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Sustainable Harvesting of Medicinal and Aromatic Plants in Hungary

Nóra KULCSÁR

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Nóra KULCSÁR

CENTRAL EUROPEAN UNIVERSITY

ABSTRACT OF THESIS submitted by: Nóra KULCSÁR

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Hungary is a Central European country that is rich in medicinal and aromatic wild plant species; in rural livelihoods, the collection, use, process, and trade of these plants are traditionally important contributors. However, due to unsustainable trade practices and several recent changes in the sector, the natural ecosystems, biodiversity, and collectors - who usually belong to poorer social groups – are affected negatively.

The thesis aims to introduce the Hungarian herbal sector from a holistic perspective, including its economic, environmental, and human dimensions, with a particular focus on sustainability. In this context, the purpose of the paper is to discover this field in its complexity and present it in detail from both theoretical and practical aspects. Another objective is to collect the best practices and feasible solutions from the field in connection with promoting a harmonious, as well as economically prosperous relationship between nature and local people. This integrated approach helps to show the industry's strengths and advantages, as well as its weaknesses and difficulties. Based on the findings, the thesis attempts also to propose some recommendations for the future.

Keywords: medicinal and aromatic plants, sustainable wild-collection, Hungarian herbal industry, Central Europe, traditional ecological knowledge, herb cultivation, ethnobotany

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List of Abbreviations

AHPA	American Herbal Products Association
CBD	Convention on Biological Biodiversity
CITES	Convention on Trade in Endangered Species of Wild Fauna and Flora
EC	European Commission
ECPGR	European Cooperative Programme for Crop Genetic Resources Networks
EU	European Union
GACP	Good Agricultural and Collection Practices
HAPC	Herbal Association and Product Council in Hungary
HUF	Hungarian Forint
IK	Indigenous Knowledge
IUCN	International Union for Conservation of Nature
MAP	Medicinal and Aromatic Plant
MPSG	Medicinal Plant Specialist Group of IUCN
NGO	Non-Governmental Organization
TEK	Traditional Ecological Knowledge
TK	Traditional Knowledge
TMF	Traditional Medicinals Foundation
UN	United Nations
WCED	World Commission on Environment and Development
WHO	World Health Organization
WWF	World Wildlife Fund

1 Introduction

Humans have collected plants, including herbs, spices, fibres, edible nuts, or mushrooms to cover their needs since ancient times. Even nowadays, for several purposes the livelihoods of millions of people, mainly from the developing world, are linked to gathered wild plants. Among them, medicinal and aromatic plants (MAP) are significant factors, since they are used as traditional medicines in many cultures, as well as they are valuable commodities in diverse markets. Due to this broad range of uses, in this thesis the term „MAP" is described to comprise plants not only in a strict medicinal sense, but also reflecting to materials of border areas, like food and cosmetics. (Schippmann et al., 2002).

MAPs are worldwide precious ingredients of modern drugs. According to Chen et al., more than 1300 herbs are used in Europe for medicinal purposes, and 90 % of them are collected from the wild. Around 80 % of the population of the Global South are relied on MAPs at first place for their healthcare[1], while more than 25 % of commended medicines in the Global North are extracted from wild herbs. Based on the estimation of the International Union for Conservation of Nature (IUCN) and World Wildlife Fund (WWF), humans use globally 50.000-80.000 flowering plant breeds for healing, from which „15.000 species are threatened with extinction from overharvesting and habitat destruction, and 20 % of their wild resources have already been nearly exhausted" in connection with the growing numbers of people in the planet. Evidently not every medicinal and aromatic plant is subject to such loss, numerous circumstances and characteristics can trigger a risk, for example „habitat specificity, distribution range, population size, growth rate, reproduction system." (Chen et al., 2016).

[1] In the developing world, people from all socio-economic classes, but mainly rural and urban poor persons use MAPs due to cultural motivation, productiveness, reduced prices, and weak health care systems. (Shanley and Luz, 2003).

Nowadays, the main drivers that hasten biodiversity loss and the usage of wild plants are „climate change, overharvesting, changes in land-use, more intensive agriculture, socio-economic changes, expansion of markets, and disappearance of local knowledge." (Pawera et al., 2020). On the other hand, there is great intention to establish sustainable societies globally. (Takeuchi, 2010).

Hungary is a Central European country that is rich in medicinal and aromatic wild plant species. Moreover, in rural livelihoods, the collection, use, process, and trade of these plants are important contributors. However, due to commercial over-exploitation and unsustainable trade practices, wild plant populations are declining, some of them are threatened with extinction in the wild. These phenomena negatively affect the natural ecosystems, biodiversity, and collectors who usually belong to poorer social groups. (Schindler et al., 2022).

The Hungarian herbal industry overall (which has undergone major changes since the collapse of the Soviet regime in 1990) is a more complex and specific professional field than the average, compared to other sectors of the horticulture industry, and depends greatly on the collection and cultivation of raw materials. In addition, medicinal plants are used broadly, for instance in the pharmaceutical, food, cosmetic and chemical industries. In Hungary, the ratio of collected to cultivated medicinal plants is almost half. However, collection is still has been steadily declining, and the amount of cultivated material was much higher some decades ago. (Nagy, 2020).

Based on this undeniable complexity of the herbal sector, the thesis aims to touch upon the environmental, economic, and social aspects of this field, with a view to one of today's most significant issue, literally the matter of sustainable development. The quintessence of this paper is to look at the Hungarian herbal sector as a whole, for the following reasons.

Brundtland Report, or usually cited as *Our Common Future*, was introduced in 1987 by the World Commission on Environment and Development (WCED), with the support of the United Nations (UN). (Jarvie, 2016).

The Report gives a broad definition to the expression „sustainable development" and stipulates that it means a „development which meets the needs of current generations without compromising the ability of future generations to meet their own needs." (WCED, 1987).

Beyond bringing out the idea of sustainable development, the publication also develops policy solutions about how this concept could be realized. The WCED examined the causes of environmental degradation, as well as made effort to highlight the relation „between social equity, economic growth, and environmental problems." (Jarvie, 2016).

Schippmann et al. also articulate the so-called „ecosystem approach" that name people and their cultural variety as main parts of ecosystems. According to the authors, the core of sustainable development is determined by the liaison between humans and the ecosystem where they live. It also means that their „well-being need to be assessed together; and a society is thought to be sustainable when both the human and ecosystem conditions are satisfactory or improving." (Schippmann et al., 2002).

Holmes underlines similarly that „issues of relationship between protected areas and local communities are of vital importance to biodiversity conservation". (Holmes, 2013).

World demand for medicinal plants and their products is growing at almost 5-7% per year. (HAPC, 2020.) According to an international report, Germany alone imported MAPs valued at 250 million US dollars in 2015. (Jenkins et al., 2018). At the same time, the supply for MAPs is definite and continuously decreasing. Slow growth of many plant species, or harmful collection methods can lead to full exploitation or even disappearance of plant

populations. Therefore, using them based on sustainable principles[2] and applying good harvesting practices may be persuasive options. Besides sustainable harvesting processes, the conservation of MAPs becomes increasingly significant. In this context, multiple solutions have been worked out concerning the conservation of herbs, for example maintaining *in-situ* and *ex-situ* conservation or forming natural reserves, wild nurseries, seed banks, and botanic gardens. (Chen et al., 2016).

This idea appears also among the pragmatic thoughts of Anthony B. CUNNINGHAM (who is one of today's eminent ethnobotanists with decades of experience in nature conservation). He believes that people certainly disturb the ecosystem structure, but instead of considering this influence as an undesired and outrageous intervention, only proper tools are needed to manage the environment. To find the best sustainable practices, he encourages relying on local communities' traditions and routines. He believes that successful biodiversity conservation should include local people too, whose livelihood is strongly linked to the sustainable use of ecosystems and natural resources. (Cunningham, 2001).

According to Gadgil et al., „the view of humans as a part of the natural world and a belief system stressing respect for the rest of the natural world" is a significant feature when talking about developing a sustainable relationship between nature and humans. (Gadgil et al., 1993). In another article, Berkes et al. highlight that „managing for sustainability requires an understanding of the system in all its complexity." People living in strong contact with nature are constantly striving to use natural resources moderately and preserve them for the future. Through their traditional practices they also indirectly contribute to strengthening the

[2] Following the perspective of FAO, the 3 main scopes of sustainability are „environmental friendliness, economic viability, and social equity". (Vantomme and Walter, 2003).

biodiversity around them. The functioning of these communities can therefore serve as a good example of what sustainability is. (Berkes et al., 1995).

Referring to the above-mentioned, more attention should be paid to historical features of the past. Especially because currently, there is no sufficiently available information concerning the traditional relationship between people and the environment. Historical data can help to recognize landscape dynamics or to structure the steps of future environmental management. Even though traditional ecological knowledge declines mainly due to urbanization, it can still be detected in the Central European region. This ancient, accumulated knowledge, combined with today's scientific knowledge, could be used for conservation issues, especially at the local level. Moreover, a holistic approach can provide an opportunity to gain relevant knowledge and information in the fields of ethnobotany and ethnoecology, all of which are closely linked to present and past changes in the landscapes. This could be key to better understanding the adaptation capacity and thus the survival of modern human societies. (Molnár et al., 2008).

Hartel et al. reach a similar conclusion in their case study conducted in neighboring Romania. According to their findings, traditional rural socio-ecological systems have numerous characteristics that are essential in connection with the question of sustainable development. Although many conventional and cultural landscapes can be found today in eastern and central European states, these areas face both internal and external challenges. But by discovering how they work, adaptation to future changes is more achievable. (Hartel et al., 2016).

In Hungary, the spectrum of wild medicinal and aromatic plants that can be collected is quite broad, which is a domestic specificity that could be a competitive advantage over many other countries where fewer species can be collected in industrial quantities due to climatic, geographical, biodiversity or other factors. (HAPC, 2020).

In addition to the dynamic development and growing trends, compliance with increasingly stringent international regulatory requirements is a constant challenge for the sector. At the same time, legal and economic uncertainty, constantly declining public funding, and a lack of sufficient and skilled labor are the main problems. (HAPC, 2020).

The people involved in the collection of medicinal plants in our country today are mainly from the low-educated social strata and the unemployed population of underdeveloped regions. The professional collection of medicinal plants in a controlled environment could help to increase the population retention capacity of the most deprived areas and alleviate unemployment and social tensions in these regions. (HAPC, 2020).

The complexity of the herbal sector is therefore apparent. Often, neither the legislation nor the practice based on it can deal with the specificities of this peripheral industry rationally and appropriately, as various disciplines are interlinked, and different professionals approach the sub-sectors and the matters from their own perspectives.

Moreover, the sustainable collection of medicinal and aromatic plants is quite a problematic issue to explore and implement. (HAPC, 2020).

1.1 Research aims and objectives

The original idea of the thesis is stemming from the concept of the harmonious relationship between nature and humans, for which sustainable wild plant harvesting could be a good example, considering the socio-economic context of the topic. On this basis, the main aim of the thesis is to present in detail the Hungarian herbal industry from a holistic approach. Besides, the paper attempts to detect through practical observations if sustainable harvesting of wild medicinal and aromatic plants can provide conservation, social, and even economic benefits at the same time. (Jenkins et al., 2018).

The *main objectives* of the paper are:

- To discover the Hungarian herbal sector thoroughly, with regard to its historical features, legal framework, geographical specificities.
- To describe wild plant collection practices; the medicinal and aromatic plant species occurring in the country; collectors and the importance of traditional knowledge in this field; sustainable harvesting methods, and good agricultural and collection practices.
- To introduce three Hungarian herb companies that are engaged in sustainability.
- To analyse projects aimed at elaborating practices that can be beneficial to local economies and residents in rural areas as well as serve nature conservation purposes at once.
- To propose recommendations based on the findings.

1.2 Research questions

To achieve the research aims as fully as possible, several additional questions shall be answered, such as:

- What are the characteristics of the Hungarian herbal medicine industry today? What are the main positive aspects and what are the difficulties? Has the number of wild MAP species decreased in recent years?
- Is there, and if so, what is the role of traditional knowledge in the herbal sector? Could it assist in addressing the environmental problems of our time?
- Is it feasible to protect nature and local people and enhance the economy at the same time? Are there any good examples? Can local people be kept motivated to apply sustainable practices?
- What should be changed regarding the Hungarian herbal sector to make it a more prosperous field?

1.3 Outline of the thesis

The thesis takes an integrated approach, on one hand by collecting and analyzing a range of scientific theoretical knowledge, and on the other hand by presenting practical examples.

The paper is divided into five main chapters.

The *Introduction* aims to draw an overall picture of the thesis, including its leading idea and additional research questions. Those features, thoughts, and phenomena are also presented that are important to consider and understand for the thesis as a whole.

In the *Methodology* chapter tools and methods are introduced to show the research design. Following a holistic aspect, a broad literature review and interviews combined with field trips took place to discover the topic from many points of view. Those features are described as well, which, although they were originally planned, were ultimately not included in the study.

The *Literature review* attempts to provide a broad variety of sources that help to understand the topic in detail and to gather all the information and data that are needed due to the complexity of the subject.

The main goal of the *Results and Discussions* chapter is to collect the best practices and feasible solutions from the field in connection with promoting a sustainable, as well as economically prosperous relationship between nature and local people. Therefore, in this part, three Hungarian herbal companies are presented, following which two projects are analyzed that were funded by the European Union and realized in a transnational framework.

In the part of *Conclusions and Recommendations*, key findings are summarized in the context of the research, as well as suggestions are proposed concerning the future of the herbal sector.

2 Methodology

The thesis aims to outline the current situation of the Hungarian herbal industry from a sustainable point of view and attempts to collect the best practices and feasible solutions from the field in connection with promoting a harmonious, as well as economically prosperous relationship between nature and local people.

The main purpose of this chapter is to outline how the study was designed to fulfill the research aims and answer the research questions in their entirety.

Those tools were selected that are relevant and suitable for explicating many perspectives. To achieve a complex and balanced analysis through a holistic approach, various methods were needed to explore the subject from as many angles as possible.

Therefore, qualitative research methods were chosen for several reasons.

First, this kind of approach is known to be flexible and open and promoted to detect „reasons for observed patterns, especially the invisible or surprising ones." (Busetto et al., 2020).

Secondly, qualitative methods are suitable for drawing a detailed picture of complex issues and echoing those actors' words indeed who just seldom speak about their views. Moreover, this approach can describe various participants from diverse fields in the meantime, as well as evolve and examine hypotheses and theories. (Sofaer, 1999).

Credibility assessment was performed throughout the writing process to recognize the accuracy of the accessible information.

Concerning the above-mentioned, the following predominant tools were selected to complete the research: in-depth document study, interviews with experts, field trips, and analysis of case studies.

2.1 Broad literature review

At first, an in-depth literature review was carried out. Due to the complexity of the subject, diverse sources were used to obtain all the necessary information and data from authentic sources.

Several online searches took place in relevance both to Hungarian and international written materials based on terms and keyword combinations, such as medicinal and aromatic plants; sustainable medicinal plant harvesting; trade in medicinal and aromatic plants; herbal sector; ethnobotany; healing with herbs; wild plant collection; cultivation of herbs; the socio-economic context of wild plant collection; wild plant harvesters; traditional ecological knowledge; conservation areas and local communities; etc.

First of all, the content of the CEU library was thoroughly browsed. Then, as a supplement, other *web engines* were investigated, like ScienceDirect, Google Scholar, researchgate.net, and PubMed. As a result of this extensive research, many scientific articles were found.

As the research broadened over time, due to the snowball effect, additional valuable literature was obtained, including both academic articles and pieces of grey literature, for example, newspapers.

Besides, explorations were carried out thematically on the *websites of governments and professional organizations* that are closely related to the thesis topic, including IUCN, WWF, TRAFFIC International, FAO, WHO, American Botanical Council, and Sustainable Herbs Program, as well as the site of the Hungarian Herbal Association and Product Council. In this case, the purpose was not only to seek professional texts but also case studies and travelogues. This practical approach was also needed to gather data on the sector's actual situation.

Since the topic's basic idea is closely related to the fields of ethnoecology and ethnobotany, numerous articles were gathered from prominent representatives of the disciplines, to get an insight and learn more about these issues. Although not all pieces of the document study were subsequently used for the thesis itself, they have contributed greatly to gain solid background knowledge.

As the thesis contains an overview of the *relevant legislation at international, European, and national levels*, each legal instrument has been checked in online collections of legislation to ensure that up-to-date and accurate information is described.

Beyond the literature in digital form, some *Hungarian and foreign textbooks* were borrowed as well from libraries. These books contributed to a better understanding of the fields of ethnobotany, ethnoecology, and the whole Hungarian herbal sector from various aspects.

As a result of the careful collection of existing data, the sources were narrowed down, and only those written materials were kept that were directly linked to the thesis topic. The gathered texts were then compared, combined, and finally analyzed. (QuestionPro, 2022).

During the writing process, a *list* of Hungarian medicinal and aromatic plants was continuously expanded and prepared, including the names of the plant species in Hungarian, English, and Latin.

Although *podcasts* are considered a relatively new form of sources, they can play a significant role in thesis writing. Digitalization is gaining ground, which can have many benefits, including access to virtual conferences, discussions, or debates. Through the thesis writing process those podcasts were listened to that had an important connection to the topic of the essay or the personalities of the interlocutors, and evidently, the information given was considered reliable. Thus, their main advantage was that the information they provided enriched knowledge on the subject and opened new perspectives.

Moreover, to give a practical example, after watching a virtual launch of a newly released handbook, the contact information of the experts involved was made available to the audience, allowing them to get in touch with the professionals afterward.

2.2 In-depths interviews combined with field trips

The Hungarian herbal sector is relatively small, dominated greatly by a few bigger companies. However, the main aim of this paper is to explore phenomena related to sustainability. Consequently, only those herbal firms were selected for the study which maintain sustainable practices during the production and still proceed with plant collection from the wild. An additional aspect was that the firms should operate in geographically different locations within the country.

Taking these criteria into account, finally, three herbal companies, and the Hungarian Herbal Association and Product Council (HAPC) were pre-selected for interview purposes.

The next table presents the relevant information regarding the interviews.

INTERVIEWS			
Nr.	**Name of interviewee**	**Position and organization with location**	**Date of interview**
1.	Balázs NAGY	sales manager, Nagy Mihály Medicinal Plant Ltd. (Cserhátsurány, Hungary)	02. May 2022 (in person)
2.	Sára KINDLOVITS Ph.D.	secretary, Hungarian Herbal Association and Product Council (Budapest, Hungary)	17. May 2022 (in person)
3.	József SCHMIDT	owner, Schmidt and CO. Ltd. (Baksa, Hungary)	20. May 2022 (in person)
4.	Nándor TEMESI	agronomist, Schmidt and CO. Ltd. (Baksa, Hungary)	20. May 2022 (in person)
5.	Zsuzsanna LOPES-SZABÓ	executive manager, Györgytea Ltd. (Bükkszentkereszt, Hungary)	28. May 2022 (via telephone)

***Table 1**: List of conducted interviews. Table format: own elaboration.*

All three firms have been running as family companies for decades, employing a considerable working apparatus, including mostly local labor.

After choosing them, the owners were contacted one by one by telephone or email to learn about the thesis topic and discuss the details of a future interview. All the representatives, who were reached out, accepted the invitation.

Regarding HAPC, it was essential to detect their attitude towards the sector, their priorities, experiences, and plans. Since they have good working contacts with most of the actors operating in the field, useful guidelines for further input were obtained from them.

Before the interviews, each interviewee was given a document named „form of consent", which allowed them to decide exactly on what points they would agree to participate in the research, and to what extent they would give their approval. All participants agreed to be part of the study, the speech being audio-recorded, photos being taken on the scenes, and their names and companies/organizations being mentioned in the thesis.

Similarly, a detailed email was sent to all interviewees to let them know exactly who the researcher is, what the study is about, and what topics shall be discussed, including the main questions.

The goal of the conversations was composite.

From one side, detecting the interviewees' subjective beliefs, motivations, and mission was emphasized. On the other side, to explore the manufacturers' apparatus and structure of operating, including technical pieces of machinery, drying facilities, working process, personnel, etc. Considering this, *semi-structured interviews* were organized, because they are „characterized by open-ended questions and the use of an interview guide in which the broad areas of interest, sometimes including sub-questions, are defined".

The previously determined questions were based upon the companies' specialties, which were investigated beforehand from the literature or their websites. Some questions were asked to all the interviewees. Qualitative interviews proved to be a good choice in the end, because they provided an opportunity for interactions, and for matters to appear spontaneously. (Busetto et al., 2020.)

Another important aspect was to carry out **field trips** in parallel with the interviews since these visits guarantee first-hand experience and provide an opportunity to get an overall picture of the business. Accordingly, interviews nr. 1., 3., and 4. happened at the same time as the field trips. Interview nr. 5. was carried out by phone because the interviewee was abroad at the time of the interview. However, at a later date, on the 3rd of July, the site of Györgytea Ltd. was inspected indeed in the village of Bükkszentkereszt, during which the herb garden was visited and a half-day herbal tour in the Bükk mountain was realized too.

Due to the special circumstances of the HAPC, interview nr. 2. with the Association's secretary took place in a public area of Budapest.

During the interviews, an audio recorder was used by the interviewer which allowed to sustain the flow of the conversation and save time in the meantime, as only the most essential things were noted down. Similarly, photos were taken on the scenes. Summaries of the interviews were made from the recordings later.

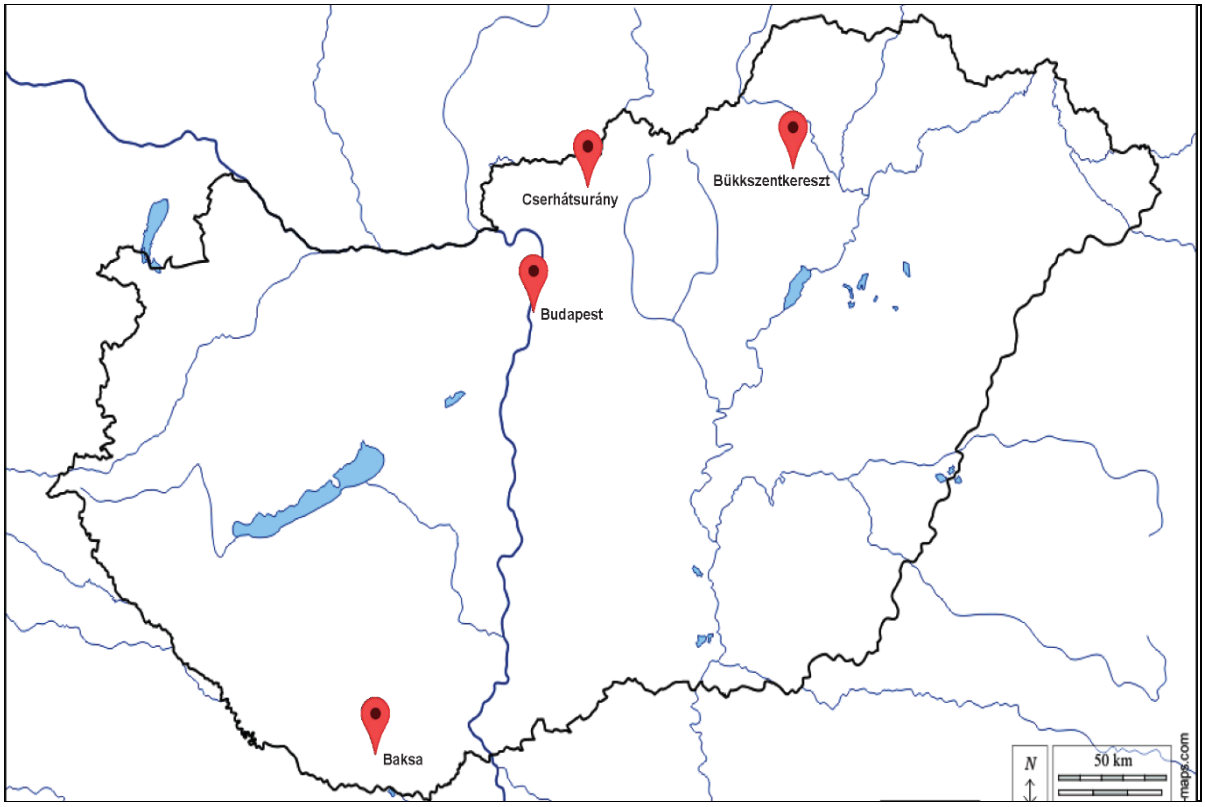

***Figure 1**: Locations of the conducted interviews. Source of map: d-maps.com; own elaboration.*

Another important aspect during the writing phase was to ensure that questions stemming from the content, requiring scientific, credible, and up-to-date information were also answered. Therefore, *personal communications* took place indeed with experts, via email or telephone. Those persons were contacted who have an outstanding academic and/or scientific record in their field and are believed to have the right answers to the matters raised.

PERSONAL COMMUNICATIONS			
Nr.	**Name**	**Position and organization**	**Date of contact**
1.	Danna J. LEAMAN Ph.D.	conservation biologist/ethnobotanist, co-chair of the IUCN Medicinal Plant Specialist Group[3], founding member of the Board of Trustees of the FairWild Foundation	27. May 2022 (via email)
2.	Elise HERAL	programme officer, Sustainable Trade – Europe at TRAFFIC International	13. July 2022 (via email)
3.	Zsolt MOLNÁR Ph.D.	botanist/ethnoecologist at the Centre for Ecological Research in Hungary, head of research group on Traditional Ecological Knowledge	19. July (via telephone)

***Table 2**: List of personal communications. Table format: own elaboration.*

2.3 Case study research

Using case studies, as a method of the qualitative research has become a worthwhile tool in recent times, principally in the field of social sciences. At first glance it may seem a problematic tool to maintain, however it is a good instrument to apply since it allows to give the researcher a comprehensive perception and interpretation of the gathered data. (Omniconvert, 2022).

Through case study approach it is feasible to gain an in-depth insight of a complex topic in its reality. The resolution on how to choose the right cases for the research was connected mainly to the unlike character of the topic. The profound understanding of multiple case studies helped the researcher to see how a project works in real life context. (Crowe et al., 2011).

[3] The IUCN SSC Medicinal Plant Specialist Group (MPSG) „is a global network of specialists contributing within their own institutions and in their own regions, as well as world-wide, to the conservation and sustainable use of medicinal plants. The MPSG was established in 1994 to increase global awareness of conservation threats to medicinal plants, and to promote sustainable use and conservation action." (WildCheck Report, 2022).

Closely related to the topic of the thesis, the practice of some international organizations (TRAFFIC, IUCN) seemed to be of particular importance, namely their projects implemented in central and eastern Europe, with the aim of supporting the local economy, the employment opportunities of its inhabitants, and the preservation of its natural assets, including the MAPs of the area. Therefore, these projects have been analyzed in the *Results and Discussion part* of the thesis.

Similarly, from the side of the Hungarian government, a so-called public works program was also carried out in recent years, which had a part related to this field, but it has not become as significant as the work of international NGOs, therefore in the end this type was not considered for the thesis.

By interpreting case studies in the essay, missions, career paths and internal functioning have been explored that all helped to see clearer what efforts are behind when dealing with matters connected to effective cooperation and partnership between nature and humans. (Sustainable Herbs Program by the American Botanical Council, 2022).

2.4 Limitations

2.4.1 Time limit

Another interview combined with fieldtrip was originally programmed, namely in the Great Hungarian Plain to examine the cultivation and collection of *Matricaria chamomilla* which has long been a typical and dominant medicinal plant of the area.

However, due to the short time available to complete the thesis, this visit was no longer feasible to schedule. And although this region has not been explicitly investigated in this paper, the other interviews, and different kind of sources available provide reassuringly sufficient data to outline the characteristics of that area indeed and to answer the research questions.

2.4.2 Group discussions with collectors

In addition to the individual interviews, it was originally planned to conduct group interviews with local people, mostly of Roma origin, who participate in the wild collection of MAPs. This would have been significant because the thesis was also initially going to devote a larger chapter to the examination of the disadvantaged social situation of Roma collectors. However, as the research progressed, it became increasingly apparent that only the closely related findings would be explored and discussed to frame the topic. The identity of the collectors remains important which means that the issue still emerges broadly in the paper. However, a more in-depth examination of the matter would have required more time and bigger volume that was not feasible for the moment due to the length of the thesis, the limited time frame, and the occurring technical difficulties in organizing the group discussions.

3 Literature review

3.1 Historical overview

Hungary has a long tradition of herb production. The first written records are found in books dating from the Middle Ages.[4] At that time monks arrived from the Mediterranean regions, such as Italy, and France and settled down in Hungary. They introduced several medicinal and aromatic plants, mainly members from the *Lamiaceae* family that were naturalized in the Carpathian basin at that time. In these early years, herb production was carried out just on a small, family scale. (Bernáth and Németh, 2002.)

Both collection and cultivation became intensive at the beginning of the 20th century. Overall, the sector of MAPs was considered a prosperous part of the country's economy. To provide an example, *Chamomillae flos, Basilici herba* and *folium* were in high demand in the market and have become known as valued „Hungaricum products". (Bernáth and Németh, 2002.)

In the middle of the 1920s oil distillation started to flourish indeed. Gyula BITTERA - a renowned herbalist of his time - planted the first lavender plantation in Hungary, using propagating material brought directly from France. Until then, lavender was known in the country only from medieval monastery gardens. This was the first large-scale planting of lavender for industrial purposes. He rented a plot of land from the Abbey of Tihany and tried lavender cultivation on it, following the French example. The success of his endeavor is proven

[4] Besides the books written by monks of the monasteries, there is another emblematic piece written by Peter Melius in 1579, under the title *Herbarium, On the names, natures, and uses of trees and herbs.*
The book contains descriptions of 275 plant species and lists the names of 1236 plant species. This was the first book about herbs in the Hungarian language. (Babulka, 2005.)
The essence of the book is still in use in herbal circles, especially in connection with developing herb recipes.

by the fact that the lavender harvested in Tihany had a higher essential oil content than the French lavender at that time. This is due to the special peninsular nature of Tihany, which is one of the richest places in Hungary in terms of the number of hours of sunshine, while the opposite is true of the amount of rainfall. This semi-Mediterranean climate, the southern exposure and the volcanic bedrock provide excellent conditions for lavender.

Besides the success of the lavender oil distillation, that produced 400-600 kg aromatic oil annually, other plants' oils also indicate a boom in the domestic industry. For instance, the oil production of *Mentha piperita* had reached 8500 kg by 1941. (Bernáth et al., 2000.)

Hungary had therefore a leading, large-scale production in MAPs in the first half of the 20th century and could maintain its important role until the late 1990s. After the regime change and the separation from the Soviet Union, the field of MAP business had to face not only political and economic changes, but also challenges. The circumstances of the production were altered, because the natural plant supply diminished, while the number of protected and endangered species increased. Privatisation of forests and meadows resulted in the reduction of number of areas used for wild harvesting. Moreover, new purchasing and wholesale firms started to operate, as well as specialized retail dealers rose after the downfall of the state monopoly. Several companies were granted permission for MAP export and import, but this liberalisation had both benefits and harmful impacts on the sector. A new trend appeared as well, which resulted in Western inventors coming to the country to set up and maintain joint ventures particularly for medicinal and aromatic plants. (Bernáth and Németh, 1998.)

3.2 A broad outline of herb collection

On the European herbal market, about 90% of the approximately 1200-1300 drugs produced and marketed from medicinal and essential oil plants are collected, mostly from developing countries. However, only professionally collected, handled, dried, packaged and stored fresh raw herbs or parts of plants can contribute to a high-quality drug with a high active ingredient content. Any errors made during the process will affect the quality and efficacy of the drug. (Bernáth, 2000).

According to the information of the Hungarian Herbal Association and Product Council (HAPC), around 70-80 species of wild medicinal plants are collected regularly in Hungary. A significant amount (approximately 30,000 tons) of drug mass is produced each year, of which the majority comes from collection. The collection of medicinal plants is subject to quantitative, territorial and conservation regulations. (Lakatos, 2020.)

The habitats of the medicinal plants collected in the country are usually located in areas with higher unemployment, so the collection contributes to the livelihoods of the local population. Some 5000-8000 thousand people participate in seasonal collection. Today, no professional qualification is required to collect medicinal plants, but before the change of regime (1989-1990), a collector's card was required. Nowadays, herb collection is possible as a private person, as a smallholder (registration with the Chamber of Agriculture requires a collection license) and as a business activity. (Lakatos, 2020).

3.3 Legal perspective

In connection with the harvest of and trade in medicinal and aromatic plants, there are several applicable legal instruments.

3.3.1 **The main international legal documents**

One of the most significant conventions is the *Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)* which is a principal tool to implement sustainability by monitoring or restricting trade in wild plants species that are threatened or might become threatened.

The convention has been signed by 182 countries and the EU, and to which Hungary acceded in 1985. The mentioned species are classified into three Appendices (I, II, III), depending on the level of threat to them from trade, and in some cases banned (Appendix I.), and for most species, regulated through a strict licensing system for international trade (Appendix II.). International trade involves both live animal and plant species and their parts and derivatives (e.g., timber), and CITES has therefore extended protection to all recognizable parts and derivatives of species covered, in addition to live specimens. Appendix III. lists species whose populations in a given country are threatened, but local conservation is not strong enough to protect them from the adverse effects of trade. The fundamental aim of CITES is to conserve the natural populations of each species.[5] This also means that it does not prohibit trade in artificial propagation in the case of plants, but only controls it. (Ministry of Agriculture, 2022.)

The *Convention on Biological Diversity (CBD)* is a significant international instrument for promoting sustainable development and encouraging actions leading to a sustainable future. The tool was signed in 1992 at the Rio Earth Summit. It highlights that biological diversity means not just ecosystems, plants, and animals, but also humans who benefit from it, using the natural resources for several purposes, like food, water, medicines, fresh air, etc. The document has been ratified by 196 nations; Hungary became a party in 1994. (CBD, 2022.)

[5] To provide some examples, considering Hungarian MAP species, *Cyclamen purpurascens,* and *Adonis vernalis* are placed on the CITES list presently.

More than 6000 species' conservation status in Europe is covered by the European Red List of Species which was developed based on „the *IUCN Red List Categories and Criteria and the regional Red Listing guidelines*". It stipulates species „that are threatened with extinction at the European level so that appropriate conservation actions" should be taken. The geographical scope of the list involves the continent, literally the „European parts of the Russian Federation and Turkey as well as the Macaronesian Islands. The Caucasus region is not included." (IUCN Red List. 2013.)

Related to the EU Biodiversity Strategy to 2020, the assessments and indicators were accomplished to gain more information and evidence on the status of medicinal plants in Europe. The *European Red List of Medicinal Plants* has been set up in 2013, containing 400 native vascular plants from ninety families. The list's main purposes are contributing to regional conservation; identifying endangered geographic areas and habitats; listing the main threats and addressing mitigating actions; supporting conservation efforts; strengthening the network of the experts in the field. (Allen et al., 2014.)

According to the European Red List of Species, „3 % of the 419 vascular plant species assessed in Hungary are considered threatened at the European level." In the case of terrestrial plants, habitat loss and degradation due to agricultural expansion and intensification are the major concerns. Regarding aquatic species, „direct habitat loss caused by natural or semi-natural ecosystems management and agricultural expansion and intensification are the main threats." The threatened species are concentrated in the country in the Pannonian Plain (IUCN Red List, 2013.)

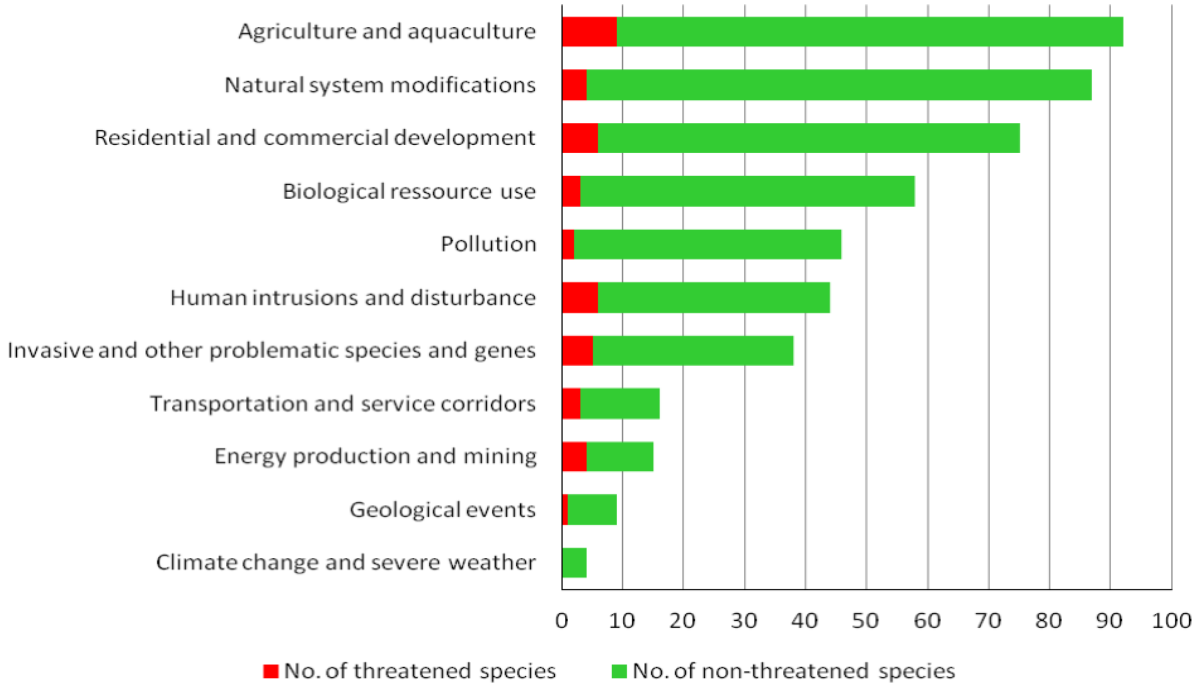

Figure 2: *The major threats at European level in connection with vascular plants. Source: IUCN Red List, 2013. URL: https://www.iucn.org/sites/dev/files/content/documents/hungary_s_biodiversity_at_risk_fact_sheet_may_2013_0.pdf*

The list also indicates three threatened species occurring in the Danube floodplain region of Hungary:

- *Chimaphila umbellata* (status: vulnerable),
- *Crataegus nigra* (status: endangered)
- *Iris spuria* (status: vulnerable).

Two species, *Crataegus nigra*, and *Iris spuria* are both linked to floodplains and alluvial meadows, and „have been highly impacted by drainage, agricultural conversion and intensification, urbanisation, and by collection of wild plants." (European Commission – European Red List, 2022.)

According to a dataset which was developed based on data collected from academic sources between 2017-2020, the total number of plant species in Hungary is 2250. (Butler, 2020.)

To have an exact number of threatened MAP species in Hungary, a consultation was initiated with Danna J. LEAMAN Ph.D., co-chair of the IUCN SSC Medicinal Plant Specialist Group. Following her guidance, thematic research was carried out on 31. May 2022 in the IUCN Red List database. According to the results, for the moment 132 medicinal plant species are placed on the IUCN Red List in relevance to Hungary. (IUCN Red List, 2022). But, as Mme LEAMAN added, a re-assessment is taking place currently concerning all European MAP species. The results will be published in some months, perhaps a year. (Pers. comm., LEAMAN, 2022).

3.3.2 European level

Several policy instruments demonstrate the commitment of Europe and the Member States of the EU to ensure nature conservation.

One of them is the *Bern Convention* which is a binding legal instrument. Its fundamental objective is to protect wild fauna and flora species and their habitats, with particular attention to endangered species (including migratory species) and habitats, and to promote cooperation between European countries for their conservation. Chapter I of the Convention lays down general conservation requirements, Chapter II provides for the protection of habitats, Chapter III for the protection of species and Chapter IV for the protection of migratory species. (Természetvédelem.hu, 2022.)

The so-called *Habitats Directive (Council Directive 92/43/EEC)* aims to ensure the conservation of many „rare, threatened or endemic animal and plant species." Around 200 habitat types are included as well for protection. The Directive promotes biodiversity, with special regard of economic, social, cultural, and regional aspects. It means a keystone of the

European conservation policy and creates the *Natura 2000 ecological network* of protected areas throughout Europe.

The Directive assures protection in diverse ways:

- Species in Annex II: the main areas of their habitat are mentioned as sites of „Community importance (SCIs) and included in the Natura 2000 network. These sites must be managed in accordance with the ecological needs of the species".
- Species in Annex IV: strict protection regime is guaranteed in connection with their entire natural areas.
- Species in Annex V: it must be granted by EU Member States that the exploitation and harvesting of these species is „compatible with maintaining them in a favourable conservation status". (European Commission – EU Nature Law, 2022.)

3.3.3 National legislation

In Hungary, the collection of wild medicinal plants can be carried out without any professional qualifications required by law. However, the purchase of medicinal plants requires a licence. (HAPC, 2020.)

Wild plant collection is regulated fundamentally by the *Hungarian Civil Code* and Acts on nature conservation, forests, forest protection and forest management.

Based on the *Civil Code*, the owner of the land suitable for collection has the right to possess, use, benefit and dispose of it. The right to use and benefit from the collection implies, among other things, that the herbs (including wild fruits and mushrooms) in the area belong to the owner of the land. The right to dispose allows the owner to transfer the possession, use and right to benefit from the land in full or within limits. The area used for collection and the time of collection are governed by the Civil Code, the nature conservation, and local regulations.

The collection of wild medicinal plants is a forestry use. Forest clearings and forest edges suitable for collection are also part of the place of collection. (Lakatos, 2020.)

The quantity that can be collected individually for private consumption is 2 kg/person/day. In areas managed by the state forestry but not having protected nature status (unless otherwise provided by law), a permit is not required for the collection of up to 2 kg of medicinal plants per person per day. However, it is important to note that medicinal plants collected for individual needs may not be placed on the market. Concerning private lands, a permit must be obtained from the owner, manager, or user of the land. (Lakatos, 2020.)

For the collection of medicinal plants (even for commercial purposes) exceeding individual needs in areas with non-protected nature status, prior written consent must be obtained from the State Forestry Manager. Permission for collection can usually be obtained from the district forest officer. Due to the right of disposal, the cost of obtaining a permit may vary from one forestry (owner) to another. (Lakatos, 2020.)

3.3.4 Collection in conservation areas

To gather information on the protected status of an area suitable for collection, the Conservation Departments of the National Park Directorates, the Nature Conservation Authority, the District Forestry Officer, or the public services module of the Nature Information System shall be contacted.

Act LIII of 1996 on Nature Conservation stipulates that protected natural areas include national parks, landscape conservation areas, (specially protected) nature reserves and natural monuments. Natura 2000 protected areas are also considered as conservation areas.

In protected areas, permission must be obtained for the collection of medicinal plants, even for quantities less than 2 kg per person per day. National Park Directorates do not have the authority to issue permits for commercial collection; an application must be submitted to the

territorially competent nature conservation authority, which is the Department of Environment, Nature Conservation and Waste Management at Government Office. Regarding conservation areas of local importance, the notary of the relevant municipality is the competent nature conservation authority. Administrative service fee shall be set by law for the permit procedure. The environmental authority has the right to limit both the areas concerned and the quantity to be collected in the permit. The permit issued covers the species and specified areas for the harvesting. In parallel, the competent ranger service will be also notified by the authority. At the end of the collection period, the quantities collected must be reported to the environmental authority. (Lakatos, 2020).

The rangers are members of the Hungarian Nature Conservation Guard Service (HCGS) and operate in all national park directorates to guard, protect and prevent damage to protected natural values and areas. They are law enforcement officers with wide-ranging powers of action. They have the right to sanction with an on-the-spot fine collectors without a permit. (Természetvédelem.hu, 2022.)

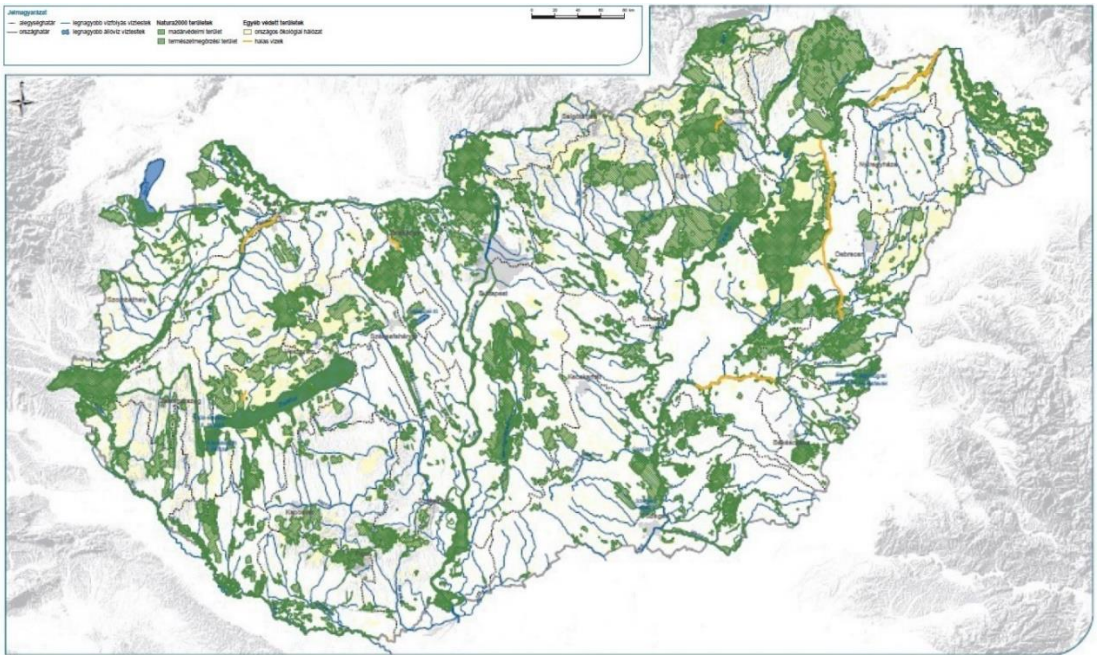

***Figure 3**: Map showing the nature conservation areas in Hungary, including the NATURA 2000 parts. Source: https://enfo.hu/sites/default/files/natura.jpg*

In Hungary, there are 1800 native plants. (Pers. comm., MOLNÁR, 2022). Considering hybrids and subspecies there were 733 protected plant species in 2021 (Természetvédelem.hu, 2022), from which about 170 – including for instance *Helichrysum bracteatum* and *Parnassia palustris* - are considered as medicinal plants according to tradition and literature. Regarding the 87 specially protected species, 30 species are known as MAPs. As a result of their protected status, the nature conservation authorities may restrict or prohibit the collection of the given medicinal plant species, while the collection of specially protected plant species may only be authorized for nature conservation or other public interest purposes, not for individual use or commercial distribution. (Györgytea, 2022).

To sum up, the following table contains the most important *national legal instruments* related to the topic of medicinal and aromatic herbs.

Act No. LIII of 1996 on nature conservation
Act No. XXXVII of 2009 on forests, forest protection and forest management
Decree No. 275 of 2004 (X. 8.) of the Government on nature conservation areas of European Community importance
Decree 10/1987 (VIII. 19.) of the Ministry of the Environment on the registration and marketing of medicinal substances and preparations other than medicinal products
Government Decree 383/2007 (XII. 23.) on the regularization of legislation adopted by decree before 23 October 1989

Table 3*: The most important national legal instruments related to MAPs. Source: own elaboration.*

The table below contains *the relevant international and European agreements* and legal tools.

Convention on International Trade in Endangered Species of Wild Fauna and Flora Signed at Washington, D.C., on 3 March 1973
Convention on the Conservation of European Wildlife and Natural Habitats of 1982 (Bern Convention)
Convention on Biological Diversity of 1992
Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora
Directive 2004/24/EC of the European Parliament and of the Council of 31 March 2004 amending, as regards traditional herbal medicinal products, Directive 2001/83/EC on the Community code relating to medicinal products for human use
EU Wildlife Trade Regulation (Council Regulation (EC) No 338/97 of 9 December 1996 on the protection of species of wild fauna and flora; implementing the Convention on International Trade in Endangered Species of Wild Fauna and Flora

Table 4*: The most relevant agreements and legal tools at European and international level. Source: own elaboration.*

3.4 Conditions for professional harvesting

Besides the legal instruments, there are many additional rules to follow when collecting herbs.

Jenő BERNÁTH, a prominent scholar highlights in *Medicinal and aromatic plants* (2000) the following conditions that should be assured for a professional herb collection[6]:

- *Sound knowledge of morphology*. The collector must know the botanical characteristics that will enable him to identify the valuable species to be collected and to distinguish them with certainty from related species of the same family or genus, which are similar but may have other uses, lower levels of active substances or toxic substances harmful to humans. There are species belonging to the same family, whose plant parts can be collected together because they are of the same value (e.g., *Tiliae flos*).
- *Knowledge of potentially toxic species*. Medicinal plants belonging to this group (e.g., *Atropa belladonna, Hyoscyamus niger*) should be treated differently from other species. When collected at the same time as other medicinal plants, blending should be avoided. Other precautions should be taken by the collector: it is advisable to pick the parts of the plants containing strong toxic substances by wearing protective gloves, not to touch the mouth or eyes during this work, and to clean the hands thoroughly after returning home.[7]
- *Knowledge of endangered and protected species*. During collection, special attention should be paid to the conservation of endangered and protected species.

[6] The following bullet points are own translations that have been originally defined in this book in Hungarian.

[7] The most common toxic or potent plants are *Datura stramonium, Atropa belladonna, Hyoscyamus niger, Senecio vulgaris, Solanum dulcamara, Aristolochia clematitis, Veratrum album, Bryonia alba, Asarum europaeum, Colchicum autumnale, Adonis vernalis, Convallaria majus.* (Bernáth et al., 2014).

- *Knowledge of the plant part to be collected*. In addition to the identification of the plant species, it is essential to know which part of it provides the drug and in which state. This is illustrated by a few generalizable examples. For fruit drugs, the color of the fruit is indicated in the pre-descriptors as an indication of the appropriate maturity, e.g., in rosehip. Regarding herbs, the stem is usually practically free of active substances. Therefore, the length of the stem is essential, and its proportion shall be maximized.
- *Knowing the right time to collect*. Medicinal plants are usually not collected at their biological (full maturity) stage, but at the so-called technological maturity stage, which, according to studies, coincides with the maximum active content. For many species of wild medicinal plants, scientific knowledge is still lacking in this respect, and drug histories and traditions guide practitioners. In general, sunny, dry weather and dew-free periods of the day are considered ideal. The optimal collection time also depends on the type of drug: the underground parts (radix, rhizome) are collected during dormancy, the bark (cortex) after the onset of the sap flow, the buds before leafing, the leaves (folium) when fully developed, the flowers (flos) are usually collected when open, dry, with or without cups, and foliated-floriated shoots (herba) are collected at the beginning of the opening of the flowers. These all help to optimize the necessary pharmaceutical and therapeutical efficacy.
- *Habitat knowledge.* Knowledge of species and habitat characteristics contributes in many ways to drug quality. Habitat knowledge can also help in the identification of related species to be isolated.
- *Consideration of habitat contamination* is an increasingly important factor. Roadside verges should be avoided due to the pollution of plants by dust and heavy metals (Pb,

Cd, etc.). Near agricultural areas, however, the risk of pesticide drift should be taken into account.

- The collector must make sure *that the collection site is not part of any protected area* (nature reserve, protected landscape area, national park).
- *Knowledge of the appropriate harvesting method*. Choosing the right collection method not only results in optimum drug quality but also takes into account that the ecological balance of the habitat's communities should not be disturbed, so that it remains an abundant source of drug extraction in the following periods.
- The collector can also improve the quality of the drug by *using the right tools* (pruning shears, knives, gloves, chamomile combs, cranberry combs). The flowers are the most susceptible to crushing and damage. Therefore, they are collected in baskets and packed in boxes to avoid browning, discoloration, and crushing. The juicy fruits are collected in buckets, while the less delicate herbaceous and seed pods and roots are put in bags. After collection, the roots are washed, dehydrated, cleaned, and depending on the purpose, peeled, or chopped.
- Harvesting is followed by *drying*. In practice, it is often the case that the moisture content of the drug is not reduced to the required level, as the additional weight is expected to generate additional revenue. Of course, incorrect technology can cause serious quality problems later.

  In this way Bernáth describes the main conditions for professional harvesting.

Harnischfager (2000) admits to the above mentioned that the collected plant materials must be swiftly unpacked but not exposed to sunshine or other elements. The drying facility must be reached promptly, and it shall be clean and aerated to protect the materials against

animals, insects, and pests. Attention should be paid regularly to avoid discoloration, damage to pieces, or contamination. Packaging (in bags or containers) should take place as soon as possible to lower the risk of mold or pests. (Harnischfeger, 2000.)

3.4.1 Unwritten law – Questions related to sustainability

There is a proverb saying that we must manage our environmental resources so that „our grandchildren can see and enjoy them as much as we do today".

According to ethnobotanist Andrea DÉNES (2012.), this thought should be applied to medicinal plants – besides the professional rules – through the following norms and collection ethics:

- Only those plants should be collected that are known to be edible or medicinal.
- Uprooting the plant is forbidden, it is crucial to leave enough leaves or flowers for the survival and reproduction of the individual. (Roots and bulbs should only be collected from very common species and in small quantities in a single area.)
- Do not tear, or pull, but use scissors to cut off the parts of the plant to be collected (except, of course, for easily detached fruits).
- Do not trample the habitat where you are collecting. Take particular care in muddy areas. Do not trample over the meadow.
- Only collect flowers and fruit from trees and bushes without breaking branches. Buds and shoots should be collected from side shoots and not from the top shoots.
- Do not collect spatially rare plants, only common species. Those who collect regularly know which species are rare where they collect. It is important to spare them for the survival of their populations and possibly for reproduction. Preferably harvest materials from each stage of life.

- Collect clean, healthy plant parts from clean places.
- Harvesting is forbidden while collectors suffer from transmittable diseases or inflammation.

Guidelines are therefore crucial regarding medicinal plant harvesting nowadays, as the described requirements contribute to constant and proper quality. Since demand for herbs is not predictable, and climatic conditions can change over time, it is always recommended to collect from diverse growing areas in order to avoid over-harvesting. (Harnischfeger, 2000).

The rotation of collecting areas is also a guarantee for sustainable harvesting. Attention must be paid to not collect the entire stand and so leave 20-30% of the specimens intact for reproduction and regeneration of the given herb species. During collection, it is important to minimize the perturbation of the area. Besides, must pay particular attention to basic hygiene requirements: disinfection of protective clothing, utensils, and cleaning cloths, particularly given epidemic situations. (Lakatos, 2020.)

The quintessence of sustainable harvesting is that harvesters need to use practices that focus not only on financial benefits but also pay attention to the preservation and survival of the plant species. In this context damages caused to habitats must be minimized, while harvesters have to be aware of not only the unique characteristics of the plant species but also the gentle harvesting methods and features to promote stability in populations. Notes should be archived regarding the plants' unique features, including life cycle, and biology. (AHPA, 2017).

3.4.2 The importance of traditional knowledge (TK), indigenous knowledge (IK), and traditional ecological knowledge (TEK)

Knowledge is defined by Gadgil et al. as „an outcome of model-making about the functioning of the natural world". People have always tried to understand how nature works around them and have gathered information to be able to maneuver their environment to suit their desire. To manage ecological services and natural resources, indigenous people have paid attention to preserving biological diversity. Their broad knowledge - including medicinal uses - has been socially transmitted from generation to generation and constantly updated with new elements. Indigenous knowledge or traditional ecological knowledge is therefore described as „a cumulative body of knowledge and beliefs handed down through generations by cultural transmission about the relationship of living beings with one another and with their environment". (Gadgil et al., 1993).

The term *indigenous knowledge* (IK) is also illustrated by respected ethnobotanist Fikret BERKES, saying that it is „local knowledge held by indigenous peoples, or local knowledge unique to a given culture or society and can be used interchangeably with traditional knowledge." In particular, the authors equally explain TEK as a subset of IK: „an attribute of societies with historical continuity in resource use practices." According to them, TEK has many likenesses with scientific knowledge. (Berkes et al., 1995).

Traditional knowledge has generally been examined in indigenous communities, mostly in African or South American tribes. Certainly, there is no such awareness in European countries, where wisdom has very different characteristics. However, a dissimilar kind of knowledge occurs in Europe too, mainly in rural areas, preserving over centuries of personal experiences of local people living in close relationship with nature. The same phenomenon exists in Hungary, where there are still some villagers who own TK. (Molnár et al., 2008.)

According to Molnár et al., traditional ecological knowledge is an element of the Hungarian local culture. Varied landscapes and outstanding cultural richness justify why a huge part of TEK has been already recorded by ethnographers, historians, or ecologists. Ethno-botanical and ethnoecological data have been collected in Hungary for a long time, resulting in accurate and precise research on folk names related to plants and geographical areas. (Molnár et al., 2008).

To provide an example, according to Hungarian ethnobotanist, Péter BABULKA, the number of medicinal plants used in medieval and modern botanical works, herbal books, and folk medicine in the 19th and 20th centuries is estimated to be at least 600. The topic has always been thought-provoking for scientists from different fields because it provides information on the use of various medicinal plants, as well as reveals several interesting connections from linguistic, ethnographic, historical, and other points of view. Particular attention should be paid to the folk names of plants and herbal remedies and the magical elements associated with healing practices. The most common magical elements that can be recognized in folk medicine and herbal medicine are notable times, places, numbers; verbal suggestions; and cures based on analogy, e.g., color. (Babulka, 2005).

This idea is also reinforced by Bernáth, who explains that herbs were used already by our ancestors, and the usage was certainly combined with cultic elements. In addition, the names of many plant species may refer to this, e.g., devil's bane root or devil's vine. (Bernáth et al., 2000.)

As Molnár et al. note, historical proceedings shall be also learned, as well as „social driving forces behind the observed landscape changes", since they are strongly linked to today's biodiversity. Through its holistic approach, TK presumes that there is a strong link between the one who monitors and the subject that is being studied. Although the observation

of nature is age-old, traditional knowledge still has not been used enough as a possible source of information. (Molnár et al., 2008.)

It cannot be said, of course, that simply owning TEK would lead to the harmonious coexistence of nature and humans. However, it is more than speculation that communities with significant environmental knowledge would be more likely to adopt sustainable resource management methods that would better guarantee their survival. (Berkes et al., 1995).

3.5 Good Agricultural and Collection Practices (GACP)

There is an increasing demand in the industry for standards that can ensure high-quality herbal products from reliable production.

The idea of developing an international attitude to GACPs has been raised only in 2003 by the Committee on Agriculture of the Food and Agriculture Organization of the United Nations (FAO). GACP aims „to facilitate the quality and supply of raw materials to ensure sufficient production and stable markets for botanical ingredients. It also has the goal of providing protection for wild plant communities." (AHPA, 2017.)

The document called *Guidelines on good agricultural and collection practices (GACP) for medicinal plants* was developed by the World Health Organization (WHO) also in the year 2003. The main objective of the guideline is to give technical assistance concerning the proper acquisition of herb materials, including cultivation, wild harvesting, and some post-harvest process, with particular reference to quality issues. (WHO, 2003).

GACP recommendations are also promoted *in Hungary*, namely by the Hungarian Herbal Association and Product Council, and the topic is also mentioned in a practical training aid written by scientific representatives of the field.

According to this manual of Bernáth et al., GACP is a recommended quality assurance system, which looks for quality not only in the final product but also in the whole production chain. The policy is based on three elements: a specialized production line for the final product; item-specific documentation (data capture of processes in the Quality manual); auditing (both internal and external). The most important features of the plan are outlined below:

- In the case of collection, the starting material should be at least a chemically well-identifiable chemical taxon; and a controlled propagating material when talking about cultivation, where the genetic background is a crucial element.
- Concerning the production of a drug of sufficient quality, the place of production must comply with the ecological conditions under which the biological potential and the integrity of the natural environment shall be ensured, as well as the possibility of biological, chemical, and physical contamination shall be minimized.
- Fixing some technological steps such as nutrient supply, irrigation, plant care, plant protection, etc., can affect quality. These steps therefore must be documented and monitored. The quality assurance system shall not only define and record the methods and conditions of primary processing (drying, essential oil distillation, extraction) but also touch on the so-called post-harvest procedures, as the requirements for storage and packaging.
- Three phases form the quality control and certification of drugs. The first stage is to check the identity and basic quality indicators of the plant material collected or harvested. The second phase essentially qualifies the drug as a finished product, the parameters are verified through tests. The third phase of drug grading is the examination of changes in the above characteristics due to the storage and packaging of the drugs.

The classification of drugs is based on the provisions of the Hungarian Pharmacopoeia VIII (Ph.Hg.VIII.), the pharmacopeias of other countries, and drug standards.

- In addition to the above-mentioned details, the GACP quality assurance system includes all other factors that have the least influence on quality, for example, requirements concerning the training, clothing, and hygiene of the workforce, storage conditions, quality of irrigation water, wastewater treatment, the display of appropriate signs, etc. The sources of hazards and the measures to avoid them are equally listed. (Bernáth et al., 2014).

3.6 Regions relevant to medicinal and aromatic plant (MAP) collection and/or cultivation in Hungary

At the beginning of the 1920s, a specialization based on geographical regions (regarding indigenous species there) has been established concerning MAPs in Hungary. This distribution has been in use since that time, resulting in concrete production territories.

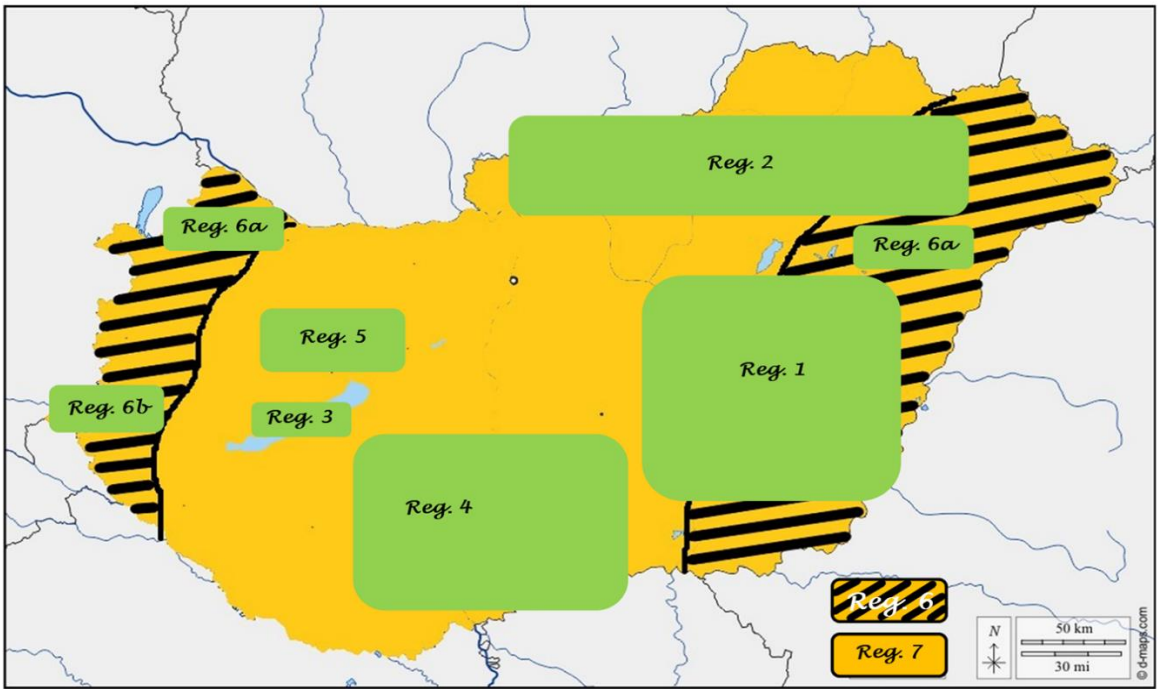

***Figure 4**: Traditional regions of utilization of the indigenous flora and the main cultivation areas of MAPs. Source of content: Bernáth and Németh, 2002. Source of map: d-maps.com; own elaboration.*

As it is mentioned in the book edited by Bernáth (Bernáth et al., 2000) the map covers the following regions, with the following unique features:

Reg. 1: Great Plain and East Tisza River region

The main herb of the salt marsh is *Chamomillae flos*, which owes its high quality to the unique ecological characteristics of the area.

Reg. 2: North-central mountainous region of Hungary

The main MAPs of the mountainous landscape are *Rosa canina, Sambucus nigra, Prunus spinosa, Crataegus spp*.

Reg. 3: Balaton highland

Due to a conscious biological and economical decision, with special regard to the area's Mediterranean climate, the cultivation of *Lavandula angustifolia* and *Lavandula intermedia* has been started.

Reg. 4: Southern Hungary

Ecological considerations have led to the establishment of *Majorana hortensis* and *Ocimum basilicum* plantations. The area is also significant for the cultivation of *Capsicum annuum* and *Humulus*.

Reg. 5: Bakony and its surroundings

Considering the specificities of the production area, the cultivation of *Claviceps purpurea* had been considerable, mostly between the 1960s and 1980s.

Reg. 6a: Great Plain and some northwestern regions

There is a long tradition of cultivating *Papaver somniferum* in these regions during springtime.

Reg. 6b: Northern part of Transdanubia

The region is suitable for cultivating *Papaver somniferum* in autumn.

Reg. 7: Region of plant species that can be collected and/or cultivated all over the country

Primarily: *Foeniculum vulgare, Carum carvi, Anethum graveolens, Coriandrum sativum, Pimpinella anisum, Sinapsis alba, Silybum marianum, Rosa canina, Sambucus nigra*.

3.7 Herbs collected in Hungary

According to the data provided by the Hungarian Herbal Association and Product Council (HAPC, 2020), currently, the mass of herbal drugs produced, collected, and cultivated in Hungary is around 27-30,000 tons of dry drugs per year. Approximately 120-130 plant species are collected, and the most important species of them, about 70-80 species are regularly collected from natural habitats. In the 1990s, about 35-40,000 tons of herbal drugs and 80-100 tons of essential oils were produced annually on 37-42,000 hectares. Nowadays, about 25-30,000 hectares are under MAP cultivation; while the mass of drugs produced there are around 27-30,000 tons. The net turnover of MAP collection, cultivation, and primary processing are HUF 20-23 billion, with an estimated production value of HUF 8-10 billion. (HAPC, 2020). Wild MAP species are therefore of great importance because the majority of domestic herb and spice exports come from the drugs of wild-harvested plants. However, wild plant species are not only important for exports, but also play an important role in the domestic drug trade. (Bernáth et al., 2014).

Nr.	Plant species (and the part of the plant containing the drug)
1.	*Robinia pseudoacacia (flos)*
2.	*Solidago virga-aurea (herba, radix)*
3.	*Juniperus communis (pseusofructus)*
4.	*Achillea millefolium (herba, flos)*
5.	*Urtica dioica (folium)*
6.	*Juglans regia (folium)*
7.	*Artemisia absinthium (folium, herba)*
8.	*Viscum album (folium)*
9.	*Sambucus nigra (flos, fructus)*
10.	*Symphytum officinale (rhizoma et radix)*
11.	*Ribes nigrum (folium)*
12.	*Crataegus (folium cum flore, fructus)*
13.	*Taraxacum officinale (herba cum radix, folium, radix)*
14.	*Tilia (flos)*
15.	*Prunus spinosa (flos, fructus)*
16.	*Frangula alnus (cortex)*
17.	*Allium ursinum (herba, bulbus)*
18.	*Populus (gemma)*
19.	*Betula pendula (folium)*
20.	*Equisetum arvense (herba)*
21.	*Hypericum perforatum (herba)*
22.	*Matricaria chamomilla (flos, aetheroleum, extractum fluidum)*
23.	*Althaea officinalis (radix, folium)*
24.	*Agrimonia eupatoria (herba)*
25.	*Galium verum (herba)*
26.	*Elymus repens (rhizoma)*
27.	*Plantago lanceolata (folium)*
28.	*Aesculus hippocastanum (semen)*
29.	*Rosa canina spp. (pseudofructus)*

Table 5*: The most abundant species collected in the wild. Source of content: Bernáth et al., 2014. Table format: own elaboration.*

Nr.	Plant species (and the part of the plant containing the drug)	Collection area(s)	Amount of drugs collected based on a 3-year average (ton)
1.	*Matricaria recutita (flos)*	Great Plain	200-500
2.	*Aesculus hippocastanum (semen)*	all over Hungary	150-200
3.	*Urtica dioica (folium)*	Hajdú-Bihar, Szabolcs-Szatmár-Bereg, and Heves counties	150-200
4.	*Rosa canina (fructus)*	north-central mountainous region, Great Plain	50-90
5.	*Sambucus nigra (fructus)*	all over Hungary	200
6.	*Achillea millefolium (herba, flos)*	Great Plain, north-central mountainous region	50-100
7.	*Solidaginis virga-aurea (herba)*	south-western and north-eastern parts of Hungary	100-120
8.	*Equisetum arvense (herba)*	all over Hungary	20-50
9.	*Sambucus nigra (folium)*	all over Hungary	60-70
10.	*Tilia (flos)*	southern part of Transdanubia, north-central mountainous region	15-20
11.	*Viscum album (folium)*	southern part of Transdanubia, north-central mountainous region	5-10

***Table 6**: The most important domestic herb species collected between 2016 and 2018. Source of content: HAPC, 2020. Table format: own elaboration.*

It is important to note that the collection area of the most significant wild stocks coincides completely with the underdeveloped regions and small areas. (HAPC, 2020).

When collecting from the wild, the activity must always comply with the relevant legislation mentioned earlier, as well the necessary permits – when it is applicable – must be obtained.

3.8 Collectors

In many eastern and central European countries, including Hungary, the level of income in rural regions is quite low. Consequently, MAP harvesting can provide extra revenue for local collectors. For the most part, these people are poorer, usually, stockholders, retired, or women with children, who live in the countryside. (Lange, 2002.)

The availability of herbal raw materials is expected to become increasingly limited due to the labor shortages in the sector, which have been present for several years. Except for developing countries, the collection is declining, while cultivation and precision farming in herbal medicine are gaining ground. In the production of raw materials, with the development of instrumental detection of active substances and impurities, there are also challenges in meeting increasingly stringent purity and quality requirements. (HAPC, 2020.)

According to Sára KINDLOVITS (secretary, Hungarian Herbal Association and Product Council), approximately 5000-8000 persons participate in seasonal herb collection in Hungary annually, but due to lack of concrete data, the exact number can only be estimated. As she explained, in most cases those people go to harvest into the wild who are on low incomes and often live on state or municipal benefits. That is the reason why many of them start nowadays working in the construction industry where they can find a more stable and better paying job. Moreover, due to preferable working conditions, younger generations settle in cities and leave the countryside. Therefore, the main problem is the decreasing number of people who could be involved into the harvesting process. Another problem is that presently only few of them are in possession of traditional knowledge regarding herbs and their collection methods. That ancient knowledge is disappearing, and the majority of the collectors is not careful enough to harvest adequately that may cause damage to vegetation. Sára KINDLOVITS added that rural communities would be open to extra employment opportunities and product

development in connection with medicinal plants but starting such a program faces difficulties due to lack of expertise and administrative obstacles related to the limited collection points. She summoned that although the number of collected plant species has not diminished recently and Hungary is still rich in MAP species, loss of natural habitats is detectable, and the steady decline in the number of collectors will lead to the disappearance of traditional herb picking. However, based on the growing global demand for herbs, including the ones coming from Hungary, it would be more feasible to do this kind of collection in smaller communities, by providing them special trainings, competent management, and long-term perspectives to keep the rural workforce in the herbal industry. (Interview – Kindlovits, 2022).

The richness of Hungarian medicinal and aromatic herbs and the situation of the Roma collectors, who belong to the poorer social strata but possess the traditional ecological knowledge concerning herbs, has also been noticed by the Traditional Medicinals Foundation (TMF) that is located in the United States of America. TMF is committed to revive herbalism and support community-based social business model, including equitable trade.

According to the Foundation's experience, although the Roma in Hungary have long preserved ancient herbal wisdom and are skilled herbalists, they have a very high unemployment rate of up to 70%, and most of them live in segregated rural communities. Their program, *Kenyér* was launched following their visit in Hungary in 2010 and named after the Hungarian word for bread (kenyér) which, as one of our most basic foods, also symbolises life. Through the project, TMF has laid the foundations for FairWild certification and helped to build a system that employs local Roma people in wildlife collection in and around Baksa (in southern part of Hungary), as well as provides training and mentoring for young people. (Traditional Medicinals Foundation, 2016).

The existence of traditional knowledge, long preserved and deeply anchored by the Roma, was confirmed by Zsolt Molnár, a renowned ethnobotanist of our time. He added that

the collection of certain things (horses, herbs or even waste) and their sale is an integral part of Roma identity and Gypsy culture. As for medicinal plants, their knowledge is extensive, they not only know the plants, but they can also estimate, for example, the quantities that can be collected. Many of them are healers indeed. (Pers. communication - MOLNÁR, 2022).

3.9 The role of eastern and central European countries in the trade of MAPs

Eastern and central European countries are famous for their abundant, but relatively cheap stocks of MAPs. On the one hand, this can be traced back to the centuries-old production of medicinal herbs in these states, which were largely wild native sources. The plants played a great role in the region's traditional medicine as well, but, beyond domestic use, they were also a popular export item in the former Soviet bloc. (Lange, 2002).

According to Lange, the recorded global importation of MAP material (based on pharmaceutical plants) reached in general 400.000 tons valued at USD 1.243 million in the 1990s per year. The tendency shows that only a few countries dominate the international trade: 85 % of global importation is directed to some 12 countries, while 12 states were subject to 82 % of the global exportation. Europe, as a whole, is definitely split into source and customer states. Between 1991-1998 around 3 % of worldwide import was connected to the region, because this part of Europe is rather known for export capacities.[8] Mainly due to the increased export amounts of herbs in the region, large numbers of MAP species were put under legal protection. (Lange, 2002).

[8] Hungary's export varied between 4000-6170 tons. (Lange, 2002).

Country of import	Volume [t]	Value [USD]	Country of export	Volume [t]	Value [USD]
Poland	3,460	7,865,000	Bulgaria	15,450	35,442,000
Russian Federation	2,560	8,473,000	Poland	10,240	26,664,000
Slovakia	1,980	1,123,000	Albania	8,210	12,605,000
Czech Republic	1,770	5,131,000	Hungary	6,170	9,029,000
Hungary	1,190	2,427,000	Turkey	4,480	9,490,000
Greece	1,100	1,568,000	Czech Republic	2,630	2,424,000
Slovenia	660	2,095,000	Yugoslavia	2,350	3,985,000
Turkey	580	1,267,000	Macedonia	1,860	4,744,000
Croatia	560	1,480,000	Romania	1,380	2,935,000
Macedonia	480	851,000	Croatia	1,260	2,937,000
Albania	250	48,000	Greece	1,050	1,506,000
Lithuania	250	1,008,000	Slovakia	480	1,052,000
Total: E+ SE Europe	**15,220**	**34,616,000**	**Total: E+ SE-Europe**	**56,020**	**116,436,000**
Total: Europe	**160,620**	**505,847,000**	**Total: Europe**	**99,230**	**320,026,000**

Classification: *pharmaceutical plants* (SITC.3: 292.4 = commodity group HS 1211). – Source: UNCTAD COMTRADE database, United Nations Statistics Division, New York.

Figure 5*: the export and import figures of MAP material of east and southeast European countries in 1998. Source: Lange, 2002.*

The importance of the collected herb species is demonstrated by the fact that the majority of domestic herb and spice exports also originated from wild species. Those species play a significant role in exports that occur extensively and with high frequency. (Bernáth et al., 2014.)

The main destination for exports is Western Europe, traditionally Germany (80-90%). Other important destinations are the Netherlands, Austria, Switzerland, and Italy. It is therefore apparent that the salability and price of goods produced in the country depend to a large extent on the world market situation. Some drugs can be sold with a relatively high degree of safety. Their prices vary, but fluctuate within reasonable limits, resulting in higher and lower profits. In particular temperate species that grow wild in our country, such as *Rosa canina*; *Sambuci flos, S. fructus*; *Taraxaci officinalis herba cum radice, T. folium, T. radix*; *Althaeae radix, A. folium*; *Tiliae flos*; as well as some cultivated ones, such as *Majoranae herba; Thymi herba, Pimpinella anisum, Menthae piperitae herba, M.P. folium, M.P. aetheroleum* are the most

popular choices. However, quality plays an important role in determining the price; sales opportunities vary from year to year. Market changes are usually monitored by the wholesaler companies. (Bernáth et al., 2014.)

3.10 Findings related to current problems in the herbal sector

The roots of the problems in connection with the Hungarian herbal sector's competitiveness are stemming from the time of the regime change, so more than 30 years. During this time, the former production structures have broken down, collection networks have disintegrated, and companies have been restructured or have ceased to exist. Privatization has led to a reduction in free access to many previous collection areas. In addition, in national parks and nature reserves, the collection has become a licensed activity, and income from the collection of medicinal plants has lost its exemption from contributions. The necessary technological improvements that could have improved the efficiency of production and processing have not been made. From a social aspect, mainly due to generational change, the number of people involved in this activity has decreased. The lack and inadequate adoption of the legislative framework have also contributed to the stagnation of the sector. A crucial problem is the lack of a reliable data on production and trade, which makes it even more difficult to see the sector as a whole clearly and critically. (HAPC, 2020.)

The utilization of wild medicinal plants can be a strategic advantage for our country since marketable medicinal plants that are suitable for collection in large quantities have been always available without significant financial expenditure. However, it is hard to make use of these resources nowadays, as collection must face several difficulties. For instance, although the collection areas are currently partially open to the public, the collection of the by-products of the land requires the consent of the owner or land user. (HAPC, 2020).

4 Results and Discussions

4.1 Nagy Mihály Medicinal and Aromatic Plant Ltd.

Mihály NAGY started to deal with medicinal plants in the 1970s and then, in 1991, his son joined the family business. At that time, the regime change took place in the country that resulted in many fallow lands and plenty of herbs to collect in the northern-central mountainous region of Hungary where the firm is located. Therefore, building on their previous expertise, processing has become the firm's primary activity. Currently, the company's executive manager is the founder's son, but the grandson, Balázs NAGY also works at the company, doing sales and other tasks. They have 14 permanent employees, and 20 workers are employed in seasonal work. (Interview – NAGY, 2022).

***Figure 6**: Machinery of the Nagy Mihály Medicinal and Aromatic Plant Ltd. Source: Balázs NAGY.*

The herb factory overall deals with more than 50 types of medicinal plants, but the composition of the varieties changes annually, usually due to the market's demand and the quantity of wild-harvested plants. Some of the raw materials for their products are collected from wild stocks. A small proportion of the raw materials they purchase are dried naturally, while the majority are dried manually in one of their four gas-fired drying kilns (their drying capacity is 10,000 kilograms of raw material per day). After drying, the processes, like cleaning, cutting, and classifying are supported by a highly mechanized technology. The company supplies cut herbs in large quantities, placing them into 100-liter paper bags. To gain pure material, a metal detector is used as well. They can reduce germ and destroy dangerous micro-organisms in goods, but they pay attention because the more intensive the treatment to remove microbiological contamination is, the more volatile or active substances the plant loses, so it is not worth overdoing it and risk to ruin the product. (Nagy, 2021.)

***Figure 7**: Dried herbs packaged in paper bags. Source: Balázs NAGY.*

The company's activities are diversified; in addition to buying and processing, cultivated herbs are playing an increasingly important role in the supply. They grow on a total of 20 hectares, mainly *Urtica dioica* and *Achillea millefolium,* but they purchase herbs from other farmers as well.[9]

As Balázs NAGY explained, previously, only 20% of the plants were grown. There were buying places in the nearby villages, where the wild harvested materials were brought in, usually already in dried form. There was no need to organize the receipts because the system worked by itself. Local people knew the herbs that grew in the countryside and passed it down from generation to generation. They went into the wild and picked the plants when the flowers flourished.

Today, according to his explanation, it is a different era, there are no buying places anymore, and the company only gets a phone call about the time when the plants will be delivered. So, the trend concerning wild collection and cultivation has now been completely reversed. In 2021, the ratio of wild-collected and cultivated plants was 23,84: 76,16 (%). Regarding the reasons for that change, the executive director pointed out in the interview that in the last 5-10 years, the number of quantities collected in the wild has decreased as collectors have tended to move into the construction industry which gives them a steady source of income throughout the whole year. The main problem is that the herbs grown in the area provide seasonal income. Moreover, the collectors, the majority of whom are of Roma origin do wild harvesting when they need a short-term, quick income. Finding the right workforce means therefore a huge

[9] To reach the best quality with cultivated plants, the company contacts as many farmers as possible, and assist them by providing them with technology, seeds, continuous professional monitoring, and, last but not least, a guarantee of purchase. They try to develop long-term relationships with producers. (Nagy, 2021.)

problem. And as Balázs Nagy mentioned, despite all the benefits of collection, it will continue to decline in Hungary. (Interview-NAGY, 2021).

The herb company operates with direct sales, and 99 percent of its products go to foreign customers, mostly in Germany.[10] In 2021, orders were taken for only 25 types of products. Balázs NAGY has noticed that European countries are increasingly interested in natural ingredients, so almost everything they produce can be sold on the market. They negotiate with buyers around February-March to see what product is in demand.

As he said, the Hungarian herbal profession has always been characterized by high-quality standards, and, such as the plants, the standards have not changed in the last fifty years. On the other side, in many cases, it may be profitable for companies to import dried herbs from abroad than to collect and process them at home, and „as long as Bulgarian and Albanian labor and raw materials are cheaper, this will not change. Hungarian consumers are price-sensitive." (Interview-NAGY, 2022.)

[10] Domestic to export sales ratio in 2021 was 0.18: 99.82 (%). (Interview-NAGY, 2022).

***Figure 8**: Achillea millefolium plantation in Cserhátsurány, with the workers of the Nagy Mihály Medicinal and Aromatic Plant Ltd. in the background. Source: own photo.*

The company is run in the spirit of environmentally responsible management. Their professional credo is to sell high-quality products, focus on sustainability, protect the soil, and support the local population. They put great emphasis on growing organic plants and similarly, processing materials collected in appropriate areas to avoid contamination with pesticides. As Nagy explained, the proportion of farmland in the Hungarian countryside is increasing, although there would still be enough herbs in the wild for collection. However, the number of collectors is decreasing drastically, as young people are moving into other professions. According to him, there are no ready-made solutions in the herbal sector, but it could be a resolution to make wild harvesting an attractive profession by employing those people in autumn and winter who would be glad to work outside in nature for the whole year. In addition, the modernization of the sector and the development of machinery could also attract young people to the herb industry. (Interview-NAGY, 2022.)

4.2 Schmidt and CO. Ltd.

The herb company is situated in Southern Hungary, a region known as „Ormánság", which has always been rich in herbs. The firm has been established soon after the regime change, at the beginning of the 1990s. Operating as a family business since 1997, they are engaged in the cultivation, collection, purchase, primary processing, and trade of medicinal and aromatic plants. Their personnel contains 18 permanent employees in Baksa, while additional workers help seasonally. 8 people work in the processing plant in Lakócsa. 20 % of their income comes from collection and 80 % from cultivation. (Interview-Schmidt, 2022).

They believe that the best and most promising alternative for the competitiveness and sustainability of agriculture is the expansion of organic farming. This not only helps people to stay healthy but contributes to protecting the environment and maintaining natural communities. The aim is to produce quality and marketable food and raw materials, which at the same time preserve the countryside, the landscape, wildlife, and the environment, including people and their communities. (Temesi, 2021).

***Figure 9**: The company's signboard in Baksa. Source: own photo.*

They farm almost 100 hectares; the main cultivated plants are *Matricaria chamomilla*, *Foeniculum vulgare*, *Rosa canina*, *Achillea millefolium*, *Trifolium pratense*, which is complemented with a second seeding, like *Malva sylvestris*, *Cnicus benedictus*. They produce the seeds themselves, therefore their own seeds are sown on the fields. They find themselves to be in a lucky position because they can combine organic farming with herb cultivation, which can result in a great variety of richness. As proof of their commitment to biodiversity, in 2020, at one of their lands of 9 hectares, they grew 7 species and 12 varieties of plants. For the third year in a row, 2 hectares of the 9 hectares have been planted with yarrow. They set up a red clover variety trial in this field, where six varieties for simultaneous main flowering were tested. The plots were separated by flowering strips consisting of a mixture of *Fagopyrum esculentum*, *Helianthus annuus*, and *Phacelia*. The remaining one hectare was divided into two, one half for hemp seed and the other half for sand oats. The result was more than expected, as the field was buzzing with wild and domestic bees. (Temesi, 2021.)

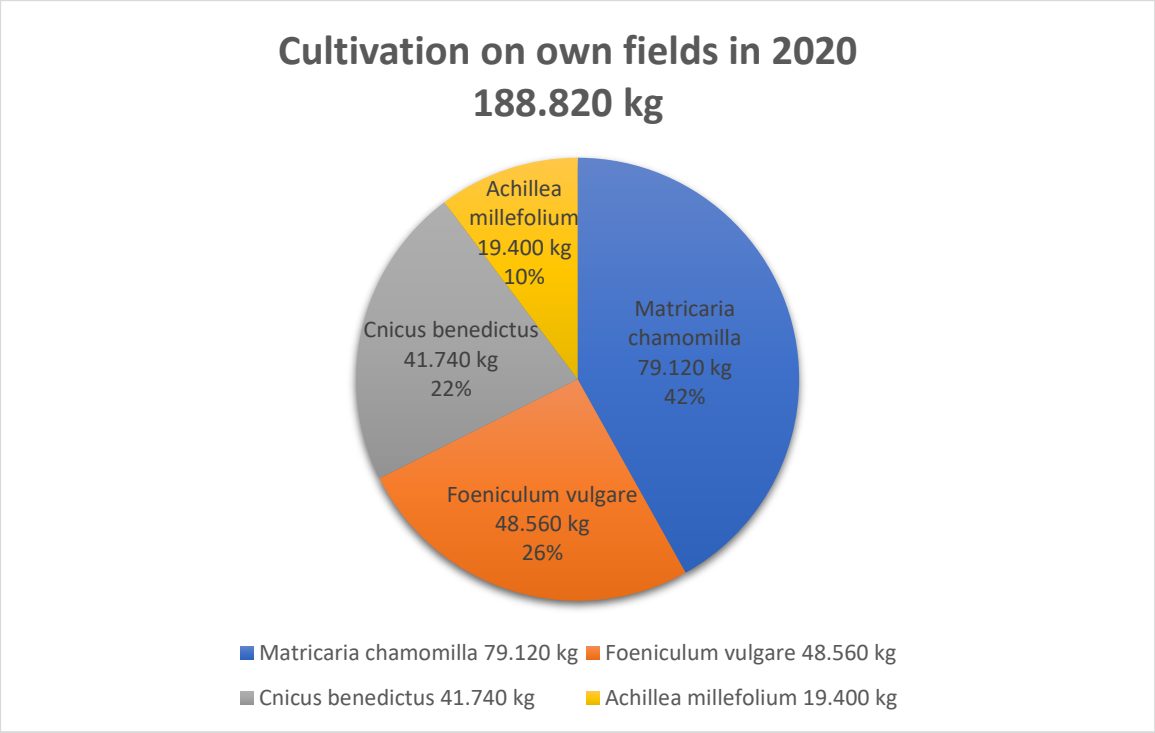

***Figure 10**: Cultivation maintained on the company's own fields in 2020. Source of content: Schmidt and CO. Ltd., 2021. Figure format: own elaboration.*

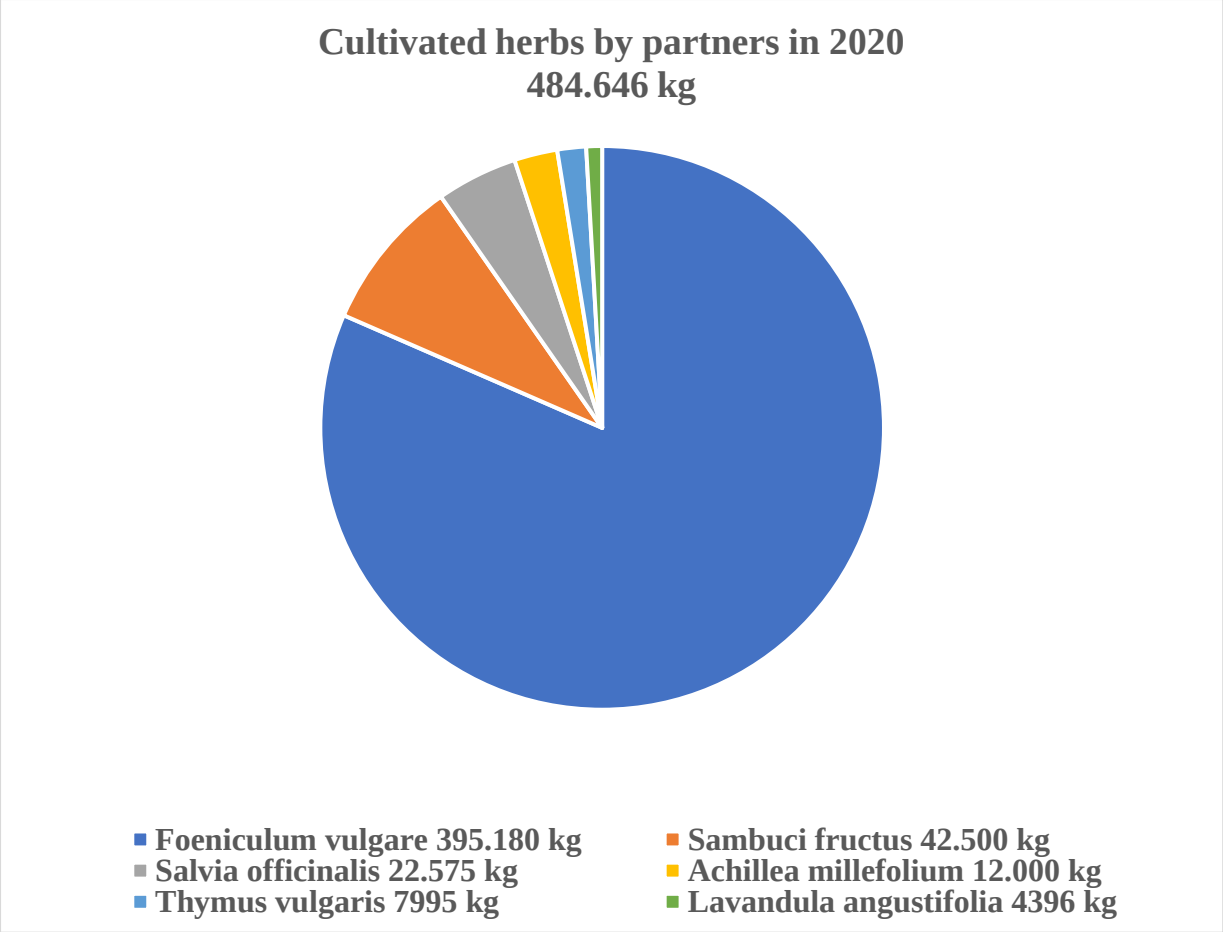

***Figure 11**: The number of cultivated herbs carried out by partners in 2020. Source of content: Schmidt and CO. Ltd, 2021. Figure format: own elaboration.*

The *wild-collection* is carried out in Somogy and Baranya counties, in cooperation with 60 people, on nearly 400 hectares. The main collected herbs are *Allium ursinum*, *Galium aparine*, *Urtica dioica*, *Tilia*, *Solidago virga-aurea*, *Rosa canina*, *Sambuci fructus*. In 2020, the amount of wild-harvested raw plants was 883.400 kg. (Schmidt and Co. Kft., 2021).

To best preserve the valuable active substances of the plants, when the raw material is brought into the plant of Baksa, it is immediately dried in one of the 11 dryer facilities. The herb plant operates with 2 diesel dryers, 5 gas dryers, and 4 machines using a burnt wood chip. The right temperature is crucial when drying, as it is not allowed to go above 40 degrees to save the essential oil content of the herbs.

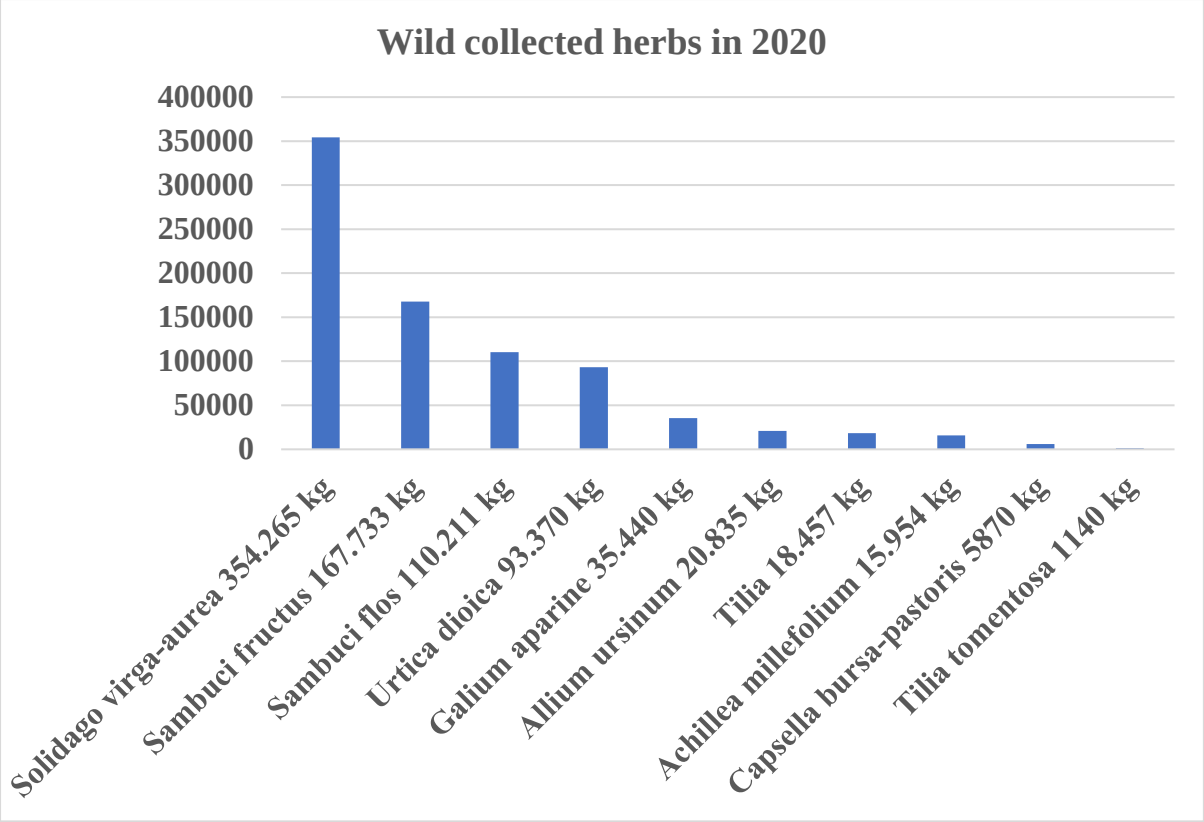

***Figure 12**: The amount of wild collected herbs in 2020. Source of content: Schmidt and CO., 2021. Figure format: own elaboration.*

The infrastructure of the herbal plant in Baksa contains also 3 Winicker-type cutting machines; various sieves, crushers, and shredders for processing; and machinery for cultivation and equally transportation. To maintain their competitiveness, they have 4000 m^2 of warehouse space, and even a 50-kWh solar power plant.[11] (Schmidt and Co. Ltd., 2021).

[11] Their goal is to become climate neutral by 2030.

***Figure 13**: A moment of proceeding at the manufacture. Source: own photo.*

As the company's owner, József Schmidt admitted, a few decades ago, 133 species of herbs were collected in the area, but today they collect far fewer because the market has no demand for so many herbs.[12] Moreover, as the area under built-up or agricultural cultivation increases, the number of natural habitats decreases, which negatively affects the number of plants that can be collected. (Interview-Schmidt, 2022).

[12] According to this phenomenon, József Schmidt explained that a few decades ago they used to collect tons of *Vinca minor* because it is from this plant that one of the ingredients of the medicine Cavinton was extracted. But since the Japanese synthesized it, nobody buys it anymore. (Interview-Schmidt, 2022).

***Figure 14**: Dried organic nettle (Urtica dioica) properly stored at the warehouse. Source: own photo.*

The company's operations are largely determined by the fact that the German Martin Bauer Group, a major player in botanical products, holds a 25% share. They are the primary buyers indeed, with 90% of the goods sold to them and the remaining 10 % going to smaller Hungarian businesses in the neighborhood.

As part of the Martin Bauer Group, Schmidt and CO. Ltd. follows a **strict sustainability program** based on strong environmental principles. As the owner explained, one of their top priorities is promoting biodiversity in the area, including the support of bumblebees. In this context, no monocultures are grown, but different cultures are varied. To ensure that there is always enough pollen for bumblebees and other insects, they also do secondary sowing.[13] Their partners should also have a biodiversity program, the minimum

[13] This aspect is critical in Hungary, where there is almost no remaining flourishing plant right after the arable lands of *Brassica napus* have flowered. For this purpose, *Foeniculum vulgare* can be used as a melliferous plant. (Interview-Schmidt, 2022).

obligation is to have a bee pasture.[14] In addition, certification schemes and procurement standard apply to the operation of the herb company. (Interview-Temesi, 2022).

Since 2001 they possess *organic certification controlled by Biokontroll Hungária Nonprofit Ltd.* The share between organic and non-organic products is currently 60-40 % but they sell an increasing proportion of organic products. This figure is justified by the fact that a great part of non-organic products is stemming from the collection of golden rod (*Solidago virga-aurea*). (Schmidt and CO. Ltd., 2021).

The *mabagrown® Procurement Standard* aims to combine product safety, product availability, social, and environmental sustainability in a single framework and encourages product development. The standard provides visibility and control of the entire supply chain through documentation. (Schmidt and CO. Ltd., 2021).

In addition, the so-called *GACP (Good Agriculture and Collecting Practices)* is also implemented into the company's management strategy to ensure appropriate and consistent quality during the cultivation, processing, and even storage of plant drugs. (Schmidt and CO. Ltd., 2021).

The *FairWild standard*[15] has been introduced to their operation by the Martin Bauer Group and has been in use since 2009. Their standard refers to the following plant species: *Sambuci fructus, Sambuci flos, Rosa canina, Tilia cordata, Urtica dioica.*

The mission of FairWild is „to enable the transformation of resource management and business practices to be ecologically, socially, and economically sustainable throughout the supply chain of wild-collected products. The aim is to provide a worldwide framework for implementing a

[14] They have partnerships with more than 20 producers, including municipalities, small, and large farmers, who cultivate herbs on more than 1300 hectares, mainly *Foeniculum vulgare*, *Rosa canina*, and *Sambuci fructus*. (Interview-Schmidt, 2022)

[15] The standard is connected to the FairWild Foundation which is a Swiss-registered Nonprofit Organization.

sustainable, fair, and value-added management and trading system for wild-collected natural ingredients and products thereof." Besides, ethical working conditions and fair salaries provided for collectors are also focal points to guarantee sustainable wild collection. (FairWild, 2022).

When applying the standard in practice, at first, it is necessary to estimate the number of herbs occurring in the relevant area, as generally only 60% of the areas can be harvested to ensure the survival of the plant's genetic stock. Every year there is training to educate the collectors on sustainable harvesting methods and to give them solid knowledge concerning the identification of poisonous plants. (Interview-Temesi, 2022).

Traceability is a fundamental part of the standard, requiring that every detail must be documented: collectors, collection areas, collection logs, resource analysis, and follow-up regarding the remaining resources. There is one employee from the herb company who brings the collectors together, looks after them, and pays them daily. Processing is also detailed to guide what drier shall be used for drying a special plant, where to store the material afterward, etc. (Interview-Temesi, 2022).

Related to sustainability, the standard has an important social aspect as well, which is called a premium. It can cover various programs based on the companies' unique features; the goals can be modified for what serves the community the best.[16] At Schmidt and CO. Ltd. they decided to support winter employment (wood cutting, cleaning, etc.), pay winter electricity bills, give gift packages, and assure bus sharing for the participating collectors.

The amount of the bonus is presently €0.50/kg, which is paid by large multinationals who give this money back indirectly to collectors. (Interview-Temesi, 2022).

[16] To provide a practical example, in Africa, they typically build schools and roads with premium money.

According to József Schmidt, the premium guarantees that the group of harvesters will survive and remain interested. Currently, there are 48 people from the region of Ormánság, which represents a few villages. Most of them are young Roma persons who like freedom and do not want to be tied down, so turnover among the employees happens frequently. He added as well that it is hard to motivate and keep them in the program because they do not tolerate being told what to do. They generally go collecting when they need money urgently.

He explained that the aim and the guidelines of the FairWild are good and noble, but many producers are not aware of it sufficiently. It works mainly with those businesses that are conscious enough to care for the environment. He also underlines that the standard requires too much effort for administration and it is not financially worth doing.[17] Besides, during the annual inspections, they are often confronted with problems arising from local customs. For example, the issue of child labor is prohibited by the standard. They should always make it clear to FairWild auditors that Roma people do not leave their children alone, but always take the little ones with them. This is also the case when collecting, especially during school holidays. The children do not work, but they accompany their parents. This is also the basis for learning about medicinal plants from their ancestors and how to collect them in the wild. This is the way how knowledge is passed down through generations. József Schmidt illustrated this through a personal experience from decades ago. It happened that they were collecting MAPs in the neighborhood, near Igal, when one of the Roma collectors approached him and asked if they were collecting „cinnadónia" too (using this particular Hungarian word) because it was time to do so. At first, József Schmidt did not understand which plant he meant exactly, but then he realized that the old Roma harvester was using the Italian name with a Hungarian accent

[17] The aforementioned Nagy Mihály Medicinal and Aromatic Plant Ltd. also possessed the FairWild standard, but they stopped using it years ago due to the high administrative burden and they had difficulty in organizing the distribution of the premium as well. (Interview-NAGY, 2022).

for the plant Greater Celandine (*Chelidonium majus)*. This can be explained by the fact that the ancestors of the Roma collector learned from the Italian monks living in the region in the past.[18] This traditional knowledge of herbs has been preserved over generations among the local collectors, however, nowadays it is decreasing because – as the owner of the company noted - younger ones do not have nearly as much knowledge as their predecessors had. (Interview-Schmidt, 2022).

Figure 15*: Chamomile (Matricaria recutita) plantation near Baksa. Source: own photo.*

Although the herbal company is profit-oriented, it is committed to both nature protection and a sustainable future and is taking steps to help local collectors from poorer communities. It is their priority to ensure continuity at the company and to preserve the jobs of

[18] This conclusion is probable, since according to the Historical-Etymological Dictionary of Hungarian herbs' names, the word „cinadónia" is of Latin origin and indeed means the plant *Chelidonium majus*. (Vörös, 2008). Thus, it is assumed that the name of the plant entered the vernacular through the Western monks.

the collectors and workers. That is why they continue to participate in FairWild indeed to provide their local collectors with the extra income coming from the premium money. (Interview-Temesi, 2022).

4.3 Györgytea Ltd.

The family-owned company was named after its founder, György SZABÓ, who is best known in Hungary as „Uncle Gyuri Szabó". It has been a long and special journey to the point where his name has become inseparable from herbs among Hungarian consumers, and his engaging personality has contributed greatly to the flourishing of the company. He is now over 90 years old but is still involved in the life of the company, which is now run by her daughter, Zsuzsanna LOPES-SZABÓ, herbal expert and executive manager, and former teacher.

According to the family legend, the maternal grandmother of Uncle Gyuri Szabó (born in the 1860s) was raised in Sajókazinc which is a little village in Borsod-Abaúj-Zemplén county, situated in northern Hungary. She had a vast knowledge of medicinal and aromatic plants, which she had inherited from her ancestors. Since there was no doctor in the village, or it was too expensive to call one, she performed in the community as a kind of medicine woman or healer, acclaimed to cure both local people and animals. Her traditional healing knowledge was considered a treasure among the locals, which was part of the community's spiritual culture and always passed down over the centuries from generation to generation. She taught her grandchild, György for the knowledge and respect of medicinal plants at a very young age. During his childhood, the little György also learned from a local midwife, as the son of this woman was a friend of him, and the children could accompany the wise woman to collect wild herbs and acquire the knowledge of what plants, when, and how to harvest. In later years, during the era of communism, he did not work with medicinal plants. It was only when he retired that he started collecting herbs again, drying them at home and selling them at the

market. In 2004, as his reputation spread quickly and more and more people were interested in his teas and advice, Györgytea Ltd. was established. (Interview-Lopes-Szabó, 2022).

The firm employs 53 permanent workers. Besides, approximately 150 families from nearby villages and numerous individuals (for example students) contribute to wild collection temporarily. They are local people who usually belong to the poorer Roma ethnic group. When it is time to harvest wild plants, a colleague from the company contacts the leader of the Roma group and lets him know that the collectors can be notified and go to harvest. Györgytea Ltd. is very conscious that Hungarian herbs should serve domestic consumers, so they do not sell their products abroad (although they often receive offers from foreign companies, most recently from a Chinese one). As Zsuzsanna Lopes-Szabó explained during the interview with the researcher, 99% of their raw materials come from wild collections, some of which they collect themselves and some of which they source from suppliers. They do not want to go into cultivation because it can be very expensive due to costs occurring related to the possession of fields, soil maintenance, and human resources. (Interview-Lopes-Szabó, 2022).

60-100 species of plants are available in their surroundings. They currently sell nearly 30 types of unique herbal teas and a wide range of tea blends, including tisanes or teas recommended for diabetes. Moreover, they organize herbal tours for visitors in the forests of the Bükk mountain, maintain educational and health promotion programs, and publish their herbal books. They have recently launched two new products specifically for baby care. In their herb factory, innovative production practices are combined with manual processing.[19] (Györgytea, 2022).

[19] The firm also welcomes college students who can learn a lot about the practical side of the profession as trainees. (Interview-LOPES-SZABÓ, 2022).

***Figure 16**: A part of the herb garden of Györgytea Ltd. in Bükkszentkereszt. Source: own photo.*

The quality of raw materials is of key importance in their internal policy, as well as environmental protection and sustainability aspects during both collection and production. In this context, they pay attention to sustainable harvesting methods and only harvest the number of herbs in the areas that will ensure the stable survival of the stand in the coming years. Besides, they use recycled and/or recyclable packaging, containing jars made of aluminum and glass. Tea bags are delivered in paperboards. Regarding the social aspects, it was said that a priority for the company is to support the villagers and provide them with work. As a family business, they care about protecting jobs and the future of their employees. However, as Mrs. Lopes-Szabó admitted, the wild collection of herbs is a heavy job, and it is sometimes difficult to cooperate with Roma harvesters due to their free lifestyle. Involving them in proper plant harvesting and maintaining sustainable methods during work remain challenges each time. (Interview-Lopes-Szabó).

According to Mrs. Lopes-Szabó, the Hungarian herbal industry shall face many difficulties nowadays. One of the serious concerns is the legal context. Since herbs are classified as food supplements, no medicinal properties can be attributed to them during distribution and marketing.[20] In her point of view, herbal products should be regulated as a separate, distinct category on the market. Despite this legal issue, the need for medicinal plants in society is growing, and demand for herb products is increasing. (Interview-Lopes-Szabó).

Traditional medicine is a living phenomenon nowadays that should be kept alive. This immense knowledge has been passed down and preserved through generations, therefore it is in the interest of all of us not to let this common value be lost. In addition to contemporary Western medicine, it is important not to forget the healing knowledge that humanity has accumulated over the past centuries. The name of Uncle Gyuri Szabó has been intertwined with herbs in today's Hungarian public consciousness. As one of the best-known representatives of herbal medicine, his personality and work contributed to the widespread recognition and popularity of traditional medicinal plants in Hungary. (Györgytea, 2022).

4.4 Projects

In recent years, there have been several running projects aimed at finding practical solutions to protect local natural assets and achieve economic growth for the local population at the same time. These projects were carried out mainly by environmental non-governmental organizations (NGOs) with the financial support of the European Union.

[20] As part of the EU legal harmonization, the category called „medicinal product" was abolished in 2011. (G.K., 2011)

4.4.1 Traditional and Wild: Promoting traditional collection and use of wild plants to reduce social and economic disparities in Central Europe

This project was financed by the European Union and was realized in a transnational framework from May 2011 to April 2014 with the contribution of nine organizations from Hungary, Slovenia, the Czech Republic, and Poland. The project was advocated essentially because, although Central Europe is still very rich in wild MAPs, traditional knowledge regarding the characteristics and usage of these plants decreases for many decades „due to urbanization, changes in land ownership and changing lifestyle choices".[21] The main goals of the program were to „protect cultural heritage of collecting and processing useful wild plants, and to foster the sustainable use of traditional knowledge and expertise among vulnerable groups, particularly the ethnic Roma populations, the elderly, and women, in rural parts of Central Europe". It aimed to build the local capacity of workers and support the region's economy in long term. (Rodina et al., 2014).

The project partners, including local authorities, academic institutions, and NGOs targeted to fight against rural unemployment and unsustainable harvesting practices. Having a transnational approach, the relevant areas' socio-economic and cultural contexts were analyzed, data was gathered on wild MAP species, a strategy for capacity building was developed, as well as markets for local products were identified. (Rodina et al., 2014).

Two pilot areas were selected from the territory of Hungary, Kunadacs, and Ormánság. *Kunadacs* is a village in the Great Hungarian Plain, in Bács-Kiskun county, involved in agriculture. The assessed plant species contained *Sambucus nigra*, *Urtica dioica*, and *Juniperus*

[21] According to the report, around „2000 wild plant species are traded commercially presently, of which 60-70 % are native to Central Europe." (Rodina et al., 2014).

communis. From the plant materials marmalade and dried herbal tea are produced, as both have a long tradition of consumption in the countryside. (Rodina et al., 2014).

Besides, investment was also carried out during the project, resulting in the construction of a folklore house that has been in use since then. The first room of the country house presents the region of Kiskunság with pictures and descriptions, while the second exhibition room shows the uses of the collected plants and the products made from them. The house is open to hosting open-air traditional children's and crafts programs during spring and summer. The investment was also supported by the local municipality, since it is important for them that residents and visitors learn more about the landscape's natural treasures, including the natural plant treasures that are an integral part of the Kiskunság region. Kunadacs has a long tradition of herb collection and processing, in the 1980s and 1990s wild plant harvesting provided a significant source of employment for local people, with a small processing plant even operating in the village. They would like to revive this now, to provide families with an extra income. (Szép magyarország, 2014).

Figure 17: *Usage of wild plants in the folklore house of Kunadacs. (Credit: Kristina Rodina. Source of picture: Rodina et al., 2014).*

The other pilot area for the program was in *Ormánság*, situated in the South-Western part of Hungary. This is the region where the previously described Schmidt and CO. Ltd. operates. Through the program, four training sessions were organized with 53 participants who gained basic knowledge about MAPs and their sustainable usage. In addition, „product development, marketing, and entrepreneurial options" were also argued. (Rodina et al., 2014).

By the end of the project, it turned out that the Hungarian herbal sector has solid economic potential, however, applying a transnational model and involving several stakeholders can help to deal with such complex matters as supporting the endurance of the traditional wild plant harvesting methods in central Europe. Moreover, new technologies and investments into community spaces (for example training facilities, and gardens) are key components of keeping and continuing the traditions of wild medicinal and aromatic plants. (Rodina et al., 2014).

4.4.2 LENA: Local Economy and Nature Conservation in the Danube Region

As one of the INTERREG projects[22], LENA was co-financed by the European Union and Hungary. It was carried out between January 2017 and June 2019 with the aim to support „the sustainable use of natural and cultural heritage and resources" in the Danube region. It was realized with the cooperation of twelve partners from seven countries (Bulgaria, Croatia, Germany, Hungary, Romania, Serbia, and Slovenia) and eleven conservation areas. The project was implemented in Hungary by WWF Hungary and TRAFFIC[23].

[22] The Danube Transnational Programme is a financial tool of the European Territorial Cooperation (ETC) or Interreg. It is strongly linked to the European Union's cohesion policy and aims to maintain common actions and policy exchanges between actors from several levels of different Member States. (Interreg, 2022.)

[23] TRAFFIC is a leading non-governmental organization working globally on trade in wild animals and plants in the context of both biodiversity conservation and sustainable development. (WildCheck Report, 2022).

The main objective of the LENA project was to support a joint and integrated approach to the conservation and sustainable use of protected natural areas (mainly Natura 2000 territories) and to create new income-generating opportunities in sectors based on natural resources. As part of the program, the previously presented FairWild standard was used for better resource management of commercially harvested medicinal plants and thus protect nature. One of the main purposes was to create long-term benefits for the regions concerned through training collectors in sustainable production techniques and the application of fair-trade standards, as well as contributing to the development of livelihoods of the local communities. (WWF Hungary, 2022).

In the project, there were various goals, for example maintaining an added value of sustainable agriculture, strengthening marketing of regional tourism, sharing know-how, generating income from wild plants in a sustainable manner, and connecting local people and nature for progress and welfare. The population of the participating regions was mostly poor, facing emigration and aging societies. (Interreg, 2022).

In Hungary, the project was realized in the Szatmár-Bereg Nature Park which is situated in the nort-east part of Hungary and has been engaged in contributing to the progress of this rural area by cooperating with local firms and persons. Nature is communicated to the companies as an advantage that can provide benefit to the local economy. Knowledge was passed on to collectors about sustainable collection methods and products that can be developed based on the available wild-collected materials in the region. (Interreg, 2022).

The program in Hungary also aimed to create job opportunities that, in addition to their economic benefits, can contribute to the preservation and enhancement of the natural and cultural heritage, through the conservation and maintenance of protected natural areas and their sustainable use. At the end of the organized and implemented harvesting of wild local plants (e.g., *Sambucus nigra, Crataegus, Prunus spinosa*), a typical and popular product has been

processed. The community's educational and demonstration cooking events have resulted in the production of pear, elderberry, and hawthorn jams. These products can be sold locally, providing additional income for dozens of families per village. It is a kind of secondary income, the amount of which depends only on the activity and commitment of the people involved in its production and sale. In other words, the implemented program will not only have an economic benefit but will also have a positive impact on nature (as a significant part of the birch bushes have been eradicated by the employees of the public works program in the area in recent years, causing huge damage to wildlife). Moreover, it is expected that the completion of the program will serve as an example to the inhabitants of the region and that the areas with birch bushes will become valuable habitats. By stopping the destruction, real value can be created. (LENA output, 2019).

4.5 Wild collection or cultivation?

4.5.1 Cultivation

With the growing global demand for various wild plant species, and due to over-exploitation happening in many parts of the world, there is a suggestion to start cultivating herbs. At first glance, it seems an obvious idea that can fulfill conservation purposes, as well as decrease the magnitude of the wild collection. However, the overall picture is much more layered and composite, since cultivating can also induce loss in genetic variation, as well as deterioration in natural habitats. (Schippmann et al., 2006).

The majority of aromatic herbs are cultivated either in home gardens or grown as crops on a small scale. The latter needs less financial investment and can generate more consistent income. It is though, an interesting question why fewer plant species are under cultivation? What are the reasons for growing some crops specifically and not others? One reason is that

herbs coming from cultivation are often designated as lower quality compared to wild harvested plants. Another explanation is that domestication is not feasible from a technical aspect with every specimen, because it may be too complicated to accomplish due to biological, social, ecological, or mostly economic factors. (Schippmann et al., 2006).

The range of medicinal plant species cultivated is naturally much narrower (approximately 40 species) than the species collected.[24] With the growing demand for organically labeled products, quality, uniformity, traceability (quality assurance), and reliability, are of paramount importance to processors, can be achieved to a much greater extent in cultivation than with collected species. The limitations of herb collection also mean that it is essential that certain wild herbs are brought into cultivation. However, the area under medicinal plants is significantly influenced by the area under cereals and industrial crops and their profitability; the traditional herb-growing areas have withered away, and the land that has been freed up has been generally taken over by horticulture and other arable crops. (HAPC, 2020.) In this context, another aspect should be taken into account, literally that those people from poorer social classes who do collect wild herbs for their livelihood may not have the possibility to own lands for producing MAPs. (Schippmann et al., 2014).

The next table shows the herbs that are in demand presently and can be cultivated small scale.

[24] For comparison, there are about 5,000 species of medicinal plants in China, of which 1,000 are in regular usage, but only 100-250 are cultivated. (Schippmann et al., 2006).

Nr.	Plant species (and the part of the plant containing the drug)
1.	*Ocimum basilicum (herba)*
2.	*Mentha piperita (herba, folium)*
3.	*Melissa officinalis (herba, folium, Melissae aetheroleum)*
4.	*Thymus vulgaris (herba, Thymi aetheroleum)*
5.	*Calendula officinalis (flos)*
6.	*Levisticum officinale (radix, folium, fructus, Levistici aetheroleum)*
7.	*Lavandula angustifolia (flos, herba, Lavandulae aetheroleum)*
8.	*Majorana hortensis (herba)*
9.	*Malva sylvestris (flos, folium)*
10.	*Althaea officinalis (radix, folium)*
11.	*Salvia officinalis (folium)*

Table 7*: MAP species that can be cultivated small scale and currently are in demand. Source of content: Bernáth et al., 2014. Table format: own elaboration.*

To make a *comparison between collection and cultivation*, let's analyze further the advantages and disadvantages of both methods.

The main benefits of herbs gathered from wild resources are the followings: easy, cheap, and unclosed accessibility for raw materials, natural characteristics without pesticides[25], and it is believed to have more healing efficacity. On the other hand, the disadvantages are vulnerability (may be overharvested), and lack of relevant management systems. (Chen et al., 2016). In addition, it cannot be ruled out that other plants may have been mixed in with the collected material, and at harvest, the plant material is often inhomogeneous, i.e., it may contain plant parts with different phases and different active contents. Some species, like mistletoe, for some reason, cannot be grown, while goldenseal makes no sense to grow in Hungary.

[25] When collection takes place in multiple areas, the contamination of the harvested small amounts cannot be detected. Similarly, documentation may be impossible. (Nagy, 2020).

Collection requires a heavy workforce and fewer and fewer people are taking on to find the work.

Another huge problem has occurred recently, literally that the privately managed areas require a permit for collecting herbs on the field, and the tendency shows that more and more areas become private and so require a permit. (Nagy, 2020).

Therefore, the main reasons for reduced wild collection nowadays are labour shortage; decline in the collector networks; climate change in the country; many former collection areas can only be used in possession of permits; collection cannot ensure the expected drug quality.

The flourish of medicinal plant cultivation in Hungary dates back to the period 1967-1990. However, after the fall of communism and the collapse of the former centralized economy, among others, the circumstances of herb cultivation have been overall motivated by the need for constant quality (reliability, quality assurance) and the fact that some species are no longer available because they have become protected. Furthermore, properly mechanized cultivation requires less labor. (Nagy, 2020).

Lange draws attention to certain facts that influence greatly the efficacy and profitability of cultivation: the lack of detailed cultivation technology for some crops that are problematic to grow; narrowed genetic diversity; the lack of machinery for specific medicinal plants; the matter that some herbs are only wanted in limited quantities. (Lange, 2004).

The area under cultivation of medicinal and aromatic plants in Hungary is about 25.000-30.000 hectares, this number contains also plants used as spices. Of this, the area under classical medicinal plants, except for mustard, poppy, and shelled pumpkin, is estimated at practically 2000-3.000 hectares. (HAPC, 2020.)

The following table presents the most commonly grown MAPs in Hungary.

Plant species	Area in hectare / year			
	2015	**2016**	**2017**	**2018**
Papaver somniferum	8276	8180	5309	1281,7
Cucurbita pepo	12603	18385	6586	6324,5
Sinapsis alba	5799	6541,2	5254	7015,4
Foeniculum vulgare	993	1282,4	979	3291,3
Silybum marianum	306,2	532,4	396	287,9
Anethum graveolens	370,8	631,8	516	336,7
Pimpinella anisum	293,6	278,2	116	147,5
Matricaria chamomilla	202,2	390,7	450	480,6
Coriandrum sativum	302,2	445,7	23	32,7
Carum carvi	266,3	365,5	361	170,4
Satureja hortensis	135,5	161,7	104	36,7
Achillea millefolium	no data	104,1	123	195,2
Lavandula angustifolia	109,3	105,6	151	158,4

Table 8*: The most important domestic cultivated MAP species, including the amount of the cultivated areas. Source of content: HAPC, 2020. Table format: own elaboration.*

Regarding endangered MAP species, cultivation (based on good agricultural practices) means an alternative for *conservation* because the continuous burden on wild herb populations can be allayed by satisfying the need of the market from plantations. In parallel, the severe conservation of the remaining plants and also the protection of the germplasm ex-situ are inevitable. Concerning other MAP species that cannot bring into cultivation, the only option for conservation is wild collection in a sustainable manner. It not only protects the plant species and their habitats but can contribute to benefit the ecological diversity and the local economy. (Schippmann et al., 2014).

According to Chen et al., the conservation strategies of medicinal and aromatic plants contain 3 types: *in-situ* conservation (natural reserves and wild nurseries); *ex-situ* conservation (botanic gardens and seed banks); *cultivation practice* (applying Good Agricultural Practices). (Chen et al., 2016).

In Hungary, the trend towards more cultivation and less traditional collection is likely to continue in the future. As Sára Kindlovits confirmed, cultivation will come to the fore, although there are several players (Albania, Bulgaria, Egypt) who market herbs at lower prices than Hungary and could therefore be serious competitors. (Interview-Kindlovits, 2022).

5 Conclusions and Recommendations

Many herbal experts and scientists report that globally the area of former plant habitats is reduced. In addition, consumer demand for medicinal plants is constantly growing, as these plant substances are not only used as medicines and pharmaceuticals but can also be used in many other areas, such as food or cosmetics. But as the multi-billion-dollar industry builds up in the Global North, the previous, centuries-old traditional collecting habits change, and overharvesting takes place. These tendencies negatively affect the stocks of wild plant populations and in the worst case, can lead to biodiversity loss or even the disappearance of some plant species.[26] Investments are therefore needed to progress harvesting methods and conservation strategies that can serve both local interests and growing international demand. (Bodeker, 1997).

As Lange also confirmed, in states of the former Soviet Union, the main threats concerning wild MAP populations are „the increasing and intensive commercial collection; unmonitored trade; destructive harvesting techniques; trade structure changes; global habitat loss and alteration". Over-exploitation can also lead to a loss in genetic variety. (Lange, 2004).

This issue is detectable in Hungary indeed.

With all this in mind, the purpose of the thesis was to discover the Hungarian herbal sector in its complexity and present it from both theoretical and practical perspectives, with the aim to seek good practices. This approach has helped to show the industry's strengths and advantages, but also its weaknesses and difficulties.

[26] In this context, some important MAP species should be mentioned that have become endangered due to overcollection, such as *Prunus africana* from the central and southern part of Africa, or *Arnica montana* from Europe.

The focus was on the usage of medicinal and aromatic plants available in Hungary, in the framework of biodiversity conservation and local economic support. Another perspective was to consider sustainable harvesting as an option for the conservation of habitats and endangered herbs, while considering their input to local economies in rural areas, including collectors' income.

The research revealed that although Hungary is still rich in medicinal and aromatic plant species, there are already signs of biodiversity loss, due to extended agriculture, among others. In addition, the herbal sector is typically a peripheral field, containing agricultural, social, economic, and environmental features. Therefore, it is more difficult to manage since each part has its own problems but there is no real holder to act.

It was found that the herbal medicine sector and the processing industry based on it could be an important contribution to the Hungarian economy. In the short term, its positive employment impact could be significant, and its value added to exports could be substantial. (HAPC, 2020.)

To advance the sector, a holistic perspective should be taken that considers it as a whole, including its economic, environmental, and human dimensions. Besides, knowledge cooperation would help to combine scientific and traditional ecological knowledge.[27]

In addition, it is with care and prudence that we should examine and shape the future of these vital medicinal and aromatic plant species. The ancient traditional ecological knowledge closely linked to these plants should not be set aside but should be better understood and applied, complemented by our modern scientific knowledge.

[27] Enough literature is available to solve that matter, but usually, it remains at the academic level due to financial problems, as there is not enough money to put theory into practice. (Interview-KINDLOVITS, 2022).

Lessons could be learned from the practice of our ancestors who used natural resources sustainably, as their own survival was tightly linked to the materials available locally.

Based on the findings of the research, it can be also concluded that the usage of MAPs in various forms will continue to grow worldwide, including in Hungary. In this country, many plant species will be still collected in the wild but following current trends, the importance of wild collection will decline year by year as there will not be enough personnel to harvest. Cultivation will therefore become more intensive. In order to support local collectors in rural areas and to preserve their traditional knowledge of medicinal and aromatic plants that is still detectable today, sustainability, transparency, required skills and knowledge, and responsible business practices would be of key importance.

With regard to the above-mentioned, the following **recommendations** should be considered to advance the Hungarian herbal sector.

- A significant shortcoming is a fact that real numbers related to wild collection are only estimated. Both the accumulation and the exchange of data are highly encouraged at the national, European, and international levels.
- Development of the sector should be based primarily on domestic production and collection. The technical, legal[28], and financial conditions for drug certification must be created, containing guidelines for sustainable harvesting practices. To facilitate the increase of the domestic herbal medicinal products industry, a proper legislative environment shall be created which, on the one hand, considers the EU harmonized legislative framework with its ongoing changes and, on the other hand, provides domestic companies with a

[28] A huge remaining concern is still the lacking proper place for MAPs in the Hungarian legislation. Until herbs are categorized as food, they cannot fulfill their true function, including healing purposes.

unique opportunity, including competitive advantage. The operation of quality assurance systems at all levels concerning good agricultural, collection, and cultivation practices shall be introduced generally, supported by training. (HAPC, 2020.).[29]

- Pilot projects can be useful tools to combine sustainable wild plant collection with local economic purposes. However, they do not reflect reality in all cases and their long-term impact is uncertain as well. Their goals are noble, but the main organizers (usually NGO-s) are not interested in an economic sense. Those persons and/or companies should be part of the programs who want to make a profit but also have the means and expertise for applying sustainable principles. If they can define the targets for what they will use the financial support received through the project and can organize it, they will be motivated in the long term to create value. Involving local people and universities would be beneficial too. (Interview-Kindlovits, 2022).
- Eco-labels and standards for certification can provide feasible and good solutions to guarantee that products made of wild herbs were created under sustainable conditions. But the implementation might be difficult and burdened with too many administrative duties. Probably more actors could be involved by simplifying administrative obligations.
- It would be essential to remove the territorial restrictions on the collection and to develop more extensive cooperation with forestry departments and national parks. A move towards a controlled collection framework must ensure that the increasingly strict territorial limits on the collection are lifted. A crucial objective is to simplify the administrative burden of collection. (Nagy, 2020).

[29] Although sustainable wild MAP collection depends upon good working practices and reliable scientific data, this option generally faces several challenges, literally „lack of knowledge about sustainable harvest rates and practices, undefined land use rights, lack of legislative and policy guidance." (Schippman et el., 2002).

- Given the specific situation of wild-collection and herb collectors, the number of new jobs should not be the only priority, but the legal income from the activity should be supported or harmonized by the following legal and administrative tools:

- Since the majority of the collectors belong to the poorer Roma ethnic group in Hungary and they gain financial aid from the state, the income from collecting should be aligned with increasingly stringent aid and social policies. (Nagy, 2020). This would also provide a solution for the issue of off-season/winter employment, which is strongly connected to the matter of why so many people stop collecting and choose a stable, steady income-generating job instead.

- To monitor professional collection, appropriate training (e.g., courses on sustainable harvesting methods) and registration of collectors should be developed, together with the issuing of a (revocable) license.

The research has shown that the herbal industry is a complex phenomenon with many advantages and difficulties. This means that challenges must be addressed in an open and compound way as well. Building on the Hungarian sector's strengths (including the good quality of herbal raw materials, and the already emphasized traditional knowledge), such solutions should be adopted in the future that sustainably generate economic benefits, based on locally available herbal raw materials, and skilled local labor. Subsidies would be important for green investments available for interested and competent companies, and for training and retaining the local workforce.

Smaller communities have a better chance to preserve the tradition of wild herb collection, and to be an integral part of health and/or provincial tourism, as well as the green economy. Through that way they can flourish and gain self-sustainability in the long-term.

A complex approach would therefore benefit not only local herbal companies but residents in rural areas and last but not least, the valuable natural resources.

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7 Glossary of terms

Ethnobotany:

„The study of a region's plants and their practical uses through the traditional knowledge of a local culture and people." (Wikipedia, 2022).

„Systematic study of the botanical knowledge of a social group and its use of locally available plants in foods, medicines, clothing, or religious rituals." (Encyclopaedia Britannica, 2022).

Ethnoecology:

This field of science „studies the local knowledge of biotic and abiotic factors and makes intercultural, comparative surveys of systems of knowledge, practice and beliefs". (Molnár et al., 2008).

Medicinal and aromatic plants (MAPs):

In the broadest sense, medicinal plants are those plants that have been or are used for medicinal purposes, according to tradition or literature. In a narrower sense, a medicinal plant is a plant that has a beneficial physiological effect and is not harmful when used in a prescribed dosage. (Györgytea.hu, 2022).

The term refers to whole plants or parts of plants which were not subject to any kind of processing, except drying, cutting, powdering, crushing, or using for making tincture.

In a broader sense, medicinal plants are medicinal herbs, aromatic plants, and spices, some of which are used for medicinal purposes because of the active substances they contain. A herbal drug is a part of a medicinal plant containing an active substance described in pharmacopoeias, monographs or standards, or the product of some primary process.

In this sector, herbal drug means:

- The part of the species of medicinal plant containing most of the active substances, usually preserved by drying, which has not undergone any mechanical processing or other treatment other than cleaning, peeling, chopping, if any.
- The product obtained from the raw plant material, for example essential oils, resins, balsams, etc. (HAPC, 2020.)

According to Bernáth et al., purchasing standards mean the quality standards for the highest quantities of herbal raw materials purchased: flowers (*flos*); leaves (*folium*); bud (*gemma*); roots (*radix*); fruits (*fructus*), seeds (*semen*); and other herbal drugs. (Bernáth et al., 2014)

According to the Hungarian National Institute of Pharmacy, medicinal plants are those which are listed in the official pharmacopoeia. The current Hungarian Pharmacopoeia VIII lists a total of 137 medicinal plants, officially excluding many plants that have been used in folk medicine for long ago.

The WHO lists about 20,000 medicinal plants. (Bernáth, 2000).

The National Institute of Food and Nutrition (NFI) does not deal with medicinal plants but considers a large proportion of them as food and applies the same legislation to them as to foodstuffs. (Györgytea.hu, 2022).

Sustainable use of herbs:

"The use of components of biological diversity in a way and at a rate that does not lead to the long-term decline of biological diversity, thereby maintaining its potential to meet the needs and aspirations of present and future generations." (WHO, 2003.)