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EcoAgriTourism, in the light of its multidisciplinary character, is a wide-open journal which brings together the opinions of specialists from both academic and economic environment, fostering fruitful collaborations.

The journal's structure covers all aspects of the fields approached, the focus being on original and current researches with applications in agriculture, food industry and rural tourism. Collaborators may feel free to undertake biological and technical aspects as well as aspects with social, cultural and environmental impact. Information of general interest is also welcome for the agriecology-food-tourism axis

Prof. Romulus Gruia Ph. D.

The Journal of EcoAgroTurism aims at approaching analyses, methodologies, options and references within the journal's framework.



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THE *BRAȘOV* AREA – the capital of carpathian *EcoAgriTourism* and *mountain sports*

The central area of the Romanian space, through the Brașov area, combines the strengths of Romanian *agritourism* (see the Bran-Moieciu-Fundata-Sirnea-Simon area) with those of *mountain tourism*, which has a 150-year tradition in Brașov through the establishment of a club of mountain lovers, namely the "Transylvanian Alpine Association, Siebenburgischer Alpenverein":

Expoziție de fotografie și documente

Promotori brașoveni ai turismului „verde“
~ oameni și fapte ~

SKV 1880 – 1945

„SKV-ul a deschis frumusețea munților ardeleni turismului și a introdus civilizația în regiuni sălbatice și încă nepătrunse, sub formă de poteci și case de adăpost“ Nicolae Iorga/1919.

Asociația Carpatină Ardeleană a Turistilor / Siebenbürgischer Karpatenverein / SKV a apărut la Sibiu în 28 noiembrie 1880 din inițiativa Dr. Carl Wolf (1849-1929), un vizionar care a contribuit substanțial prin ideile și acțiunile sale la propășirea Transilvaniei.

Din SKV au făcut parte de-a lungul timpului numeroase personalități săsești și românești între care: Albert Bielez, Robert Gutt, Take Ionescu, Julius Römer, Carl Conradt, Emil Sigerius, Josef Konnerth, Wilhelm Bruckner, Emil Racoviță, Mihai Haret, Ion Pillat, Simion Mehedintzi, Gheorghe Dima, Tiberiu Brediceanu, Ioan Meșiotă, Iacob Pușcariu, Bucura Dumbravă, Dan Rădulescu...

Asociația și-a propus și a reușit editarea de publicații, conferințe științifice, excursii în comun, îmbunătățirea potecilor și întreținerea lor, construirea de adăposturi, crearea de semne de orientare, un sistem de ghizi și sistemul de salvare în munți, protecția florei alpine și a monumentelor naturii, explorarea științifică a munților Carpați și animarea interesului pentru acești munți.

Dr. Karl Wolf

Începând cu 1881 Asociația Alpină Ardeleană înființată la Brașov în 1873 devine Secțiunea Brașov a SKV

(Source: <https://adevarul.ro/>)

This authentic tradition imposes for the Barsov region with the "*tip of the spear*" the city of Brasov, a commensurate future development.

In summary, we consider five directions of eco-development as benchmarks, so that Braşov moves to the next level, respectively from the "geographical center" to the "core and axis of rotation" of Romania. In short, these directions of the eco-development concept of Braşov that we highlight are the following:

1. Braşov, the core of Industry 4.0
 - AI development + biotechnologies + nanotechnologies + aerospace.
2. Braşov, the core of tourism - the capital of the Carpathian Mountains
 - Multivalent development of responsible tourism (mountain / agrotourism / ecotourism + cultural history / museum).
3. Braşov is the hub of Romanian transport
 - Romania's main highway junction complementary to air transport (passengers + cargo + military).
4. Brasov, the financial axis
 - Development as an international banking center through a smart attractiveness strategy.
5. *Sanogen* Brasov
 - Development through "environment & health" interconnectivity elements (HEALTH as a multipurpose node of hospitals + the treatment and recovery system & ENVIRONMENT: Braşov, the European green capital + Mountain sports).

IN CONCLUSION we hope that these traditions and concepts will be continued with the enthusiasm of future generations !

Director of the publication,

Prof. Romulus GRUIA, PhD,
PhD supervisor, Scientific Leader

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STUDY ON THE POSSIBILITIES OF DIGITALIZATION OF THE AGRI-FOOD LOGISTIC CHAIN IN THE MOUNTAIN AREA

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Abstract: This study explores the potential of digitalization in optimizing the agri-food logistic chain in the Carpathian Mountains, Romania. The region is rich in agricultural resources but faces numerous logistical challenges due to its rugged terrain, fragmented farming structure, and inadequate infrastructure. These issues result in increased transportation costs, product spoilage, and inefficiencies in the supply chain.

By adopting digital technologies such as the Internet of Things (IoT), blockchain, artificial intelligence (AI), and big data analytics, these challenges can be mitigated, leading to improved efficiency, reduced costs, and enhanced sustainability. IoT can provide real-time monitoring of goods during transport, while AI can optimize transportation routes and forecast demand. Blockchain ensures transparency and traceability, fostering trust among stakeholders.

The study includes an analysis of current agri-food production and logistics in the Carpathians, statistical comparisons with other mountainous regions, and case studies of digitalization initiatives from regions such as the Alps and Pyrenees. It highlights how digital technologies have already led to significant cost reductions and improved logistics outcomes in similar regions.

Furthermore, this study outlines the benefits of digitalization, such as reducing food waste, lowering fuel consumption, and increasing supply chain transparency. However, challenges remain, including infrastructural gaps, high implementation costs, and the need for workforce training in digital skills.

In conclusion, digitalization presents a clear opportunity to transform the agri-food logistics chain in the Carpathians, but concerted efforts from both public and private sectors are necessary to overcome existing challenges. The study provides a roadmap for leveraging technology to enhance the region's agricultural logistics, contributing to a more sustainable and efficient future.

Keywords: IOT, blockchain, artificial intelligence, digitalization;

1. Introduction

The Carpathian Mountains, a region known for its rich biodiversity and agriculture, represent one of Romania's most important agri-food production areas (Oprea, 2015; Oprea, 2017).

Despite its significance, this region faces significant logistical challenges due to difficult terrain, seasonal weather patterns, and fragmented agricultural lands.

Digitalization offers a transformative potential to overcome these challenges. By integrating modern technologies such as the Internet of Things (IoT), blockchain, artificial intelligence (AI), and big data, the agri-food logistic chain in

the Carpathians can be streamlined for greater efficiency and sustainability.

This study focuses on the ways in which digital technologies can address these obstacles and enhance the region's agricultural economy (Comuzzi, M. & Patel, A., 2016; Stephenson, D., 2018; Björkdahl, J., 2020).

The research objectives of the paper are:

1. Assess the current state of agri-food logistics in the Carpathians.
2. Explore the potential of digital technologies in optimizing supply chains.
3. Provide a roadmap for implementing digital solutions in the Carpathian region.

2. Challenges in the Agri-Food Supply Chain in the Carpathians

The Carpathian region faces unique logistical challenges that hinder the efficiency of the agri-food supply chain. These challenges can be grouped into geographical, infrastructural, and environmental factors.

Geographical Challenges are:

- Rugged terrain and mountainous roads increase transportation times and costs;
- Limited access to urban centers where processing and distribution facilities are located
- Weather patterns that disrupt the transport of goods, particularly during winter months.

Infrastructural Challenges are:

- Fragmented agricultural holdings with many small-scale farms lacking cold storage and transport vehicles;
- Poor road conditions in remote areas make it difficult to transport goods in a timely manner;
- Lack of modern logistics centers that can efficiently handle food storage, packaging, and distribution.

These factors contribute to inefficiencies in the transport of agricultural products, leading to increased costs, product spoilage, and market inaccessibility (Halper, F.S., 2014; Olszak, C.M-K, 2018; Al-Sai, A. et al, 2022).

3. Technological Solutions for Agri-Food Logistics

Modern technological advancements offer several solutions to the logistical challenges in the Carpathians. By incorporating IoT, blockchain, AI, and big data analytics, the region can optimize its logistics network.

IoT sensors can be placed on vehicles, storage units, and even products to monitor conditions in real-time. For example, IoT sensors can measure temperature and humidity levels during transport, ensuring that perishable goods remain fresh.

Blockchain technology provides a transparent and secure method for tracking goods as they move through the supply chain. This allows for greater accountability and ensures the integrity of transactions.

AI can optimize transportation routes and predict demand patterns. AI-driven systems can analyze traffic conditions and weather forecasts to recommend the most efficient routes for delivery. Data analytics tools can process large volumes of data to identify inefficiencies in the supply chain.

By analyzing historical data, logistics managers can improve inventory management, reduce waste, and allocate resources more effectively.

4. Statistical Analysis of Agri-Food Production and Logistics in the Carpathians

The Carpathian region plays a significant role in Romania's agricultural output, particularly in the production of dairy, meat, and organic crops (figure 1). However, logistical inefficiencies have led to significant losses. Based on several studies, key data points include:

- 30% of Romania's total agricultural output is generated in the Carpathian region.
- 25% of the perishable goods produced in the region are lost due to transportation issues.

The average transportation cost for goods in the Carpathians is 40% higher than in lowland regions (figure 2) (Grossmann, R., 2018).

These statistics highlight the need for a digital transformation in the region's logistics network.

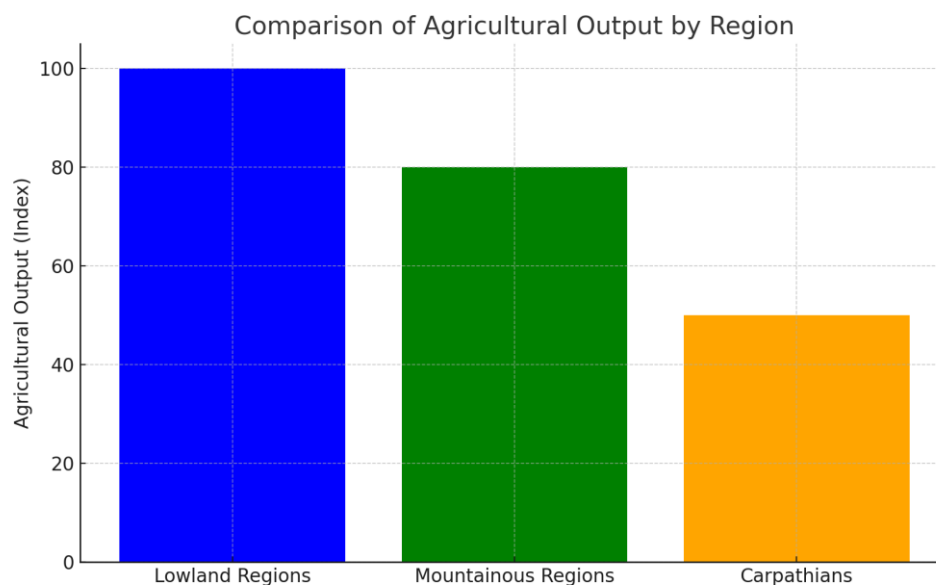


Fig. 1. *Agricultural Output Comparison*

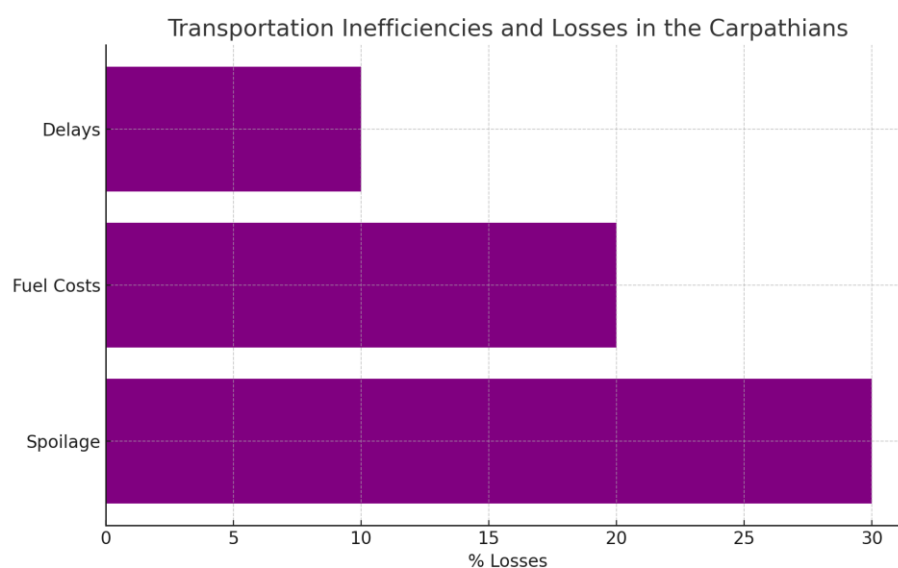


Fig. 2. *Transportation Losses in the Carpathians*

5. Case Studies in Digitalization from Similar Mountain Areas

Several mountainous regions around the world have successfully implemented digital solutions to optimize their agri-food supply chains. These case studies provide valuable lessons for the Carpathians.

In the Alps, IoT sensors have been used to monitor the transport of dairy products. By tracking the temperature and humidity levels in

real-time, producers have reduced product spoilage by 15%. Blockchain technology was also implemented to ensure the traceability of organic products.

The Pyrenees region has adopted AI-driven logistics systems to optimize transportation routes for agricultural products. This has resulted in a 25% reduction in transportation costs and a 10% reduction in fuel consumption, contributing to lower carbon emissions (Informs, 2019; Schoenherr, T.S.-P., 2015).

In figure 3 there are presented the adoption rate of digital technologies in Agri-Food Logistics.

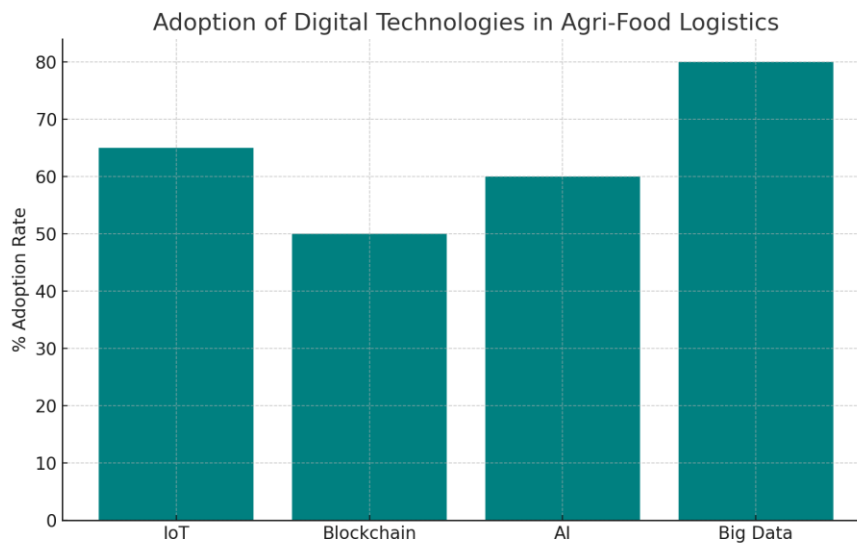


Fig. 3. *Adoption of Digital Technologies*

6. Benefits of Digitalization for the Agri-Food Logistic Chain in the Carpathians

The implementation of digital technologies in the Carpathians can provide several key benefits:

- Cost Reduction: By optimizing routes and reducing transportation inefficiencies, logistics costs can be reduced by up to 20%.
- Waste Reduction: IoT-enabled monitoring systems can reduce product spoilage, leading to a decrease in food waste by 15-25%.
- Increased Transparency: Blockchain technology provides transparency and traceability throughout the supply chain, building trust among consumers.
- Sustainability: AI-driven systems can help reduce fuel consumption, contributing to a reduction in carbon emissions.

7. Challenges of Implementing Digital Solutions in the Carpathians

While digitalization offers many benefits, there are significant challenges that must be addressed before widespread adoption can occur:

- Infrastructure Gaps: Many areas in the Carpathians lack reliable internet connectivity, which is essential for deploying IoT systems and cloud-based data storage.

- High Costs: The initial investment required to implement digital technologies can be prohibitive, particularly for small-scale farmers.

- Workforce Skills: There is a lack of digital skills among workers in the agri-food logistics sector. Training programs are needed to equip the workforce with the skills to operate and maintain new technologies (Williams, S., 2016).

8. Future Perspectives and Opportunities for Digitalization

The future of digitalization in the Carpathians depends on a coordinated effort from both the public and private sectors.

Government support in the form of subsidies and infrastructure investment will be crucial in overcoming the region's logistical challenges.

At the same time, private companies must be willing to invest in digital technologies that can streamline their operations.

A few opportunities for Growth are (Waller, M.F., 2013; Halper, F.S., 2014; Young Chang, R., 2018).

- Expansion of IoT and AI Solutions: The potential for IoT and AI to improve logistics efficiency is vast. Future developments in these technologies will likely lead to even greater improvements in cost savings and sustainability;

- Collaboration between Stakeholders: Collaboration between farmers, logistics

companies, and government agencies will be key to successful digitalization.

Acknowledgement: This article was supported and partially financed by the European Union. The research project was supported by the Grant SMARTER 2022-1-FI01-KA220-HED000086152 -Experiential Learning tools to obtain supply chain competences.

9. Conclusions

Digitalizing the agri-food logistics chain in the Carpathians presents a clear path toward improving efficiency, reducing costs, and enhancing sustainability.

By leveraging modern technologies such as IoT, blockchain, AI, and big data, the region can address many of the logistical challenges that have historically hindered its agricultural sector.

The benefits of digitalization extend beyond cost savings. They include reducing food waste, increasing transparency in the supply chain, and supporting sustainable practices that align with global environmental goals.

However, significant investment in infrastructure, workforce training, and policy development is required to make these benefits a reality.

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THE STUDY ON THE USE OF FLOUR OBTAINED FROM GRAPE SEEDS IN THE INDUSTRY OF OBTAINING DIETARY FOOD PRODUCTS

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Abstract: Grape seeds are one of the most accessible by-products of the wine industry in large quantities (about 2.4 million t/year). Numerous researchers have shown that grape seeds have a high potential for use as a functional ingredient in the food industry due to their high protein, fiber, mineral and polyphenol content. Grape seeds contain 12-16% oil, 8.2% protein and 38.6% fiber, of total dry matter. Apart from the fact that they are a rich source of oil, grape seeds are also appreciated due to the content of phenolic compounds, such as gallic acid, catechins and epicatechins. Increasing consumer demand for gluten-free alternatives to wheat flour, have led to the development of these products.

Flour from wine by-products obtained by dehydrating and grinding of wine by-products, is considered an important source of nutrients that has an antioxidant character, being noted for its protein content, mineral elements, total fibers, total polyphenols, vitamin C, which gives it the quality of a functional ingredient, used to fortify food products.

The aim of the paper is to evaluate the sensory, physico-chemical qualities and the possibilities of using grape seed flour in the bakery industry from both a chemical and a rheological point of view. Research shows that following physico-chemical analyzes that grape seed flour contains about 42 times more fiber than wheat flour and about 9 times more calcium, 8 times more magnesium and 2 times more potassium. The physico-chemical analyzes carried out on grape seed flour are: moisture, ash, determination of protein content, determination of lipid content, total sugar, total fiber and titratable acidity.

The quality indicators of the flour obtained from grape seeds revealed the fact that it has a high nutritional value and has antioxidant capacity, which can be successfully used to fortify food products (bakery products, pastry products).

Keywords: grape pomace, flour, valorization, polyunsaturated fatty acids, unsaturated fatty acids

1. Introduction

Whole grape pomace flour, grape seed flour or grape skin flour are also obtained from grape pomace resulting from the wine industry. Increasing consumer demand for gluten-free alternatives to wheat flour, and especially for flours with a high level of fiber and minerals, have led to the development of these products.

Grape seed flour is considered an important source of antioxidants (Iurie, R., 2017; Oprea, O.B. et al., 2018; Oprea, O.B. et al., 2022). Grape seeds have the role of improving venous and capillary circulation, preventing the appearance of varicose veins and improving tissue

oxygenation and nutrition (Lacy, B.E., et al., 2016).

Grape seed flour is made from the small seeds (and sometimes skins) of grapes used to make wine. This flour has a high content of flavonoids called oligomeric proanthocyanidins.

These flavonoids have excellent antioxidant properties, in proportions that many consider to be far above those of vitamins E, C and beta-carotene (Pircu (Vartolomei) N., et al. 2015; Pircu (Vartolomei) N., 2020).

Cereal products, mainly bakery and confectionery products, are the food product category with the largest number of applications that mainly use whole grape pomace flour, grape

seed flour or grape skin flour (Rosell, C.M., et al. 2006; Temea (Moroi) A.M., et al, 2016).

Grape seeds have just as many benefits as grape pulp. Although they do not have a pleasant taste and often reduce the flavor of grapes, they have a huge therapeutic potential and bring many unexpected benefits to the body, such as reducing cholesterol or preventing cardiovascular diseases.

The composition of grape seeds contains vitamins A, C, D, P, vitamins from the B complex, minerals (calcium, magnesium, iron, phosphorus, potassium, silicon, zinc, copper, iodine, fluorine, selenium), fibers, oil, enzymes, amino acids, antioxidants including Quercetin and resveratrol, citric acid.

For therapeutic purposes it is recommended to use the seeds that come from red or black grapes, bio or organic, because they have a high content of antioxidants.

Grape seed flour is obtained after cold-pressed oil extraction. Then it goes through a special grinding process, which helps preserve all the nutritional properties of the flour.

Wheat bran is rich in insoluble fiber, which helps stimulate intestinal transit and eliminate waste from the body. Thus, eating wheat bran can prevent digestive problems such as bloating and constipation, and studies show that a high-fiber diet can reduce the risk of gastrointestinal diseases by up to 40%.

Soluble fiber in bran can help reduce bad cholesterol levels in the body, thus preventing cardiovascular disease. Studies also show that regular consumption of wheat bran can reduce the risk of chronic diseases such as diabetes or cancer.

Wheat bran is also rich in essential vitamins and minerals. They contain B-complex vitamins such as B1 (thiamine), B2 (riboflavin), B3 (niacin) and B9 (folic acid), which are important for cellular metabolism, energy production and nervous system health. They also contain minerals such as iron, magnesium, phosphorus, zinc and selenium, essential for maintaining bone health, the

immune system and the proper functioning of the body (Campos, D.T., et al, 1997; Collar, C., et al. 2007; Apostol L., et al. 2019).

Wheat bran also contains antioxidants and other phytonutrients, such as lignans, which may reduce the risk of chronic diseases such as cardiovascular disease or diabetes (Healthline, 2021). According to a study published in the Journal of Agricultural and Food Chemistry, wheat bran contains more antioxidants than other common grains.

The purpose of the research is to study the possibility of using wheat bran and grape seed flour in the technology of manufacturing bakery products.

2. Materials and methods

To carry out the proposed tests and analyses, the following bread samples were developed.

I used:

- ✦ Sample 1: Bread sample with the addition of bran in the amount of 15% compared to the total mass of flour;
- ✦ Sample 2: Bread sample with the addition of bran in the amount of 10% of the total mass of the flour and grape seed flour in the amount of 5% of the total mass of the flour.

After mixing, the obtained doughs were put into bowls and put to ferment at different times, at a constant temperature. After 60 minutes, the dough is removed and 2 pieces of dough of 250 grams each were divided and shaped, after which they were put into molds and left to leaven. The remaining dough is again put to ferment for another 15 minutes (75 minutes since it was introduced the first time). After this time, two more pieces of dough of 250 grams each were divided, which were shaped and put into molds and left to leaven.

The recipe presented in table no. 1 was used as a basis for preparing the baking samples.

Table 1. Recipe for making bread samples

No. Crt.	Ingredients	Sample1 (grams)	Sample 2 (grams)
1	Flour	850 g	800 g
2	Bran	150 g	110 g
3	Grape seed flour	-	40 g
4	Salt	20 g	20 g
5	Yeast	15 g	15 g
6	Water heated to 37°C	650 mL	650 mL

Source: Prepared by the author

When obtaining bread samples, the technological regime presented in table no. 2.

Table 2. The technological data used to make the bread samples

No. Crt.	Parameters	U.M.	Value
1	The mass of the pieces of dough	g	250
2	The initial temperature of the dough	°C	32-34
3	Fermentation temperature	°C	32
4	The relative humidity of the air in the proofing cabinet	%	75±5
5	Duration of fermentation	min	60
6	Baking temperature	°C	210±5
7	Baking time	min	30±5

Source: Prepared by the author

Both sensory and physico-chemical properties of the obtained bread samples were analyzed. The analyzes carried out are: acidity, humidity,

specific volume and porosity of the obtained samples (Banu, C., Stoica, A., 2003; Banu, C. et al. 2004).

Table 3. Analysis methods used

No. Crt	The name of the method	The reference standard
1	Sensory analysis	SR 91:2007 SR 878-96
2	Determination of acidity	
3	Moisture determination	
4	Determination of specific volume	
5	Porosity determination	

Source: Prepared by the author

3. Results and discussions

According to SR 878-96, the humidity of the bread must fall between the values of 45-48%.

Following the analysis of the physico-chemical properties of the bread samples, results were obtained and presented in table no. 4.

Table 4. Results of the physical-chemical analysis of the bread samples

No. Crt	Analyze	Sample 1		Sample 2	
		60 min	75 min	60 min	75 min
1	Determination of acidity (degrees of acidity)	3.74	2.64	4.02	3.95
2	Moisture determination (%)	46.38	45.73	47.02	46.14
3	Determination of specific volume	276.51	290.22	280.32	286.55
4	Determination of porosity (%)	70.15	73.89	72.25	73.00

Source: Prepared by the author

The results obtained for the bread we made, under laboratory conditions, fall within these values, which means that the bread obtained corresponds to the criteria to be considered a quality bread.

It is observed that better moisture is obtained in the case of bread with the addition of grape seed flour, having a better graininess and more suitable for obtaining quality breads.

It is observed that better moisture is obtained in the case of bread with the addition of grape

seed flour, having a better graininess and more suitable for obtaining quality breads.

In the bread with bran, it is observed that the humidity is slightly lower compared to the other bread, due to the size of the bran particles that do not absorb much water.

According to SR 878-96, the bread must fall between the following minimum porosity values: 62-74% (Apostol, L. et al, 2020). The two samples fall within this limit, which means that the size of the bran particles, the distribution of the bran particles in the bread and the grape seed

flour and the leavening time of the bread samples are correctly chosen in these bread samples (Bordei, D., & Fotini, T., 2000; Bordei, D., 2004; Bordei, D., 2007).

According to SR 878-96, the volume of bread must have the following minimum values: 215-275 cm³ per 100 g of product. It is observed that the results obtained for the volume of each bread

are close (having a similar volume), in the bread where we used bran, it is observed that the volume is slightly lower compared to the bread in which we also used grape seed flour. After the bread samples were subjected to sensory analysis, the results presented in table no. 5 were obtained (Oprea, O.B., & Gaceu, L., 2020).

Table 5. Organoleptic characteristics of the bread samples

No. crt	Organoleptic characteristics	Sample 1	Sample 2
1	Appearance	Pleasant	Pleasant
2	Colour	Uneven brown color, smooth appearance	Uniform brown color, smooth appearance
3	Core	The product is sufficiently cooked, when pressed with a finger it returns to its original shape, the core does not crumble	The product is sufficiently baked, when pressed with the finger it returns to its original shape, the core does not crumble, it is slightly fluffier than the other sample.
4	Flavor	There is a strong aroma of bran.	Strong, pleasant, specific aroma
5	Taste	Specific taste of bread with added bran	Pleasant taste, slightly sweet, specific
6	Foreign bodies	No foreign bodies	No foreign bodies



Fig. 1. Bread sample with the addition of 10% bran and 5% grape seed flour relative to the total flour mass

The bread for which we used bran and grape seed flour (sample 2) has a pleasant appearance, the appropriate size, color and shape, and also the pores are uniform and correctly distributed.

Conclusions

The results obtained for the humidity of the bread we made, under laboratory conditions, fall between the values of 45-48%, which means that the bread obtained corresponds to the criteria to be considered a quality bread. It was also possible to observe the variation of acidity in bread with bran and bread with bran and grape seed flour which can also vary due to the different fermentation times of 75 minutes, 60 minutes, the results being within the limits.

It could be observed that the porosity varies according to the grain size of the bran and also

due to the different fermentation and leavening times.

From the results obtained, it can be concluded that it is good to use medium grain bran and grape seed flour also of medium quality to obtain this type of bread. We can conclude that grape seed flour can be used in the manufacture of bakery products, but only in a mixture with wheat flour, because grape seed flour does not contain gluten and the dough obtained from it does not have the property of retaining fermentation gases and increasing the proportion of grape seed flour in relation to the total mass of flour leads to a decrease in the volume of the bread and worsening sensory properties.

During the baking test, it was observed that the bread with a fermentation time of 75 minutes, for which we used medium-grained breadcrumbs and grape seed flour, has a pleasant appearance,

the appropriate size, color and shape, and also the pores are uniform and correctly distributed.

From this research and from the results obtained, it was observed that in order to obtain superior quality products it is important to comply with all the conditions mentioned above.

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EFFECTS OF DIGITALISATION ON ONLINE VIDEO PLATFORMS AND CONSUMER BEHAVIOUR

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Abstract: The mass changes in the consumption of linear television started with the Internet, and a significant decrease in the consumption of this traditional model emerged with the rise of online video platforms in the media industry. Today, our consumer habits are changing in the digital age, and online video platforms play a significant role in this shift. These platforms, such as YouTube, Netflix, Hulu, Amazon, and HBO, have impacted what we buy. This paper investigates digitalisation, online video platforms, and, most importantly, Netflix and their success. They affect what we like, how businesses advertise, and how we engage with brands.

Keywords: Netflix, consumer preferences, market competition, media industry, online streaming platforms, subscription video-on-demand (SVOD).

1. Introduction

Our society's digitalization has led to a new world where every aspect of our lives is increasingly linked with technology. Whether shopping for groceries, planning a trip, or looking for amusement, technology has expanded our perspectives and introduced us to a world of limitless possibilities. Along with the digital revolution, online video platforms have emerged as a significant player, captivating audiences with diverse material, including educational courses and user-generated entertainment. YouTube, Netflix, TikTok, and other platforms have evolved into virtual stages for storytelling, advertisement, and interaction with others. Therefore, this essay focuses on the close connection between digitalization and online video platforms, emphasizing their profound impact on consumer behaviour.

From its inception, Netflix has been driven by a single question: 'What do our customers and potential viewers want?' This question is a guiding principle for ensuring customer satisfaction and has been instrumental in Netflix's success. For instance, the COVID-19 pandemic and the subsequent mass isolation brought about a significant shift in digital platforms.

As one of the companies quick to adapt, Netflix capitalized on this unprecedented situation, further solidifying its position in the market.

Netflix's story started as a DVD rental company in Scotts Valley, California, founded by Reed Hastings and Marc Randolph in 1997.

Netflix began to introduce streaming services in 2007. The expansion of Netflix outside the USA started in 2011, and many of its original series began to win awards year by year. Furthermore, the success story behind Netflix's dynamic brand strategy comes from the combination of disruption and stability. The brand position, as well as brand identification, took some effort and time to be formed. The result created a solid reputation with a well-defined corporate identity. Therefore, many electronic companies, such as Xbox, Blu-ray players, PS3, Apple, etc., are partners with Netflix today.

In customers' minds, Netflix has a different place than its competitors, mainly because of its strong brand positioning. They lead to new subscribers every day, differentiating Netflix from other companies. The more extensive user base motivates the platform to improve faster than others. These user-friendly business strategies make the platform unique.

Almost every month, Netflix comes up with original content, such as interactive content (e.g., Black Mirror's episode Bandersnatch), produced outside the USA (e.g., Squid Game).

Above all, due to the extensive transmission of digitalization and rapid growth of online media channels, consumer preferences have faced significant changes. Undoubtedly, Netflix is one

of the leading companies behind these changes. Based on consumers' previous viewing, its prediction algorithm maps consumer preferences.

These algorithms almost perfectly match the preferences. In this study, we will discuss the model of consumer behavior more specifically and explain the factors behind Netflix's effect on consumers from a microeconomic point of view.

2. Behind the Scenes of Netflix's Success

The mass changes in the consumption of linear television started with the Internet. However, a significant decrease in the consumption of this traditional model emerged with the rise of Netflix in the media industry. Consumers were no longer limited by the scheduled time of the TV programs. They have been controlling when, what, and how to watch. Unlike linear TV content, consumers are not obligated to view the shows at a set time.

The content on online media channels can be consumed any time viewers want. Therefore, this may suggest that traditional family gatherings in front of the TV have become a thing of the past. The revolutionary impact of Netflix cannot be avoided in today's world. Especially after 2013, the number of households with cable television decreased dramatically.

In 2013, 40% of the households in the USA subscribed to nontraditional media models, as Time reported, and this percentage has been increasing over the last decade. The central part of this percentage includes video-on-demand services such as Netflix, Hulu, HBO, etc. According to this data, the essential economic questions are: "How long can traditional broadcast and cable television survive in the market?" and "Is Netflix responsible for what? How do we view the media market?"

Netflix's layout revolutionized media channels with customisable user profiles and recommendations. These algorithm-based viewing recommendations improve the consumer experience. The aim behind Netflix's algorithm structure is to observe more and more choices to get a better prediction of what consumer preferences will be like. On the one hand, it is beneficial for the company to collect as many preferences as possible because they can shape the new business strategies.

On the other hand, this structure enables viewers to find the list of movies/series they would love to watch easier.

Besides revealing consumer preferences, Netflix shapes these preferences and modifies consumer behaviour. Netflix is not a passive observer of consumer preferences, which is one of its crucial revolutionary impacts in the market. For instance, when you search for a classic movie missing from Netflix's content, the platform offers alternatives similar to what you are searching for. Netflix benefits even from content not included in the platform to move consumers' preferences. Many studies prove that consumer choices depend on consumer preferences and what options we know.

With the help of unique machine learning (ML) and algorithm developments, Netflix has moved consumer preferences from one way to another. The best example is Squid Game, the most viewed series on Netflix ever, with 142 million households viewing it just under a month after its launch. Netflix's aim to extend its content produced outside of the USA is paying off. Its attempt in the South Korean market was already successful with Parasite's (2019) movie, and today, Squid Game's success can be seen as a jubilee. To give better insight, the cost of Squid Game was only \$21 million during its production, and Netflix got almost \$1 billion in total profit from it. Initially, the company did not have a strong marketing strategy for the Squid Game when the trailer dropped.

However, a flood of content about Squid Game has already been created on TikTok, Twitter, Instagram, and YouTube. The moment Roblox (online game platform) created the versions of Squid Game, rather than shutting them down, Netflix used this as an advantage of promotion. Then, to reach more consumers, a new marketing strategy is created by using all official social media platforms. The more consumers see the memes, posts, teasers, and actors about Squid Game, the more chance it will go viral. These marketing promotions of the original content are the critical factors in shaping the consumer preferences for the company.

Moreover, the personalised home page of the platform provides the feeling of a private journal for the consumers.

Therefore, if they have subscriptions on several digital platforms, they usually prefer to search on Netflix rather than any other movie recommendation channel. From a microeconomic perspective, we can claim that Netflix is preferred to linear TV and other online media channels. In other words, Netflix is chosen over linear TV and other online streaming channels. If

the consumer chooses Netflix over each option she can afford, this can be taken as a consequence of the model of behaviour.

Most importantly, Netflix's success allows the company to create a reference point for all other online streaming platforms. The entrance point of all other platforms is based on this reference point, and what they can be in the eyes of the consumers also depends on this reference point. For instance, Netflix's essential subscription in a month cost \$8.99 to US consumers, while HBO and Hulu cost \$14.99 and \$6.99, respectively. These platforms build their business strategy and choose their position in the market depending on

the reference point Netflix created. This comes back to the impact of Netflix on the consumer decision-making process. How the judgment and decision-making process evolve to subscribing to the platform can be understood with the help of this study.

Besides these advantages mentioned above, Netflix provides high-quality subtitles in many languages. This increases the customer base and creates a platform with audiences worldwide. Today, Netflix's subscriber base is around 238.39 million (Figure 1).

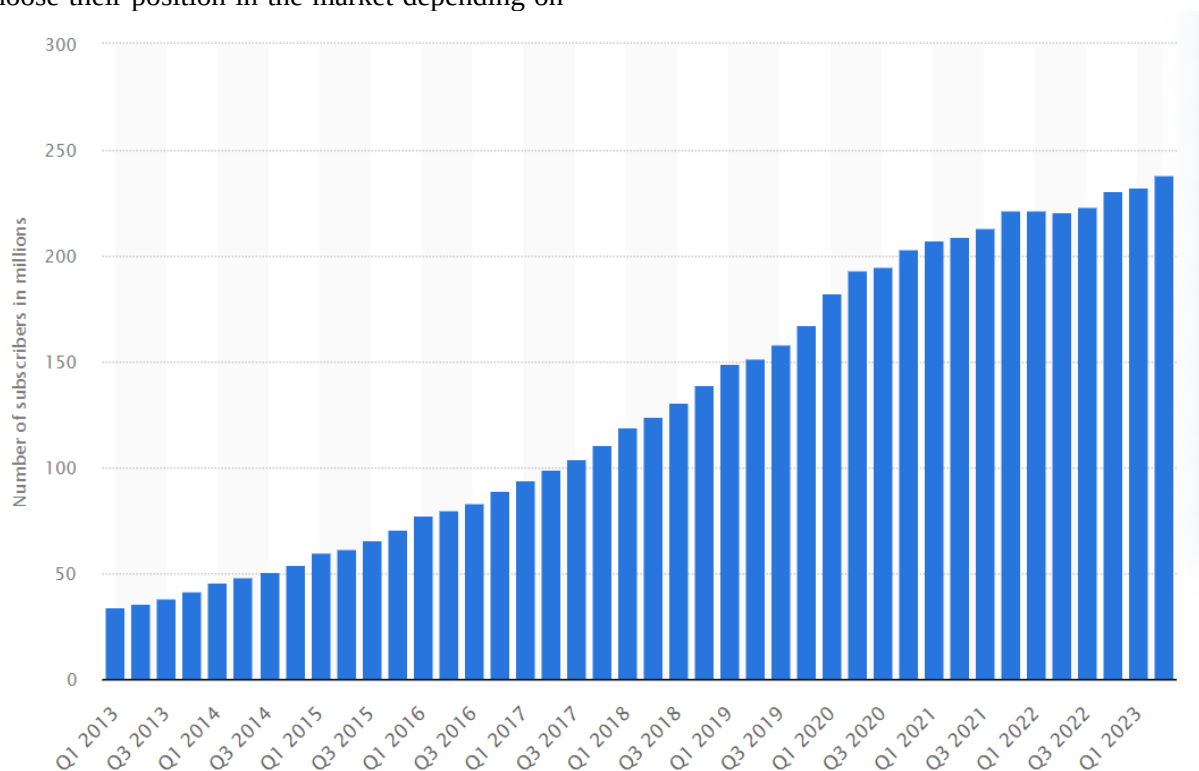


Fig. 1. Number of Netflix paid subscribers worldwide from 1st quarter 2013 to 2nd quarter 2023 (in millions).

Source: Statista, 2023.

In the digital age, social media enables to interact with customers directly, and Netflix takes advantage of this. For instance, Netflix has its official accounts on Twitter based on each country. Each has active roles in promoting shows, creating polls, and attracting the audience with inside jokes from series/movies. In addition to social media accounts, it takes part in articles, interviews, live TV shows, streaming services, and campaigns.

We should also mention the connection between online streaming sites (e.g., Twitch, YouTube) and Netflix. These platforms complement each other on a different level. A

Netflix show's advertisement can be seen in a YouTube video. Many fans of Netflix's original content record a video about the show or live stream their reactions to scenes from these shows. All these platforms allow the company to advertise in different ways, providing an accessible environment to reach several targeted groups of consumers.

We should focus on Netflix's official social media accounts after the COVID-19 pandemic to better understand social media usage for shaping consumer preferences. Consumer behaviours are usually stable in ordinary times, and if there are any behaviour change-related innovations, they

adapt very slowly. By contrast, consumers are willing to try new habits during the pandemic. Netflix could track the consumer's needs during this unique moment and shift their behaviour even more than it used to do.

The company's first step was increasing the quality of communication with its subscribers through digital data-gathering and monitoring techniques in social media platforms. By doing so, Netflix could modify consumer preferences in the market.

Furthermore, Netflix's prediction algorithm provides substantial financial success against its competitors like Amazon's VOD service, HBO, Hulu, etc. For instance, the difference between the advertisement strategy of Hulu and Netflix is that subscribers have to watch many advertisements before and during the viewing time, in the case of Hulu Plus. However, the only time Netflix subscribers come across ads is when they watch a new Netflix original series/movie trailer.

Amazon Prime users do not have to watch advertisements either, but they have to pay rental prices for some of the series/movies in addition to the monthly subscription fee. This pricing model is called pick-and-pay (a la carte), which is not indistinguishable from what cable television services offer to their customers. However, subscribers can still access most of the series/movies similarly to Netflix without additional payment.

Another crucial difference between Netflix and other providers is the motivation to change brand strategies over time and develop technological transition as fast as possible. The company also keeps its customer base updated on these changes and builds incentives for new subscribers. Netflix uses consumer research methods such as A/B testing and surveys to develop creative business strategies.

To evolve its marketing strategies, Netflix improves its machine learning (ML) with each new subscriber. This ML provides the best user experience (UX) by suggesting an almost flawless content algorithm. All these factors have an impact on building brand awareness and

perfectly match predictions of consumer preferences.

The biggest competitor of Netflix, HBO, with its robust ideas in the market. Both companies are challenging each other by launching new methods of viewing the content for the consumers. Creating better content under these companies' names boosts the movie industry. Despite all the ambitious strategies of HBO, Netflix maintains its leader status in the market with a large user base.

Also, if we compare the Emmy Awards that both companies got in recent years, we can see the competition between the two companies.

The Netflix effect on the movie theatre industry can be seen clearly if we evaluate the movie awards during the last 6-7 years. Many were against the idea of including online video platforms as nominees. They claimed that nominees must be aired in movie theatres.

Therefore, online platforms are unsuitable for the standards of elimination processes, but online video platforms took over half of the awards in Emmy 2021. These platforms include Netflix, HBO, Apple TV+, Disney+, Amazon Prime, etc. The awards enabled Netflix and all others to prove their success in the media industry. They also helped as a marketing tool. For instance, "The Crown," an original Netflix series, earned multiple wins, increasing the show's awareness in the market.

It attracted existing subscribers' attention and caused new consumers to subscribe to the platform. Moreover, the reports show that after Emmy Awarded Netflix original miniseries "The Queen's Gambit" rose in popularity, Google searches on 'how to play chess' broke records. Despite all the arguments against including online video platforms in movie theatre awards, Netflix earned its first nominations at the Emmy Awards in 2013.

This number reached 160 and 129 in 2020 and 2021, respectively (Figure 2.). Because online video platforms and networks are crucial in the movie awards, it is inevitable to involve them in them.

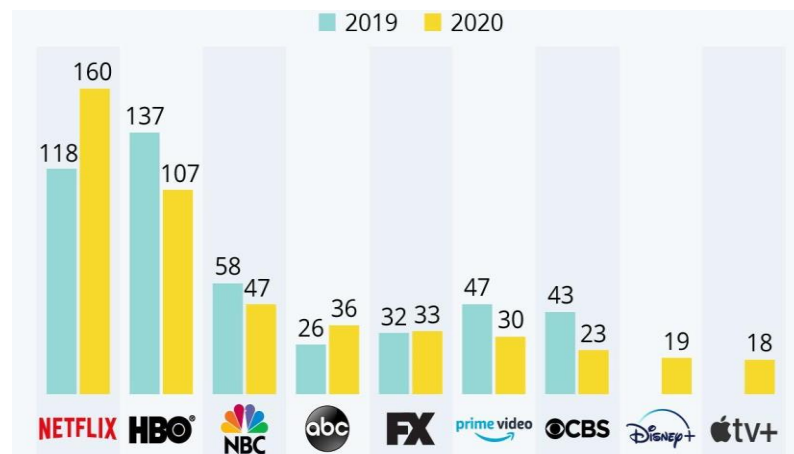


Fig. 2. Networks/Platforms with the most nominations at the 72nd Emmy Awards

Source: Academy of Television Arts & Sciences, 2021.

The impact of Netflix on the media industry is also crucial for actors and actresses. Netflix's original series usually prefer to cast lesser-known actors/actresses, and overnight, they have become well-known in societies worldwide. This is one of the main strategies of Netflix to engage viewers with the platform.

This strategy effectively shapes consumers viewing behaviours because subscribers want to watch those newborn stars in upcoming series/movies.

"Binge-watching" is another business strategy Netflix uses to shape consumer behaviours in the industry. The term "binge-watching" came into our lives after the rapid growth of online viewing media platforms.

According to some research surveys, more than half of Netflix subscribers prefer to watch series episodes one after the other. Especially when the new season of a popular series is released, the consumers usually learn to watch an entire season in one day. Most of the time, the motives behind binge-watching are caused by the hesitation to get spoilers from other viewers on social media. The chances of coming across a post on social media about the new season of a popular Netflix series are high.

Therefore, subscribers prefer to watch it through all episodes at the time when they are released. Netflix prefers to release all season episodes together on purpose, enabling consumers to integrate with the platform more. Interactive content was also created with a similar purpose in the popular Netflix original series "Black Mirror".

Additionally, when we evaluate digital media platforms, we should not forget about the effects of illegal online streaming websites in the

market. Whether it is an unlawful or legal option, the empowerment of online subscription services is rising rapidly. Even if some countries have control over these websites and have banned them strictly, others are not paying attention. Netflix attaches importance to its original content for not getting illegally served on these platforms.

However, it is almost impossible to stop them, and at the same time, even these illegal streaming options can be taken as a way of promotion. Finding the series you want and downloading it securely on these websites is not as easy as subscribing to Netflix. Therefore, consumers most likely choose to subscribe to the online streaming platform when they like several series/movies one after another from the same platform. Still, Netflix and all other platforms should consider the existence of illegal websites and create strategies to cope with them efficiently.

2.1. Example of Netflix Effect: Turkish media industry

Netflix expanded into the Turkish market in January 2016, changing the whole structure of the Turkish media industry. The popularity of video-on-demand platforms in the country increases every year, and the leading company is Netflix. One of the reasons behind the rapid growth of its popularity in Turkey was the illegal platforms streaming Netflix's original series even before the company expanded its market to Turkey. Other popular global online streaming platforms in Turkey are Apple+ and Amazon Prime Video.

However, some local platforms are additional to them, namely BluTV and PuhuTV. Their

algorithmic recommendation systems are similar to Netflix. The content of these platforms covers Turkish series/movies and international ones. Therefore, they have a competitive advantage in the market in terms of reaching a specific group of Turkish viewers.

Netflix subscribers in Turkey are usually between the ages of 15-40 who speak English

or/and want to improve their English. Learning English through series/movies is an essential factor behind the motives of purchasing Netflix subscriptions for Turkish society.

Today, it is estimated that the number of subscribers to Netflix in Turkey is over 600,000 (Figure 3.).

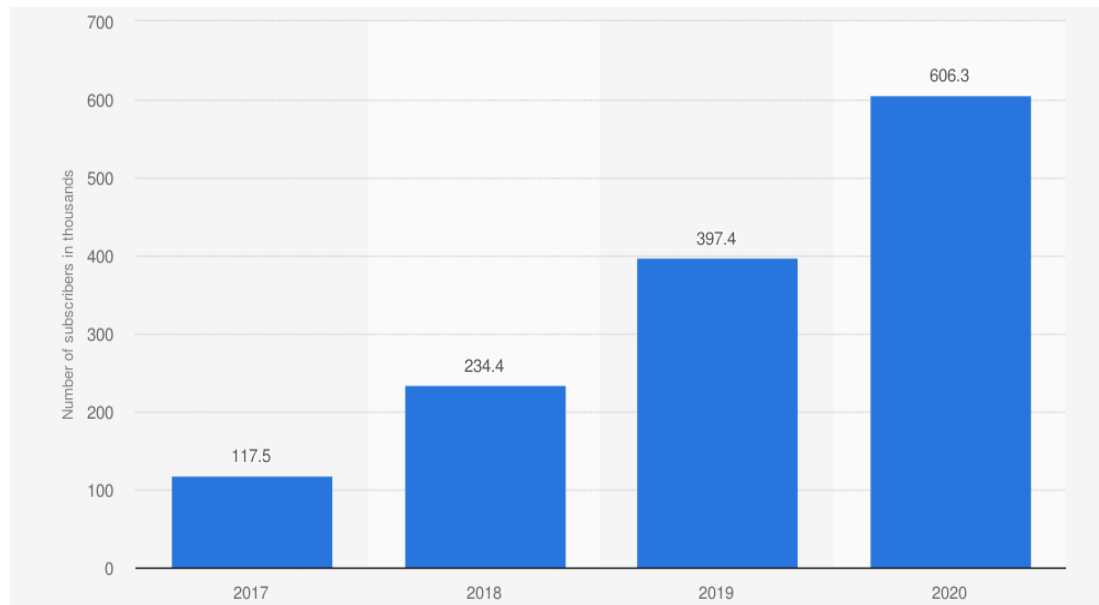


Fig. 3. *Estimated number of active streaming subscribers for Netflix in Turkey from 2017 to 2020 (in 1,000)*

Source: Statista, 2021.

Above all, Netflix supports Turkish media producers and encourages them by giving them freedom in their work. The regulation agency of Turkish media (RTÜK) has become extremely strict over the industry. Many shows/series/movies/news are banned and fined over the years. The factors behind these strict changes are connected to the government's effect on media platforms. The government buys most channels, and the regulation agency gains more control over them over time.

These strict rules discourage producers, actors, and directors from working in the TV industry, and the demand for a free platform to work with occurred. Therefore, this turned back into an advantage for Netflix, allowing it to step up in the industry. Many creative production offers were given to Netflix from the beginning of its expansion to Turkey, and the company supported these works by streaming them not only in Turkey but also internationally. The impact of Turkish productions on Netflix contributed to the Turkish economy by

approximately \$52 million. Besides adding jobs in the media industry, most of the series and movies attract viewers to visit iconic places, allowing the tourism industry to grow. For example, Göbeklitepe (southeastern Şanlıurfa province) is one of the tourist locations that attracted attention after the Netflix original series called The Gift.

Also, The Protector had scenes in Istanbul's most famous historical places, such as Hagia Sophia, Grand Bazaar, Mimar Sinan Tomb, and Sultanahmet Square. The fact that these places are not featured in the sense of historical documentaries but take part in series/movies created curiosity about them in consumers.

The Gift, Love 101, The Protector, Ethos, Fatma, Rise of Empires Ottoman, Into the Fight, Intersection, The Yard, Love is in the Air, The Club, and Yaşamayanlar are Turkish series streaming on Netflix. Netflix also covers well-known Turkish movies such as Miracle in Cell Number 7, Grudge, Paper Lives, Last Summer, Stuck Apart, Money Trap, etc.

Even though online streaming channels have a robust impact on consumer preferences, traditional broadcast and cable television are still in demand in Turkey.

Many households prefer to have both conventional and nontraditional streaming platforms. Besides these, Turkish audiences use illegal streaming sites since they are free, and it is almost impossible to shut them down completely. These websites keep changing domain names whenever they are closed because of copyright laws. Still, it is estimated that the primary streaming preferences of Turkish viewers are these illegal websites.

3. Conclusions

In short, Netflix's success is based on observing and modifying consumer preferences after its shift from being a DVD rental company to offering online streaming as a web platform. Netflix uses several ways to improve its algorithm and shape consumer behaviour. A/B testing, surveys, and machine learning (ML) can be given as examples. Each business strategy of Netflix impacts building brand awareness and perfectly matching predictions of consumer preferences.

As of today, Netflix may most probably lead the online streaming of media in the years to come. The impact of Netflix on the television and media industry is expected to increase, but at the same time, new revolutionary changes may also be seen in traditional streaming platforms. As we cover in this study, over-the-top (OTT) services are anticipated to change the media industry. Besides, predictions show that even illegal online streaming options will make the industry robust and reshape consumers' consumption behaviour. These changes will drastically affect mass media distribution and production, and Netflix will continue to be the most significant player in this effect.

However, the future might bring more challenges to the company since it is already struggling with licensing fees and the production costs of Netflix's original content. Although Netflix is influential in the market, it should not underestimate the obstacles, and the company has to keep working on building strong partnerships.

The most essential goal Netflix hopes to reach in the future must be offering exclusive content with cheap options and promotions. To compete with premium channels and traditional networks in the market, Netflix has to focus on this goal.

In short, Netflix differs from other online streaming services in its content creation, delivery, promotion, and, most importantly, customer engagement. The company's power is based on its ability to modify consumer behaviour and estimate preferences beforehand.

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SUMMARY ON THE ROLE OF INFORMATIONAL CONTENT IN THE COMMUNICATION AND PROMOTION OF TOURISM SERVICES IN ROMANIA

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Abstract: This paper examines the role of informational content in promoting tourism services in Romania, emphasizing the importance of well-designed websites and effective digital strategies. In a globalized and competitive tourism market, a destination's visibility depends largely on the methods and technologies used to communicate with potential visitors. Continuous promotion is vital for maintaining tourist interest and supporting sustainable development. Promotion enhances the attractiveness of tourist destinations by increasing visibility, attracting more tourists, strengthening the destination's brand, and stimulating demand for services such as accommodation, recreation, and dining. It also plays a key role in promoting local culture and protecting natural resources, which is essential for sustainable tourism. Websites are crucial for tourism promotion, providing direct access to information and reservation systems. A well-optimized website should offer clear, user-friendly access to key details about attractions, events, and services. Multimedia content, such as images and virtual tours, adds to the visual appeal, while functionalities like online bookings and SEO optimization ensure accessibility for a broader audience.

Keyword analysis from major Romanian tourism portals like Romania.travel, Infoturism.ro, and Turistinfo.ro highlights the importance of using both general and niche keywords. These keywords enhance search engine visibility and help cater to various tourist preferences, from cultural experiences to ecotourism and city breaks.

In conclusion, online content and digital marketing strategies are essential tools for promoting tourism in Romania, ensuring that destinations remain competitive, attractive, and sustainable.

Keywords: tourism promotion, multimedia content, website, SEO;

1. Introduction

The paper analyzes the role and impact of informational content in promoting tourism services in Romania, emphasizing the importance of a well-designed website and effective digital strategies. In the context of globalization and increasing competition in the tourism market, a destination's ability to become known largely depends on the methods and technologies used to convey information to the general public.

Tourism, as an economic sector, requires continuous promotion to maintain tourists' interest and ensure the sustainable development of tourist destinations.

2. The Role of Promotion in Tourism Activities

Promotion plays a crucial role in increasing the attractiveness of a tourist destination, generating a steady flow of visitors. The objectives of promotion are multiple: increasing visibility, attracting tourists, strengthening the destination's image, and stimulating demand for tourism services.

Promotion strategies must be well-structured and meet the specific needs of each market segment, whether it's families, young people, seniors, or business travelers.

Tourism promotion is not just about attracting a large number of tourists in the short term but also creating a positive long-term image. This must be based on a sustainable approach that protects the

environment and respects local culture and communities. Effective promotion contributes to creating a strong brand identity for destinations, which, in turn, enhances competitiveness in an increasingly saturated global tourism market.

3. Key Elements of Promotion

1. Increasing the visibility and attractiveness of the destination: Effective promotion helps bring the destination to the attention of a broad audience, both nationally and internationally.

By increasing visibility, the destination becomes a viable option for more tourists. Visibility can be increased through various channels, such as online and offline advertising, social media campaigns, and collaboration with influencers in the tourism industry.

2. Informing and educating tourists: One of the purposes of promotion is to provide essential information about tourist attractions, events, and services. Good promotion not only informs but also educates tourists about what they can discover and how to have a quality experience.

By educating tourists about local culture, historical heritage, and natural values, promotion contributes to a better appreciation of the visited destinations and respect for their resources.

3. Increasing demand for tourism services: In addition to increasing the number of tourists, promotion helps stimulate demand for tourism services, from accommodation and food to excursions and recreational activities.

A well-planned strategy can also help extend the tourist season, attracting visitors during less busy times of the year.

4. Local economic development, revenue generation, and job creation: Effective promotion has a positive impact on the local economy, contributing to revenue growth and creating new jobs. Tourism plays a vital role in the economic development of regions that rely heavily on tourist income.

Attracting more tourists stimulates demand for local products and services, which has a direct effect on the growth of businesses and local infrastructure.

5. Promoting cultural and natural heritage: Responsible and sustainable tourism can play an important role in conserving a destination's cultural and natural heritage. Proper promotion can attract tourists interested in such values, contributing to their preservation and valorization.

In addition, promotion campaigns can educate tourists about the importance of protecting the environment and local cultures, thus helping preserve the authenticity of tourist destinations.

6. Innovation in the use of new technologies and promotion platforms: Digital technologies offer new opportunities for promoting tourist destinations. The use of social platforms, mobile apps, and virtual or augmented reality takes tourism to a new level of interaction with the public.

Digital platforms such as YouTube, Instagram, and TikTok allow the creation of visually attractive and interactive content that can capture a wide audience's attention and inspire people to plan trips.

4. Perception of a Tourist Attraction Through Websites: A Comprehensive Analysis

In the digital age, the perception of a tourist attraction is heavily influenced by the information and presentation available online. The role of websites in shaping this perception cannot be overstated, as they serve as the primary gateway for potential visitors to explore, evaluate, and decide on visiting a destination. This essay delves into how websites influence the perception of tourist attractions, examining the elements that make a website effective in promoting tourism and how they impact decision-making processes for travelers. It also explores the interplay between visual content, user experience, and information accuracy in the context of modern tourism.

The Importance of Online Presence in Tourism

In today's world, where digital interaction dominates, a tourist attraction's online presence significantly impacts how it is perceived by potential visitors. Whether it's a historical site, a natural wonder, or a theme park, travelers increasingly rely on online resources to gather information before deciding on a visit. Websites serve as the virtual face of these attractions, providing a first impression that can either draw in or deter prospective tourists.

According to studies in digital marketing, nearly 85% of travelers research a destination online before making travel plans. This high level of reliance on the internet underscores the importance of well-designed, user-friendly websites that effectively communicate the unique qualities of a tourist attraction.

Websites provide an opportunity to create a narrative around the attraction, highlighting its history, culture, activities, and significance in a way that resonates with potential visitors.

5. Visual Appeal and Design: The First Point of Contact

One of the most critical factors in shaping the perception of a tourist attraction is the visual presentation of the website. People are highly visual creatures, and the first thing a potential visitor notices about a website is its aesthetic appeal. Images, videos, and graphic design elements can evoke emotions and provide a virtual experience of the destination. For example, a website featuring high-quality, vibrant images of the Grand Canyon or Machu Picchu can transport visitors and create a sense of awe, effectively persuading them to visit.

Websites that use immersive visuals—such as 360-degree panoramic views, virtual tours, and drone footage—offer an even more engaging experience. These tools allow visitors to explore the attraction in detail, providing them with a sense of what it would be like to experience the place firsthand. This visual storytelling helps to create a strong connection between the user and the attraction, enhancing its appeal and fostering a positive perception.

However, the aesthetics of a website go beyond just images and videos. The overall design, including the layout, color schemes, fonts, and navigation, also plays a crucial role in shaping how an attraction is perceived. A clean, professional design reflects well on the destination, suggesting that it is well-maintained, reputable, and worth visiting.

On the other hand, a poorly designed website with outdated graphics, clunky navigation, or slow load times can negatively impact the user's perception, potentially leading them to question the quality of the attraction itself.

6. Content Quality and Informational Value: A Critical Aspect of Digital Communication

In today's digital landscape, where vast amounts of information are constantly being generated and consumed, the quality and informational value of content play a crucial role in shaping perceptions, building trust, and fostering engagement. Whether in marketing, education, or journalism, content that is high in

quality and rich in informational value has become an indispensable tool for effective communication. This essay explores the importance of content quality, the factors that determine it, and its role in digital communication, particularly in fostering trust, engagement, and decision-making among users.

Content quality can be understood as the degree to which information is accurate, relevant, engaging, and useful to its intended audience. It goes beyond mere accuracy, incorporating aspects like clarity, relevance, comprehensiveness, and the ability to meet the needs and expectations of its target readers. High-quality content not only informs but also provides insights, stimulates thought, and encourages action. Whether in the form of a blog post, a product review, or a research paper, quality content demonstrates expertise, authority, and trustworthiness, thus enhancing the overall user experience.

One of the key indicators of content quality is relevance. Content must be tailored to the audience's needs and interests. In the digital age, users are bombarded with information from various sources, and only content that directly addresses their questions or problems will stand out. For instance, a well-written article on travel tips for first-time visitors to Paris will resonate more with a traveler planning their first trip to the city than a generic article on European travel.

Another critical factor is accuracy. In an era where misinformation and fake news are rampant, providing factual and well-researched information is essential. Users are more likely to trust and engage with content that is backed by reliable sources and data. Inaccurate or misleading information can not only tarnish the reputation of a content creator or brand but also lead to significant consequences, especially in fields like healthcare or finance, where people make decisions based on the information they consume.

Informational value refers to the usefulness and practicality of the content for its intended audience. High informational value means that the content offers something meaningful—whether it's solving a problem, answering a question, or providing new insights. Informational value is closely tied to the purpose of the content; it ensures that users walk away with something tangible, whether knowledge, tips, or actionable steps.

For example, a comprehensive guide on how to start a small business has high informational

value if it includes step-by-step instructions, necessary legal documents, potential pitfalls, and financial advice. The reader gains valuable insights that can directly influence their actions or decisions. On the other hand, content that is vague, superficial, or filled with unnecessary information may fail to deliver value, even if it is presented attractively.

Informational depth is an essential component of informational value. Content that delves deep into a subject, providing detailed explanations, real-life examples, or case studies, is often perceived as more valuable. Shallow or overly simplistic content, while easy to digest, may not meet the needs of users seeking in-depth knowledge. For instance, in the realm of academic content, a well-researched and detailed study on climate change will be considered far more valuable than a brief overview of the topic that lacks data or evidence.

In digital marketing, the quality and informational value of content can be the difference between success and failure. Modern consumers are savvy; they do not respond well to superficial, sales-driven content. Instead, they seek authenticity and value. Brands that prioritize creating high-quality content that educates, entertains, or informs their audience are more likely to build trust, foster loyalty, and encourage conversions.

Content marketing strategies often revolve around delivering valuable information to potential customers at different stages of the buyer's journey. For example, a tech company might create in-depth blog posts or tutorials explaining how their product solves common industry problems. This content, rich in informational value, helps potential customers understand the product's benefits and applications. By the time these readers reach the decision-making stage, they have already developed a level of trust and understanding, making them more likely to choose that brand over its competitors.

Furthermore, high-quality content improves search engine optimization (SEO), as search engines prioritize well-researched, authoritative, and user-friendly content. Google's algorithms, for instance, reward websites that offer comprehensive, valuable information by ranking them higher in search results. Websites with poorly written, low-value content tend to be penalized, as search engines aim to provide users with the most relevant and trustworthy results.

Building trust is a fundamental goal of any content strategy, and trust is earned through quality. High-quality content demonstrates expertise and authority, which are crucial factors in establishing credibility. Whether it's a brand, a news outlet, or an educational platform, users are more likely to engage with and return to sources they trust. Trustworthy content often includes verifiable information, clear citations of sources, and transparency regarding the author's or organization's background.

In the realm of online reviews and testimonials, quality content can influence consumer behavior significantly. A well-detailed, honest review of a product or service can reassure potential buyers, while poorly written or overly biased content can deter them. In this sense, high-quality, authentic content fosters engagement by encouraging users to interact, share, or comment, thus building a community of loyal followers.

Additionally, engagement is enhanced when content is both high in quality and designed to invite participation. Interactive content, such as polls, quizzes, or forums, allows users to contribute and feel involved, thereby deepening their connection to the content and its creators. Quality content often sparks discussions, prompts questions, and encourages users to take further actions, whether it's making a purchase, sharing information, or seeking more knowledge.

Despite the importance of content quality, maintaining high standards consistently can be challenging, especially in fast-paced environments where content is produced rapidly. One of the primary challenges is the pressure to produce content frequently to stay relevant in a competitive market. In some cases, quantity is prioritized over quality, leading to the production of content that lacks depth or value. This can harm a brand's reputation and diminish user trust.

Another challenge is ensuring that content remains up-to-date and accurate. Information, especially in fields like technology, science, or finance, can become outdated quickly. Content creators must regularly review and update their work to ensure it remains relevant and valuable to their audience.

Moreover, content fatigue is a real issue. With so much information available online, users can become overwhelmed, leading to disengagement. To combat this, content creators must focus on providing fresh perspectives, unique insights, and high-value content that stands out from the crowd.

7. User Experience and Website Functionality

User experience (UX) is another vital component of how a tourist attraction is perceived through its website. A seamless, intuitive, and enjoyable browsing experience can leave a lasting positive impression on potential visitors, while a frustrating or confusing interface can have the opposite effect. Modern travelers expect websites to be fast, responsive, and easy to navigate, especially when accessing them on mobile devices.

A website that offers smooth navigation, clear menus, and a logical structure enhances user engagement and helps visitors find the information they need quickly. For instance, a website for a large theme park like Disneyland should have an intuitive layout that allows users to easily explore different sections, such as attractions, dining options, accommodations, and ticket purchasing. If visitors struggle to find this information or encounter broken links, they may become frustrated and choose to visit another destination with a more user-friendly website.

In addition to navigation, the functionality of a website can also influence how an attraction is perceived. Features such as online booking, integrated maps, and real-time updates on weather conditions, crowd levels, or events can significantly enhance the user experience. For instance, a ski resort's website that offers live webcam feeds, snow conditions, and an easy-to-use booking system for ski passes and rentals will likely be perceived as well-organized and efficient. This ease of use can translate into a perception that the destination itself is well-managed and that visitors will have a smooth and enjoyable experience once they arrive. Moreover, accessibility features are becoming increasingly important in shaping how a tourist attraction is perceived. Websites that offer language options, audio guides for the visually impaired, or text descriptions for images and videos demonstrate inclusivity and consideration for all visitors.

These features can enhance the perception of the destination as being welcoming and accommodating to diverse groups of tourists.

8. Trustworthiness and Reputation Management

The perception of a tourist attraction is also heavily influenced by the trustworthiness and

credibility of the information presented on its website. Inaccurate or outdated information can lead to disappointment and frustration among visitors, damaging the reputation of the destination. Therefore, it is essential that tourism websites maintain up-to-date, reliable, and transparent content.

One way to build trust is by incorporating user-generated content, such as reviews, testimonials, or social media feeds, directly on the website. Potential visitors often trust the opinions of other travelers more than promotional content provided by the attraction itself. Websites that prominently feature positive reviews, ratings, and real visitor experiences help build credibility and authenticity. For example, websites like TripAdvisor allow users to leave reviews and ratings of tourist attractions, which can significantly impact the perception of a destination. If a potential visitor reads numerous glowing reviews about an attraction's beauty, cleanliness, and hospitality, they are more likely to develop a positive perception and plan a visit. Conversely, negative reviews about poor service or misleading information on the website can deter potential tourists. Reputation management also involves addressing any negative feedback or complaints that arise. Websites that actively engage with visitors, respond to feedback, and take steps to improve based on user input demonstrate a commitment to visitor satisfaction. This proactive approach can help maintain a positive perception of the destination, even in the face of occasional criticisms.

9. Cultural Sensitivity and Localization

Tourism websites that cater to an international audience must also be culturally sensitive and localized to appeal to visitors from different regions. Localization goes beyond simply translating the content into multiple languages; it involves adapting the website's design, images, and messaging to resonate with diverse cultural preferences and expectations. For example, a website promoting a tourist attraction in Japan may feature traditional aesthetics, colors, and symbols that align with Japanese culture while also providing information in English or other languages for international tourists. The website could also highlight cultural experiences unique to Japan, such as tea ceremonies, festivals, or traditional crafts, making the attraction more appealing to international visitors seeking an authentic cultural experience.

Cultural sensitivity is particularly important when promoting attractions related to indigenous communities or sacred sites. Websites must ensure that they present these attractions with respect and accuracy, avoiding stereotypes or oversimplifications. By collaborating with local

communities and incorporating their perspectives into the website content, tourism organizations can promote these destinations ethically and responsibly, fostering a positive perception among culturally aware travelers.

10. The Role of Social Media Integration

In today's interconnected digital landscape, websites do not exist in isolation. The integration of social media platforms plays a pivotal role in how a tourist attraction is perceived. Social media channels such as Instagram, Facebook, and YouTube allow destinations to reach a broader audience and engage with potential visitors in real-time. Tourism websites that incorporate social media feeds, hashtags, and shareable content enable visitors to connect with the destination in a more interactive way. For example, a website that encourages users to share their travel photos using a specific hashtag can create a sense of community and excitement around the attraction. These user-generated images and videos provide social proof, validating the attraction's appeal and authenticity.

Moreover, social media influencers and travel bloggers can significantly shape the perception of a tourist attraction. Collaborations between tourism organizations and influencers who have a large following can lead to increased visibility and credibility. For instance, an influencer's visit to a remote beach or a hidden mountain village, documented through stunning photography and shared across platforms, can inspire their followers to consider visiting the destination.

In conclusion, the perception of a tourist attraction is profoundly shaped by its online presence, particularly through its website. A well-designed, visually appealing, and informative website can create a positive image of the destination, encouraging potential visitors to explore further and plan a trip. Key elements such as high-quality visuals, engaging content, user-friendly navigation, and social media integration all contribute to shaping this perception. Ultimately, a website's ability to provide a seamless, enjoyable, and trustworthy online experience translates into how visitors perceive the destination itself. In an increasingly competitive tourism market, maintaining a strong online presence is essential for attracting and retaining tourists, making the website a crucial tool in the promotion and success of tourist attractions worldwide.

11. The Importance of a Website in Promoting Tourism

A well-structured website is vital in promoting tourism services, as it provides continuous access to information and online

booking facilities. Moreover, a website represents the digital face of a tourist destination, and its design and functionalities must meet high standards to attract visitors and keep them engaged. In an increasingly digitalized world, the website becomes the main channel through which tourists obtain information and make reservations. The main functions of a website include:

1. Centralizing and efficiently distributing information: The website should be a central point of information, where tourists can find all the necessary details about a destination – attractions, facilities, events, and booking methods. Additionally, a well-organized website can serve as a resource center for tourists, offering detailed guides on what to do and see in the area.

2. Providing multimedia content to attract visitors: Images, videos, and virtual tours are essential in promoting tourism, offering a realistic and attractive perspective on the destination. A well-made virtual tour can help tourists explore the destination before visiting physically, thus stimulating their interest and desire to book a vacation.

3. Facilitating online bookings and payments: Online booking and payment functions are indispensable for a complete user experience. The simplicity and security of these processes contribute to a smooth tourist experience. Modern tourists expect to be able to complete all necessary transactions online, from booking accommodation to purchasing tickets for various attractions.

4. Analyzing user behavior to optimize marketing strategies: A well-developed website also offers analytical tools that allow understanding of visitor behavior and adjusting promotion campaigns according to their preferences and needs. The collected data can be used to improve user experience by personalizing content and offers for each type of tourist.

Tourism websites must be optimized for search engines (SEO) to ensure that they are easy to find by tourists. Additionally, websites must be accessible on all devices (desktop, tablet, mobile), as a significant portion of users search for tourism information from mobile devices. A responsive and easy-to-use mobile website can make the difference between a successful booking and a lost potential customer.

Analysis of Keywords in Major Romanian Tourism Portals

Keywords play a crucial role in search engine optimization (SEO) for tourism websites. They not only influence search engine rankings but also how tourists find the information they need to plan a trip. In this context, an analysis of the keywords used on major tourism portals in

Romania provides a clear picture of how destination promotion strategies are structured.

1. **Romania.travel**

- Main keywords: Romania, tourism, destinations, events, traditions, culture, gastronomy, nature, trails, tourist attractions.

2. **Infoturism.ro**

- Main keywords: tourist offers, vacations, packages, accommodation, tourist circuits, city breaks.

3. **Turistinfo.ro**

- Main keywords: accommodation, guesthouses, hotels, villas, accommodation offers, vacations, reservations, Romania.

4. **RomaniaTourStore.com**

- Main keywords: excursions, private tours, adventure, ecotourism, thematic vacations, guided experiences, hikes, mountain excursions.

5. **Descoperă România**

- Main keywords: destinations, tourist attractions, hiking trails, cultural events, vacations, tourist attractions, Romania.

12. Conclusions

The promotion of tourism services through informational content and online platforms is essential for the development and consolidation of tourist destinations in Romania. In an increasingly competitive and globalized tourism market, a destination's ability to stand out largely depends on how it promotes itself in the digital space. Tourism websites are no longer just presentation tools but have become central pillars in the marketing strategy of any destination, offering tourists essential information and the ability to plan and book vacations conveniently and efficiently.

Well-structured, visually appealing, and search engine-optimized (SEO) websites not only enhance the visibility of a destination but also improve its overall image. By including multimedia content, virtual tours, and online booking features, websites succeed in capturing the attention of potential tourists and providing them with a positive experience from the planning phase. Online promotion also enables increased interaction with the public, either through reviews from other tourists or the use of social media, which can significantly amplify the destination's reputation.

The analysis of keywords and their optimization for Romanian tourism portals such as Romania.travel or Infoturism.ro demonstrates the importance of adapting digital strategies according to the target audience and their preferences. Niche keywords, such as those related to ecotourism or private tours, help attract a specific segment of tourists and increase the quality traffic on websites.

In conclusion, integrating effective content and SEO strategies into digital tourism promotion ensures greater visibility, significantly contributing to the success and sustainable development of tourist destinations in Romania, especially in the context of a constantly evolving market.

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BIOMASS ENERGY PRODUCTION SOURCING AND FORECASTING

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Abstract: The energy market research highlighted the following combustible materials that produce energy: firewood, sawdust, briquettes and pellets. The woody crops that are intended exclusively for energy production are: poplar, ash, maple, willow, birch, beech, acacia. In different counties of the country the energetic willow species is successfully cultivated.

This species can be cultivated on lands with high humidity, representing an alternative in agriculture and the use of uncultivated lands. Recent years have seen favourable changes in the energy sector through alternative energy sources. The European Union aims to reach a 20% cap on the production of energy from alternative sources by 2020. Reaching this ceiling implies a number of other factors favourable to development and here we mention the decrease in CO₂ emissions, which, compared to 1990, must fall by 20% by 2020, according to EU proposals, through the use and exploitation of alternative energy sources.

Today, much of the energy needed by mankind is produced from fossil fuels. Fuels in the world are found in three forms: fossil, nuclear and renewable. Fossil fuels, according to research by the European Union, are seriously damaging to the environment. Government energy policy is only involved in research that is aimed at new ideas for producing energy and reducing the environmental impact. European Union states (EU-27) are dependent on imported fossil fuels from Asian countries, USA.

Keywords: higher caloric power, biomass, wood, bark

1. Introduction

Wood bark and sawdust are organic materials that shouldn't pollute the environment. When the sawdust is stored on the ground, it significantly changes the quality and composition of the soil, changing the carbon/nitrogen ratio in the soil. The sawdust resulting from wood processing at sawmills together with raw, snow or household water into the environment polluting the ground water. The woody biomass comes from the wood that resulted from cutting the crowns, which can't be used industrially. The bark isn't good for the production of fermentable sugars, due to the content of extractable substances and aromatic compounds.

Briquettes and pellets are products made from wood waste such as wood chips, sawdust and agricultural wastes. Briquettes are considered solid and environmentally friendly heating fuels. Briquettes must protect the environment.

Briquettes result from the process of compressing wood chips, sawdust or wood waste. Sawdust briquettes are environmentally friendly

materials that are often used in Romania. Lately, vegetable lighters have become very popular. Mechanical pressure of the wood material results in smaller products (pellets). Pellets are solid fuels with a moisture content (max.12%) obtained from sawdust, wood chips. The energy capacity of pellets is 19700 kJ/kg (3250 kWh) energy at 0% moisture content. Gases from sawdust deposits contain greenhouse gases. The greenhouse gas components are methane (CH₄) and carbon dioxide (CO₂). Waste is classified into waste from the wood processing industry, household consumers and agricultural processing.

In Romanian household waste has the largest share (81%), while street waste has 10% and construction and demolition waste have 9%.

The percentage of biodegradable matter in waste has recently decreased from 72% in 1998 to 61% in 2019 and 50% in 2022, the amount of biodegradable matter per inhabitant.

Today biomass is constantly increasing. This growth is materialized by the directions of use of biomass and products resulting from biomass

processing. Researchers in Hungary have highlighted that bioethanol is produced by 2 large companies, producing 30 thousand tons of alcohol/year. The amount of methyl alcohol produced in Hungary per year is 200 thousand tonnes. In Hungary, ethanol production based on feedstock and lignocellulose conversion process could play an important role, due to the fact that around 6-8 million tonnes/year of cereals are harvested annually.

In Romania, fuels such as bioethanol, vegetable oils, biodiesel, biogas, synthetic biofuels, bioethanol, can be obtained. The vegetable plants from which this fuel can be obtained are: sugar sorghum, sugar beet, straw, used oils, household waste.

In 2010, biogas accounted for 12% of energy production in Europe. Agricultural plants (maize, wheat and barley) are used to produce bioenergy from plants, reduce emissions of volatile substances.

Biomass production from algae is an option in energy production. Microalgae are a potential for cultivation as energy crops. Until 2000 there were 50 factories (Asia) producing 12 tons of dry substances per year. The net increase in forest area in EU countries was 59.3% at the end of 2005 compared to the 1990s, according to IEA statistics (2012). According to Eurostat (2012) the annual amount of wood harvested in the European Union in 2005 is 59.3%/year of which 10% is considered waste (branches, bark, etc.), which can be used for energy production. According to European statistics, Romania is in 13th place at the end of 2006, followed by Spain, Bulgaria, France, etc. in terms of availability of wood material. In the European Union (EU) countries in 2006, about 22.9% of forest trees are estimated to be destroyed, 3% less than in 1993; at EU level, the rate is 25.9% (Eurostat 2012).

Global biomass production is estimated at 146 billion tonnes per year from the primary source of harvested forest material. Agricultural and forestry plants are estimated to produce 20 tonnes per hectare of biomass harvested per year, with the largest amount coming from equatorial forests at 1000 t/ha. The aquatic world represented by algae and seagrass shows a production of 50 tonnes each year, and according to other research plants in this category such as artificial seaweed cultures can produce up to 50 t dry biomass. Submersible aquatic plants produce on average 5-7 t dry biomass per ha, among which linden and water lettuce, which are characterised by their high growth rate. Other

plants are those growing in marshes, such as reeds (7.5-13.0 t/ha), rushes (4.2-6.3 t/ha), or other plants that can accumulate around 20-37 t/ha.

Renewable energy resources are one of the options for replacing fossil fuels in Romania and in the world, with great prospects for future development. According to SRE-SEC estimates (2008), Romania is expected to consume 34.9 Mtoe (Million tonnes of oil equivalent) of energy by 2020. According to the same study, biomass covers more than 60% of the total Renewable Energy Sources (RES), i.e. 190 -200 PJ/year. One of the main current strategic directions, which Romania must implement, is to mobilise all efforts to introduce and implement RES.

Biomass comes from the Greek terms Bios - life and mass - to gather, so it represents the amount of living matter of the whole earth (DEX 1996). Compared to other combustible materials (coal, oil, etc.), biomass is widespread and is found in various forms (wood, woody plants, aquatic plants, agricultural plants, waste, etc.). Every country on earth has the opportunity and the obligation to produce green energy from biomass.

2. Materials and method

The determination of calorific value for wood and woody or lignocellulosic materials is almost similar to that for coal (as a solid fuel) and with few differences from liquid (gasoline, diesel, etc.) or gaseous (methane gas, LPG, biogas, etc.) fuels. In general, the method of determining calorific value is done separately for solid (ASTM D3286-96, Dihoiu 1995) or liquid and gaseous fuels.

The number of tests required by standards and other researchers is 5, 8 or 10 experimentally investigated samples (ASTM D3286-96, DIN 51900-1 2000,). The experiments in this work were carried out on 5 samples (DIN 51900-1 2000) for each species or type of material investigated, taking as the validated study value, their average when it has a probability of more than 95%. For the determination of the calorific value of the peel, the Pre-Control method with tight limits was used, in this case using only 3 samples and taking their average.

The equipment used to determine the calorific value of woody biomass was the XRY-1C type explosive combustion calorimeter produced by Shanghai Changji Geological Instrument Co. of China. Before the actual test, the calorimeter

bomb is calibrated with benzoic acid, using benzoic acid with a known calorific value (usually 26 463 kJ/kg (1kJ/kg=1J/g), or with small differences of maximum $\pm 3\%$ from this value), to determine the calorimetric coefficient k . The higher calorific power is determined with the relationship:

$$PCS_s = k \cdot \left(\frac{(t_f - t_i)}{m_l} \right) - q_s - q_b [\text{kJ/kg}]$$

where:

k - the calorimetric coefficient, determined by calibration with benzoic acid, expressed in kJ/deg;

t_f - final temperature, in degrees;

t_i - initial temperature, in degrees;

m_l - mass of wood, in kg.

q_s - heat consumed for burning the nickel wire, in kJ;

q_b - heat obtained by burning the cotton wire, in kJ

The lower calorific value of wood is determined from the higher calorific value using the following relationship:

$$PCI = PCS_s - 6 \cdot (U + 9 \cdot h) [\text{kJ/kg}]$$

where:

PCS_s - higher calorific value, in kJ/kg;

U - is the moisture content of the wood sample, in kg/kg;

h - hydrogen content of the wood sample, approximately 3.6 %.

The procedure for determining the calorific value of the wood material concerns first the preparation of the raw material and the plant, then the actual determination and finally the final result. The preparation of the wood material for testing consists of taking a small part of about 0.6-0.8 grams of the whole material, the sample being weighed to an accuracy of 0.0002 g. The sample must be clean, freshly cut wood, because old wood does not have all the volatile and flammable substances that could influence its calorific value. This sample is placed in a porcelain crucible and placed in a laboratory oven to dry at a temperature of $103 \pm 2^\circ \text{C}$ (Fig.1).

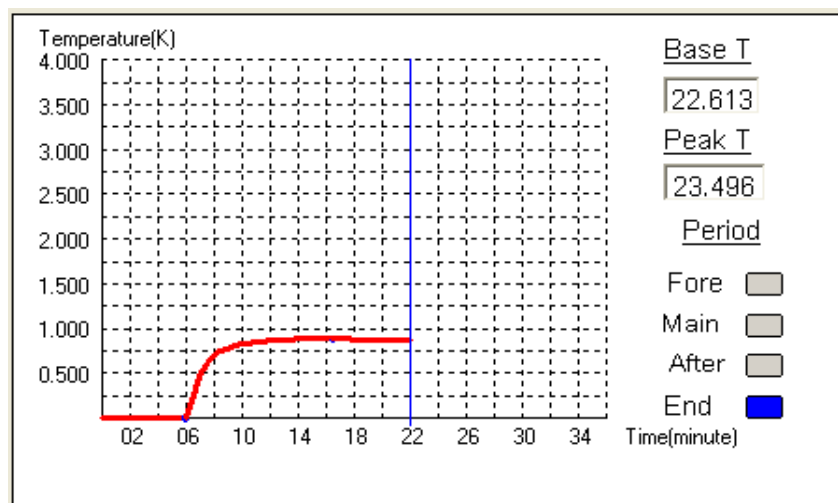


Fig. 1. Working diagram

The test contains three different periods, respectively:

The initial period (fore), which aims to determine the temperature variations, of the water in the calorimeter, due to the exchange of heat with the outside before burning. During this period, usually 5 minutes, the precision thermocouple temperature is displayed and read minute by minute.

The main period ("main") begins with the ignition of the sample and has as a consequence the increase of the water temperature in the calorimetric vessel, due to the burning of the wood particle and the emanation of heat.

The final period ("after") aims to determine the average temperature variation of the water in the calorimeter due to the heat exchange with the outside, after combustion. For the oak briquettes $U = 0\%$, $m = 0.7890$ g, higher calorific power =

18960 kJ/kg, lower caloric power= 18602 kJ/kg,
 $U = 10\%$, $m = 0.4900$ g, higher caloric power=
 17273 kJ/kg, lower caloric power= 15987 kJ/kg,
 $U = 20\%$, $m = 0.2190$ g/cm³, higher caloric power=
 15766 kJ/kg, lower caloric power= 13194 kJ/kg,

$U = 50\%$, $m = 0.4180$ g, higher caloric power=
 11243 kJ/kg, lower caloric power= 4813 kJ/kg.

The variation of the calorific power for oak
 briquettes is presented in Fig. 2.

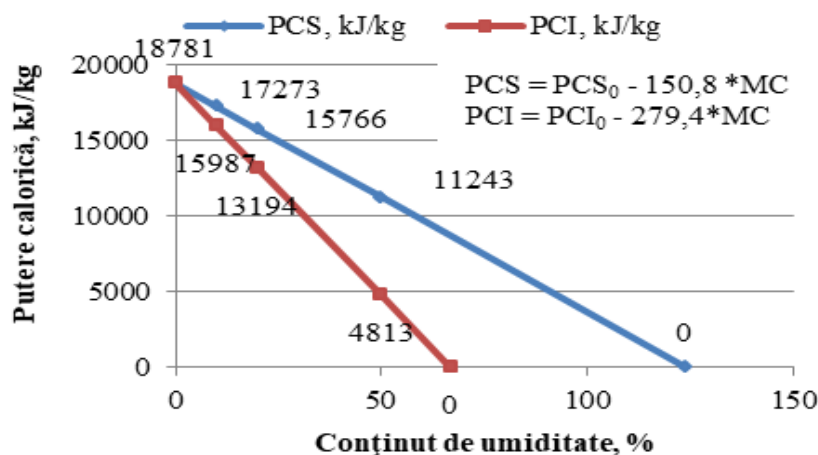


Fig. 2. The variation of the calorific power for oak briquettes

3. Conclusions

Today's economic market is faced with dwindling fossil fuel resources. In principle, greenhouse gases and harmful emissions must also be taken into account, thereby increasing the use of biomass as an energy source. Biomass material produces a large amount of energy, which can be made available to any consumer. For example, the Lower Calorific Value (LHV) of wood varies between 15480 and 19440 kJ/kg (4300 and 5400 kWh/t), depending on the species and moisture content of the material used as solid fuel. Biomass may have a potential of 14% of the world's total energy.

The unfavourable physical properties of biomass use, dictated also by large storage spaces, further compromise the economic use of biomass as feedstock. In addition, storing a large amount of wet biomass will further increase costs through the high rate of dry matter loss due to microbial activity and the danger of self-ignition.

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VALORIZATION OF BEEF BONES RESULTING FROM BY-PRODUCTS IN FOOD PRODUCTION

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Abstract: Bones from animals are a waste generated in large quantities in slaughterhouses around the world. These are either transformed into primary processing products such as whole bone powder or simply disposed of, which can cause not only a waste of resources but also pressure on the sensitive and fragile environment of cold areas (Mengliang Ye, 2020). The proposed work follows the efficiency of using beef bones by-products resulting from slaughterhouses to obtain new products for food industry.

Bones from animals have been mostly analyzed in research as soil fertilizer, but their properties can also serve in the food industry by integrating them into the production process of some assortments. In this work, the benefits that the use of beef bones brings in the recipe of canned tripe soup were followed. For the analysis, two tests were carried out based on the canned tripe soup recipe. The first test noted T1 was made with beef bone soup and the second test noted T2 was made with water. The comparison of the two recipes was carried out to determine if the beef bones come with an additional supply of benefits to avoid waste and to support the idea of sustainability.

The organoleptic characteristics of the two samples were determined by sensory analysis based on a questionnaire. The results highlighted the superior appearance and taste characteristics of the sample with beef bones. As physico-chemical determinations, fat and protein content were determined by Soxhlet and Kjeldhal method. In the case of fat content, the results showed an increase for the sample in which beef bones were used (Fat T1: 4.7g) comparatively with the sample in which water was used (Fat T2: 3.6g). Also, the protein content was higher for the sample where beef bones were used (Protein T1: 7.3g) compared to (Protein T2: 5.3g).

Keywords: beef bones; tripe soup; sustainability; by-products; food industry

1. Introduction

Beef by-products (bones, blood and viscera) are the non-meat components that come from meat processing and are generated in large quantities daily (Oprea, 2013). Using bones as fertilizer is a valuable recycling strategy that supports sustainability at the same time (Mondini, 2008).

The most concentrated form of organic phosphorus is the bones (Schröder, 2000) (Su, 2003), therefore they are rich in collagen, although their properties have not been used effectively. Apart from a few transformations into whole bone powder, most were thrown outright (Li, 2009; Buculei, 2014; Gruia, 2021).

Most of the research focuses on the use of animal bones as a phosphorus fertilizer, which could therefore reduce reliance on chemical

fertilizer in a sustainable way (Ahmed, 2021) (Christel, 2014) (Glæsner, 2019).

The subject of the use of animal bones in the field of the food industry is not frequently touched upon in research works, therefore the present work aims to pursue the valorization of these bones in obtaining new food products that are superior in terms of quality and nutritional intake to the usual ones.

This provides a strategy to increase the value of beef bones and at the same time to reduce the environmental impact of the large quantities of bones that result daily from slaughterhouses.

2. Materials and methods

2.1. Materials

For the development of the two products, we started from the main raw material, namely the beef bones. Based on these, a soup was made by

boiling the beef bones with dehydrated celery, onions and spices.

Bone broth contains high amounts of nutrients like collagen which is the most abundant protein in the human body. It offers many potential health benefits, including joint, gut, and skin support. More researches are needed to determine benefits specific to bone broth itself, but research on nutrients in bone broth offers promising findings (Levi, 2023).

Beef bone broth packs slightly fatter than chicken broth. This makes it a perfect base for rich stews and soups (Sachdev, 2023). Due to these properties, in the present work, it constituted the liquid base of the product that was wanted to be developed, instead of water.

2.2. Methods

2.2.1. Establishing the recipes

In order to check how the beef bones influence the tripe soup product that we wanted to develop, two tests were carried out based on the following recipes.

• **Test 1** - tripe soup with beef bone soup

Firstly, the beef belly, beef bones and the rest of the ingredients (carrots, sour cream, dehydrated celery, vinegar, dehydrated onion, egg, salt) were weighed. After quantities were prepared the beef bones were boiled together with onions, celery and spices for 2 hours, and meanwhile the belly was cut into noodles and placed in metal cans. The obtained soup was then homogenized with the rest of the ingredients and added to the cans over the beef belly. The boxes were closed and subjected to the sterilization process at 110°C for 60 minutes.

• **Test 2** - tripe soup with water

For the second test, the same recipe was followed, but instead of beef bone soup was used water which was mixed directly with the rest of the ingredients and added to the cans over the cut beef belly. And in this case, the closed cans were subjected to the sterilization process at 110°C for 60 minutes.

2.2.2. Sensory analyses

The sensory analysis of the two samples was carried out on the basis of a questionnaire that was distributed to a group of 15 people, men and

women aged between 30-50 years, with knowledge in the food field.

Each test was analyzed and noted by each person in terms of appearance, color, taste and smell.

The tasters gave a score from 0 to 5 for each characteristic, and the results were centralized in the form of graphs.

2.2.3. Determination of fat content - Soxhlet method

Principle of the method

The free fatty substances are extracted from the analysis sample with the help of an organic solvent with the Soxhlet apparatus. The dehydrated and defatted sample is weighed and calculate the content of free fatty substances by the difference.

Equipment and materials

- Soxhlet extraction apparatus
- temperature-adjustable oven
- filter paper

Reactive

- n-Hexane
- petroleum ether or ethyl ether

Procedure

Insert the filter paper into a tall weighing vial and dry it in the temperature-adjustable oven until the mass is constant. About 5g of the sample is inserted into the filter paper, then covered with degreased cotton wool and dried at 105°C for about 2 hours. After cooling, the envelope is inserted into the extractor of the Soxhlet apparatus, and about 200cm³ of solvent is poured into the extraction flask, after which the apparatus is assembled and placed on a temperature-adjustable electric bath and waited for about 5-6 hours. After the extraction is finished, remove the bag and dry it in the oven at 105°C until the mass is constant.

Calculation

The fatty substances content is calculated with the following formula:

$$\% \text{ Fatty substances} = \frac{m_1 - m_2}{m} \times 100 - A$$

where:

m₁ - the mass of the sample before analysis, g

m₂ - the mass of the envelope with the dehydrated and degreased sample, g

m - the mass of the sample taken for determination, g

A - the water content of the sample, %

As a result, the arithmetic mean of two parallel determinations that do not differ between them by more than 0.5g of free fatty substances per 100g of samples is taken for analysis. Reference document: State Standard STAS 9065/2-73 (Standardization, 1973)

2.2.4. Determination of protein content – Kjeldhal method

Principle of the method

The analyzed sample is mineralized by heating with concentrated sulfuric acid in the presence of a catalyst. Following the degradation of proteins and other nitrogen compounds, ammonium ions are released which combine with sulfuric acid to form ammonium bisulfate. The ammonia set free by strong alkalization is distilled and titrated.

Equipment and materials

- mineralization plant
- titration distillation plant
- usual laboratory glassware (flasks, beakers, graduated pipettes, burettes)

Reactive

- sulfuric acid (d=1.84), free of nitrogen
- 0.1N hydrochloric acid
- boric acid 4%
- copper sulfate and potassium sulfate
- sodium hydroxide solution 33% free of nitrogen and carbonates and 0.1N solution
- Tashiro reagent alcoholic solution

Procedure

Mineralization: From the shredded and homogenized sample, 0.5-2g is weighed on the analytical balance and inserted into a Kjeldahl mineralization tube. Add 20ml of concentrated H₂SO₄, 1g of CuSO₄ and 5g K₂SO₄ or a catalyst tablet, the tube is attached to the mineralization plant.

Heat gradually to avoid foaming. At first, the liquid acquires a blackish-brown tint, then it clarifies gradually. Mineralization is considered finished when the liquid becomes clear, no longer has a yellowish tint, and there are no unattached particles left on the walls of the flask. From this

moment it continues heating for another 30 minutes. Normally, mineralization lasts about 2 hours; products with high fat content mineralize harder. Allow the digestion tubes to cool to 50-60°C and add to each 50 ml of ammonium-free distilled water.

Distillation of ammonia: The cooled mineral is passed into the distillation plant. Add 50-60 ml of 33% NaOH using the automatic device and 25 ml of H₃BO₃ in the collecting beaker. Start the distillation, which lasts a maximum of 7 minutes (until 100ml of distillate is collected).

Distillate titration: Titrate the distillate with 0.1N HCl in the presence of Tashiro reagent from green to bluish gray.

Calculation

The fatty substances content is calculated with the following formula:

$$\% \text{ Protein substances} = \frac{V \times 0.0014 \times 6.25}{g} \times 100$$

where:

V = the number of ml of 0.1N HCl in the collecting beaker

0.0014 = the amount of nitrogen in g, corresponding to 1 ml of 0.1N HCl

g = amount of product taken for mineralization, g

The difference between the results of two parallel determinations performed by the same operator in the same laboratory must not exceed 0.5g of total protein substances per 100g sample. Reference document: State Standard STAS 9065/4-81 (Standardization, Determination of total protein, 1981).

3. Results

3.1. Sensory analyses

Figure no. 1 shows the results obtained for the external appearance parameter of the two tests. As can be seen in the Figure 1, Test 1 represented by the sample obtained with bone soup recorded higher scores compared to Test 2.

The superior results in the case of the aspect for Test 1 are due to the increased fat content in the product given by the intake of bone, which makes the product look closer to that of ordinary soups.

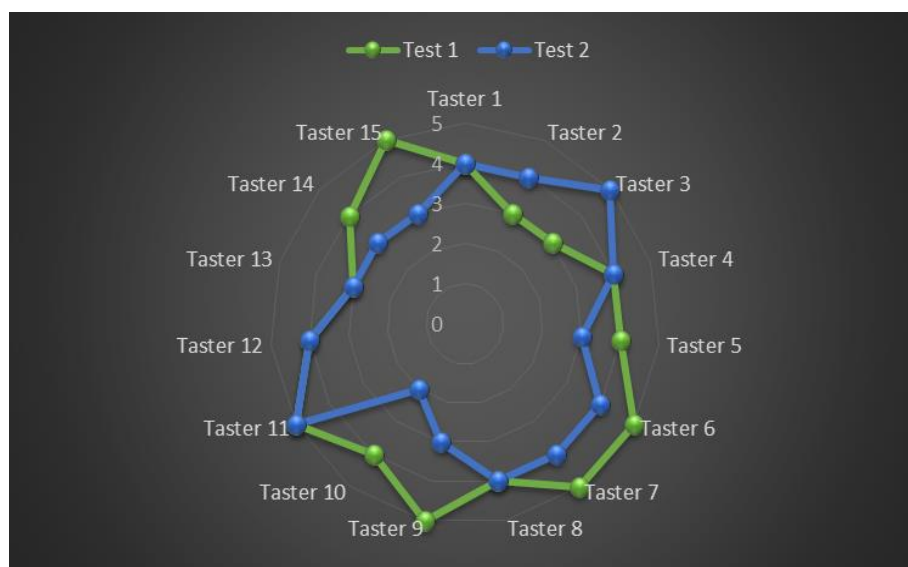


Fig. 1. Representation of exterior appearance for Test 1 and Test 2

Figure number 2 shows the results from the 15 tasters for the color parameter. As can be seen, the results obtained do not differ much between them, although small score can be observed for Test 1 obtained with beef bone soup. The slight increase in the score for Test 1 in the case of

color results from the slightly yellowish color given by the fat content of the bone soup, compared to the whiter color of Test 2 obtained with water. In both cases, we can say that good results were obtained for the two tests.

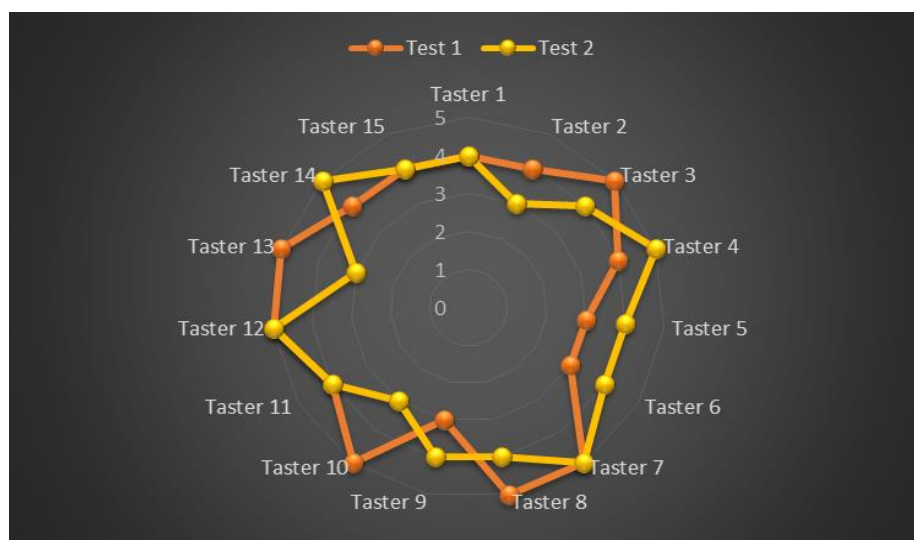


Fig. 2. Representation of color for Test 1 and Test 2

Figure no. 3 shows the results for the same assortments but from the point of view of taste on the. As can be seen in the graphic representation, the values obtained for Test 1 compared to the values for the Test 2 are quite different. The taste of the product obtained with beef bone soup was superior compared to the product obtained with

water. The contribution brought by the bone broth stood out very well in the taste analysis, giving the product a fuller bouquet of flavors. There were also tasters who scored the two samples equally or who considered that the water sample is more suitable in terms of taste after as can be seen on the graph.

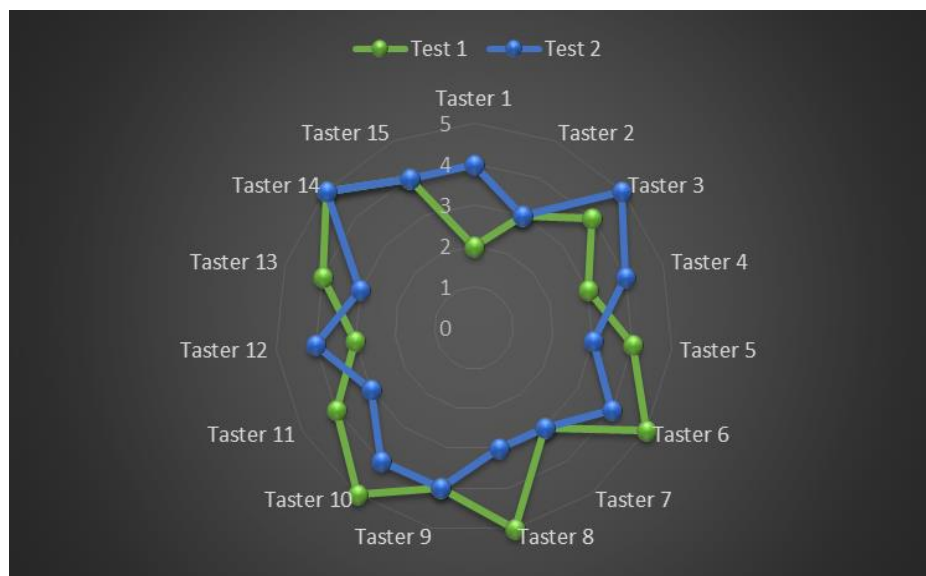


Fig. 3. Representation of color for Test 1 and Test 2

In the case of smell, the results obtained in Figure 4 do not differ much from each other, as can be seen. The addition of beef bone soup does not influence the product in a negative or positive

way, which may be due to the fact that the two products already contain beef belly, which balances the two tests in terms of smell.

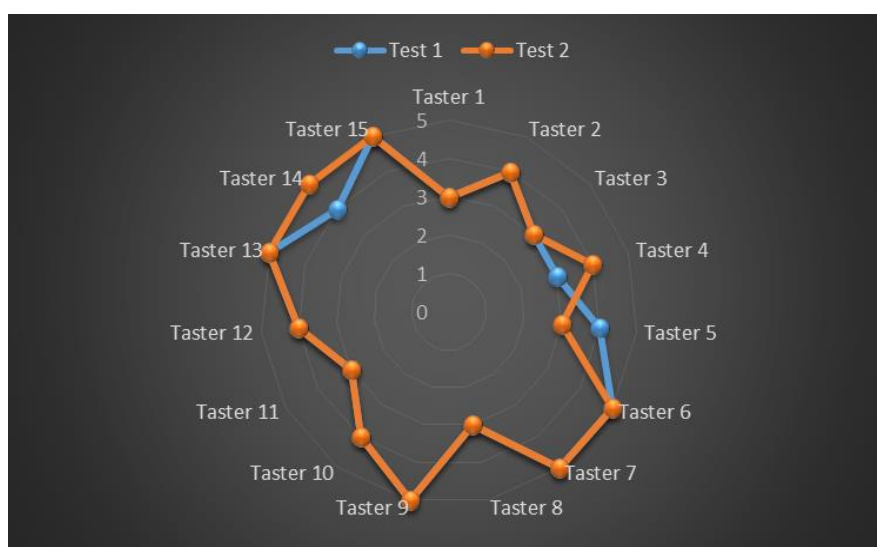


Fig. 4. Representation of color for Test 1 and Test 2

Sensory analyses conclusions for Test 1

Appearance of the contents: The assortment taken out of the can presented a uniform appearance. The product present red bell pepper and carrot pieces in a sour soup serving. In the bottom, the metal can present a brown stain due to the applied heat treatment.

Color: Specific of boiled beef tripe in yellow coloured soup.

Taste and smell: Pleasant, characteristic of the ingredients used, without foreign taste and smell (moldy, sour, rancid). The analyzed product can be seen in the Figure 5 below.



Fig. 5. Tripe soup with beef bone soup

The Sensory analyses conclusions for Test 2

Appearance of the contents: The assortment taken out of the can presented a uniform appearance. The product present red bell pepper and carrot pieces in a sour soup serving. In the bottom, the metal can present a brown stain due to the applied heat treatment.

Color: Specifics of boiled belly in a slightly yellowish white soup.

Taste and smell: Pleasant, characteristic of the ingredients used, without foreign taste and smell (moldy, sour, rancid).

The analyzed product can be seen in the Figure 6 below.



Fig. 6. Tripe soup with beef bone soup

3.2. Fat content

Determination of the fat content was carried out for each of the two tests 3 times, and an average was made from the results obtained. In order to determine the fat content as best as possible, the samples were subjected to a theoretical calculation based on the fat content that comes with each product in the recipe and which was

removed from the specification of each ingredient, the fat obtained by the Soxhlet method and the fat obtained by analyzing the products in an external analysis laboratory. All the results were centralized and can be seen in Figure 7 below.

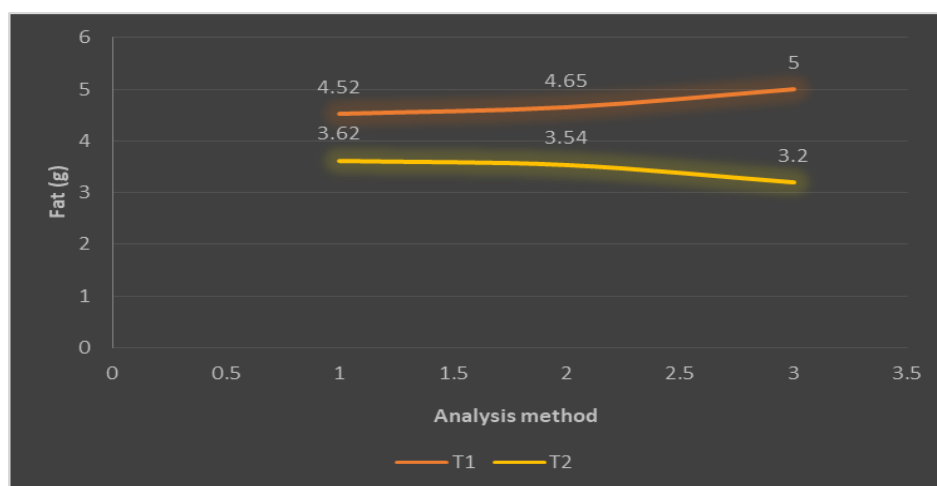


Fig. 7. Graphic representation of the fat content for the 2 samples

Fat content conclusions for Test 1 and Test 2

In the obtained graph, were entered the data resulting from the arithmetic mean of three determinations for each analysis method. As can be seen, the values obtained for the fat content by the three methods do not differ much between them. In all cases, the highest fat content was for Test 1, which is justified by the fat intake that the beef bones bring compared to the water used to obtain Test 2.

To establish the final fat content of the two products, an average can be calculated between the values obtained by each analysis method, and the obtained result can be taken into account as the fat of the assortment. Thus, for Test 1

obtained with beef bone soup, the final fat content of the product is 4.72g, and for Test 2 obtained with water, the fat content is 3.45g.

3.3. Protein content

To determine the protein content of the two tests, the same method was followed, namely, the protein content was determined by the calculation method based, by the Kjeldhal method and the products were analyzed for the protein at an external laboratory. As in the case of fat content, three determinations were made for each of the three methods, and the average of the results can be found in Figure 8 below.

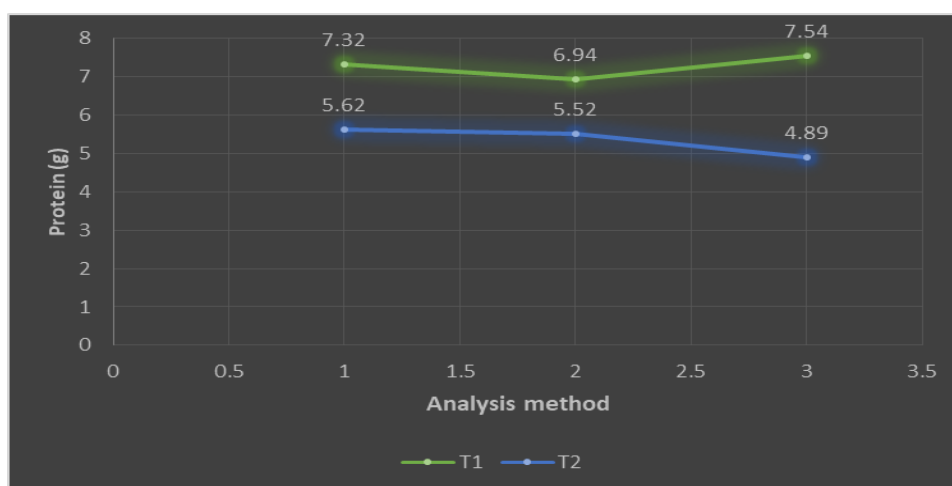


Fig. 8. Graphic representation of the protein content for the 2 samples

Protein content conclusions for Test 1 and Test 2

As can be seen in the obtained graph, the protein content differs quite a lot between the samples. If for Test 1 the protein content goes up

to the value of 7.54g, in the case of Test 2 it does not exceed the value of 5.62g. In this situation, it can be seen how much the addition of beef bone soup influences the product's protein content increase, which comes from the collagen found in them.

4. Conclusions

This study provided ways in which beef bones resulting as by-products can be used in the food industry and which through their use can bring additional nutritional benefits to the product. The beef bones used for obtaining the new product had a positive influence. They came with an intake of protein substances that was observed from the analyzes performed, thus resulting in a valuable source with a good exploitation potential (Mondini, 2008).

Less visible benefits were also observed in determining the fat content. Compared to a control sample made according to the usual work method specific to soup-type products, the sample in which the water was replaced with the soup obtained from beef bones also came with an intake of fatty substances.

Even if the beef bone soup replaced water in the proposed research, the sensory analysis carried out on the group of people chosen based on knowledge in the food industry did not record negative aspects regarding the characteristics such as taste and smell which are essential in the acceptance of the product by consumers.

Thus, the fact that the new product obtained with soup made from beef bones was not rejected, but even registered higher scores than the usual one, leads to the conclusion that beef bones can be exploited by researching and using their potential in the food industry.

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GENERAL PRINCIPLES REGARDING GASTRONOMY THEORY AND PRACTICE IN THE GASTRO INDUSTRY SECTOR

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Abstract: The study highlights the gastronomic field in relation to the other sectors of activity within the integrated food act. Conceptualize, define and highlight the principles of the Gastro Industry activity sector, as a distinct sub-branch scientifically, technologically and managerially supported by the complex approach of Gastronomic Engineering. It is also described the purpose of these restructurings of the field of gastronomic activity, namely, the valorization of culinary production through quality gastronomic preparations, in accordance with an Integrated Food Policy on the short axis and supporting quality: agri-rural-urban. All of these have as their scientific basis nutritional gastronomy, which is analyzed as functionality and with concrete examples in relation to culinary recipes and menus of assured quality. It results in a series of principles and conclusions, which provide the appropriate framework for action in the gastro-industrial sector, complementary in the food act and practically having the highest added value, including "values" of agriculture and the food industry integrated in obtaining the quality raw materials necessary for the realization culinary preparations.

Keywords: gastronomy, gastro industry, gastronomic engineering, menu, nutrition.

1. Introduction

In the concerns of great responsibility in the provision and quality of food, in the sense of the UN, GASTRONOMY is the distinct branch that represents "a cultural expression related to the natural and cultural diversity of the world", an importance emphasized by the fact that every year, on June 18, it is marked "Sustainable Gastronomy Day" [3,12,31].

In short, in the current conditions, the UN emphasizes that we need to be more careful about how we use natural resources along the entire axis "from Farm to Fork", along the lines of sustainability and resilience, that is, to optimize and make the food circuit more efficient along the axis agri-rural-urban [1,5,11,14].

In this context, studies on this topic become useful, especially in a systemic approach. Thus, the "AGRI-RURAL-URBAN" axis is the one that de facto celebrates the richness and diversity of the food heritage, as well as highlighting as meaning the direction of the food act and related services, from agri-rural to urban, from primary production to production culinary. The aim of the study is to contribute to: the economic and social

development of rural communities; to solving the way of feeding large urban agglomerations in daily dynamics and, complementary, as a tourist destination [4,16,17,27].

The main objective of the study is to contribute, through an interdisciplinary scientific and managerial approach, to an INTEGRATED understanding of the current challenges regarding GASTRO INDUSTRY and the valorization of culinary production through quality gastronomic preparations, in accordance with an Integrated Food Policy on the axis of agri- rural-urban. Another objective is to optimize the food act and the restaurant system along the lines of encouraging effective collaboration between producers, processors and traders / restaurateurs, in order to offer consumers (including tourists) authentic, tasty and healthy culinary experiences, in the EFFICIENT INTERACTION between the Romanian countryside and urban, on the principles of GASTRONOMY ENGINEERING.

2. Working Method

A number of conceptual methods regarding the principles and definitions of notions are

considered, as can be seen in the summary and the box below [10,13,18]:

DEFINITIONS	
❑ GASTRONOMY is the study of the relationship between food and culture, the art of preparing and serving rich or delicate and appetizing dishes, the cooking styles of certain regions and the science of good nutrition . ➤ GASTRONOM = <i>person with good experience in gastronomy.</i> ➤ GASTRONOMIST = <i>is the one who unites theory and practice in the study of gastronomy.</i> <i>(source: „Gastronomy / Description, History & Cuisine Britannica”, 2023)</i>	
GASTRO INDUSTRY	GASTRONOMIC ENGINEERING
It is the distinct production and service sector based on the scientific, technological and managerial principles of gastronomic engineering related to the manufacture of quality food and select drinks (simple or mixed, chosen for flavors and taste in famous brands), as well as their marketing or serving in specialized public catering units (restaurants, canteens, guesthouses, coffee bars, etc.)	It is the approach that combines food science with culinary art and gastrotechnics, based on the philosophy of sensorybioharmony and health through rational, technologically balancedphysico-chemical and organoleptic nutrition, preparing dishes through efficient, efficient and diversified management on distinct groups or as food custom

3. Results and discussions

To describe the current evolution and the systemic restructuring of the way of producing food in an integrated food act, we will first highlight the coherence of the structural elements of the gastronomic field, at the systemic, industrial and manufacturing level [2,6,7,15,19,21 ,22,26].

3.1 The place and role of the gastro industrial sector in the dynamics of the act integrated food

As a first first finding, from which we start the analysis, is that GASTRONOMIC ENGINEERING practically represents the

scientific approach of the field of obtaining food through the integrated food act, which has the highest added value in the branch of agri-food production, namely, the gastro sector industrial (implicitly also of the restaurant industry) [8,9,20,25,28,29,30].

Current information has opened a corridor for gastronomy over time, but "gastronomic engineering" through this monographic approach, widens it, arranges it, makes it coherent and adapted to "traffic" for a high-performance evolution in the perspective of the coming decades, so that Romania is fit for competition increasingly fierce international, independent corridor, as can be seen from figures 1 and 2.

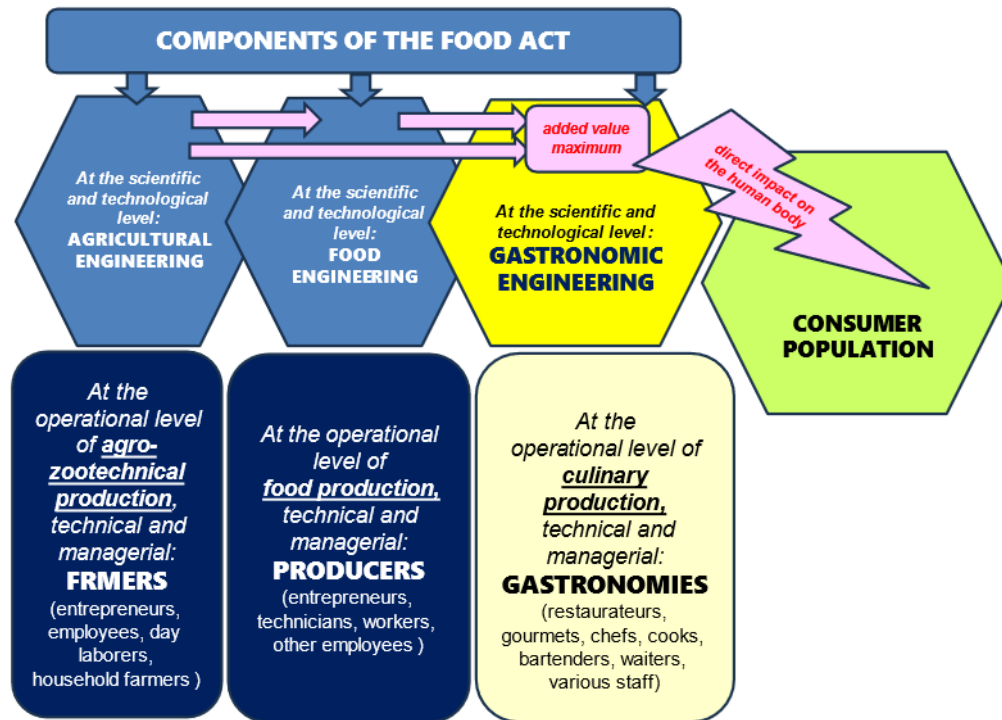


Fig. 1. Components of the structure and functionality of the food act

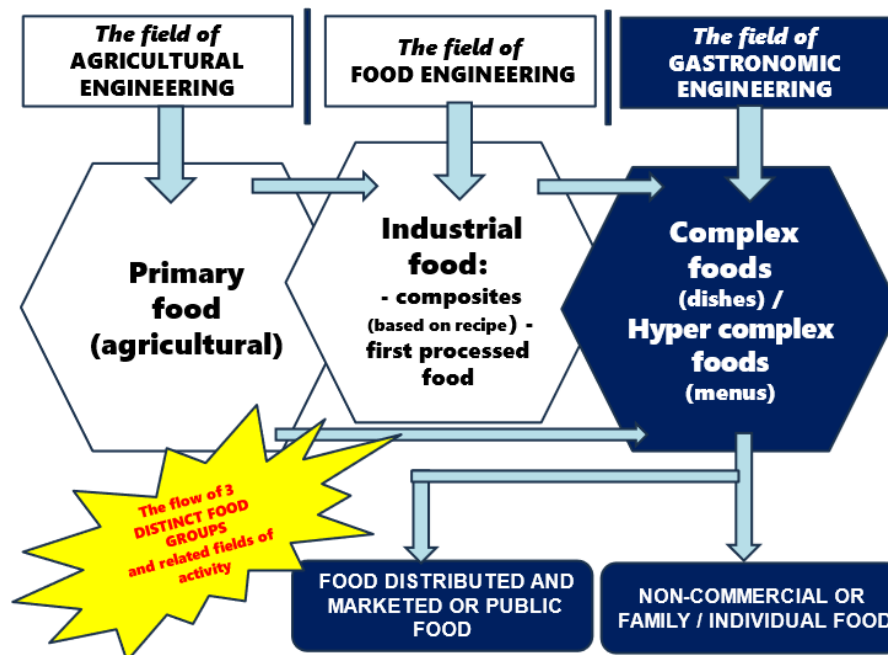


Fig. 2. Food groups produced for food security, on production areas

If we analyze holistically, at the level of the food system, in figure 3 we present an eloquent scheme of the place occupied by gastronomy, as a **distinct production sector** expressed through an engineering approach (technical, biological, managerial, economic, ecological, legal, etc.). Detailing (in fig. 4) the structure of the

highlighted gastro industry sector, a useful schematization becomes possible to include elements (of course, known) but in a coherent interconnection necessary for the concerns of optimization and efficiency of systemic circuits [18].

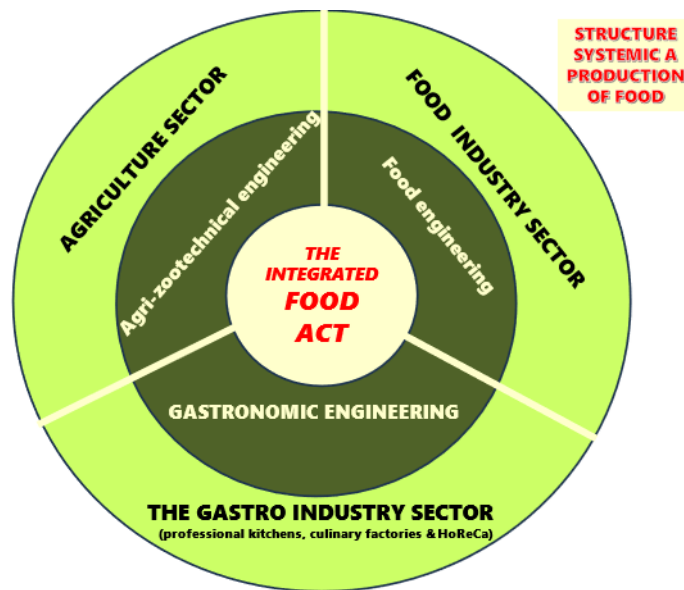


Fig. 3. The third distinct sectors of the food act specific to production of food, in a general context, as elements of the national economy

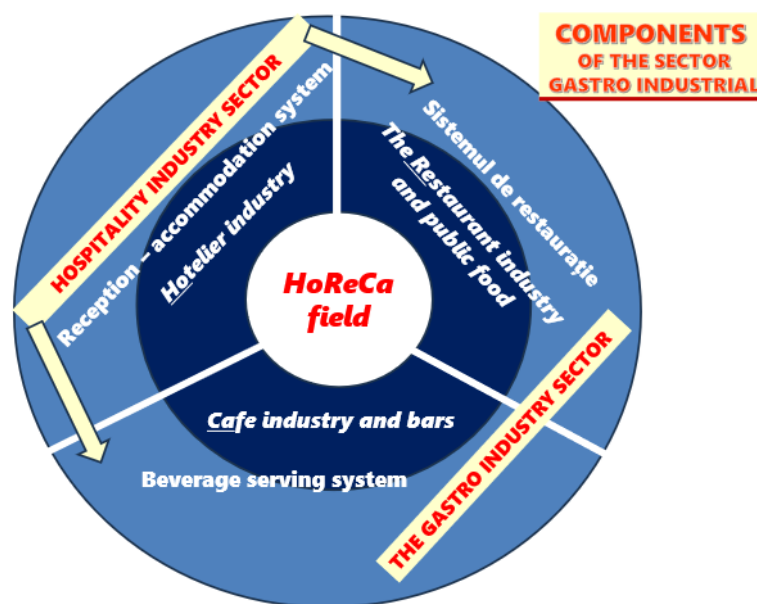


Fig. 4. Scheme of structures and their interconnection, as elements that make up the HoReCa field

3.2. Principles and structural elements of gastronomic engineering, as an approach to support the activity of the gastro industrial sector

Hedonism, or food pleasure, is inseparable from a **balanced menu**. The way the population eats plays an important role, especially related to the regulation mechanisms of hunger, saturation and satiety (fullness), the essential role being played by culinary preparations and the gastro-industrial sector in general [6,12].

In current practice based on the principles of gastronomic engineering, a balanced diet is achieved by ensuring the presence of at least one food from each group in the daily menu. In this way, the satisfaction of the body's essential requirements, covered by the daily menu dishes, is achieved, qualitatively. The general structure of the menu represents the scheme of information that we want to convey to consumers (menu schemes), and the complex foods that we will serve are the "phrases" with

which we will express ourselves and "dialogue" with our customers or guests. We remind you that the nutritional structure of the menu represents the intake of food, or the amount of nutrients (proteins, lipids, carbohydrates, vitamins and minerals) provided by the components of the menu (expressed in grams), which must be found in balanced proportions [19,20,23,24].

The reference level of menus and foods in the expression of NUTRITIONAL GASTRONOMY

It is necessary to be aware of a **gastronomic paradox** of our days. On the one hand, we live in an informational effervescence, cooking food from increasingly sophisticated recipes from cookbooks or media shows, we have the opportunity to buy all kinds of food based on culinary recipes that circulate at an incredible speed, the offer of restaurants and retail is increasingly diverse, etc., and on the other hand, the rate of metabolic decompensations and illnesses is constantly increasing!

Within the framework of theoretical gastronomy, we are specifically talking about NUTRITIONAL GASTRONOMY, as a basic element of **gastronomic engineering**, through which the aspects of food association indicated

by spicy recipes, with a mixture of valma, are studied, practically taking into account only the taste of the food... Obviously, the taste it is essential, but technically and biologically important, how we arrive at the splendor of taste in the context of the complexity of all the influencing factors of the way of eating, both at the collective and at the family level. In practice, we will have to purchase for public food establishments, (but also for family food) healthy foods (ie ingredients of culinary recipes) in order to cook healthy culinary preparations [18].

Basically, we remind you that the human body needs more than 50 essential nutrients to grow, develop and stay in good health. Therefore, we all eat, but do we also feed ourselves? That is why, through nutritional gastronomy, we will have to cook tasty dishes, but also beneficial to health, i.e. avoid devitalized foods and menus (junk-food) and with extremely high energy densities (caloric bombs) [18,23,24].

As examples for practical gastronomy, which may in the future induce a real "*revolution in the kitchen*" [23], we will indicate in summary a series of dishes as a benchmark for the argumentation of those mentioned (table 1).

Table 1. Examples of recommended pieces of nutritional gastronomy

No. crt.	MENU ITEM	SAMPLE DISHES
1	Appetizers	Curd with dill, Tomatoes stuffed with cheese, Peppers stuffed with cheese, green bean salad with garlic, green bean salad, Leek salad with mushrooms, Oriental summer salad, Eggplant salad, Leurde salad, green bean salad with garlic, Roe salad, Tuna salad, Pané cheese, Chicken schnitzel.
2	Salads	Tomato salad, Cucumber salad with dill, Endive salad, Spinach salad, Dandelion salad, Arugula salad with cherry tomatoes, Cabbage salad, Mixed salad with bell peppers, cucumbers, tomatoes, onions, Cabbage salad with green onions and radishes.
3	Sauces, dressings	Vinaigrette sauce, Garlic sauce (<i>mujdei</i>), Mustard sauce, Yogurt sauce with greens and garlic, Horseradish with beetroot.
4	Egg preparations	Scorp eggs, Omelet with <i>telemea</i> cheese, Soft boiled eggs, Romanian eggs, Eggs with cheese on top.
5	Soups	Vegetable soup, Cream of vegetable soup, Onion soup, Potato soup, Cream of green pea soup, Chicken soup with dumplings, Chicken soup with homemade noodles, Chicken soup with rags, Beef soup - consomé.
6	Borsch and bortsch	Borscht, Green bean borscht, Nettle borscht, Fish borscht, Chicken borscht, Lamb borscht, Bean soup, Lobode soup, Leek soup, Vegetable soup, Horseradish soup, Greek chicken soup, Beef soup, Pork belly soup, Belly soup, Smoked bean soup, Pork bone soup.

7	Cooked meals	Pea dish, Leek dish, green bean dish, Potato dish, Bean lamb, Baked cabbage, Spinach dish, Stevia dish, Nettle dish, Vegetable pot, Stuffed mushrooms in the oven, Ostropel, Stew of chicken with vegetables, Duck on cabbage, Cabbage with cabbage, Lamb stew, Tongue with olives.
8	Pasta	Noodles, Spaghetti with tomato sauce, Macaroni and cheese, <i>Coltunasi</i> with cottage cheese, Macaroni with nuts.
9	Fish preparations	Marinated herring, Breadcrumbs in parchment, Fish paste, Carp platelet, Fried fish, Pané fish fillet.
10	Steaks, stews, minced meat	Peppers (zucchini) stuffed with meat, <i>Sarmale</i> in cabbage leaves with pork, Marinated chicken, <i>Mititei</i> , Pickled chicken, Pickled beef, Pickled tongue, Baked turkey, Baked chicken thighs, Fried chicken, Leg of lamb in the oven, Beef tenderloin in a pan, Grilled pork cutlet or neck.
11	Gaskets	Sautéed vegetables, Grilled vegetables, steamed vegetables, Rice, Mashed potatoes, Peasant kaizer potatoes.
12	Pickles	Pickled cabbage (Sauerkraut), Pickled red cabbage, Donuts in vinegar, Cucumbers in brine, Cucumbers in vinegar, Assorted pickles.
13	Prepared from wheat, sorghum, rice and other cereals	Rice with vegetables, Rice with mushrooms, Cous-cous with vegetables, Mallow, Mallow with cheese and cream, Transylvanian <i>bulz</i> , Homemade bread with grains and seeds
14	Sweets	Vanilla ice cream, Vanilla charlotte / cocoa, Strawberry mousse, burnt sugar cream, Jam and walnut cones, Apple pie, Cheese pie, Plum / apricot / cherry cake, Cake, Muffins, Semolina with milk, Doughnuts, <i>Papanasi</i> , Plum / apple / peach / pear / apricot compote, Cherry jam / white or bitter cherries, Pear jam with ginger, Plum / apple jam, Homemade chocolate.

We find various nuances within the recipes and menus that take into account the biological-technical and managerial complexity of the gastro industry sector and the principles and rules supported by the gastronomic engineering approach.

4. Conclusions

Optimizing and streamlining the food circuit along the lines of sustainability and resilience requires taking into account as a distinct branch of activity (in addition to agriculture and the food industry), the gastro-industrial sector and its technical-organizational expression through the coherent approach of gastronomic engineering, which actually represent the final step, with the highest added value, of the integrated food act on the "Farm to Fork" axis.

Gastro industry is the production and service sector with a specific conceptual, scientific and applied basis on the principles, methods and rules of gastronomic engineering related to the manufacture of quality food and select drinks (simple or mixed), to marketing or direct serving in establishments specializing in public food (restaurants, canteens, guesthouses, gastronomic points, cafe-bars, etc.).

Gastronomic engineering is the complex approach that combines food science with culinary art and gastro-technics, in the direction of sensory bio-harmony and health through nutrition and rational gastronomy (balanced physico-chemical, organoleptic, technological and economic management), diversified through culinary recipes and menu items, for distinct consumer groups or as personalized food.

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THE SHORT FOOD CHAIN AND ITS IMPORTANCE FOR SUSTAINABLE DEVELOPMENT IN MOUNTAIN AREAS

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Abstract: The paper explores the concept of the short food chain and its role in the sustainable development of mountain areas. The short food chain involves reducing the number of intermediaries between producers and consumers, thereby promoting the direct sale of local products. This approach brings multiple benefits to the local economy and the environment. Mountain areas, characterized by economic and social vulnerabilities, can benefit from short food chains by supporting small producers and conserving biodiversity. A key aspect of the paper is the analysis of how short food chains support the local economy. Farmers can obtain more advantageous prices by eliminating intermediaries, which improves their living conditions. Short food chains also stimulate rural tourism and attract consumers interested in authentic and sustainable products.

The paper provides examples from mountain regions in Europe and Romania to illustrate the positive impact of these food chains. For example, in the Italian Alps and the French Pyrenees, local farmers have succeeded in capitalizing on their traditional products through local markets and cooperatives, thus contributing to the development of the rural economy and environmental protection. In Romania, regions such as Țara Moșilor and the Apuseni Mountains demonstrate how short food chains can support the local economy and agricultural traditions, providing farmers with a viable alternative to long commercial chains. With the support of public policies and community cooperation, short food chains have become a successful model for the sustainable development of mountain areas. This approach helps reduce carbon emissions, conserve natural resources, and maintain cultural traditions, offering a sustainable solution to the economic and environmental challenges facing these regions.

Keywords: short food chain, mountain area, economy, policies;

1. Introduction

In the context of climate change and global sustainability challenges, the concept of the short food chain (SFC) has gained increasing importance, especially in mountain regions. This type of food chain involves reducing the distance between producers and consumers by eliminating or limiting intermediaries, thereby reducing environmental impact. At the same time, the short food chain contributes to the development of the local economy and the preservation of regional culture and traditions.

Mountain areas are characterized by rich biodiversity but also fragile economic and social conditions. Farmers in these regions face specific challenges such as difficult access to markets and harsh climatic conditions. In this context, the short food chain represents a viable solution for

supporting the sustainable development of these communities. This study aims to explore the importance of the short food chain for mountain areas and how it can support sustainable and equitable development.

2. The Concept of the Short Food Chain

The short food chain is defined by reducing the number of intermediaries between the producer and the consumer. This type of food chain allows producers to sell directly to consumers or through local markets, thereby eliminating large-scale distribution, which involves multiple stages and long transportation distances. Most often, short food chains are associated with local markets, producer cooperatives, and direct distribution networks (e.g., on-farm sales or farmers' markets).

A major advantage of the short food chain is the increased traceability of products, allowing consumers to know exactly where the food they purchase comes from. Moreover, consumers can access fresher, seasonal, and often more environmentally friendly products. Producers benefit from a direct relationship with consumers, eliminating intermediaries and retaining a larger share of the revenue generated.

In mountain areas, short food chains have significant potential to support the local economy and protect the environment. These regions are often isolated and have limited transportation infrastructure, which makes integration into traditional long food chains difficult. Therefore, the SFC can represent a practical solution for farmers in mountain areas, offering them access to local markets and reducing their dependence on complex logistical infrastructure.

The short food chain is an economic model that has been successfully adopted in many mountain regions in Europe, providing concrete solutions for supporting small producers and preserving local identity. This approach has enabled farmers in isolated regions to access local and regional markets, capitalize on their products, and contribute to the sustainable development of their communities.

In Europe, mountain areas such as the Alps, the Pyrenees, and the Carpathians are recognized for their biodiversity and for agricultural traditions that have been preserved over generations. In many of these regions, the short food chain has become an important pillar of the local economy, facilitating direct links between producers and consumers and reducing dependence on large distributors.

A successful example is the "Alpine Pearls" program in the Alpine region, which promotes sustainable tourism and local products from the area. Under this program, small farmers from Alpine villages sell their fresh and traditional products directly to tourists and local restaurants, eliminating intermediaries and obtaining more advantageous prices. Products such as Alpine cheeses, ecologically raised beef, and mountain honey are offered through local markets and cooperatives, ensuring greater traceability and higher quality.

In the Pyrenees, the short food chain has been implemented in many mountain communities facing economic difficulties. Cooperation programs between farmers and local authorities have enabled the creation of local markets and gastronomic events where mountain products,

such as lamb or mountain vegetables, are sold directly to consumers. This model not only supports local farmers but also attracts tourists interested in authentic products, thus contributing to the tourism economy.

In Romania, mountain areas such as those in the Southern Carpathians and Apuseni Mountains have begun adopting similar short food chain models, particularly due to the support provided by rural development projects funded by the European Union. These projects have encouraged small producers to market their products directly to consumers, rather than relying on conventional markets or large distributors.

An example from Romania is the Țara Moșilor region, located in the Apuseni Mountains, where the short food chain has become a viable strategy for local economic development. Producers in this area are known for traditional products, such as cow and goat cheeses, forest fruits, and beekeeping products. They have started selling their products directly in local markets or through cooperatives, as well as in traditional product markets organized in major cities.

Similarly, the Bucegi Mountains region offers a success story where small farmers and producers have developed short food chains for products such as mountain milk, cheeses, honey, and organic meat. In many cases, these products are sold to tourists visiting the mountain areas, thereby also supporting the development of rural tourism. Farmers' markets and local gastronomic events play an essential role in promoting these products.

Thus, both in Europe and Romania, the short food chain has proven to be an effective strategy for the sustainable development of mountain areas, offering economic and ecological solutions for local farmers, while also providing consumers with the opportunity to purchase fresh, authentic, and sustainable products.

3. Challenges and Opportunities for Mountain Areas

Mountain regions are characterized by rugged terrain, harsh climatic conditions, and difficult access to national and international markets. These aspects contribute to the economic vulnerability of local communities, which rely heavily on agriculture and related activities.

Mountain farmers face higher production and transportation costs and often have limited access to modern technologies or government support.

Under these conditions, the short food chain offers a range of opportunities to revitalize the local economy and protect the environment.

One of the main advantages of short food chains is their potential to support economic diversification in mountain areas. Farmers practicing subsistence agriculture can turn surplus into additional income by selling their products directly in local markets or through short distribution networks. This not only supports the rural economy but also helps maintain a traditional lifestyle based on ecological and sustainable farming practices.

Short food chains can also support biodiversity conservation in mountain regions. Traditional agriculture in these regions is often less intensive and more environmentally friendly than industrial farming practices. By promoting local production and sustainable practices, short food chains contribute to the protection of natural habitats and the reduction of carbon emissions associated with long-distance transportation.

The challenges and opportunities of the short food chain in mountain areas are influenced by factors such as geographic isolation, poor infrastructure, climatic conditions, and agricultural traditions. Despite these difficulties, many mountain regions in Europe and Romania have successfully implemented short food chains, benefiting from the support of local and European policies. Analyzing these examples can provide valuable solutions for overcoming challenges and maximizing opportunities.

One of the main obstacles faced by farmers in mountain areas is limited market access. Large distances from urban centers and poorly developed transportation infrastructure make it difficult to distribute products to consumers. For example, in the French Alps, many mountain communities struggle with the transportation of dairy and other perishable products to larger markets, reducing their profitability potential.

Another problematic aspect is the high cost of production. Harsh climatic conditions and difficult-to-cultivate land increase costs for farmers in mountain areas compared to those in plains regions. In the Spanish Pyrenees, for example, livestock farmers face high costs for maintaining mountain pastures and raising animals in tough conditions. These high expenses make it difficult to compete in the market with products from areas with intensive agriculture and lower costs.

Limited access to modern technologies is another challenge. In many mountain regions,

farmers do not have access to modern agricultural equipment, and processing and preservation technologies are often outdated. This affects the quality and shelf life of products, reducing farmers' ability to diversify their offerings.

4. Opportunities of the Short Food Chain in Mountain Areas

Despite these challenges, the short food chain offers numerous opportunities for mountain communities in Europe and Romania. A positive example from Europe is the Swiss Alps region, where local farmers have developed farmers' markets and cooperatives to sell their products directly to consumers. These markets offer cheeses, meat, and honey produced under traditional conditions, attracting tourists seeking authentic and organic products. Thus, the short food chain has supported both the local economy and rural tourism, contributing to the increased visibility of mountain products in national and international markets.

In Romania, a successful example is the Maramureş region, where local farmers have developed a network of farmers' markets and cooperatives to market their traditional products. They sell products such as sheep cheese, smoked meats, organic vegetables, and honey, all from small mountain farms. This type of short food chain has helped preserve agricultural traditions and support the local economy, providing farmers with a stable market and a reliable source of income.

Additionally, the opportunities offered by digitalization and online commerce represent a viable solution for farmers in mountain areas. In the French Pyrenees, for example, many local producers have adapted their business models to new technologies, selling their products through online commerce platforms. This approach has allowed them to expand their customer base and overcome geographical barriers that limited their market access.

Another example from Romania is the Bucovina region, where local farmers have started promoting and selling traditional products through social media platforms and websites dedicated to artisanal food products. This strategy has increased the visibility of regional products and provided consumers across the country with access to authentic mountain products.

Thus, the short food chain offers numerous opportunities for mountain communities in Europe and Romania, supporting the local

economy and contributing to the sustainable development of these regions. However, to fully capitalize on these opportunities, it is necessary to implement public policies and innovative solutions that help farmers overcome the challenges they face.

5. The Economic Impact of Short Food Chains in Mountain Areas

The short food chain can have a significant economic impact on mountain communities. First, it offers farmers a fairer price for their products by eliminating the need for intermediaries, who typically reduce the profit margins of small producers. As a result, farmers can retain a larger share of the revenue they generate, contributing to improved living conditions and local economic growth.

Second, the short food chain encourages the development of local markets and rural tourism. Farmers' markets, cooperatives, and farm shops become attractions for tourists seeking authentic products and local experiences. This phenomenon can contribute to the development of a circular economy in mountain areas, where agricultural revenues are reinvested into the community.

Another important economic aspect is job creation. Besides benefiting farmers, the short food chain can generate employment opportunities for local processors, distributors, and retailers. Furthermore, the creation of local food networks can stimulate agricultural innovation, for instance by adopting ecological technologies or promoting value-added food products such as organic or traditional goods.

Short food chains have a significant economic impact in mountain regions, supporting small producers and contributing to the development of local communities. Across Europe and Romania, numerous short food chain initiatives have led to increased farmer incomes and the strengthening of rural economies.

A prominent example from Europe is the Tyrol region in Austria. Here, the short food chain has been implemented through cooperatives and local markets, allowing small mountain farmers to sell traditional products such as cheeses and meats directly to consumers.

These farmers' incomes have increased due to the elimination of intermediaries, and access to local markets has encouraged the economic development of the community. Additionally, revenues generated from rural tourism, which focuses on authentic food products, have created a multiplier effect throughout the region.

In the Piedmont region of Italy, short food chains have boosted the competitiveness of small producers of wines and cheeses. Local producers have formed cooperatives and created gastronomic events and themed markets, attracting both locals and tourists. This approach has led to the development of a circular economy in which agricultural revenues are reinvested in the community, stimulating job creation and reducing migration from mountain areas.

In Romania, the Sibiu region offers a positive example of a short food chain. Here, mountain farmers have created cooperatives and associations that facilitate the sale of traditional products such as "telemea" cheese, lamb meat, and organic vegetables, both in local markets and through gastronomic tourism. The short food chain has supported the economic development of the community and helped create a regional brand, attracting both tourists and investors.

These examples (Table 1) demonstrate that short food chains have a major economic impact, helping farmers in mountain areas to retain their income, create jobs, and develop sustainable local markets. At the same time, they contribute to the revitalization of the rural economy and the preservation of agricultural traditions specific to these regions.

Table 1. *Economic Benefits of Short Food Chains in Different Regions*

Region	Additional Income (%)	Job Growth (%)
Swiss Alps	15%	10%
Pirinei Mountains	12%	8%
Țara Moșilor (România)	18%	14%
Bucegi Mountains (România)	20%	12%

6. The Short Food Chain and Environmental Sustainability in Mountain Areas

Another major benefit of the short food chain is its positive impact on the environment. Typically, long food chains involve transporting food over long distances, which leads to increased greenhouse gas emissions and high energy consumption. In contrast, short food chains reduce these emissions because products are transported over shorter distances, from the farm to the local market or directly to the consumer.

Moreover, short food chains encourage sustainable farming practices. In mountain regions, where ecosystems are often fragile and vulnerable to climate change, organic or integrated agriculture represents a viable solution for protecting natural resources. Farmers in these regions have a direct interest in maintaining soil and water quality, as these resources are essential for long-term agricultural production.

Therefore, short food chains can help reduce environmental pressure in mountain areas, while also providing a viable economic alternative for local communities. This approach promotes a balance between economic development and environmental protection, thus contributing to global sustainable development goals.

The short food chain not only supports the local economy and traditional agriculture but also plays a crucial role in environmental protection, especially in mountain areas. By reducing the distance between producer and consumer, this economic model helps lower carbon emissions associated with food transportation, protects biodiversity, and encourages sustainable farming practices. In mountain regions across Europe and Romania, there are numerous success stories illustrating how the short food chain can support environmental sustainability.

A remarkable example from Europe is the Italian Alps, where many mountain communities have adopted short food chains to reduce their negative environmental impact. Local farmers produce food under ecological conditions, respecting the biodiversity of the area, and the products are sold directly in local markets or through specialized cooperatives.

This encourages traditional farming practices that use natural fertilization methods and crop rotation, thus limiting the use of pesticides and chemical fertilizers that could harm the fragile mountain ecosystems. Organic products, such as

raw milk cheeses and beef raised in Alpine pastures, are sold to tourists and local consumers, reducing the need for imports and long-distance transportation.

In the French Pyrenees, mountain farmers have developed a short food chain model that supports the conservation of natural resources. Agricultural practices in this region are based on maintaining mountain pastures and preserving traditional methods of processing dairy and meat products. By eliminating intermediaries and selling products directly to consumers, producers can promote environmentally friendly farming methods, such as extensive agriculture, which has a low environmental impact. Moreover, farmers are motivated to continue conserving mountain habitats because their income depends on the quality and authenticity of the products they sell, especially in local markets.

In Romania, the Apuseni Mountains region offers a successful example of how short food chains and environmental sustainability can go hand in hand. Farmers in this area have adopted organic farming practices to protect the region's unique biodiversity. Agriculture in Apuseni is traditional and non-intensive, and local products such as sheep cheese, vegetables, and honey are sold directly in local markets or through cooperatives. This approach helps reduce the use of chemical fertilizers and pesticides, thus protecting the soils and forests in the region. Additionally, by promoting these local products, farmers in Apuseni help preserve diverse natural ecosystems, which include natural pastures, forests, and unspoiled water areas.

Another significant example comes from the Bucovina region, where the short food chain is integrated with tourism activities that emphasize environmental conservation. Local farmers, who produce milk, cheeses, and meat under ecological conditions, have developed partnerships with guesthouses and local restaurants, thereby reducing emissions generated by long-distance transportation.

This model of collaboration between farmers and tourism operators contributes to maintaining sustainable agriculture (Table 2), based on local resources.

Additionally, forests and pastures are protected through traditional agricultural methods, helping to preserve the natural landscape of Bucovina.

Table 2. *Reduction of CO₂ Emissions Due to Local Food Production*

Region	Emission Reduction CO₂ (%)	Local Organic Production (%)
Swiss Alps	25%	30%
Pirinei Mountains	20%	25%
Țara Moșilor (România)	28%	32%
Bucegi Mountains (România)	22%	35%

7. The Role of Public Policies and Community Cooperation

To support the development of short food chains in mountain areas, a favorable legislative and policy framework is necessary. Public policies can play an essential role in facilitating local farmers' access to markets and promoting sustainable agriculture. For example, governments can support local infrastructure, such as roads and storage facilities, which are essential for the transportation and preservation of perishable products.

Additionally, subsidies and grants can help mountain farmers adopt modern technologies and environmentally friendly agricultural practices. In Europe, the Common Agricultural Policy (CAP) already provides support for rural development, including through programs that encourage short and sustainable food chains. However, national policies must be tailored to the specific needs of each mountain region to address local demands.

Another key element is cooperation between farmers and local communities. The establishment of cooperatives and producer networks can improve market access and facilitate the exchange of knowledge and resources. Farmer cooperation can reduce production costs and improve logistical efficiency, thereby increasing the competitiveness of local products.

Public policies and community cooperation play a fundamental role in the implementation and success of short food chains, especially in mountain areas, where accessibility challenges and economic vulnerability are evident. Without an adequate legislative and policy framework, small producers and farmers in these regions would face insurmountable difficulties in marketing their products, developing their businesses, and contributing to the local economy. In many mountain regions of Europe and Romania, success stories reflect the importance of collaboration between public authorities, local communities, and non-

governmental organizations in supporting short food chains.

In Europe, the Common Agricultural Policy (CAP) of the European Union has had a significant impact on the development of short food chains in mountain areas. CAP supports farmers in disadvantaged regions, including mountain areas, through subsidies and rural development funds, promoting sustainable agricultural practices and facilitating farmers' access to local markets. For example, in the French Alps, many agricultural cooperatives have benefited from financial support through CAP to improve their production and distribution infrastructure. This support has allowed farmers to collaborate and develop local distribution networks where mountain products, such as mountain cheese and beef, are sold directly to consumers.

Another example comes from the Spanish Pyrenees, where local authorities have launched special programs to support traditional mountain agriculture and create local markets dedicated to organic and traditional products.

Here, cooperation between local farmers, public authorities, and NGOs has led to the creation of a local and national distribution network through which mountain products are promoted and sold not only in the region but also in major cities across Spain. This model has enabled farmers to keep their revenues within the community and promote sustainable agricultural practices that respect the environment.

The Tyrol region in Austria is another example where public policies and community cooperation have supported the short food chain. The Austrian government has implemented policies that encourage mountain farmers to collaborate through cooperatives and sell their products in local markets. Government support has included both funding for farm modernization and logistical support for creating efficient local distribution networks. This type of cooperation has strengthened the local economy and reduced depopulation in mountain regions.

In Romania, public policies to support the short food chain began to develop particularly after joining the European Union, when access to European rural development funds became possible. A notable example is the rural development program implemented in Maramureș, a mountain region where agricultural traditions are closely tied to cultural identity. Here, through funds available under the National Rural Development Program (PNDR), local farmers have benefited from subsidies to modernize their farms and promote their products in local markets. Public policies have also supported the creation of cooperatives, allowing farmers to distribute their products more efficiently and promote their regional identity, such as traditional cheeses or smoked meat products.

Another example from Romania is the Sibiu region, where a project supported by European funds aimed at promoting local products through short food chains has been implemented. The project, carried out in cooperation with local authorities and farmers' associations, facilitated the sale of traditional products in local and regional markets by creating a local quality brand. This type of cooperation between farmers and authorities has led to increased revenues for small producers and contributed to the development of gastronomic tourism in the area.

Another success story is the Bucovina region, where the short food chain has been supported by community cooperation projects and public policies promoting organic farming. Local farmers, with the support of local authorities and NGOs, have created weekly markets dedicated to organic and traditional products, offering consumers direct access to authentic, high-quality products. Through cooperatives and associations, they have managed to optimize their distribution networks and sell their products not only locally but also in major cities across the country.

Public policies and community cooperation are essential for the success of short food chains in mountain areas in Europe and Romania. Without government support, access to markets, infrastructure, and modern technologies would be much more difficult for small farmers in these regions. At the same time, cooperation between farmers, local authorities, and non-governmental organizations helps create efficient distribution networks and promote local products.

Examples from the mountain regions of Europe and Romania show that when there is close collaboration between various actors, short

food chains can bring economic, social, and environmental benefits, contributing to the sustainable development of these regions.

8. Conclusions

The short food chain is a viable solution for many of the economic, social, and environmental challenges facing mountain areas. This paper demonstrates that this economic model brings benefits for both local farmers and consumers, as well as for the environment. First, the short food chain allows farmers to obtain a fairer price for their products by eliminating intermediaries who usually reduce small producers' profit margins.

This provides local producers with a stable source of income and helps improve the economic conditions in mountain communities, where agriculture is one of the main economic activities. Another significant advantage is the promotion of local and authentic products, which contributes to preserving the agricultural and cultural traditions of mountain regions. Farmers who practice traditional agriculture have the opportunity to sell their products directly to consumers, either through local markets, cooperatives, or online platforms.

This encourages the preservation of sustainable and environmentally friendly production methods, such as organic farming and crop rotation. Products from short food chains are often fresher, organic, and seasonal, meeting the growing demand for healthy and sustainable products.

On the other hand, the paper highlights the challenges mountain farmers face in implementing this model. Difficult access to markets, poor infrastructure, and harsh climatic conditions are just some of the obstacles that limit the economic potential of mountain regions. In many cases, farmers lack access to modern processing and preservation technologies, reducing their competitiveness in the market. However, success stories from Europe and Romania show that these challenges can be overcome with the support of public policies and community cooperation.

Public policies play a crucial role in supporting short food chains. For example, in Europe, the Common Agricultural Policy (CAP) offers farmers in mountain areas subsidies and support for rural development. This financial support allows farmers to invest in farm modernization, create cooperatives, and improve distribution networks. In the mountain regions of

Italy and France, public policies have helped strengthen short food chains, supporting the development of local markets and rural tourism. In Romania, European funds have played an important role in the development of short food chains. Through the National Rural Development Program (PNDR), farmers in mountain regions have received subsidies for modernizing agricultural infrastructure and promoting local products. For example, in Maramureş and Bucovina, small producers have created cooperatives and weekly markets where they sell their products directly to consumers, contributing to the development of the local economy and the preservation of agricultural traditions.

The general conclusion of the paper is that the short food chain represents a sustainable development model that brings economic, social, and environmental benefits to mountain regions. However, for this model to be successfully implemented, cooperation between farmers, public authorities, and local communities is essential. With the support of well-targeted public policies and the promotion of cooperatives and local markets, short food chains can help revitalize the rural economy and protect the environment in mountain areas. Moreover, it is important for farmers to have access to modern technologies and online platforms to expand their distribution networks and capitalize on their products at national and international levels.

The short food chain can become a reference model for other disadvantaged regions, offering sustainable solutions to current economic and environmental challenges.

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THE SUPERIOR UTILIZATION OF FLAX SEEDS AS A SANOGENIC AGENT IN FOOD AREA. CASE STUDY: BAKERY INDUSTRY

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Abstract: The study focuses on fortifying bread with flaxseeds to enhance its nutritional and health benefits. The study evaluates the sensory and functional properties of bread when fortified with varying concentrations of flaxseeds (5%, 10%, and 15%). Flax seeds are rich in omega-3 fatty acids, dietary fiber, lignans, and proteins, all of which contribute to improved heart health, digestive function, weight management, and cancer prevention. The incorporation of flaxseeds in bread offers an effective way to increase these nutrients in the daily diet. The study includes sensory analysis of bread fortified with flaxseeds in different concentrations. The sensory attributes analyzed were appearance, aroma, texture, and taste. The bread samples with increasing levels of flaxseeds showed differences in crust color, crumb softness, and flavor, with higher flaxseed concentrations leading to darker crusts, firmer crumbs, and a stronger nutty aroma.

The bread was prepared using a direct method with wheat flour, flaxseeds, yeast, water, salt, and sugar. Sensory analysis was conducted by a panel of evaluators using a hedonic scale, assessing attributes like taste, aroma, and crumb texture. Bread fortified with 5% flaxseeds was found to be most acceptable in terms of sensory properties and overall appeal. As the flaxseed concentration increased to 10% and 15%, the bread became denser, harder, and slightly bitter, though still acceptable for niche markets.

The study highlights the health benefits of consuming flaxseed-fortified bread, such as improved cardiovascular health, better digestion, and cancer prevention. Additionally, flaxseed fortification offers a cost-effective way for bakeries to cater to health-conscious consumers and meet the growing demand for functional foods.

The study concludes that fortifying bread with flaxseeds provides significant health benefits while maintaining acceptable sensory qualities, especially at lower concentrations (5%). It suggests that flaxseed-fortified bread is a viable option for improving public health and aligning with consumer preferences for nutritious and functional food products.

Keywords: flax seeds, sanogenic agent, bakery

1. The Importance of Fortifying Bread with Flaxseeds

Bread is a staple food in many cultures worldwide, consumed daily by millions of people. As food science has evolved, so too has the understanding of how bread can be enhanced to improve its nutritional profile. One increasingly popular way of doing this is by fortifying bread with flaxseeds.

Flaxseeds (*Linum usitatissimum*) are tiny seeds packed with essential nutrients, and their incorporation into bread offers numerous health benefits. This essay explores the importance of fortifying bread with flaxseeds, considering its impact on nutrition, public health, and potential economic advantages.

1.1. Nutritional Composition of Flaxseeds

Flaxseeds are renowned for their rich nutritional profile. They are an excellent source of dietary fiber, omega-3 fatty acids, lignans, and plant-based proteins. Specifically, flaxseeds contain about 18% protein, 28% dietary fiber, and 42% fat, of which the majority is alpha-linolenic acid (ALA), a type of omega-3 fatty acid that is crucial for human health. These nutrients play important roles in maintaining bodily functions and preventing various diseases.

Omega-3 Fatty Acids: Flaxseeds are one of the richest plant-based sources of omega-3 fatty acids, particularly ALA. Omega-3 fatty acids are essential for heart health, brain function, and reducing inflammation. Unlike fish oil, which is a common source of omega-3s, flaxseeds offer a vegetarian alternative, making it suitable for individuals with dietary restrictions.

Dietary Fiber: The fiber content in flaxseeds is impressive, with both soluble and insoluble fibers present. Soluble fiber helps regulate blood sugar and cholesterol levels, while insoluble fiber aids in digestion by promoting bowel regularity. Together, these fibers support a healthy digestive system and help prevent conditions like constipation and diverticulosis.

Lignans: Flaxseeds are an abundant source of lignans, compounds that exhibit antioxidant and phytoestrogenic properties. These compounds have been associated with reduced risks of cardiovascular disease and certain types of cancer, particularly hormone-related cancers like breast and prostate cancer.

Protein: Flaxseeds are a good source of plant-based protein, which is essential for building and repairing tissues, producing enzymes and hormones, and supporting overall metabolic health. This is particularly beneficial for people following vegetarian or vegan diets, where high-quality protein sources may be limited.

1.2. Health Benefits of Fortifying Bread with Flaxseeds

The fortification of bread with flaxseeds is not just a way to increase the nutritional value of bread; it also offers multiple health benefits. These benefits are wide-ranging and include heart health, digestive health, weight management, and the potential to reduce the risk of chronic diseases.

1.3. Heart Health

Cardiovascular diseases (CVD) remain the leading cause of death worldwide. The inclusion of flaxseeds in bread fortification can significantly contribute to heart health due to the omega-3 fatty acids, fiber, and lignans they contain. Omega-3 fatty acids have been shown to reduce triglycerides, lower blood pressure, and decrease the risk of arrhythmias. Additionally, the lignans in flaxseeds possess anti-inflammatory properties that can help reduce the risk of plaque buildup in the arteries, further reducing the risk of CVD.

Fortifying bread with flaxseeds can also help regulate cholesterol levels. Studies have shown that flaxseeds can lower total cholesterol and low-density lipoprotein (LDL), the "bad" cholesterol, while increasing high-density lipoprotein (HDL), the "good" cholesterol. High levels of LDL are associated with an increased risk of heart disease, while higher levels of HDL are protective against heart disease.

1.4. Digestive Health

Flaxseeds are rich in dietary fiber, which promotes digestive health by ensuring proper bowel function. The soluble fiber in flaxseeds forms a gel-like substance in the stomach, slowing digestion and improving nutrient absorption. Insoluble fiber, on the other hand, adds bulk to the stool and helps food pass more quickly through the digestive tract, preventing constipation.

Regular consumption of flaxseed-fortified bread can also help prevent gastrointestinal disorders such as irritable bowel syndrome (IBS) and diverticulitis. Furthermore, fiber-rich diets are known to reduce the risk of colorectal cancer. For individuals who struggle to meet their daily fiber intake, consuming flaxseed-fortified bread offers an easy and convenient solution.

1.5. Weight Management

Flaxseeds may also support weight management, an important factor in preventing obesity and related diseases such as type 2 diabetes and heart disease. The high fiber content of flaxseeds helps promote feelings of fullness and satiety, reducing overall calorie intake. When added to bread, flaxseeds slow down the digestion process, leading to prolonged feelings of satiety after a meal.

In addition, flaxseeds are relatively low in carbohydrates, making them an attractive ingredient for individuals following low-carb diets. Incorporating flaxseeds into bread fortification provides a nutritious and satisfying food option for those looking to manage their weight without compromising on essential nutrients.

1.6. Cancer Prevention

The lignans in flaxseeds have been associated with cancer prevention, particularly hormone-related cancers such as breast and prostate cancer. Lignans have estrogenic and anti-estrogenic effects, which means they can help regulate hormone levels in the body. In women, lignans have been shown to reduce the risk of breast cancer by blocking the effects of estrogen on breast tissue. In men, flaxseed consumption has been linked to a reduced risk of prostate cancer.

Moreover, flaxseeds' antioxidant properties help protect cells from oxidative damage, which can lead to the development of cancer. While more research is needed to fully understand the relationship between flaxseed consumption and

cancer prevention, current studies suggest promising protective effects.

1.7. Economic and Practical Considerations

In addition to the numerous health benefits, fortifying bread with flaxseeds presents economic advantages. As consumers become more health-conscious, the demand for functional foods—foods that offer health benefits beyond basic nutrition—has increased. Flaxseed-fortified bread meets this demand by offering a simple yet effective way to improve health outcomes.

1.8. Cost-Effectiveness

Fortifying bread with flaxseeds is relatively cost-effective compared to other types of food fortification. Flaxseeds are widely available and inexpensive, making them an accessible ingredient for both large-scale bakeries and small local producers. The minimal cost of adding flaxseeds to bread can be offset by the potential health benefits and the reduced healthcare costs associated with improved heart health, digestive health, and weight management.

Moreover, flaxseeds have a long shelf life when stored properly, making them a practical choice for bakeries. Unlike some food ingredients that spoil quickly, flaxseeds can be stored for extended periods without losing their nutritional value, ensuring a consistent supply for bread fortification.

1.9. Consumer Appeal

There is a growing consumer demand for bread that is healthier and more nutritious. Flaxseed-fortified bread can cater to this market by offering an enhanced product that appeals to health-conscious consumers. The subtle nutty flavor and crunchy texture of flaxseeds also add to the sensory experience of eating bread, making it more enjoyable for consumers.

Furthermore, flaxseed-fortified bread can be marketed as a functional food that offers tangible health benefits, such as heart health support, digestive health improvement, and weight management assistance. As more people seek to incorporate healthier foods into their diets, flaxseed-fortified bread offers an appealing option that aligns with current food trends.

1.10. Challenges and Considerations

While the benefits of fortifying bread with flaxseeds are clear, there are some challenges and considerations to keep in mind.

Consumer Education

One challenge is consumer awareness and education. Not all consumers are familiar with the health benefits of flaxseeds or understand why flaxseed-fortified bread is a healthier option.

To maximize the impact of this fortification strategy, it is important for producers and retailers to educate consumers about the benefits of flaxseeds and how they can improve health outcomes. Clear labeling and marketing campaigns can help raise awareness about the benefits of flaxseed-fortified bread. Including information about the high omega-3 content, fiber benefits, and potential disease prevention properties can encourage consumers to choose flaxseed-fortified bread over traditional bread options.

Allergies and Dietary Restrictions

Another consideration is that some consumers may have allergies or dietary restrictions that prevent them from consuming flaxseeds. While flaxseed allergies are rare, they do exist. Additionally, flaxseeds contain phytoestrogens, which may not be suitable for individuals with certain hormonal conditions. For this reason, it is important to ensure that consumers have access to information about the ingredients in their bread and that alternative options are available for those with dietary restrictions.

Processing and Shelf Life

Flaxseeds are sensitive to heat and light, which can degrade their nutritional content, particularly the omega-3 fatty acids. Therefore, careful processing and storage methods must be used to preserve the nutritional benefits of flaxseeds during bread production. Milling flaxseeds into flour or incorporating whole flaxseeds into dough must be done in a way that maintains their integrity.

2. Materials, equipment and research methodology

The following raw materials were used to perform the experiments:

- Wheat flour;
- Flax seeds;
- Yeast;
- Water;
- Salt;
- Sugar

In table 1 the recipe for the studied baking products is presented.

Tabel 1. *The recipes used for 1kg of wheat flour, respectively 400g wheat flour*

1 kg wheat flour			400 g wheat flour		
700 ml water			280 ml water		
20 g yeast			8 g yeast		
20 g salt			8 g salt		
30 g sugar			12 g sugar		
Flax seeds	5%	50 g	Flax seeds	5%	20 g
	10%	100 g		10%	40 g
	15%	150 g		15%	60 g

For dough preparation, the direct method was used, which consists of preparing the dough in a single phase using all the ingredients from the recipe. It is the simplest and quickest dough preparation method and is characterized by high yeast consumption.

The dough is kneaded with classic mixers for 10-15 minutes, then fermented for 2-3 hours at a temperature of 30-32°C, using 1.5-3% yeast.

The direct dough preparation method, even in the form of the classic process, results in products with weak taste and aroma, and the crumb is crumbly and ages quickly. Dough prepared using the direct method contains lower amounts of acids, flavor substances, and soluble substances compared to dough prepared using the indirect method.

The addition of additives can improve the texture of the crumb and preserve freshness. Intensively kneaded dough with reduced fermentation before dividing has greater precision during division and is mechanically processed better than dough obtained by the classic process. These aspects, along with the shortening of the technological process and the larger volume of the bread, represent the advantages of the method. Reducing the fermentation time of the dough before dividing has a negative effect on the taste, aroma, and crumbliness of the crumb when sliced. In both cases, the maturation of the dough depends on how the dough preparation is managed and on process parameters. Temperature plays an important role. Higher temperatures accelerate maturation and shorten fermentation time, while lower temperatures slow down the maturation process and extend fermentation time. Cold doughs (22-25°C) are slightly moister and stickier, making them more difficult to process compared to warmer doughs (26-27°C).

The fermentation time is influenced by the amount of yeast used. Smaller amounts of yeast extend the maturation time, while larger amounts shorten it, as the amount of carbon dioxide

produced affects the stretching of gluten films to a greater or lesser extent.

3. Sensorial research

Sensory analysis is a technique used to determine the characteristics and quality of food products by integrating knowledge from sciences such as neurophysiology, human physiology, sociology, statistics, psychology, etc. (Lawless Harry T. and Heymann H., 2010). The sensory attributes of food products are among the most important decision-making factors in purchasing and consumption. The sensory analysis method used for testing the obtained products was the acceptance testing method, which involves analyzing the responses of groups of tasters to a series of questions related to "How much do you like this product?" (Lawless and Heymann, 2010). A nine-point hedonic scale was used in the evaluation, with nine possible ratings for the product, ranging from "I like it extremely" to "I dislike it extremely."

The sensory analysis methods used for testing the products were the following: the rating scale method and the acceptance testing method. The rating scale method involves using criteria to evaluate the intensity of a sensory attribute or characteristic. This method is widely applied and used for the quantitative evaluation of a set of organoleptic properties (appearance, smell, taste, color, etc.) of food products (Lawless and Heymann, 2010).

The first stage of the sensory method is to establish the evaluation panel by selecting members based on a questionnaire, followed by training the panel for sensory evaluation of the tested products. The second stage involves developing the sensory analysis sheet. After individual evaluations, the sensory analysis sheets are centralized, and a calculation method is applied to assess the results.

3.1. Sensory Analysis of Fortified Bread

Over the years, food scientists have explored various ways to enhance the nutritional content of bread through fortification, using ingredients like flaxseeds, chia, vitamins, minerals, and whole grains. However, while fortification improves nutritional value, it is essential to maintain the sensory qualities of bread—such as taste, texture, and appearance—that make it a favorite food for many people. Sensory analysis plays a critical role in evaluating fortified bread, ensuring that it meets consumer preferences while delivering

enhanced nutritional benefits. This essay explores the sensory analysis of fortified bread, covering its key sensory attributes, methods used in sensory evaluation, and the challenges and considerations in fortifying bread.

3.2. Sensory Attributes of Bread

Bread's sensory appeal is based on several factors, including its appearance, aroma, texture, and taste. These sensory qualities are influenced by the ingredients used, the baking process, and, in the case of fortified bread, the specific fortifying agents added. Understanding these sensory attributes is critical in assessing the overall acceptability of fortified bread.

3.3. Appearance

Appearance is the first sensory attribute consumers notice when selecting bread. The visual qualities of bread include color, shape, size, and crust texture. Fortifying bread with ingredients such as flaxseeds, chia, or other whole grains can alter its appearance by changing the color or adding visible seeds or grains.

For instance, bread fortified with flaxseeds may have a darker crust or specks of seeds visible throughout the loaf. Changes in appearance can influence consumer perceptions of the bread's freshness and health benefits.

Color is particularly important, as consumers often associate darker or whole grain breads with higher nutritional value. However, significant changes in color due to fortification may also lead to consumer rejection if the appearance deviates too much from traditional expectations.

3.4. Aroma

The aroma of bread is one of the most appealing aspects of freshly baked bread. The characteristic smell of bread results from the Maillard reaction during baking, which creates a complex mix of aromatic compounds. Fortification may alter the aroma of bread depending on the added ingredients. For example, flaxseeds or whole grains may impart a nutty aroma, which can be either desirable or off-putting, depending on consumer preferences.

In sensory analysis, the intensity and type of aroma are evaluated to determine if the fortified bread retains its familiar appeal or if new aromas enhance or detract from the overall experience. It is essential that the aroma of fortified bread maintains its ability to attract consumers, as smell plays a key role in stimulating appetite and influencing taste perception.

3.5. Texture

Texture is a crucial attribute in the sensory evaluation of bread. Bread texture is characterized by its crust and crumb. A good bread crust is usually crispy or chewy, while the crumb is soft, elastic, and moist. The fortification of bread can affect both the crust and crumb structure, depending on the type of fortifying agent and its concentration. For example, adding fiber-rich ingredients like flaxseeds, chia, or oat bran can result in a denser bread with a less airy crumb. The addition of seeds may also add a crunch to the bread, which can enhance the texture for some consumers but may be undesirable for others who prefer a smoother, softer crumb. The mouthfeel of fortified bread is another aspect of texture that sensory evaluators assess. Bread that is too dry, too tough, or too crumbly may be rejected by consumers, even if it offers superior nutritional benefits.

Maintaining a balance between fortification and texture is essential for ensuring consumer satisfaction.

3.6. Taste

Taste is perhaps the most critical sensory attribute that influences the acceptability of fortified bread. Bread should have a mild, slightly sweet, or savory taste, depending on the recipe and ingredients used. Fortification can significantly alter the taste of bread, especially if strong-flavored ingredients like seeds, herbs, or minerals are added.

For instance, bread fortified with flaxseeds may have a nutty or earthy flavor, which some consumers may enjoy while others may find it overpowering. In sensory analysis, it is crucial to evaluate how fortifying ingredients interact with the natural flavors of bread. The goal is to enhance taste or introduce new flavors without compromising the overall balance of the bread's flavor profile. The addition of vitamins and minerals can also influence taste. For example, fortifying bread with iron can sometimes result in a metallic aftertaste. Sensory analysis helps identify such issues, allowing bakers and food scientists to adjust formulations to improve flavor acceptability.

3.7. Methods of Sensory Analysis in Fortified Bread

Several methods are used in sensory analysis to evaluate fortified bread. These methods help food scientists and manufacturers understand how consumers perceive the product's sensory

qualities. The following are common sensory evaluation techniques used in bread analysis:

3.8. Descriptive Analysis

Descriptive analysis is a detailed method in which trained panelists evaluate and describe the sensory characteristics of fortified bread. Panelists are trained to detect subtle differences in attributes such as appearance, aroma, taste, and texture. They use specific terminology to describe these attributes, providing a comprehensive profile of the bread.

Descriptive analysis is valuable for identifying how fortification affects the sensory properties of bread. For example, it can help determine if the texture is denser due to added fiber or if the taste is more nutty or bitter due to seeds. This method provides in-depth insights that can guide product development and formulation adjustments.

3.9. Consumer Acceptance Testing

Consumer acceptance testing is conducted with a larger group of untrained consumers who evaluate the bread based on their preferences. Consumers are typically asked to rate their overall liking of the bread as well as specific attributes such as taste, texture, and appearance. This method provides direct feedback from the target market, indicating whether the fortified bread meets consumer expectations.

In acceptance testing, bread samples may be presented in a blind test to avoid bias. The results help manufacturers determine whether the fortified bread will be successful in the market and identify areas for improvement.

3.10. Triangle Test

The triangle test is a sensory discrimination method used to detect differences between two bread formulations. In this test, three samples are presented to panelists—two are identical, and one is different. The panelists are asked to identify the different sample. This method is useful for determining if consumers can detect differences between fortified and non-fortified bread or between two different fortification levels.

The triangle test helps assess whether fortification has caused noticeable sensory changes in the bread. If panelists cannot distinguish between the fortified and non-fortified samples, it suggests that fortification has minimal impact on sensory properties, which is often desirable.

3.11. Challenges and Considerations

Fortifying bread with nutrients like seeds, fiber, or vitamins can present challenges in terms of sensory appeal. While fortification aims to improve nutritional value, it is essential to maintain the sensory qualities that consumers expect from bread.

3.12. Balancing Nutrition and Sensory Appeal

The challenge in fortifying bread lies in balancing improved nutrition with sensory appeal. Over-fortification can lead to negative sensory changes, such as an undesirable texture, flavor, or appearance. For example, adding too much fiber can result in a dense, dry bread, while too many seeds can make the texture too coarse.

Manufacturers must carefully consider the types and quantities of fortifying ingredients used to ensure that the bread remains enjoyable to eat. Sensory analysis plays a critical role in fine-tuning formulations to achieve the right balance.

3.13. Ingredient Interaction

Fortification can also lead to interactions between ingredients that affect the sensory properties of bread. For example, certain fortifying agents may react with the natural components of bread, altering its flavor or texture. Sensory analysis helps identify these interactions, allowing manufacturers to make necessary adjustments to preserve the bread's sensory qualities. Sensory analysis is an essential tool in the development and evaluation of fortified bread. It helps ensure that fortification enhances the nutritional profile of bread without compromising its sensory appeal. By evaluating attributes such as appearance, aroma, texture, and taste, food scientists can optimize fortified bread formulations to meet consumer preferences.

The challenge lies in balancing the health benefits of fortification with the sensory qualities that make bread a widely enjoyed staple food. With careful formulation and sensory analysis, fortified bread can offer both improved nutrition and a satisfying eating experience, contributing to better public health outcomes without sacrificing consumer satisfaction.

4. Results

For the research, a control bread and three breads with the addition of flaxseeds in concentrations of 5%, 10%, and 15% were made (Figure 1).

Depending on the concentration added, the characteristics of the product were influenced differently. As the amount of flaxseeds increases, the bread's rising capacity decreases, the crust's color is not as intense as in products with a lower

concentration of flaxseeds, and the crumb becomes progressively harder and more crumbly. Table 2 presents the average scores given by evaluators for the characteristics of the products.

Table 2. Characteristics and scores obtained for the bread samples in the sensorial tasting

No.crt.	CHARACTERISTICS	SCORES			
		P ₀ (control sample)	P ₁ (5%)	P ₂ (10%)	P ₃ (15%)
1.	Crust color	3,60	3,18	2,73	3,09
2.	Crumb color	3,50	3,09	3,00	3,45
3.	Uniformity of crumb pores	4,10	3,64	3,18	3,36
4.	Crumb softness	4,20	3,64	3,36	3,45
5.	Crumb crumbliness	3,40	3,45	3,27	3,36
6.	Bitter taste	1,40	1,82	1,73	1,91
7.	Salty taste	1,40	1,55	1,64	2,18
8.	Sour taste	1,00	1,27	1,55	1,64
9.	Aroma	2,10	2,45	2,64	3,09
10.	Persistence of the aroma after chewing and swallowing	2,00	2,18	2,55	2,82



Fig. 1. Comparison between control sample and samples with different concentrations of flax seeds

In Figure 2, the average scores given by evaluators for each characteristic of the bread can be observed. According to the graph, it is evident that, depending on the percentage of flaxseeds added, the characteristics of the bread change, and the scores vary.

The graph shows that the bread with a 15% flaxseed addition received the highest scores. Overall, the evaluation indicates that the bread with a 5% flaxseed addition is suitable for general population consumption, with the previously mentioned health benefits.

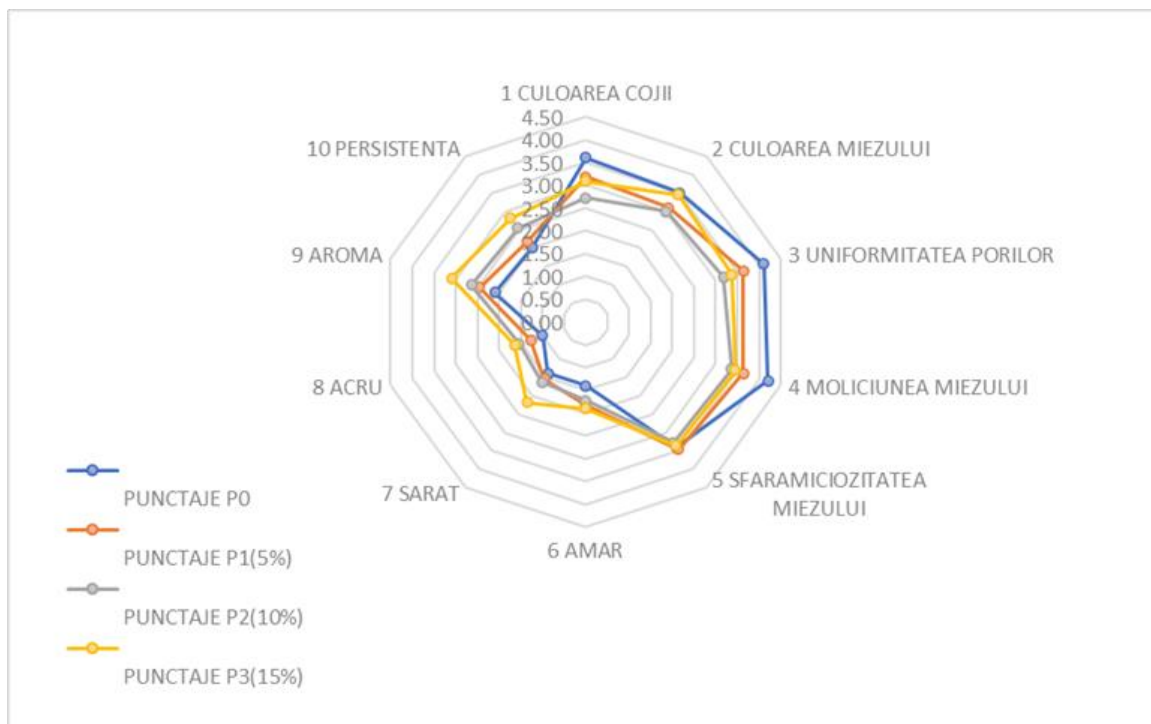


Fig. 2. Comparison between different characteristics of the studied bread samples with different flax seed quantities

Tabel 3. Scores for the studied bread samples regarding total acceptability

No. crt.	CHARACTERISTICS	SCORES			
		P ₀	P ₁ (5%)	P ₂ (10%)	P ₃ (15%)
1.	Total acceptability	7,36	6,55	6,64	6,82

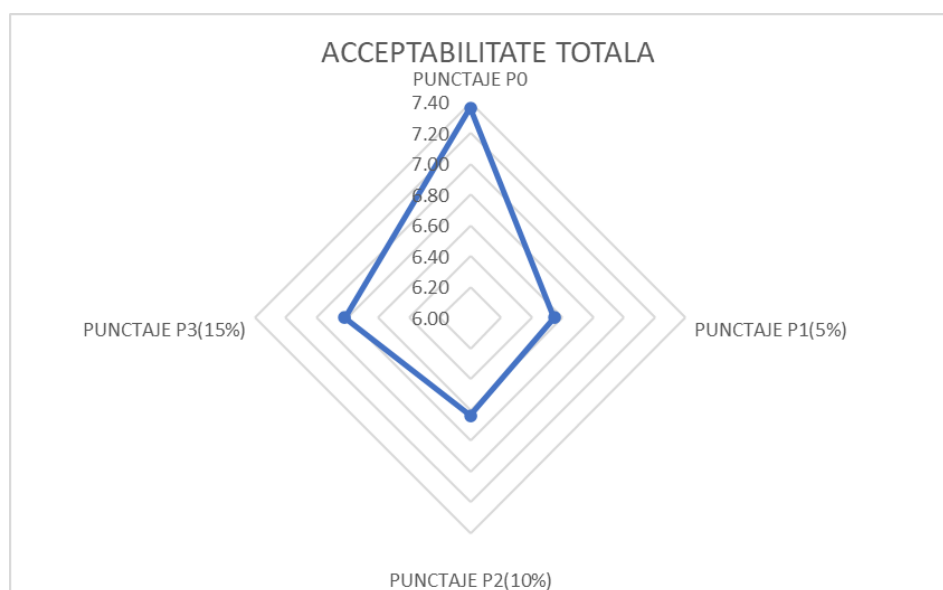


Fig. 3. Total acceptability of the studied bread samples with different flax seed quantities

6. Conclusions

In conclusion, fortifying bread with flaxseeds is an important strategy for improving public health through enhanced nutrition. The rich composition of flaxseeds, including omega-3 fatty acids, dietary fiber, lignans, and protein, provides numerous health benefits ranging from heart health to cancer prevention. In addition to the health benefits, flaxseed fortification is a cost-effective and practical solution that aligns with current consumer demands for healthier and functional foods. While there are some challenges to consider, such as consumer education and proper processing methods, the overall benefits of flaxseed-fortified bread far outweigh these obstacles. As more people seek to improve their diets and reduce their risk of chronic diseases, flaxseed-fortified bread offers a convenient and accessible way to promote better health and well-being. Sensory analysis is an essential tool in the development and evaluation of fortified bread. It helps ensure that fortification enhances the nutritional profile of bread without compromising its sensory appeal. By evaluating attributes such as appearance, aroma, texture, and taste, food scientists can optimize fortified bread formulations to meet consumer preferences.

The challenge lies in balancing the health benefits of fortification with the sensory qualities that make bread a widely enjoyed staple food. With careful formulation and sensory analysis, fortified bread can offer both improved nutrition and a satisfying eating experience, contributing to better public health outcomes without sacrificing consumer satisfaction.

In a world where chronic diseases like heart disease, obesity, and diabetes are on the rise, simple changes like incorporating flaxseeds into everyday foods such as bread can have a profound impact on public health. By fortifying bread with flaxseeds, we can help create a healthier future for individuals and communities alike.

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