C.-A. and R.-M.R.-R.; investigation, V.M., C.P. and C.-G.R.-R.; data curation, R.-M.R.-R. and V.M.; writing—original draft preparation, C.P., C.-G.R.-R. and M.C.-A.; writing—review and editing, C.-G.R.-R. and R.-M.R.-R.; supervision, V.M. and R.-M.R.-R. All authors have read and agreed to the published version of the manuscript.

Funding: The fatty acids: macro- and micro-elements analysis and microbiological analysis costs were supported by the "Ion Ionescu de la Brad" Iași University of Life Sciences: Doctoral School grant for laboratory investigations 2019–2022.

Institutional Review Board Statement: Not applicable. No animals were used directly in our study, but the developed products from their milk yields.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data present in this study are available on request from the corresponding author.

Conflicts of Interest: The authors declare no conflicts of interest.

References

1. Derville, M.; Allaire, G.; Maigne, E.; Cahuzac, E. Internal and contextual drivers of dairy restructuring: Evidence from French mountainous areas and post-quota prospects. *Agric. Econ.* **2017**, *48*, 91–103. [CrossRef]
2. Derville, M.; Allaire, G. What outlook for the mountain dairy supply chain after the end of the quota? An approach in terms of competitive system. *INRA Prod. Anim.* **2014**, *27*, 17–30.
3. Maciuc, V.; Radu-Rusu, R.M. Assessment of Grey Steppe Cattle Genetic and Phenotypic Traits as Valuable Resources in Preserving Biodiversity. *Environ. Eng. Manag. J.* **2018**, *17*, 2741–2748.
4. Maciuc, V.; Ujică, V.; Nistor, C.E.; Băcilă, V.; Nistor, I.; Olaru, S. Results concerning the indexes of milk production of RBP cow population taken into official control in 2012–2013. *Lucr. Ştiinţifice Ser. Zooteh.* **2014**, *62*, 49–51.
5. Maciuc, V.; Creangă, Ș.; Maciuc, D.; Vidu, L. A New Software Programme for Data Management in Dairy Farms. "ST26733". *Agric. Agric. Sci. Procedia* **2015**, *6*, 226–231.
6. Farruggia, A.; Pomiès, D.; Coppa, M.; Ferlay, A.; Verdier-Metz, I.; Le Morvan, A.; Bethier, A.; Pompanon, F.; Troquier, O.; Martin, B. Animal performances, pasture biodiversity and dairy product quality: How it works in contrasted mountain grazing systems. *Agric. Ecosyst. Environ.* **2014**, *185*, 231–244. [CrossRef]
7. Gâf-Deac, I. Strategic and Tactical Systematization of Local/Proximity Short Supply Chains. *Noble Intl. J. Sci. Res.* **2017**, *1*, 30–33.

8. Lienard, G. Some lessons learned from long-term pastures maintained by extensive livestock suckler farming. *Fourrages* **2014**, *218*, 133–139.
9. Loucougaray, G.; Dobremez, L.; Gos, P.; Pauthenet, Y.; Nettier, B.; Lavorel, S. Assessing the Effects of Grassland Management on Forage Production and Environmental Quality to Identify Paths to Ecological Intensification in Mountain Grasslands. *Environ. Manag.* **2015**, *56*, 1039–1052. [CrossRef]
10. Nistor-Anton, M.; Maciuc, V. Study of milk production indices for cattle breeds exploited in private farms in Neamt county. *Sci. Pap. Anim. Sci.* **2020**, *74*, 39–42.
11. Ciocan-Alupii, M.; Maciuc, V. The evolution of dairy products that benefited from the mention of optional quality "Mountain product" in the mountain area of Romania, during the period 2017–2020. *Sci. Pap. Anim. Sci.* **2020**, *74*, 109–115.
12. Fotea, L.; Bocanici, M.; Vintila, A.L.; Tapaloaga, P.R.; Tapaloaga, D.; Panait, R.C. Obtaining acidophilus products through traditional methods of processing the milk obtained from cattle in the mountain area of Dorna Basin. *Curr. Opin. Biotechnol.* **2013**, *24*, S93. [CrossRef]
13. Delagarde, R.; Faverdin, P.; Baratte, C.; Peyraud, J.L. Graze In: A model of herbage intake and milk production for grazing dairy cows. 2. Prediction of intake under rotational and continuously stocked grazing management. *Grass Forage Sci.* **2011**, *66*, 45–60. [CrossRef]
14. Derville, M.; Allaire, G. Change of competition regime and regional innovative capacities: Evidence from dairy restructuring in France. *Food Policy* **2014**, *49*, 347–360. [CrossRef]
15. Maciuc, V.; Radu-Rusu, C.G.; Popescu, C.E.; Radu-Rusu, R.M. Influence of season and cows farming system on milk physical, chemical and hygienic traits. *Rom. Biotechnol. Lett.* **2017**, *22*, 13096.
16. Romanian Parliament. *Decision No. 506/2016 on the Establishing of Institutional Framework and of Implementing Measured of the Commission Delegated Regulation (EU) No 665/2014 of 11 March 2014 Supplementing Regulation (EU) No 1151/2012 of the European Parliament and of the Council with Regard to Conditions of Use of the Optional Quality Term 'Mountain Product'*; Romanian Parliament: Bucharest, Romania, 2016.
17. Romanian Parliament. *Mountain Law No. 197/20 July 2018*; Romanian Parliament: Bucharest, Romania, 2018.
18. Romanian Ministry of Agriculture. *Order No. 174/20 July 2021 on the Approval of the Procedure of Conformity Verification of Data Comprised within the Documentation Required to Achieve the Right of Using Facultative Quality Indication "Mountain Product" and of Inspection of Compliance with the European and National Regulation by the Economic Economics That Achieved the Right of the Above-Mentioned Indication*; Romanian Parliament: Bucharest, Romania, 2021.
19. Dopieralska, P.; Barłowska, J.; Teter, A.; Król, J.; Brodziak, A.; Domaradzki, P. Changes in Fatty Acid and Volatile Compound Profiles during Storage of Smoked Cheese Made from the Milk of Native Polish Cow Breeds Raised in the Low Beskids. *Animals* **2020**, *10*, 2103. [CrossRef]
20. Esposito, G.; Masucci, F.; Napolitano, F.; Braghieri, A.; Romano, R.; Manzo, N.; Di Francia, A. Fatty acid and sensory profiles of Caciocavallo cheese as affected by management system. *J. Dairy Sci.* **2014**, *97*, 1918–1928. [CrossRef]
21. Agradi, S.; Curone, G.; Negroni, D.; Vigo, D.; Brecchia, G.; Bronzo, V.; Panseri, S.; Chiesa, L.M.; Peric, T.; Danes, D.; et al. Determination of Fatty Acids Profile in Original Brown Cows Dairy Products and Relationship with Alpine Pasture Farming System. *Animals* **2020**, *10*, 1231. [CrossRef]
22. Povolo, M.; Pelizzola, V.; Lombardi, G.; Tava, A.; Contarini, G. Hydrocarbon and fatty acid composition of cheese as affected by the pasture vegetation type. *J. Agric. Food Chem.* **2012**, *60*, 299–308. [CrossRef]
23. Corazzin, M.; Romanzin, A.; Sepulcri, A.; Pinosa, M.; Piasentier, E.; Bovolenta, S. Fatty Acid Profiles of Cow's Milk and Cheese as Affected by Mountain Pasture Type and Concentrate Supplementation. *Animals* **2019**, *9*, 68. [CrossRef]
24. European Commission. *Delegated Regulation (EU) No 665/2014 of 11 March 2014 Supplementing Regulation (EU) No 1151/2012 of the European Parliament and of the Council with Regard to Conditions of Use of the Optional Quality Term 'Mountain Product'*; European Commission: Brussels, Belgium, 2014.
25. European Commission. *Regulation (EU) No 1151/2012 of the European Parliament and of the Council of 21 November 2012 on Quality Schemes for Agricultural Products and Foodstuffs*; European Commission: Brussels, Belgium, 2012.
26. Zuliani, A.; Esbjerg, L.; Grunert, K.G.; Bovolenta, S. Animal Welfare and Mountain Products from Traditional Dairy Farms: How Do Consumers Perceive Complexity? *Animals* **2018**, *8*, 207. [CrossRef] [PubMed]
27. Morgan-Davies, C.; Wilson, R.; Waterhouse, T. Impacts of farmers' management styles on income and labour under alternative extensive land use scenarios. *Agric. Syst.* **2017**, *155*, 168–178. [CrossRef]
28. Necula, D.; Ilea, A.; Coman, I.; Krumpe-Tamas, O.; FenesanDaria Ognean, L. Characteristics of the Compostion and Bioactive Properties of Mountain Milk used for Emmental Cheese Making. *Sci. Pap. Ser. D Anim. Sci.* **2021**, *64*, 191–198.
29. Onaciu, G.; Jurco, E.; Jurco, S.; Maciuc, V.; Ognean, L. Influence of varying milk urea nitrogen on chemical, hygienic and physical traits of cow milk. *Rom. Biotechnol. Lett.* **2019**, *24*, 866–873. [CrossRef]
30. Vidu, L.; Chelmu, S.S.; Băcilă, V.; Maciuc, V. The content of minerals and fatty acids in buffalo milk, depending on the reank of lactation. *Rom. Biotechnol. Lett.* **2015**, *20*, 10076–10084.
31. Cucu, G.I.; Maciuc, V.; Maciuc, D. *Scientific Research and Elements of Experimental Technique in Animal Sciences*; Alfa Publishing House: Iaşi, Romania, 2004.

32. *AOAC 920.122-1920*; Cheese—Collection of Samples Procedure. AOAC International: Rockville, MD, USA, 2015. Available online: http://www.aoacofficialmethod.org/index.php?main_page=product_info&cPath=1&products_id=1563 (accessed on 5 April 2022).
33. *AOAC 926.08-1927*; Cheese—Loss on Drying (Moisture) in Cheese. Method I. AOAC International: Rockville, MD, USA, 2015. Available online: http://www.aoacofficialmethod.org/index.php?main_page=advanced_search_result&search_in_description=1&keyword=drying+(moisture)+in+cheese&x=0&y=0 (accessed on 5 April 2022).
34. *AOAC 935.42-1935*; Ash of Cheese. Gravimetric Method. AOAC International: Rockville, MD, USA, 2015. Available online: http://www.aoacofficialmethod.org/index.php?main_page=product_info&cPath=1&products_id=551 (accessed on 5 April 2022).
35. *AOAC 920.123-1920*; Nitrogen in Cheese. AOAC International: Rockville, MD, USA, 2015. Available online: http://www.aoacofficialmethod.org/index.php?main_page=product_info&cPath=1&products_id=852 (accessed on 5 April 2022).
36. *AOAC 920.125-1920*; Examination of Fat in Cheese. AOAC International: Rockville, MD, USA, 2015. Available online: http://www.aoacofficialmethod.org/index.php?main_page=product_info&cPath=1&products_id=1195 (accessed on 5 April 2022).
37. FAO. Methods of food analysis (chapter 2). In *FAO Food Nutrition Paper, Food Energy—Methods of Analysis and Conversion Factors*; FAO: Rome, Italy, 2003; Volume 77, pp. 12–17.
38. FAO. Calculation of the energy content of foods—energy conversion factors (chapter 3). In *FAO Food Nutrition Paper, Food Energy—Methods of Analysis and Conversion Factors*; FAO: Rome, Italy, 2003; Volume 77, pp. 18–56.
39. *ISO/TS 17764-1:2002*; Animal Feeding Stuffs—Determination of the Content of Fatty Acids—Part 1: Preparation of Methyl Esters. ISO: Geneva, Switzerland, 2002. Available online: https://www.iso.org/standard/34610.html (accessed on 5 April 2022).
40. *ISO/TS 17764-2:2002*; Animal Feeding Stuffs—Determination of the Content of Fatty Acids—Part 2: Gas Chromatographic Method. ISO: Geneva, Switzerland, 2002. Available online: https://www.iso.org/standard/34611.html (accessed on 5 April 2022).
41. Simeanu, C.; Măgdici, E.; Păsărin, B.; Avarvarei, B.-V.; Simeanu, D. Quantitative and Qualitative Assessment of European Catfish (Silurus glanis) Flesh. *Agriculture* **2022**, *12*, 2144. [CrossRef]
42. *AOAC 994.10-1994(2010)*; Cholesterol in Foods. Direct Saponification-Gas Chromatographic Method. AOAC International: Rockville, MD, USA, 2014. Available online: http://www.aoacofficialmethod.org/index.php?main_page=product_info&products_id=186 (accessed on 5 April 2022).
43. *AOAC 968.31-1969*; Calcium in Canned Vegetables—Titrimetric Method. AOAC International: Rockville, MD, USA, 2014. Available online: http://www.aoacofficialmethod.org/index.php?main_page=product_info&cPath=1&products_id=79 (accessed on 5 April 2022).
44. Singh, M.; Yadav, P.; Garg, V.K.; Sharma, A.; Singh, B.; Sharma, H. Quantification of minerals and trace elements in raw caprine milk using flame atomic absorption spectrophotometry and flame photometry. *J. Food Sci. Technol.* **2015**, *52*, 5299–5304. [CrossRef] [PubMed]
45. European Commission (EC). *Regulation No 152/2009 of 27 January 2009 Laying Down the Methods of Sampling and Analysis for the Official Control of Feed (Text with EEA Relevance)*; OJ L 54; European Commission: Brussels, Belgium, 2009; pp. 1–130.
46. *ISO 21528-1:2017*; Microbiology of the Food Chain—Horizontal Method for the Detection and Enumeration of Enterobacteriaceae—Part 1: Detection of Enterobacteriaceae. ISO: Geneva, Switzerland, 2017. Available online: https://www.iso.org/standard/55228.html (accessed on 5 April 2022).
47. *DIN EN ISO 6888-1:2021*; Microbiology of the Food Chain—Horizontal Method for the Enumeration of Coagulase-Positive Staphylococci (Staphylococcus aureus and Other Species)—Part 1: Method Using Baird-Parker Agar Medium. European Standards: Brussels, Belgium, 2021. Available online: https://www.en-standard.eu/din-en-iso-6888-1-microbiology-of-the-food-chain-horizontal-method-for-the-enumeration-of-coagulase-positive-staphylococci-staphylococcus-aureus-and-other-species-part-1-method-using-baird-parker-agar-medium-iso-6888-1-2021 (accessed on 5 April 2022).
48. *ISO 16649-2:2001*; Microbiology of Food and Animal Feeding Stuffs—Horizontal Method for the Enumeration of Beta-Glucuronidase-Positive Escherichia coli—Part 2: Colony-Count Technique at 44 Degrees C Using 5-Bromo-4-chloro-3-indolyl beta-D-glucuronide. ISO: Geneva, Switzerland, 2019. Available online: https://www.iso.org/standard/29824.html (accessed on 5 April 2022).
49. *ISO 11290-1:2017*; Microbiology of the Food Chain—Horizontal Method for the Detection and Enumeration of Listeria monocytogenes and of Listeria s—Part 1: Detection Method. ISO: Geneva, Switzerland, 2017. Available online: https://www.iso.org/standard/60313.html (accessed on 5 April 2022).
50. James, M.C.; Terry, S. *A First Course in Statistics*; Global Edition; Pearson: London, UK, 2018.
51. Sendra, E. Dairy Fat and Cardiovascular Health. *Foods* **2020**, *9*, 838. [CrossRef]
52. Hu, M.-J.; Tan, J.-S.; Gao, X.-J.; Yang, J.-G.; Yang, Y.-J. Effect of Cheese Intake on Cardiovascular Diseases and Cardiovascular Biomarkers. *Nutrients* **2022**, *14*, 2936. [CrossRef]
53. Manuelian, C.L.; Currò, S.; Penasa, M.; Cassandro, M.; De Marchi, M. Characterization of major and trace minerals, fatty acid composition, and cholesterol content of Protected Designation of Origin cheeses. *J. Dairy Sci.* **2017**, *100*, 3384–3395. [CrossRef]
54. Pillonel, L.; Badertscher, R.; Bütikofer, U.; Casey, M.; Dalla Torre, M.; Lavanchy, P.; Meyer, J.; Tabacchi, R.; Bosset, J.O. Analytical methods for the determination of the geographic origin of Emmentaler cheese. Main framework of the project; chemical, biochemical, microbiological, colour and sensory analyses. *Eur. Food Res. Technol.* **2002**, *215*, 260–267.

55. Sulejmani, E.; Hayaloglu, A.A.; Rafajlovska, V. Study of the chemical composition, proteolysis, volatile compounds, and textural properties of industrial and traditional Beaten (Bieno sirenje) ewe milk cheese. *J. Dairy Sci.* **2014**, *97*, 1210–1224. [CrossRef] [PubMed]
56. Lourenco, A.; Handschuh, S.; Fenelon, M.; Gómez-Mascaraque, G.L. X-ray computerized microtomography and confocal Raman microscopy as complementary techniques to conventional imaging tools for the microstructural characterization of Cheddar cheese. *J. Dairy Sci.* **2022**, *105*, 9387–9403. [CrossRef] [PubMed]
57. Regan, J.T.; Marton, S.; Barrantes, O.; Ruane, E.; Hanegraaf, M.; Berland, J.; Korevaar, H.; Pellerin, S.; Nesme, T. Does the recoupling of dairy and crop production via cooperation between farms generate environmental benefits? A case-study approach in Europe. *Eur. J. Agron.* **2017**, *82*, 342–356. [CrossRef]
58. Wiesner, S.; Duff, A.J.; Desai, A.R.; Panke-Buisse, K. Increasing Dairy Sustainability with Integrated Crop–Livestock Farming. *Sustainability* **2020**, *12*, 765. [CrossRef]
59. Renhe, I.R.T.; Corredig, M. Effect of partial whey protein depletion during membrane filtration on thermal stability of milk concentrates. *J. Dairy Sci.* **2018**, *101*, 8757–8766. [CrossRef]
60. Steinwidder, A.; Starz, W.; Rohrer, H.; Hausler, J.; Pfister, R. Milk performance per area of pasture- or silage-fed organic dairy cows in mountainous regions of Austria. *Zuchtungskunde* **2018**, *90*, 218–239.
61. Steinwidder, A.; Starz, W.; Podstatzky, L.; Gasteiner, J.; Pfister, R.; Rohrer, H.; Gallnbock, M. Effects of time of calving on pasture-based dairy systems in mountainous regions. *Zuchtungskunde* **2011**, *83*, 203–215.
62. Sturaro, E.; Marchiori, E.; Cocca, G.; Penasa, M.; Ramanzin, M.; Bittante, G. Dairy systems in mountainous areas: Farm animal biodiversity, milk production and destination, and land use. *Livest. Sci.* **2013**, *158*, 157–168. [CrossRef]
63. Vilela, T.P.; Gomes, A.M.; Ferreira, J.P. Probing the structure-holding interactions in cheeses by dissociating agents—A review and an experimental evaluation with Emmental cheese. *Curr. Res. Food Sci.* **2020**, *3*, 201–206. [CrossRef]
64. Xia, X.; Tobin, T.J.; Subhir, S.; Fenelon, A.M.; Corrigan, M.B.; McSweeney, P.L.; Sheehan, J.J. Effect of b-casein reduction and high heat treatment of micellar casein concentrate on the rennet coagulation properties, composition and yield of Emmental cheese made therefrom. *Int. Dairy J.* **2022**, *126*, 105240. [CrossRef]
65. González, M.; Budelli, E.; Lema, P.N. Acoustic techniques to detect eye formation during ripening of Emmental type cheese. *Innov. Food Sci. Emerg. Technol.* **2020**, *59*, 102270. [CrossRef]
66. Romdhane, K.; Abdul, M.M.; Dufour, E.; Pillonel, L.; Schaller, E.; Baerdemaeker De, J.; Bosset, J.O. Chemical characterisation of European Emmental cheeses by near infrared spectroscopy using chemometric tools. *Int. Dairy J.* **2006**, *16*, 1211–1217.
67. Chen, J.; Liu, H. Nutritional Indices for Assessing Fatty Acids: A Mini-Review. *Int. J. Mol. Sci.* **2020**, *21*, 5695. [CrossRef] [PubMed]
68. Ohlsson, L. Dairy products and plasma cholesterol levels. *Food Nutr. Res.* **2010**, *54*, 5124. [CrossRef] [PubMed]
69. Noakes, M.; Nestel, P.J.; Clifton, P.M. Modifying the fatty acid profile of dairy products through feedlot technology lowers plasma cholesterol of humans consuming the products. *Am. J. Clin. Nutr.* **1996**, *63*, 42–46. [CrossRef] [PubMed]
70. Grummer, R.R. Effect of feed on the composition of milk fat. *J. Dairy Sci.* **1991**, *74*, 3244–3257. [CrossRef]
71. Ciocan-Alupii, M.; Maciuc, V.; Nistor-Anton, M. The evolution of meat products which have benefited from the optional quality mention "Mountain Product" in the Mountain Area of Romania, during the period 2017-2020. *Sci. Pap. Anim. Sci.* **2021**, *76*, 79–84.
72. Lotric, M.Z.; Salehar, A.; Kompan, D.M. Alpine dairy farming in connection with the Slovenian autochthonous Cika cattle. In *Animal Farming and Environmental Interactions in the Mediterranean Region*; Casasus, I., Rogosic, J., Rosati, A., Eds.; Wageningen Academic: Wageningen, The Netherlands, 2012.
73. Zucali, M.; Tamburini, A.; Sandrucci, A.; Bava, L. Global warming and mitigation potential of milk and meat production in Lombardy (Italy). *J. Clean. Prod.* **2017**, *153*, 474–482. [CrossRef]
74. Avondo, M.; Secchiari, P.; Battaglini, L.M.; Bonanno, A.; Pulina, G. Soil, pasture and animal product quality. *Ital. J. Agron.* **2013**, *8*, e19. [CrossRef]
75. Montel, M.C.; Buchin, S.; Mallet, A.; Delbes-Paus, C.; Vuitton, D.A.; Desmasures, N.; Berthier, F. Traditional cheeses: Rich and diverse microbiota with associated benefits. *Int. J. Food Microbiol.* **2014**, *177*, 136–154. [CrossRef] [PubMed]
76. Bărzoi, D. *Microbiology of Animal Originated Food Products*; Ceres Publishing House: Bucharest, Romania, 1985.