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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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Sustainable tourism, a priority challenge

Sustainable development plays a vital role in on long term economic, ecologic and social-cultural equilibrium of the destinations and allows tourism to contribute to certain global problems. The tourism and recreation sector is submitted to economic, social, environmental and political processes that transform organization and its practices, either in residential, mobility, consumption, technologies, finance field... These evolutions and contradictions belong to a series of profound changes that need to renew the analyses frame. At its turn, knowledge produced in the tourism field opens ways towards other aspects (work, territory, migration, culture, etc.).

On the other hand, tourism has a considerable effect upon environment. It is estimated that it will produce a significant proportion of gas with greenhouse effect at worldwide level (approximately 5%). Transportation and accommodation, consumption of „natural" spaces and landscapes are included among the causes of adverse effects. A destination that does not take into consideration the principles of sustainable development will become on short term a place that will not be visited. That is why, taking into account sustainable development approach in the field of tourism industry, it is essential to assure integrated management of territories, in harmony with environment and communities, as well as to assure resource serviceability and a better life quality. We must add that sustainable tourism improves the image of a destination on international level. That is why sustainable tourism is a priority at present.

Director of the publication,
Full Prof. Romulus GRUIA,
PhD, PhD supervisor

SUMMARY

INVASIVE KNOTWEED SPECIES AS A RICH SOURCE OF ANTIOXIDANTS

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Abstract: *Variety of food is important in terms of providing essential nutrients in the human diet. Antioxidants, which allow the organism to defend against the oxidative stress, environmental pollution and other toxic substances, play an important role in the healthy human nutrition. Three alien taxons of knotweed - Japanese (Fallopia japonica), Sakhalin (Fallopia sachalinensis) and Bohemian (Fallopia x bohemica) are abundantly spread all over Europe and represent a big ecological problem, due to their rapid expansion and flexibility, which significantly alter the biodiversity of the area. At the same time, the use of knotweed in traditional Asian medicine is extensive and in many cases successful. Resveratrol is only the most known substance in Japanese knotweed and is already widely used as a dietary supplement, in cosmetics and medicine. Determination of other antioxidants and their bioactivities (e.g. antioxidant, antimicrobial, cytotoxic) from different tissues of knotweed is therefore an interesting topic that cannot change only the attitude of modern society towards these plants, but also contribute to the creation of more effective strategy for limiting their spread. The recent scientific publications are mostly focused on Japanese knotweed, while the research of Sakhalin and the Czech knotweed is limited. Hence, the characterization of these two taxons represent the new challenge due to their altered biological and chemical activity.*

Keywords: *knotweed, invasive, antioxidants;*

1. Introduction

Variety of food is important in terms of providing essential nutrients in the human diet. The antioxidants, which allow the organism to defend against the oxidative stress, environmental pollution and other toxic substances play an important role in the healthy human nutrition . Vegetable food provides many bioactive substances that act independently and synergistically and prevent the development of chronic and oxidative stress - related diseases. Bioactive molecules present in plants are called phytochemicals, among which antioxidants prevail. In addition to plant foods the nutrition recommendations are suggesting to consume variety of food supplements based on plant extracts and with high antioxidative activity.

2. Composition Invasive knotweed species

2.1. Traditional use of knotweed

In traditional Asian medicine the use of knotweed (particularly Japanese species) is known to treat various diseases. The roots of Japanese knotweed were primarily used in traditional Chinese medicine (TCM). China Pharmacopoeia describes and claims the use of Japanese knotweed named Hu Zhang. It can be consumed either as young wild vegetable preparations from rhizomes or as a drink in the form of a medicated Itadori tea. Some closely related species, which belong to the knotweed family (*Polygonaceae*), for example buckwheat and rhubarb, also boast many positive effects on the human body and are known to contain a wide range of different antioxidants. TCM uses a Japanese knotweed for enhancing the functioning of the gall bladder, the prevention of liver disease, lung disease associated with impaired blood circulation, treatment of elevated lipid levels, tumors, inflammations, leukorrhea, ... Modern clinical and experimental studies have shown that the individual active components present in Japanese knotweed act positively on the course of many diseases. Positive effects are mainly observed in the course of cardio-vascular and nerve disease [9], [10]. There is also evidence of its antiviral, antibacterial and antifungal activity [11]. Similar activity was

detected for the rhizome Sakhalin knotweed [12]. Interestingly, the alternative medicine describes Japanese knotweed as a key component in the treatment of Lyme disease [13].

In addition to the therapeutic use, the Japanese knotweed is also used in the culinary. Young shoots are consumed in a similar way as asparagus; moreover, knotweed may replace rhubarb in some dishes. Steve Brill in his book [14] describes Japanese knotweed, particularly its young shoots, harvested to a height up to 20 cm, as an excellent spring vegetable with a slightly sour taste. The book also mentions knotweed as a good source of vitamin A and vitamin C, manganese, zinc, potassium, and a number of phenolic compounds.

In Asia, Japanese knotweed rhizome juice is produced to make yellow dye staining and rice flour [15]. In India and South Asia, knotweed leaves are sometimes used as a substitute for tobacco [5]. Japanese knotweed rhizomes are also used to prepare tea named Itadori, which in Japanese language means well-being. According to the study performed by Burns et al. [16], the tea is a good dietary source of resveratrol and a suitable replacement for red wine. People, who avoid wine because of alcohol, may benefit from resveratrol by drinking Itadori tea.

Nevertheless, there are few data and research on the knotweed toxicity. There are concerns regarding consuming it by pregnant women, since substances may interfere with the functioning of uterus. Tannins, which are present in the plant, may operate carcinogenic [17] and prevent the activity of some digestive enzymes [18]. Knotweed contains oxalic acid, similarly to rhubarb (*Rheum rhabarbarum, Polygonaceae*); hence, the consumption of young shoots is preferable. The diet with a higher content of oxalic acid is not advisable for people with an increased risk for the development of arthritis, rheumatism, gout, and kidney stones. There are also indications that the consumption of knotweed in certain subjects leads to increased skin sensitivity to light, which was also observed in consumption stems of buckwheat (*Fagopyrum esculentum, Polygonaceae*) [19]. The rhizome extract nevertheless showed a low toxicity towards aquatic organisms [20].

Transparent study on the pharmacological effects and eventual toxicity of Japanese knotweed should be given more attention in the future. It would also be desirable to more accurately investigate the substances contained in the above-ground parts of the plant, and determine their positive/negative effects on the organism [10], [15].

2.2. Invasiveness of knotweed

On the other hand, alien invasive knotweed represents a big ecological problem, because of its rapid expansion and flexibility, which significantly alter the biodiversity of the area.

The ability of plants to invade an area is strongly influenced by their flexibility, regeneration capacity and resilience. A variety of substances, namely secondary metabolites, produced and secreted by plants into the surrounding area, also contribute to all of the above characteristics [21-23].

Three taxons of knotweed (Figure 1), namely Japanese knotweed (*Fallopia japonica*), Sakhalin knotweed (*Fallopia sachalinensis*) and Bohemian knotweed (*Fallopia x bohemica*), a hybrid of these two species are present in Europe. All three of them differ in the degree of invasiveness. The alien invasive knotweed is often referred to only as a source of environmental and social problems, but these plants in some parts of the world play an important role in maintaining human health and are included in the everyday human diet.

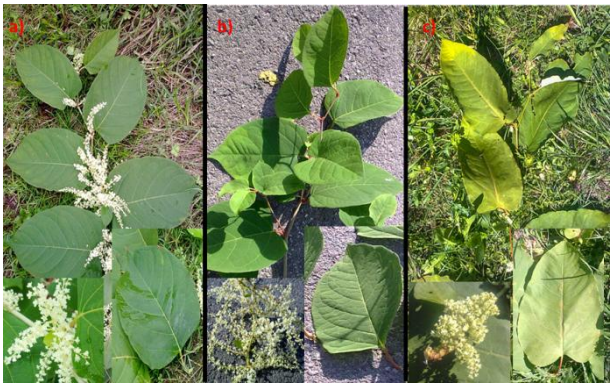

Fig. 1. *The leaves and the flowers of a) Japanese knotweed (Fallopia japonica), b) Bohemian knotweed (Fallopia x bohemica) and c) Sakhalin knotweed (Fallopia sachalinensis)*

2.3. Knotweed as a source of antioxidants

Japanese knotweed has been already extensively studied both in the ecological field, in conjunction with its invasiveness, as well as in the field of pharmaceuticals and the use of these plants for the isolation of a variety of useful

materials, especially those with antioxidant activity [5], [24]. It is also known that the useful pharmacological activity of plant foods on the human body is the result of different combinations of secondary metabolites that are present in their tissues [23], [25-27].

Knowing the fact that knotweed is a very resistant, fast-growing plant, which in most cases only causes a problem in modern society, it would be interesting to discover the wider benefits of this plant to humans [28]. Determination of particular antioxidants and the antioxidant activities of extracts prepared from different tissues of knotweed is therefore an interesting topic that can change the look of modern society on these plants, but also contribute to the creation of more effective strategy for limiting their spread. The recent scientific publications are mostly focused on Japanese knotweed, while the research of Sakhalin and the Czech knotweed is limited, even if they are widely spread across Europe.

Resveratrol, one of the main active substances in Japanese knotweed, has shown strong antioxidant activity. When used at many model organisms it affects the longevity and the aging process. Resveratrol, which is isolated from the roots of Japanese knotweed, is already widely used as a dietary supplement, in cosmetics and medicine [29-31].

Besides resveratrol, knotweed contains a large variety of secondary metabolites with antioxidant activity, such as quinones, phenolic acids, stilbenes, tannins, flavonoids and catechols [20]. The roots of Japanese knotweed are the most often considered, but also rhizomes, leaves, stems and flowers of Sakhalin and the Czech knotweed represent a potential source of natural bioactive antioxidants [32]. The main active components of knotweed are stilbenes and quinones [33].

Researchers detected in underground and aboveground parts of knotweed similar bioactive components. The main differences between the plant bodies are present in particular in quantities of individual substances. Specific differences between the three taxons and their tissues are also found. The differences can be also attributed to different geographical location of plant growth [21], [28], [34].

It was also found that the presence of mycorrhizal connections rootstock in Czech knotweed increases the amount of resveratrol and its derivatives [35]. The presence of particular fungi also affects the levels of resveratrol and its glycosides. Since glucose is transported from the plant to fungus by symbioses for the latter to cover its energy needs for nitrogen fixation, less glucose remains available for the formation of glucosides [36]. According to the current information the best source of resveratrol, however, represents the root of Japanese knotweed [33].

As mentioned above, the knotweed rhizomes are a reach source of stilbenes, while the aboveground parts contain more flavonols [37]. The leaves, stems and inflorescences contain many flavanols, especially catechins and epicatechins. Considering catechins, the most abundant are the derivatives of caffeic acid [38]. In the aboveground parts of the plant quinones and stilbenes are also present, but in lower concentrations than in the rhizomes [39]. Sakhalin knotweed contains up to 70-fold lower concentration of stilbene compared to rhizomes of Japanese knotweed [38]. It was found that piceid, gicosilated form of resveratrol, is presents in different tissues in the quantity 10-times higher than the free resveratrol [33], [40], [41]. The rhizomes contain the highest concentration of stilbenes in autumn, when it is also their biggest weight in the aboveground parts of the plants compared to the spring. The content of stilbenes in the aboveground part of knotweed is much lower than in their rhizomes [33].

Given the qualitative and quantitative content of the antioxidants the Czech knotweed is more closely resembled to Japanese knotweed than to the Sakhalin one [34]. The content of stilbenes, such as piceatanol and astringin, can surpass the values in Japanese knotweed [32]. Japanese knotweed rhizome can be characterized by the presence of stilbenes and certain anthraquinones, whereas the rhizome of Sakhalin knotweed on the content of anthraquinones [42] and phenylpropanoid glycosides [21].

Young shoots contain similar components as the roots, but they are present in lower concentrations [37]. Sakhalin knotweed leaf extract could in future be used to control various plant diseases, as it has also fungicidal activity, which the researchers attributed to its high content of catechins [43].

It has to be also stressed that due to the large amounts of biomass that knotweed produce, their distribution, invasiveness, content of stilbenes and other secondary metabolites they can represent an excellent source for the extraction of antioxidants. One hectare can produce between

20 and 30 tons of plant biomass, which contains more than 80 kg stilbenes [21], [33].

Different parts of the herb can be used in a wide variety of purposes. Different parts of Japanese knotweed contain varying amounts of resveratrol, piceid, emodine and physcion, whereby it has been shown that the roots of the maximum content of these components, while the amounts of the stem and leaf-represented in small quantities [44]. Same authors have also monitored the effect of harvest time on the amount of resveratrol, piceid, emodin and physcion in the roots. Results showed that resveratrol is present in higher quantities in October, piceid in August, while the amount of emodine maintains fairly constant throughout the year.

2.4. Knotweed as an antimicrobial agent

In addition to the described antioxidant properties the knotweed is also attributed the possible antimicrobial effects. However, once more the most studied are the effects of extracts of roots of Japanese knotweed, while the extracts of other tissues and the other two knotweed taxons are limited [11]. Marinas et al. [45] in their study, carried out with different tissues of Japanese knotweed, found that leaf extracts containing quercetin, rutin and epicatechin, possessed the significant antimicrobial activity. It was also shown that epicatechin and its derivatives prevent the growth of Gram-positive bacteria, whereas its antifungal activity is much lower.

Conclusions

Since different tissues of all three taxons of knotweed contain many functional components, it is expected that these plants will be in the future used for the development of new functional foods and isolation of novel food and pharmaceutical ingredients.

So far, research in the study of secondary metabolites have mostly focused on Japanese knotweed and its rhizome, due to the high content of stilbene resveratrol and its derivatives. In the future, it would be important to accurately analyze the components also of the aboveground parts of these invasive plants and special attention has to be paid to Sakhalin and the Czech knotweed. In this way, we can obtain important information on the causes of the spread of knotweed species in a new environment and find useful components of these invasive plants, which would be useful in the food industry, the pharmaceutical industry and agriculture.

Although currently knotweed represents a burning issue for botanists and biologists, it is an excellent starting point for nutritionists in the food industry. So far, it is not used much, but it has a big potential. Due to the increasing role of resveratrol in nutraceuticals, therapeutics and cosmetics, it is expected that demand will grow in the future. This brings new market opportunities for the agriculture sector [44].

Following the pattern of the eastern cultures knotweed could also be used in cooking, in the preparation of salads, soups and some other dishes. Scientists are trying to make these plants and their benefits as close as possible to the people, for them to also see them from the positive side. On the one hand, these plants are found at almost every stream and there is enough for everyone. On the other hand, it can also be planted and thus establish it as a new market niche. However, we have to be careful to control their spread due to extreme invasiveness of these plants.

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DECISION SUPPORT SYSTEM APPLICATIONS IN THE HUNGARIAN FOOD INDUSTRY

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Abstract: *The food market has changed dramatically in the past decades. It is likely that the economics of scale will continue to be important when competing for the attention of consumers with decreasing buying power. For the production industry in general, there are various reasons why companies choose to invest in traceability systems and decision support systems. Today businesses in the food sector are faced with a number of problems: decreasing profitability, increasing competition and rapidly changing consumer demands, resulting from the global crisis. Decision support systems have recently proved themselves to be helpful tools and are becoming essential to stay competitive within most sectors of the food industry. If they want to effectively carry out their everyday tasks, react quickly to control the operation of the business while complying with statutory requirements, it is indispensable for them to use ICT tools, different applications, such as ERP, DSS, CRM, BI, DM. We analyzed the trends and current situation in Hungary based on secondary and primary based research.*

Keywords: *Food sector, Hungary, DSS technologies, ICT, BI.*

1. Introduction

Business life - just like our everyday lives - is determined by a series of decisions. These decisions can bring success or failure. Nowadays, with the development of information technology solutions, there is a whole range of opportunities for decision-makers to make decisions that give their business a market advantage. Given that large amounts of data were generated due to the integration of information systems within the company, it was necessary to use the Decision Support System (DSS).

DSS is a tool that the organizations use to extend and support decision [1]. Power determined it as an organized collection of technology, tools, data and system with supporting hardware and software by which an organization collects and understands information from environment and business and turns it into a basis for marketing action [6].

There are many methods to make decision and there are the huge range of domains in which decisions are made. The concept of DSS is very wide. Basically, DSS is an IT system, which supports our decision making. When we make a decision, we choose between alternatives. DSS supports the estimation, the evaluation and or the comparison of alternatives that is how it helps us to make a right choice [1].

There are five generic DSS types, which are determined based upon the dominant technology component. These are: Communications-driven, Data-driven, Document-driven, Knowledge-driven and Model-driven Decision Support Systems [13].

Communication-driven: In the early 1980s was developed the Group Decision Support Systems (GDSS), which benefits from expanded communications capabilities that became available in the computing architecture. It was the first wide category of DSS. The development of networking technologies in the last 30 years made this type of multi-participant decision support much more powerful and more ordinary. Groupware supports electronic communication, scheduling, and other group productivity and decision-support-enhancing activities. For example the two-way interactive video, chat tools, email and electronic white boards are included in this category.

Data-driven: Executive Information Systems (EIS) and data-driven spatial Decision Support Systems, management reporting and file drawer

systems, data warehousing systems and Online Analytical Processing (OLAP) are included in this group. These systems emphasize access to and treatment of a grate database of structured data, particularly a static time-series of internal company data and in some systems, external data. The simple file systems make available the most basic level of functionality by query and retrieval tools [13]. Dhar and Stein said, the highest level of functionality and decision support are provided, what is linked to analysis of large collections of historical data by OLAP with the Data-driven DSS [4].

Document-driven: Swanson and Culnan called it Document-based system. These are formation to help managers handle and regain the unstructured web sites and documents. There are different kind of storage and processing technologies integrated in it, to provide complete document retrieval and analysis [19]. The access is provided by the web to huge databases, for example database of videos, images, pictures [5].

Knowledge-driven: To the decision maker, these DSS can suggest or recommend actions, because it has a specialized problem-solving „expertise". It means, these DSS has knowledge about extraordinary domain, the DSS understands the problem with it, and has proficiency at solving some of these difficulties. It operates with heuristic models, which called inference engines [13].

Model-driven: Simple analytical and statistical tools provide the most elementary level of functionality. These are just rare data intensive, however the decision maker itself should provide the data, which will be analyzed to help the user. To the decision maker these systems should provide a simplified representation of a situation, which is understandable for him [12] Accounting, financial, optimisation and representation models are used by the system [15]

Wu says, Business Intelligence (BI) is the successor of DSS. He writes in his article, that the new generation of DSS applications evolved into BI systems [21]. According to Loshin (2012), BI includes data warehouses, business analytics tools and knowledge management. In this wording, the author views Business Intelligence as a process, where from data will be information, and from information will be knowledge [10].

This information may belong to the entity's production and service. These are used in enterprise information systems. They may also be related to management tasks. This information will be used in management information systems. Based on this time development, we distinguish the following types of management information systems: Transaction Processing Systems (TPS), Management Information Systems (MIS), Office Automation Systems (OAS), Decision support systems (DSS), Expert Systems (ES), Top Management Information Systems (EIS), Integrated Enterprise Management Systems (ERP), Business Intelligence Systems (BI) [20].
We should talk about the big data as well. With the fast development of information-technology tools and the need of handling, analysis and interpretation of huge interrelated datasets resulted a new scientific field. It is called big data according to Baranyi [2]. This application can be useful for companies, so it has also appeared in DSS.

However, the cloud begins to form a major stream of business environments. Businesses are increasingly questioning "when and why" is needed for the cloud, and at the end of the acceptance process the "how" is being sought [8]. According to Botos's study, micro-enterprises in the agricultural sector do not look for cloud services or big data, because the enterprise management system is not used either [3].

In order to carry out an economic activity, a functioning business association is needed (in the most cases). There are the next categories of companies in Hungary: General partnership (kkt), Limited partnership (bt), Joint enterprise (kv), Limited liability company (Kft.) and Company limited by shares (Rt.) [6]. Categories and numbers of food, beverage and tobacco companies in Hungary in 2016 are the following Kft: 5396, Rt: 176, kkt: 51, bt: 768.

In this article, we examined, what DSS technologies are used and how widespread is the use of the different technical solutions by food companies. We also tried to determine the factors that influenced the success or failure of DSS from the incoming questionnaires.

2. Matarial & Methods

Hampel's (2010) research focused on the sources of information, which used in various areas of the operation and on decisions of different subject. In addition, it focuses on the main features and capabilities of information systems, which are used in businesses. He tried to involve 250 food companies in his research, but only 27 of them took part in it. Totally of 59 people participated in this survey. Almost half of

the executives belonged to the top managers (47%), while 53% were among the middle managers. The proportion of the limited liability company (47%) and the company limited by shares (51%) was close to the same. The remaining questionnaires were returned from cooperative leaders [7]. Sasvári investigated how widespread are the information systems in Poland. 155 companies completed the anonymous questionnaire. 26% of respondents were micro-enterprises, 34% were small enterprises, 25% were medium-sized enterprises and 15% were large companies [17]. Sasvári studied also single indicators, to get to know, what existing information and communication technology is used by enterprises. He used the available Hungarian related reports issued by KSH, and international data (Statistical Office of the European Communities) as well. The author also worked with more than 6.000 items from secondary information sources [9].

Botos et al [3] research focused for rural micro and small to medium enterprises about their significant economic role. With their survey they wanted to get answer that how firms use internet, which are the relevant ICT for them and what it depends on. They asked several SMEs from a settlement – which is a typical in North Hungarian region and its main profile is agriculture – to fill their survey. 106 SMEs were interviewed. Their sample represents well the enterprises of this settlement. In most cases these were service and commercial businesses and firms which related to the agriculture. The objective of the research was to analyse the use of DSS solutions in Hungarian food businesses. In order to answer the questions, we made an on-line anonym questionnaire survey with 43 questions in five groups of questions among Hungarian food companies. The questionnaire was sent randomly, regardless of corporate size and geographic location. The sample of completed questionnaires is not representative, therefore the results of the study can only be interpreted in the scope of the companies involved in the research. Only 31 of them filled the questionnaire completely. Nearly 84% of filling companies were SME (61.3% micro-enterprises), while 16% were large enterprises.

3. Results

In Hampel's research 53% of executives worked for a company, which has revenue over than 1000 million HUF and 47% worked for a company, which has revenue between 51-1000 million HUF annually. Companies which employ more than 1000 employees reported only 7% of the survey. Most of the executives worked in a company, what employs 50-99 people (29%), 100-149 (17%), 500-999 (12%) or 250-299 (10%). Most questionnaires were sent back from the companies that processed meat processing and preservation (19%), dairy products (17%), bread and fresh pastry production (12%), poultry processing and preservation (10%).

62% of the 26 food business companies used some kind of integrated enterprise information system. In 46% of the surveyed companies, there was a single integrated information system that provided the internal information for the leaders. 15% operated one or more subsystems of more than one integrated enterprise information systems. Where multiple types of (non-integrated) information systems were used, managers could not clearly decide, there is any connection between these or not. A half of the companies used standard system, suits to their needs. Nearly the same number of businesses (46%) worked on information systems, what was developed by external experts. There was very little proportion of companies (15%), which using their own software, what was developed by internal professionals.

In most companies (81%), information systems were used for accounting and related tasks. Second place was for the billing function (77%). The respondents used frequently the information systems for office tasks, to record stockpiles, customer and supplier data. These functions were used in 73% of the surveyed companies. In just over three decades, computer programs were used to assist logistics tasks and other tasks (19%). In only 15% of companies, information systems were used to resource planning.

According to the leaders of these companies, their system supports the analysis of the current situation, but only 31% of the systems are available for forecasting.

In the financial field, 8 of the 48 sources of information listed are favorably used by managers: planning, controlling, finance and accounting, purchasing, executives, business cards, internet and banks.

In the field of production factors, there are relatively few, only three sources of information, which about the leaders think it has paramount importance: production, managers and planning information.

In production and service, production is the first, most important source of information, followed by five others: planning, executives, sales, subordinates and inventory management. Using other sources of information is negligible. Leaders believe that marketing and trade decisions require the most information sources, the ten others, which also require more information: planning, controlling, business cards, managers, finance and accounting, customers, internet, owners, competitors, and inventory management [7].

The most common among our fillers was the integrated corporate information system and the management information system. Nearly a quarter of them use such systems and have the same proportion of those who plan to introduce the customer relationship management system. Only one from the respondent business uses BI applications. In 4 companies, BI has not work yet. There are 20 companies that do not use and do not plan to introduce it. As about 60% of respondents are micro-enterprises, the existence of BI applications can't be expected within them (Fig 1).

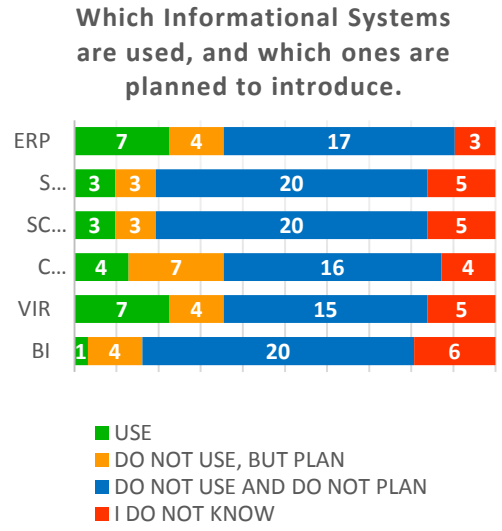

Fig. 1. *Current and planned use of information systems*

From the received answers, it also turns out that it operates only in eight companies and eight more plans to introduce some information system. In view of this and the above, the use of ERP and VIR is very popular.

According to Moe there are various reasons why companies choose to invest in traceability systems in the production industry. Some of them are: to avoid of uneconomic mixing of low - and high - quality raw materials, to optimize the use of raw material for each product type and to improve process control [11].

Rózsa examined the ERP systems of SMEs in Hungary. Nearly 100 companies answered her questionnaire. Only 12% of them do not use, and do not plan to use any kind of ERP systems. Some of the fillers' reasons were, this means extra work for them, and they do not want to spend long time on the introduction of it [16].

Sasvári studied the polish enterprises. The polish micro-enterprises are also largely characterized by the lack of information systems and 73% of them do not plan to introduce them. While only 5% of micro-enterprises use TPS in Hungary, 36% use it in Poland. Polish think the introduction of SCM (24%) and CRM (23%) is important. 15-20% of micro-enterprises said the same about OAS, ERP, BI and SRM. Polish small businesses do not really have an information system, and 59% of them do not even plan to introduce any system. The intranet is also used here. TPS, ERP and SRM have an important role in this country. They are used at around 30% for small businesses. ERP systems in Poland are more widespread than in Hungary. According to Sásvári, nearly twice as much small businesses use it there, than here. 33% of respondents consider the introduction of SCM and 28% of them think the same about TPS. 76% of polish medium-sized companies have OAS systems, 75% operate intranets, 66% have TPS systems and 65% use ERP systems. 48% of this businesses use BI. Also, SRM and CRM systems have a 48% usage rate. MIS and EIS operate in 35-40% of medium-sized enterprises. The proportion of other information system types is between 20-30%. 23% of medium-sized enterprises plan to introduce EIS and 21% of them intend to use ERP, SCM. Almost every polish company has an intranet, and which not, these plan to introduce it. 70-80% of these type of companies operate TPS, OAS, ERP and CRM systems, and 50-60% of them use SRM, SCM, MIS, DSS, EIS and BI systems [17].

For every business, it is important to recognize the information that is relevant to them. This allows data analysis to be designed to represent data in a form that facilitates recognition of relevant parts for a company. Such tools are included in the following diagram with average response values. Value 1 means that the device is not relevant to the company, and 5 is that it is very relevant (Fig. 2).

The graph shows that the Excel spreadsheet is the most relevant for the companies. The other

items fall below 3, which means that they are not even moderately relevant for the businesses.

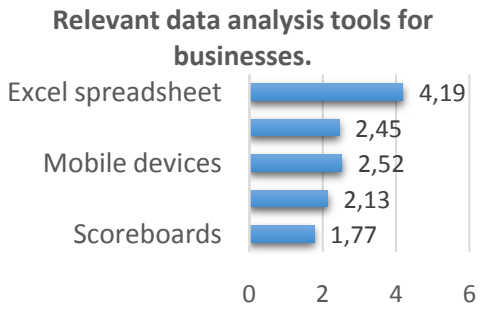

Fig. 2. *Relevant data analysis tools for Hungarian businesses*

Sasvári says, the infrastructural background of e-commerce is well-founded for small and medium sized companies in Hungary, however the same can't be said in the case of microenterprises. Only 48% of the microenterprises have local wired network. It is 20% lower than the national average. Among small and medium-sized companies the penetration of the same network is 70 %, and 94% among bigger companies and institution. If we study the penetration of wired communication in various economic sectors, we will see the average is about 70%, however the widespread of it in case of „Electricity, gas and water supply" is 100%. „Compulsory social security", „Public administration and defense", „Mining and quarrying" are also above the national average. (Both of them are over 80%.) „Other community, social and personal service activities" is penetrated 57%, „Agriculture, hunting and forestry" is below the average with it 57% of penetration. The other sectors show signs of average penetration.

The remaining studied sectors (except the „Electricity, gas and water supply") were below the average, ranked only in the 24th place in the European Union.

Sasvári studied the next single indicators, to get to know, what existing information and communication technology are used by enterprises: sales systems, purchasing systems, production, logistics and/or service systems, reordering systems (stockpiling), invoicing and payment systems, other computer systems. The electronic invoicing systems have the biggest penetration among companies, average of 46%. Regarding all indicators „Agriculture, hunting and forestry" was below the average [18].

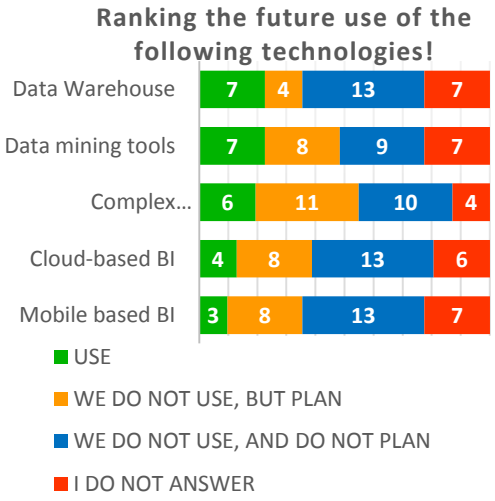

Fig. 3. *Future use of BI technologies*

It is noticeable that Cloud-based BI technology is being used by four respondents, and Mobile-based BI technology is being used by three businesses, which is controversial when we think, that using business intelligence applications has been selected by an enterprise when using information systems was asked.

Botos et al. studied the basic of the result of the principal component (1. Function supporting internal and external Internet relations; 2. Importance of online presence; 3. Function supporting purchasing activity; 4. Importance of online advertising; 5. Sales promotion function) and cluster analysis, to get to know, how wide spread is the ICT in the agro-enterprises. Services of agro-enterprises are not necessary for their activities because they communicate with partners and clients personally. Trust is really important factor for these companies. They carry out the purchase and sell the products just few places. The result what they got, was not surprising in line with usage of internet services. These firms use internet to send e-mails and search general information. Sad to say, the microenterprises related to agriculture (family farms and individual) chose these two services in almost all cases. The larger companies use internet not only for keep in touch with partners and clients but also for marketing and innovation goals. These firms have a very low e-commerce activity, but in purchasing and sales, internet has effect reducing costs [3].

As we see, the agri-food sector is not wild penetrated by ICT. Earlier it was even worse. The European Union projects were tendered for the Future Internet technologies in this sector. AgriXchang was the name of the tender which

run the period of 2010-2012, SmartAgriFood was a program for the period of 2011-2013, and FIspace was the latest. It finished in 2015. The aim was these programs, to develop agro-food data exchange services, because there was a huge lack in it. (Future Internet National Technology Platform Establishment of Agriculture and Food Industry Chapter Hungary)

Conclusions

Nowadays, it is increasingly difficult to find a business where, directly or indirectly, there is no aspect of the electronic economy. Even if you do not have a personal computer or perhaps a mobile phone, your accountant will need to process your company's certificates using IT tools. The emergence of information economy - information as a factor of production poses new challenges. Economic actors are often faced with the situation that they are forced to respond more quickly and efficiently to the economic challenges not only for their success but also for their survival. In this paper shorty summarized the different categories of DSS and presented in a few words the Business Intelligence (BI) as the successor of DSS. We listed the management information systems based on its time development and shortly mentioned the „future's" applications. At the end of the introduction, we introduced the types of Hungarian companies and the number of Hungarian food, drink and tobacco manufacturing companies. We complemented our resource with the studies of Hampel, Sasvari and Botos and described the electronic economic systems of Hungarian food businesses. To sum up, it can be said that DSS systems are not widely spread in our country. It is important to point out that in our own research the small and the micro-enterprises represented themselves in larger numbers, however in Hampel's study, medium and large companies were those, who sent back the filled questionnaires. Using a second study of Sasvári, we briefly described the electronic business systems which are used by Polish companies.

Overall, we can say that the ERP system is the most widely used integrated corporate governance system. The "future" technologies in our country are less used by food companies. The most relevant data analysis tool for them is Microsoft excel. Of the technologies to be used in the future, the data warehouse is the most popular, while cloud and mobile based BIs are the least popular for Hungarian micro, small and medium-sized enterprises.

However, it is not really surprising. According to Botos at. al., the micro-enterprises do not look for cloud services or big data, because the enterprise management system is not used either.

It can be concluded that DSS have already proved useful in the food industry and there are great possibilities for extended usage.

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RESEARCH OF CALORIFIC POWER FOR WOOD SPECIES IN ROMANIA

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Abstract: *Biomass in the form of wood was and will remain a fuel material that remains deep in people`s consciousness as a material that can provide the energy needs of the population at a low price. The importance of using wood biomass also results from the fact that it belongs to the category of renewable energy sources, it is a neutral fuel source in terms of carbon in dioxide emissions in nature and is found in large quantities in nature in various forms. Biomass is considered a renewable source with a major potential in green energy production, which deserves to be capitalized in the field of energy production on the world market. Biomass is one of the oldest known combustible materials.*

Keywords: *biomass, calorimeter bomb, value calorific, wood*

1. Introduction

During the year of the energy crisis and the Gulf War , and recently at the beginning of the third millennium (2001-2010), when Romania and the European Union saw dependence on gas and oil imports from the Asian countries, they focussed on the production and research of gas production, heat and energy from alternative energy sources. Current energy sources present on the energy market of fossil fuels, nuclear resources, and renewable energy resources.

The evolution of energy production from fuels has been divided into three main periods.

According to Piriou`s (2013) description the first stage considered in the decomposition of fossil fuels. The second stage begins when the energy crisis the occurs. The third stage consists of exploiting and ensuring the energy needs.

The European Union wants energy production from alternative sources to reach the 20% ceiling in 2020 of all energy produced.

Fossil and nuclear fuels, according to research conducted by the European Union, seriously damage the environment.

Biomass is one of the renewable energy sources used by the oldest type of people. Until the 18 th century, biomass is considered to be an important source of energy for cooking, heated.

2. Biomass-renewable energy source

Biomass is a renewable energy source, because it grows year after year, it is widespread in the world and presents low costs composed to fossil fuels.

Residues of biomass from which the fuel material is produced may include wood and wood waste, agricultural cereals and waste resulting from their production, municipal waste, livestock manure, active biomass and algae.

Biomass is one of the forms of renewable sources that can be converted into solid, liquid and gaseous fuel, and which can generate both heat in the form of heat by combusting it and electricity through conversion processes.

Biomass in plant form is a complex compound and varies from one species to another. In the last vegetable matter has the potential to contribute to the production of energy.

Biomass takes part in the carbon cycle in nature by using carbon dioxide. Carbo dioxide participates in photosynthetic processes during tree growth, but is also the component that causes a complete burning during wood combustion.

At present biomass is about 12% of primary energy production in the world, and in developing countries it occupies 40-50% ot he energy supply needs.

The woodworking plays an important role in many European countries. Normally, bark and sawdust are organic matter that shouldn`t pollute the environment.

World biomass comes from the wood that be used industrially, from the quantities of wood to be processed, from the wood and woodworking.

From the point of view of origin, the waste is classified as waste origin from the woodworking processing. In the municipal waste system in Romania, the largest share is domestic waste (about 81%), while street waste and building and demolition waste account for 10% and 9% respectively.

Biogas is obtained from anaerobic transformation and is produced from a wide variety of biomass and waste type. The main industry, domestic consumers and agricultural source to be used as raw material is manure from livestock forms, especially cattle and pig farms.

3. Invasiveness of knotweed

The installation used to determine the calorific value of wood biomass was the XRY-1C explosive type burner produced by Shanghai Changji Geological Institute in China (fig.1).

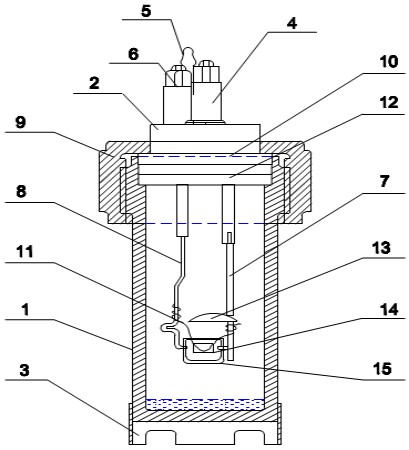

Fig. 1. *Calorimeter bomb*

The method of determining the calorific value of wood material refers firstly to the preparation of the raw material, the to the actual determination and ultimately to the final result.

The test sample 1 binds to the cotton yarn 2 and put in the crucible of the bomb 3.

Connect the spiral nickel wire 4 to the sample and the cotton yarn, the place the protective cap 5 correctly.

The crucible is connected to the calorimetric bomb cap 6 by 2 electrodes 7 and 8, which continues with the electrical coupling bomb of the calorimetric bomb 9 and 10.

By bombing cap, the bomb 11 is coupled throught the stator 12 to the oxygen cylinder, introducing 3 atmospheres.

In figure 2 is presented working diagram.

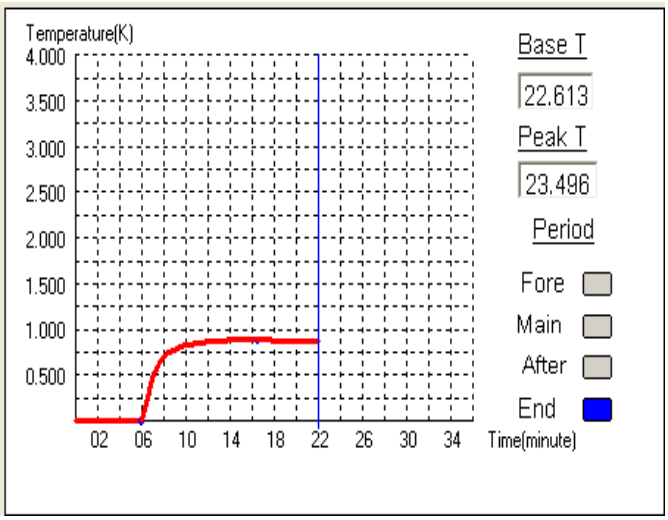

Fig. 2. *Working diagram*

The test contains three distinct periods (fig.3).

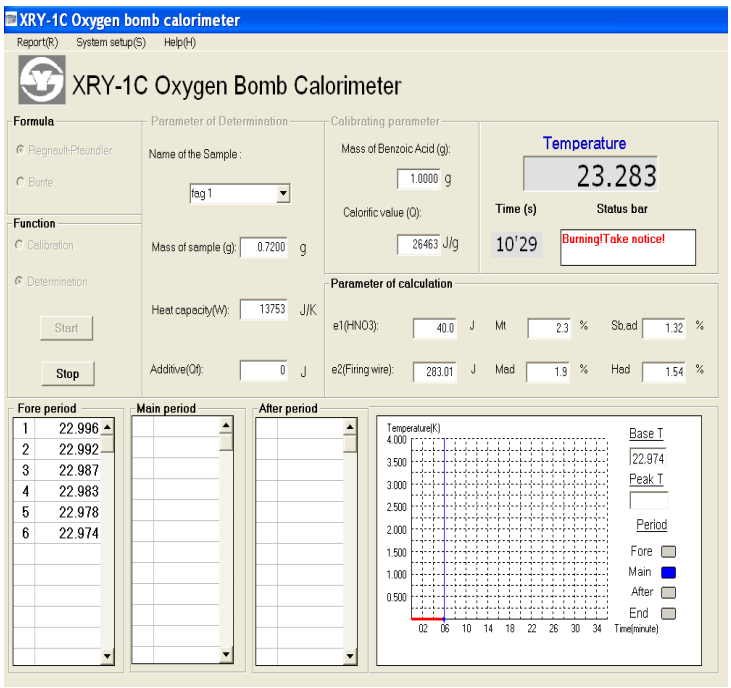

Fig. 3. *Three distinct period at calorimeter bomb*

The initial period aim to determine the the temperature variations of the water in the calorimetric vessel due to the heat exchange with the outside before the combustion.

The main period start with the ignition of the sample and consequently increases the temperature of the water in the calorimetric vessel.

The final period aim to determine the average temperature variation of the water in the calorimetric vessel due to heat exchange with the outside.

For carpinus betulus, m1 = 0,650 g, U = 0%, gross calorific value is 18741 kJ/kg, net calorific value is 18268 kJ/kg ,m2 = 0,9620g, U = 10 %, gross calorific value is 16748 kJ/kg, net calorific value is 16558 kJ/kg, m3 = 0,998 g, U = 20%, gross calorific value is 14992 kJ/kg, net calorific value is 14613 kJ/kg, m4 = 1,4040 g U=50%, gross calorific value is 9724 kJ/kg, net calorific value is 8776 kJ/kg.

In fig.4 is presented variation valorific value for carpinus betulus.

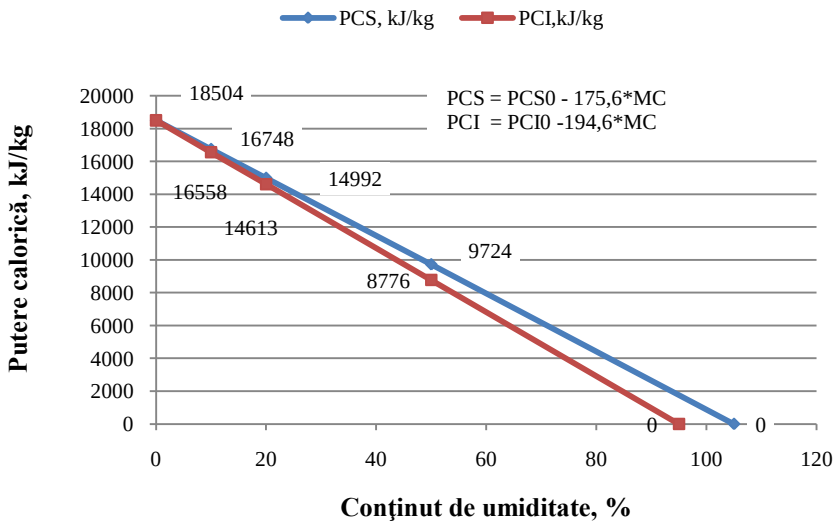

Fig. 4. *Variation value calorific for carpinus betulus*

For fagus silvatica, m1 = 0,6900 g, U = 0%, gross calorific value is 19647 kJ/kg, net calorific value is 19051 kJ/kg, m2 = 1,1420g, U = 10 %, gross calorific value is 16878 kJ/kg, net calorific value is 16639 kJ/kg, m3 = 0,8750, U = 20%, gross calorific value is 14497 kJ/kg, net calorific value is 13930 kJ/kg, m4 = 1,4260 kJ/kg, U=50%, gross calorific value is 6994 kJ/kg, net calorific value is 5801 kJ/kg.

In fig.5 is presented variation valorific value for fagus silvatica.

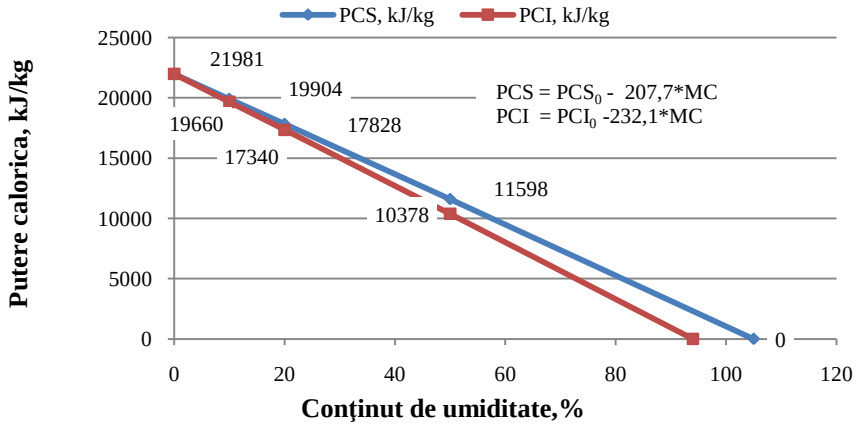

Fig.5. *Variation value calorific for fagus silvatica*

Conclusions

Wood biomass is made up of all the remains of timber exploitation and processing. That is why the dimensional categories are very varied. Variability also exists in terms of wood moisture, starting with humidities of 10-12%, up to its considered a renewable energy source, a renewable fuel material;

Combustion of wood biomass is a ecological combustion, because it is a renewble regenerable material.

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ANALYSIS OF APPLICATION OF ERP SYSTEMS AT HUNGARIAN MEAT COMPANIES

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Abstract: *Companies involved in the meat supply chain are facing even tighter laws and regulations and in recent years (sometimes due to scandalization exaggerated by the media) people's concern has been growing rapidly against this field of the food industry. These problems pose a serious burden on companies in the meat industry, so interest and demand for enterprise resource planning (ERP) systems are constantly increasing. Therefore, the introduction and development of information systems is indispensable for the competitiveness of meat companies. Nowadays, the effective use of information systems not only improves the efficiency of corporate activity, but is also a precondition for staying on the market. The purpose of our research was to evaluate the application of information systems at Hungarian meat companies, find out which modules of the systems are used and what benefits they gain for them. For our investigations, we have designed a survey in which a larger group of companies can be chosen to answer the questions relevant to the topic*

Keywords: *Information systems, ICT, meat industry, ERP systems, competitiveness.*

1. Introduction

Enterprise Resource Planning systems have become indispensable for companies due to technological advances and the spread of digital solutions. Until the 2000s the major ERP vendors were mainly targeting he high end of the market (companies with more than 1,000 employees) (van Everdingen, et al., 2000). The effective use of information systems is now a precondition for staying on the market and improving the efficiency of business activity (Sadrzadehrafiei et al., 2013). In the case of companies with a large client base, their introduction is highly recommended, in case of most smaller companies, it is generally enough to use certain subsystems, most often the financial modules (Ahmad - Cuenca, 2013). What we call integrated enterprise management systems also include complex software solutions that draw up the company's physical material and information flows, model the company's entire business activity, and filtering the data provide it to managers; helping them make a more rational use of resources and more efficient production. A company can be greatly influenced, improved by the use of an ERP system (Oláh et al., 2017; Wallace-Kremzar, 2006). The usability of such a system does not depend on the size of a company: the functions can be used at retail companies just like any large company (Kovács, 2011). When a company decides to introduce an ERP system, it not only purchases tools and software, but the system also means strategy and business advantage for the company. However, the effectiveness of introducing a system is not immediately visible, this is mostly a long-term process (Gaál, 2009). ERP systems have a great deal of leverage on productivity and economical use of materials, which improves logistics development. It plays a vital role in the proper functioning of inventory management, it works properly when the data is up to date. The ERP system not only monitors inventory management but builds up information for the leadership on this basis, allowing managers to make quick and easy decisions (Hágen, 2014; Hágen - Peer, 2015; Szikora, 2002).

During an earlier survey (van Everdingen, et al., 2000) respondents were asked to indicate the three most important criteria for selecting their current information system (lowest cost, user-friendliness, fit with business procedures, scalability, support, and training). Their results show (Figure 1.) the most important criterion used in selecting an information system is the best fit with current business procedures. About one-half of the respondents have mentioned the

best fit in the top three criteria ranking, while more than one third mentioned it as the single most important one. Hence, compatibility with the business procedures is the major issue for companies to decide on a new system (van Everdingen, et al., 2000).

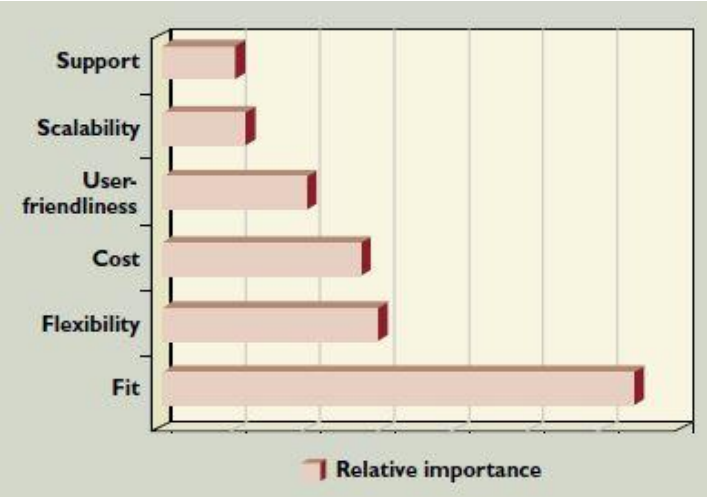

Fig. 1. *Criteria for information systems selection (van Everdingen, et al., 2000)*

In order to prevent social damage along the meat product industry laws and regulations, controlling this industry, are getting even tighter and in recent years (sometimes due to scandalization exaggerated by the media) people's concern has been growing rapidly against this field of the food industry. These problems pose a serious burden on companies in the meat industry (Dupuy et al., 2005; Hu et al., 2009), therefore, interest and demand for enterprise information systems are constantly increasing. Thus, the introduction and development of information systems is indispensable for the competitiveness of meat companies. The operators of the verticum can only make good economic decisions and react to changes in the market if they bear the necessary information (Herdon et al., 2011; Hotváth, 2014).

A great advantage of ERP systems is that the data generated during production and processing is recorded at the site of the production and can be processed immediately (Hetyei, 1999). However, the selection, implementation and operation of an integrated enterprise information system entails many difficulties and pitfalls. Approximately 40% of ERP implementation projects are not initiated as planned (budget, time frame, objectives). When selecting a resource-intensive system, it is important to be careful, especially for companies in the food sector, because of its specific requirements.

In the food sector, the flow of information is slightly modified, considering that the production management system is obliged not only to gather information from the immediate environment (supplier), but also from its suppliers and producers. The ERP systems integrated and used in the food industry must meet the following functional requirements (Herdon et al., 2006):

- Accurate follow-up in accordance with EU Regulation 178/2002.
- Consideration of future follow-up requirements for GMO preparations.
- Guaranteed quality with paperless quality assurance management.
- Accurate risk limiting registration, TRU (Traceable Resource Unit) registering the partner delivered to (silent recall actions are possible).
- Controlled delivery quality (joining deliverers into the complete value chain)
- Transparent mix management for greater process and product safety.

Especially in the meat sector a process-oriented, recipe-based ERP application can successfully management the variability of products and processes, accurately account for all raw material and finished products, and significantly improve product costing, production predictability, and scalability far better than a generic or discrete-oriented application.

2. Materials and Methods

We have designed a survey for the research, in which a larger group of companies can respond to questions relevant to the topic. During our work, we have visited several companies to make

a case study, yet they can be regarded unique and may not necessarily reflect the general situation. As there is no comprehensive and accessible statistics on this topic, we have mapped the Hungarian situation with questionnaire surveys. The questionnaire survey was commissioned by Ipsos for the Department of Applied Informatics and Logistics at the Faculty of Economics at the University of Debrecen on a random sample basis from 13 September to 10 October 2017 among poultry breeding, pig breeding and meat processing companies. This survey was used to study the usage patterns of information and communication technology (ICT) services that aid information flow. Our goal, among others, was to get answer to the following questions:

- What are the communication technologies used by companies in corporate contact?
- How is the development of enterprise infrastructure influenced by competitiveness?
- Do they use any information system to support their processes?
- If so, how important are some modules, what modules are they using, what they are planning to introduce?
- What are the advantages and disadvantages of the introduced information system?
- What product identification technology do they use?

As a result of the survey, we worked with a sample of 103 elements. The sample, according to the most important background variables of the pattern is presented in Table 1.

Table 1. *Pattern on the samples by major background variables (N=103)*

aspect of variable	variation of the pattern
number of employees per capita	
1	36%
2-9	33%
10-49	19%
50-249	5%
250 and more	7%
annual net revenue	
Under 10 million Ft.	0%
Between 10 and 100 million Ft.	24%
Between 100 and 500 million Ft.	35%
Between 500 million and 1 billion Ft.	14%
Above 1 billion Ft.	27%
main activity of the business	
0146 swine farm	18%
0147 poultry farming	46%
101 meat processing, -preserving, manufacture of meat	36%
region of the activity	
Southern Great Plain (Bács, Békés, Csongrád)	33%
South-West Hungary (Baranya, Somogy, Tolna)	8%
Northern Great Plain (Hajdú, Jász, Szabolcs)	22%
Northern Hungary (Borsod, Heves, Nógrád)	7%
Central Transdanubia (Fejér, Komárom, Veszprém)	10%
Central Hungary (Budapest, Pest county)	8%

Source: own editing, 2018

One of the most common objectives of researches is to segment the companies surveyed, in other words, the formation of groups that are relatively homogeneous and distinct from each other. Classification or grouping is a very important field of study in statistical methodology and is

also a key issue in practical applications. For segmenting, the multivariate statistical method widely used in scientific research. The cluster analysis was chosen, which is a summary description of grouping and a grouping methodology (Simon, 2006).

Since the cluster analysis is very sensitive to outbound data, we first extracted them using a simple chain method and removed using the SPSS program. As we did not know how many groups we would like to create we used the hierarchical model the Ward method that combines the clusters that will have the smallest increase in the internal variance in the aggregation.

Data was analysed using SPSS software after conversion. The results of our cross-tablets by SPSS show how much real data was counted from existing cases and how much was left out of it. We used descriptive statistical methods (percentage distributions, standard deviations, averages) to evaluate the questionnaires, to quantify the common occurrence frequency of the different occurrence of the variables we used the actual contingency table. Pearson's kh-square ($\chi 2$) test is a statistical procedure suitable for testing discrete variables. The null hypothesis of the test represents independence, ie. the estimated and the measured data are the same. The level of significance of the khi-square value of the scoreboard generated by SPSS shows the independence of the variables. If the significance level is less than 0.05 in the calculation of the khi-square, we can determine whether there is a relationship between the variables (Balogh et al., 2015).

3. Results

By cluster analysis, companies were classified into homogeneous groups based on three relevant variables (Table 2). The three variables were the number of employees, the company's annual net revenue and the development of ICT. As a result, three clusters were obtained. The first group consists of small-sized companies with medium-turnover and medium-level ICT development, the second is medium-sized companies with high turnover and good ICT development and the companies in the third group with high number of employees, medium-volume turnover and medium- level ICT, Cluster 3 is only 6.8% of the companies.

Table 2. *Distribution of business clusters and their preferences*

Ward Method		Number of employees	Annual net turnover	Level of ICT
1	Mean	1,33	2,62	2,69
	N	52	52	52
	Std. Deviation	0,474	0,491	0,805
2	Mean	2,64	4,59	4,15
	N	44	44	44
	Std. Deviation	0,750	0,583	0,820
3	Mean	5,00	2,29	2,86
	N	7	7	7
	Std. Deviation	0,000	,488	1,069
Total	Mean	2,14	3,44	3,03
	N	103	103	103
	Std. Deviation	1,164	1,135	0,902

Source: own editing, 2018

According to the aim of the article, it was relevant for us to examine the relationship between the developed clusters and the use of ICT tools as information systems at the companies, (Table 3). Analysing the relationship between the clusters and the use of information system, we can conclude that there is a demonstrable relationship between the enterprise groups and the use of the information system. The third group of companies, consisting the fewest companies uses the least information system.

Table 3. *Relationship between company groups and use of information system*

			Ward Method			
			1	2	3	**Total**
Is there an information system in use at the company?	Yes	Count	27	33	2	62
		% within Ward	51,9%	75,0%	28,6%	60,2%
		% of Total	26,2%	32,0%	1,9%	60,2%
	No	Count	25	11	5	41
		% within Ward	48,1%	25,0%	71,4%	39,8%
		% of Total	24,3%	10,7%	4,9%	39,8%
Total		Count	52	44	7	103
		% within Ward	100,0 %	100,0 %	100,0 %	100,0%
		% of Total	50,5%	42,7%	6,8%	100,0%

Source: own editing, 2018

We have examined what sort of relationships between the clusters and the most important characteristics of their investigations can be observed. We have determined that access to the clusters is influenced by the use of the information system. Based on these, the individual groups were characterized (Table 4).

Table 4. *Characterization of companies classified in the clusters*

		1. cluster	**2. cluster**	**3. cluster**
Clustering variables	Size of staff	small	medium	big
	Net revenue	medium	big	medium
	Level of ICT	medium	advanced	medium
Variable only in the characterization	Use of information systems	neutral	mostly yes	mostly no
Category name		*developing*	*developed*	*undeveloped*

Source: own editing, 2018

Based on our findings, we can conclude that the first group includes enterprises who are open to the use of information systems and their use of ICT could be improved, so we called them developing companies. The second cluster is formed from large companies, where the use of ICT is advanced and mostly use information systems. They deserve the name of the developed companies, while in the third cluster, medium-sized companies have been involved, most of which do not use an information system and their net revenue is only moderate. This group therefore got the name of undeveloped companies.

Conclusions

It is clear that ERP systems greatly improve the potential for identify preservation, management of the supply chain and firm level management. In the market, there is a need for industry-specific software solutions primarily at medium-sized companies. The ERP software has been introduced for almost every big company, so demand in this segment is declining heavily. Medium-sized businesses require practical systems free from unnecessary features, which usually does not meet standard software offered to large corporations. In this market segment, vendors-specific software developers can gain

direct competition advantage because they can create special processes with mirrored imaging systems without incorporating unnecessary features. It is more and more apparent that different companies have different requirements for systems in different economic sectors. A standard software cannot fully, or only at significant expense, can meet sectoral requirements.

According to our results, companies that run higher turnover and have higher revenue use ERP systems or individual standalone programs for implementing and tracking workflows. Hopefully, this tendency will continue, helping the growth of smaller businesses as there is a statistically significant relationship between revenue and the use of information systems.

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PSYCHO – GASTRONOMY STUDY, WITH APPLICATIONS IN „BODY MELOIMPACT" ON DIRECTION OF MELO-PSYCHO-NUTRITION

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Abstract: *The study gathers fragmentary notices of gastro physics linked to aspects of sound psychological impact in relation to the feeding manner, to gastronomy, in the idea to achieve a unitary concept of psycho-gastronomy on direction of phonic impact upon nutrition. The paper methodologically approaches vibration frequencies in the relation between harmonious sounds and the living body. There are defined the collocations* ***„body meloimpact"*** *(for all positive, neuter or negative situations, at all species) and* ***„melotherapy"*** *(when the effect is a positive one, especially in relation to the human species). There is emphasized the* ***melo-psycho-nutrition method*** *necessary to harmonize all the elements of the process of body meloimpact, with consequences upon the equilibrium of the metabolic balance concerning nutrition and food assimilation. It is aimed to increase productivity at plant or animal level, as well as to improve the dynamic equilibrium concerning food digestion at human species too. In this last case there are especially analyzed aspects linked to culinary production, to psycho-gastronomy and to practical applications at the level of restoration system and, in general, at hospitality industry.*

Key words: *food, gastro physics, melos, nutrition, psychology.*

1. Introduction

As a recent science, the ***gastro physics*** field shows the way our senses combine and even reciprocally condition between them, in order to influence our perception about what we eat. It is the science that analyses the combination between gastronomy and psychophysics in order to find out the multitude of ingredients (apparently peripheral) that influence our organoleptic perceptions (of flavor, taste etc.) and, practically, direct our culinary choices so that we may make the difference between a memorable meal and one that may be forgotten.

Gastro physics is the new science about aliment consumption beyond food (Spence, Ch., 2017), that presents itself as an immense and fertile research field, full of interesting promises, and of whose results will benefit many people and many fields of study, which bring their contribution to this approach: nutritionist, neurology, psychology, sociology, public health, marketing, design… To synthesize, in order to have a maximum profit of every meal, we must „think not only of what is in our mouth, but also of what is in our mind".

In this context, it is not only the taste, smell and aspect of a dish, but also different exterior factors, with no connection with the food, that also affect the respective dish, making it seem better or less good. In fact, our senses interact in order to offer us the complex sensation we have when we eat or drink something. Eating is a multi-sensorial experience, implying much more senses and much more impressions than it has been thought up to now (Gaceu,L., 2016; Shamtsya, M., 2016).

The **gastro physics** demarche starts from a series of observations and questions. For example: Did you know: that the white wine seems better in a red or blue lit room? That we eat our fill quicker and it seems to us we have

eaten more if we eat from smaller plates, than when we eat exactly the same helping from larger plates? That the cover weight we use when eating complex food, or the dish arrangement in the plate influence, without knowing, our opinion about those courses? Why 27% from the drinks bought on planes are tomato juice? Which is the effect of dishing up food on little, or red, or circular plates? Why do we eat 35% more food when we eat with another person and 75% more with three? Which is the influence of the background music (the subject of the present study)?

At the same time, other approaches, like for example from neurology, lead towards changes of paradigm, linked to the *„human brain flavor system", laying* the bases of a new scientific field: ***neuro gastronomy*** (Shepherd, G.M., 2013). It starts from the hypothesis that the smell sense has been diminishing during human evolution, which led to the idea that this flavor basic component is essential and much stronger than it was previously thought. The neuro gastronomy principles are based on the smell mechanic, especially by the manner how the nose is stimulated, after having introduced dishes in the mouth cavity. While eating, the brain conceptualizes odors as spatial models, and from these ones, together with the other senses, it is in fact built the flavor perception. Shepherd correlates its research with tendencies in nutrition, diet and obesity, so that the process ends with human perceptions about smell and flavor in their relation with the neural basis of conscience.

We practically direct towards gastronomic psychology, biomedical based on *nutritional psychology*, i.e. the link between emotions and the way how we feed ourselves. We speak about the psychology of food consumption, respectively nutritional psychology, which is the science of the manner nutrients affect the spirit state and the behavior. This field examines the relation between food and our inner experience, enlightening biological physiological mechanisms, influenced by nutrient contribution that are at the bases of our mood and behavior (Lusk, Jayson L. et al., 2014; Kiesel, K. et al, 2011; Zimmerman, F., 2011; Spurlock, M., 2004; Jarvis, W., 1983 and others).

In this context we may analyze the place **background** in which we feed ourselves, taking into consideration the psychological impact (Gruia,R.et al., 2015; Shamtsya, M., 2016). Therefore, the taste of a dish doesn't mean everything. We are facing the feeding act with much more senses than we imagine and there is a big number of elements that influence what we think and feel about that specific dish. There become important the music we hear, the light around, the dish color, the cutlery size, even the name courses are introduced to us – all these influence our perception and may subtly make the difference between a „decent" meal and a great one (Stănescu, Mihaela, 2014).

Psycho-gastronomy has old roots. One of these ones, linked to *sound perception*, shows that, starting from ancient customs, as, for example, incantations (White magic) practiced in ancient times, and they are whispered, underlying certain key words by incantations that give off a certain frequency that enters in resonance with the human body. Not to speak about text messages, when music is accompanied by words.

Nowadays has incantation, especially music, lost its force to penetrate the human psychic producing real transformations? Obviously not, only people's ignorance has increased. It becomes relative even the mere observation of the balanced relation of "restaurant music" in relation to the consumed food (what type of music assures a greater pleasure, creates harmony or, more directly said, a better psychic mood and a better digestion? Or which one has a negative impact?).

The paper has as an objective the study of sound perception and their psychological impact in relation to the feeding manner, to gastronomy. Recent studies try rehabilitation from scientific perspective of music influence upon the body, evidently complementary with the psychological impact.

Therefore, we mention that there is known the action of sound waves both upon plants that better spring and grow, and milk productivity, at cows in whose stable s one sings, or it is listened to music. That is how there are rediscovered multiple music virtues: it doesn't have only a cultural esthetic role or function, as some people think at first sight, but also a physiologic, magic function, of ***body impact*** and even a ***therapeutical state*****.** From here also come the collocations **„body meloimpact"** (for all positive, neuter or negative situations, at all species) and **„melotherapy"** (when there is a positive effect, especially in relation to the human species).

2. Working method

The research methodology is based on VIBRATIONAL FREQUENCIES, on other principles of physics and, especially, on the demarche of quantum mechanics. The sound study and their parameterization have as an analyses element the indicator: Hertz (Hz). It is known that Hz indicates the number of cycles per second of the respective wave and that man has the capacity to perceive frequencies between 15 Hz and 20.000 Hz. There are approached study methods of sensorial analyses, principles of neuro gastronomy and concepts of gastro physics.

3. Results and discussions

Quantum mechanics generally admits that matter is nothing but vibration. Decomposition in the smallest components practically leads only to the existence of particles and waves. Atoms (nucleus and electrons that spin around it) confer a specific set of **vibration frequencies** on every substance, by number, electron and orbit form. From here it is inferred that nothing is solid mass, only surrounded nuclei from where they endlessly rotate. Everything is in motion and vibration 9from time to time) with an incredible speed (Emoto, M., 2006).

It may be considered that every individual (organism) vibrates at a certain small frequency, similar in fact to all the things that are vibrating and vibrate at their own speed. *Aliments* are not an exception, having of course their own frequency, here having a generous research space.

The fact that everything is in vibration implicitly means that all that exists create and emit sounds. Extrapolating, one may say that particular frequency of all aliments and organisms may be interpreted as being sound and, from here, their parameterization by the Hertz (Hz) indicator. The human being intrinsicly has a universe of frequencies that overlap, and the result is a "symphony" of cosmic proportion, being thus able to resonate with the rest of the world, therefore including and maybe more direct, with FOOD.

The process practically indicates that sounds with the same frequency enter in resonance, i.e. there is produced a sonic wave of low frequency, which is called ***resonance.*** We may deduce that organism and food are in resonance, meaning that the vibrations that characterize them attract themselves and interact between them.

Vibration frequencies inevitably lead to equilibrium or disequilibrium. When frequencies are fundamentally incompatible, they can't enter in resonance. But after the theories of the Japanese Masaru Emoto (2006), there may also be resonance when frequencies are not identical.

In this context, when the difference of frequency is double, 4 times, 8 times … etc bigger, or half, a quarter etc, the result is resonance. As for example, at the piano the *La note* has 440 Hz and the same note *La* lower with an octave has 220 Hz. It results that, for every sound, from every level, there is a resonant sound at all other levels. The human being has the capacity to use the scale *Do, Re, Mi, Fa, Sol, La, and Si* in order to create the desired music. It is met the fact that most of the things from nature emit stable frequencies. Harmony becomes possible and, why not, the harmony organism-food by organism meloimpact or, where applicable, by melotherapy.

All these lead towards the complex idea to overlap principles, so that we may cure: **music in relation to nutrition, by the "melo-psycho-nutrition" concept.**

Observations about the link between music and nutrition date since old times (see the cassette).

N.B.

Legends speak about a god - PAN who, when playing his panpipe used to bewitch animals, for instance goats danced. Orpheus domesticated wild animals with his lyre, and in the Bible it is told how David played his harp and so released Saul who felt better and the evil spirit separated from him.

Along times it was observed the benefic effect of music with pleasant sonorities (at unpleasant sonorities the effect being zero or negative) and more than that, at certain endowed persons there were observed fantastic feelings, similar to those from the fairy tale world, or alien, paranormal, expressed in the present language. Today we see directly or in different movies how certain animals "sing", emit melodious sounds by training. Many of them have melomaniac's behavior, they gather around the radio sets, seeming to listen.

Unfortunately, the modern man being extremely occupied does not save any more when listening to the flute or harp. Childhood has disappeared from man, the capacity to wonder facing beauty, the unprecedented, which offers freshness and vigor (probably in the subconscious).

Lacking information, it seems extremely important both to denounce the harmful effects and to inform people of all ages, and especially youngsters, about the truth about music and its virtues, its benefic, healing effects, therapy *by music.* Therefore, **melotherapy** is the method of time for himself. *„The process of enchantment"* does not any more take place healing or attenuating symptoms by listening to music. From technical-biological perspective we may state that the *organism impact by music* has stimulating effects upon organism physic (at all worlds) and, of course, also upon psychic, in case of people. From this perspective, in our opinion, joining the musical sound to the alimentary act in relation with the body impact and the human psychic, we may define the "*melo-psycho-nutrition"* collocation.

MELO-PSYCHO-NUTRITION is the organism meloimpact method, in the idea to stimulate the human organism by the sound, both from *"psycho-metabolic"* perspective in relation to digestion, and „*psycho-hedonic"* one in relation to the wellbeing offered by food, with the delight or pleasure to eat, as well as, in the *infrahuman world,* to stimulate animal or plant productive performances, through music in relation to the feeding act.

No wonder that it has become normal that, in public houses, event meals are accompanied by music (as a rule backing music or pop, jazz, musical show).

In that direction, a series of questions may be asked: What music has the virtue to stimulate or cure (melotherapy)? What music has a negative impact (digestion perturbations etc.)? What rhythm does it have and in what relation to the organism biorhythm? In what a surrounding is it listened to (in a restaurant, in a bar, in special halls etc.)? Which are the listening conditions? Which has to be the sonorous level? And other questions are possible. A number of experiments are still necessary.

Without entering into details, we consider as a research way the idea that music has the capacity to **induce info-energetic equilibration** by the ***bioresonance*** phenomenon induced by sound vibrations, especially by instrumental music (it requires though profound scientific studies). Besides, to understand music without words is what confers it power and value. They say there wouldn't be music and it wouldn't be needed if it were possible to verbally express what is communicated through music: all the variety of human feelings, natural phenomena, suggestion of seasons, of the moments of the day and night with its ineffable fascination, mirific sceneries, force and energy mobilization or, on the contrary, despair, their dissipation in the galactic ocean.

The human organism may be analyzed on the bases of bioresonance principles, indicating normal or sickly functioning of different organs, including linked to the digestion process. For instance with the *Rayocomp PS 1000 Polar* device, through the incorporated resonator (antenna of dipole type), one may generate basic frequencies of the researched organs that are thus recognized through the resonance phenomenon. The bioresonance phenomenon is objectified through ***biotensor*** that will have a movement of linear oscillation in case the bio field is chaotic, signifying dysfunctions (illness) or it will have a circular movement, in case the corresponding biofield is ordered, this being in general a health sign and, implicitly, a nutritional equilibrium sign.

This way we may experiment both the effect of the "melodic field" (melos) upon organism and, as for nutrition, *food vibrations* upon organism, as well as harmony (or lack of harmony) in common created upon organism, by *musical environment* during meals. We mean compatibility ***and complementarities of music vibrations with the vibrations of the alimentary act (of food and digestion) based on melo-psycho-nutrition principles.***

Starting from the hypothesis that aliments, as raw materials, but also as prepared dishes, the more "natural" they are, the bigger energetic, vibration and informational potential they have. In this sense, every aliment has practically its own vibration „pattern". If the chosen aliment resonates with the disharmonic frequency discovered at bioresonance testing, that aliment and the musical environment will transform the blocked field and the disharmonic frequency into

an ordered field and harmonic frequency, achieving equilibrium (regulation).

In the experiment, the linear movement of the loop will become a circular movement. With the help of the Rayocomp device one may test the most appropriate aliment or dish from metabolic point of view. One may also prepare a complex aliment from informational perspective, containing thus both information of functional type (example of the metabolic cure) and information of disharmonic oscillations (when the impact is a negative one upon organism).

Food probably acts through bioresonance mechanism. It may be considered like a "melody". Blocked frequencies are characteristic for every consumer, having different blocking degrees. The succession of vibration frequencies characteristic to the analyzed organs (including sick ones, where applicable) is unique and it must resonate with the specific "melody" offered by the environment (food plus musical environment), freeing necessary energy to decode vibrations for high nutrition efficiency or to trigger the cure, where applicable. For animals, there is pursued to influence production (an already mentioned example, quoted in several experiments, is milk production, but also benefic influences in cultivating plants).

The **rhythm** is the essential element that confers the state of comfort or discomfort and that connects the auditorium (listener) to the time feeling. It is known that during intrauterine life the fetus listens to its mother's heart beating. It is with this rhythm that he gets accustomed under a context of maximal protection, at body temperature. The drum rhythm at primitive peoples and in medieval and classic music we retrieve the well known rhythm from our life of beyond memory, hoarded in the subconscious.

Even if there are not yet relevant studies linked to a better nutrition and digestion in relation to a certain melody, as a supposition, we may anticipate that the harmony of classic music will have a beneficial effect (but it will have to be parameterized and quantified at physic and psychic level).

In the **restoration system**, as a rule, one recommends to listen to at least three musical pieces. Their choice in made in function of the educational level, the musical culture, the emotional estate, the event people are taking part, the moment along the menu and, if the case, the diagnosis when a person is ill. During the audition, the environment temperature is recommended to be $20\text{-}22^0$C (with the limits between 18 and 24 degrees).

Therefore, **melo-psycho-nutrition**, also like melotherapy and other methods of the organism meloimpact, may be used both with prophylactic aim and curative one. In the future, when studies will confirm, the gastronomical specialist is the one who may select musical fragments in function of the menu and the consumer (!).

So that music subtly acts, on the system of vibrations and bioresonance, we consider that classic, cult composer's music in public alimentation saloons (no matter the consumer's cultural degree) will have a beneficial effect in the alimentary act. On the other hand, in our opinion, a market success might have ***touristic programs based on musical circuits adapted to the spirit of that program***: classical music, or ethno-folkloric, or modern touristic route, or different combinations having also as events of the circuit shows and musical auditions the visit of museums with this specificity, or of memorial houses of great composers. For sure, the organized meals will be accompanied by the music specific to the place or the theme of the given touristic program.

The restaurant music becomes concrete by being a specific musical genre, where the scene is the restaurant and the spectators are the clients sitting at tables. If the artistic act succeeds to be professional, the restaurant music and the musician or authentic fiddler become the basic element in liveliness and good humor. Maybe without thinking it is made in fact *psycho-melo-therapy*. Psychologically, the consumer lives next to such a musician who *„becomes a god to whom the table companion, being very happy, makes reverence, or the friend on the shoulder of which he cries when being full of sorrow, or maybe the start of hope of the depressed intellectual, or the poor person's or the satisfied one's joy, at the same time",* as a famous musician maestro was noting (Albeșteanu, V., (OUT4FOOD, Nr.20, 2016).

The creation of „ambience" in a restaurant is also linked as an application of psycho-gastronomy. Thus, to choose a melody, certain illuminations are recognized in these problems. What are new are researchers concerning the color of napkins, on the supposition that the napkin color psychologically influences the dish taste (Lundgren, Linda, 2017). It is exemplified that pink napkins increase the perception of the

sweet taste, blue napkins underline the egg flavor and the one of Indian hot food, and orange or yellow napkins will diminish the salt sensation.

Melo-psycho-nutrition is therefore a specific and implicit component of ***the health generating cuisine*** that contributes to harmonize the feeding manner in relation to mental and emotional equilibrium, i.e. a distinct side in integronic alimentation: environment - food - organism. We therefore speak about elements of integration, of multiple integration through which alimentation is structured and defined from the equilibrium and harmony perspective. We thus refer to ***integronic dynamics*** of alimentation processes (Gruia, R., 2014), taking into consideration its nutritive, metabolic, genetic, ecologic and psychological components, specific to the sustainable alimentary act.

Conclusions

1. The study of sound perception and their psychological impact in relation to the feeding manner, to gastronomy, shows that every individual (organism) vibrates at a certain low frequency, the same way as, in fact, all things that are in vibration and vibrate at their own frequency, that may induce the compatibility and complementarities of music vibrations with the alimentary act vibrations (of the food and digestion) on the bases of melo-psycho-nutrition principles.

2. Foods have their own frequency, that may be interpreted as being sound and, from here, their parameterization by the indicator Hertz (Hz), so that the particular frequency of all aliments, on one hand and of organisms, on the other, by organism meloimpact or, as it is the case, by melotherapy, may lead to psycho-nutritive equilibrium, to organism-food harmony.

3. Melo-psycho-nutrition is a method of organism meloimpact, of stimulation y sound of the human organism both from "psycho-metabolic" perspective in relation to digestion, and „psycho-hedonic" in relation to the well being estate offered by food, with delight o pleasure to eat, and, in infra-human world, of stimulation of animal or plant productive performances, through music in relation to the feeding act.

4. Applications of melo-psycho-nutrition may be found in the complementarities between musical tours and themes of touristic programs, i.e. professionally well programmed restaurant music (selection of musical samples in function of menu and consumer) may lead to satisfaction, or even to exceptional feelings, which makes the melo-psycho-nutrition process be an implicit component of health generating cuisine, thus contributing to harmonize the feeding manner in relation to mental and emotional equilibrium.

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POSSIBILITY OF AGRI- AND FOOD INDUSTRY APPLICATIONS IN HIGHER EDUCATION

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Abstract: *With the growing up the so-called net generations, Innovative solutions came into focus. These solutions do not intend to motivate students by placing them under external duress, rather they create an inner dem and in the students in accordance. Nowadays, gamification is a more and more widely applied method, thus it can satisfy both corporate and educational purposes, depending on its field of application. This is the reason why the new approach towards education is becoming more and more popular at an international level (Kapp, 2012). Moreover, the problem of the lack of motivation can also be solved by the application of this (Pásztor, 2014). The purpose of this research is to reveal the correlations between gamification and the motivation of students, besides estimating the possibilities of the introduction of a gamified business application into higher education in Hungary.*

From the applied methods, we would like to highlight the questionnaire (Pilot), which was distributed among the students of agricultural science, in the Faculty of Economics and Business at the University of Debrecen. In the questionnaire, which was anonymous, besides generic questions like sex, age, qualifications, etc., we also covered fields such as education, the knowledge of gamification, and educational programs.

With help of the pilot questionnaire, we could get a closer look at the relationship of agrarian students with gamification and their knowledge about the method. It can be stated, that this new form of studying is generally not known by the students of our faculty but those who had heard the term before, used the technique in connection with an application e.g. a language-learning program. Most students have a positive attitude towards the introduction of gamification, which could be used in many other fields according to them. As a result, we would like to emphasise the discussion of the possibilities of introducing this into food industry related majors.

Based on their opinion, it can be concluded that students could imagine introducing it into other areas as well, so the development of an application that aims the students in food industry related majors specifically is not out of the question. This would explain and test the knowledge of the material in the most important subjects with the help of gamification. The agricultural and food sciences play a strategically important role in countries like Hungary, thus with help of gamification we could help the recruitment of qualified professional and make their education a bit more interesting.

Keywords: *gamification, motivation in higher education, applications in education.*

1. Introduction

Internet plays an increasing role in our daily lives as, for the members of Generation Z, it has become almost essential recently. This goes far beyond the growth rate of television and mobile phone, and with these becoming cheaper and cheaper, the Internet became accessible for almost anyone. It can be used to collect information, to play games, as a form or relaxation, to exchange messages, or to study (Bognár, 2009). Online games are characterised by continuous innovation as one of the key elements of our digital society is technological innovation. Our society is often referred to as an information society, a term which was first mentioned in this form in Japan in the 1960s (Z. Karvalics, 2007). With the spread of new technological tools, the various IoT solutions became widely accessible and, of course, cheaper. With the growing up the so-called net generations, innovative solutions came into focus. These solutions do not intend to motivate students by placing them under external duress, rather they create an inner demand in the students in accordance with the age of "Motivation 3.0" (Pink, 2010). Nowadays, gamification is a more

and more widely applied method, thus it can satisfy both corporate and educational purposes, depending on its field of application. What we mean by gamification are the techniques or methods used when a game-design element is used in a non-game context (Deterding et. al., 2011). Gamification plays an increasingly important role in business and in education as well (Kapp, 2012). This is the reason why the new approach towards education is becoming more and more popular at an international level. Moreover, the problem of the lack of motivation can also be solved by the application of this (Pásztor, 2014). For this reason, we believe that it is important to do a research in the topic of gamification in higher education. The purpose of this research is to reveal the correlations between gamification and the motivation of students, besides estimating the possibilities of the introduction of a gamified business application into higher education in Hungary. Former literature review also reveals that when some game elements was used in education and training has been applied across all levels of education from primary schools (Chang et al., 2011) to secondary education (Giannakos, 2013), and higher education (Dib – Adamo-Villani, 2014). In our opinion, a gamified application could be useful in agri-food programs, with the help of which students could learn the material easier.

2. Materials and methods

From the applied methods, we would like to highlight the questionnaire (Pilot), which was distributed among the students of agricultural science, in the Faculty of Economics and Business at the University of Debrecen. In the questionnaire, which was anonymous, besides generic questions like sex, age, qualifications, etc., we also covered fields such as education, the knowledge of gamification, and educational programs. We did the primary data collection with help of GoogleForm, while for the evaluation we used the SPSS program. In many cases, we used indicators with help of which we could declare the presence or the absence of knowledge by using questions. As for the questions, we tried to exclude all subjective answers. It included open and closed questions as well, however, the answers indicated the type of the expected answer. To edit the survey, we used the funnel technique, which means that we started from general questions to specific ones, this way, synchronising the thoughts of the person filling out the questionnaire with the survey itself (Babbie, 2008).

We also covered the question of motivation, and last but not least, the possible fields of science where the introduction of a gamified business application could be feasible. In the second half of the questionnaire, we measured the satisfaction rate of a self-developed business application, and we examined the possibilities of its improvement. The number of measured data is 45, which contains the results of students of several classes and faculties.

We should also mention the method of sampling. Nowadays, network sampling is becoming a more and more popular method, which means that questioning happens on a large network or through social media. This is also called snowball-sampling by scientific literature (Goodman, 1961). The main point is to share our survey on a social media platform and encourage the people we know to do the same.

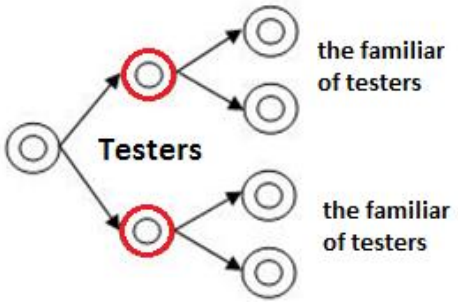


Fig. 1: *Model of the snowball-sampling*
Source: Own figure, 2017

This way the number of those filling out the survey can grow exponentially and within a short span of time, thus we can reach many people in a short time. One of the disadvantages is that our friends and the friends of those people do not cover the entire population, meaning that it cannot be considered representative in this case. As an advantage, we could mention that it is a time and cost-effective method that can also be used successfully to reach unspecified groups (Kmetty – Simon, 2013). In my case, the number of measured data is quite low (45), however, in the first round, the people questioned were the Alfa and Beta testers of the CrownKing application. This way, we could reach 10 out of the 15 testers, hoping that more people had heard about the application from their friends. Thus, we have made the survey available for others as well. This last period was restricted to a short time (3 weeks) to filter out rolls that were too big. Therefore, most probably, it did not reach the

third- or fourth-rate friend network, meaning that there is a greater chance that the survey reached those people who could have heard about or had already heard about CrownKing from one of the testers.

3. The possibilities of gamification briefly

If we would like to know where and in what fields gamification can be useful, we have a simple case, because the answer is quite simple; in many areas of life. However, before thinking of some sort of miracle, we must point out that in some sectors, such as marketing, HR and education, it is possible to achieve rapid and outstanding results by its implementation. Interestingly, game play has evolved around the turn of the millennium as a marketing method, but it has been constantly evolving over the years. Coca-Cola and StarBucks were among the first to introduce it, but at that time it still served only for marketing purposes. Nowadays, several marketing managers apply it as part of the marketing mix, and many gaming applications have been marketed through incentives to buy or just because of CRM. In addition to this, many forms of education and methods can be applied and are applied in the field of education, however, learning and transfer of knowledge based on game-based approaches are highly effective as students can learn the material more effectively than with help of traditional education. Several simulation applications have been developed using this method to help students learn a school subject or university course and reduce the burden placed on the instructor. All in all, the method from the marketing sector has now entered into a number of areas, as a result of which it has partly changed. Gamification as a method can have an on-and-offline approach. In this publication, we investigate the online solutions or the ones supported with help of informatics. The essence of this method is that as a result of a flow experience one gets preoccupied with a work session, therefore, he/she can reach the target more efficiently and faster.

4. Decision theory and gamification

Gamification can also be linked to leadership decision making, as a situational decision can have serious consequences in many areas of life. However, with help of this method, using a business-specific business simulation application, we can avoid these consequences and educate future managers for better leadership decision-making. Decision and decision support as concepts, because of their interdisciplinary nature, appear in several disciplines. In economics, it refers to the statistical methods used to examine the expected value-utility. Researchers and trainers working in different fields have formulated different approaches to what we call decision. We would like to highlight two of them:

"The decision is a deliberate choice between action variants in a given environment, where action modes are explored as action opportunities in the pre-decision phase of decision-making processes." (Kindler, 1991)

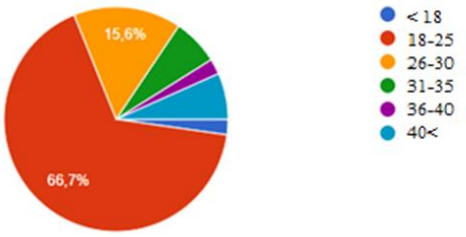
"Decision-making is always a responsible risk-taking." (Rókusfalvy, 2002)

Looking at the previous concepts, it is apparent that their basis is almost the same, that decision always involves some action or choice. Rókusfalvy, however, identifies it with the risk assumption, which in all cases involves responsibility. In this approach, we can talk about the economic side strictly. So, interpreting the readings, we can say that decision always means choosing between alternatives, which are accompanied by the criterion and risk, and the person who needs to have the appropriate competencies. There is, of course, a likelihood of risk, which can be used to maximize our own usefulness. At this point, we can make an optimal decision, but in reality there are more alternatives and more equally optimal solutions and decision choices that can be applied to a given situation, then a leader with the right competency, who can make the best decision with their system approach, gets appreciated. In the near future, gamification could play an essential role in decision making and could play a huge part in the development of leaders with the right competency.

5. Results

With help of the pilot questionnaire, we could get a closer look at the relationship of agrarian students with gamification and their knowledge about the method. It can be stated, that this new form of studying is generally not known by the students of our faculty but those who had heard the term before, used the technique in connection with an application e.g. a language-learning

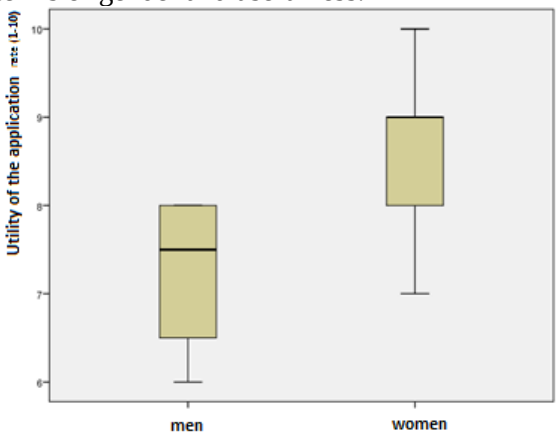
program. This is not surprising as the special features of the method have been used in the field of education for a few years. Most students have a positive attitude towards the introduction of gamification, which could be used in many other fields according to them. As a result, we would like to emphasise the discussion of the possibilities of introducing this into food industry related majors. We would only like to highlight the most important results of the pilot in the next section. In terms of age, the majority (66.7%) are aged 18 to 25, but over three-quarters of the fillers are 30 or 30 years of age, as shown in Figure 2. However, 3 of the respondents were over the age of 40 and 1 person under the age of 18. Overall, as testers and students were the primary target group, we could find the appropriate people in terms of age groups to fill out the survey.



Source: Own figure, 2017

Fig. 2: *The respondents grouping by age n=45*

With help of a box-plot, the following figure shows how the fillers perceive the distribution in terms of gender and usefulness.

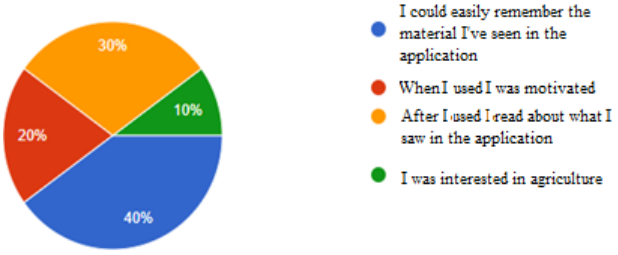


Source: Own figure, 2017

Fig. 3: *Box-plot; the relationship between gender and utility n=45*

They had the task of marking the usefulness of the CrownKing application on a scale of 1-10. It can be seen that women considered our self-made gamified application more useful. While 8 points for men were the highest, 10 points for women were also given in response.

In the next section, we wanted to find out what influenced the users most, moving them into a positive direction, while testing the CrownKing application. At that time, we also added the advantages and opportunities of gamification to the responses. On the first place, nearly half of the respondents replied that they were more likely to note the lessons learned than if they had learned something about the subject in the traditional way. It is not surprising that the students looked up the things read or seen in the application on the Internet, so they managed to learn voluntarily by stimulating their curiosity. Of course, motivation was also increased in 20% of respondents.



Source: Own figure, 2017

Fig. 4: *The positive impacts from users may experience while testing the CrownKing application n=10*

Gamified business applications: The basic element of simulation applications is the fact that we are examining the decision-making situation through a simplified model of reality. There are many variations of simulation applications, but the simplest of them are simple simulators. Here we include: Farm simulator, Euro Truck simulator, which gives the user the experience of driving. Additionally, business simulators are of course the most widespread in the business world as well as in education. With business simulation applications, young people, students or apprentice economists, can encounter many life-like problems where bad decisions do not have real consequences, so we also save costs simultaneously. We are trying to describe briefly two outstanding applications, which are intended to demonstrate good practice. Finally, we would also like to show own development and other possibilities in food industry related majors.

Maximulation

The application is primarily designed for business people, so the creators primarily recommend it for corporate trainings. It aims to provide practical examples to help motivate your users while expecting active participation from

the user. The specific purpose of the game is to place its users into different economic situations while they work together as a team to simulate a company. Strategic, HR, marketing, stock management and commercial decisions should therefore be taken, alongside a changing market environment. There are, of course, several teams involved in the application at the same time, so a kind of competitive situation can develop, and everyone can try different positions if they rotate in the workplace (I1, 2016).

Consumergoods Midi

The purpose of the game is to simulate students' decision-making processes that can be used in real life. In one industry, 5 teams are competing in the same market. You can model the operation of a company that produces and sells durable consumer goods in the application. Inflation does not burden players and geographically production takes place in a moderately developed country. For the fast development, the economy is on the rise at the beginning of the game. It consists of several periods that represent a quarter and at the end of each quarter they need to make decisions about the next period. At that time, they need to determine the products, prices and advertising. There is also the possibility of borrowing so players can expand their development resources. For each industry, the minimum and maximum selling price is defined as deterministic. The application can be excellent for economics students, as it is possible to make more statements during the game, which can only be interpreted and analyzed in depth by means of pre-studies - finance, accounting and economics (I2, 2010).

CrownKing - a self-developed example

In our previous research, a gamified application was made, which is partly a business simulation application - since it realises the full agribusiness - and as the agricultural line is strengthened, it is also a farm simulation application. As a result of the topic choice, the application got the name CrownKing, referring to the golden crown system in Hungary, which was tested by 15 agrarian related BSc students in the second phase of the development. The application includes commerce, production, processing, quests, questions, statistics and weather modules that meant to strengthen realism. The game is set in Hungary where the primary goal is to produce, process and acquire newer areas. Users can learn about different agrotechnical operations, crops and yields, and the basics of trading and the market by using the app in different decision situations. In our previous article we have also presented the application details (Kovács et. al, 2017), but we would like to emphasize the services module as a similar or improved gamified application could be used to train food technicians.

Source: Own figure, 2017

Fig. 5: *The CrownKing user interface, services*

As seen in the previous figure, in the services module users can process different raw materials and produce finished products. On the left side of the page you will find various services, of which you can see the pálinka making function opened. Here we can produce distillates from different fruits, which can be sold with higher added value. As an opportunity, we would like to point out that, in case of food industry trainings, a similar gamified application could be excellent to define a range of products consisting of several components. You can get to know technology, resources, costs, revenue while using the app, so you can get extra knowledge in the world of

work. Additionally, with daily quiz questions, you can make the application more colorful, from which students can also learn in a gamified way. As an alternative, we would also mention the inclusion of an online exam surface, which can also help educators reduce administration.

Conclusions

Based on their opinion, it can be concluded that students could imagine introducing it into other areas as well, so the development of an application that aims the students in food industry related majors specifically is not out of the question. This would explain and test the knowledge of the material in the most important subjects with the help of gamification. It can be seen that gamification is applicable in many areas and is an effective method of motivation. Following a brief introduction of the self-developed example, the idea has emerged to improve the application further, targeting food industry students, but as every development, we need to do a precise needs survey first. In conclusion, it can be said that agricultural and food sciences play a strategically important role in countries like Hungary, thus with help of gamification we could help the recruitment of qualified professional and make their education a bit more interesting.

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WINE ROAD - AN INSTRUMENT FOR THE PROMOTION OF RURAL TOURISM IN SOUTHERN DOBROGEA

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Abstract: *The main purpose of this paper is to highlight the specific activity of wine tourism, and opportunities of its valorization for sustainable economic development of rural communities in this area. The potential of wine tourism consists of vineyards, resources of natural landscape and cultural heritage. By mapping are proposed and highlighted touristic routes named "wine road" in the studied region. Management efficiency of wine tourism from Southern Dobrogea is an important factor to promote the sustainability of rural tourism in this region.*

Keywords: *Dobrogea, rural, sustainable, tourism, wine.*

1. Introduction

Southern Dobrogea is a predominantly rural area [1] in South-Eastern part of Romania, situated between Danube and Black Sea Coast, providing natural environment favorable to viticulture, as a traditional activity in this region. It's a multicultural geographic area [9], with many touristic attractions, as: South part of the Black Sea Coast with sunny bio-climate and beaches for seaside resorts, marine and Danubian lakes, protected areas, cultural and historical sights, rural collections of traditional folk art, villages with local customs of Southern Dobrogea's inhabitants [7].

The relief with sunny slopes, slightly tilted along Danube and Carasu Valley (currently Danube - Black Sea Canal), the continental-temperate with Mediterranean influences in West part, and Pontic influences in East part, soils developed on limestone geologic substrate are main factors that favored development of wine-growing [7,10].

The wine tourism is a type of activity linked wine-growing and touristic resources of the rural area. As a traditional activity, the wine-growing could contribute to the prosperity of the rural local economy [6]. This activity can be integrated into a thematic touristic route [8,13], which aims to capitalize the wine-growing potential associated with local touristic attractions.

The purpose of this study is to define the specific tourism with wine-growing potential in Southern Dobrogea, and finding solutions for sustainable development [5,6] of the rural community in this region.

2. Material and Method

The research methodology consists of bibliographic documentation and field research to identify villages with high wine-growing potential, specific customs and traditions, and opportunities of its valorization for this kind of tourism.

It was considered the presentation of rural aspects of some villages focused on identify local resources, the infrastructure, opportunities for patent approval and licensing experts in enotourism and enotouristic equipments, recreative or cultural touristic activities, opportunities of organization and practice of wine tourism [12].

The wine tourism potential consists of vineyards, natural and cultural resources, authentic local customs and traditions [2,3,4].

The analysis of spatial repartition of vineyard areas [11], their correlation with local touristic resources, the processing statistical datas, the mapping [14] using an open-source GIS soft, will highlight the proposal of touristic routes named *Wine Road*.

Thus, there is the opportunity to develop of representative villages, that will emphasize touristic flows, through authenticity and uniqueness, revitalizing the rural settlements with

natural, ethno-cultural, and wine-growing potential from the studied region.

3. Research Results

Wine-growing resources of Southern Dobrogea totals about 10,000 ha [15], dispersed distributed, but concentrated in two main vineyards [11]: *Murfatlar* and *Ostrov*. It highlights other secondary areas, which include villages with small vineyards, named by the main village, as *Topalu* or *Cobadin*. Figure 1 shows a distribution of wine-growing potential of studied area.

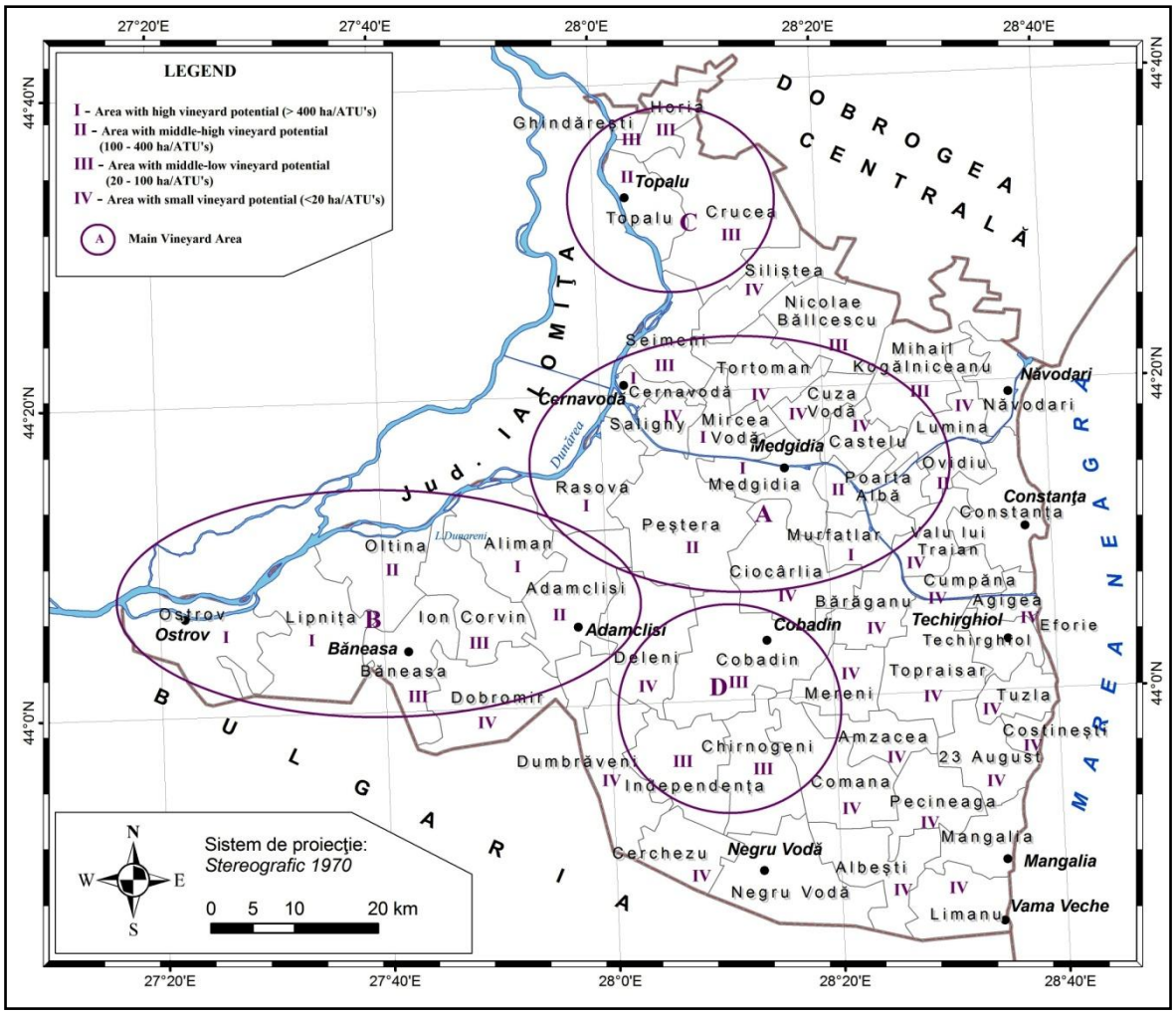

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Fig. 1. *Main vineyard areas of Southern Dobrogea*

The size of vineyard from an administrative-territorial unit (ATU) is not a criterion for valorization of wine-growing area for agritourism. According to the vineyard area included, rural ATU's are grouped (table 1) as:

- *ATU's with high vineyard potential* (8);
- *ATU's with medium-high vineyard potential* (6);
- *ATU's with medium-low vineyard potential* (11);
- *ATU's with low vineyard potential* (25).

Figure 2 shows the percentage of wine-growing areas from Southern Dobrogea: with the largest value on studied area distinguish *Murfatlar Vineyard* - 64%, *Ostrov Vineyard* - 30%, and two secondary areas, *Topalu* - 3%, *Cobadin* - 2%.

In the *Murfatlar Vineyard*, the wine-growing bordering Murfatlar, Medgidia, Cernavodă towns, and form the great *Winery of Murfatlar* (over 6,300 ha). The vineyards stretches along to Danube - Black Sea Canal, most of wine-growing are located in terraces. This area has warm climate with high sunstroke and air temperature, optimal conditions for special kinds of grapes for natural sweet wines. The soil, limestone, is very favorable for production of sweet, dry or semidry wines [10]. The representative kinds of grapes are *Chardonnay*, *Pinot Gris*, *Sauvignon Blanc*,

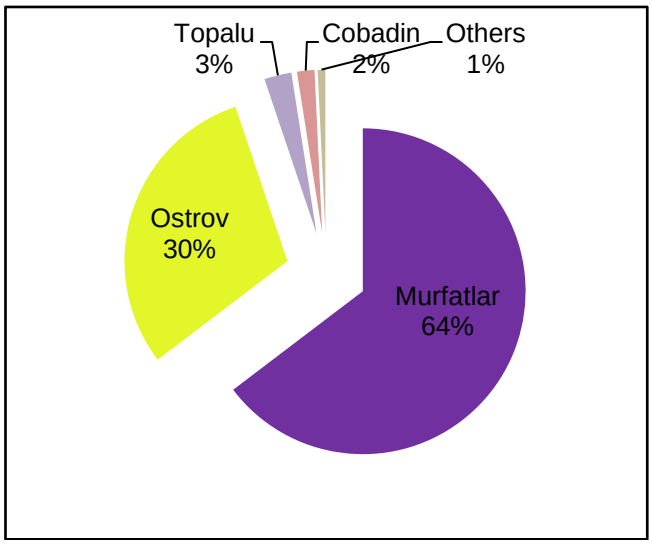
Pinot Noir, *Merlot* and *Cabernet Sauvignon*, but also varieties developed here, as *Columna*, *Mamaia*, or old kind *Feteasc*ă *Neagr*ă [12].

Table 1

The repartition of wine-growing areas on administrative-territorial units from Southern Dobrogea

Category of vineyard potential	**Vineyard area**	**Administrative-Territorial Units**
High (I)	> 400 ha	*Murfatlar, Medgidia, Lipnița, Ostrov, Rasova, Aliman, Mircea-Vodă, Cernavodă*
Medium-High (II)	101-400 ha	*Adamclisi, Ovidiu, Peștera, Topalu, Poarta Albă, Oltina*
Medium-Low (III)	21-100 ha	*Seimeni, Ion Corvin, Horia, Băneasa, M. Kogălniceanu, Cobadin, Crucea, Independența, Chirnogeni, Ghindărești, Nicolae Bălcescu*
Low (IV)	≤20 ha	*Albești, Pecineaga, Amzacea, Dumbrăveni, Ciocârlia, Saligny, Costinești, Limanu, Comana, Dobromir, Cumpăna, Mereni, Topraisar, Lumina, 23 August, Bărăganu, Cuza-Vodă, Tuzla, Valu lui Traian, Agigea, Castelu, Cerchezu, Siliștea, Deleni, Tortomanu*

Source: processed data, INSSE, 2017 [15]



Source: processed data, INSSE, 2017 [15]

Fig. 2. *The percentage of wine-growing areas from Southern Dobrogea*

Wines and grapes from Murfatlar Vineyard obtained many awards and gold medals at international wine competition [12]. The kinds of wines from Murfatlar are various: *Pinot Gris*, *Chardonnay* and *Riesling Italian* (unflavoured white wines), *Muscat Ottonel* (flavoured white wine, most awarded), *Merlot*, *Pinot Noir*, *Cabernet Sauvignon* (red wines), and varieties of table grapes: *Muscat Hamburg*, *Afuz Ali*.

The *Ostrov Vineyard* has discovered two centuries ago favorability for table wine growing varieties. In this area of vineyards with 3,000 ha, more than 50% represent table grapes, being centers and wine growing in rural areas on left terraces of Danube. The special kind of grapes is *Afuz Ali*, which benefit here the best conditions of development. Its grapes reach maturity very quickly, enjoying a climate that gives them, an amber color. In Ostrov vineyard grown other varieties of grapes as *Muscat Adda*, *Muscat Hamburg*, *Sultanina*, but *Afuz Ali* remains supreme. It is grown from Băneasa to Oltina along the Danube, reaching Aliman. Secondary is developing white wines for consumer as kind *Feteasc*ă *Regal*ă, or red wines as *Cabernet Sauvignon*, *Merlot* and *Pinot Noir* [12].

In other regions highlights:

- wine-growing area from *Topalu*, with wines as *Chardonnay*, *Cabernet Sauvignon*, *Merlot*;
- vineyard from *Cobadin-Chirnogeni* area, with wines as *Sauvignon Blanc*, *Pinot Gris*,

Cabernet Sauvignon, *Merlot*, *Pinot Noir*, *Fetească Neagră*.

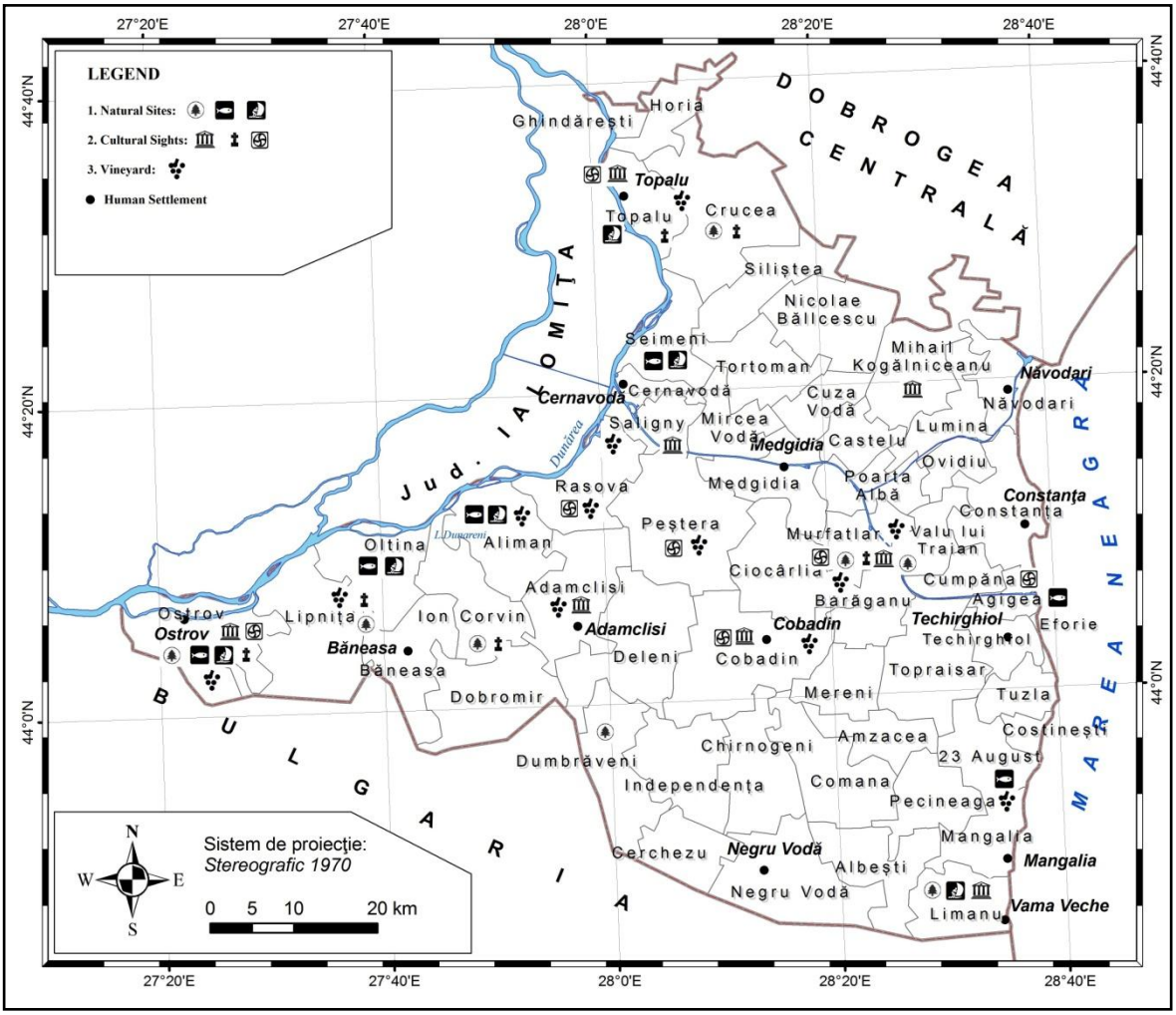


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Fig. 3. *Potential of* ***Wine Tourism*** *in Southern Dobrogea*

The touristic potential of Southern Dobrogea is diversified [9] and represented (figure 3) by: Southern part of the Black Sea Coast and resorts (from *Mamaia* to *Vama Veche*), marine lake (*Techirghiol*, for health tourism), Danubian lakes (*Bugeac, Oltina, Dunăreni, Vederoasa,* for fishing and nautical sports), protected areas (*Fântânița-Murfatlar*, *Limanu*, *Canaraua Fetii*, *Esechioi*, *Alah-Bair, Dumbrăveni, Valu lui Traian* Forests or fossil points along Danube - *Topalu*, *Movila Banului*, *Aliman*), the lake in chalk (*Murfatlar*), monasteries (*Dervent*, *Sf. Andrei, Crucea, Lipnița, Capidava, Mircea Vodă, Murfatlar*), historical traces (*Tropaeum Traiani* Monument from Adamclisi, *Murfatlar Cave complex in chalk*, *Păcuiul lui Soare*, *Altinum*, *Capidava*, *Axiopolis*, *Sacidava*, *Durustorum* - archaeological sights along Danube), traditional rural collections (*Cobadin*, *Limanu*, *Mihail Kogălniceanu, Ostrov, Topalu*).

Due to location of vineyard with nearby of touristic attractions (figure 3), can identify touristic routes to cross these famous vineyards, being true *Wine's Roads*.

Thus, it proposes three *main routes*:

1. *Wine Road* *Constanța - Murfatlar - Medgidia - Cernavodă* (figure 4) represents most important vineyards road in Southern Dobrogea, because of *Murfatlar Vineyard* across of *Sun's Highway* between Bucharest and Black Sea Coast, or National Roads 3 and 22C. Touristic resources are mentioned: botanical protected area, *Straja* Monument on the right bank of Danube-Black Sea Canal, higher than 50 m (*Valu lui Traian*), *Fântânița* Forest, the lake in chalk, Cave Complex in chalk, *Sf. Teotim* Monastery (*Murfatlar*), *Înălțarea Domnului* Monastery, *Mircea cel Bătrân* International Honorary Cemetery and Monument of *The 1st World War* (*Mircea Vodă*), *Anghel Saligny* Museum

(*Saligny*), wetland area of Danube, *Axiopolis* fortress, *Painted Tomb of Hinog Hill* (*Cernavodă*).

The great sights for wine tourism are: *Vineyard's Museum of Murfatlar* with many material evidences, sculptures inspired by wine growing, drinking vessels and wine store, wine equipment used along the time showing millenary tradition of wine growing in these areas, and Wine Cellars: *Murfatlar Winery Research Station*, *M1 Atelier*, *Domeniul Vlădoi* (Murfatlar), *Castel Hinog* and *Trantu* (Cernavodă), *Gabai* (Valu lui Traian).

2. *Wine Road* *Murfatlar - Cobadin - Adamclisi - Ion Corvin - Ostrov* (figure 4), along to oldest National Road between Bucharest and Black Sea Coast through Chiciu - Ostrov. On this route, natural touristic sites alternate with important historical and religious sights: *Tropaeum Traiani* Monument of Adamclisi, *Sf. Ioan Botezătorul, Dervent* and *Sf. Apostol Andrei Cave* Monasteries, *Canaraua Fetii* and *Esechioi* protected areas, *Bugeac* Lake, *Păcuiul lui Soare*, *Durustorum* and *Altinum* Fortress, ethnographic collection, wetland area of Danube.

It can be visited Wine Cellars from Ostrov (*Domeniile Ostrov*), Lipnița (*Lipnița*), Adamclisi (*Frâncu* and *Domeniile Adamclisi*), Cobadin (*Viișoara*).

3. *Wine Road* *Ion Corvin - Cernavodă - Topalu* (figure 4), along Danube river with touristic resources as *Oltina*, *Dunăreni*, *Vederoasa* Lakes, *Aliman*, *Movila Banului*, *Topalu* fossil points, *Capidava*, *Axiopolis*, archaeological sights, *Dinu and Sevasta Vinitilă* Art Museum from Topalu, Wine Cellars from Aliman (*Alira*), Rasova (*Rasova*), Cernavodă (*Castel Hinog* and *Trantu*), and Topalu (*Darie*).

It can be observed *secondary wine roads*, as:

a. Constanța - Mangalia - Vama Veche, along Black Sea Coast (with *Clos des Colombs* Wine Cellar, closer to Olimp seaside resort);

b. Medgidia - Peștera (*Domeniul Bogdan*, *Saidia* - Wine Cellars) - Adamclisi (*Frâncu* and *Domeniile Adamclisi* - Wine Cellars);

c. Constanța - Cochirleni (*Vinvico* Vineyard).

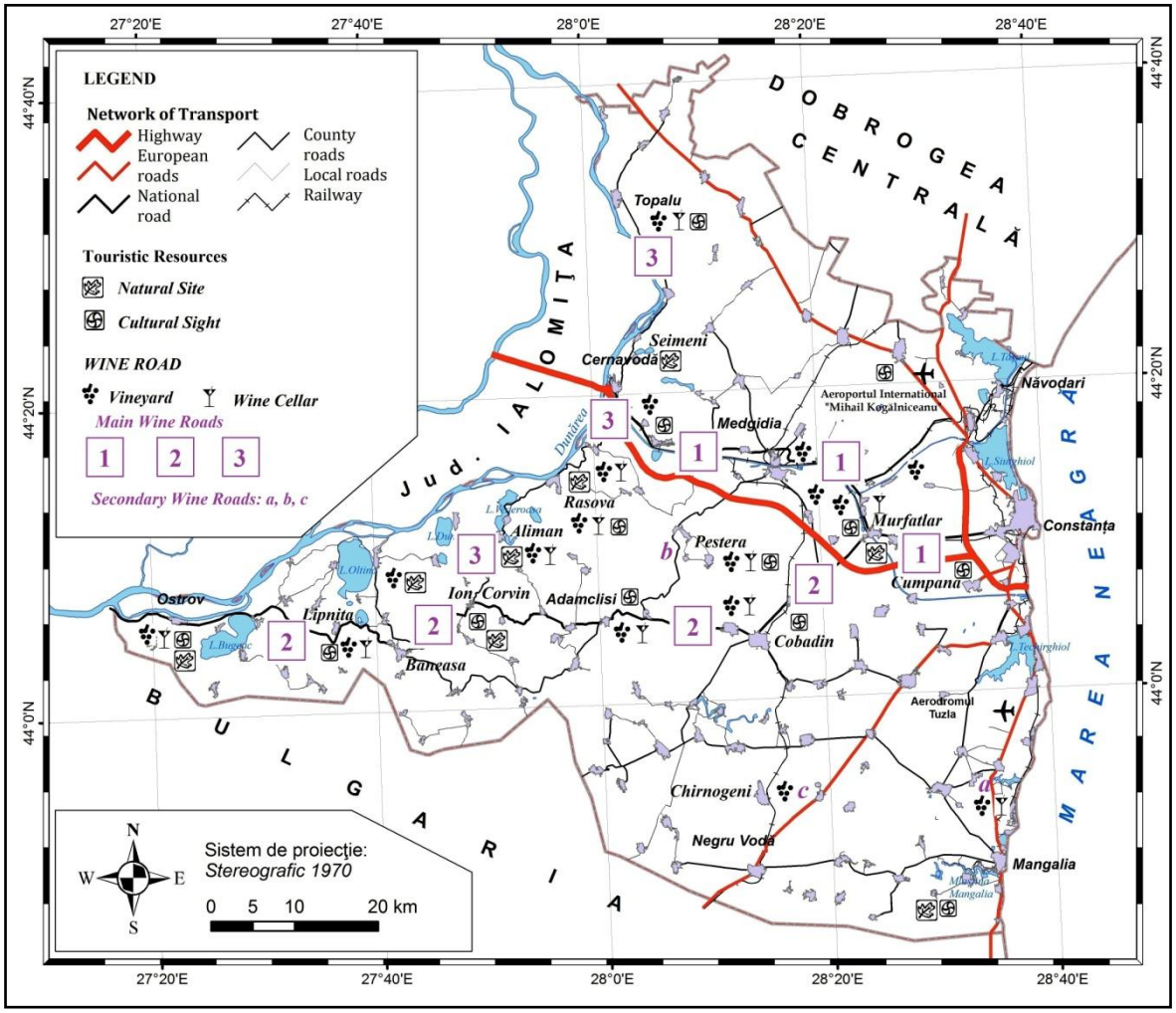

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Fig. 4. *Proposal **Wine Roads** in Southern Dobrogea*

For each *Wine Road* may be implemented specific touristic product, with customs and tradions accompanied of *Dobrogea's cuisine* and *wine tasting* from famous vineyards of Southern Dobrogea.

In order to promote the natural and cultural heritage, the customs of wine-growing, grape processing, winemaking and their exploitation for tourism, it is mandatory to build a Local Center of Promotion for Tourism in villages with wine-growing potential, and clear signaling of sights on thematic itinerary *Wine Road from Southern Dobrogea*.

Conclusions

There is the opportunity to develop touristic villages, that will emphasize major touristic flows, through authenticity and uniqueness, revitalizing the rural settlements with natural, ethno-cultural and winery potential in Southern Dobrogea.

Residents, small businesses and local community are interested to create an Association to promote *Dobrogea's Wine Touristic Product* in *Wine Roads* to be included in touristic package.

The placement of enotouristic points for wine tastings and demonstrations of traditional art on vintage, and winemaking process, with cultural sights and local cuisine are resources that will contribute to development of tourism in this rural area.

Management efficiency of wine tourism from Southern Dobrogea is an important factor to promote the sustainability of rural tourism in this region.

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EXPLORE ICT USAGE CHARACTERISTICS IN BUSINESS RELATIONSHIP OF AGRO-FOOD SUPPLY CHAIN

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Abstract: *Food sector is increasingly becoming a closely interconnected system with a whole network of complex relationships. Supply chains are highly complex systems and they are built on a lot of partnerships and forms of cooperation. The length and complexity of the chains have a significant effect on the quality of information flow among chain members and the amount of inventory levels. Information and Communication Technologies (ICTs) play an increasingly important role in supply chain management. Use of ICT is unavoidable in business relationships.*

The usage of ICT supporting transactions is lagging behind in business relationships of chain actors. At the same time there is a demonstrable and measurable link between enterprise performance and ICT use. Maintaining or enhancing competitiveness is easier by taking advantage of opportunities provided by ICT tools. Which ICT tools are used by enterprises, of course, depends largely on the degree of IT development.

Our main task is to identify the chain actors and explore the chain management toolbox for food products produced from agricultural raw materials. In the quantitative phase of our research we made survey relating to use of ICT among the agricultural small and medium sized enterprises (SME) sector and in the primary producer sector, focusing on the Northern Great Plain region.

Overall, domestic enterprises and mainly primary producers do not use even basic ICT tools at a level - which would be useful for their operating – than what would be expected, so productivity and the growth of efficiency are also inhibited. One of the reasons is the lack of appropriate ICT knowledge of owners and employees so they cannot take advantage of the opportunities offered by ICT properly.

Keywords: *SME, ICT, e-commerce, cloud services.*

1. Introduction

Food sector is increasingly becoming a closely interconnected system with a whole network of complex relationships. Consequently, supply chains are highly complex systems and they are built on a lot of partnerships and forms of cooperation.

The length and complexity of the chains have a significant effect on the quality of information flow among chain members and the amount of inventory levels. Information and Communication Technologies (ICTs) play an increasingly important role in supply chain management. Use of ICT is unavoidable in business relationships and their effect on business activities can only be determined by analyses on scientific level.

The present paper aims to overview the level of ICT infrastructure of the Hungarian SME sector at regional level and compare it to the EU member states. At this stage of our investigation we rely on seconder data (HCSO - Hungarian Central Statistical Office - and Eurostat). We used data for 2015 and 2016 as these are the latest data available.

2. Position and economic role of the SME sector

Small and medium-sized enterprises (SMEs) are the engines of the European and Hungarian economy. This is also demonstrated by the adoption of the European Charter for Small Enterprises in 2000 (European Commission, 2004). Their specificity is due to the fact that greater flexibility, better innovation capacity, lower fixed costs, smaller market power and less capital characterize them (Motwani et al., 1998).

These enterprises have intuitive and unstructured decision-making style (Gilmore et al., 2001).

One of the main objectives of SMEs, like any businesses, is to enhance their competitiveness. If an enterprise wants to achieve a long-term competitiveness, it must be cooperative in order to obtain knowledge and technological devices (Nyíri & Szakály, 2010).

In 2014, 99.8 per cent of Hungarian enterprises were SMEs which employed 69.8 per cent of the employees (Nemzetgazdasági Minisztérium, 2016). According to Holicza (2016), the major problems the SMEs are faced with are the followings:

- education does not prepare for starting business,
- insufficient financing,
- if no success is achieved, losses may be significant,
- complicated administration procedures.

It is to be noted that the Master course of Business development has been launched in 2009 at the Faculty of Economics and Business of University of Debrecen and one of its main purpose is to reduce these above mentioned failures.

In order to reduce administrative burdens „The Small and Medium Enterprises Support Strategy 2014–2020" supports the „Think small first" principle (EC Vállalkozáspolitikai és Ipari Főigazgatóság, 2016). The lack of further trainings and IT knowledge are among the problems of the SMEs (Chikán et al., 2014).

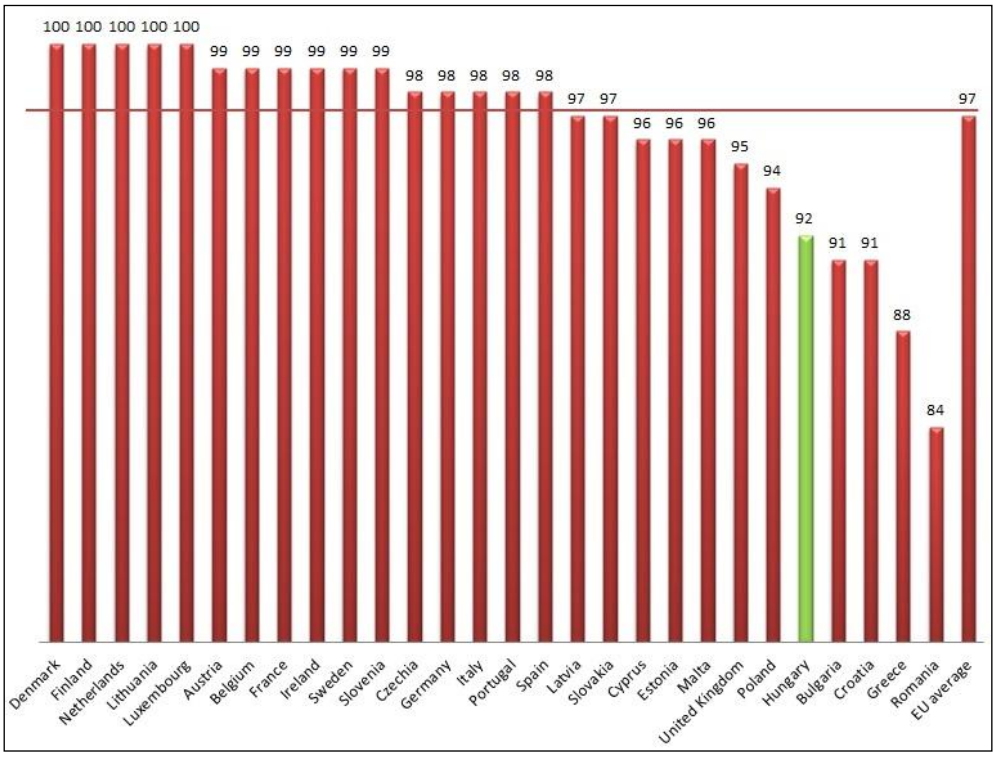
3. ICT usage of SMEs

The use of ICT remains a key challenge for most companies. The major part of the enterprises lack the appropriate knowledge about the opportunities of ICTs. It is a quite complex system and one of its crucial points is the quality of the Internet access (availability, speed and bandwidth).

3.1. Internet access

The proportion of 97% of enterprises with internet access remains stagnant over the last few years in the European Union. In the case of the following five countries, all enterprises have internet access (with variable speed):

- Denmark
- Finland
- Netherlands
- Lithuania
- Luxembourg



Source: Own edition based on Eurostat data for 2016

Fig. 1. *Proportion of enterprises with internet access in EU member states.*

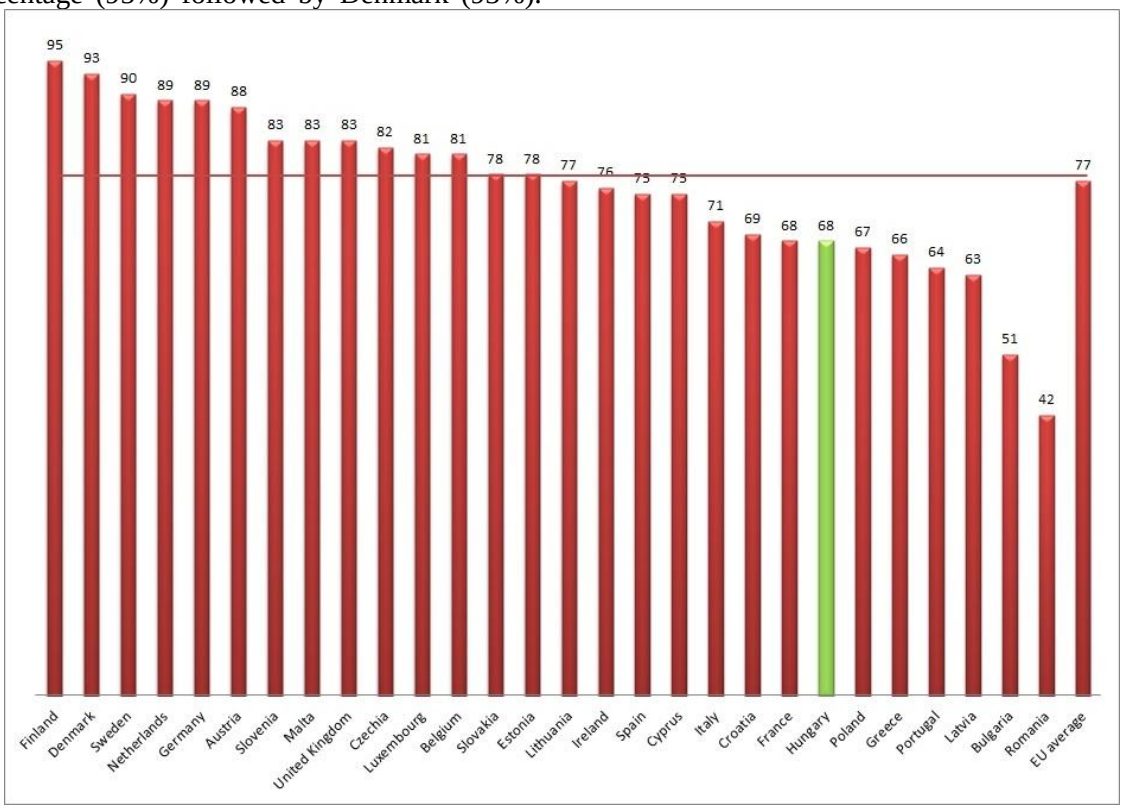
This ratio (92%) in Hungary remains 5% below the EU average (92%), while Romania was the Member State with the lowest value (84%), however, that latter value is still not a bad ratio.
Looking at the Hungarian enterprises at regional level the dominance of Transdanubia regions can be noted, the proportion is the lowest in the Northern-Great Plain (89.7%) and this result indicates that there are no significant differences at regional level.

3.2. Proportion of enterprises having a website

With regard to the proportion of enterprises having a website, the average rate for the EU is 77% (Figure 2). Finland has the highest percentage (95%) followed by Denmark (93%). There are enterprises in almost all countries which do not feel the need to have a website since they have established partnerships that ensure the necessary income level. In their opinion this investment in creating a website would not meet the expected return

Romania also has the lowest value in this case (42%), while 68% of the Hungarian enterprises has a website or web portal and in Hungary it is probably due to the focused tenders in the early 2000s.

The gap is even wider at regional level compared to the Internet access since the difference is 16% between the most developed Central-Hungarian region (74.3%) and the least developed Northern-Great Plain (58.2%) region.



Source: Own edition based on Eurostat data for 2016

Fig. 2. *Proportion of enterprises having a website in EU member states.*

3.3. Use of cloud services

The essence of the cloud services is that no considerable IT knowledge is required for the enterprises and they do not have to employ IT experts. Thus, the labour-related costs becomes available and the resulting savings can be used to purchase services, often for a smaller budget. Cloud services have several advantages, it will not only improve competitiveness but simultaneously enhance the efficiency and by correct use it may also increase data protection. Data traffic from cloud services is steadily growing because economic competition requires the enterprises to react faster to the environmental changes.
There are three kinds of cloud service models (Harding, 2011):

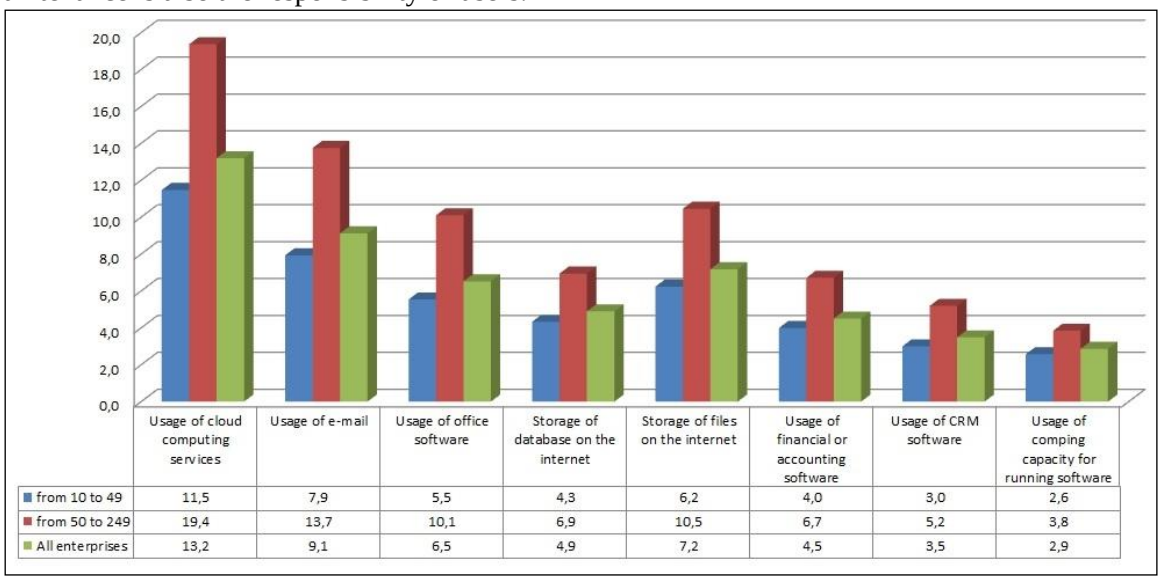
- IaaS, Infrastructure as a Service,
- PaaS, Platform as a Service,
- SaaS, Software as a Service.

IaaS (Cloud Infrastructure as a Service): The basis of cloud services. Enterprises access to memory space and installed applications in virtual environment, however, maintenance have to be done by the users.

Paas (Cloud Platform as a Service): The service provider installs the required applications written in the selected programming language. Maintenance is also the responsibility of users.

Saas (Cloud Software as a Service): Applications of the service provider run in the cloud infrastructure and can be accessed via web browsers. They do not require large-scale investment and can be used immediately.

Usage level of different cloud services by the Hungarian small and medium-sized enterprises presented is in Figure 3.



	Usage of cloud computing services	Usage of e-mail	Usage of office software	Storage of database on the internet	Storage of files on the internet	Usage of financial or accounting software	Usage of CRM software	Usage of comping capacity for running software
from 10 to 49	11,5	7,9	5,5	4,3	6,2	4,0	3,0	2,6
from 50 to 249	19,4	13,7	10,1	6,9	10,5	6,7	5,2	3,8
All enterprises	13,2	9,1	6,5	4,9	7,2	4,5	3,5	2,9

Source: Own edition based on Eurostat data for 2016

Fig. 3. *Usage of cloud services by size class (in percentage of enterprises using the internet).*

Figure 3. shows a clear difference in the usage level of cloud services between small enterprises and medium enterprises and take everything into consideration the latter enterprise category (with 50-249 persons employed) places more emphasis on use of cloud services.

In Hungary a call for tender has been published last year with the title of „GINOP-3.2.4-8.2.4-16 Support for develop and market launch of cloud based (IaaS, PaaS, SaaS) enterprise services and ICT solutions" (Széchenyi 2020, 2018). The aim was to support economically important sectors lagging behind in respect of IT readiness as agriculture or food industry (NACE Rev.2 C 29-30). Only Central-Hungary (Budapest and Pest County) is ineligible. The application can still be submitted (from 8 February 2017 to 8 February 2019).

4. E-commerce

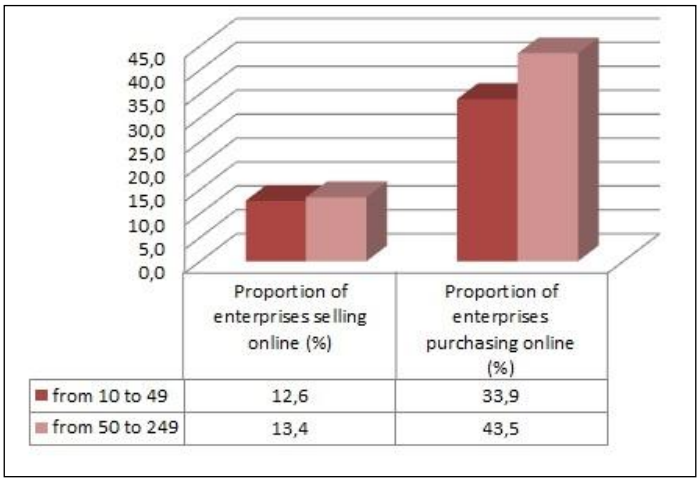
The term „e-commerce" refers to the online purchase and sales of goods and services. It can be divided into two groups:

- B2B (business-to-business)
- B2C (business-to-consumer)

B2B is a business model which focused on business between enterprises. The commerce is done through the internet via computers and ordering, order delivery and invoice management based on pre-set parameters (Krauszné & Krausz, 2017).

B2C model is based on web sites and costumers chose and order the goods or services and they decide on the payment method (Krauszné & Krausz, 2017).

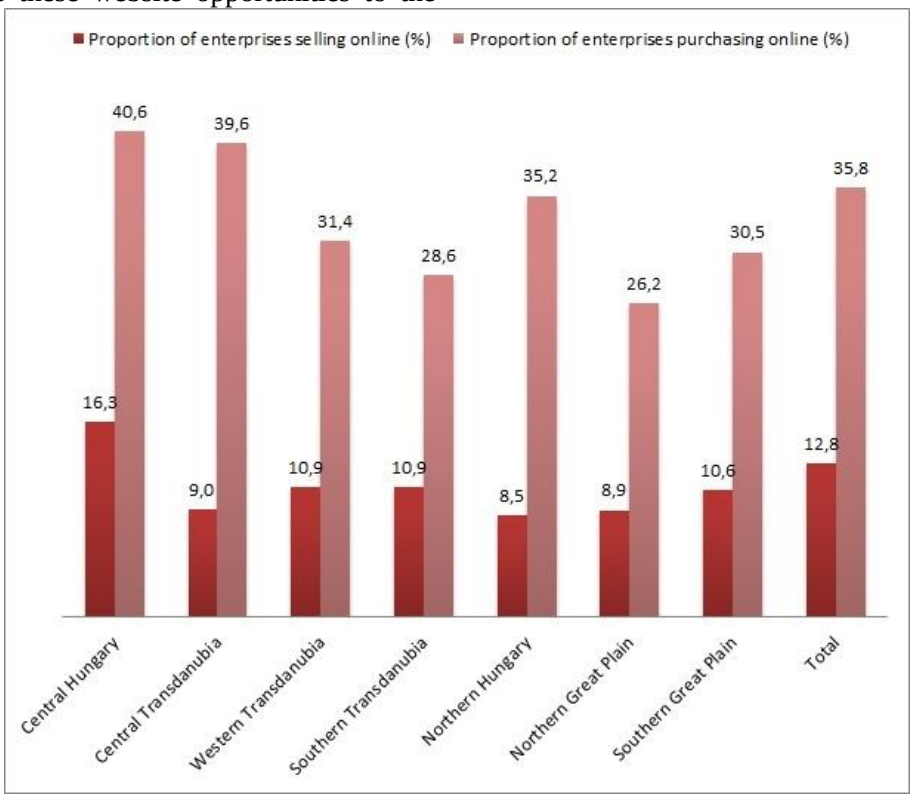
There is no significant difference between small and medium enterprises in terms of online sales. 12.6% of small enterprises (with 10-49 employees) and 13.4% of medium enterprises (with 50-249 employees) sells goods or services online (Figure 4.). The proportion of online purchase, however, shows significant difference between the two enterprise size categories and it may be said that the ratio of purchasing and procurement increase in line with the size of enterprises (Figure 4.).



Source: Own edition based on HCSO data for 2015

Fig. 4. *Proportion of online sales and purchases of the Hungarian small and medium-sized enterprises.*

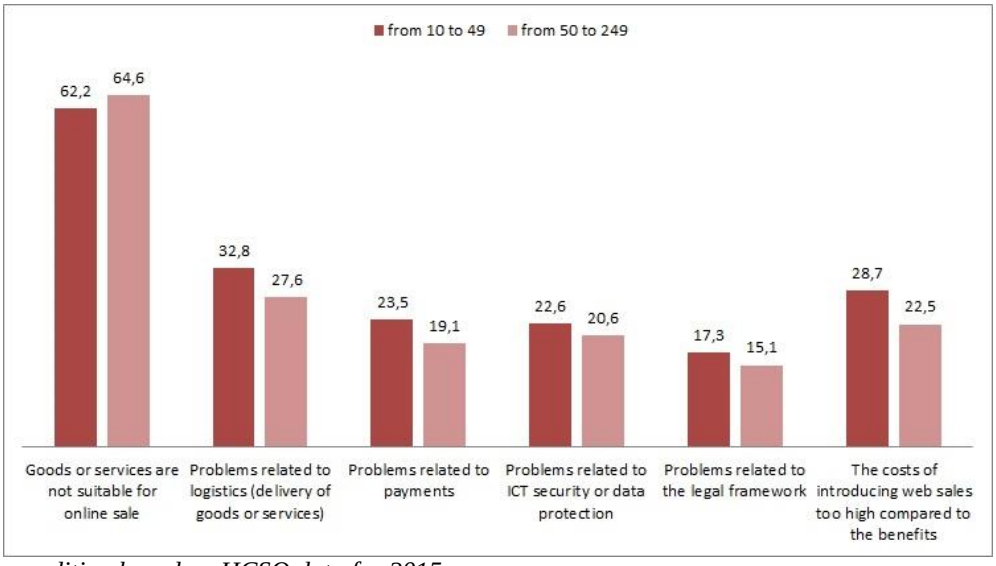
Examining the same indicators at regional level, the differences between the NUTS-2 regions are much greater (Figure 5.). Enterprises of Central-Hungary use these website opportunities to the greatest extent. The difference between the other regions is negligable.



Source: Own edition based on HCSO data for 2015

Fig. 5. *Proportion of online sales and purchases by Hungarian NUTS-2 regions.*

Figure 6. shows some obstacles to online sales. Nearly two thirds of both small and medium-sized enterprises consider their goods or services unsuitable for web sales and thus this is the most restrictive factor to web sales. It cannot be overlooked either that every third enterprise faces with logistical difficulties, while the least restrictive factor is the legal framework.



Source: Own edition based on HCSO data for 2015

Fig. 6. *Obstacles for web sales related to Hungarian small and medium-sized enterprises.*

Conclusions

There is digital development when enterprises fully make use of the opportunities and advantages offered by digital technologies. In terms of several ICT usage indicators Hungarian SME sector is far lagging behind the EU average. Appropriate usage level of these basic IT devices and services enable this gap to be overcome and it is essential. By appropriate use of opportunities offered by ICT tools to maintain or boost the competitiveness can be easier achieved. The ICT usage level of enterprises highly depends on the degree of IT development. We hope that the online sales proportion of enterprises will grow and they will increasingly focus on the opportunities by methods as targeted consumer access with marketing campaigns.

There are advantages in terms of procurement as well, for example, comparing products, purchase without having to queue or travel and with a short period of time for delivery at the address indicated. In the light of the above we conclude that the opportunities existing in the neglected sectors and regions which lagged behind in terms of IT are under-utilised, however, all enterprises try to adapt to the phenomenon of data boom while new market activity types and roles are developed.

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A SYSTEM OF SUSTAINABLE RESOURCE MANAGEMENT INDICATORS FOR RESTAURANTS

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Abstract: *Assessing the impact of hotels and restaurants on the environment proves that, despite expectations, compared to economic benefits, the hospitality sector is one of the least sustainable. This reality can be changed by decoupling the development of the hospitality sector from the increase in resource consumption.This paper aims at defining the concept of Sustainable Resource Management and highlighting its peculiarities in the hospitality sector, as well as the development of a set of indicators for hotel and restaurant sustainable management of resources, which is coherent, perfectible and adaptable to the realities of each unit in the hospitality sector. To this end, a combination of techniques was applied, including the study of relevant scientific papers in the field of sustainable tourism and resource management, qualitative interviews with managers and owners of hospitality entities, and direct observation of the activity of three restaurants in the touristic destination of Brașov. The results show that for restaurant and hotel managers, cost constraints are a hindrance to the application of sustainability principles, as well as the notion that environment-friendly policies do not provide guarantees on the incidence of food risks. Difficulties also arise from the lack of experience in applying performance assessment methods to ensure the sustainability of business in hospitality. A system of Sustainable Resource Management indicators can play the role of a guide in this direction, the one proposed in this paper having four main dimensions: food and energy management, restaurant hardware management (capital goods, kitchen tools and inventory of serving salons), restaurant software management (human resources, consumer behavior, social responsibility) and financial performance of sustainable resource management.*

Keywords: *hospitality sector; restaurants, Sustainable Resource Management; system of indicators;*

1. Introduction

Sustainable management takes on the concepts of sustainability and combines them with management concepts. Using the three facets of sustainability - ecological, social and economic - sustainable management aims at creating and perfecting the skills of an anthropic system to develop under the conditions of maintaining its economic viability and meeting the needs of the present and future generations, under conditions of restricted access to resources. In the economic system, as in any other system, the laws of thermodynamics, which define the boundaries of the Earth in energy and waste processing, are applied.

As a result, the adoption of new economic models that position the state of the environment within the decision-making process must be at the center of sustainable management. For ecologists nature is everything, but business managers are concerned about the environment because it is critical to the well-being of managed entities.

Sustainable management assumes the interconnections between the ecosystem and the economic system by integrating the goal of profitability with environmental responsibility (Gruia,R., 2017).

Although there are many people for whom sustainability refers only to inputs from the natural environment and the impact on the natural environment, the concept of sustainability has evolved beyond the ecological dimension, including social and economic factors.

Company managers have the role of integrating sustainability requirements and management principles in a systematic and realistic way so that sustainability is not just a vision but a practical action ground.

1.1. Objectives

The specific objectives of the research were:
• Defining the concept of Sustainable Resource Management;
• Study of the peculiarities of Sustainable Resource Management in the hospitality sector;
• Developing a project of a set of indicators of sustainable management of hotel or restaurant-specific resources that are coherent, do not involve high cost of data mining and can be refined and adapted to the realities of each hospitality unit.

2. Methodology

The research methodology involved a combination of techniques including the study of literature on sustainable tourism and resource management, as well as interviews with managers and owners of hospitality entities from Brasov touristic destination. For information gathering, discussions were held with representatives of the academic environment, and conferences and seminars on topics related to environmental protection and management of hospitality companies were followed. Also, the method of direct observation of the activity of three hotels and three restaurants from Brasov touristic destination was used.

2.1. Sustainable resource management in hospitality

Applying the methodology developed by the International Tourism Partnership in cooperation with the World Tourism & Travel Council, KPMG and 23 global hotel companies to determine the carbon footprint of hotels, it results that in Romania the occupancy of a hotel room for one year implies carbon dioxide emissions of 10,512 tons (Chong and Ricaurte, 2015; Hotel Footprints Tool, 2018), three times higher than a hotel in France.Restaurants are the largest consumer of retail energy. It uses about five times more energy per unit area compared to any other type of commercial construction, reaching an annual consumption equivalent to 490 tons of carbon dioxide per restaurant (Cîrstea, 2015).

These assessments show that, despite expectations, compared to the economic benefits, the hospitality sector is one of the least sustainable. The current situation in Brasov touristic destination is characteristic of the one described in the economic theory of externalities, which states that the private economic agents ignore the environmental costs, considering that it is the public administration that has to take care of the local natural capital. Changing this reality may be the result of collaboration between researchers and practitioners to better understand the impact of the hospitality industry on the environment, the gap as against the objectives set out in the Paris Climate Change Agreement, and the modalities for concrete action to decouple the development of hospitality by increasing resource consumption, based on the implementation of the solutions offered by current science and technology (International Tourism Partnership, 2017). Sustainability has the ability to bring to the attention of managers and researchers in the field the real world of physical resources and constraints on their consumption. Therefore, Sustainable Resource Management has the necessary valences to become a central issue and not a marginal one in scientific and applied management.Based on the information obtained by applying the above-mentioned methods, in the author's opinion, Sustainable Resource Management is a conscious process of mobilizing and allocating resources for production and consumption so as to minimize the impact on the environment and to maximize the conservation and reuse of resources in order to achieve the organization's purpose, in accordance with its economic, social and ecological mission, goals and responsibilities.

2.2. Particularities of Sustainable Resource Management in Hospitality

The efficient use of resources and the protection of the environment are not an appendix of tourism services, but the central element of the processes carried out by the hospitality entities. Over the past decades, access to resources has changed the cost structure of hospitality entities towards a substantial increase of the weight of electricity, gas, water and food commodities costs, which are the main expenditure items alongside staff costs.

As a result, we may state that Sustainable Resource Management in hospitality means managing specific production and services as well as influencing the behavior of tourists and consumers so as to minimize the negative impact on the natural and cultural environment and maximize the conservation and reuse of resources, mainly food, water and energy.

Davies and Konisky (2000) believe that the restaurant sector affects the environment in three ways. First of all, there is the direct impact of restaurant services, including: energy consumption, solid waste generation, cooling agent losses, greenhouse gas emissions, water pollution with liquid food waste and detergents from washing facilities, the risk of consumer illness due to food causes. Secondly, the impact on the upstream environment occurs through pollution from suppliers, agricultural farms and processors, including pesticide residues, animal waste, and food safety risks generated in production processes and which restaurants cannot control. Thirdly, there is a downstream impact in the relationship between restaurant operators and consumers, consisting of the use of dishes and disposable cutlery or plastic packaging in the generation of catering waste. By tracking the route from providing the necessary resources to delivering the final product, managers can determine the ways to reduce resource consumption from product design to waste reuse and recycling (figure no. 1).

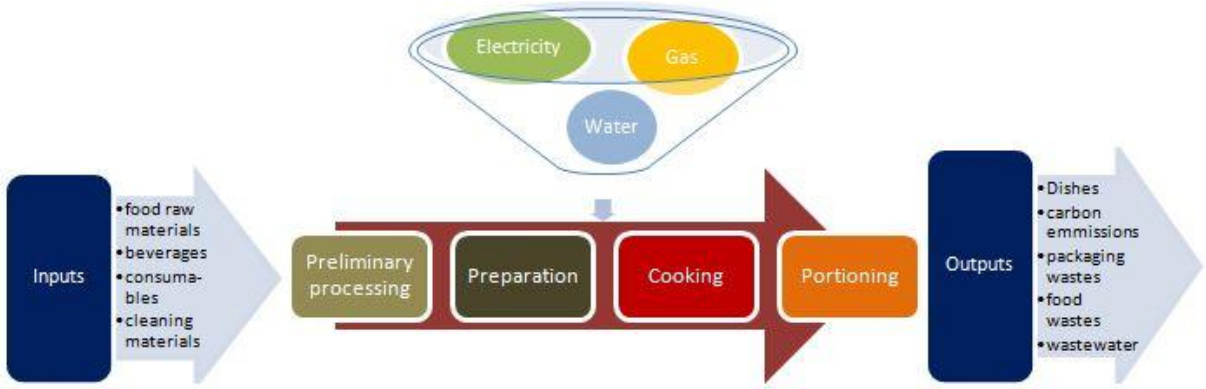

Fig. 1. *The production process in restaurants*

In figure no. 2 the flow concepts for developing a sustainable resource management framework are adopted using three dimensions: material resources, technology and human factor (Wang et al., 2013). The first dimension, the material resource, refers to the input flow, with its main component - ethical food - in relation to the culinary production flow, which includes the drafting of the menu list, culinary preparation and serving according to the principles of sustainability. The second dimension, the technology, is addressed in the relationship between the culinary flow and the output flow, which includes the processes of cooking from the culinary production flow and the processes of serving, cleaning and treating waste according to the sustainability principles from the output flow. The third dimension, the human factor, refers to staff training and consumer educating regarding the practical issues of the principles of sustainability, as well as onto the social responsibility of the hospitality entity.

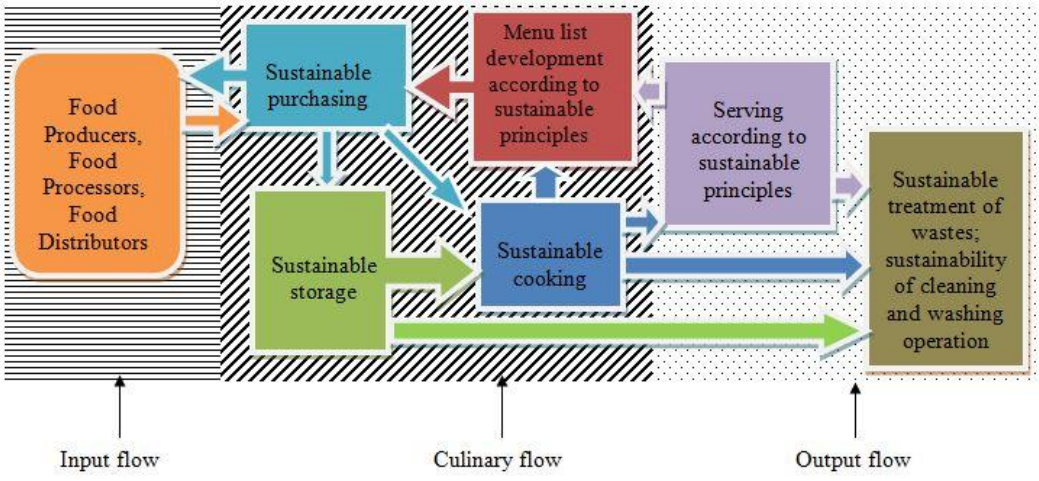

Fig. 2. *Sustainable resource flow in the restaurant*

The level of restaurant performance in the effective realization of Sustainable Resource Management can be measured by comparing to a reference, which implies reaching consensus on a system of indicators of resource management sustainability.

2.3. A system of indicators for Sustainable Resource Management specific to the hospitality sector

Indicators are the variables used to present the characteristics or states in which an entity or system is at a time. Indicators are needed because what cannot be measured cannot be managed (As the management guru Peter Drucker famously said, "If you can't measure it, you can't manage it."). A set of indicators accepted by most representatives of the restaurant sector would allow entities to use sustainability to improve their performance and competitiveness and not just to respond to environmental hazards, stakeholder requests or legal requirements.

The necessity of the study regarding how to measure the sustainability and the possibility of comparing the sustainability status of hospitality entities was motivated by exploratory discussions with academics of the Faculty of Food and Tourism from Transylvania University of Brasov and with environmental managers from hospitality companies, as well as by the author's personal experience.

If the utility of such a system of indicators is generally accepted by hospitality entities, public authorities and non-profit organizations concerned, there is no consensus on the selection of specific indicators. Not eventually, managers of hospitality establishments need a body of indicators to quantify and demonstrate the benefits of sustainable practices to the owners, and thus have arguments for implementing the necessary changes in organizing the work processes in the entities.

An essential requirement for the process of developing a set of indicators for sustainable resource management is to ensure their coherent character. The lack of coherence makes relatively simple concepts, such as energy efficiency, difficult to compare as performance levels to other hospitality entities, to other economic sectors, to other touristic destinations or in order to compare the same hospitality entity at different moments in time. In particular, there is a need for a process of selection between different environmental sustainability indicators so as to arrive at a valid, robust set of data, not too complex and non-redundant, so that obtaining them does not involve too high or unjustified costs.

Based on the study of the scientific literature in the field and on the experience accumulated in the practical activity in Brasov restoration system, we can state that this system of indicators must allow the analysis on the three dimensions mentioned above (Wang et al., 2013), plus the dimension of the financial performance obtained through a favorable behavior to the sustainability of the resources: (1) the management of food and energy resources, (2) the management of the use of equipment and installations, (3) human resource management and social responsibility, (4) financial management of resources. According to the model in figure no. 2, the development of the indicator system can be extended to a few sub-dimensions of sustainable resource management: sustainable supply, sustainable storage, development of the menu list according to the principles of sustainability, sustainable culinary production, serving according to sustainability principles, sustainable use of equipments, washing and cleaning in sustainable ways, sustainable waste management, staff training and consumer education on sustainable use of resources, social responsibility of the restaurant, financial performance of resource utilization (figure no. 3).

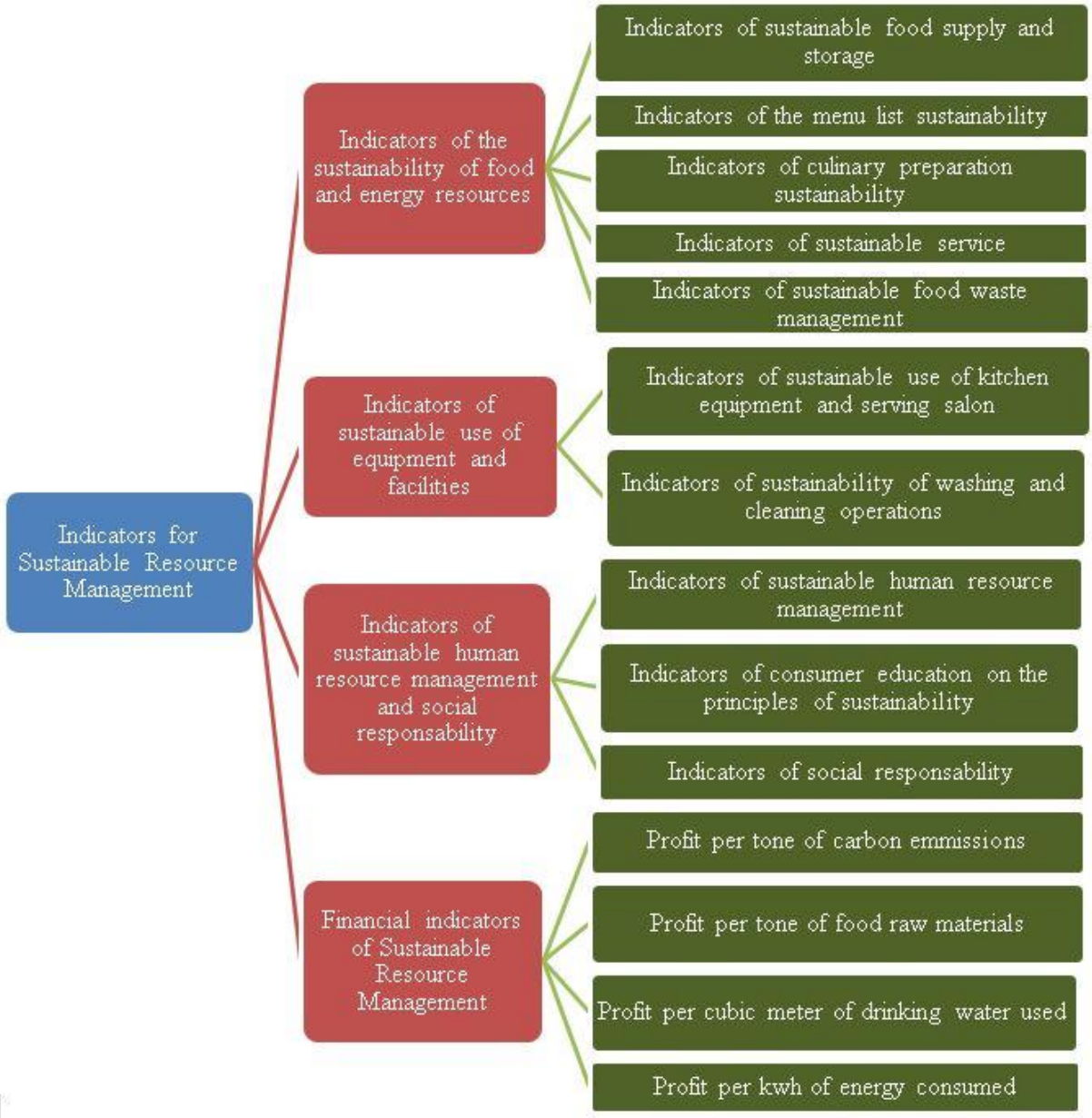

Fig. 3. *The framework for developing a system of indicators of sustainable management of restaurant resources*

The indicators of the sustainability of food and energy resources (figure no. 4) are the physical dimension of sustainability, including four sub-ranges of resource management sustainability: (1.1) indicators of sustainable food supply and storage, (1.2) indicators of the menu list sustainability (1.3) indicators of culinary preparation sustainability, (1.4) sustainable service indicators, and (1.5) indicators of sustainable food waste management.

Waste management involves more and more active engagement of customers in environmental protection, but the first step in reducing the amount of waste generated in restaurants is to carry out a waste audit.

It is also very useful to train staff on this issue, as many people can even blame cultural obstacles to the idea of recycling food and recycling waste.

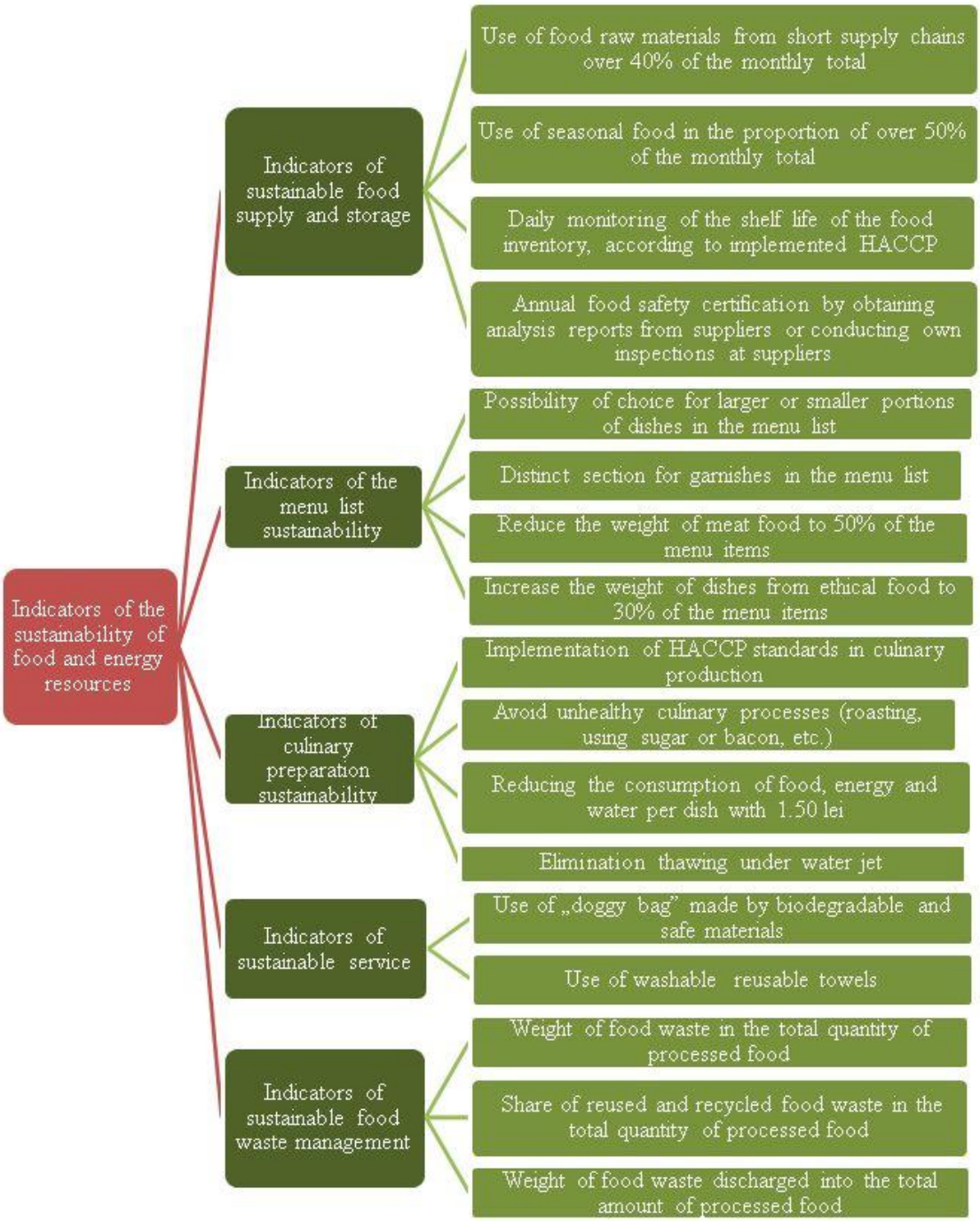

Fig. 4. *Indicators of Sustainable Management of Food and Energy Resources*

Indicators of sustainable use of equipment and facilities (figure no. 5) are geared to complying with environmental protection requirements, reducing water and energy consumption and ensuring food security. The largest amount of energy used in restaurants goes to processes that take place in the kitchens. Refrigerators and cooling equipments are the second largest consumer of energy in restaurants. They operate on a 24/7 basis so all energy-saving solutions can deliver consistent savings over longer periods, monthly or annualy. It is desirable to load as much as possible dishwashers, cutlery and glasses as the amounts of energy and water consumed are the same regardless of the loading of the installations. Programmable thermostats are energy saving solutions also, as adjusting with a degree of ambient temperature leads to saving 5% of the amount of energy normally used. And also the use of automated lighting control solutions or maintaining constant temperatures in the serving salon, in the kitchen and adjacent spaces (Cîrstea, 2015).

The largest amount of water is used in restaurants by kitchen culinary processes, and the second largest consumer is the toilets. Operational remediation of water leaks in taps and pipelines, reduction of water volume in toilet tanks are solutions to reduce water consumption in restaurants.

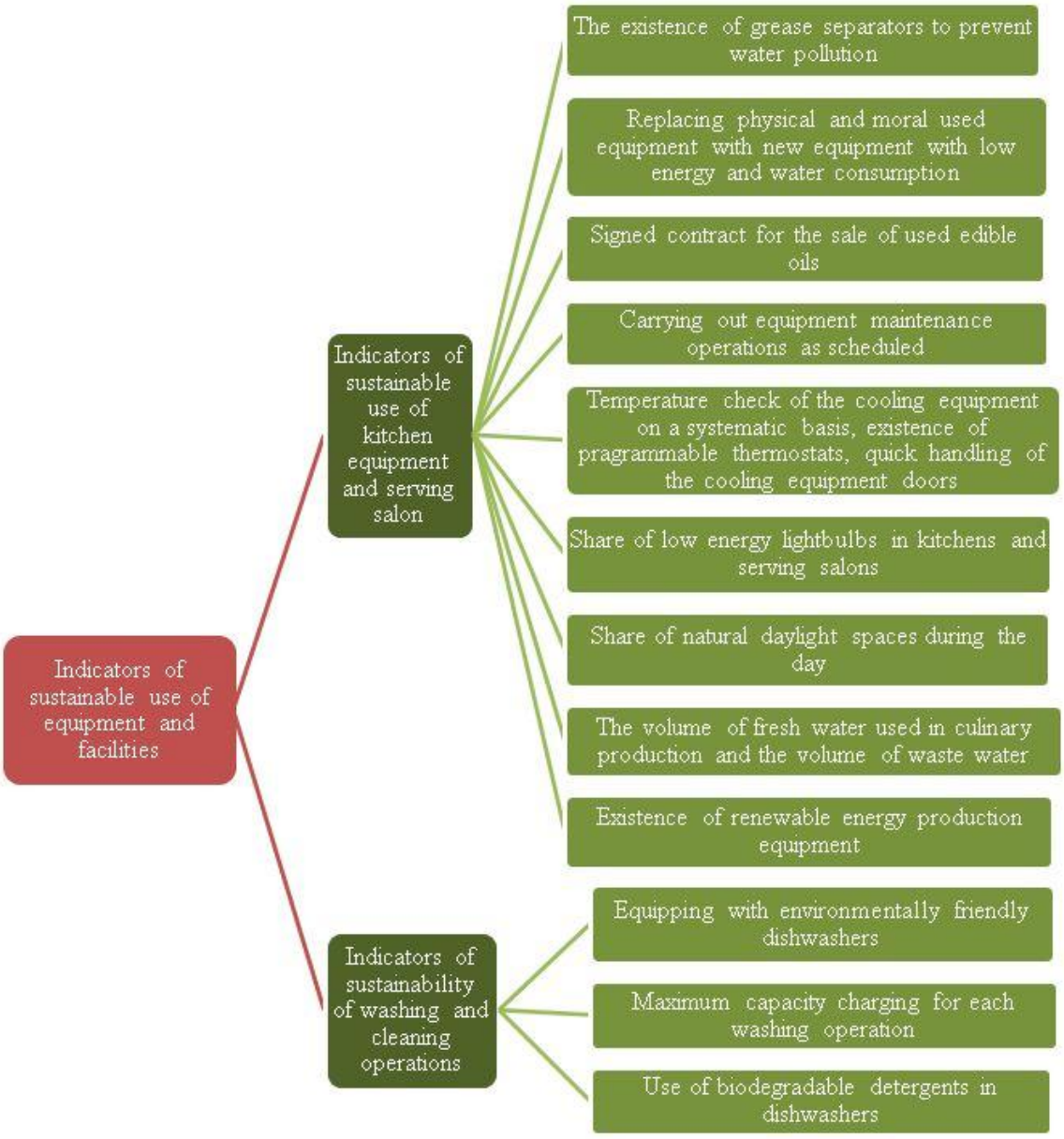

Fig. 5. *Indicators of Sustainable Management of Equipment and Facilities*

The indicators of sustainable human resources and social responsibility management (figure no. 6) refer to the performance of the hospitality entity from the point of view of equity and involvement in the good work of the local community, with the indication that both the indicators and the boundaries of the concepts are vague compared to the first two groups of indicators. The majority of indicators in this group are reported by the yes / no answer to the statement on the application of one or other of the micro-criteria of social sustainability: integration, communication and participation, equity, social security (Rasouli, 2016). In practice, the social impact is much more difficult to observe and quantify compared to the impact on the environment. Measurement of environmental sustainability performance implies material impact, both as input and output, which makes the operation more accurate, while social sustainability indicators appear to be a compliance to social performance measures, with simple quantitative expression: the number of participants in actions to protect the environment,

the number of participations in activities of interest for the local community.

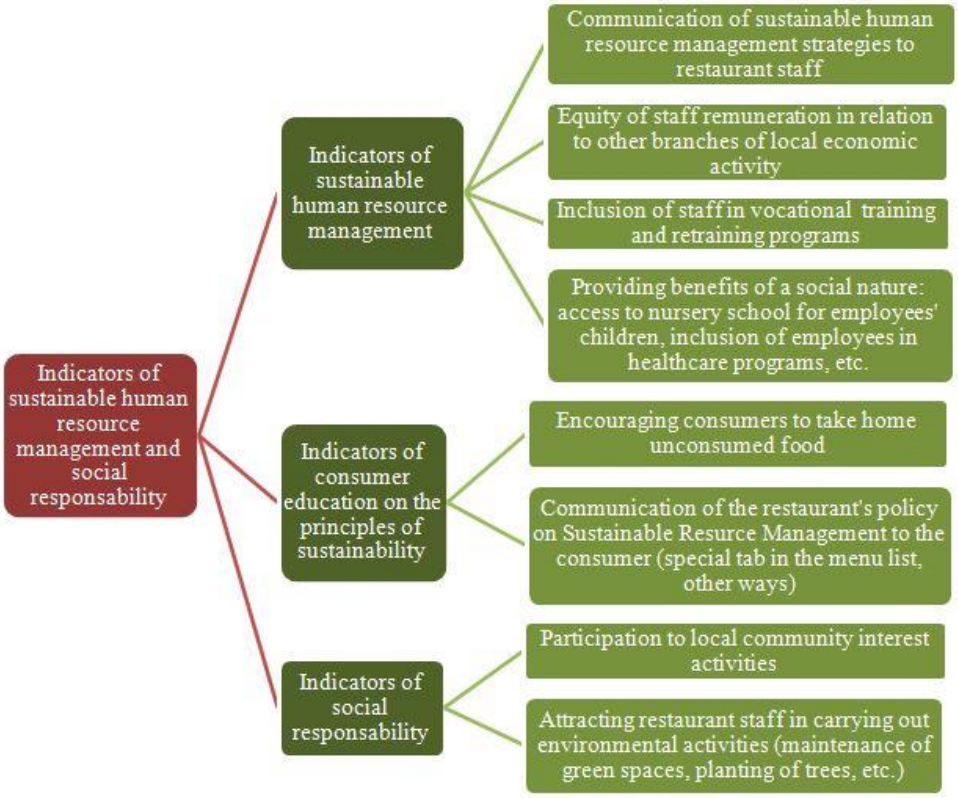

Fig. 6. *Indicators of Sustainable Management of Human Resources and Consumers*

The financial indicators of sustainable resource management are geared towards determining the profit obtained on the physical unit of resource consumed in the activity of a restaurant to obtain the respective volume of profit. Because the restaurant's profit margin is relatively small, lowering energy consumption improves the restaurant's financial performance, with significant effects on carbon footprint reduction and resource management sustainability. In restaurants, approximately 3% - 5% of the total operating costs are represented by electricity expenses (Cîrstea, 2015).

Estimates in the restaurant sector suggest that effective water management practices can reduce operating costs by about 11% and those with energy and water by 10% and 15%, respectively. Food service infrastructures use hot water for many culinary and cleaning operations, so reducing water consumption offers real benefits by reducing the value of energy bills (Cîrstea, 2015).

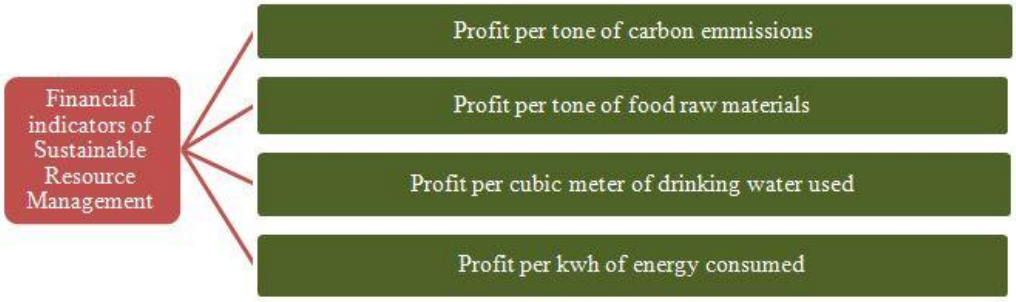

Fig.7. *Financial Indicators of Sustainable Resource Management*

C**onclusions**

Ensuring sustainability is the effort to produce goods and services recognized on the market today without sacrificing our ability to produce goods and services that will be recognized on the market in the future. In the logic of things, the goal of managers is not to conserve resources, but to use them incessantly, and to rely the consumption on renewable resources such as

agricultural products or solar energy. A sustainable perspective requires managers to verify production processes to observe if there are opportunities to obtain the same goods and services from renewable resources and without generating pollution and waste. This research shows that for restaurant and hotel managers in Brasov touristic destinations cost constraints are a hindrance to the application of the principles of sustainability. The same effect has the idea that environment-friendly policies do not provide guarantees on the incidence of food risks. Difficulties arise also from the lack of experience in applying performance evaluation methods of their own activities from the point of view of the sustainability criteria. The scientific rigor and the interdisciplinary skills that the academic community can engage in sustainability research are factors that can lead to developing solutions to sustainability challenges. The interdisciplinary expertise required to develop and test a system of indicators has hampered the emergence of the framework for research and implementation of the hospitality sustainability principles in Brasov touristic destination. A project to attract experts from disciplines such as management, tourism and food engineering, economics, environmental protection, political science, health, social sciences, and law could provide sustainability management research from an organizational perspective, focused on its practical aspects on how hospitality entities can manage the sustainability challenges.

The research results, based on the study of a significant volume of specialized researches, show that the sustainable management of restaurant resources has four main dimensions: (1) the management of food and energy resources, structured in 5 sub-dimensions, (2) the management of restaurant hardware, structured in 2 sub-dimensions (3) restaurant software management (human resources, consumers, social responsibility), structured in 3 sub-dimensions and (4) performance financial management of sustainable resource management. There were 41 indicators focused on environmental protection, sustainable supply and storage of food, green menu design, sustainable food production, primary and secondary use of food products, food waste management, sustainable use of equipment and installations, the relationship between restaurant services and consumers with respect to the principles of general sustainability, social responsibility and financial performance in the use of restaurant resources. Sustainable resource management indicators can be a guide for restaurant and hotel managers in Brasov touristic destination. Better practical results can be achieved in reducing the negative impact of hospitality entities on the environment by implementing good practices of culinary production with minimal resources, by providing ecological hospitality services as well as by Sustainable Resource Management.

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RELATION BETWEEN CORPORATE SIZE AND ICT USAGE IN AGRO-FOOD SMES

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Abstract: *In our article differences between corporate size categories have been analysed on the basis of survey data from enterprises operating in the primary agricultural production and the secondary food manufacturing part of the agro-food supply chain. Our aim is to reveal whether a close relationship between the small and medium size categories as treated officially. It could be also determine how wide the gap is between enterprise sizes (micro, small, medium and large) categories regarding the use of Information and Communication Technologies (ICT). Data set about ICT usage of 500 enterprises were recruited for our survey by a market research company and the survey was conducted in the fourth quarter of 2017. Enterprises involved from all four size categories, however, as the number of surveyed large companies operating in the agro-food sector was not suitable for further analysis, this category was excluded. Additionally, Eurostat data set with 12 indicator and broken down to 3 size categories (small, medium and large) is also involved and analysed. Our results suggest the difference in ICT usage characteristics between small and medium categories is not higher than between medium and large ones on the basis of analysis of the secondary data set. ICT use of large and small categories, however, shows a significant difference. The analysis made on our survey data shows no significant difference between small and medium enterprises regarding ICT usage features, however, between micro enterprises and the larger ones, there is. The growing complexity of the vertical and horizontal cooperation within the chain may motivate smaller, mainly micro enterprises to stimulate their ICT usage and use of advanced technologies, in our opinion a dedicated ICT strategy is needed and it should focus on this size class as these enterprises mean an important part in the agro-food sector.*

Keywords: *agro-food, SMEs, ICT, size, differences.*

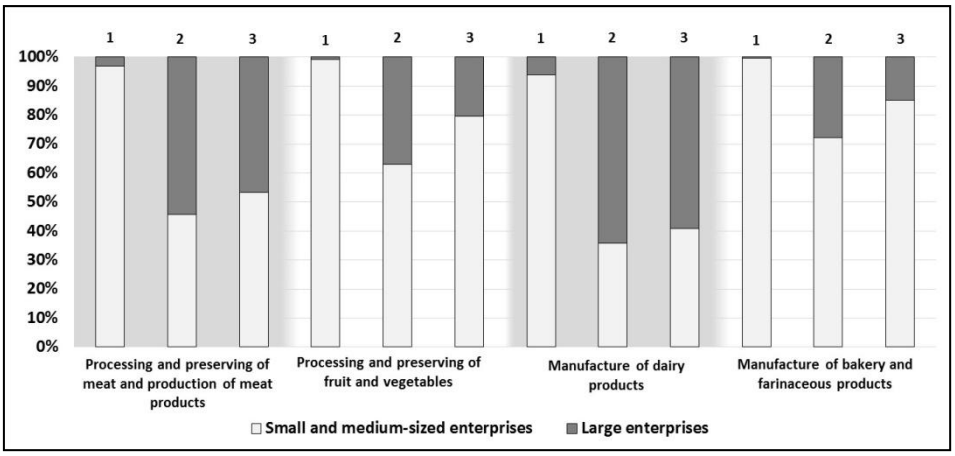
1. Introduction

Agro-food part of the whole food supply chain is significantly important for both the European Union and Hungary. In the article of Felföldi et al (2017) there are detailed information about the role of agriculture and food industry in the Hungarian economy and it is to be noted as well that the SME sector (in the article the term SMEs also includes micro enterprises) has also a high contribution ratio to the agro-food sector.

In our article differences between ICT usage characteristics of corporate size categories have been analysed on the basis of survey data from enterprises operating in the primary agricultural production and the secondary food manufacturing part of the agro-food supply chain.

Regarding the agriculture sector in Hungary, the contribution of different sizes of holdings can be characterised well by 4 economic indicators. Unlike the standard SME classification due to the different economical features of holdings, the categories has been determined by agricultural size of farms in respect of the Hungarian conditions. In this way we classified farms having less than 100 hectares as micro, small and medium-sized holdings and farms having more than 100 hectares as large holdings. From the total number of holdings, 98% belongs to the SME category which employs almost 84% of the total labour force connected to the sector. However, it uses only 36% of the agricultural area and its share from the standard output is 51%. From the NACE Rev.2 categories of Food manufacturing (C10) four subsectors were analysed. The share of these four subsectors analysed from the total number of food manufacturing industry is the following: Processing and preserving of meat and production of meat products: 14%; Processing

and preserving of fruit and vegetables: 12% ; Manufacture of dairy products: 3% ; Manufacture of bakery and farinaceous products: 50% ; Other: 21%. Figure 1. gives a brief overview on the share of SME sector by three different indicators.



Data source: Eurostat, 2018

Fig. 1. *Share of Small and medium-sized enterprises from the total enterprise number (1), value added at factor cost (2) and persons employed (3) compared to large enterprises by subsectors of food manufacturing*

Our aim in this article is to reveal whether a close relationship between the small and medium size categories as treated officially. It could be also determine how wide the gap is between enterprise size categories (micro, small, medium and large) regarding the use of Information and Communication Technologies (ICTs). The research is important because several studies provided evidence for relationship was found between ICT and the performance of enterprises including different sectors and size categories.

The SME sector currently use only simple ICTs and they hardly move forward, their ICT adoption is slow. The main reason for this phenomenon is ICT adoption is a complex process (Kusumaningtyas & Suwarto, 2015) and this is also true for the Hungarian SMEs, as one of the principal weaknesses of Hungarian SMEs is the low innovation ability (including ICT usage) and performance (Szira, 2014). The study of OECD (2004) gives a comprehensive picture about the relation between SME sector and ICT including e-business and besides it deals with the barriers, motivating factors and also the usage characteristics by enterprise size categories. The article of Ahmedova (2015) gives a detailed description about factors which can increase the competitiveness of the SME sector in Bulgaria. One of the important factors is ICT usage which shows a growing trend among Bulgarian SMEs, however, a more intensive deployment of ICT is founded to be need not only for optimization of the company's internal processes, but also for the successful involvement in e-business.

Bayo-Moriones & Lera-López (2007) have also proved the positive impact of ICT for general business indicators like productivity, profitability, market value and market share by analysing indirect indicators such as process efficiency, quality of service, cost savings, flexibility of organization and production and customer satisfaction.

The literature review of Consoli (2012) is an important summary about the determinant factors of ICT adoption and the impact of ICT and also lists papers on which impacts were classified into four groups: performance, growth, expansion and new products, furthermore, adoption factors classified into five groups: individual, organisational, environmental, technological and economic. Taruté & Gatautis (2014) also examined ICT adoption and ICT impact. They analysed the barriers for ICT adoption and used the results of Ashrafi & Murtaza (2008), they presented internal and external barriers. Another important result of Taruté & Gatautis (2014) is the comprehensive overview of the positive direct and indirect impacts of ICT on enterprises and the findings that highlight, for best performance it is important to align ICT investments with internal capabilities and organizational processes.

Earlier the costs meant a significant problem for the SME sector. One of main findings of

Esselaar et al. (2006) was the fact that the main constraint to ICT usage remains too high investments and/or usage costs. Modimogale & Kroeze (2011) also highlight this perceived high cost of ICT as a hindering factor in usage for SMEs. Plumb & Zamfir (2008) presents a detailed list about the direct and indirect costs which can be arisen in the process of ICT adoption and they highlight that direct costs of ICT adoption, (such as costs of hardware, upgrades, training and consulting costs, maintenance costs, the costs of maintaining networking security) are often underestimated, while indirect costs (like restructuring, time or management costs) can be more significant than direct costs. Assante et al. (2016) offers many opportunities that could help companies to improve their business and a more efficient use of technology, such as EDI which does not directly increase sales but can reduce operating costs. Another advantage of use technologies like EDI is that it can speed up and reduce errors in information sharing (Füzesi et al. 2016).

Today, free cloud services offer good solutions for these barriers, mainly for those which concern the budget of enterprises. In the article of Hassan (2017) Malaysian small and medium enterprises were analysed and findings suggest that although cloud computing offers a lot of benefits to the SMEs, specifically on cost savings, the relative advantages of the technology can only be achieved if adequate resources are allocated. Tutunea (2014) studied Romanian SMEs and as the most important benefits of using or adopting cloud solutions were identified the reduction of software costs, followed closely by increase in productivity and increase in the efficiency of activities.

Furthermore a high percentage of respondents is considered to be the reduction of costs of the hardware infrastructure.

Sasvári (2016) found that different enterprise size categories consider in other way about the advantages of cloud services. His results based on a comparison between Austrian and Hungarian enterprises suggest that SMEs consider important the high-level mobility and remote access to information systems while large enterprises the faster information flows. Vasiljeva et al. (2017) investigated Latvian enterprises and, however, the sample size was limited, a vast majority (68%) of the respondent enterprises claimed cloud services reduce costs and they defined access to applications and data from anywhere at any time as top advantage.

Nevertheless, regarding the advanced ICT such as cloud services, the European enterprises have still a distrust of them which means barrier in usage (Sasvári, 2016).

This fact is justified by a survey of Brewster et al. (2012) on usage of advanced internet technologies and only a few respondents used really those that are already available today, while the majority of the respondents use basic and simple systems and applications. On the other hand, recent surveys also found that agro-food SMEs are getting interested in practical, close to market applications and they started to recognize the advantages of using the cloud.

Regarding e-commerce, obstacles are existing as well. HCSO and Eurostat (2015) statistics indicates the most important obstacle is the vast majority of the enterprises do not consider their goods or services suitable for web sales, the second hindering factor is the logistical problems for delivery and cost is the third greatest obstacle to e-commerce. European Commission also highlights the importance of use of ICT. The 'smart' use of ICT by companies is a critical factor for success in innovation, competitiveness and growth. As large companies are moving to exploit the advantages offered by ICT, smaller companies have to follow suit or risk being left out of digital supply chains (European Commission, 2018). European Commission provides opportunity for ICT development for enterprises in several sector. The eFood Chain project, for instance, is one the measures to increase the efficiency of the agro-food supply chain and demonstrate the real benefits of ICT and eBusiness solutions for enterprises, in particular SMEs.

The eFoodChain Reference Framework will enable European companies operating in the cereals, fresh fruits and vegetables and dairy sectors to use ICT more effectively (www.efoodchain.eu).

Despite of the several advantages listed above there are several areas today where the gap is wide and further studies and examinations can help their ICT inclusion. Consoli (2012) also draws attention to the analysis of factors of ICT adoption and the impacts on organizations as these steps are very important to understand how to stimulate in SMEs the process of investment in new technologies to acquire competitive advantages and good business performance.

2. Methodology

We wanted to understand if there is a significant difference in the usage level of enterprises operating in the agro-food sector by the different size categories (micro, small, medium and large enterprises). In accordance with our aim an analysis have been performed using secondary data from database of Eurostat and Central Hungarian Statistical Office and primary data from our survey.

2.1 Data set

First we made an analysis on relevant data available in Eurostat data. We collected data from Eurostat database on percentage of enterprises using advanced ICT services by size for each EU-28 Member States, without any restriction in economic activity. The following indicator groups have been included in the analysis with 12 separate indicator:

Online presence of enterprises
1. Have a website and pay to advertise on the internet (I1)
2. Use social networks (I2)
3. Use multimedia content sharing websites (I3)
Social media use by purpose
4. Develop the enterprise's image or market products (I4)
5. Obtain or respond to customer opinions, reviews questions (I5)
6. Involve customers in development or innovation of goods or services (I6)
7. Collaborate with business partners (e.g. suppliers, etc.) or other organisations (e.g. public authorities, non-governmental organisations, etc.) (I7)
Integration with partners
8. Enterprises sending eInvoices B2BG, suitable for automated processing (I8)
9. Enterprises receiving eInvoices, suitable for automated processing (I9)
Use of pay Cloud Computing services
10. Buy only low CC services (I10)
11. Buy only medium CC services (I11)
12. Buy high CC services (I12)

Eurostat data set with this 12 indicator are broken down to 3 size categories (S-Small enterprises, M-Medium enterprises and L-Large enterprises) and given as percentages that is the proportion of enterprises using a certain ICT solution. Information gained from the survey is very important as statistical databases publicly available provide limited data on restricted queries like different ICT usage indicators of enterprises operating in different economic sectors by size or region.

The survey was conducted in the fourth quarter of 2017 and using structured questionnaire and responses are recorded by a market research company contacting the leaders or a management member of enterprises. Enterprises have been selected by stratified sampling based on statistics of Hungarian Central Statistical Office. Enterprise size based on staff employed and region at NUTS-2 level were the basis of sampling. Data set contains data about 500 enterprises operating in sectors related to agriculture and food industry. The Nace Rev. 2 codes of enterprises involved in our survey are the followings:

Section A – Agriculture, forestry and fishing
01.11 – Growing of cereals (except rice), leguminous crops and oil seeds
01.13 – Growing of vegetables and melons, roots and tubers
01.21 – Growing of grapes
01.24 – Growing of pome fruits and stone fruits
01.41 – Raising of dairy cattle
01.46 – Raising swine/pigs
01.47 – Raising of poultry
Section C – Manufacturing
10.1 – Processing and preserving of meat and production of meat products
10.3 – Processing and preserving of fruit and vegetables
10.5 – Manufacture of dairy products
10.7 – Manufacture of bakery and farinaceous products

The number of sample enterprises by size based on total number of employees and by region is shown on Table 1.Our sample well represents the distribution of Hungarian SMEs operating in the selected sectors. The blue filling of sample follows well the pattern of HCSO data and the sample size is almost 3% of the total number of studied enterprises. The sample without micro enterprises, however, represent almost 12% of operating enterprises registered in HCSO database.

Table 1. *Number of enterprises operating in the above-specified sectors in HCSO database and number of respondent enterprises in our survey database by region and enterprise size*

Data source: HCSO and own survey data

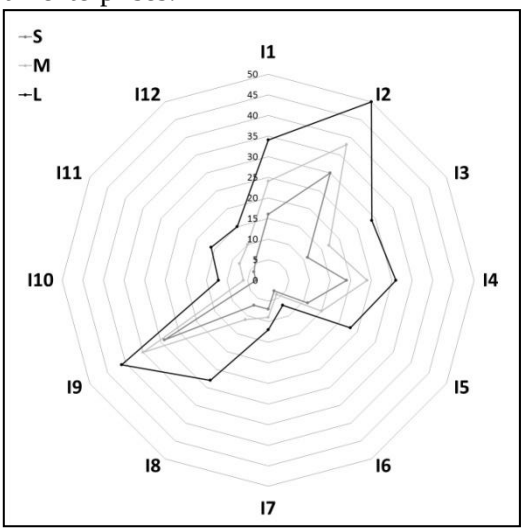
Region \ Enterprise size	Micro enterprises	Small enterprises	Medium enterprises	Large enterprises	Total
			HCSO database		
Central Hungary	1761	383	73	6	**2223**
Central Transdanubia	1205	189	46	9	**1449**
Western Transdanubia	1575	215	47	7	**1844**
Southern Transdanubia	1557	243	52	5	**1857**
Northern Hungary	1392	175	47	1	**1615**
Northern Great Plain	3948	363	98	8	**4417**
Southern Great Plain	3089	398	93	18	**3598**
Total	**14527**	**1966**	**456**	**54**	**17003**
			Number of respondent enterprises in our database		
Central Hungary	23	28	7	0	**58**
Central Transdanubia	19	23	6	1	**49**
Western Transdanubia	18	30	3	2	**53**
Southern Transdanubia	27	21	10	0	**58**
Northern Hungary	25	14	6	0	**45**
Northern Great Plain	57	50	17	3	**127**
Southern Great Plain	40	47	21	2	**110**
Total	**209**	**213**	**70**	**8**	**500**

2.2 Calculation methods

Standard deviation was calculated for each Eurostat data series to determine the distribution of values and the results showed normal distribution. F-test has been applied in case of each indicator to determine the difference in variance between the three size categories. F-test has been made between each group and on the basis of the result two sample T-test with equal or unequal variances has been applied in case of each three size group pairs belonging to one indicator. Our null hypothesis in case of two sample T-test is that there is no significant difference between groups. We reject null hypothesis if t stat > t critical two tail and P two tail < Alpha (0.05). These statistical calculations have also been run on the values of questions assessed on Likert scale and descriptive statistics have also been applied to characterise the differences between enterprise categories by size. The questions of our survey have been formulated in accordance with Eurostat indicator groups (Online presence, Social media use, Integration with partners and Use of cloud computing services) in order to facilitate an objective comparison of enterprise size classes.

3. Results

Related to the ICT usage characteristics of Hungarian SMEs and large companies we first showed the values of 12 Eurostat indicators chosen on Figure 2. which presents the difference between the three size categories. The values of large companies are much higher than the values of SMEs, and it is apparent that the values of medium enterprises are closer to the values of small enterprises.



Data source: Eurostat, 2018

Fig. 2. *Percentage of enterprises using different online services by size*

In order to determine the position of Hungary among EU Member States we divided the data set of usage values for 2016 into quartiles and Hungary was in the lower quartile in almost all indicators and all three size categories. Overall, our position is very poor, however, the average usage ratio is low in other Member States as well.

Our next step, as current article investigates the difference between enterprise size classes, is calculating two sample T-tests with equal and unequal variances (on the basis of results of F-tests) on the data set of Eurostat (Table 2.). We divided the data by enterprise size to Small (S), Medium (M) and Large (L) categories and indicators show what percentage of enterprises use the advanced online technologies.

Table 2. *Result of T-test – difference between enterprises broken down by employee size class*
Source: Own calculation on Eurostat data

	t stat	t critical two-tail	P(T<=t) two-tail	t stat	t critical two-tail	P(T<=t) two-tail	t stat	t critical two-tail	P(T<=t) two-tail
Indicators	between M and S			between L and M			between L and S		
Online presence of enterprises									
Have a website and pay to advertise on the internet	***2.449***	***2.006***	0.017	***2.878***	***2.004***	0.005	**5.613**	**2.006**	0.000
Use social networks	***2.790***	***2.005***	0.007	***3.569***	***2.004***	0.000	**6.685**	**2.005**	0.000
Use multimedia content sharing websites	**5.508**	**2.004**	0.000	**5.353**	**2.004**	0.000	**9.891**	**2.004**	0.000
Social media use by purpose									
Develop the enterprise's image or market products	***2.854***	***2.008***	0.006	***3.596***	***2.007***	0.000	**6.497**	**2.010**	0.000
Obtain or respond to customer opinions, reviews questions	***2.837***	***2.007***	0.006	***3.742***	***2.006***	0.000	**6.929**	**2.007**	0.000
Involve customers in development or innovation of goods or services	***2.530***	***2.006***	0.014	***3.162***	***2.007***	0.002	**5.916**	**2.006**	0.000
Collaborate with business partners or other organisations	***2.206***	***2.010***	0.032	***3.258***	***2.011***	0.002	**5.169**	**2.007**	0.000
Integration with partners									
Enterprises sending eInvoices, suitable for automated processing	1.619	2.004	0.111	***2.398***	***2.004***	0.019	**4.013**	**2.005**	0.000
Enterprises receiving eInvoices, suitable for automated processing	1.413	2.006	0.163	***2.427***	***2.005***	0.018	**3.874**	**2.006**	0.000
Use of pay CC services									
Buy only low CC services	***3.561***	***2.010***	0.000	***2.699***	***2.010***	0.009	**7.736**	**2.004**	0.000
Buy only medium CC services	***3.750***	***2.008***	0.000	***3.637***	***2.007***	0.000	**8.589**	**2.004**	0.000
Buy high CC services	1.985	2.006	0.052	***2.887***	***2.007***	0.005	**4.788**	**2.004**	0.000

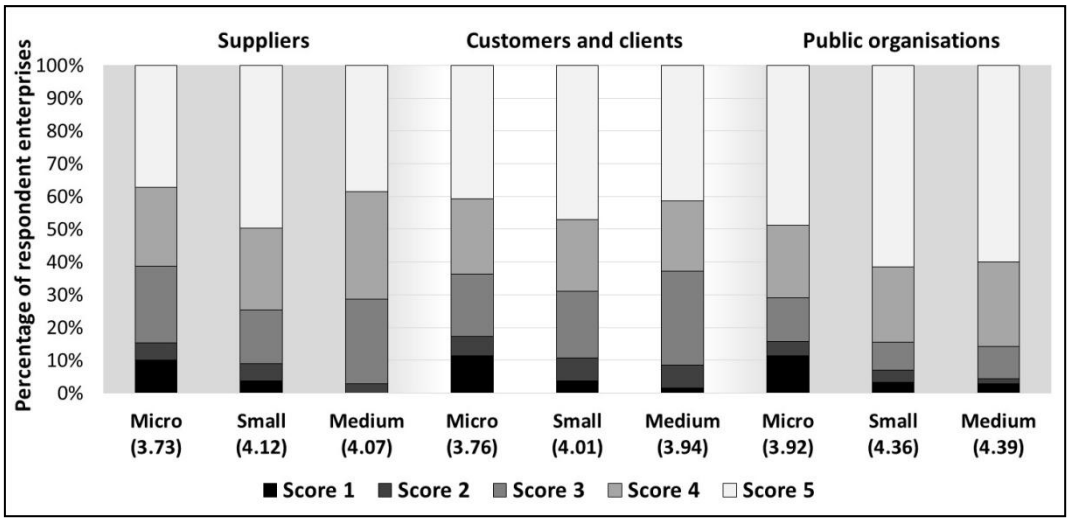
Our results suggest that the difference between Small and Large enterprises is significant in case of each indicator. It also can be seen in the table that Medium enterprises differ more from Large enterprises than from Small enterprises in terms of ICT characteristics and in case of three indicators the results of T-test indicate that there is no difference between Small and Medium enterprises.

A comparative analysis between enterprise size categories has been run on the data of our survey, excluded the group of large companies because of its small number and included micro enterprises. We have investigated if there is any relation between corporate size and their evaluation score for the questions.

First three simple "yes" or "no" questions have been asked to determine their integration with their partners. The questions ask the enterprise require partners to use a certain information system, or it has to use one and does the enterprise harmonise its ICT development with its most important partners.

A small percentage of enterprises require partners to use a certain information system and there is no difference between the three enterprise size classes. However, with the growth of company size a bigger percentage of enterprises has to use a certain information system required by a partner. There is a slight difference between medium sized and smaller enterprises and almost one third of the enterprises harmonise its ICT development with its most important partners.

To determine the role of internet in enterprise relations the respondent enterprises have evaluated its importance with their partner types (suppliers, customers and clients and public organisations) on a scale between 1 (not important) and 5 (very important). Figure 3. shows the distribution of respondent enterprises by score indicating the average score given by the enterprises in a size class in brackets.



Data source: own survey

Fig. 3. *Share of the scores given to the importance of internet with partners*

To determine if the differences between enterprise size classes are significant One-way ANOVA test has been applied and the result showed significant difference in case of two partner types.

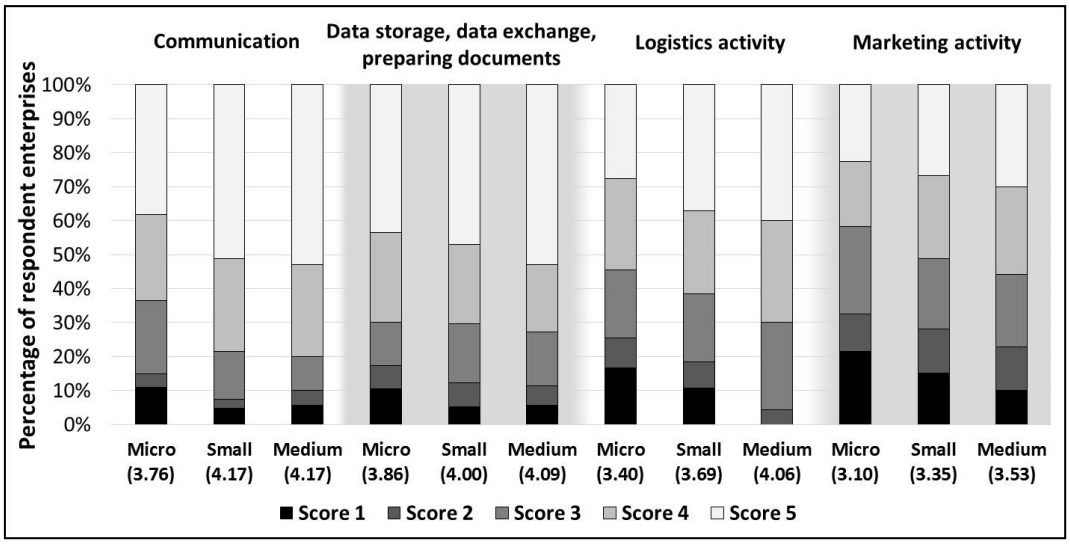
The difference between evaluation on importance of internet in case of Supplier and Public organisation partner types is significant and two sample T-test has been run with equal and unequal variances based on the result of F-tests. The result can be seen on Table 3.

Table 3. *Result of T-test on scores given to the importance of internet with partners*
Source: own calculation on survey data

Importance of Internet in relations with	t stat	t critical two-tail	P(T<=t) two-tail	t stat	t critical two-tail	P(T<=t) two-tail	t stat	t critical two-tail	P(T<=t) two-tail
	Between Small and Micro			Between Medium and Small			Between Medium and Micro		
Suppliers	**3.314**	**1.966**	**0.001**	*-0.319*	*1.968*	*0.750*	**2.051**	**1.969**	**0.041**
Customers and Clients	ANOVA test showed no difference between the three groups. (F stat (2.420) < F crit. (3.014); P value > 0.05 (0.089)								
Public Organisations	**3.731**	**1.966**	**0.000**	*0.219*	*1.979*	*0.827*	**2.652**	**1.969**	**0.008**

The next part of our survey is the evaluation of cloud computing solutions in the enterprise activities. Analysing the use of cloud services by enterprises operating in the agro-food sector and their assessment of the usefulness and importance in their organisations of these solutions has become a central area in articles concerned with this issue as these solutions such as open source software and applications or free cloud services may be suitable to help them. In Hungary, micro and small enterprises often face difficult financial state and for them free Cloud computing services can offer good opportunities to develop their ICT readiness as these solutions do not have initial costs.

Figure 4. presents the share of scores given by the respondent enterprises for the question related to the importance of the different cloud solution in their partnership.



Data source: Own survey

Fig. 4. *Share of assessment of respondent enterprises for the following question: Evaluate the importance of using cloud solutions in your partnership (on a scale between 1 – not important and 5 – very important)*

The average score is between 3 and 4 in case of micro enterprises in all four indicators, however, the average scores of small and medium sized enterprises are mainly above 4. To see the differences between size classes, two sample T-test has also been run on data and Table 4. presents the result.

Table 4. *Result of T-test on scores given to the importance of cloud services with partners*
Source: Own calculation on survey data

	t stat	t critical two-tail	P(T<=t) two-tail	t stat	t critical two-tail	P(T<=t) two-tail	t stat	t critical two-tail	P(T<=t) two-tail
	Between Small and Micro			Between Medium and Small			Between Medium and Micro		
Communication	**3.553**	**1.965**	**0.000**	*-0.015*	*1.981*	*0.988*	**2.512**	**1.978**	**0.013**
Data storage and exchange, preparing documents	ANOVA test showed no difference between the three groups. (F stat (1.169) < F crit. (3.014); P value > 0.05 (0.311)								
Logistics activity	**2.199**	**1.966**	**0.028**	**2.124**	**1.968**	**0.034**	**3.642**	**1.969**	**0.000**
Marketing activity	*1.794*	*1.966*	*0.074*	*0.986*	*1.979*	*0.326*	**2.302**	**1.979**	**0.023**

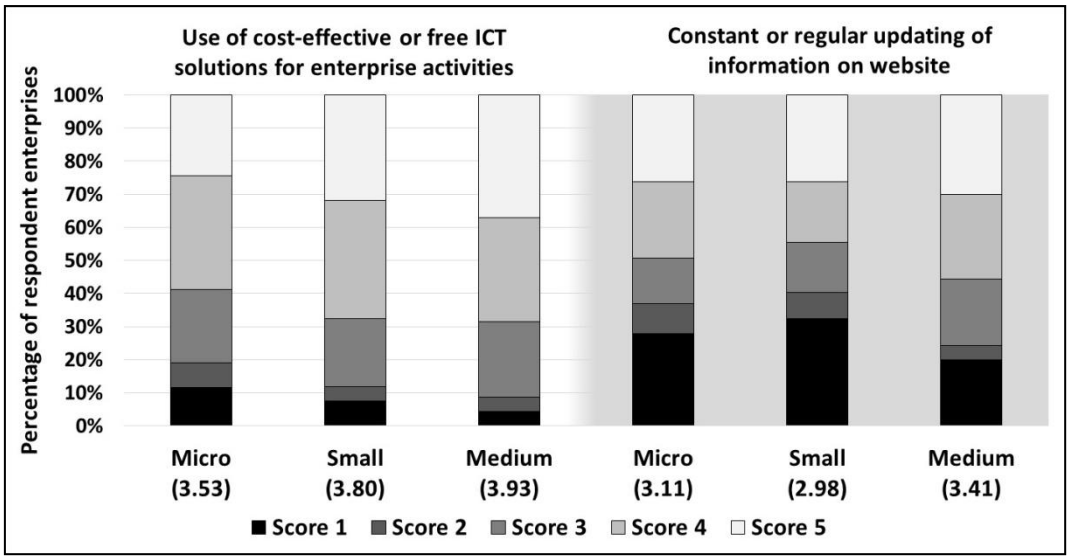
As Table 4 shows, the difference between enterprise groups is the most striking in case of logistics activity. Cloud solutions for communication shows micro enterprises slightly lag behind the other two categories, the evaluation of small and medium sized enterprises is similar. In case of marketing activity, enterprises have given low scores for the importance of cloud solutions and the difference is significant between medium and micro enterprises, small enterprises are halfway in between. The third indicator (Data storage, data exchange and preparing documents) shows no difference between groups.

Regarding online solutions enterprises have been asked to evaluate the following two questions on a scale between 1 (not important and 5 (very important):

- How important is it to you to use cost-effective or free ICT solutions in enterprise activities (like logistics, marketing, communication, etc.) for the competitiveness?
- How important is it to you to update website information constantly or regularly?

Figure 5. illustrates the share of scores given to the questions by enterprise sizes. The first indicator, serving also as a control question to the previous one, is in line with the average scores of indicators on the importance of cloud solutions presented previously, respondents considers it important, however, the average values are

slightly lower. Regarding the second indicator, a constant or regular update of the website information is not relevant in neither case and the average scores are very low in all three enterprise categories.



Data source: Own survey

Fig. 5. *Share of the scores given to the importance of free ICT solutions and updating of websites*

Table 5. lists the result of T-tests on the date belonging to these two indicators and a significant difference can be seen in the first case between micro enterprises and SMEs. The calculation shows no difference between the three enterprise classes for the second question.

Table 5. *Result of T-test on scores of the importance of free ICT solutions and updating of websites*

Source: Own calculation on survey data

	t stat	t critical two-tail	P(T<=t) two-tail	t stat	t critical two-tail	P(T<=t) two-tail	t stat	t critical two-tail	P(T<=t) two-tail
	Between Small and Micro			Between Medium and Small			Between Medium and Micro		
Use of cost-effective or free ICT solutions	**2.348**	**1.966**	**0.019**	*0.830*	*1.979*	*0.408*	**2.581**	**1.977**	**0.010**
Constant or regular updating of information on website	ANOVA test showed no difference between the three groups. (F stat (1.989) < F crit. (3.014); P value > 0.05 (0.138)								

Conclusions

The growing complexity of the vertical and horizontal cooperation within the chain may motivate smaller, mainly micro enterprises to stimulate their ICT usage and use of advanced technologies. In our opinion a dedicated ICT strategy is needed and it should focus on this size class as these enterprises mean an important part in the agro-food sector.

In Hungary, enterprises operating in the agro-food industry are often face with difficult financial state and for them free cloud computing services can offer good opportunities as they do not have initial costs and further maintenance is also less expensive. ICT adoption is very important to them as ICT sector is a dynamically growing sector and if customers and partners of an enterprise adapt faster to these technological innovations, it may have a negative effect on the different processes, performance and financial results of the organisation.

Our overall conclusion is the micro and small enterprises need more support both from the side of finance and prepare for usage of these opportunities.

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WINE LIST OPTIMIZATION – A CUSTOMER BEHAVIOUR PERSPECTIVE

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Abstract: *The present article aims at providing an analysis for one of the most important tools in Food and Beverage Management – the wine list. The current market situation in Romania offers a challenging perspective on the interaction between customer behaviour and the wine list. A quantitative marketing research technique was used, and the resulted data was analysed in relation with both customers' characteristics and literature findings.*
The relation between wine list perception and several important demographics is presented. Another important finding is describing the importance of the wine list from a wine selection perspective – 23% of the respondents are considering that the wine list structure impacts the wine selection. Furthermore, 39% are using the wine list as the main tool to choose the wine in a restaurant.
The results are underlying the importance customers give to wine lists and how they interact with this important Food and Beverage Management tool.

Keywords: *Management, customer behavior, wine list;*

1. Introduction

According the Registrar of Commerce from Romania, at the end of 2013 there were 24.400 restaurants in Romania with a combined turnover of 6.7 billion lei. Only Bucharest with 3.102 restaurants, represents one third of the total restaurant market, even though it hosts only one eighth of the companies in this field.

Table 1. *Romanian restaurant industry 2013*

Counties	Number of companies	Total turnover (million, Ron)
Ilfov (including Bucharest)	3196	2489.3
Cluj	1381	398.9
Constanta	1625	369.3
Brasov	857	291.1
Timis	1254	275.3
Total top 5	8313	3823.9
Total	24432	6768.1

Under these circumstances, Unilever Food Solutions conducted a study in order to identify the culinary habits of the Romanian customer and the data showed that most of the Romanians prefer to dine out mainly because they like to enjoy the food they order, they like to socialize and to be served.
An online survey designed by a specialized company in e-commerce, showed that 42.2% of all respondents stated that they prefer to have a dinner in a casual restaurant, mainly pizzerias and 29.7% are appreciating traditional and international cuisine.
According to the same study, when dining out, 5% of the respondents prefer to drink spirits, 31% enjoy beer and 20% will definitely order wine (Tempea, 2010).
The consumption of wine in Romania decreased considerably in the past years (from 4.7 million of hl in 2014 to 3.8 million hl in 2016) and according to the wine consumption statistic

provided by the International Organization of Vine and Wine, Romania is ranked 14.

The objective of this paper is to provide a more in-depth understanding on how restaurant managers could conceive, design and use the wine list in order to increase the wine sales in restaurants and to provide a pleasant experience to all guests interested to order a bottle of wine.

2. Literature review

Wine is considered to be playing an essential role in the enjoyment of the restaurant dining experience (Yuksel and Yuksel, 2002), therefore different types of food and beverage establishments are offering wine selections to their guests. The process of selecting a bottle of wine from the wine list within the restaurant environment, it is considered an experience that reveals the limits and in the same time, the importance of circumstances for consumer behaviour (Davis and Charters, 2006).

Henderson and Rex (2012) suggested that the first action required in the process of creating a wine list should be recognizing the goals of the wine program. The purpose of the wine list in any restaurant setting is to promote wine sales and to exceed the guest's expectations.

The main objective of wine lists is to encourage guests to easily discover and purchase a desired bottle of wine without spending too much time and effort (Henderson and Rex, 2012). Berenguer et al. (2009) revealed that wine lists have been identified as an important factor that can differentiate restaurants. In the same time the length and the style of a wine list can separate high-quality dining establishments from those providing just excellent food. Henderson and Rex (2012) also stated that there is a remarkable difference between restaurants which offer a wine list that respects a clear layout and a fair pricing strategy than the restaurants which do not consider important editing an elaborate wine list and do not take into consideration the pricing strategies.

An efficient wine list should not be sophisticated in terms of the information and value provided. It considered to be tiring for a customer to try to read the whole wine list and to be able to process the information in a short period of time. The wine diversity from a wine list can represent an asset for the restaurant but it is not considered a priority (La Villa, 2009).

According to La Villa (2009) the major sources of revenue for a food and beverage establishment are food and beverages, and wines in particular. The specific method of laying out the wine list and pricing the wine will differ from restaurant to restaurant but their ultimate goal, most definitely will remain the same and will be referring to promoting wine sales (Henderson and Rex, 2012).

Berenguer et al. (2009) explained in their investigative study that an excellent wine list should be *"easy to use", "easy to change", "varied", and "extensive", "specialized", "imaginative and "selective".*

Furthermore, a well-developed wine list should be up-to-date on regular basis because successful wine sales within any restaurants are strongly depending on the wine knowledge and the involvement of the restaurant manager (Berenguer et al., 2009).

A different approach was visible before the study conducted by Berenguer et al. (2009), in a 12-week study, in a mid-price chain restaurant and according to the findings Wansink et al. (2006) succeeded to demonstrate that high wine sales can be associated with wine and food paring 7.6%, with wine recommendations 12% and with wine tasting 48%. According to his findings, it is easy to notice the factors which influence wine sales in a restaurant.

Along with that, it is necessary to define and understand the target market attracted by restaurants. Fulfilling guest's needs is the most important element in building a long-lasting relationship. The presence of a wine list into a restaurant establishes the standards of the restaurant, the level of service but only if it is properly conceived and managed (Robinson, 2010).

Obtaining feedback from guests in regards of the wine selections provided by the restaurant, could be considered the first priority of the food and beverage manager (Brown, 2007). Constant implication in the process of receiving feedback and using the information for future changes, may be the key to successful wine sales (Cichy, R., F. and Hickey, P. J. 2007)

Most of the information provided by literature offers valuable knowledge related to the increase of the wine sales within a restaurant, but very little is known about a restaurant 'owner strategies in the process of selecting the wines meant to enhance and to exceed guest's expectations.

For the purpose of this article, the researcher will present the most important three strategies of designing, organizing and managing a wine list.

According to Beardsall (2002), a wine list is a *"minor art form that, unfortunately, can be made into a pretentious exercise in sales"* and because most of the guests prefer to dine out rather to enjoy a delicious meal than to appreciate a good bottle of wine, is the restaurateur' job to create a list with wines that will complement the cuisine as well as the prices.

Wine lists that are organized by region of origin will present a distinct section for each of the major wine regions from the world (Henderson and Rex, 2012) therefore this kind of wine list will include a section for Romanian wines, Italian wines and French wines. In the same time each of this section will display wines categorized by the wine regions of the specific countries. A major flaw with this method is represented by the limited attention the guests are paying to the entire wine list, missing opportunities to try different wines from all parts of the world (Beardsall, 202).

Henderson and Rex (2012) stated that in modern times, the wine consumers will know precisely what kind of wine they prefer to enjoy and for this type of guest the easiest way to select a bottle of wine is by having the structure of the wine list organized according to the type of grape used in the process of making wine.

A wine lists that respects this type of format, must have a section for the most important varietal: Chardonnay, Cabernet Sauvignon, and Merlot. Furthermore, each section will contain the specific wines from different corners of the world. In this context, most definitely this specific wine list can guide customers in choosing the kind of wine they love.

Henderson and Rex (2012) identified a major issue for this structure of a wine list because not all wines are obtained through the fermentation of a single type of grape. Along with this issue, Beardsall (2002), considers that organizing the wines using this sophisticated strategy, will be for no help for guests, unless they are familiar grape flavours.

The progressive wine list is a totally different approach when it comes to arranging wines in a wine list and Robinson (2010) suggested that using this approach choices are displayed according to their style from light to full-bodied. Furthermore, the progressive wine list will consist of a first section that will present the wine by the glass, from the sweetest to the driest, the second section will display sparkling wines and champagnes, from the sweetest to the driest, the white wine section where all white wines are listed in three subcategories: light bodied white wines, medium bodied white wines and full bodied white wines. Like previous descriptions, here too, wines are presented from the sweetest to the driest. As a logical extension, the next section shows the rose wine following the same structure as the white wines and in the end a red wine section is revealed respecting the same structure as all the other sections (Henderson and Rex, 2012).

La Villa (2010) mentioned that a brief description for each wine will be highly appreciated and will provide guidance to both unexperienced clients and wine lovers or "connoisseurs". An extra mile, in enhancing the guests' dining experience will be the presence of a recommended wine next to a dish from the food menu. This will offer to an uninitiated client, the possibility of an easier and faster decision in the process of acquiring a wine that is meant to compliment a culinary experience. (Henderson and Rex, 2012).

3. Methodology

The decision in regards of chosen the appropriate research instrument was based on the aim of the research, in correlation with the need to capture the complexity of the research topic.

For the purpose of this article, one data collection instrument was considered, in order to gain a detailed understanding of the efficiency of wine lists from restaurants located in the centre-part of Romania the customer point of view.

Tryfonos (2015) stated that piloting the research instruments before the actual study commence is vital for the success of the research itself because it enables the researcher to develop and improve the questionnaires avoiding any problems that may occur in the future. For these reasons the research instrument used in this study was piloted and issues related to their feasibility, validity and reliability were well anticipated.

The initial questionnaire was given to a number of five persons from one of the restaurants targeted for the research. After they were handed to randomly chosen respondents, the researcher analysed the time each customer took to respond and if there were any issues related to the ambiguity of the questions. A constructive feedback was provided by all five participants at the pilot study and necessary changes were done.

Well-structured questionnaires *containing "definite, concrete and pre-determined questions"* (Kothari, 2004) were handed to all

customers found in restaurants located in the central region of Romania.

The researcher expected all respondents to interpret their own perception towards the efficiency of wine list found in each restaurant targeted for the research and due to the fact the all three cities have a high touristic potential, all questionnaires were elaborated in both Romanian and English to increase the viability of the chosen research method.

Quantitative data were gathered through paper questionnaires that were administrated using the pen-paper method and aimed at customers found in restaurants from central region of Romania. The questionnaires contained an introduction and different types of questions such as ten closed questions that implied that customers would mark with an x one or more answers which made the completion easier and faster. Three questions encouraged respondents expressing opinion by using the scale Unimportant, Somehow important, Neutral, Important, Very important, as well as 1 to 5 ranking.

Eight concise questions were used for an indication of Yes/ No answers. Only two open question were visible in the questionnaires which tried to encourage customers to be more inclined to answer the question.

The total number of questions found in the paper questionnaires was twenty-four and Romanian or Foreign customers available at that particular moment in the restaurant were invited to fill them in.

4. Data analysis

For the purpose of analysing the data collected through the questionnaires, the IBM SPSS Statistic was used, and all information was introduced in the database and the descriptive statistic, frequency and cross tabulation were considered appropriate for better understanding of the outcome.

For the purpose of identifying the profile of the customer who considers wine list very important, the researcher analyzed the data using the descriptive analysis and focused mainly on the efficiency of the crosstabs function of the IBM SPSS.

The Figure 1 displays the finding from which is interesting to observe that wine list is perceived very important by females with a university degree (18 respondents, accounting for 17.48%) followed by males with the same degree (11 respondents, accounting for 10.68%). On the opposite pole, it is visible that males with university degree considers the wine list unimportant (6 respondents, accounting for 5.83%) as well as females from the category (4 respondents, accounting for 3.88%).

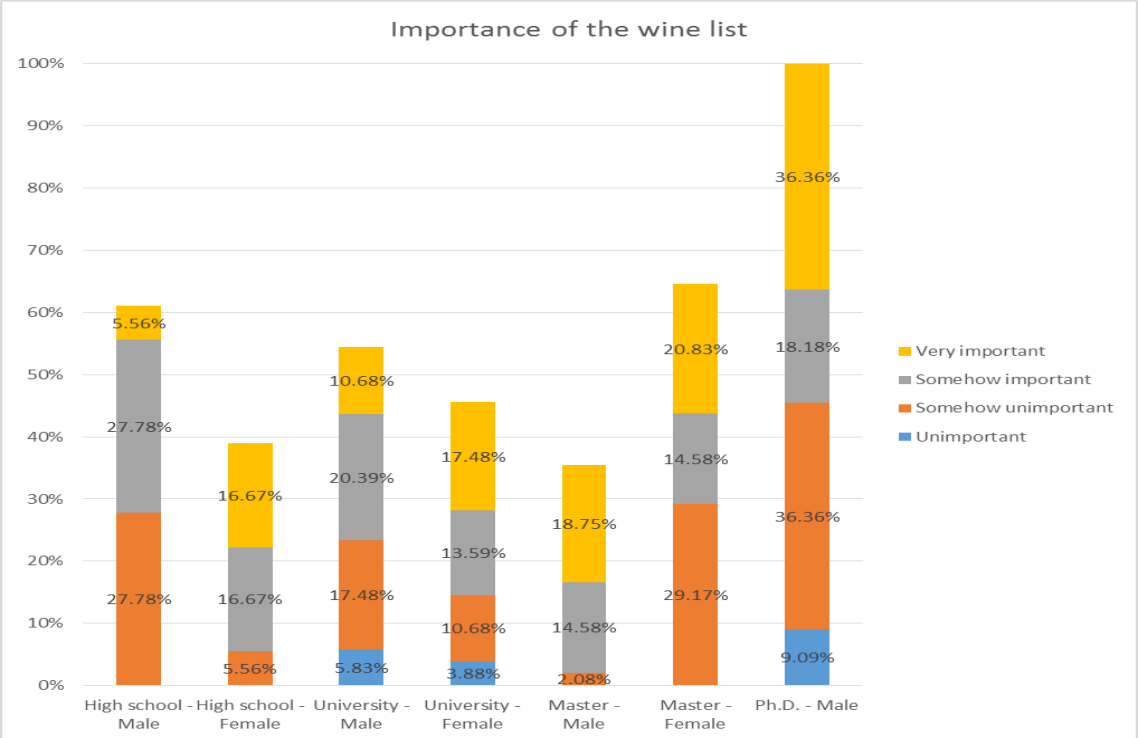

Fig.1. *Relationship between the importance of wine list, gender and education (percentages)*

4.1. Customer's perception towards the efficiency of the wine list structure.

The first half of the survey is focused on establishing if the structure of the wine list is perceived as a useful tool in selecting a bottle of wine.

As shown below in Figure 2, 33.89% of the customers consider important the structure of the wine list only in some cases, 30% consider it helpful but rarely, 23.33% are always considering helpful the structure of the wine list and 12.78% never consider helpful the structure of the wine list.

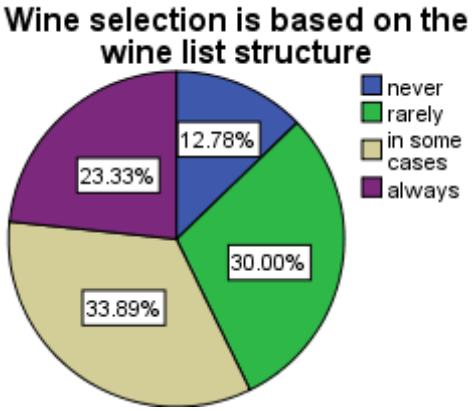

Fig. 2. *Wine selection is based on the wine list structure*

Moreover, going deeper with the investigation it is easy to observe in Figure 3 that customers when ordering the wines, they do consider the wine list a source of valuable and useful information (38.89%) but they prefer to order wines relying more on the wine knowledge and suggestions of the restaurant staff (45%). Only a small percentage (16.11%) rely on the wine list when ordering wine.

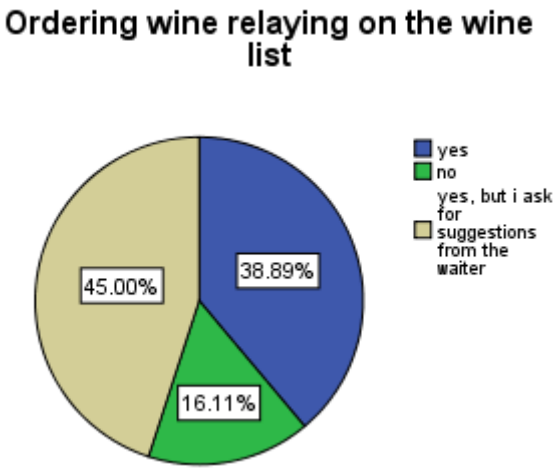

Fig. 3. *Ordering wine relying on the wine list*

4.2. Customer's perception towards the content of the wine lists

The next question analyses the useful information found in the wine list from the guest's point of view. This question refers to what kind of information the customer finds valuable and helpful when reading the wine list found in restaurants. As shown below in Table 1 out of 180 respondents the largest percentage (51%) considered very useful the information related to the wine and food paring followed by information related to the sugar content (46%) and wine descriptions (42%).

Table 2. *Useful information found in the wine list (in percentages)*

Useful information related to:	**Not useful**	**Quite useful**	**Neutral**	**Useful**	**Very useful**
The type of the grapes	5%	20.6%	8.9%	30%	35.6%
Wine regions	5.6%	11.7%	20.6%	32.2%	30%
Wine description	3%	12%	10%	32%	42%
Sugar content	6%	9%	12%	27%	46%
Wine and food paring	3%	12%	7%	28%	51%
Price range	4%	8%	16%	34%	38%

The third part of the questionnaires was conceived in order to investigate the customer's perception towards the content of the wine list. Furthermore, respondents were invited to answer objectively if the wine list found in the restaurants from central region of Romania are offering a wide variety of wines. As the figure 4 shows, 65% of the respondents answered positively and 21.67% negatively. The rest of 13.33% mentioned that the wine list does not necessary provides a wide variety of wines.

Fig. 4. *Wine variety in wine list*

4.3. Customers' feedback in relation to the wine lists

The last part of the questionnaire was designed in order to have a more in-depth understanding of the guests' perception related to the wine list. All respondents were invited to write down if they were interested in providing feedback concerning the wine lists and what they would like to change or improve in order to definitely enjoy navigating, selecting and ordering a bottle of wine.

As seen in the Figure 5 presented below, 63.89% of the respondents offered yes as an answer, 20.56% declared that they would not provide a feedback related to the wine lists and 15.56% of the respondents mentioned that they will not necessary agree to provide feedback.

Fig. 5. *Wine list feedback*

After determining the results of the data analysed, the researcher wanted ca go further and evaluate the last question of this section when customers were asked to provide feedback to the wine list found in the restaurants. Interesting findings are displayed in the Table 3 and it is easy to observe a small difference between respondents who would like to improve and respondents who would not improve/add anything to the actual wine list. Also when respondents were asked what they would add to the wine list, there is a significant small percentage that indicated that new elements should be added to the design, structure, presentation, and price rang or other.

Table 3. *Guest's feedback towards wine list*

	Design	**Structure**	**Presentation**	**Price range**	**Other**
I would improve	46.1%	40.6%	35.6%	37.2%	21.7%
I would add	19.4%	17.8%	29.4%	26.7%	35.6%
I would not improve/add	34.4%	41.7%	35.0%	36.1%	42.8%

In this context, the researcher finds a contradiction in what the customers are stating related to the feedback towards wine lists and their actions.

As describe above, an important number of respondents were willing to provide feedback yet, they did not know what they would like to improve/add.

Conclusions

Paper questionnaires helped the researcher identifying the customers' perception towards wine lists found in the restaurant from central region of Romania. After analysing all 180 questionnaires handed in person to all respondents found on the restaurant premises, few important conclusions must be highlighted. There is a significant percentage of customers (32.78%) who are considering wine lists somehow important and very important (31.11%), pointing out what Henderson and Rex (2012) mentioned about the importance of wine list for customers. Even though customers do pay attention to the wine list, only 33.89% are appreciating the structure of the wine list in some cases and 30% stated they rarely they considered the structure of the wine list helpful for selecting a wine. When asked if they do rely on the wine list for ordering wine, 45% stated that they do but they ask for wine recommendations as well.

In regards of what kind of information, the customers found valuable and helpful when selecting a bottle of wine, 32.2% considered wine regions as a useful source of inspiration and it supported the literature provided by Henderson and Rex (2012). The findings are consistent with the results of the study by Cohen et all (2009) conducted with Australian, UK and French wine consumers, in which respondents considered the most important criteria in selecting a bottle of wine the "match with food" aspect.

The largest percentage (51%) appreciated that wine and food paring information are very useful when deciding to purchase a bottle of wine and 42% of the respondents stated that a brief wine description will be highly appreciated due to the guidance it provides to all customers which sustain La Villa (2010) who stated that managers should pay a great deal of attention to introducing recommendations of wines next to the dishes from the food menu, followed by a short description of each wine.

As a conclusion, customers are paying attention to the wine lists, they evaluate the structure and the content and they are willing to provide feedback, anytime they are asked. If restaurants managers are open and enthusiastic in obtaining guest's opinion towards the wine list as Brown (2007) mentioned, surely actions will be taken to design and conceive wine lists. What puzzled the researcher is the insufficient wine knowledge customers have by not being able to provide any relevant information to what they would improve or add to a wine list. Further study with the implication of restaurant managers in identifying the methods of conceiving and managing wine lists is thus needed.

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DEVELOPMENT SUPPORT OF DIVERSIFIED FOOD PRODUCTION AND AGROTOURISM BY INNOVATIVE AGROFORESTRY EDUCATION

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Abstract: *The family farmers can produce quality organic products. The food and nutrition needs of the family are amply fulfilled with a production including rice (black, red), pigs, poultry, goats, fish, roots, fruits, vegetables, culinary herbs and feed for livestock. The main project objective of the AgroFE (Leonardo) and Agrof-MM (Erasmus+) European projects is to develop an agroforestry training system, based on a common framework and core content, and to promote training at European level. The Method as backbone of an organised, planned process was from training design, development, experimentation and assessment. Developing a European level training system there was established a common professional referential whose training declination called 'Core Content'. The process was based on 3 stages. 1) Collecting of information from actors and stakeholders; 2) Organizing of the information collected in a structured document; 3) Validating the reference book). In developing ICT tools the phases were 1) Design the architecture; 2) Building the prototype; 3; Testing; 4) Using the services (website, e-learning system; knowledge base; etc.).Trainings should involve professionals, agroforestry farmers, and should be as innovative as possible: field based trainings, usages of ICTs, development of training materials. Supporting these objectives a collection of different resources were made, the professional book of references has been developed, the knowledge data base and more collaborative and dissemination systems have been also developed. The knowledge databank is a component of the project training system which consist of the RUBEDO which uses a data base management software (DBMS-SGBD), type 'NoSQL', MongoDB, and the user interface with the ElasticSearch search engine. The agroforestry will be important for rural areas and farms according to more aspects. Environmental, economic, agricultural production, rural living are very important issues and the trainings need innovative ICT support.*

Keywords: *agroforestry, e-learning; education, training, knowledge databank, KDB.*

1. Introduction

Agroforestry systems can be exclusively formed by either one or a combination of agroforestry practices (the most common situation) and practised at the same time or at different times during the year on any one farm. Agroforestry practices can also be combined in a temporal [1] and at a spatial [2] scale.

The agricultural system has experienced a strong abandonment of agroforestry [3] in the 20th century, to count today only a few million ha in Europe [4]. Depending on the countries, states or professional organizations and training actors [5] try to reintroduce agroforestry in the course of training and qualification in initial training and in adult education [6]. Based on the results of scientific research, development structures and those of the "farmer-researchers", experimental courses were conducted in different countries, including BE, FR, in the UK on a small scale as resources, trainers and available skills are scarce.

The AgroFE (http://www.agrofe.eu) project partners have identified training needs in the short term. These needs are on the one hand operators and future operators, adults and pupils/students, teachers and counsellors, tutors. Fortunately the ICT tools have been developed increasingly nowadays, so there are tools and methods for e-learning and e-collaboration [7][8][9]. One of the important parts of the project is to apply innovative solutions for building and using the web sites, social media and knowledge repositories for teaching and learning agroforestry. The Agrof-MM

(http://agrofmm.eu) extends the education and trainings to Mediterranean and Mountain areas in Europe.

The term e-learning is widely understood to refer to the use of information and communications technology (ICT) in learning and teaching [10]. E-learning systems can be observed at both the institutional and the local level in higher education. Institutional systems include learning management systems (LMS), used primarily to manage delivery of course material to enrolled students, and the platforms that support massive online open courses. Local e-learning systems are observed at the level of a single course, class, lesson or learning activity. While investments at both levels can contribute to improvements in learning and teaching [11], each has its own goals, methods and challenges.

The main environmental benefits which agroforestry systems deliver are the improvement of use of nutrients through the reduction of losses at a farm level (including erosion) but also by the enhancement of carbon sequestration, the reduction of fire risk and biodiversity enhancement. There is an acknowledgment of the importance of woodland grazing to improve biodiversity [12][13] and regeneration [14][15][16] in forestry areas if an adequate animal stocking rate is used [17]. Social benefits of agroforestry systems for owners and people in general are based on their productive and environmental advantages (Fig. 1.).

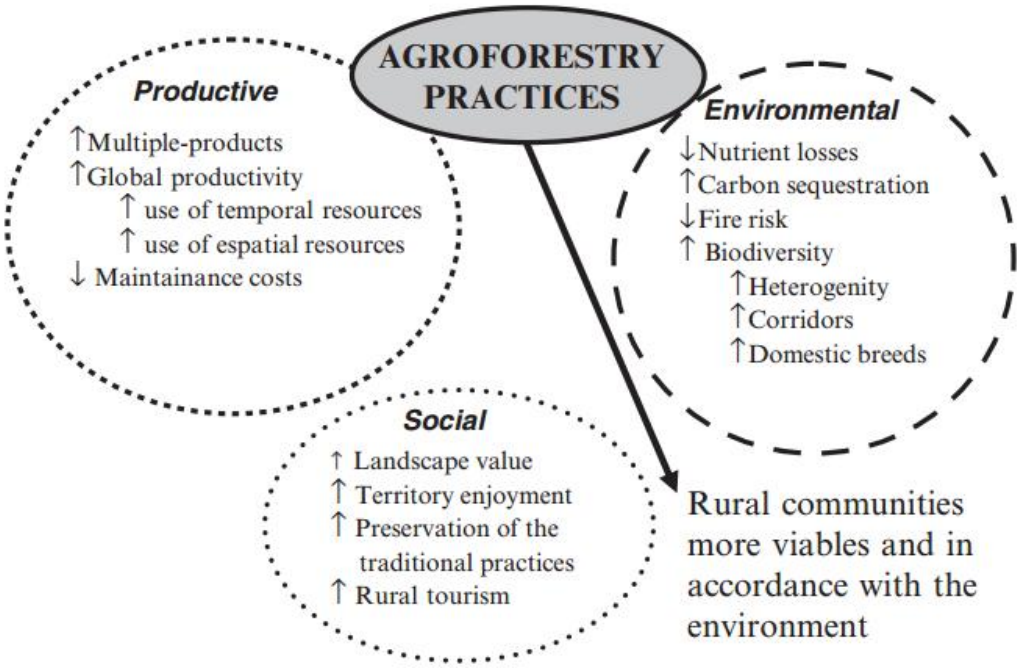

Fig. 1. *Productive, environmental and social benefits of agroforestry system practices*

2. Methodology

The partners have established a common professional referential whose training declination is a solid and enforceable core, also called 'Core Content', which aims to prepare for the exercise of the profession of agroforester. The training will therefore be declined to operational aims, taking into account the diversity of possible context for the necessary adaptations, each project being a particular case.

The process of developing such a ''European Professional referential of Agroforester'' is based on 3 stages and is based on the French professional methodology of referential development. A professional referential is called professional reference book as well.

1) Collecting of information from actors and stakeholders, based on:

- Investigation (s) of literature, of business documents, from testimonies of experimenters, experts, researchers, technicians, developers, ...;
- Questionnaires and interviews including questions such as (examples): What major agro-ecological principles the agroforester must master to design a viable project? What

reasoning on the place and role of agroforestry on the scale of the farm, the scale of the territory (interest, complementarity, implementation, conduct, ...), reasoning the farmer should be able to hold and its impact on the management and daily practice? What an agroforester should know concerning the Common Agricultural Policy, CAP, applied to one particular country?

2) Organizing of the information collected in a structured document:

- Either structured under the form of ''significant professional situations, SPS'';
- Or structure under the form of ''core competencies' (or Main Competencies) by country or by actors.

3) Validating the professional referential (professional reference book) in a process involving all the domain actors, all the stakeholders.

In computing, a database is gathering highly structured data, a well-defined organisation, based on different types of structures: relational, hierarchical. This is absolutely not the case in a databank in which we store structured tables of numbers as well as illustrated text or video or emails, external knowledge or those from the project in their various forms. But it should be noted that the KDB in the prototype of the AgroFE project is based on a software, RUBEDO developed in PHP and RUBEDO is built on different components (a database management software (DBMS), type 'NoSQL', MongoDB and the user interface uses the ElasticSearch search engine).

3. Results

The AgroFE Leonardo project

In the AgroFE project in partner countries there is a need for conversion and development of about 15 000 to 20 000 farms, in the next 5 – 7 years, which means training of the same number of operation managers. To achieve these goals more advisors and trainers in agroforestry are needed.

The main project objective is the development of an agroforestry training system, based on a common framework and core content, and to promote training at European level. The training should involve professionals, agroforesters, and should be as innovative as possible: field based trainings, usages of ICTs, development of training materials.

The specific objectives were:

- Producing of one proposal of European professional referential of farmer agroforester, as support of the training common framework - core content, which one could be adapted to local environment;
- Designing, implementing a knowledge data bank (KDB - BdC), knowledge which will be used as materials, resources for trainings, including the existing and the transfers from partners;
- Developing new training pathways then carrying out experimentations targeting student future farmers or advisors and adults, farmers, in the countries of the partnership;
- As much as possible, inserting, developing the trainings in the framework of the qualification, certification systems for the targeted levels, trainings based on to the needs and specifications of the country education systems.

Related to the objectives of the AgroFE project the following results can be highlighted:

- A collection of different resources were made based on the synthesis of needs and expectations of partners. This collection were used in developing new and existing training sessions.
- A professional book of references has been developed to support for transfers in training.
- The knowledge database has been developed which will be used for tools and training resources and which will also integrate existing resources in the future.
- Collaborative and dissemination platforms were created such as official web site, videoconference system, facebook, mailing list and Moodle for project document and as Learning Management System.

The Agrof-MM Erasmus+ project

Based on the AgroFE Leonardo project the Agrof-MM extends the activity to the Medirranean and Mountain areas between 2015 and 2018. Education is essential, not only in order to make this innovation method of production known, but also in order to allow the acquisition of new competencies and knowledge by those working in the agroforestry agricultural profession. This is why Agrof-MM sets up different types of training:

- Courses, group work, conferences
- Training in the field and online
- Self-training
- Thematic workshops
- Case studies

- Visits to agroforestry plots
- Tutored placements on farms.

The Agrof-MM training programs directed to pupils, students, farmers and future farmers, foresters, workers, teachers, trainers and agricultural advisors. Agrof-MM analyses existing educational systems and develops new innovative tools:

- A description of existing training procedures and an identification of needs
- A census and evaluation of existing educational tools
- The enrichment of the European book of professional reference for agroforestry farmers. Created in the framework of the preceding AgroFE project, the book of professional reference describes the tasks that the farmers and foresters who practice agroforestry must be able to achieve. It also serves to support the transferral of training.
- The design of the book of professional reference as well as the training systems
- The production of educational material including multimedia tools
- The practical validation of educational systems
- The analysis and dissemination of the results obtained.

The Knowledge Data Bank and ICTs

The knowledge database has been developed which will be used for tools and training resources and will also integrate with existing and future training resources. Collaborative and dissemination platforms were created such as an official web site, video-conference system, Facebook, mailing list and Moodle training portal for project document and as a Learning Management System (LMS) (Fig. 2.).

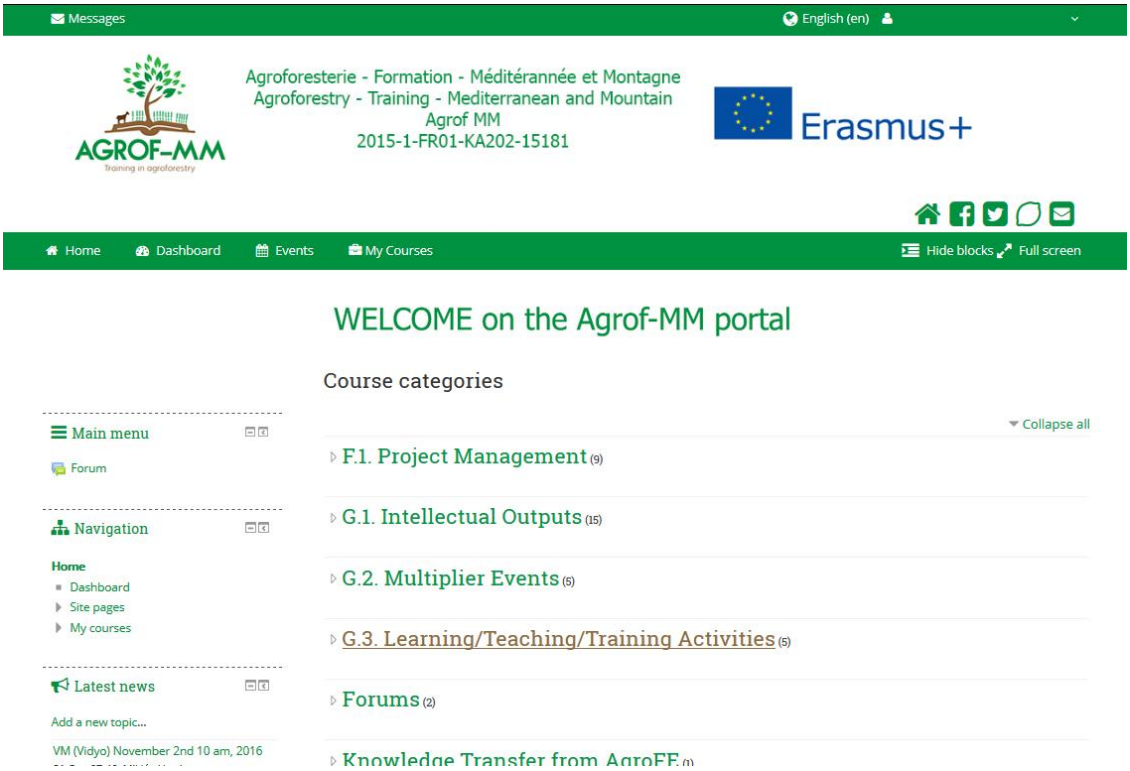

Fig. 2. *Agrof-MM training portal*

The knowledge databank is a component of the project training system. It aims to gather and share a set of documents, resources that partners can use and which will have been accessed by learners and the public users. The project focuses to the newest innovative ICT solutions and trends. The knowledge databank is to enable the sharing, access and consultation in the use of certain resources for training. These resources are under different forms: Mono document object (like a photo, a text, a diagram) and Composite materials (for example a html web page with images, a pdf file with pictures and diagrams, a video clip with images and sounds ...). The prototype of the AgroFE project is based on a software, RUBEDO [18], developed in PHP and RUBEDO is built on different components: a data base management software (DBMS-SGBD),

type 'NoSQL', MongoDB, and the user interface uses the ElasticSearch search engine. The paper describes the knowledge databank system prototype and the used ICT tools in the project, such as LMS and the collaborative working environment. These tools have been used in both the AgroFe and the Agrof-MM project.

Practical trainings – field works (in Hungary at University of Debrecen)

Education in Agro-FE project is contained a field trip, which topic was NATURA2000 habitat mapping of agroforestry and salty grassland to using Mobil GIS technology in practice in near Püspökladány, Hajdú-Bihar County, Hungary. During in the field trip, the participants are visited three locations.

In the first location, estimation of tree mass was determined by tree diameter and height. The tree height was measured by Leica DISTOTM D8 laser distance measurement. Finally the estimation was made by DigiTerra Explorer (the tree volume estimation module), which is used tree volume estimation based on the Sopp-board; and it can be used field as well with GPS. In the first location Quercus robur L., Ulmus turkestanica and Fraxinus excelsior were measured and the estimation module is require for valuation 10 tree/species.

In the second location were presented groundwater monitoring wells and ecological habitat assessments. The depth of ground water was measured and the precise positioning of monitoring wells were detect with mobile GIS tools. Furthermore the main soil type of the area were also showed using soil profiles The photos about the field work in near Püspökladány can be seen on (Fig. 3.)

Fig. 4. *Educational practice in AgroFE project (Field work for students of University of Debrecen at Püspökladány, Hungary), Credit: UD*

In the third location was Ágota-puszta, which is part of Hortobágy National Park, and it is one of the four sample area of ChangeHabitats2 project. This area is mainly characterized by salt affected soils, alkali grasslands, micro heterogeneous relief with isolated micro watershed.. In this location was presented how can we combine the field measurement with mobile GIS tools.

We used EMRC tools to detect the electrical conductivity values of this soils, and we combined it with mobil GIS tools (tablets) to detect the precise positioning of measurement points.

The University of Debrecen, Institute of Water and Environmental Management held professional day for AgroF-MM on 19 October 2016 which was placed in Tokaj-Tarcal (Figure 4). At the first location the participating farmers and future farmers heard presentations from the colleagues of the Vine and Wine Research Institute about the region, the erosion protection solutions and agroforestry/afforestation role in preventing erosion. Furthermore the University

of Debrecen presented the AgroF-MM project. Briefly described its purpose, presented the operating principle and theoretical background of those instruments to students what they tried on terrain in the remainder parts of the practical day.

The knowledge database has been developed which will be used for tools and training resources and will also integrate with existing and future training resources. Collaborative and dissemination platforms were created such as an official website, video-conference system, Facebook, mailing list and Moodle training portal for project document and as a LMS.

The different ICT tools were integrated into a toolset, but they were used to separately too. The Moodle server was used as virtual collaboration space and e-learning system. The system implemented at 09/01/2014. We created the initial structure for collaborative work and starting the e-learning courses. Within the AgroFE project (2014–2015) 217 users are registered (enrolled) in the system. From this, there are 155 enrolled students from different countries. The Vidyo videoconference systems was used for project virtual meeting, video conferencing, distance teaching, conference broadcasting. The Videotorium serves as repository for project videos. For supporting the quality assessment more questionnaires have been developed and the LimeSurvey was used for online survey and evaluation.

The proposal of professional referential (book of professional specifications) of the agroforester job, in Europe has been developed. A professional referential describes what an agroforester must be able to do in the context of his professional activity. This document was produced by iterative and interactive contribution of partners AgroFE project and agroforestry stakeholders. The partners have established this common professional referential whose training declination is a solid and enforceable core, also called ‘core content’, which aims to prepare for the exercise of the profession of agroforester. The training will therefore be declined to operational aims, taking into account the diversity of possible context for the necessary adaptations, each project being a particular case. The result of the work done by AgroFE partners and covers the professional practices of the partner countries, namely, from east to west, Romania, Hungary, Czech Republic, France, Belgium, and the UK. These proposals can be found in the public KDB.

Within the project more training programs were implemented assed on the knowledge transfer from the project. Summarising the results it seems the subject was exciting for the students. Nowadays, in Hungary, the agroforestry systems not so popular, may be one of this project result can be extending this system. The opinion of students this systems are would be important. The term of content of this course was good and useful for the students and they evaluated to good and excellent the IT tools using under the course. Under the AgroFe-MM project, we are planning the education extend to MSc level and transfer this Agroforestry knowledge to mountain area in Hungary, because this is one of the goal of this new project.

The developed collaborative environment which consisted of more subsystems served the project partners very well. The videoconference systems (desktop and the multimedia central unit) served the virtual meeting of project partners and videoconferences efficiently in high quality.

The live broadcasts on the internet used for delivery the lecture to wide audience (students, experts, farmers). The virtual meetings had been recorded to videos what every project partners could replay. Because of the efficiency and quality of service more project partners asked for permission to use these services in other projects. The LMS had been used as virtual collaborative space for project members and organising learning and training courses in different countries.

Based on the quality assessment, the content and service also was high quality. It gave possibilities for very efficient work for more than 200 participants in agroforestry. The knowledge database (knowledge data bank) is very new innovative solution for harvesting, storing and delivering contents in agroforestry. It was used in different training programs with good feedback. The knowledge database will serve the Agrof-MM partners in the next years.

This education development project is unique in Europe. The The Center for Agroforestry at the University of Missouri (http://www.centerforagroforestry.org/) is one the centers contributing to the science underlying agroforestry, the science and practice of intensive land-use management combining trees and/or shrubs with crops and/or livestock. They give webinars and organise trainings, workshops but this training materials related to their

environments. In Europe we need to develop educational tools for European specialities.

Conclusion

The agroforestry will be important for rural areas and farms according to more aspects. Environmental, economic, agricultural production, rural living is very important issues. The project participants are involved in to developing curricula for more training levels on different (L4/L5/L6) levels. The latest version of the Moodle system has been implemented for collaborative space and we carried out more virtual meetings by the new videoconference systems, which have been tested and used more times. All the virtual meetings have been recorded in the Videotorium system. We are convinced that using the innovative technologies and solutions the system will serve and support to achieve the project goals. Analyzing the open source tools we have created the architecture of the knowledge base and service system for harvesting materials, building knowledge base and information service, implement e-learning service in agroforestry. The Knowledge Data Bank and service system is developing and will be finished in this year. Finally is introduced the Hungarian specialties in the projects like education, subject about agroforestry, conference and workshops and field trip in Püspökladány and Tokaj-Tarcal region**.**

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CO-AUTHORSHIP NETWORK ANALYSIS OF SCIENTIFIC ARTICLES ON WINE PRODUCTION

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Abstract: *The research analyses 381 publications on wine production based on several criteria (appearance time, geographic location, authors' connections, and outstanding co-author cliques). In this research, we examine how the number of publications is changing over the years, which countries and journals are dealing with the chosen topic. Regarding the relationship between authors of publications, we seek to find out how the authors relate to each other; alone, small or large groups are most commonly publicized, or can the authors of the subject matter be highlighted.*

Keywords: *SNA, co-authorship network, sparkling wine.*

1. Introduction

Social Network Analysis (SNA) has developed as a specialty in parallel with scientometrics since the end of the 1970s. The SNA point of view on social relationships in terms of network theory can consist of nodes and edges. Nodes are the individual actors creating the networks, and edges are the relationships between them. The resulting graph-based structures are often very complex. We can state that research in several academic fields has shown that social networks operate on different levels and play a crucial role in determining the way problems are solved, organizations are run, and the degree to which individuals succeed in achieving their goals [11][22].

SNA is a wide strategy during the investigation of social structure [17] and is used to gain patterns of relationships between the nodes mentioned above to ascertain an underlying social structure [21]. SNA integrated the narrative data analysis while it provided a way of examining the relation structure among the people, organizations and the places they mentioned across each of the interviews. This versatile approach was particularly useful because it provided not only a possibility to analyse the specific links individuals had with one another, with places and with organizations [14], but also because one of the main aims of SNA is to identify the core actors in a network [24] and to find and interpret patterns of social ties among actors [7].The role of SNA has increased recently because the topic plays an important role in several disciplines [5] [17]. Network analysis permits the investigation of the characteristics of management to compare with other fields of knowledge, as well as the existing linkages between the most central and most prominent authors within the examined discipline.

Finally, network analysis gives a greater understanding of which authors collaborate, of the social groups that emerge from the collaboration relationships, of the role played by the most important 'star authors', and of the impact of their belonging to certain institutions and journals [1].

2. Co-authorship networks

Co-authorship networks, as one of the most understandable and well-known forms of collaboration networks [10], are built on the social dimension of the relatedness of different authors [13].

The research and publishing method has changed dramatically over the past decades. 60-70 years ago the most scientific research was done by individual researchers publishing single-authored articles. Nowadays, science is more accessible and freer than it has ever been before and there is a particularly growing interest in scientific collaboration.

This collaboration can take various forms such as research projects, publications in scientific

journals or in conference papers. Collaboration is mostly facilitated by technological advances, geographical proximity and the similarity of the actual research topics.

When a scientist publishes together with their colleagues, they can establish a scientific network. After the analysis of such networks we can acquire a useful picture of the relationships between individual authors [20].

We can state that scientific networks are usually formed around prominent researchers. These well-known scientists mostly work as a hub in attracting a large number of researchers from several different universities and research institutions [6] [19]. The general trend observed in the most influential scientific journals is an increase in activities driven by collaboration both between researchers and between research institutions and universities, especially with regard to international co-authorship networks [4].

Co-authorship analysis can be used to ascertain the position of an author in the cooperation network. It might provide important information on the scientists' own contribution to the research output included in their official scientific biography. The leanness of the connections across the communities denotes the fact that most of the journals which belong to the same community tend to cite the same publications within their community, and rarely reference articles from other communities [16].

Journal rankings might also have an impact on global scientific collaboration because publishing in more prestigious scientific journals in many countries has a higher value in most academic performance indicators. Several authors and research groups have analysed different discipline specific journal rankings and quality [2].

It is unarguable that high quality publications are needed to develop a personal researcher career [1]. When a researcher publishes together with their co-authors, they create a unique and individual co-author network. This co-author network includes all those who have added their own knowledge to the common database significantly and on merit during the preparation of the article. Imaging these personal networks together we can create a sample on which the connections between the authors and co-authors can be analysed.

Earlier studies have shown that collaboration makes the research achievement of the co-authors better and more effective [2]. Actually, many scientometric studies have evidenced the significance of the different socio-economic variables in scientific production measurement based on the nationality or the country of residence and collaboration patterns [17]. Overall, countries with a high gross domestic product have invested more in scientific development aimed to promote an increase in publications and to reach this aim.

3. Introduction to wine

Wine is produced by fermentation from the fruit of the vine. The taste, colour and quality of the wine are determined by three factors: the type of grape, the soil density of the crop and the climate. When making wine, we must pay particular attention to harvesting only grape bunches of intact grains (The exception is the ‘aszú’ wine, because we use the grapes of this variety that are due to noble rotation due to Bothritys mushroom). The harvested grapes are crushed by a crusher, followed by fermentation. In the case of white wine, only grapes extracted from grapes are fermented, while rosé and red wine leave the must left on the grape shell to make it beautiful pink and red. Due to the fermented wine turbidity is filtered by various methods, and then bottled [23].

There are basically two ways to separate the wines. On the one hand it is based on colour (white, rosé, red) and on the other hand character (dry, half-dry, semi-sweet, sweet). Alcohol and carbon dioxide are produced by the sugar yeast in the grape juice. If carbon dioxide is not allowed to go away, we get bubbling wine.

Depending on the process and pressure of carbon dioxide in the bottle, we distinguish the following three groups:

- pearl wine is made from lower quality grapes, carbon dioxide is artificially propagated into the bottle with at least 3 bar overpressure;
- in the sparkling wine, carbon dioxide can naturally be fermented, but it can also be artificially incorporated into the bottle. The pressure ranges from 1 to 2.5 bar and the alcohol content starts at 7%;
- the champagne is produced naturally by the bubbles as a result of fermentation. Within the bottle the pressure is above 3 bar and the alcohol content is at least 8.5%.

4. Materials and methods

The sample that we used for our research was acquired from Scopus, the largest multidisciplinary bibliographical abstract and citation search database [8]. Using 'sparkling' and 'wine' keywords, we managed to find the number of 381 articles.

We used the Gephi to create and analyse the connection network. Gephi is an open source network exploration and manipulation software. Developed modules can import, visualize, spatialize, filter, manipulate and export all types of networks. The visualization module uses a special 3D render engine to render graphs in real-time. This technique uses the computer graphics card, as video games do, and leaves the CPU free for other computing. It can deal with large networks and it takes advantage of multi-core processors.

The user interface is structured into Workspaces, where separate work can be done, and a powerful plugin system is currently being developed. Great attention has been taken to the extendibility of the software. An algorithm, filter or tool can be easily added to the program, with little programming experience. Sets of nodes or edges can be obtained manually or by using the filter system. Filters can select nodes or edges with thresholds, ranges and other properties. In practice filter boxes are chained, each box takes in input, the output of the upper box. [3]. Dynamic network visualization offers possibilities to understand structure transition or content propagation [15]. Exploring dynamic networks in an easy and intuitive way has been incorporated in Gephi from the beginning.

We used the Yifan Hu Multilevel layout algorithm which is an algorithm that brings together the good elements of force-directed algorithms and a multilevel algorithm to reduce algorithm complexity. This is one of the algorithms that works really well with large networks [12].

Our network analysis comprises the analysis of the below centrality indexes. Betweenness centrality analysis reveals which participants' cooperation keeps the relationship going. In other words, we will identify which participants are most able to control the information flowing in the network.

In this regard, the key author will be the one that stands in between multiple other authors, as this means they have a high chance of standing on the path between two authors.

Closeness centrality research aims to identify which authors are able to reach all members of the network – primarily within their own clique – directly, rapidly and easily, without relying on any third member. Authors can also be ranked based on degree centrality. This value reflects how many other authors the given author is linked to, i.e. it shows how many incoming or outgoing links the node (i.e. the author) has. This helps identify which authors have a central role with regards to publications in the subject area of our research [9].

In order to be able to present visual graphs, we transferred the nodes and links into Excel, which was then imported into the program.

The records (nodes) were provided by an existing table containing the id and full name of the author. We used the id of the articles and the id of the author to identify the relationships between the nodes. If an article was published by multiple authors, then the id code of the article is shown in the table once for each of the authors it was written by. These data provided a table that made it possible to identify which other authors each author is linked to.

5. Results

We have analysed the interactions of publications about sparkling wines on various aspects. We have examined the countries from which most of the articles have been published, and we have studied which journals and the topics that the sparkling wine has played. Each of the results was illustrated by a diagram. After that, we created the social network based on the authors' relationships with Gephi.

During the analyses, we were looking for the answers to the following questions:

- How does the number of publications change over the years?
- Which countries deal best with the chosen topic?
- Which journals published the largest number of articles about sparkling wines?
- Are authors working alone or in small groups or co-authoring cliques?
- Can we highlight authors who play a decisive role in the network?

We have been looking at articles since 1989, because only a few articles were published before, and not on a regular basis. Between 1896 and 1988, a total of 22 articles were published during 92 years, and between 1989 and 2015, 359 articles were published. Fig. 1 shows that the subject started to get better from the mid-90's, and instead of 1-2 appearances annually, there were already 8 to 10 articles related to sparkling wine.

This growth can be observed on the one hand because the wine-growing has been steadily evolving over the past few years and wine consumption has been growing. On the other hand, wine marketing has also developed, which is due to consumption growth. Numerous domestic and foreign wines can be reached on the shelves of the department stores, the prices of which are on a wide scale so that almost any social layer can be accessed.

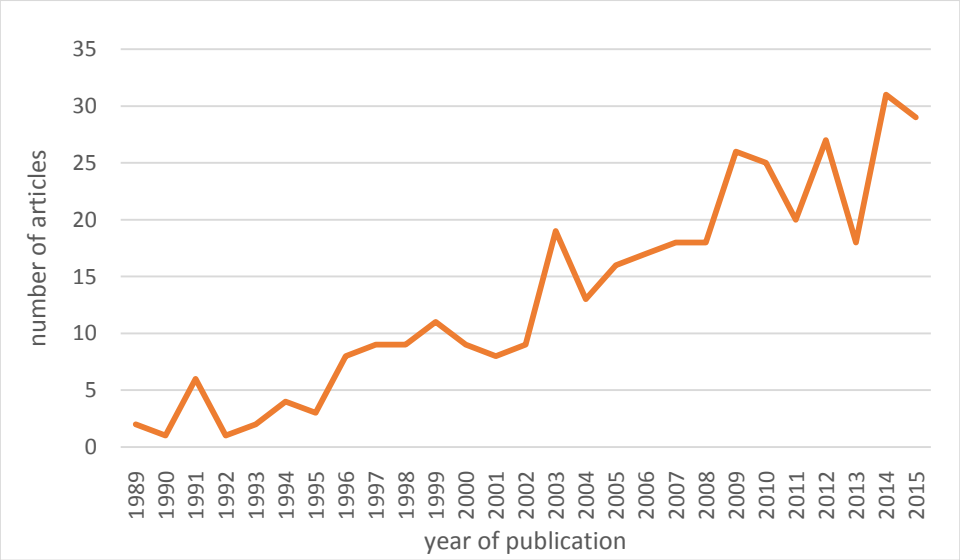

Fig. 1. *Number of articles between 1989 and 2015*

The 359 articles come from different countries around the world. There are some countries that only published 1-2 articles in the period under review, but there are some that have been published quite well. 60% of all identifiable articles were published by one of the research centers in 5 countries, namely Spain, France, Italy, Germany and Brazil.

The Wine Institute, the association of Californian wine producers, produced a statistics on world wine production between 2011 and 2014. The wine production of the listed countries in 2014 is summarized in Table 1.

Table 1. *Volume of wine production in 2014*

Country	Volume of wine production (1,000 hl)	Rate (%)
France	46,701	16.5
Italy	44,739	15.8
Spain	38,204	13.5
Germany	8,493	3.01
Brazil	2,732	0.97
Other countries	141,435	50.22
Total	282,304	100

The data in Table 1 shows, that the country publishing the three most articles has the largest wine production in the world. They produce 45.8% of the total volume, and the three countries collectively account for 44% of the articles. The production of Germany and Brazil is

much lower as well as in the middle of the world class.

Fig. 2 shows the publication distribution of the listed 5 countries and the 'Other countries' category, which shows the total number of publications in 32 other countries.

The 381 articles published on this topic were created as a result of the work of 946 authors. When the two data are merged, an average of 2.48 authors produced an article. However, the definition of co-authors is not that simple. By uploading the author's 946 author's connection to the Gephi program, an eye-catching network can be created. Fig. 3 shows the top 5 co-authoring cliques.

The figure shows five clearly identifiable graphs and groupings of authors. The modularity of the members is high, which means that the relationship between the authors within the group is strong, mainly published together in order to improve the recognition and popularity of each other.

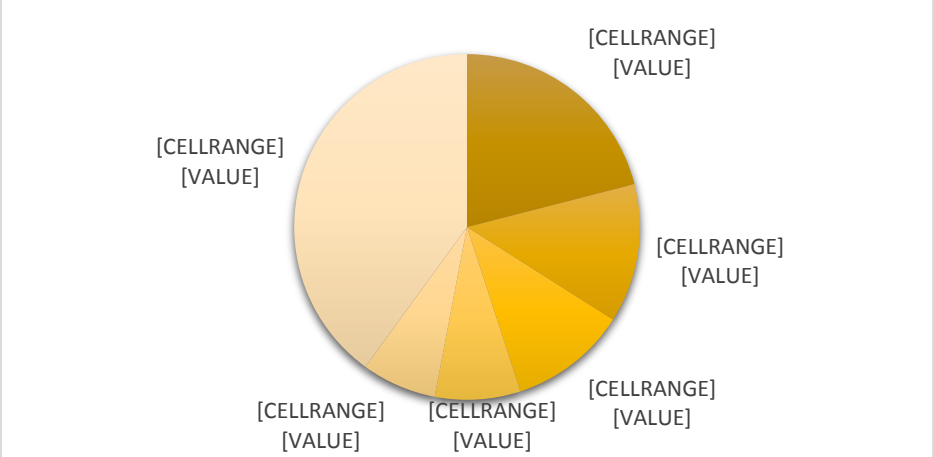

Fig. 2. *Distribution of articles by country*

It can be concluded that there are some authors who work in smaller groups, while some have more co-authoring cliques. The importance of these cliques is that members can increase their own and mutual recognition at the same time by jointly preparing a given publication. We have found that five authors have the central role in the network: López-Tamames, Buxaderas, Lamuela-Raventos, Liger-Belair, Jeandet. They stand out on the relationship between all authors and their own co-authoring group, based on degree, closeness centrality and betweenness centrality (Table 2).

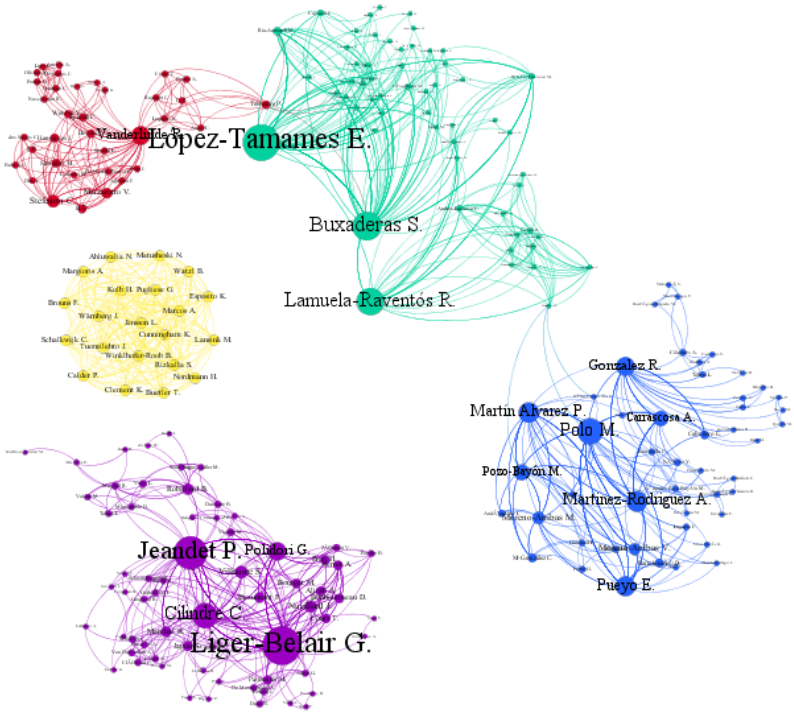

Fig. 3. *TOP 5 co-authoring cliques*

Analysing the entire co-authorship network, it can be stated that in addition to the five co-author cliques, smaller groupings can be found in a larger proportion.

This is also confirmed by the fact that only 227 authors from 946 publish in the cliques, while the other 719 authors are outside of these cliques. Authors who are not members of large groupings are more likely to work in smaller groups than on their own. From the analyses we can also conclude that we can highlight authors from the network that are decisive in the subject.

Table 2. *Top 5 authors based on betweenness centrality*

Name	Degree	Closeness centrality	Betweeness centrality
Liger-Belair G.	109	0.80	460.86
Jeandet P.	92	0.89	407.66
Lopez-Tamames E.	111	0.71	397.71
Buxaderas S.	118	0.91	300.92
Lamuela-Raventós R.	39	0.62	283.84

These authors are all in one clique and are not only outstanding on the whole network but also on the role they play in the cliques. In summary, we can highlight authors who have the work of decisive authors who publish their sparkling wines, but these authors are not found in small associations but in one of the larger cliques. In summary, some of the researchers who publish sparkling wines have a prominent role, but these authors are not found in small associations but in one of the larger cliques.

Conclusions

At the end of the research we came to the conclusion that the social network analysing is a very useful method. We can easily analyse relationships between individuals by having the right skills. We will continue the research by analysing the citation network. We will look at who most people refer to and what can be the reason for that.

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MANAGEMENT OF HEALTHCARE WASTE IN THE M'SILA REGION (ALGERIA)

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Abstract: *This study is part of the management of healthcare waste in the M'Sila region. The 140 surveys carried out among the various stakeholders in the management of healthcare waste (public and private) and waste collectors from the Communal People's Assembly (CPA) through the fourteen daïras of the wilaya have confirmed the existence of large quantities of care waste dumped directly into uncontrolled landfills as if they were ordinary garbage due to the absence of repressive measures by the services concerned who may put an end to these overtaking threatening public health, biodiversity and the environment in general.*

Keywords: *Health care waste, Environment, Biodiversity, Public health*

1. Introduction

The Health care waste (HCW) is defined as all waste from a healthcare facility, consisting of both potentially infectious waste and non-infectious waste. The infectious waste consists notably of infectious perforating objects and perforating non-infectious waste. In addition, it includes the same types of waste from minor and dispersed sources, including wastes produced in the context of home health care (Prüss *et al*., 1999, WHO, 2005, Chartier *et al*., 2014).

Investment in health is expensive. Therefore, minimizing the causes of disease through prevention should be a regular component of investment programs. The risk of infection posed by the waste of care activities handled without precaution is obvious to everyone and is preventable. However, so far, this issue has been too often overlooked (Rushbrook *et al*., 2005).

The development of our public and private enterprises was accompanied by a significant waste production. African countries in general and Algeria in particular as a whole are confronted with the problems of waste management linked to care.

The lack of infrastructure, combined with the absence of epidemiological data, makes hospital hygiene a public health problem with the following consequences: infectious risks, air pollution, environmental degradation and chemical risks Handling of hazardous materials.

The lack of media coverage associated with the lack of information at the regional level and the development of health facilities, the advent of private clinics, makes hospital waste production an aggressive public health problem and the environment.

At the same time, the composition of these wastes is changing from an organic profile (food waste) to complex materials (packaging, plastics, end-of-life products, etc.) that pose major risks to the environment and public health. The method used for their disposal remains to date landfill, because of its low cost compared to other sectors such as incineration or composting (Kehila, 2014). Healthcare waste has negative effects on garbage collectors in municipalities due to the transport of hazardous products. Their incineration causes air pollution which exposes man to viral infections and contagious diseases that are sometimes fatal; especially that in these landfills there are various animals that feed garbage and also insects that could transmit diseases to humans.

The waste management policy is part of the National Environmental Strategy (NES), as well as the National Plan for Environmental Actions and Sustainable Development (NPEA-SD), which was concretized by the promulgation of the law 01- 19 of 12 December 2001 on the management, control and disposal of waste, dealing with the aspects inherent in the management of waste, and the principles of which are (Kehila, 2014): Prevention and reduction of the production and harmfulness of waste at the source; the organization of sorting, collection, transport and treatment of waste; recovery of waste through reuse and recycling; the environmentally sound treatment of waste; informing and educating citizens about the risks posed by waste and their impact on health and the environment; the institution of management tools: National Program for Integrated Solid Waste Management and National Plan for Special Waste Management.

Direct management is predominant and the technical disposal of waste is the preferred option by the public authorities. Private sector participation is still weak and does not seem to be improving. The State remains the main actor both in the financing of major infrastructures and in the day-to-day management of the various segments of waste management. A system of taxations has been implemented but it remains insufficient in view of the magnitude of the quantities of waste produced, one wonders then about the parameters that could go in the direction of improving the efficiency of the waste. integrated waste management policy advocated by the Algerian public authorities (Djemaci and Ahmed Zaïd-Chertouk, 2011).

In 2002, the cadastre of health care waste recorded more than 40,190 tons of hospital waste, which is spread over the different regions, 43% in the Central Health Region, 29% in the Eastern Health Region, 22% in the Western Health Region , 4% in the South-East health region, and 2% in the South-West health region (MATE, 2003).

Out of 236 existing incinerators at hospital level on the national territory, 64 incinerators do not work. An incentive tax destocking of waste from health care activities has been put in place, amounting to 24,000 DA / tonne of stored waste. A national study on the management and elimination of infectious health care waste (DASRI) was launched on 48 wilayas of Algeria with a budget of 35 billion centimes. Some experiments have been conducted by Algerian companies to eliminate hospital waste (Djemaci, 2012).

In view of the many problems posed by this waste and its impact on the environment, our work raises and discusses the reality of the management of waste related to care and its impact on the environment and therefore on health in the wilaya of M ' Sila and proposes solutions applicable at different levels in order to reduce the health risks resulting from the care activities.

2. Context of the study

2.1. Health Monograph of the M'sila Region

The wilaya of M'Sila covers an area of 18175 km2, with a population of 100,859 inhabitants spread over 15 daïras, comprising 47 communes (Figure 1). It includes the following human resources: 122 medical specialists, 385 general practitioners, 108 dental surgeons, 116 midwives (Table 1). The wilaya of M'Sila also has 29 agencies ENDIMED (National drug Distribution Company), 04 hospitals, 12 maternity hospitals, 13 laboratories, 15 sub-sectors. At the level of the private sector, there are: 04 private medical and surgical clinics, 03 medical imaging centers, 02 laboratories and 02 outpatient ENT ophthalmology clinics (DSWM, 2007).

Population growth and urban development have led to the proliferation of wastes whose management is not yet under control with all the resulting implications for ecosystems and public health.

The Algerian legislation on waste from intra- and extra-hospital care activities highlights the complexity of its application to the "diffuse sector".

Article 1: To lay down the procedures for the management of waste control and treatment.

Article 2: Waste management, control and disposal shall be based on the following principles: prevention and reduction of waste production and harmfulness at source; The organization of the sorting, collection, transport and treatment of waste; Recovery of waste through reuse and recycling; The environmentally sound treatment of waste; Information and awareness of the risks posed by waste and its impact on health and the environment. Waste from hazardous care activities that are: sharps waste such as needles, syringes, lancets, blades ...; Potentially infectious waste: buffers, dressings, gloves ...; Pathological waste, including anatomical material, should be

treated as potentially infectious; Chemical waste, eg mercury from thermometers, chemical disinfectants ...; Pharmaceutical waste: unused drugs ...; The cytotoxic (wastes are university where the anticancer treatments are practiced; Radioactive waste, are produced only by the departments of nuclear medicine, cancer treatment and diagnostics as well as research structures in large hospitals.

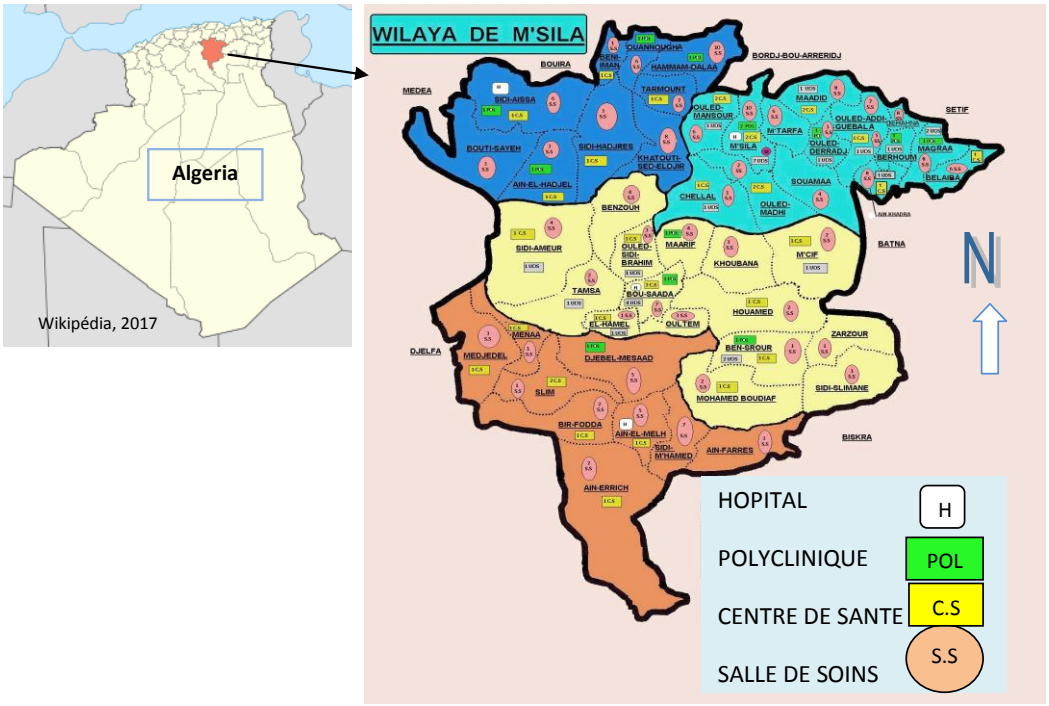

Fig.1. *Health Monograph of the Wilaya of M'Sila (DSWM, 2007, modified map)*
Producers of waste from health care activities in diffuse environments

The diffuse sector corresponds to all the producers of health care waste. It includes all health professionals, most often on a liberal basis, and households.

For professionals practicing on a liberal basis, they are: general practitioners and specialists, dental surgeons, midwives, pharmacists and laboratories for biology and medical analysis.
Within the framework of salaried medicine and sources, there are: nursing home services, home hospitalization, hem dialysis centers, consultation and care rooms, health insurance agencies and Health centers, nursing homes of the national educational institutions, fire and rescue centers, retirement homes, as scattered small producers.

2.2. Different methods of treatment

For the treatment of infectious waste, it can be summarized as follows: separation of needles and syringes, shredding, encapsulation, disinfection by microwaves, steam disinfection including autoclaving, disinfection by dry heat, disinfection To wet heat, chemical disinfection, incineration.

2.3. Fundamental risks associated with mismanagement of HCW

Poor management of HCW can lead to serious illnesses for health personnel, waste disposal personnel, patients and the general population. The greatest risk from infectious waste is the risk of needle-stick injuries, which can lead to hepatitis B, hepatitis C, or HIV infection. However, many other diseases can be transmitted by contact with infectious.

2.4. Algerian legislation on waste management

Executive Decree No. 03-477 of 9 December 2003 laying down the procedures and procedures for the preparation, publication and revision of the National Special Waste Management Plan.
Executive Decree No. 03-478 of 9 December 2003 defining the procedures for the management of healthcare waste in the Official Gazette of the Republic of Algeria No. 78.

Table 1. *Health Monograph of the Wilaya of M'Sila (DSWM, 2007)*

RESENTATION OF THE WILAYA				
Surface area: 18.175 Km²				
Population: 1.008.590 inhabitants				
Number of Daïra: 15				
Number of Towns: 47				
Calling: Agro-pastoral				
HUMAN RESSOURCES				
	Public	Private	Total	Ratios / Habitat
Specialist physicians	48	74	122	Jan-67
General practitioners	198	187	385	Jan-19
pharmacists	1	140	141	Jan-53
Dental surgeons	43	65	108	Jan-38
paramedical	1809	41	1850	1/545
Women	114	2	116	Jan-94
Agencies ENDIMED	29			
CARE MANAGEMENT				
Infra structure		Number	1 / clothes	
Hospitals		4	1/252147 clothing	
Bed		1165	1/865 clothes	
Dialysis centers		3	1/336197 clothing	
Polyclinics		13	1/77584 clothes	
Health Centers		Thirty	1/33620 clothes	
Treatment rooms		176	1/5730 clothes	
UDS		40	1/6172 student	
Integrated rural maternity		12		
PMI		31	1/6699 women	
Laboratories		13	1/6699 clothes	
UMC hospital		4		
Point guards extra hospital		11		
Total structure extra hospitals		219	1/4605 clothes	
Number of subsectors		15		
PRIVATE SECTOR				
		Number	Beds	
Medical surgical clinics		4	97	
Medical Imaging Centers		3		
Laboratories		2		
Ambulatory clinics ophthalmic		2		

Article 1. Pursuant to the provisions of article 18 of Act No. 01-19 of 12 December 2001, the purpose of this decree is to define the procedures for the management of health care waste.

Art. 2. For the implementation of this Decree, all health care facilities shall be deemed to be health institutions, irrespective of the legal regimes applicable to them, including specialized hospitals, university hospitals, Polyclinics, clinics and basic care units, medical practices, dental surgery offices and analytical laboratories.

Art. 3. Waste treatment activities are classified into three categories: anatomical waste; Infectious waste; Toxic waste.

Art. 4. As soon as they are generated, healthcare waste is pre-collected in sachets provided for this purpose, in accordance with the provisions laid down in Articles 6, 9 and 11 of this Decree.

Art. 5. Anatomical waste is defined as anatomical waste, all human anatomical and biopsy waste originating from the operating theaters and the delivery rooms.

Art. 6. Anatomical waste must be pre-collected in green and single-use plastic bags.

Art. 7. Infectious waste is classified as infectious waste, waste containing micro-organisms or its toxins, which may affect human health.

Art. 8. Sharp, sharp, or sharp infectious wastes shall be placed in rigid, puncture-resistant containers, fitted with a closure system, free of chlorine prior to their pre-collection in the bags provided for that purpose during incineration, and containing an adequate disinfectant.

Art. 9. Infectious waste must be pre-filled in plastic bags with a minimum thickness of 0.1 mm, single-use, and yellow in color, resistant and solid and free of chlorine during incineration.

Art. 10. Toxic wastes are classified as toxic wastes, wastes consisting of: waste products and obsolete product, pharmaceutical, chemical and laboratory products; Waste containing high concentrations of heavy metals; Acids, waste oils and solvents.
Art. 11. Toxic wastes should be pre-collected in single-use, resistant and solid red plastic bags that do not release chlorine during incineration.
Art. 12. Toxic waste must be sorted, packaged and labeled under the same conditions as special waste of the same type, in accordance with the regulations in force.
Art. 13. Waste of care must be sorted at source so that it is not mixed with household waste and the like, nor mixed with one another.
Art. 14. Compaction of healthcare waste is prohibited.
Art. 15. Once two-thirds full, the pre-collection bags of healthcare waste as provided for in Articles 6, 9 and 11 above shall be firmly closed and placed in rigid containers with a lid , And shipped to the regrouping premises.
Art. 16. The containers shall be of the same color as the pre-collection bags, and shall state the nature of the waste in an easily legible manner. Once they are full, they must be transferred to the regrouping room, with a view to their removal for processing.
Art. 17. Containers used for the collection and transport of treatment waste must be cleaned and decontaminated after each use.
Art. 18. In any case, waste treatment activities must not be deposited outside the grouping premises.
Art. 19. The amalgamating premises shall be used only for the storage of health care waste. They must be ventilated, illuminated, protected from bad weather and heat, equipped with water and waste water, cleaned after each removal and periodically disinfected.
Art. 20. The grouping premises must be closed and arched in order to prevent access by unauthorized persons. An inscription mentioning the use of the premises shall be affixed, in an apparent manner, to the door.
Art. 21. The duration of storage of health care waste at the collection premises, prior to their removal for treatment, shall not exceed twenty-four hours (24 hours) for establishments.

3. Material and methodology

We carried out four types of surveys at the level of fourteen daïras: Ain El Melh, Ain Hadjel, Ben Srour, Bou Saâda, Chellal, El Khoubana, Hammam Dalaa, Magra, Medjedel, M'Sila, Ouled Derradj, Ouled Sidi Brahim, Sidi Ameur, Sidi Aissa (Figure 2). The 140 investigations included 04 questionnaires:
Questionnaire 1: Activity of collection of the waste of care with the communes.
Questionnaire 2: Survey on waste disposal practices of health care activities with health professionals practicing in an out-of-hospital environment.
Questionnaire 3: Investigation of health care waste disposal practices among health professionals practicing in hospital.
Questionnaire 4: Survey of the general population.

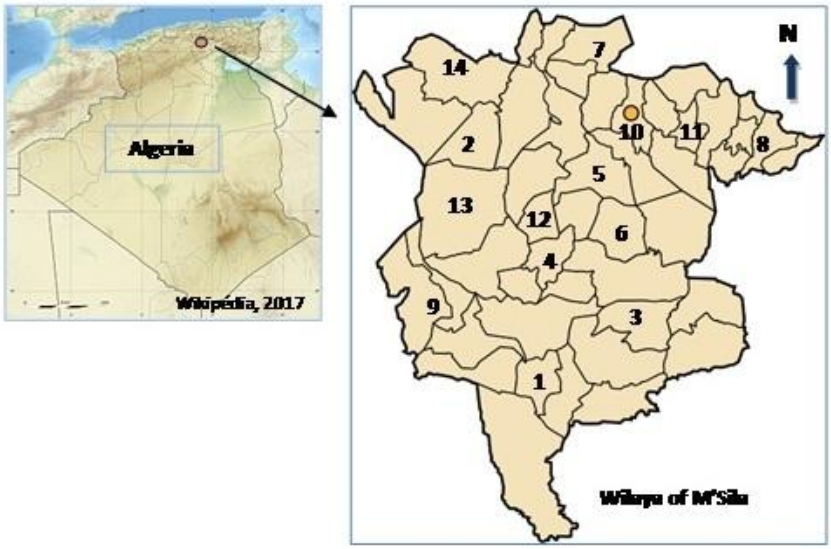

Fig.2. *Geographical location of the 14 daïras of surveys on the collection and disposal of health care waste in the M'Sila wilaya*

Legend: 1. Ain El Melh, 2. Ain Hadjel, 3. Ben Srour, 4. Bou Saâda, 5. Chellal, 6. El Khoubana, 7. Hammam Dalaa, 8. Magra, 9. Medjedel, 10. M'Sila, 11. Ouled Derradj, 12. Ouled Sidi Brahim, 13. Sidi Ameur, 14. Sidi Aissa

4. Results & discussion

4.1. Survey of municipalities

The only institution responsible for collecting all types of waste, including hospital "HCW" is the APC "commune" (Table 2).

The results of the survey on HCW collection activities in the wilaya of M'Sila show an absence of a HCW collection activity in an extra-hospital setting, health professionals practicing on a liberal basis; Contract between the CPA and the health professionals practicing on a liberal basis; Organization of selective collection of HCW; Sorting of HCW; Specific collection "random pick-up"; Of a specific site to store them and to treat them before and after the collection "disinfection, sterilization and incineration".

The uncontrolled "public" wild dump but in the future, there will be a project for a controlled dump. Pick-up of the SARs with household waste is done by a truck with bucket and they will be dumped to the garbage dump.

Table 2. *Collection of HCW by CPA*

Commons	Collection of HCW in extra-hospital settings		A project to collect HCW from health professionals		Organization of a Selective Collection of HCW Produced by Health Professionals on a Liberal basis		A project for Selective Collection of HCW	
	Yes	No	Yes	No	Yes	No	Yes	No
Ain El Hadjel		X		X		X		X
Ain El Melh		X		X		X	X	X
Ben Srour		X		X		X		X
Bou saâda	X			X		X		X
Chellal		X	X		X	X		X
El Khoubana	X		X		X		X	
Hammam El Dalaa		X	X		X		X	
Magra		X		X		X		X
Medjedel	X		X		X			X
M'Sila	X			X		X	X	
Ouled Derradj		X		X		X		X
Ouled Sidi Brahim		X	X			X	X	
Sidi Ameur	X			X		X		X
Sidi Aissa	X		X		X		X	

4.2. Survey of health professionals working in extra-hospital settings

The rate of elimination of HCW by the specific pathway is low but increasing. There are differences in behavior across occupations; The practice of sharp-cutting-sharp sorting is marked and growing; The collection of HCW is not regulated and the answer to the questionnaires is not always communicated.

For the sorting of health care waste: 84% sort the HCW. For the elimination of the "sharp-cutting-sharp" SAR: 47% in household garbage; 39% in plastic or glass bottles; 27% of this waste goes to the incinerator of the hospital or is incinerated in a pit in an isolated area and 13% put in a specific container (Figures 3 and 4).

The sorting and estimation of the quantity of the different types of waste produced aims at: - to guarantee the absence of a mixture of DASRI with ordinary waste and consequently - to choose well, and better adapt the means to eliminate them and treat them.

When the sorting step is not observed, the contamination of ordinary waste by SARs occurs and very harmful consequences will result to manage a larger quantity of hazardous waste. In addition, the disposal of hazardous waste costs about 10 times more than the destruction of ordinary waste. Sorting is therefore of paramount importance (CSH, 2005).

4.3. Survey of Health Professionals in Hospitals

Intermediate storage areas for HCW: an intermediate storage room outside the service next to the incinerator.

The types of waste from hospital services are: placenta, organ and cyst part, flasks, pipette, test tube, tubing, syringe, Petri dish, blood bag ...

A washing and disinfection zone for the equipment: a washing area for rolling stock and

waste production areas. There are three waste production areas in the various health sectors in the M'Sila region: hospital services, cooking and administration (Table 3).

The danger continues outside the hospital if the waste is not transported and disposed of properly. This is a major risk for any person responsible for the transport, treatment and disposal of hospital waste. The same applies to the population living around the waste management facilities. For this reason, the correct treatment of special wastes arising from care activities is of great importance and must take into account all risks and aspects.

Fig. 3. *The incineration of Ain El Melh*

Fig. 4. *Storage of "sharp-sharp-cutting" HCW in plastic containers and bottles*

Table 3. *Types of waste from Ain El Melh Hospital (240 beds and 07 services)*

Designation	Quantity Kg / month	Method of disposal	Receiving environment
Placentas	121	Incineration	
Part of organ and cyst	13.2	Incineration	
Pipettes	6.6	Incineration	
Test tube	12.1	Incineration	
Tubing	13.2	Incineration	Hospital Incinerator
Syringes	14.3	Incineration	
Petri dishes	6.6	Incineration	
Gloves	2.2	Incineration	
Sponges	11	Incineration	
Movies / Radio	1.1	Evacuation	
Dressings	11	Incineration	
Cotton	11	Incineration	
Anesthesia bottles	7.7	Incineration	Dump
plaster bandages	5.5	Evacuation	
Paper and other	300	Evacuation	
Developer and fixer	80	Evacuation	Waste

4.4. The management of expired or unused medicines (MNU)

Unused or expired medicines also constitute a source of water contamination by discharging into wastewater via sinks or toilets or discharge into the domestic waste stream (soil and water contamination). The factors generating MNU are multiple: stop or modification of the treatment, unsuitable conditioning, variability of the observance of the treatment by the patient ...

The question of the management of unused or expired medicines has arisen in terms of safety (prevention of the risk of ingestion / contamination by mistake, especially for children) before constituting an environmental concern (Bussy, 2014).

In the M'sila region, surveys were carried out on 02 ENDIMED pharmacies and 25 private pharmacies. These surveys show that:

- Wastes in pharmacies are represented by obsolete medicines and pharmaceuticals.
- For ENDIMED pharmacies, expired medicines are stored in the back of the pharmacy and then the ENDIMED department of Sétif takes charge of their disposal.
- The expired medicines are incinerated either in a pit provided by the municipal hygiene department or in the incinerator of the hospital.

Conclusions

Human activity is mainly directed towards the production of health goods and services. Waste, which does not naturally integrate into this activity, has long been neglected. Their uncontrolled and uncontrolled proliferation, apart from these profitable recycling activities, was carried out to the detriment of the natural environment with ultimately a negative impact on human health and the environment.

It is essential that those responsible for the management of healthcare waste should have a better understanding of all the factors that contribute to optimum safety.

It is therefore necessary to redefine a good hospital waste management strategy in order to reduce health risks.

This study proposes simple hygienic solutions that can be used to minimize health risks due to wastes resulting from healthcare activities.

The disposal of waste from the health care facility must be given special attention. First of all, we must appoint a "waste manager" who will know the situation perfectly and propose solutions to be put in place.

Here are some steps to follow to organize the waste circuit: to know the waste circuits in each department, in all its details: sorting, conditioning, storage, collection and treatment to highlight the interests and the points to be modified; To know as precisely as possible the flows of the various waste by a weighing campaign of 2 to 3 weeks; Prospect the different companies to know their products and services; Find out if other institutions do not have the same problems, solve them together, especially treatment, and train and inform staff.

It is very important to propose the creation of private waste management companies (collection, transport, treatment ...) managed by engineers and masters in ecology and environment.

The identification by management of the problem of health care waste should inevitably be followed by the development of an action plan.

Once the diagnosis of the prevailing situation has been made.

Action plan should present the following points.

- Identify the problem and the risks that are not resolved
- Agree on sensible (and sustainable) actions to be taken
- Evaluate available resources, even if they are small
- Assigning duties and responsibilities to everyone (who does what and when?)
- Specify how progress will be monitored and recognized successes
- Indicate the quality control / supervision procedures of the health care plan / management system for monitoring progress, verifying improvements and identifying gaps and needs (Rushbrook and Zghondi. 2005, Chartier *et al*., 2014).

Hospital waste at risk of infection is a real danger to public health and it is inconceivable that the lethargy observed in the execution of the various measures relating to this waste, persists and is not stopped permanently.

To sensitize the service agents in charge of the cleaning, the collection and the incineration of this waste on the dangers incurred by the whole population in case of non respect of the procedures related to the collection and to the incineration of these products. Provide the service agents in charge of this waste with appropriate clothing, including gloves, and a specific vehicle intended solely for the collection of this waste, which must be disinfected after each round.

Launch a program to acquire and install incinerators for these wastes, the technical characteristics of which must respect the environment (CNCPPDH, 2009).

The treatment and disposal of biodegradable pathological waste is a critical issue for many health facilities. There are five basic processes for the treatment of hazardous components in healthcare waste, in particular sharps, infectious and pathological objects: thermal, chemical, irradiation, biological and mechanical.

Awareness-raising among hospital managers surveyed for effective implementation of biomedical waste management legislation, occupational medicine, adoption and implementation of appropriate, feasible and regularly assessed biomedical waste management programs. Appropriate and continuing training of health professionals to hope for a lasting change in risk behaviors and the creation of a culture of prevention of occupational risks (Ndiaye et al., 2012).

Acknowledgement

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BAKED GOODS CONSUMPTION HABITS IN THE GLUTEN FREE DIET

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Abstract: *Celiac disease is one of the most frequent and well defined of all lifelong diseases. It is a chronic, autoimmune disorder which is the result of an immune system response to the ingestion of gluten. A lifelong strict adherence to gluten-free diet is the only treatment currently available. Since bread and baked goods are basic and frequently consumed food in Hungary and made principally from wheat, the aim of our empirical research was to investigate the gluten-free bread and baked goods consumption habits of people following gluten-free diet. The empirical research was carried out using Google forms in January 2017. Size of the sample is 196. The online form was shared in four closed gluten free Facebook groups in Hungary since they are really active in sharing information concerning gluten-free lifestyle and diet. Bread proved to be essential part of the Hungarian dining habits even in the gluten-free diet. Gluten-free bread is consumed mostly several times per day and breakfast almost cannot be imagined without bread in Hungary. Choice and quality of gluten free breads and baked goods is almost acceptable, while the price is considered to be high in Hungary. It is still a challenge for bakeries to improve the quality of gluten-free breads and baked goods. Since the prices of gluten-free foodstuffs are higher than the conventional ones, there is an economic burden for people with celiac disease, because it is not optional for them to choose these special gluten-free foodstuffs. Loyalty to certain brands is strong among the respondents that provides opportunity for producers to develop new products that could be introduced into this special market presumably easier.*

Keywords: *coeliakia, bread, diet, consumption habits*

1. Introduction

Celiac disease is a serious autoimmune disorder that can occur in genetically predisposed people where the ingestion of gluten leads to damage in the small intestine. (Gluten is a generalised term that describes the storage proteins found in wheat, rye, barley and their derivatives.) This immune response to gluten leads to malabsorption of nutrients and related health issues, as well. This disease is permanent and damage to the small intestine occurs always when gluten is consumed. Celiac disease affects about 1 in 100 individuals worldwide. Although most patients remain undiagnosed as a result of variation in the severity and range of symptoms that a patient experiences. As regards the U.S. approximately 80% of those with celiac disease are undiagnosed (I1, I8, Panagiotou - Kontogianni, 2017). There are variations in the rate of prevalence in the different countries. In Europe, the rate of prevalence is 1%, but in Germany, this rate is only 0.2%, while in Finland and Sweden, the rates are 2-3% (I2). In Hungary, 1-2 % of the population is said to be affected, but only every 10th has been diagnosed (I3). Some symptoms of gluten-related disorders such as celiac disease or non-celiac gluten sensitivity are more likely to appear in women than men in general (I5).

1.2. The celiac disease

Up to 200 symptoms have been associated with celiac disease. Those related to malabsorption of nutrients include bloating, diarrhoea, anaemia, weight loss and growth failure. Non-gastrointestinal symptoms include fatigue, migraines, depression and seizures, infertility, joint pain and premature osteoporosis. Some individuals have no obvious symptoms at all, some may have just one symptom, and many

people do not have gastrointestinal symptoms (I1). A lifelong strict adherence to gluten-free diet is the only treatment currently available. Medicines usually are not required. It may take several months or longer for the small intestine to completely recover. Improvement can be measured by regular monitoring of the antibody blood tests used for screening, and by improved health. When one follows a gluten-free diet, blood tests should eventually come back to normal. Gluten-free diet is always required until another form of treatment is discovered (I1).

1.3. The gluten-free diet

On a gluten-free diet, wheat, rye and barley and any foods or ingredients derived from them must be removed from the diet. These food stuffs can include, for example, any form of bread product or bakery item, practically all noodle-type foods, such as Italian pastas and lasagne pastas, as well as most other forms of bakery items containing gluten in their flour-based mixtures. As one source notes, some food stuffs available for purchase also contain gluten where many consumers least suspect them, such as in sauces for all kinds of ethnic foods, commonly used salad dressings, packaged powder mixtures for and ready-made soups, as well as a wide range of popular processed foods. (I4) Beverages are also on the list of gluten-containing items and these include practically all types of beer and malted beverages, although there are also further fermented drinks containing gluten in various forms. (I8) Many consumers attempt to avoid gluten by purchasing oats, as this grain does not contain gluten. However, data shows that even oats are often sold in an already contaminated form, having come into contact with or been mixed with wheat during production and/or processing. (I4)

- Cross-contamination is a health threat to those suffering from celiac disease. Once food stuffs are brought into home cross-contamination can occur whenever:
- foods are made on common surfaces
- with utensils that have been improperly cleaned after preparing gluten-containing foods
- difficult to clean equipment is utilized for both gluten-free and gluten containing foods
- common household food preparation appliances are used and improperly cleaned, including toasters, strainers and flour sifters. Celiac disease sufferers may have to purchase two sets of each appliance
- oil is used to deep-fry food and then reused for supposedly gluten-free food preparation
- spreadable condiments, including e.g. mustard, ketchup, mayonnaise, or margarine are applied with a knife to gluten-containing baked goods and then the knife is reinserted into a jar or container. The condiment becomes contaminated. (I8)

Sufferers of celiac disease must ensure themselves of a carefully prepared list of all those foods that they are allowed to eat and consistently, dutifully follow it. In preparing such a list, four main categories may be used to somewhat simplify matters:

- foods that are naturally gluten-free
- natural gluten free grains and flours
- especially produced gluten-free products
- distilled vinegars and alcoholic beverages, as well as gluten-free certified wines and beers (Compare Panagiotou – Kontogianni, 2017, I8).

1.4. The gluten-free market

The “Free from food expo 2016” in Amsterdam can be considered as revolutionary since both the number of exhibitors and visitors broke the record. More than 250 exhibitors introduced their latest products. It supports that the “free from market” has been dynamically expanding not only in Europe but worldwide. The number of producer companies and the sales of gluten-free foodstuffs has been continuously increasing (Koltai, 2016). In the gluten-free market a considerable development has been started almost 20 years ago, more and more producers appeared on the market and more and more products are available for people following gluten-free diet. It has to be added, that this considerable increase can only be partly supported by the higher number of people with celiac disease. There are several fashion diets nowadays, such as the gluten-free diet (Sári, 2015). The gluten-free fashion diet has arrived to us from the West. In the US 11% of the households purchased gluten-free foodstuffs in 2014, although only 1% of the population has been diagnosed with celiac disease. In addition to gluten-free foodstuffs, even gluten-free dog food is available in the US (Lukács, 2014). The gluten-free market is expected to expand in Europe from the yearly 0.9 billion EUR (year

2012) to 1.3 billion EUR (year 2017). Among the consumers of gluten-free foodstuffs there are some other people who has to follow this diet for other medical reasons (hazipatika, 2013). As regards the increased number consumers we have to point out the importance of healthy lifestyle, as well. However it is a common practice that family members of people with celiac disease also follow the same diet for practical reasons (Koltai, 2017).

Almost one third of Canadians (10 million) are looking for gluten-free products. This includes about 2.5 million Canadians requiring gluten-free products for medical reasons. The vast majority, more than 7 million, perceive gluten-free products to be a healthier choice or in some cases have a family member with a medical need (I12). A study from 2013 shows the detailed reasons for gluten-free consumption among US consumers: Digestive health: 39%, Nutritional value: 33%, Weight loss: 25%, Healthier skin: 20%, Joint pain relief: 18%, Mental function: 13%, Stress relief: 12%, Cleansing regimen: 10%, Depression relief: 9%, Asthma/allergies: 6%, Celiac disease: 5% (Hartman, 2013). The demand for new products and for variety in the gluten-free category is increasing. Consumers have noted an improvement in quality in recent years, although nearly 25% feel that certain types of products still need improvement in quality, taste or variety (Packaged Facts, 2013). Between 2007 and 2013, there were 2,344 food products and 197 beverage products with a gluten-free claim introduced to the Canadian marketplace. In the U.S. market, there were 10,482 new food products and 1,645 new beverage products with gluten-free claims. Products with gluten-free claims also gained market share, growing from 4.5% to 15.4% of total new product launches in Canada, and from 3.4% to 24.3% of new product launches in the U.S. (Table 1).

Table 1. *Trends in the Number of Food Products with Gluten-Free Claims Launched in Canada and the U.S. Annually 2007–2013*

	Canada			United States		
Year	Total	Gluten-Free	Gluten-Free %	Total	Gluten-Free	Gluten-Free %
2007	4,767	216	4.5	17,686	603	3.4
2008	3,159	167	5.3	16,501	895	5.4
2009	3,139	136	4.3	11,811	934	7.9
2010	4,748	294	6.2	16,128	1,612	10.0
2011	5,550	392	7.1	15,330	1,683	10.1
2012	4,425	411	9.3	15,201	1,720	11.3
2013	4,720	728	15.4	12,512	3,035	24.3
Total	30,508	2,344	7.7	105,169	10,482	10.0

Source: Mintel Global New Products Database, 2014 in I12

1.5. Bread in human nutrition

A true foundation of the human diet, bread has been present as an indispensable part of human meals for thirty thousand years. Bread provides us with vital energy, nutrients and other ingredients essential for good health, digestion and metabolism. As some one-half of the average individual's daily energy should be provided in the form of carbohydrates (including starch), bread is a necessary part of daily food intake. (I9). Medical and nutritional research emphasize the importance of bread and other baked foods for nourishment. (I10) While the consumption of white bread has decreased in the last 20 years on the Hungarian bakery market, it is still among the 5 most frequently consumed foods. Crescent rolls and other types of rolls are also frequently consumed, since they are among the 10 most frequently consumed foods in Hungary. ¾ of the population over 15 years consumes white bread several days per week, 58 % on a daily basis. The average consumption of bread was 50 kg, crescents 60 pcs, rolls 150 pcs per day per capita in 2010 in Hungary. Bread was purchased 67 times in a year, which comes to purchase every 5th day by Hungarian households (I7).

Gluten-free baked goods

Research shows that, unfortunately, many of the gluten-free bread products obtainable in shops and supermarkets are of poor quality and taste. Other complaints include reports of their dry, crumbling texture, which are unpleasing for consumers used to fresh, moist baked goods

(Ylimaki et al., 1991; Arendt et al., 2002; Gallagher et al., 2003). Friis (1996) reports on the difficulties in completely removing all traces of allergenic protein from bread components in production. Research proves that residual gliadin can actually aggravate celiac disease and cause symptoms to continue in sufferers (Ciclitira et al., 1985; Thompson 2001; Sanchez et al., 2002). Gujral et al. (2003) report that while rice flour enjoys hypoallergenic properties, its low protein content and inability to be used properly in kneading make bread preparation using rice flour a continuing challenge. (Compare also Kadan et al., 2001 and McCarthy et al., 2005)

Therefore, finding substitutes for gluten, at least in the bakery sector, represents a formidable technological problem. Gluten, good or bad, remains a necessary protein for baking bread with an agreeable, tasty structure that consumers want when making their baked goods purchases. Without gluten, dough loses its elasticity and becomes difficult to form. This is why gluten-free baked goods look like they do and are not moist, but crumby in consistency. Thus, many gluten-free products for sale today are still of comparably low quality, unpalatable and undesired (Arendt et al., 2002). Overcoming these shortcomings will take a great deal of research and development. Although such activities have been ongoing for years, satisfactory substitutes are commonly not present on store shelves (Compare Gallagher et al., 2004).

People wishing to eat bread in the gluten free diet basically have two options: buying or baking the bread for themselves. There are several gluten-free bread brands available on the Hungarian market. Ingredients, texture, colour, softness of these breads are rather different. There is a rather good choice in gluten-free flour mixtures on the Hungarian market, as well. The composition of these mixtures are also rather different.

2. Material and method

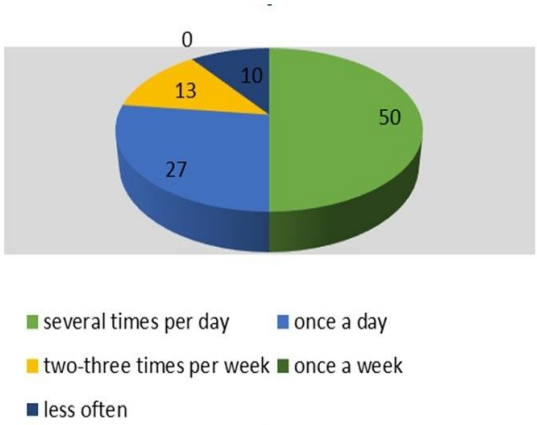
Bread is a basic and frequently consumed food made from basically wheat. Bread (gluten-free of course) is consumed by people with celiac disease as well. The aim of our empirical research was to investigate the gluten -free bread consumption habits of people with celiac disease. Since there is rather good choice of gluten-free breads and gluten-free bread flour mixtures are available on the Hungarian market, we wanted to investigate how often and to which main meals the respondents eat bread and whether they buy or bake the bread for themselves. In both cases (buying – baking) we investigated the motivations, frequencies and preferred brands, as well. A Web based survey was carried out in January 2017 in Hungary. The online questionnaire was shared in four closed gluten-free Facebook groups since they are really active in sharing information concerning gluten free lifestyle and diet. Size of the sample is 196. In the questionnaire the following question types were applied: dichotomous questions, multiple choice questions, rating scale questions, and demographic questions. In the first part of the 'Results and Discussion' chapter an overall picture of the gluten-free baked goods consumption habits of our respondents has been drawn up with the help of descriptive statistics. To confirm our hypotheses cross-tabulation analysis has been used. Crosstabs can be used to test the relationship between two nonparametric nominal or ordinal variables. The cells in the workspace of the table include the values obtained for each combination of the values of the two variables. They provide information about the relationship between the variables in the title column and row. The Pearson-Chi-square test, often used in the statistics of nominal variables, does not affect the reliability of the hypothesis test (Tóthné, 2011). With the Chi-square test, we can check the null-hypothesis whether the two parameters are independent or not independent of each other. In case the significance level for the Chi-square value is less than 0.05, the null hypothesis is discarded, otherwise it is retained. If the two parameters are not independent, the strength of the relationship is examined with the Cramer association coefficient. If the final result is between 0.5 and 1, there is a strong connection, if it is below, the connection is weak. As a final step, the residual values of each parameter is examined (standard residual). If the absolute value is more than 2, we can say that the measured value is significantly higher or lower than expected.

Almost 89.7% of the respondents is female and 10.3% male. 24.4% lives in the capital of Hungary (Budapest), 20.5% in county centres, 25.6% in other towns and 29.5% in other settlement types. There are seven NUTS 2 regions of Hungary, our respondents are representing all the NUTS 2 regions. By level of education half of the respondents (50%) has higher education background while 38.5% has high school background. Regarding the legal

status of respondents 41% is active white-collar worker, 21.8% is active blue-collar worker, while 20.5% was student. Regarding the marital status of respondents 62.8% is married, 29.5% is single and 7.7% is divorced. Regarding the financial situation of respondents 44.9% has average income.

3. Results and Discussion

With the first question we wanted to reveal how often our respondents eat bread. Figure 1 shows the results.

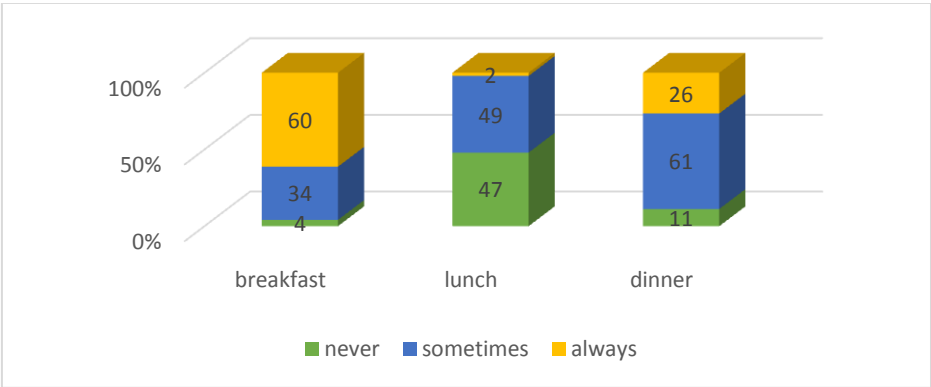


Source: Own research (%), 2017

Fig. 1. *The frequency of gluten-free bread consumption*

Bread, rolls and crescents, either salty or sweet, form part of our daily consumption (I7). There is a saying that "Hungarians eat bread with bread". Furthermore leftover bread is often used to thicken soups and stews. As Figure 1 shows bread is essential part of the Hungarian dining habits. It is consumed mostly several times per day. It is rooted in our traditions, habits and traditional meals that are always consumed with bread such as the traditional Hungarian goulash soup or our great variety of stews. Breakfast is one of the most important main meal in Hungary. There is another saying that "Eat breakfast like a King, lunch like a Prince, and dinner like a Pauper".

Breakfast is the most important main meal in Hungary. The traditional Hungarian breakfast is based on bread, rolls and crescents. In addition to breakfast, most Hungarian mothers prepare bread, or roll-based sandwiches for their children for elevenses. As Figure 2 shows, breakfast almost cannot be imagined without bread in Hungary.



Source: Own research (%), 2017

Fig. 2. *Frequency of gluten-free bread consumption to main meals*

As Figure 2 and 3 shows bread plays an important role in the Hungarian dining habits. Gluten-free breads are different from the conventional ones regarding their characteristics (ingredients, colour, softness, etc.). The availability of these breads are also different, they cannot be purchased so easily like

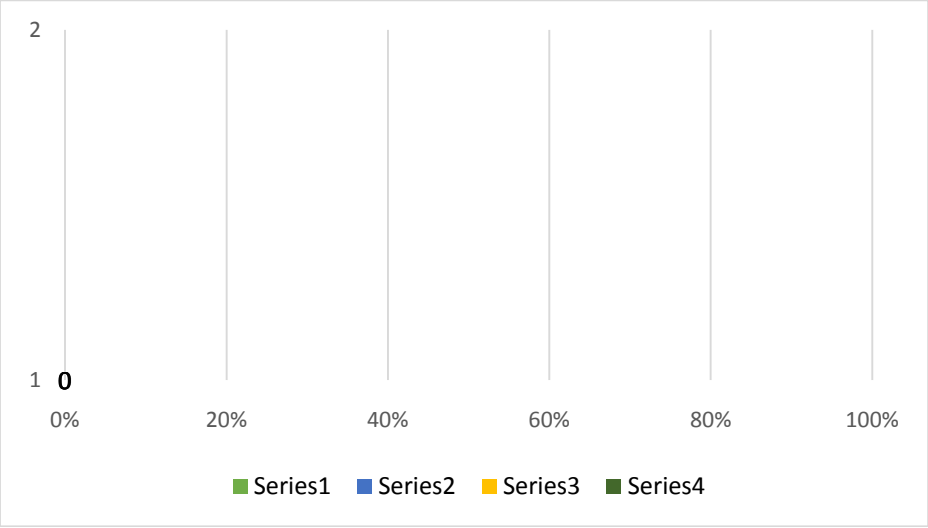
conventional breads. If the buying possibilities of consumers are limited (e.g. they live in villages), it is reasonable for them to buy bread less often but in these cases they buy a bigger amount that is enough for them for a week or even for more. Another possible reason for the low buying frequency (50% and 78%) that respondents may complete the bought bread and baked goods with self-baked ones. The investigation reveals that 51.3 % of the respondents mainly buys the gluten-free bread. As regards baked goods, 62.8% of our respondents buys, while 32.5% does not buy such foodstuffs at all. Table 2 shows the buying frequency of gluten free-bread and baked goods. It can be seen that the buying frequency of baked goods is rather low, they are not bought on a daily basis at all, and only 4% of the respondents buys them in every two-three days.

Table 2. *Buying frequency of gluten-free bread and baked goods*

Buying frequency (%)	bread	baked goods
daily	1	0
every two-three days	25	4
weekly	24	18
less often	50	78

Source: Own research, 2017

Hungarian purchases are generally based on conventional shops including small shops, supermarkets and hypermarkets, as well. The popularity of online shopping is continuously increasing, but so far not as common as the conventional ways of shopping. Figure 2 supports this general fact with the place of purchase of gluten-free bead and baked goods. Special shops offering foodstuff and dietary supplements for people following special diets are available mainly in bigger towns. As Figure 4 shows respondents prefer these special shops, then supermarkets and multi stores are the most frequent places of purchasing gluten free-bread and baked goods. In special shops the choice of gluten free breads and baked goods is rather wide and probably the personal atmosphere and trust are also included in this result. The most obvious reason for buying gluten-free bread and baked goods in supermarkets and multi stores is that these items are just simply added to the shopping list and they are purchased together with the regularly bought products.



Source: Own research (%), 2017

Fig. 3. *Location of gluten-free bread and baked goods purchases*

We asked them if they are loyal to a certain bread brand, if they buy the same bread brand all the time. The research revealed that our respondents are careful. 39.7% of the respondents said: Yes, mainly; 30.8% said: Yes, always and only 29.5% said: No. The most common bread brands (Schär, Mester Család, Nutri Free, Glutenix, Enjoy Free, Spar Free From, Glulu) that are widely available in Hungary were listed and the respondents were

requested to mark how often (always, often, sometimes, never) they buy those brands. The investigation revealed that Schär, Enjoy Free and Mester Család are the most popular bread brands as Table 3. shows the results for the three most popular brands.

Table 3. *Preferred bread brands*

Preferred brands	always	often
Schär (1)	54%	45%
Enjoy Free (Aldi) (2)	28.5/	18%
Mester Család (3)	7%	16%

Source: Own research, 2017

We asked our respondents if they are satisfied with the gluten free bread choice in Hungary. 48.7% of the respondents said: No; 37.2% said: Yes, partly and only 14.1 % said: Yes, totally. Regarding the gluten-free baked goods choice, 65.4% of our respondents is not satisfied, 25.6% partly satisfied, while 6.4% is totally satisfied (other answer: 2.6%). We also asked them if they are satisfied with the quality of gluten free breads in Hungary. 46.2% of the respondents said: No; 43.6% said: Yes, partly; and only 10.2% said: Yes, totally. Regarding the quality of gluten-free baked goods, 53.8% of the respondents is not satisfied, 33.3% is partly satisfied, while 6.4% is totally satisfied (other answer: 6.5%). Gluten-free products are more expensive than conventional food products, so we wanted to know the opinion of our respondents how satisfied they are with the prices of gluten free breads in Hungary. As a summary, we can state that they consider the prices are rather expensive, as listed below. Bread: Expensive: 44.9%; Unrealistically expensive: 34.6%; Slightly expensive: 19.2%; Yes, the price is correct: 1.3%. Baked goods: Expensive: 39.7%; Unrealistically expensive: 35.9%; Slightly expensive: 16.7%; Yes, the price is correct: 6.4%; other answer: 1.3%.

These results (choice, quality, price) can realistically ground the following result, as 74.4% of the respondents bake bread although the bread baking frequencies are different. We wanted to find out the reasons why they bake bread. The results are as follows: Not satisfied with the quality of the available bread: 23.1%; The price of bread is high: 23.1%; Trust only the home made bread: 11.5%; etc. We asked our respondents how often they bake bread. 21.8% of the respondents bakes bread two times a week, 24.4% once a week, 25.6% less often, 2.6% gave other answer. Brand loyalty was a question again. We asked our respondents if they are loyal to a certain brand when buying gluten-free bread flour. The results are as follows: Yes mainly, but try some other brands as well: 57.7% - Yes, always: 21.8% - No: 17.9% - Other answer: 2.6%.

Thus we can state that our respondents are loyal to their ordinary brands. We can state that respondents in the Central Transdanubia Region are the most loyal in Hungary. Furthermore, it can be stated that loyalty to certain brands also depends on the financial situation. (Chi-Square: 0.0). Generally, respondents from all income groups are experimenting with other brands, but it can be emphasized that the non-earners' brand loyalty is 57%, the number of respondents is well above the expected value (std Residual: 4.28), while 71% of those with below the average income are experimenting with other brands and the percentage of 'yes' answer is much lower than expected (std. Residual: -2.58). In this case, we can suppose that they are looking for the same quality at cheaper prices. Interestingly, in the case of people with higher incomes, brand loyalty is much lower than the average. We wanted to explore that out of the listed gluten-free bread flour brands (Anna Panni, Doves Farm, Mester Család, Amisa, Barbara, Bauck Hof, Dia-Welness, Emese, FE-MINI, Glutenix, "Own mixture", Nutri free, Szafi free) which are the most popular ones. Out of these brands Szafi free (19.2%) proved to be the most popular one, following by "Own mixture" and Nutri free with 10.3%, respectively, and Mester Család with 9%.

As can be seen, it is common among the respondents to bake bread. There are several possibilities to bake bread, such as an electric oven, gas oven or bread machine. 47.4% of the respondents bake bread in an electric oven, 16.7% in a gas oven, while 11.5% in a bread machine. The rest does not bake bread or named other options. This is a surprising answer, as bread can be easily and comfortably made with a bread machine. We looked at how school

education and making bread are independent. The significance level in the chi-square test is 0.00. Therefore, we accepted the alternative hypothesis that the two parameters are not independent of each other. It is an interesting observation that the standard residual value of less than -2 meaning that the number of people making their bread this way was far behind than expected, while the respondents bearing final exam use it more than expected.

We considered it important to examine in territorial terms why people in Hungary bake bread. It turns out that there is also a connection in this case and we can conclude that in South Transdanubia, far more people than expected have indicated that they only trust what they make for themselves. This suggests some bad experience. In the North Plains and in the Central Danubian region, more people prepare their own bread reasoned with its price. On the other hand, in Central Hungary, curiosity is the reason that makes more people bake than in other regions. According to settlement size, the same question revealed that in other settlements more emphasis is placed on the fact that it is difficult to obtain gluten-free bread, it is also harder to seek for a good recipe, and it is also expensive to buy so they rather prepare for themselves. Which is also logical, as gluten-free flour can be stored for a long time, and if you need to go to town, it is more practical to buy it. In the capital, more people do not bake than the expected value, which can be explained by the range of products available and that they can afford to buy ready-made products. In other cities, ready-to-buy breads are found to be very expensive and are rather baked individually. This is perfectly understandable as the raw material is available in the vicinity, while the purchasing power of the buyers is much smaller than that in the capital.

Conclusions

Based on our empirical research we can state that bread is essential part of the Hungarian dining habits. Gluten-free bread is consumed mostly several times per day. Breakfast almost cannot be imagined without bread in Hungary even in the gluten-free diet. 51.3 % of the respondents mainly buys the gluten-free bread and 62.8% of the respondents buys gluten-free baked goods, as well. 50% of the respondents less often than weekly buys gluten-free bread, while 24% buys it on a weekly basis. 78.2% of the respondents less often than weekly buys gluten-free baked goods, while 17.9% buys it on a weekly basis. Our respondents prefer special shops when purchasing gluten free-bread and baked goods. Regarding brand loyalty more than 2/3 of the respondents are loyal to a certain brand when buying gluten-free bread and more than ¾ of our respondents are loyal to their ordinary brands when buying gluten-free bread flour. The choice of gluten-free breads is acceptable, while the choice of gluten-free baked goods is not acceptable by the respondents. The price is considered to be high in both cases in Hungary

It is still a challenge for bakeries to improve the quality of gluten-free breads and baked goods. The prices of gluten-free foodstuffs are higher than the conventional ones. The gluten-free market has been continuously expanding, and the range of consumers is not limited to people with celiac disease only. People with rather different reasons may follow this special diet. However there is an economic burden for people with celiac disease, since it is not optional for them to choose special and expensive gluten-free foodstuffs. Loyalty to certain gluten-free brands is strong among the respondents that provides opportunity for producers to develop new products that could be introduced into this special market presumably easier.

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STUDY ON ANTIBACTERIAL EFFECTS OF CINNAMON ESSENTIAL OIL AND CINNAMON EXTRACTS

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Abstract: *Taking into account that pathogens of food origin are responsible for many infectious diseases and increase public health problems in the world, counterfeiting techniques are the subject of many research. The theme is important because food-borne diseases are not limited to developing countries and research on preservatives that can inhibit the bacterial degradation of food and cosmetics is useful for permanent maintenance and improvement of health. Starting from the idea that one of the main properties of extracts, volatile oils and the main cinnamon compounds is antimicrobial activity against Gram-positive and Gram-negative bacteria, it is appropriate to study this plant because by its intake to fight against bacteria responsible for diseases infectious diseases in humans, and are also responsible for the degradation of food or cosmetics. In recent years, several investigations have shown in vitro the presence of an antibacterial activity of volatile scrap oil against bacteria that can cause food poisoning. The aim of the paper is to contribute by investigating the effects of cinnamon on nutrients and molecular bonds, on cosmetics and on active (intelligent) packaging. It is desirable to demonstrate the bactericidal ability of volatile oil and cinnamon extracts, respectively, to inhibit the development of pathogens without adding chemical preservatives, in many cases being less appreciated by consumers.*

Keywords: *antibacterial activity, extracts, cinnamon, volatile oils.*

1. Introduction

One of the most well-determined properties of cinnamon extracts, essential oils and their bioactive components is the antibacterial activity against Gram-positive and Gram-negative bacteria responsible for human infectious diseases and degradation of food or cosmetic products. There are some studies showing the antibacterial activity of cinnamon essential oils obtained from different parts of the plant and extraction methods. Food products can be vectors for many dangerous microbial agents that can cause infections. Foodborne pathogens are responsible for infectious diseases that are a growing public health issue worldwide, affecting about 2 million children every year, especially in developing countries. Still, foodborne diseases are not limited to developing countries, and the research on preservatives able to inhibit bacterial degradation of food and cosmetics is important for the improvement of public health. In recent years many investigations have shown the antimicrobial activity of cinnamon essential oil against food poisoning bacteria in vitro. Other investigations have showed the protective effects of cinnamon in food matrices, cosmetic products and active packaging and their capacity to inhibit pathogen multiplication without introducing chemical preservatives that consumers could find unpleasant.

It is appropriate to start the study taking into account Chemical Composition of Cinnamon. The main compounds identified in cinnamon (*C. zeylanicum*) belong to two chemical classes: polyphenols and volatile phenols. Among polyphenols, cinnamon contains mainly vanillic, caffeic, gallic, protocatechuic, *p*-coumaric, and ferulic acids [1]. With regards to volatile compounds, the chemical composition of cinnamon essential oils depends on the part of the plant from which they are obtained. In bark essential oil, cinnamaldehyde is the most represented substance, with a content ranging

from 90% to 62%–73%, depending on the type of extraction, this being higher for steam distillation than Soxhlet extraction [2]. The other minor volatile compounds are hydrocarbons and oxygenated compounds (*i.e.*, β-caryophyllene, benzyl benzoate, linalool, eugenyl acetate, and cinnamyl acetate). In cinnamon leaf essential oil, the main component is eugenol, which reaches a concentration of more than 80%. In the essential oil obtained from cinnamon fruit and flowers, (E)-cinnamyl acetate and caryophyllene are the major components.

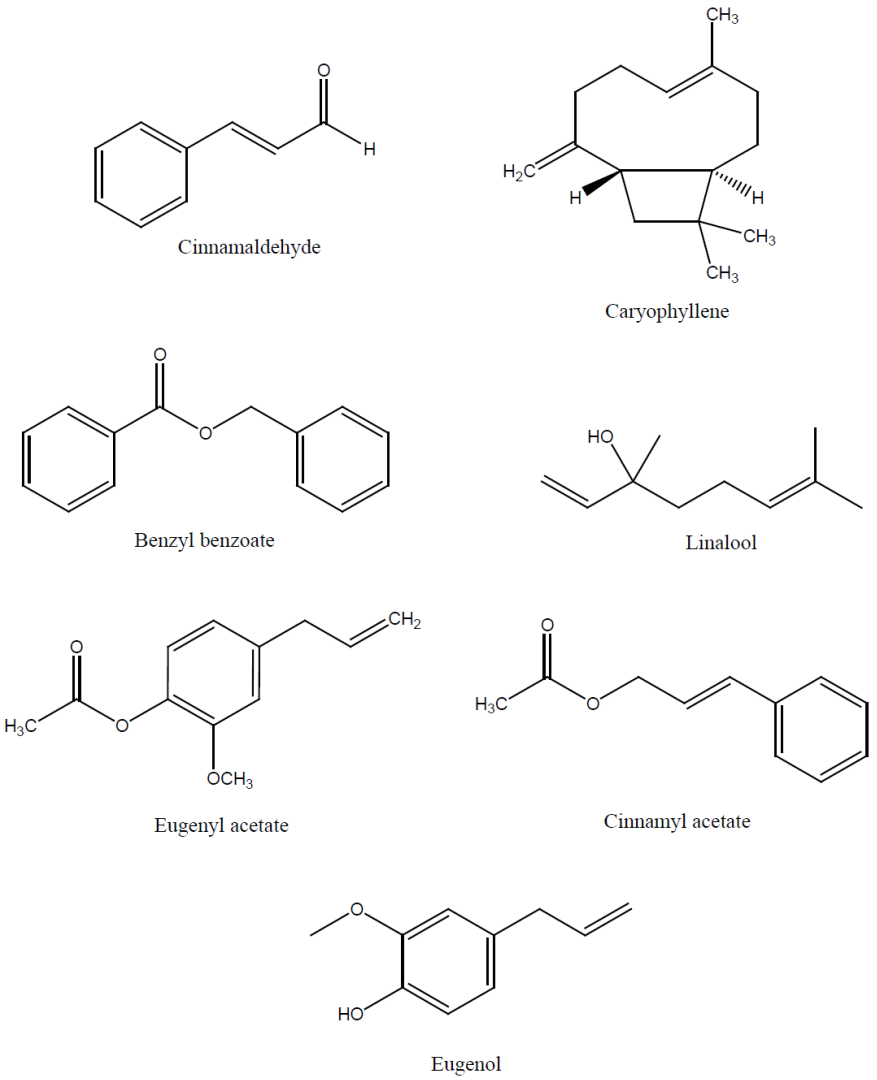

Fig. 1. *Major and minor chemical compounds of cinnamon essential oil*

Starting from the idea that one of the main properties of extracts, volatile oils and the main cinnamon compounds is antimicrobial activity against Gram-positive and Gram-negative bacteria, it is appropriate to study this plant because by its intake to fight against bacteria responsible for diseases infectious diseases in humans, and are also responsible for the degradation of food or cosmetics. In recent years, several investigations have shown in vitro the presence of an antibacterial activity of volatile scrap oil against bacteria that can cause food poisoning. The aim of the paper is to contribute by investigating the effects of cinnamon on nutrients and molecular bonds, on cosmetics and on active (intelligent) packaging. It is desirable to demonstrate the bactericidal ability of volatile oil and cinnamon extracts, respectively, to inhibit the development of pathogens without adding chemical preservatives, in many cases being less appreciated by consumers.

2. Materials and methods

The Laboratory methods and techniques have been monitored to obtain cinnamon extracts. A

comparative analysis has been done. Our experiments used extracts obtained with extraction techniques under subcritical pressures on samples from different Romanian or French areas, and analyzes by known classical methods.

3. Results and Discussions

3.1. Antibacterial activity of Cinnamon against bacteria responsible for human Infectious Diseases

In 2011, the antibacterial activities of several *C. zeylanicum* bark extracts, were tested in vitro against *Klebsiella pneumonia* 13883, *Bacillus megaterium* NRS, *Pseudomonas aeruginosa* ATCC 27859, *Staphylococcus aureus* 6538 P, *Escherichia coli* ATCC 8739, *Enterobacter cloacae* ATCC 13047, *Corynebacterium xerosis* UC 9165, *Streptococcus faecalis* DC 74, by the disk-diffusion method. *C. zeylanicum* bark extracts were obtained with different organic solvents, as ethyl acetate, acetone and methanol. The results showed that the antibacterial activity, expressed as inhibition zone, ranges from 7 to 18 mm for the application of 30 μL, suggesting a high antibacterial activity [3].

Mandal et al. showed that the ethanolic extract of stem bark *C. zeylanicum* had antibacterial activity against clinical isolates of methicillin resistant *S. aureus* (MRSA), from Kolkata, India. The antibacterial activity was indicated as both diameters of inhibition and minimum inhibitory concentration (MIC) values at different times of incubation. The cinnamon extract, which showed a diameter of inhibition zone ranging from 22 to 27 mm, resulted to be bactericidal after 6 h of incubation. In conclusion was showed that *C. zeylanicum* could be considered a valuable support in the treatment of infection and may contribute to the development of potential antimicrobial agents against MRSA bacteria [4].

As part of the studies on the antibacterial activity of cinnamon, the sensibility of two clinical strains of *Moraxella catarrhalis* (an important cause of lower respiratory tract infection, resistant to conventional antimicrobial agents) to the hydro-ethanolic extract of *C. zeylanicum* bark and clove powder, was tested using disk-diffusion and broth dilution methods. The results showed that cinnamon extract is active against both strains and, thus, it represents an alternative source of natural antimicrobial substances for use in clinical practice for the treatment of cases of *M. cattarhalis* [5].

In 2012, Guerra et al. published an investigation on the antibacterial activity of the combination of *C. zeylanicum* essential oil and antibiotics, in which additive and synergistic effects were shown [6].

More recently, Yap et al. reached similar results. In fact, the authors showed that the combination of piperacillin and cinnamon bark essential oil induced a noticeable reduction in the registered MIC values against a clinical strain of beta-lactamase-producing *E. coli*. In conclusion was showed that a reduced use of antibiotics could be employed as a treatment strategy to decrease the adverse effects and possibly to reverse the beta-lactam antibiotic resistance [7].

Also, cinnamon bark essential oil obtained by hydro-distillation was tested for antibacterial activity (expressed as MIC) against several pathogenic bacterial strains (*Salmonella typhi*, *Salmonella paratyphi* A, *E. coli*, *S. aureus*, *Pseudomonas fluorescens* and *Bacillus licheniformis*) and analyzed with thin layer chromatography (TLC) and gas chromatography coupled with mass spectrometry (GC-MS). The results showed that the tested sample has excellent activity against all the selected strains (MIC values ranged from 2.9 to 4.8 mg/mL). TLC and GC-MS analyses of chemical composition revealed the presence of t-cinnamaldehyde (which was the most abundant substance, corresponding to 4.3%), eugenol (0.32%) and minor components such as cuminaldehyde, and γ-terpinene [8].

Al-Mariri and Safi studied the antibacterial activity against Gram-negative bacteria (using a microdilution broth susceptibility assay) of cinnamon bark essential oil obtained via hydro-steam distillation. The sample showed good antibacterial activity against the Gram-negative bacteria (*E. coli* O157:H7, *Yersinia enterocolitica* O9, *Proteus spp*. and *Klebsiella pneumonia*) with very low MIC values (12.5 μL/mL, 6.25 μL/mL, 1.5 μL/mL and 3.125 μL/mL, respectively) [9].

Some studies showed that cinnamon extracts and essential oils could be active against oral cavity infections. Chaudhari et al. in 2012 [10], showed that cinnamon essential oil was active against *Streptococcus mutans* and concluded that the use of cinnamon essential oils can be a good alternative to other antibacterial compounds against the bacteria responsible for oral infections. More recently, the antibacterial activity of *C. zeylanicum* fresh leaf extract was studied against *Enterococcus faecalis*, one of the main causative factors of pulp and periapical

diseases of the oral cavity. *E. faecalis* was grown both on cellulose nitrate membrane and on a tooth model system. The antibacterial activity was determined by the agar diffusion test and microdilution method. The results showed that the obtained inhibition zones vary with increasing concentration (5% to 20%) of cinnamon fresh leaf extract.

Moreover, a complete inhibition of bacterial growth was registered after 12 h of contact, using NaOCl as a reference, which suggests that the cinnamon extract is active against both planktonic and biofilm forms; this was also observed in vivo [11].

Another recent research has demonstrated that the essential oil obtained from the fresh leaves of *C. zeylanicum* is active against *S. mutans* and *Lactobacillus acidophilus* which are involved in dental plaque formation and caries development. The MIC values obtained from *S. mutans* with the tube dilution bioassay were lower than that of gentamycin (0.31 μL/mL and 0.83 μL/mL, respectively). *L. acidophilus* was less sensitive to this essential oil (1.46 μL/mL). The authors concluded that promising in vitro data would require in vivo studies to determine the dose to be used in products for oral hygiene, which have no cytotoxicity [12].

3.2. Examples of cinnamon applications in food and cosmetic industries

In recent years many investigations have shown the antimicrobial activity of cinnamon essential oil against food poisoning bacteria in vitro. Other investigations have studied the protective effects of cinnamon in food matrices, cosmetic products and active packaging and their ability to inhibit pathogen growth without introducing chemical preservatives that consumers could find undesirable. For instance, a recent investigation showed that the essential oil obtained from the bark of *C. cassia* can control the growth of the spoilage microorganism *L. monocytogenes* in meat products contaminated at a concentration of 5 ppm, which did not change the sensorial properties of the products. In particular, cinnamon essential oil reduces the bacterial growth rate significantly in artificially contaminated samples when compared with an untreated control [13].

Similar investigations were performed a few years back by several research groups that studied the antibacterial activity of cinnamon against foodborne pathogens, especially in contaminated meat, such as *Salmonella typhimurium*, *S. aureus* and *E. coli*, *Arcobacter butzeiri* and *Arcobacter skirrowii* [14–16].

The following paper is particularly noteworthy because the extract obtained from a cinnamon stick resulted to be active at room temperature (~23 °C) against *L. monocytogenes*, *S. aureus*, and *Salmonella enterica* in a food matrix different from meat and represented by cheese, suggesting that the extract is a potential natural food preservative [17].

Another interesting investigation reports the antibacterial activity of cinnamon bark essential oil and its main constituents, trans-cinnamaldehyde and eugenol against *Cronobacter sakazakii* and *C. malonaticus*, which are opportunistic pathogens that cause infection in children and immunocompromised adults. These bacteria are present in many food products; therefore, decreasing the bacterial count would be desirable. The antibacterial activity was assayed in liquid and vapor phases to test the strain susceptibility to both nonvolatile and volatile compounds. The results showed that the MIC values of cinnamon essential oil (ranging from 0.25 to 0.5 mg/mL) in liquid and vapor phase are similar to those registered in the same conditions for t-cinnamaldehyde (ranging from 0.128 to 0.3 mg/mL). Eugenol showed higher MIC values (ranging from 0.512 to 1.0 mg/mL), suggesting lower antibacterial activity. Based on these results, the authors concluded that cinnamon essential oil could be incorporated into food packaging materials or used to create an active modified atmosphere to reduce the contamination of *Cronobacter* species [18].

Another study showed that commercial essential oils obtained from the two most common species of cinnamon, *C. cassia* (leaf-branch) and *C. verum* (bark), were tested against *L. monocytogenes* NCTC 11994, *L. monocytogenes* S0580 (isolated from pork meat), *S. typhimurium* ATCC 14028, *S. typhimurium* S0584 (isolated from pig carcass), *E. coli* O157:H7 ATCC 35150 and *E. coli* O157:H7 S0575 (isolated from minced beef), *Brochothrix thermosphacta* ATCC 11509, and *P. fluorescens* ATCC 13525. The antibacterial activity was evaluated using the disk-diffusion methodand both MIC and MBC values were calculated. The essential oils showed high antimicrobial activity against the tested bacteria with MIC values lower than 1 μL/mL. The authors attributed this activity to the main bioactive constituents, especially cinnamaldehyde. They suggested that these

essential oils and their main active components could be used as natural alternatives for food preservation to retard or inhibit the bacterial growth of pathogenic and spoilage bacteria and to extend the shelf life of the food products [19].

Herman et al. (2013) showed that commercial cinnamon essential oil in a cosmetic emulsion at 2.5% concentration possesses very good antibacterial activity against several contaminants such as *P. aeruginos*a ATCC 27853, *E. coli* ATCC 25922, and *S. aureus* ATCC 29213. The antibacterial activity, evaluated with the disk-diffusion test, was found to be higher than that registered for methylparaben, used as positive control. The diameters of inhibition zones ranged from 24 to 44 mm for the cinnamon essential oil, and from 9 to 8 mm for methylparaben [20].

Another practical application for the antibacterial activity of cinnamon essential oil was reported by Hill et al. [21] who tested cinnamon bark extract entrapped in nanoparticles prepared with poly DL-lactide-co-glycolide (PLGA), a biocompatible polymer widely used in the pharmaceutical industry and which could be used in the food industry to deliver antimicrobial compounds to food matrices. The authors tested the antibacterial activity of the nanoparticles loaded with cinnamon extract against *L. monocytogenes* and *S. typhimurium*. The results showed that the nanoparticles exerted antibacterial activity against the tested bacteria. Therefore nanoencapsulation could be a good method to deliver entrapped antibacterial substances to pathogens in food products without a heavy influence on sensorial properties.

Conclusions

1. Experiments have shown that the antibacterial activity of cinnamon is due to the compounds
2. It is highlighted the need to develop a good national strategy on the use of cinnamon in food to reduce or avoid bacterial degradation and hence reduce the incidence of food-borne infections. In addition, we suggest that cinnamon may be an alternative to synthetic antibiotics, especially for the treatment of antibiotic-resistant bacterial infections.
3. Cinnamon is not harmful when used in correct concentrations. However, we have found in preliminary studies that excessive and long-term use also has a number of side-effects, ie no such use is recommended.

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BENEFITS OF OPERATING A WEBSHOP IN RURAL DEVELOPMENT

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Abstract: *The importance of e-commerce in Hungary is unquestionable. 66% of the population is regular internet users (I3), every fourth person uses it on a daily basis. Online sales have increased from 137 billion HUF in 2010 to 427 billion HUF in 2016, while offline sales were not able to reach this growth (I1). Undoubtedly, online sale has become a very valuable market. The age groups really valuable as consumers spends about 6 hours a day online, out of which 3 hours is active usage (I2). The Internet is also the most important source of information and keeping in contact, as 41% of the population uses it method. The availability of the Internet access in Hungary is literally independent of the geographic location, thanks to the Digital Renewal Action Plan in Hungary's current strategy, as one of its main points is "Enhanced and Secure Infrastructure for All." (Botos 2013) plan. There are many unfavourable processes in Hungary's rural areas. Of these, emigration and the abandonment of the local economy are outstanding. To stop these processes, the "National Rural Strategy" (2012-2020) was created. Its most important areas are employment growth, balanced and diverse land and forest management, production structure, restoration of local food production and food markets, local energy production, strengthening the local communities, improvement of population patterns and conservation of natural systems and the biodiversity. The integration of rural economies into the on-line marketplace and their linkage to different DBEs not only vertically but horizontally can be one of the keys to their survival and development. The situation of businesses on the on-line marketplace in the countryside is very special. On the one hand, they are more favourable in many aspects of their operation, but in some cases they have disadvantages that fundamentally threaten their survival. The purpose of this article is to get to know this environment, map its benefits and drawbacks. For this, we use the results of in-depth interviews conducted with businesses operating on an on-line market in rural settlements.*

Keywords: *e-commerce, countryside, webshop, online shopping, retail in Hungary*

1. Introduction

Just like everywhere in the whole world, the importance of trade backed with IT tools in Hungary is unquestionable. Every fourth person uses IT tools for entertainment, information gathering, shopping, or work on a daily basis. Online sales have increased from 137 billion HUF in 2010 to 427 billion HUF in 2016, while offline sales were not able to reach this growth (I1). Undoubtedly, online sale has become a very valuable market. The age groups really valuable as consumers spends about 6 hours a day online, out of which 3 hours is active usage (I2). The Internet is also the most important source of information and keeping in contact, as 41% of the population uses it method. The availability of the Internet access in Hungary is literally independent of the geographic location, thanks to the Digital Renewal Action Plan in Hungary's current strategy, as one of its main points is "Enhanced and Secure Infrastructure for All." (Botos 2013) plan. There are many unfavourable processes in Hungary's rural areas. Of these, emigration and the abandonment of the local economy are outstanding. To stop these processes, the "National Rural Strategy" (2012-2020) was created. Its most important areas are employment growth, balanced and diverse land and forest management, production structure,

restoration of local food production and food markets, local energy production, strengthening the local communities, improvement of population patterns and conservation of natural systems and the biodiversity. The integration of rural economies into the on-line marketplace and their linkage to different DBEs not only vertically but horizontally can be one of the keys to their survival and development. The situation of businesses on the on-line marketplace in the countryside is very special. On the one hand, they are more favourable in many aspects of their operation, but in some cases they have disadvantages that fundamentally threaten their survival. In our research, we intend to develop tools that can provide effective help to people living in rural areas to create similar operating conditions to the ones of their urban competitors. In the first part of the research, we want to study the circumstances and possibilities. For this we use the results of in-depth interviews conducted with businesses on the on-line marketplace operated in rural settlements.

2. Materials and Methods

In this chapter, we have a look into the position of e-commerce in Hungary and the Digital Business Ecosystem theory as we believe that building on these fundaments can be used to set up a toolkit for the ultimate result of the research. In the last part of this chapter, we present the current situation of the rural areas in Hungary.

2.1. E-commerce

The main driving force for retailing in Hungary is e-commerce with its 18% growth (Figure 1). Under favorable economic conditions, the continuous development of ICT and online stores also contributes to this trend. (Nagy, 2016). E-commerce has became an inevitable participant in the development of the economy (Anvari and Norouzi, 2016). No doubt this is true not only for Hungary, but also globally as it is one of the strongest growth motors (Gabrielsson & Gabrielsson 2011). In the retail sector, in particular, in the case of webshops, the ever-increasing customer expectations have created even more challanging conditions. Particularly true for the SME sector, which unfortunately has very limited resources for innovation (I8). Fortunately, 86% of the businesses on the market are aware that one of the basic elements of success is to provide a superior customer experience. More and more sectors are entering the on-line retail market that we could not even imagine before. In all regions of Hungary, the number of people using the Internet to acquire a product or service is constantly increasing.

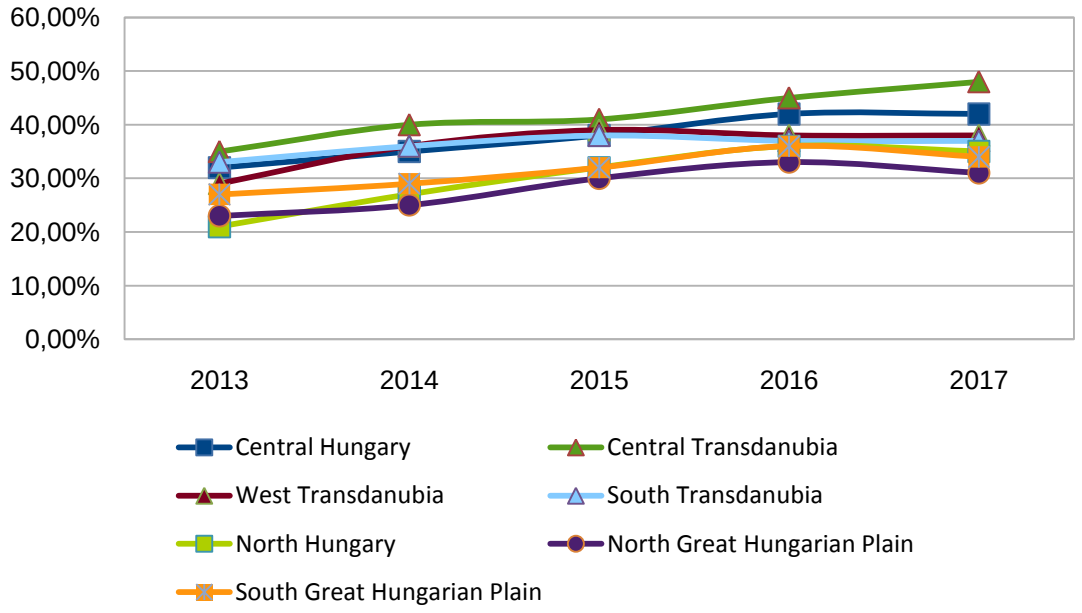

Fig. 1. *Using the Internet to purchase a product or service in different regions of Hungary source; own editing based on Internet 1*

The success of the on-line market brings along the development of many industries and technology. Its impact has infiltrated into the logistics sector, the banking sector as well as it has had serious impacts on the IT industry since it requires new, safe, fast, user-friendly operation at affordable prices.The extent of the Internet network, the availability of hardware goods, and the development of new software products will help the size of the companies' economically viable market not to be determined by where their seat is.

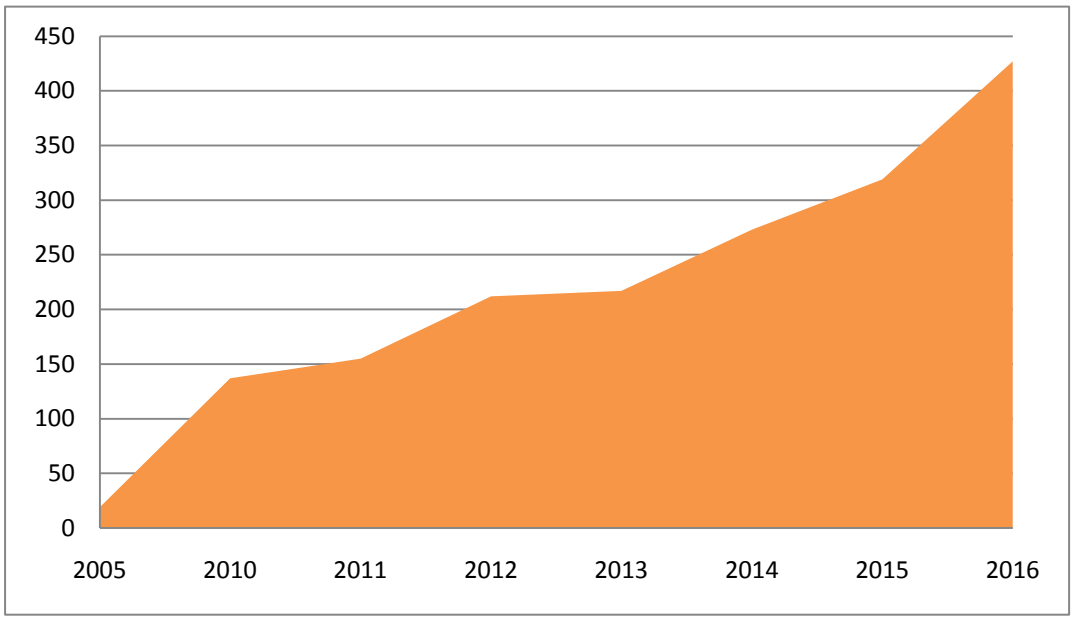

Fig.2. *Online net retail turnover in Hungary*
Source: own editing based on Internet 2

2.2. Digital Business Ecosystem (DBE)

The business ecosystem "An economic association operated by interplaying organizations (organizations) and individuals. This is called the "organization of the business world". If this economic association supplies goods and services to customers then it is part of the ecosystem. "(Moore, 1996). A prosperous ecosystem in a dynamic, developing free market is able to strike a balance between co-operation and competition. The ecosystem is a biological metaphor that highlights the interdependence of participants in a business environment. They are the ones who "jointly develop their opportunities and duties" (Moore, 1996). Also in connection with Digital Business Ecosystems, we can mention that we can observe an equally structured operating model between biological behavior and software product based on theoretical computing and reaching toward an evolving self-organizing self-optimizing environment (Evolutionary Environemnt or EvE). The digital business ecosystem places all this in the digitized world, where the "nerve" of business relationships and processes is the Internet or other electronic media.

DBE technology itself has come to the fore in assisting European SMEs. We know that ICT innovation is very expensive, mainly affordale for multinational corporations only, while the largest number of employers, SMEs, are primarily motivated by the fast profit (I 4). For this reason, the European Union has created projects that develop and introduce technology based on the DBE philosophy for the SME. (peardrop, seamless, etc.) (I 5; I 6). Of course, technology did not stop at European borders, but it is also successfully introduced in countries like India (agriculture). SMEs can connect to the running application and upload their products, services and search for information and partners. The benefits expected from the introduction of the DBE philosophy are that SMEs can easily expand their market both horizontally and vertically without having to invest heavily in, to separate their presence from geographical constraints, to stay competitive with multinationals, to remain in the market (Nanchira et al, 2007) and gain more information. Based on

this new paradigm, developments started in 2003 (Nanchira et al., 2007).

2.3. Rural Development

Under rural areas, we mean a wider area where villages and small towns form economically and socially unified compounds and compared with urban areas: there is significantly lower concentration of population, economic, social and cultural structures, and - most of the land is used for agricultural, forestry, nature conservation and recreational purposes (I7).

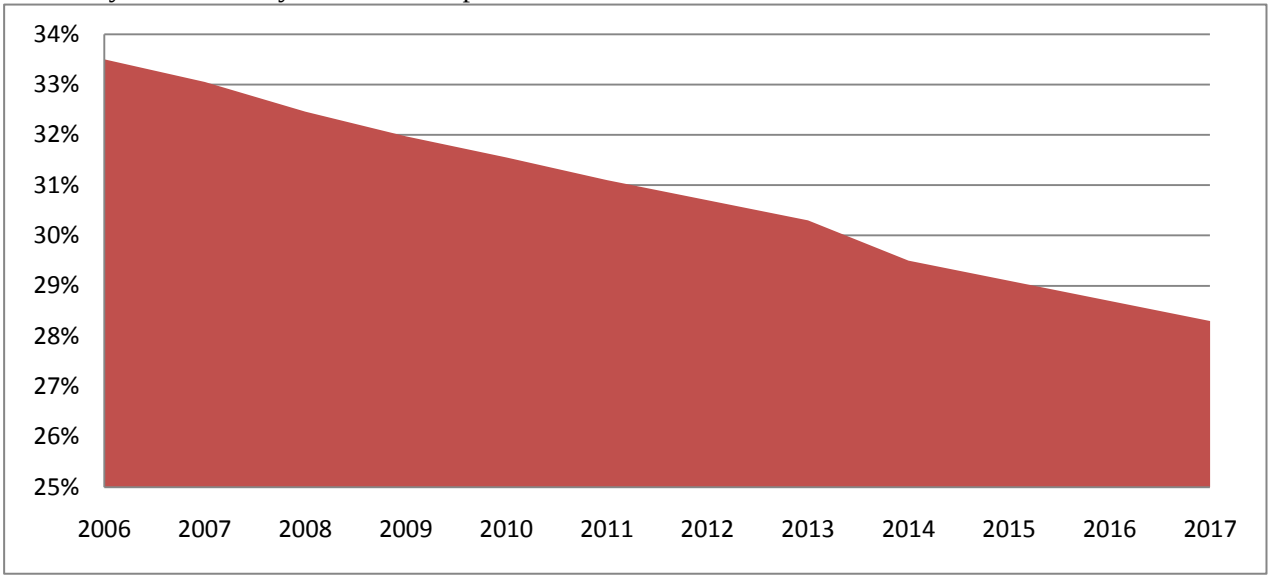

Fig.3. *Percentage of population in rural areas compared to the total population in Hungary*
Source: own editing based on Internet 3

Unfortunately, the depopulation of these areas has started in recent decades. As you can see in Figure 2, this trend has become really shocking. The migration of the population has brought along the depletion of the economy there. Recognizing this, Hungary, jointly with the EU, has developed several strategies. The aim of the National Rural Strategy is to reverse the unfavorable processes in most of the country's rural areas, and outline the objectives and principles of the country's rural policy, based on a vision of sustainability, viable agri- food and food production and the values of rural life. As it aims to renew the countryside in Hungary as a whole, it defines the agri-food and rural development tasks based on the protection of natural values and the environment and the sustainable utilization of natural resources.

Key fields of the strategy:

Inreasing employment.

Triggering balanced and diverse land and forest management.

Transforming and modernizing the production structure.

Restoration of local food production and food markets.

Establishing energy production based on local sources.

Strengthening rural communities.

Improving population patterns, move back and forth with increased childbearing..

Prrotecting the biodiversity of natural habitats.

The target group of the strategy is comprehensively the people living in the country, whose quality of life is to be improved. One of its target groups is the active age group living in rural settlements whose income, employment and the expansion of their employment opportunities are essential for the future of the countryside. The other are those young individuals and families who are planning to return to the country or who are planning to relocate to the countryside, on who on the future of our rural areas and agriculture depend (Káposzta J - Tóth T., 2013).

To do so, we must create conditions that are essential in the 21st century. One of the most important infrastructures is internet access. The importance of broadband access is increasing alongwith the online time and the amount of downloaded data. For this reason, the European

Union has formulated the need for access to high speed and super-fast Internet within the Digital Agenda for Europe (I9). On this basis, an Internet connection of 30 Mbit / s or faster must be available for all European users by 2020, and half of European households must have an Internet subscription of 100 Mbit / s or faster. Today, only 1% of Europeans have a high-speed fiber-optic Internet connection. Additionally, e-commerce traffic, regular internet usage and e-government services must be increased by 2015. For these aims - due in part to the increase in the number of users - a large-data transmission network provides the infrastructural fund (Botos 2013).

This is also reflected in the Digital Reform Action Plan of Hungary, one of its main chapters is "Enhanced and Secure Infrastructure for All", with the subsection is "Promoting NGA Network Investments". The plan was elaborated by the Ministry of National Development and beyond the current state of analysis, for the period 2010-2014, it contains Hungary's objectives regarding the infocommunication sector and how to achieve them. The Action Plan is in line with the European Union's objectives, infocommunication programs and Hungary's economic development programs (NFM, 2010).

From the literature research, it can be stated that e-commerce is becomimg increasingly inevitable. The growth of B2C trade is driven by the Internet. Due to ICT-based trade, localization of companies is less important than in the past. It is clear from the rural development plan that the objective is to create economic diversity in rural areas in addition to traditional agriculture and local industry, to create new, innovative and competitive businesses in areas beyond the city. A broad spectrum of rural economies can be one of the cornerstones of rural prosperity. These undertakings need support, what is recognized and actively supported by the Hungarian Government and the European Union. Although, in our experience, the business environment of many businesses is merely vertical and little emphasis is placed on the horizontal fulfillment, however, as different DBE studies prove, if horizontal partners find the right synergies, it will be beneficial for all parties. In the next phase of the research I intend to narrow down my observations along the lines of these findings to a segment of e-commerce, the web store operation. In our view, this is the area where rural businesses can compete in certain conditions. The strong development of many industries, such as logistics and infocommunication, supports this statement. Our goal is to look at businesses that deal with e-retailing in rural areas. We need to meet their operating environment, the potential benefits and disadvantages, and how this depends on their location in rural areas. In order to understand this problem more thoroughly, we believe that we are going to map it with in-depth interviews and then confirm the outlines that are formed by a closed questionnaire questionnaire.

3. Research Methodology

The first part of the research was conducted through deep interviews. We want to present the full research in a series of articles. This method of data collection is most often used when it is free of group influencing, we are interested in the opinion, experience and vision of the respondent from his or her own work and individual market approach. (I10) B2B is most commonly used for corporate research, decision-makers, and the views and market designs of specialists whereno statistics, but qualitative results can help to determine the purpose of our research. The criteria for selecting interviewees were that they have been on-line for at least 3 years, and the operating center of their company is considered a rural area. As we want to reinforce the opinion they represent we are reflecting with a questionnaire survey and we have chosen a semi-structured interview form of in-depth interviews. We contacted 10 companies out of which 5 positive responses were received. Answers were provided by businesses in clothing sales, used clothing sales, sales of simple technical articles, sales of other technical articles, and sales of locally produced products. I used the interview to confirm or disprove the hypothesis first, and accordingly I compiled a series of questions that contained a loose structure with mostly open questions. During the interview, I did not change the order of the questions, but in some cases, due to the content of the answers, stating the next question would have been meaningless. The interviews took between 22 and 50 minutes. Prior to the interview we made some hypothesis.

The companied do not build horizontal connections

There are some compulsory operations that are currently performed manually, although they can be automated.

The distance from the city does not mean disadvantage in the operation of webshops.

4. Presentation of the results

After outlining who the subject of the survey was, we will present important results from the prospective of our research. Our goal is to understand the main tasks of running a web store, how much time it takes to operate and what disadvantages and benefits they derive from having their from havingcenter in the countryside. It can be generally stated that 1 person operates the store and sometimes has 1-2 helpers. Apart from the ones running a tiny tech business, everyone has their offline store and operates their on-line store as a complementary activity. The yearly maintenance cost of the website is not significant, as it costs 50,000 to 400,000 Ft per year, which is an insignificant amount compared to the offline store. An important question was "what bigger steps you could break the operation into". Answers included the supply of goods, product uploads, product maintenance, marketing, customer contact, packaging, posting. An important part of our research is to get acquainted with who they are interacting with. We have found that it is primarily only with suppliers and buyers. Horizontally they are not related to any other business. One important finding of DBE is that if companies have a horizontal relationship, not just vertically, in a well-developed system this will be beneficial to all parties. For this reason we have sought processes where the above mentioned idea can be realized. Then we were wondering how much time they spend with an operation and what they want to deal with more. The responses show that they spend an average of 1 to 6 hours with uploading 1 product. We must understand this time as required to acquire product data, take photos, make videos and editing them, make descriptions, upload, and of course self-checking. Overall, this is significant for businesses where initiation of new products is common. On the other hand, the shortcoming of the product descriptions will later appear in the customer service because when asked about a parameter, you have to retrieve the data and answer the query. In contrast, there is not ample time for marketing. There are now free or paid tools available to help you create effective marketing communications. This is a returnable investment, but it takes a lot of time. Returning to the product uploads, we thought we would like to sort the quantities by month. The results showed a large spread. There are places where this product number is practically zero and others where it is 30-40. The first response was from retailers of local product, while the latter of the webshop of clothing and small technical gadgets. To the question of how much time they work with the store on a working day, we got the following answers in the same pattern of 6 to 10 hours in case 2, and for the first case only 1 hour. To the question of the benefits and disadvantages of not operating their businesses in a city advatntages were listed like cheaper storage, cheaper labour. Since they do the operation themselves, I mean the lower wage expenses. One of its disadvantage is that it would be difficult to hire a qualified workforce who can handle marketing, customer relations, and product uploads tasks, too. They considered the information flow neutral, which means that they can also access the Internet through seminars and trainings that can improve their business success. The question of distance is not so clear. In some cases, where supplies are made via the internet, it is completely neutral. In contrast, where it requires personal appearance, such as clothing supply, they have a major disadvantage compared to the Budapest based companies. So in this case, as well, the issue of benefit, disadvantage, neutrality is a function of distance and not the fact that it is rural or urban.

From these parts of the interview we can summarize the following:

Companies are not interrelated in horizontal direction. With this, our first hypothesis was confirmed. A significant proportion of webshops can be operated from the countryside as well. The development of logistics eliminates problems caused by geographic location. Servers are operated from a data center with remote access. With this, my third hypothesis is partly justified. Data uploading takes up a considerable amount of time only for businesses where the stock is changing. The amount and quality of the data uploaded will affect the time spent with customer contact. Many people are trying to get pictures and data from the internet. There are often errors in the data uploaded. Significant time savings could be achieved by automate certain processes. Our second hypothesis is also confirmed. It takes a lot of time to create SEO for each product and other marketing. There is a demand for free marketing results. Every

business is clearly aware that the more resources is spend on marketing, the more successful they will be. In the next step, we intend to complete a more extensive questionnaire survey with closed questions. Depending on the outcome, we will conduct further research. If the survey confirms our hypothesis, we will propose to create an automated community-based system that, according to our belief, can significantly reduced the time allocated to certain operational steps.

Conclusions

Every fourth person uses IT tools on a daily basis for entertainment, gathering information, shopping, or work. The growth of online sales largely exceeds that of offline sales. The online marketplace is a great opportunity for businesses in rural areas. It can be quoted that they primarily build vertical relationships between the participants, while in horizontal direction they are not very open toward each other. Our goal was to find aspects where they could work together in a horizontal direction when running webshops. During the interviews, we have proved that rural areas are basically no obstacles to successful operation. In addition, we have found work phases that can be automated. In the next step, based on the information we have so far, we want to make a more comprehensive survey of closed questions, to create the basic foundations of the toolkit to be prepared.

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SURVEY STUDY CONCERNING OF MYCOTOXINS GENERAL CHARACTERISTICS AND THEIR POSSIBLE PRESENCE IN AGRICULTURAL AND FOOD DERIVED PRODUCTS

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Abstract: *Mycotoxin contamination of food and feed depends on environmental / climatic /storage conditions, harvesting techniques and some others factors.*
A survey study was performed using students from Transilvania University of Brasov (UTBV) and Erasmus students in UTBV in 2013/2014 in order to identify the level of their knowledge concerning the topic of mycotoxins in agricultural and food derived products.
The results were compared and the differences and similarities between the groups were indicated, also in the context of the demonstrated data coming from the scientific literature.

Keywords: *mycotoxins, survey, contaminants, agri-food products*

1. Introduction

Mycotoxins are toxic compounds produced by wide range of fungal species, having different chemical structures, biosynthetic pathway and origins. Mycotoxins are natural contaminants occurred universally in food and feed [8] that are stored in an inappropriate medium.
Typically, the classifications of mycotoxins reflect the scientific background of the person doing the categorizing (Table 1.) [18, 12, 10].

Table 1. *Possibilities to classify mycotoxins, according to the person who performed the classification and its own criteria*

Who performed the classification	Criteria of classification	Classes of mycotoxins
clinicians	depending on the organ they affect	hepatotoxins, neurotoxins, nephrotoxins, immunotoxins, etc
cell biologists	according to generic groups	teratogens, mutagens, carcinogens and allergens
organic chemists	according to their chemical structures	lactones, coumarines, etc
biochemists	according to their biosynthetic origins	polyketides, amino acid-derived, etc
physicians	by the illnesses they cause	St. Anthony's fire, stachybotry toxicosis, etc.
mycologists	by the fungi that produce	*Aspergillus flavus* (produce aflatoxin), *Aspergillus ochraceus* (produces ochratoxin), *A. fumigatus* (produce gliotoxin, fumagillin, helvolic acid (fumigacin), fumitremorgin A and Asp-hemolysin), *Fusarium (produce* trichothecenes, zearalenone , fumonisins, moniliformin*)*, and *Penicillium* (produce brevianamid A, citreoviridin, citrinin, cyclopiazonic acid, fumitremorgin B, griseofulvin, luteoskyrin, ochratoxin A, patulin, penicillic acid, penitrem A, PR-toxin, roquefortine, rugulosin, verrucosidin, verruculogen, viridicarumtoxin and xanthomegnin)

World Health Organisation (WHO), 1946	According with human diseases - Acute toxicity is the rapid onset of an adverse effect from a single exposure. - Chronic toxicity, the slow or delayed onset of an adverse effect, usually from multiple, long-term exposures.	aflatoxins, ochratoxins, zearalenone, and trichothecenes

Presently, over 300 mycotoxins have been identified and reported, which contaminate about 25% from the word agri-food production, leading to huge agricultural and industrial losses [11].

Using a quick search (key work mycotoxin*) in Pubmed database (May 3, 2018), we identified a great interest also in the scientific literature (Fig.1.).

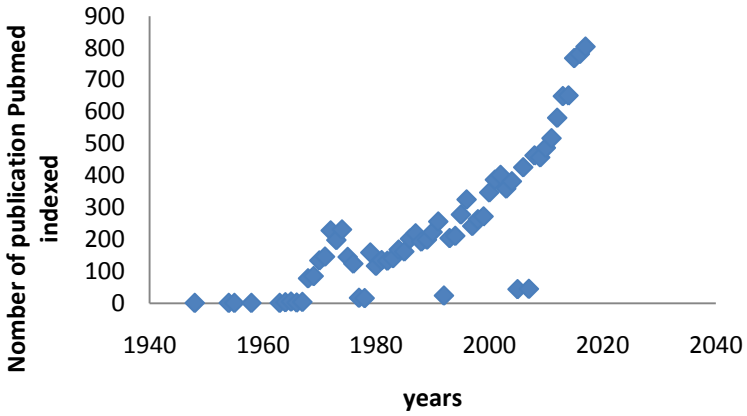

Fig. 1. *Indexed articles in PubMed database (search May 3, 2018; key word – mycotoxin*)*

Consumption of mycotoxin-contaminated food (corn, cereals, soybeans, sorghum, peanuts, and other products) or contaminated also with their metabolites (animal-derived food products, such as meat, milk, or eggs) or feed can cause acute or chronic toxicity in human and animals [2].

Due to their diverse and often unspecific biological effects of mycotoxins, causing symptoms such as loss of appetite, nausea, reduced feed intake and reduced bodyweight, mycotoxicoses are generally difficult to diagnose. The amount of mycotoxins needed to produce adverse health effects varies widely among toxins, as well as for each animal or person's immune system [6].

Specific characteristics of mycotoxins make them harmful to the human health and it is important to identify methods of identification. HPLC remains a very used technique worldwide when speaking about mycotoxins identification and quantification in eco agricultural products. But also some simple and rapid method as thin layer chromatography (TLC) are used for (semi)quantitative analysis [7].

Our research group developed also immunosensors with good performance parameters which could be used for detection of aflatoxin B1 [4] from botanical matrices.

In order to test the knowledge of different groups concerning the mycotoxins, we created a questionnaire where we asked the people about the sources of mycotoxins, possible risks, which, on a daily basis (eating), may encounter.

2. Study design

It was created a questionnaire with 28 questions. The first five questions concern the general information of the people who filled out the questionnaire, and all other questions regarding the topic of mycotoxins. For some questions we decided to give the possibility of "multiple answer", ie, have the possibility to choose more options for the same question. Instead, for all other questions there is the possibility of only one answer. The questionnaire

was first pre-tested and verificated using a small group (5 persons).

The six groups involved in the study were:

- Students from Food and Tourism Faculty in "Universitatea Transilvania din Brașov" in Romania - (G1 – Ro. Romanian),
- Erasmus students in "Universitatea Transilvania din Brașov" in the Academic Year 2013/2014 - (G2 - Erasmus),

Questionnaire was first created and pretested in Romanian. Translation in English (for Erasmus students from different countries that were students of Transilvania Univ of Brasov-G2) were done.

We submit the anonymous questionnaire to adults (>18 years old) using printed forms for, with exception for the group of Erasmus (G2) and group of Twirling (G4). For the group G2 we used an online questionnaire in English, because quickest way to reach all the Erasmus students in a short time more convenient to send through social networks (half being increasingly used by all young people) and at the same time also convenient for reprocessing data.

For each group we submit the questionnaire to people in order to have in the end 100 people/group. The exclusion criterion was for questionnaires that was not 100% completed. We considered in the study the questionnaires completed at least 80%.

The study was done respecting the Ethical rules for scientific studies: confidentiality of person and personal data, and the persons could refuse to fill the questionnaire at the beginning or during the time than they fill, without any problem.

3. Results and discussions

We compared the socio-demographic characteristics of the students involved in the study and the results are indicated in the Table 2.

Table 2. *Socio-demographic characteristics of involved students*

Socio-demographic characteristics		G1 – Romanian Students (%)	G2 - Erasmus students in UTBV (%)
Age	18-25 years	23%	57%
	26-40 years	42%	16%
	41-55 years	32%	13%
	>55 years	3%	14%
Gender	Female	82%	49%
	Male	18%	51%
Origin place	Rural	66%	38%
	Urban	32%	62%

Most of the Erasmus students come from Universities situated in different cities, while the faculty group is not easy to find a proper justification of such data.

After obtained socio-demographic profile of our groups, we just addressed the central question, concerning the topic of this test – possible definition of mycotoxins.

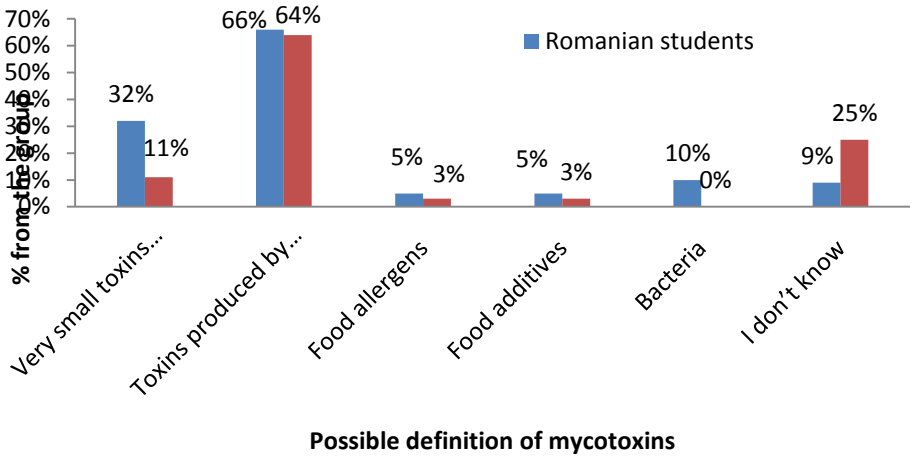

Fig.2. *Histogram showing the percentage from the groups related to the question about what people think that mycotoxins are*

The important fact is that all groups have the highest percentage in the response "Toxins produced by fungi / mushrooms", which is also the correct answer, as it appears on the definition in the Oxford Dictionary online of Mycotoxin: "Any toxic substance produced by a fungus" [20].

Probably many people have analyzed the etymology of the word "mycotoxin" and looked at the different options. In fact, as you can search on the net, the correct definition of "mycotoxin" is: "A mycotoxin (from Greek μύκης (mykes, mukos) "fungus" and τοξικόν (toxikon) "poison")is a toxic secondary metabolite produced by organisms of the fungi kingdom, commonly known as molds. The term 'mycotoxin' is usually reserved for the toxic chemical products produced by fungi that readily colonize crops.

One mold species may produce many different mycotoxins, and the same mycotoxin may be produced by several species" [21].

In addition to the previous question, the groups were asked where can be found mycotoxins and their answers are presented in Fig. 3.

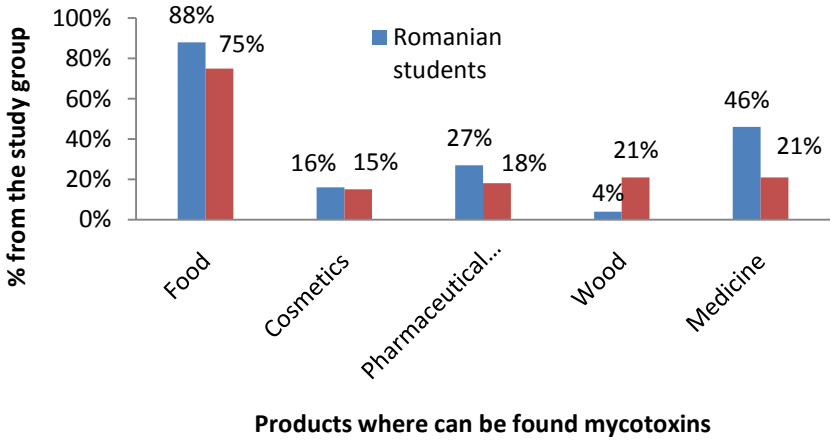

Fig.3. *Histogram showing the percentage from the groups related to the question about where the people think that mycotoxins can be found*

Both groups choosed the food as major sources of mycotoxins . For Group 1 there are also two other answers of secondary importance: 27% for the response "Pharmaceutical products" and 46% for "Medicine".

Indeed, as reported in a study performed by Wiemann and Keller [16] fungi are used to produce a multitude of natural products and also to provide beneficial antibiotics and immune suppressants by the pharmaceutical industry with efficient drugs.

However, identification of trace amounts of known mycotoxins in food and feed samples is of major importance to ensure consumer health and safety.

Table 3. *Students answers regarding their knowledge about the way mycotoxins can affect them*

		G1 – Romanian Students (%)	**G2 - Erasmus students in UTBV (%)**
Mycotoxins can affect	Plants	37%	28%
	Animals	54%	57%
	People	95%	80%

	They are not dangerous	2%	3%
Mycotoxins can appear	During plant development	16%	28%
	During products storage	48%	45%
	During the process of obtaining food	35%	29%
	After being consumed by humans or animals	9%	14%
	I don't know	16%	24%
Mycotoxins can enter into the body	While eating	89%	81%
	While breathing	20%	23%
	Through direct contact to the skin	11%	25%
	By blood	7%	13%

Scientific studies [13, 9, 17] and FAO (Food and Agriculture Organization of the United Nations) regulations concerning mycotoxins and food supply indicated that it is possible to find ways fpr the prevention of aflatoxin at the preharvest stage and the detoxification of aflatoxins.

All groups have a very high percentage for the response "While eating", always taking into account that, in fact, for almost all of the previous questions, many answers related to the food. It can be noticed the percentage of G2 (25%) for the response "through direct contact to the skin", probably because some people have thought of the fungal spores or directly to contact the fungi themselves.

In fact, there are studies [14] that reported that the mycotoxins patulin, gliotoxin and sterigmatocystin can be produced by common indoor moulds and enter the human body via inhalation of mycotoxin containing spores and particulates. Even in the study of Abeunhosa and colab. it is stated that mycotoxins are toxic when digested or inhaled, so the answer "while breathing" is correct [1].

Other study indicated that exposure to mycotoxins is mostly by ingestion, but also occurs by the dermal and inhalation routes [15].

Then, also the answer "through direct contact to the skin" could be correct.

The possible presence of the mycotoxins in different food products was also a topic to be asked to our groups and the obtained data was indicated in Table 4.

Table 4. *Possible products where can be found mycotoxins*

Mycotoxins can be identified in the following products	**G1 – Romanian Students (%)**	**G2 - Erasmus students in UTBV (%)**
Chips	36%	13%
Carbonated brinks	19%	7%
Meat	49%	29%
Milk	52%	28%
Yogurt	41%	23%
Spices	40%	11%
Grain	46%	30%
Bread and bakery products	38%	32%
Dried fruit	17%	18%
Coffee	18%	14%
Nuts	20%	20%
Tea	19%	9%

Herbal supplements	23%	7%
Food cooked at high temperatures	13%	12%
I don't know	14%	37%

Contamination of different products is a subject of concern for different food regulators. EFSA (European Food Safety Authority), about "aflatoxins in food" [19], affirms that "aflatoxins can occur in groundnuts, treenuts, maize, rice, figs and other dried foods, spices and crude vegetable oils, and cocoa beans, as a result of fungal contamination before and after harvest. Aflatoxin M1 is a major metabolite of aflatoxin B1 in humans and animals, which may be present in milk from animals fed with aflatoxin B1 contaminated feed."

The groups indicated the products which they believe that contain the lowest amount of mycotoxins (Table 5.).

Table 5. *The type of products with possible low concentration of mycotoxins, according with our study groups*

Type of product with possible low concentration of mycotoxins	**G1 – Romanian Students (%)**	**G2 - Erasmus students in UTBV (%)**
Own garden products	55%	39%
Greenhouse products (under controlled conditions)	20%	37%
Products labeled as "Bio" (without fertilizers and fungicides)	48%	21%
Products grown without chemical fertilizers	24%	19%
Products purchased close to the date of validity	3%	10%
Goods purchased after the date of validity	5%	10%

Table 6. *Possible ways to distroy mycotoxins in food*

Possible ways to distroy mycotoxins in food	**G1 – Romanian Students (%)**	**G2 - Erasmus students in UTBV (%)**
Boiling	63%	37%
Frying	7%	7%
Cooking	11%	10%
Freezing	15%	11%
You can not destroy them	24%	48%

Arquino and colab. [3] reported that gamma radiation treatment can be used as an effective method for preventing fungal deterioration of medicinal plants subject to long-term storage, then, in general, it is best to replace the traditional methods with innovative methods that can give better results to block the activity of mycotoxins.

The following pie charts (Fig. 4. (a) and (b)) highlight where people, for each group, were aware about this topic of mycotoxins.

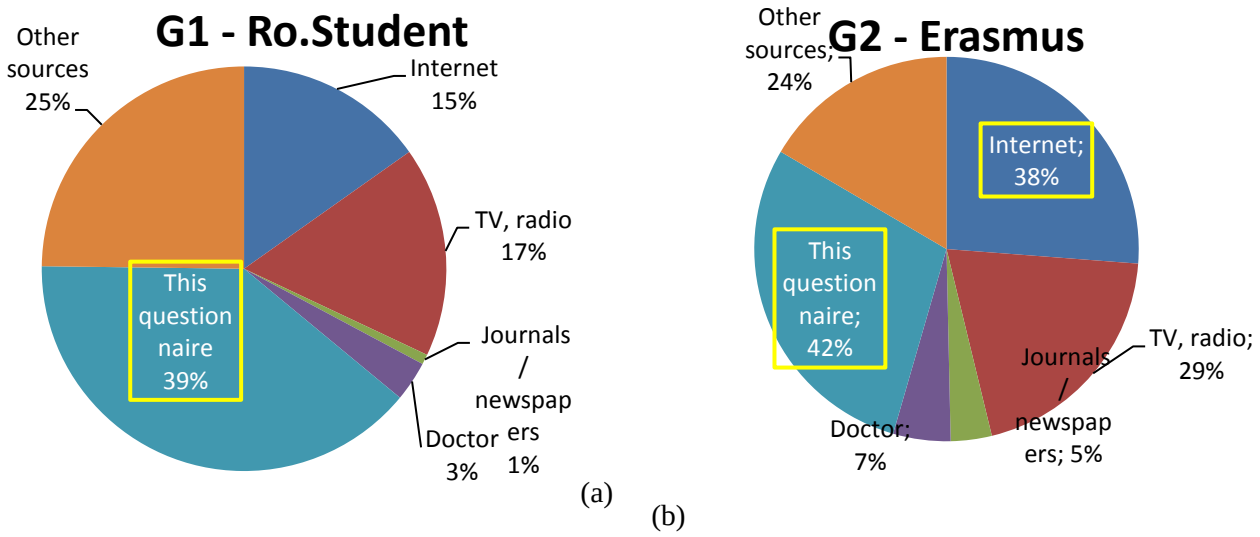

Fig.4. *Distribution of the answers of both students groups concerning the information sources for the topic of mycotoxins*

For both groups, most of the people were aware of this topic in "this questionnaire. For the Group G2, however, we have obtained two comparable options: "this questionnaire" (42%) and "Internet" (38%).

Conclusion

This results of this study indicated that young people have a limited information concerning the topic of mycotoxins which can cause health problems even now. It is very important to have food materials stored for consumption in well dried conditions and stored properly, in order to prevent the fungi development and mycotoxins appearance.

It is very important to have a good information of young consumers about the possible sources of mycotoxins in order to increase the quality of the products and also to diminish the diseases related to these contaminations. Manufacturers, consumers and researchers need to improve the processing methods for quality control of agri-food products.

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A REVIEW OF THE ANTIMICROBIAL ACTIVITY OF *THYMUS VULGARIS, MALALEUCA AND OCIMUM BASILICUM*

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Abstract: *The paper presents a review of antimicrobial activity of Thymus vulgaris, Maleleuca and Ocimum basilicum which is detailed in chapter 3. In the first part of the study the biological importance of plants was appreciated, the most common being the antioxidant, antimicrobial, antibacterial and antifungal activity. The most interesting being found in the case of Ocimum basilicum which is cytotoxic against common foodborne bacteria and essential oil exhibited most potent antiproliferative activity against an in vitro human colon carcinoma model. For the antimicrobial activity test, the two most common methods described in the last part of the article, Disk Diffusion Assay and Determination of Minimal Inhibitory Concentration (MIC) and Non-Inhibitory Concentration (NIC) have been described, the first method being the most used.*

Keywords: *antimicrobian activity, Malaleuca, Thymus vulgaris, Ocimum basilicum, review*

1. Introduction

The consumption of foods contaminated with some microorganisms represents a serious health risk to humans. The subsistence and growth of microorganisms in foods may lead to spoilage, formation of toxins and quality deterioration of food products [6,14]. In recent years, the essential oils and herbal extracts have attracted a great deal of scientific interest due to their potential as a source of natural antioxidants and biologically active compounds [5, 14, 24, 28]. The antimicrobial and antioxidant activities of essential oils have formed the basis of many applications, including fresh and processed food preservation, pharmaceuticals, alternative medicine and natural therapies [5,6,14].

2. Biological importance

Thymus vulgaris L. (fig. 1) is an aromatic plant of the Labiatae family. It is an essential oil which contains more than 60 ingredients, most of which possess important antioxidant and antimicrobial properties [2]. Oil of thyme, the essential oil of common thyme (Thymus vulgaris), contains 20–54% thymol [17]. Thymol, an antiseptic, is an active ingredient in various commercially produced mouthwashes [21].

Fig. 1. *Thymus vulgaris* [30]

In 2015 the article published in International Journal of Clinical Medicine says that thyme has been thought of to be antiseptic, antimicrobial, medication, astringent, medicinal drug, carminative, disinfectant, medicinal drug and tonic. Thyme is useful in cases of assorted intestinal infections and infestations, like hook worms, gram-positive and gram-negative bacterium. Thyme may also improve liver functioning, and act as an appetite stimulant. It is used in treatment of cartilaginous tube, bronchial and urinary infections. It is also helpful in treatment of laryngitis and inflammation [22].
About the *T. vulgaris* is also said that is a bronchial antispasmodic, an expectorant, and an antibacterial agent. In animal experiments, a spasmolytic effect was demonstrated for the flavone fraction and an expectorant effect on ciliary activity for the terpenes [18].

Melaleuca (fig. 2) is a genus of nearly 300 species of plants in the myrtle family, *Myrtaceae*, commonly known as paperbarks, honey-myrtles or tea-trees (although the last name is also applied to species of Leptospermum) [33]. Tea tree oil has broad-spectrum antimicrobial activity, and non-specific cell membrane damage is a major mechanism of antibacterial action [7].

Fig. 2. *Malaleuca (tea tree)* [32]

Clinical studies with tea tree oil products have shown efficacy for a number of superficial diseases including acne, oral candidiasis, tinea, onychomycosis and molluscum contagiosum [8, 16]. Another study showed that because of its strong antibacterial and excellent protective features exhibited in antioxidant activity tests, this essential oil and extracts from the herbal parts of *M. alternifolia* represent a potential natural source that can be used freely in food, agriculture, and pharmaceutical industries as a culinary herb [29].

Basil (*Ocimum basilicum* L.) a member of Lamiaceae is an aromatic, herbaceous, autogamous plant that is annual and perennial [4].

Fig. 3. *Ocimum basilicum* [33]

This plant is 20-60 cm long, white-purple flowering plant, and is originally native to India and other regions of Asia and also Africa, South America, and the Mediterranean but widely

cultivated in many countries [13, 15]. Different varieties of this plant have been recognized as a medicinal plant in folk medicine from ancient time [20]. Basil is used as cardiotonic, abdominal pain reliever, anti-diarrhoea medicine, hypolipidemic plant hypoglycemic agent, anti-inflammatory and anti-oxidant [1].

Some studies about *Ocimum* indicate that this aromatic and medicinal plant has been used traditionally in the treatment of headaches, coughs, constipation, warts, worms and kidney malfunctions [25, 27].

A medical study has shown that *Ocimum basilicum* is cytotoxic against common foodborne bacteria and essential oil exhibited most potet antiproliferative activity against an in vitro human colon carcinoma model [10].

3. Antimicrobial activity

3.1. Antimicrobial activity of Thymus vulgaris

Antimicrobial activity of the *Thymus vulgaris* essential oil is the most efficient because has inhibited all the tested bacterial and yeast strains both in the original and the half-diluted concentrations, as reported in Farmacia , 2015, Vol. 63 [26].

Table 1. *Effect of thyme essential oils on different bacterial and yeast strains Original concentrations (conc.) and 50% ethanolic dilutions (diluted) of the oils were tested* [26]

Volatile oils from different *Thymus* species		***Microorganism***					
		P. aeruginosa NCAIM B01053	*C. sakazakii* ATCC29544	*L. innocua* T1	*S. pyogenes* NAICAM *B.1998*	*C. albicans* HA201	*S. cerevisiae* BF
Thymus vulgaris	conc.	+++	++	+++	+++	+++	+++
	diluted	+++	++	+++	+++	+++	+++
Thymus serpyllum	conc.	+++	++	+++	+++	+++	+++
	diluted	+++	++	+++	+++	+++	+++
Thymus pulegioides	conc.	+++	++	+++	+++	+++	+++
	diluted	+++	-	+++	+++	-	++
Thymus glabrescens	conc.	+++	-	+++	+++	-	+++
	diluted	+++	-	+++	+++	-	-

+++ = complete inhibition; ++ = limited inhibition; - = no inhibition

Other researchers who compared the results of essential oils with that of standard drug, hexoral, it was concluded that oils are more potent anti-oral-pathogen activity and T. vulgaris oil also exhibited higher activity than ampicillin on *S. pyogenes* and *S. aureus*, showing significant antimicrobial activity [19].

3.2. Antimicrobial activity of Malaleuca

According to the research, *M. alternifolia* displayed significant antimicrobial activity against all microorganisms tested. The Gram-positive bacteria were more sensitive to the essential oil than Gram-negative bacteria and fungi. *E. coli* had the lowest MIC (2mg/ml) [29].

Another article concluded that *Melaleuca sp.* oil extracted in Brazil showed antimicrobial potential in vitro against the bacterial isolates obtained from lower limb wounds and also to the standard *S. aureus* strain (ATCC(r) 25923(tm)).

Table 2. *Effect of different concentration of basil essential oil (BEO) on Staphylococcus aureus in raw beef burger during refrigerated storage (4±1°C) for 12 days* [23]

Treatment	Days					
	0	1	3	6	9	12
Control	$1.5x10^3 \pm 48^a$	$1.2x10^3 \pm 57^a$	$1.7x10^3 \pm 57^a$	$< 100^a$	$< 100^a$	$< 100^a$
BEO 0.0625%	$1.5x10^3 \pm 48^a$	$1x10^2 \pm 1^a$	$< 100^b$	$< 100^a$	$< 100^a$	$< 100^a$
BEO 0.125%	$1.5x10^3 \pm 48^a$	$< 100^b$	$< 100^b$	$< 100^a$	$< 100^a$	$< 100^a$
BEO 0.25%	$1.5x10^3 \pm 48^a$	$< 100^b$	$< 100^b$	$< 100^a$	$< 100^a$	$< 100^a$

Identification of the microorganisms (*Staphylococcus aureus*) and the test for susceptibility to the antimicrobial agents were carried out by automation using the apparatus MicroScan(r) auto SCAN-4 System (Siemens, Germany) with the use of the com Pos Combo Type 41 panel (Siemens, Germany), and seeding was carried out using various slopes as the stock cultures [9].

3.3. Antimicrobial activity of Ocimum basilicum

It turned out that the number of bacteria showed a decrease in the count of *S. aureus* in all of the Ocimum basilicum essential oil concentrations which means it has a strong antimicrobial activity- table 2 [23].

On the other hand, in another study the essential oils from 12 tested basil cultivars showed better antifungal than antibacterial activity [3].

4. Methods

For testing the antimicrobial activity of plant oils have been used in research two most common methods: Disk Diffusion Assay and Determination of Minimum Inhibitory Concentration (MIC) and Non-Inhibitory Concentration (NIC).

4.1. Disk Diffusion Assay

The disc-diffusion assay (fig. 4) was used to determine the antimicrobial activity of the extracts. Each microorganism was suspended in Mueller-Hinton (MH) broth and diluted approximately to 10E6 colony forming unit (cfu)/mL.

They were "flood-inoculated" into the surface of MH agar and MH Dextroxe Agar (MDA) and then dried. Six-millimeter diameter wells were cut from the agar using a sterile cork-borer and a part of each extract were delivered into the wells.

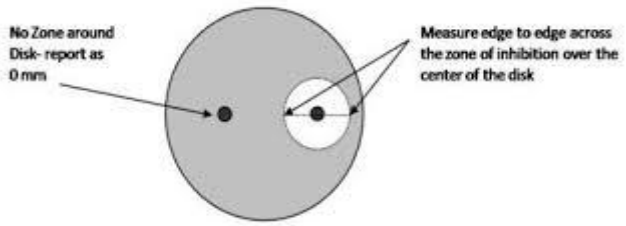

Fig. 4- *Disk Diffusion Test* [30]

The plates were incubated and the diameters of the growth inhibition zones were measured after 24 h. Clear halos greater than 10 mm were considered as positive results [26, 27, 29].

4.2. Determination of Minimum Inhibitory Concentration (MIC) and Non-Inhibitory Concentration (NIC)

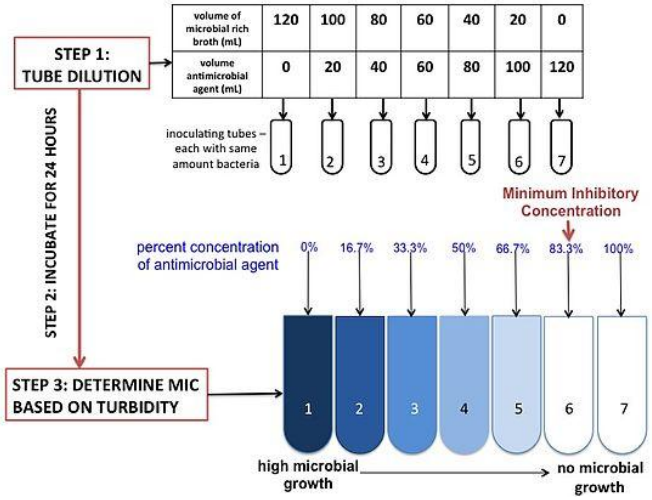

Fig. 5- *Determination of Minimum Inhibitory Concentration* [31]

Determination of MIC and NIC (fig. 5) values was carried out by bacterial growth in BHI broth (LABM) was monitored through changes in optical density of bacterial suspensions in the presence of multiple concentrations of essential oils. The effect on the growth, measured by the optical density method, is manifested by a reduction in the area under the OD/time or curve relative to control well at any specified time [10, 29].

5. Conclusions

In conclusion, *Thymus vulgaris* is a good anti-inflammatory, antibacterial, expectorant and helps in the treatment of bronchial and urinary infections in detriment of Tea tree (*Malaleuca)* which only shows antioxidant, antimicrobial and anticaterial activity. *Ocimum basilicum* is cardiotonic, hypolipidemic and hypoglycemic agent,antiproliferativ and antifungal.

The extracts from the three plants act differently for different bacterial and yeast strains, for example*: P. aeruginosa, C. sakazakii, L. innocua, pyogenes, C. albicans, S. cerevisiae, S. pyogenes, S. aureus, E. coli, S. typhimurium, L. monocytogenes, A. niger, A. versicolor*. The most widely used method for determining the antimicrobial activity of plant extracts is disk diffusion assay.

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Honor to Professor Simion POPESCU - on the occasion of his 80th anniversary

He was born on 15 August 1938 in Sipot, Gorj, and he worked for many years in Brasov in the field of engineering sciences at Transilvania University, at the Faculty of Mechanics, and later at the Faculty of Food and Tourism.

Now is a moment of great significance for the university education in Braşov and a time of congratulation for our highly esteemed Teacher who reached the octogar . A man's life are not the years he lived, but his content of deeds, achievements, generosity to those around him, and their appreciation.

Specialist in mechanical engineering / agricultural machinery, together with the talent of university professor, scientific consultant, all these have been generously given to many generations of students and master students, as well as to numerous doctoral candidates (over 40 doctors in engineering sciences). T
he enormous energy and abilities are the qualities that predetermined the training of young specialists, contributed to the mobilization and consolidation of the didactic and scientific teams, which he honored many years, being head of department and then vice-rector of the Transylvania University in Brasov.

On the occasion of the 80th birthday, we want God to give you many years before, to give you heavenly energy and goodness and to have good health with your family.

Happy Birthday!