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Synthesis Value Chain Mapping Report Phytopharmaceutical Industry

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*Cross-clustering partnership for boosting eco-innovation
by developing a joint bio-based value-added network for the Danube Region*



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For further information about the DanuBioValNet project, you will find a short description at the end of the document. To learn more and to download additional resources please refer to the project website <http://www.interreg-danube.eu/approved-projects/danubiovalnet>.

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INTRODUCTION

The DanuBioValNet project was launched in 2017 through a cross-regional partnership involving 17 partners from 10 Danube regions to enhance transformation from fossil-based economy towards an economy using renewable resources by creating Danube bio-based value-added networks. The project is designed to connect Danube actors in a bio-based industry to minimise greenhouse gases and to optimise biomass resource utilisation. These effects will improve the sustainability, regional development through diversification of the local economy and will also positively affect the workforce. The emerging transnational cooperation of clusters is put in the focus to foster bio-economy and eco-innovations and lead to a strengthening of the regional economies.

Partners agreed that phytopharma, eco-construction and bioplastic/advanced packing (bio-based packaging) are high potential value chains that allow partners to connect SMEs, farmers, universities, and research institutes within a value-added DanuBioValNet network. The partners intend to develop and implement a long-term, industry-driven roadmap for such collaboration along the entire value chain based on cluster partnerships for these processes. Focusing on the selected high potential, and harnessing the nature of regional clusters within wider cross-regional selected value chains, DanuBioValNet will implement pilot actions, involving SMEs, universities, research institutions, policymakers, and civil society among others. The pilot actions serve as the prerequisite for creating a blueprint for cross-regional cooperation.

VALUE CHAIN MAPPING

The present Value Chain Mapping Report is the third key deliverable of the project. It is the first Value Chain Mapping Report in the Danube region. Coinciding with the period during which the block chain technology proved to change the added value creation logic and with the time that perception of strategic timeframe shrinks to one year and less.

The findings and conclusions of this report summarise the regional Value Chain Mapping Reports, with the specific focus on the missing links, main gaps, and constraints along the selected value chain and illustrate the most promising cooperation areas within this particular value chain. The report also provides observations and considerations to be taken into account of the upcoming roadmapping activity. The report follows the guidelines stipulated in the approved application form. This report also takes into account the learning and feedback received during a discussion with a partner, the kick-off conference in Prague, the SCOM meetings as well as the Phytopharma Day in Stuttgart held on December 5th, 2017.

OBJECTIVES OF THE REPORT

The report's objective is to provide an overview of the interviews conducted with representatives of the pharmaceutical industry in the DanuBioValNet region. The report should serve to highlight the tendencies and patterns that emerge from the aggregate information collected through the interviews. To reach the particular respondents, the contacts and networks of the clusters were used, or, when there is no cluster organisation identified, the interviews were done with the companies perceived as market leaders.

The summary statements relating to the topics listed below are based on the total number of cases interviewed. All respondents are anonymous.

METHODOLOGY

The initial value chain of phytopharma was developed among the project partners based on the research for relevant information material, among them studies, reports, global market studies, academic papers, including related policies. The lead partner provided a predefined value chains structure as base for further considerations. The regional reports on Bioeconomy (WP 3.1) identified three most promising value chains. It was supplemented with series of methodological templates on how to do the cluster mapping along selected value chains. In close collaboration cluster managers, and regional stakeholders/project partners completed the value chain and cluster maps, including NACE codes which describe the structure of three related industries: phytopharma, bio-based packaging, and eco-construction. Partners were encouraged to conduct the quality check on information received (activity and corresponded NACE Code). The quality check was performed with back calls to the cluster managers and selected firms.

Given that the ultimate interest is to stimulate value added activities in selected regions of Danube, it is useful to understand the current and potential market considerations appropriate for each of the value chains. In the context of end markets the value chain assessment explores the critical success factors of DanuBioValNet value chains to gain insight into the related gaps and to understand the primary drivers of value chain development. For the purpose of this activity, end market analysis is defined in terms of end market producers that are selling final products to the end consumer. The face-to-face interviews were conducted to collect related information. Three task groups were established among the DanuBioValNet partners to elaborate questionnaires for the value chain mapping. The groups were formed based on the motivation of partners and regional strengths in each of the selected value chains. Questionnaires were semi-structured by

nature aims to be used for face-to-face interviews. All project partners, in cooperation with cluster managers, conducted face-to-face interviews with selected end manufacturers in the region (see more in the regional Value Chain Mapping Reports). Questionnaires were analysed and findings were used for the identification of common gaps and constraints and promising cooperation areas. Partners discussed the findings and ideas at

the workshop held in Stuttgart on December 5th, 2017.

Partners finalised the activity by drafting regional Value Chain Reports. The following table provides an overview of what value chain analyses were conducted in each of the project partner regions. Some regions covered all three value chains, other only two or one, depending on regional preferences.

Table 1: Overview of conducted Value Chain Analyses in each Project Partner Region
(Source: Regional Value Chain Reports)

	ECO Construction	BIO Packaging	Phytopharma
Romania	X		
BW Germany			X
Upper Austria	X	X	
Czech Republic	X	X	X
Croatia	X		
Slovenia	X	X	X
Slovakia	X	X	X
Serbia	X		X
Bulgaria	X		X

Along those lines, the objective of this report is twofold. First, it summarises findings of regional reports on value chain mapping. Second, it provides vital observations to be taken into account in the roadmapping of the selected high-potential value chains.

STRUCTURE OF THE REPORT

The rest of the report is organised as follows. The next section provides an introduction to the phytopharmacy value chain methodology. Chapter 2 presents a summary of findings of regional reports on value chain mapping and the following chapters provide some vital observations to be taken into account in the roadmapping exercise of the selected high-potential value chains.

PHYTOPHARMA VALUE CHAIN

The DanuBioValNet project defines phytopharma as “health-related products derived from plant sources”¹ and comprised value added activities associated with producing pharmaceutical and cosmeceutical agents of plant origin. These include bio-active ingredients for pharmaceutical grade medicines, natural herbal medicines, cosmetics, cosmeceuticals, nutraceuticals, nutritional supplements and similar health-related natural products.

Phytopharmaceutical products offer a wide variety of value chains as they are part of at least three industries – pharmacy (dietary supplements, drugs), cosmetics (natural cosmetics, perfumes) and food industry (seeds, oils, herbal essences and extracts, etc.). The figure below illustrates the structure of the phytopharmaceutical value chain².

1) Memo Phytopharma Day, Stuttgart December 5th, 2017.

2) The value chain map were not designed to shed detailed insights on dynamics within and between nodes (e.g. separate nodes and channels for large commercial operators vs. SMEs and informal enterprises), but simply to identify the nodes themselves as clearly as possible.

Figure 1: Value Chain for Phytopharmaceutical Sector (Source: DanuBioValNet)

Illustration of simplified value creation. The cultivation of medicinal plants in the region is being conducted by farmers, end-product producers, as well as some research institutes among others. The cured plant is dried in the so-called “vegetable drug”. Plant drug products are crushed or powdered plant drugs, tinctures, extracts, essential

oils, extracted juices and derived secretions. They are obtained by extraction, distillation, compression, phase separation (fractionation), purification, concentration or fermentation. An active substance is obtained which is incorporated into the final product.

Markets in phytopharmaceutical and natural cosmetics are constantly increasing. The demand for natural products increases from year to year and due to the wide variety of possible products, actual trends and changing pattern of needs, companies are willing to expand their production operations. The global market for botanical and plant-derived drugs will grow from USD 29.4 billion in 2017 to around USD 39.6 billion by 2022 with a CAGR of 6.1 %. Europe is the largest herbal product market

worth USD 7.5 billion. Germany and France are the region’s market leaders. The German market for itself has an annual volume of EUR 4 billion (2015). In the European market, Germany has a share of 50 %³. The respondents of the survey represent different companies within the phytopharmaceutical co-construction value chain, including collectors, purificators, processors and manufacturers etc.;

Table 2: Interviewees and the Value Chain notes covered

Country	BW	BG	CZ	RS	SK	SI
Number of interviewees	3	N.A.	9	5	2	N.A.
Main business areas covered	Producers	Collectors and producers	Collectors, processors and producers	Whole VC	Collectors and purificators	Growers and food suppliers
The size of the company	Big company	SMEs	SMEs; big company	Small; big company	SMEs; big company	SMEs

SUPPLIERS OF THE SOURCE MATERIAL

For all producers the main source of the plant raw materials is cultivation. Wild collection plays only a minor role to them in some special cases. Some producers grow the resource material by themselves. The rest of the producers buy the semi-finished product from specialised cultivators of herbs. Well established producers from Baden-Württemberg (BW), Germany as well as from Czech have very well established supply chains and are capable to sourcing at global level (US, China, South Africa, Russia, Nicaragua, South America, India, Canada). In Europe main sourcing countries are Latvia, Romania, Albania, Germany, and Bulgaria, while firms from other DanuBioValnet regions mainly source locally.

The stable high quality is sine qua non of the supply chain, from raw materials to the final products. In the Guideline on Good Agricultural and Collective Practice for Medicinal Plants (GACP) the rules for the cultivation and harvesting of medicinal plants, their drying and storage together with the appropriate hygiene standards and the provision of traceability are laid down. Long term contracts are driving the supplier industry. The majority of companies have long-term contracts with their suppliers.

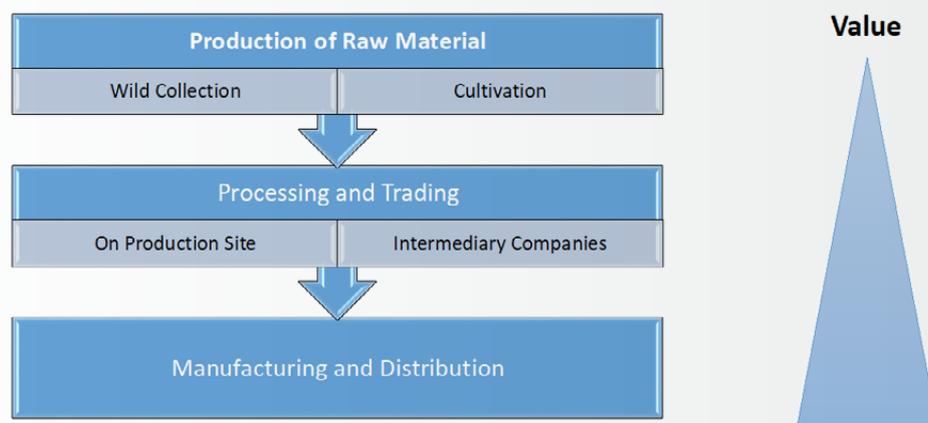
Two major groups of cultivators were identified. In Serbia and Czech, most cultivators in majority grow the resource material by themselves – having their own production of seeds (multiplication and

3) Significance of wild plants as resources for phytopharmaceuticals and natural cosmetics, Rainer Luick University of Rottenburg/Germany, <https://www.bio-pro.de/de/veranstaltungen/dokumentation/phytopharma-day>.

cutting) or buy the seeds from the institutes that have certified seed production or certified companies. In particular cases, some seeds are imported from Netherlands or Germany. Other groups (Slovakia, Bulgaria) are mainly buying seeds from certified seeds cultivators, for example from France, Hungary, Czech Republic (in particular hemp). The future availability of plant material depends on a variety of factors: the future development of the organic market in the US, growing competition, and, among others, environmental problems. The current obstacles or constraints involved in

obtaining increased volumes of the source material are climatic conditions and the daily capacity of the factories. In case of herbal collectors and cultivators, the obstacles to obtain more material are: hand labour, the aging of people involved in collecting and disinterest of the younger generation, specific mechanisation, administrative procedures for wild harvesting, lack of certified laboratories, outdated methods of physical and chemical analysis (the reference values are not updated, required parameters are not in accordance with EU standards).

Figure 2: Value added from production towards Manufacturing and Distribution⁴



RELATED INDUSTRIES AND SUPPORT SERVICES

Added value services are the key missing link in several regions. This is partly due to the cost optimisation but mainly due to the absence of the service in the region (absence of standards, equipment, knowledge). The establishment of specialised services depends on the demand, and, as in all other, economy of scale up to a certain threshold size of transaction has to be established.

The Czech value chain mapping, e. g., revealed the region as the only partner region with strong cooperation between firms and universities and research labs. Firms in other regions mainly depend on their own facilities/capacities or on services in other countries. Several examples also indicate that firms are using services in Czech Republic.

Bulgaria, Serbia as well as Slovakia stressed out that the level and availability of R&D centres and services are insufficient and hamper the growth of the firms.

Phytopharmaceutical associations are playing a critical role in terms of legislative and regulatory issues. They are also very helpful for creating long-term policy improvements and changes in the future. This way, the producers can make sure that their needs and ideas are collected. Firms are mainly making partnerships around those topics. Clusters along the phytopharmaceutical value chain do not exist and related technical assistance to related firms is very limited.

Table 2: Cluster Initiatives in the Phytopharmaceutical Sector

Name	Country	Number of cluster actors	Established
Orlicko Agrocluster	Czech Republic	15	2016
CzechBio	Czech Republic	31	2009
Indagro Pol	Romania	10	N. A.
HERBAL PHARMANET	Serbia	16	2012
Bioeconomy Cluster	Slovakia	16	2015

⁴) Source: The European Production of Medicinal and Aromatic Plants (MAPs), Joannes Novak, <http://www.coop4pam.com/web/wp-content/uploads/2017/10/O-setor-das-PAM-na-Europa-Johannes-Novak.pdf>

QUALITY AND LABOUR FORCE

The suppliers run their own quality measurement (QM) and the producers have also a quality management system at their company in place. Also, they rely on independent quality management certification bodies. Some project partner regions, like Serbia and Romania, have a shortage of internationally accredited certification bodies that are allowed to issue internationally recognised quality certification. In those cases the suppliers have to appoint expensive foreign certification bodies. Almost all producers (semi products, final products) stressed the importance of capacity building for cultivators, harvesters, and collectors. Technical assistance is still limited. Some of

the producers offer technical assistance to their suppliers (e. g. BW) to assure quality of the plant-based input. Technical assistance can be delivered in a variety of forms: Producers participate in on-site trainings and provide educational support for the local collectors and cultivators, while representatives and employees responsible for the respective activities train the cultivators, support meetings of cultivators, and support knowledge sharing.

To improve the quality and the price of the plant material, some of them are willing to deploy staff and/or technology for QM into the countries of the plant material origin.

COMPETITION

The main competitors for the respondents dealing with the herbal essences and extracts are producers in the three following areas: food industry, pharmacy and cosmetics (since there is a wide range of possible products). Since the synthetic essences are the substitutes for natural essences, respondents face a tough competition in both domestic and foreign markets.

There is a different picture when it comes to competition. The interviewed **cultivators** confirmed that there is no strong competition in their industry on the regional level. In terms of small-scale growers in the region, there is a need to cooperate rather than compete. Although there is a large assortment of customers, the cultivators are not able to increase the volume of their production. On the other hand, the price of the herbs has not changed significantly since the last century, so they are not

under pressure to increase production. However, in general, they mentioned the competition on regional, national and international level.

The **producers** of the phytopharmaceuticals feel competition mainly on national and international levels. Some of them have unique products on the market and nobody in the world produces the same, thus they do not have the competitors. But in general, the producers have to compete, of course, with international oil-chemistry-based pharmaceutical companies.

The most frequently mentioned countries considered as the "best in class" were as follows: France, Italy, Slovenia, Netherlands, Lithuania, Germany, US, Switzerland, and Turkey. The Cluster Mapping Report on phytopharmaceutical industries confirmed this observation, partly⁵.

FUTURE PERSPECTIVES

The potential of the phytopharmaceutical sector in Danube is huge. The Danube region has excellent natural resources, with research capacities and companies, several of them global leaders in the field of the production of herbal medicinal products. Natural conditions of Danube enable the cultivation of high quality medicinal plants for a use in several phytopharmaceutical value chains (rosemary, lime, willow, velvet, chamomile, and many others).

However, value added is uneven distributed across the Danube value chain. Regions with a significant

production of Medical Aromatic Plants (MAPs) in general do not equal to countries with extraction companies and with big manufacturing companies⁶. Most of cultivators and producers see the perspective in organic production and broader cooperation not only in pharmaceutical industry but also with other sectors. They see the opportunities in the development of new business models (sharing economy) and in new technologies (weather forecasting, virtual technologies, analytics, logistic). All of them also see great potentials in the bio-based (herbal) pharmacy.

5) Meier zu Köcker, Gerd and Dermastia, Mateja (2017): Cluster Mapping Synthesis Report on the Phytopharmaceutical Sector, <http://www.interreg-danube.eu/approved-projects/danubiovalnet/outputs>.

6) The European Production of Medicinal and Aromatic Plants (MAPs), <http://www.coop4pam.com/web/wp-content/uploads/2017/10/O-setor-das-PAM-na-Europa-Johannes-Novak.pdf>.

Value chain mapping exercises reveal the same pattern. Baden-Württemberg has a majority of firms positioned in the end market side, with well-established global players. While several other regions covered the whole value chain, their market penetration and access to Europe and global markets, such as US, China, is limited.

The companies, the suppliers of herbal material, stated that their main challenge is to keep up with the high demands from the pharmaceutical industry: to grow a greater variety of species, since wild collecting decreases; to apply EU standards for physical chemical analyses to all required parameters; to engage themselves in a more organic production, etc. According to them, the large companies should cooperate more closely with small businesses, in order to provide them support training, granting them certificates, offering new ways of growing, and getting better acquainted with new trends.

The **producers** currently do not have any big problem with the supply of plant material. However, they are exposed to a strong chemical pharmacy lobby and stressed that the use of phytopharmaceutical medicines and natural cosmetics needs massive public promotion. But they experience a strong pharmaceutical lobby which makes the situation of natural resource materials worse as in the case of some herbs with excellent healing effects that have been redefined as medical herbs

and not suitable for eating (food industry).

The cultivators suggest that the large producing companies have to collaborate more deeply with them, and provide training about proper growing, harvesting, knowledge sharing, information about new trends and opportunities, help in the certification process, etc.

All companies are interested to cooperate within the Danube region and with the consortium of DanuBioValNet. The producers of final products were identified as of interests in the first contact. This and other areas of mutual cooperation will be more clearly and deeply defined in future meetings.

However, some of them currently face some limitations in relation to the technological and human resources, but they are ready to pay more to obtain sufficient and needed amounts. In terms of policy, the respondents dealing with processing of hemp would prefer improvements in terms of legislation and bureaucracy burden.

The most promising markets in the area of phytopharmaceuticals are considered Germany, France, US and Switzerland. The most promising potential markets for phytopharma-based products, according to the producers, are all the countries from the European Union as in these developed countries there is the interest in growing, expanding and using natural products. Also Far East was identified as potential market.

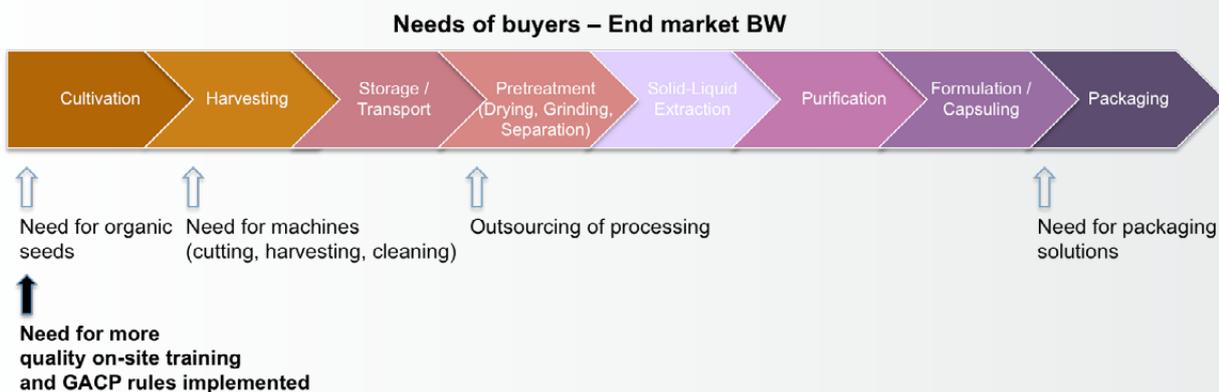
VALUE CHAIN NARRATIVE

Regarding the regional value chain of the phytopharmaceutical sector, the entire value chain is covered in the Danube region. The first part of the value chain is represented by cultivators. They include mainly smaller garden centres, nurseries and family farms where the cultivation of herbs has a long tradition. The **cultivation** of herbs is often a part of a wider agricultural production of the farms. There are also companies specialised on one specific species of plant or seeds production. The commercial collecting of wild herbs is very

significant in Bulgaria, Romania and Serbia, but, on a smaller scale, in all other Danube region as well.

The end part of the value chain is represented by **producers** who buy the resource material from domestic and foreign cultivators. There are also companies which can cover all the value chain of their production by themselves (cultivation of resource material and all processing activities). The biggest are located in Baden-Württemberg and Czech Republic.

Figure 2: Phytopharmaceutical: Needs of Buyers – End Market BW



The main gaps and needs can be combined among the project partner regions to obtain a comprehensive picture:

Gaps	Missing Links	Regulation/legislation
Lack of Human resources Lack of sufficient Technologies Uncoordinated wild collection (mainly unemployed people, only partly organised by intermediaries) Suitable machines for all steps connected to the farming and harvesting of the plant materials	Clusters R&D capacity Laboratories to provide compliance with EU regulations Training/Technical assistance in terms of quality improvements	Standards Stable high quality standards regarding e. g. pesticide pollution, contamination of the plant material by false treatment, etc. Better regulation on the EU level regarding use of phyto-based medicines and prevention of pesticide pollution

THE DANUBIOVALNET PROJECT

The DanuBioValNet project is aiming at establishing bio-based industry networks across the Danube Region. The emerging transnational cooperation of clusters will foster bio-economy and eco-innovations and lead to a strengthening of the regional economies.

Consequently, with this project the partners pursue a strong strategic orientation beyond the immediate and medium-term economic objective of strengthening the regional economy. It is the strategic goal to establish cross-border strategic partnerships, particularly in developing regions, with the help of powerful cluster organisations. In this way, project results will be sustained beyond an immediate effect and the creation of strategic investments, especially in emerging industries such as the bio industry, will be enabled and facilitated. This will be achieved mainly by newly emerging or transforming value-added chains, which are increasingly being transnationally established and further developed as a result of the increasing internationalisation of value-added processes.

In this way, long-term economic effects are achieved, based on a network of agile clusters, which prepare the investment approaches in a targeted manner and implement them with high efficiency. One example of the present project is the establishment of bio-refineries in the regions, which can form a strategic technological backbone of a successful independent bio-industry.

The partners intend to develop and implement a long-term, industry-driven roadmap for such collaboration along the entire value chain based on cluster partnerships for these processes. With the project, a pilot function of the implementation is taken over and the prerequisite for creating a blueprint for similar and similar cross-national cooperation, also in other industries, is created.

For achieving these tasks, 17 project partners from 10 countries have joined forces. The project will pave the way from an economy based on fossil resources towards an economy using renewable resources. The striving of the partners to minimise greenhouse gases and resource-saving as well as

resource-efficient utilisation of available biomasses will result in synergistic effects. These effects will improve the sustainability, regional development through diversification of the local economy and will also positively affect the workforce.

The development of new bio-based value chains needs to be done by connecting enterprises from different regions and industries. However, due to a missing holistic transnational approach, Danube actors in bio-based industry still operate disconnected and cannot properly benefit from the potential. Therefore, the aim of this project is to develop new methods, strategies and tools to connect enterprises transnationally.

Clusters as the strong representatives of a group of industries that are closely linked by common products, markets, technologies and interests are chosen to organise and bear the industry cooperation and creation of new value chains, because they are performant and sustainable partners and guarantee the upgradeability in the dimension industry, sciences and also politics.

One of the planned outputs of this project will be the development of a Joint Bio-based Industry Cluster Policy Strategy (JBCS) to describe the procedure and to make it actionable and reusable. Furthermore, a bundle of new methods and tools to support clusters for transnational working will be developed and joint into a strategy. They will be tested in three pilot actions where it is planned to create new bio-based value chains in the Danube region.

The main target groups are on the one hand the policy – four Ministries are involved –, on the other hand clusters and their SMEs – nine cluster organisations are involved. The policy level will benefit from the JBCS, which can be used as a political framework.

The clusters and SMEs will benefit from the new innovative tools and methods developed for transnational cross-clustering. Successfully established new bio-based value chains in the pilot actions can motivate other clusters and SMEs to test this newly developed approach in the future.

The following partners commit to the implementation of the cluster partnership and transnational cooperation:

Role	Official Name in English	Acronym	Country
LP	BIOPRO Baden-Württemberg GmbH	BIOPRO	Germany
ERDF PP1	ClusterAgentur Baden-Württemberg	CA BW	Germany
ERDF PP2	Anteja ECG	ANT	Slovenia
ERDF PP3	PROUNION	PU	Slovakia
ERDF PP4	Romanian Cluster Association	CLUSTERO	Romania
ERDF PP5	Association of Business Clusters	ABC	Bulgaria
ERDF PP6	National Cluster Association - CZ	NCA	Czech Republic
ERDF PP7	Business Upper Austria - OÖ Wirtschaftsagentur GmbH - Upper Austrian Food Cluster	UAFC	Austria
ERDF PP8	Ministry of Economy	ME	Romania
ERDF PP9	Ministry of Economy, Entrepreneurship and Crafts	MEC	Croatia
ERDF PP10	Ministry of Education, Science and Sport	MIZS	Slovenia
ERDF PP11	Croatian Wood Cluster	CWC	Croatia
ERDF PP12	Institute for Economic Forecasting	IPE	Romania
ERDF PP13	Business Upper Austria - OÖ Wirtschaftsagentur GmbH - Cleantech-Cluster	BizUp	Austria
IPA PPI	Innovation Center of Faculty of Mechanical Engineering	ICME	Serbia
ASP1	Montenegro Vine Cluster	MVC	Montenegro
ASP2	Ministry of Economic Affairs, Labour and Housing Baden-Württemberg	WM	Germany

LP = Lead Partner, PP = Project Partner, IPA = Instrument for Pre-Accession, ASP = Associated Strategic Partner, ERDF = European Regional Development Fund

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ANNEX

VALUE CHAIN MAPPING REPORTS PHYTOPHARMA

BADEN-WÜRTTEMBERG, GERMANY

1. The objective of the Regional Report

For the survey three important phytopharmaceutical companies in Baden-Württemberg were interviewed which all produce phytopharmaceutical medicines, two of them also producing natural cosmetics as well. All are selling their products to pharmacies and two of them also to shops/retailers, only one to direct consumers.

All of them are getting their raw material (i.e. the plants) from cultivation mainly. Wild collection plays only a minor role to them in some special cases. The information about the origin of the cultivated plants was very vague saying on the one hand Germany and on the other hand worldwide. Only one company gave some more specific answer, here Bulgaria as one of the mentioned countries is in the DanuBioValNet consortium. All companies have long-term contracts with their suppliers/farmers and also get their raw materials through cooperations. Regarding obstacles or constraints involved in obtaining good or more raw materials twotimes problems with quality were mentioned. Only one company saw a problem in some crop failures but didn't regard this as much important.

In relation to supporting activities helping the companies all mentionend the importance of R&D centers, one stressing the point of competence of R&D especially in the field of organic farming. The role of associations is seen also as important if qualified. One company stressed that the direct contact to the suppliers/farmers is of more importance to them than any other. When it comes to interests in other partnerships a diverse range of answers was given – from environmental organisations to certification institutes and public funding authorities.

The way to get more and better quality of raw material is for all three companies done by on-site trainings. Two firms are doing this with their own skilled personal, one with external experts. The product quality management is for all three companies on the level of the suppliers having quality measures. One firm does also audits and independent quality certifications. Two of the three companies are interested in deploying staff and/or technology for QM into the countries of plant material origin. Only one company also has interest in deploying or outsourcing of processing (e.g. drying) into the countries of plant material origin.

In relation to the competition topics no valuable information was given.

Regarding the future perspectives of the phytopharma market all companies stated that regulatory measures wether on the EU or german level would be appreciated. One company stressed the point

that it would be of great help if the phytopharmaceutical medicines would be payed by the public health insurancies. The most promising markets in the next 5 to 10 years seem to two companies China and Russia, but also Europe, India, America and Southeast Asia were mentioned.

All companies are interested to cooperate with the Danube Region and with the consortium of DanuBioValNet. No special interests were addressed in this first contact. This has to be defined more deeply in further meetings.

2. General Information

All companies are producers of phytopharmaceuticals (drugs/medicines), two are also producing natural cosmetics and one is also a producer of phytobased dietary supplements and herbal extracts. All firms are selling their own brands. Only one company answered about the time needed for developing a new product. A timeline of 1-5 years was given. Only one company answered the question about percentage of R&D related to overall budget with 5%. The clients/buyers of their products are for all companies, pharmacies, for two companies also shops like health food and organic grocery stores and for one company also direct consumers.

3. Suppliers of the source material

For all companies the main source of the plant raw materials is cultivation, only one company states also wild collection besides cultivation as main source for them.

Two companies buy plant material from Germany and on a global scale, one enterprise does not buy in Germany but in the US, China, Bulgaria, South Africa, Albania and Russia.

Main criteria when purchasing plant material are for all three companies reliability and quality. Only one enterprise also quotes the criteria price, safety and packaging.

The relationship of all three companies to their suppliers is with long-term contracts and through cooperations. Current obstacles or constraints involved in obtaining increased volumes of source material are for two companies problems with quality. One company also states contaminations as a problem and one company is also giving the answer that fair and transparant quality standards like e.g. implementation of GACP rules are important to them. One company states that crop failure in some cases is a problem but no general shortage occurs.

About the future perspectives regarding the availability of plant material following answers were given. One company thinks that this is depending on the future development of organic market in the US but has a general optimistic view. One company thinks this will get crucial because of growing competition

in this market. One company believes that this will be more of a problem in the future because of environmental problems.

4. Related industries and support services

Only one company answered the question what other industries/know-how are necessary to develop product-oriented activity that the company is engaged in. They said that they need organic seeds and suitable machines for cultivation, harvesting, cleaning and cutting. Furthermore, they need packaging. The availability of R&D centers is of importance for all three companies. For one company it is also important they are competent in organic topics.

The opinion about the role of supporting associations differs. One company states that direct contact to their suppliers is of more importance to them. Associations are more helpful for long-term political decisions. Another company states that associations are then important if they are qualified. And the third company states on a more general view that associations and R&D centers are important.

Other partnerships of interest for the companies are for one enterprise environmental organisations, for the second certification institutes, for the third public funding authorities.

5. Quality and Labor Force

What kinds of capacity-building activities is your company engaged in or willing to undertake to obtain more and better quality of the plant-based material input it uses? To this question all companies answered that they are doing on-site trainings, two companies with their own employees and one company using external experts for the on-site trainings. The product quality management is for all three companies on the level of the suppliers having quality measures. One company furthermore has controlling measures at the level of the suppliers through audits and has installed independent quality management certification. Another company does also own measures at the level of their company. Two of the three companies are interested in deploying staff and/or technology for QM into the countries of plant material origin. Only one company also has interest in deploying or outsourcing of processing (e.g. drying) into the countries of plant material origin.

6. Competition

The three companies didn't quote any specific competitor but two of them state that the competitors are on international level, for one company it is on regional and for the other more on national level. Regarding the questions about substitutes for the products or about best-in-class per product area no answers were given. Only one answer was obtained

regarding the questions what countries would be the most sophisticated clients and who is ready and willing to pay better price. Here Europe was stated as such one. Regarding the question who is taking the lead in promoting the use of phytopharma products also only one company answered and stated that there are at the moment nearly no public fundings for that. All is done by the pharma firms itself.

7. Future Perspectives

From your point of view, what has to be done or changed on the regional and EU policy level to enable the potential of the phytopharma market to innovate, expand and generally move forward? One company answered that the regulatory environment on the EU level should be strengthened, another one would prefer if the bureaucracy regarding the authorization of new medicines would be reduced on EU level. And one company suggests that the cost for phytopharmaceutical medicines in Germany would be payed by the public health insurances. The company also wishes more regulatory measures for the phytopharma market on a general view. The question what needs to be done or improved in the phytoparma and natural product value chain in order for the company to be able to source a consistent supply of material for its production following answers were given. One company answered that is no question of the value chain but is only dependent on the sales. Another company quotes the importance of transparency in the whole value chain and the improvement of quality on a whole. The third company thinks that more training and quality improvement measures are necessary (like abandonment of pesticides).

The most promising potential markets for phyto-based products are for two companies China, Russia and for at least one company furthermore Southeast Asia, America, India and Europe.

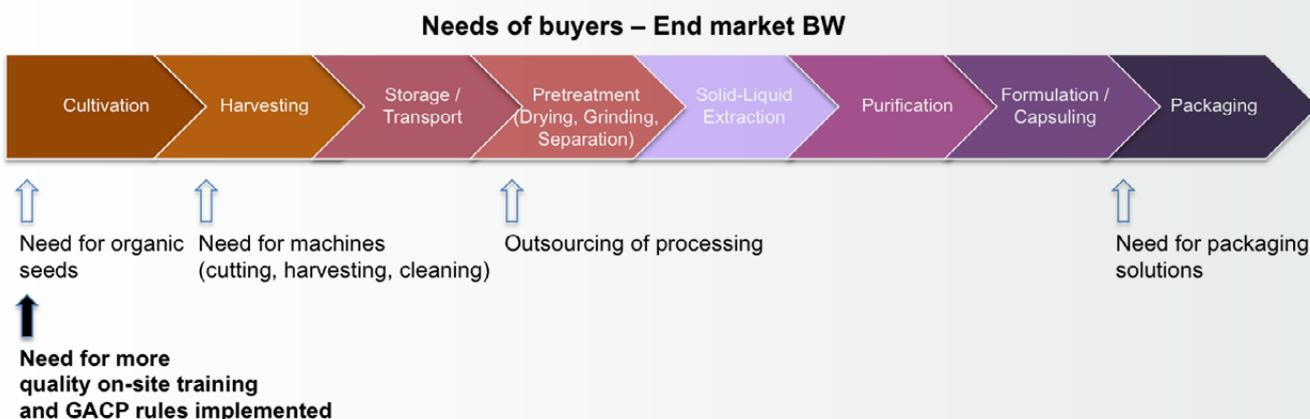
The way to new cooperation is for one company done by networks (universities, NGOs, fairs) and by a second company by a worldwide network of farmers plus an own team in their enterprise for drug acquisition.

All companies are interested to cooperate with the Danube Region and with the consortium of DanuBioValNet. No special interests were addressed in the first contact. This has to be defined more deeply in further meetings.

8. Regional Value Chain Narrative

· Visual map illustrating the way the product flows from raw material to end markets which shows the type and number of regional actors involved in all value-added activities in BW

PHYTO-PHARMACEUTICAL



- **List of main actors/stakeholders, their position and activities in the VC**

- all three companies are representing the end market of the phytopharmaceutical value chain.
- one more company in BW which didn't participate in this survey is at the level of a processor, converting plant material to intermediates which are then sold to end market companies.

- **Main gaps e.g. in technology, standards, IPR, workforce, access to market, suppliers, regulation**

- one main gap seems to be suitable machines for the all steps connected to the farming and harvesting of the plant materials
- one another main gap seems to be stable high quality standards regarding e.g. pesticide pollution, contamination of the plant material by false treatment, etc.
- this could be better regulation on the EU level regarding use of phytobased medicines and prevention of pesticide pollution

- **Missing links and/or key stakeholders**

- this could be producers of suitable machines for the end market companies and their suppliers/farmers
- this could be partners in the suppliers/farmers origin countries dealing with better training in terms of quality improvement

- **Policy related obstacles from a cross-regional cooperation point of view**

- here nothing really obvious was mentioned

- **List of suggested cross-regional cooperation areas within DanuBioValNet regions/partners**

- Bulgaria was the only mentioned country which is already a source of origin of plant material by one of the three companies. Another company is already having long-term relationships to Romania.
- But as all of three companies stated that they are interested in further contacts to DanuBioValNet and to the Danube Region this should be topic of future meetings with them.

The Value Chain Mapping Report Phytopharma/Baden-Württemberg was created by:

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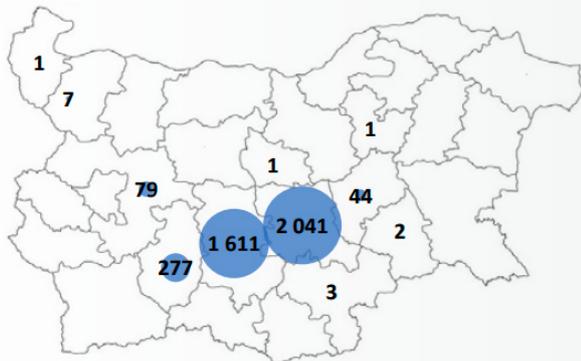
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BULGARIA

1. The objective of the Regional Report

The Regional Report provides overview of the interviews conducted with the representatives of the phytopharma (phytopharmaceutical industry) in the Bulgaria.

For the survey we connected with Bulgarian National Association Essential oils, Perfumery and cosmetics (BNAEOPC)- the only official representative in the country of the producers and traders of essential oils, aromaterapy, perfumery and cosmetics, packaging and raw materials for cosmetics, scientific institutions in the branch. They represent members as follows: 27 - Essential Oils; 71 - Perfumery Cosmetics Toiletries; 9 - Packages and Equipment. The resulting report provides highlights of the tendencies and patterns that emerge from the aggregate information collected through the interviews.



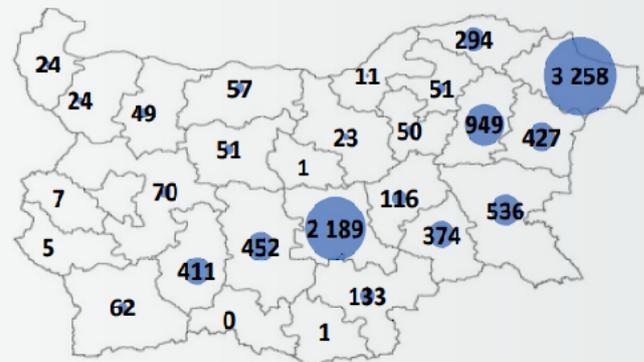
Roses areas by region (ha)

2. General Information

Bulgaria has long traditions in the cultivation of medicinal and aromatic crops and production of essential oils

There were 2 parts of surveyed companies within the value chain of the phytopharma industry in Bulgaria. The representatives of the first part of the value chain are **the cultivators** who are engaged in growing and processing. They cultivate mostly the following species for essential oil production: Oil-bearing rose, Lavender, Lemon balm, Chamomile, White marjoram, Thyme, Coriander, Frying and many others.

There are many producers in the area who harvest / grow the same product, because of suitable climatic and soil conditions.



Lavender areas by region (ha)

Source: State Agricultural Fund - declared for direct payments areas. The data is based on the registration of the farms and may differ from real location

The proportion of large-scale plantations is 40%. The estimated % of herbal waste (biomass) in processing phase is 85%. Main production technologies used are manual harvesting, mechanical harvesting, processing, distillation, testing and certifying. The seed are provided by Certified producers. Both Conventional and Organic operating procedures for cultivation are implemented. The main markets/counties for export are EU, USA, Far East and the business usually doesn't receive technical assistance from its customers.

The other part of the phytopharma value chain is represented by the **producers** and in Bulgaria the main products are essential oils, concretes, absolutes, flower distillation waters. Absolutes are highly concentrated aromatic oils extracted from plants using a solvent method. The multi-step process includes first extracting the aromatic oil from the plant material with a chemical solvent such as hexane. After the solvent is removed what is left behind is a waxy substance called a concrete. Most of them have their own brand. The buyers of

their products are companies producing natural cosmetics, diet supplements, drugs pharmaceutical, producer of health foods, fragrance and flavour companies

3. Suppliers of the source material

Some of the cultivators produce the resource material by themselves – growing their own seeds (multiplication and cutting), but most buy the seeds from the Certified producers

For the most of the interviewed producers main source of the plant raw materials is cultivation and the material is all home grown in Bulgaria. The percentage of import is very small for some exotic oils. Wild collection plays only a minor role to them in some special cases.

The preferred relationship of the companies to their suppliers is with long-term contracts and through cooperation. Main criteria when purchasing plant material are quality of the biomass, reliability of the supplier, and the price is on third place, followed by on-time delivery and volume.

The projected future needs regarding source materials are stable supply for example of (rose and lavender flowers) and controlled quality. The current obstacles or constraints involved in obtaining increased volumes of the source material are climatic conditions and the daily capacity of the factories.

4. Related industries and support services

Both the cultivators and the producers state that the role of the supporting associations (for example Bulgarian National Association Essential oils, Perfumery and cosmetics) in the overall activity of their company is very important and they really appreciate being a part of the association. There is agreement that it is critical for the company's operations to nurture and maintain good partnerships with other companies from the branch.

Also Associations are very helpful for creating long-term policy improvements and changes in the future. This way the producers can make sure that their needs and ideas are collected, delivered to the proper Ministries and Policy makers, then heard, met, and implemented into Action Plans of the overall Agriculture Policy.

The Producers indicate that the industries and know-how necessary to develop product-oriented activity that their companies are engaged in are perfumery, cosmetic, pharmaceutical and food industries, and aromatherapy.

The cooperation with universities and R&D centers is mentioned as very important and beneficial for them. Even though that some of the producers have their own R&D activities and laboratories, they also cooperate with the Institute of Roses, Essential and Medical Cultures, Kazanlak and Agrarian University – Plovdiv.

It was stressed out that the level and availability of R&D centers that are relevant to their company's activity is very insufficient and this is one of the areas that needs improvement and creates opportunities

5. Quality and Labour Force

The quality of the source material is the most important for the phytopharma companies (price is on the third place), unlike many other industries. To obtain more and better quality of the plant-based input, the producers participate in on-site training, provide educational support for the local collectors and cultivators. Representatives and employees responsible for the respective activities train the cultivators, support meetings of cultivators and knowledge sharing.

The product quality management is extremely important and very well organized. It starts with the quality measurement performed by their suppliers, continues with the producers own quality management system at their companies and is complemented by Independent quality management certification.

To improve the quality and the price of the plant material, some of them are willing to deploy staff and/or technology for quality management into the areas of the plant material origin and also accept international support in this field. This could be one of the opportunities for the project.

Deploying or outsourcing of processing (e.g. drying) into the countries of plant material origin is not of interest.

Labor Force is very big problem and challenged for the industry. There are not enough people interested in cultivation and it is especially difficult in the times of the collection /harvesting, as the needs for helping hands catapults in this period. Qualified human resources are also insufficient in producers operations.

6. Competition

The competition on national and regional level is very strong both for the cultivators and the producers. There is competition for most of the end products on international level as well, even though some of the products are unique on the market and nobody in the world produces the same. The substitutes for the phytopharma products are not a lot, but to some degree those are the synthetic products, manufactured by oil or chemicals based pharmaceutical companies.

Regarding the question about the "best in class" in this product area, the answer was that among the leaders are Turkey, France and of course Bulgaria. It was strongly confirmed that countries our producers consider to be the most sophisticated clients, that are ready and willing to pay better price are the clients from European Union. Those are the countries who are also taking the lead in promoting the use of phytopharma products.

7. Future perspectives

The most promising potential markets for phyto-based products according to the producers are all the countries from the European Union as in these developed countries, there is the interest in growing, expanding and using natural products. Also, Far East was identified as potential market.

The cultivators suggest that the large producing companies have to collaborate more deeply with them, and provide training about proper growing, harvesting, knowledge sharing, information about new trends and opportunities, help in the certification process, etc.

All companies are interested to cooperate within the Danube Region and with the consortium of DanuBioValNet. The Producers of final products were identified as of interests in the first contact. This and other areas of mutual cooperation will be more clearly and deeply defined in future meetings.

8. Regional value chain narrative

· Visual map illustrating the way the product flows from raw material to end markets which shows the

type and number of regional actors involved in all value-added activities in Bulgaria



Value Chain Bulgaria

- | | |
|---|-----------------------------------|
| ■ Cultivation | ■ Harvesting |
| ■ Storage / Transport / Trading | ■ Analysis / Testing / Developing |
| ■ Pretreatment (Drying, Grinding, Separation) | ■ Extraktion (Solid-Liquid,...) |
| ■ Purification | ■ Formulation / Capsuling |
| ■ Packaging | ■ Sales |



Regarding the regional value chain of the phytopharmaceutical industry, the entire value chain is covered in Bulgaria. In the beginning of the value chain are the cultivators. The end part of the value chain is represented by producers who buy the resource material mostly from domestic cultivators. There are also many companies who actually cover the entire value chain by themselves (from the cultivation of resource material and to all processing and packaging activities).

• List of main actors/stakeholders

The survey was prepared in cooperation with Bulgarian National Association Essential oils, Perfumery and cosmetics and represents results from their key member companies.

• Main gaps

- one main gap is the insufficient level and availability of R&D centers that are relevant to their company's activity
- the other seems to be the insufficient daily capacity of the factories
- Lack of qualified workforce for producers and shortage of labor in the harvesting season
- better regulations on the regional and EU level

• Missing links and/or key stakeholders

The value chain seems to have all the necessary links. Probably the R&D centers are one missing links. Also, the the deployment of staff and/or

technology for quality management to the region, as well as knowledge sharing and flow of information about the new opportunities.

• Policy related obstacles

- They rely on legislation about a more strict control over the trade of essential oils - to prevent the import of lower quality products, mixing them with some home produced (for example rose oil), and selling them as original, that compromises the quality and the name of the great and brand producers.
- Also much needed is proper protection for the unique products with high added value that are specific for the countries within EU towards the countries outside the union
- The producers feel that policy makers should support the phytopharma sector with proper legislation in the EU and creation of standards of production.

• List of suggested cross-regional cooperation areas within DanuBioValNer regions/partners

Regarding the possibility for cooperation within the Danube Region, the respondents see the potential in the areas of:

- R&D centers cooperation and knowledge sharing with a main focus on research into the application of oils and food supplements
- Business cooperation;
- They look for the partners who will buy their

products (oils) to be used as source materials
 – Partners to sell / distribute their branded end products

– Interested in further contacts within DanuBioValNet and finding new opportunities and this should be topic of future communication and meetings with them

The Value Chain Mapping Report Phytopharma/Bulgaria was created by:

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CZECH REPUBLIC

1. The objective of the Regional Report

The objective of the Regional Report is to provide overview from the interviews conducted with the representatives of the phytopharmaceutical industry (phytopharma) in the Czech Republic. The report should serve to highlight the tendencies and patterns that emerge from the aggregate information collected through the interviews. The summary statements relating to the topics listed below are based on the total number of cases interviewed. All the respondents are anonymous.

2. General Information

The respondents of the survey represent different companies within the value chain of the phytopharma industry in the Czech Republic. The representatives of the first part of the value chain are **the cultivators** who are engaged with activities, such as production of seeds of natural/medical plants, assembling of species-rich seed mixtures, production of floral and herbal ingredients, cultivation, reproduction and drying of medical herbs, processing of herbs for teas and hemp cultivation and processing. They cultivate mostly the following species: mint, elissa officinalissage, lavender, thyme, marigold, echinacea, wormwood, peony, Hippophae rhamnoides and hemp. The size of their land varies from 0.32 ha to 200 ha, and some of them cultivate the plants in containers (10 x 10cm to 1 litre) in their own submerged substrates. They use almost all production technologies (manual harvesting, mechanical harvesting, drying, storing, packing and processing) and the percentage of the herbal waste in the processing phase is different, amounting to about 40% in average.

The percentage of incomes from the herbs cultivation related to their other income-generating activities is various as well. For some of the respondents, the growing and processing seeds and herbs cover 100% of their incomes, for some of them it is only 30%.

Regarding their knowledge about other cultivators in the region, they very often do not have much information about other growers.

The final part of the phytopharma value chain is represented by **the producers** of natural cosmetics, dietary supplements, medical teas and herbal extracts. These are companies specialized on the production of hemp tea and herbal salts, bio-quality teas, distribution of healing hemp and similar areas. There is also a company that produces the cosmetics based on the microorganism of Pythium oligandrum (smart fungus) for people and animal - unique in the world and patented. The producers spend about 5 % of their operational budget on R&D activities and it takes 8 months in average to enter the market with the new products.

3. Suppliers of the resource material

The interviewed cultivators grow the resource material by themselves - having their own production of seeds (multiplication and cutting) or buy the seeds from the certified Czech companies (e.g. Agrožen Želešice, SEMO a.s., Moravia Seed Group s.r.o.).

Some of the interviewed **producers** grow the resource material by themselves too, e.g. the legal varieties of hemp grown in organic farming and smart fungus, so they are 100% independent. The rest of the producers buy the semi-finished product from specialized cultivators of herbs. They buy as much resource material from the Czech cultivators as possible but still the majority of the herbs material is imported from foreign countries, such as Latvia, Romania, Albania, Nicaragua, China, Asia, South America, Germany, India, Canada, etc. They prefer the long-term relationships with the suppliers.

Some of the producers mention a lack of some types of herbs on the market and feel the need of a specific material in bio-quality (hemp). But the others do not have a reason to buy/increased the volumes of their resource material because they do not see any changes on the market. Thus, they do not need to store more resource material.

4. Related industries and support services

Among the clients of the **cultivators** there are the local companies in the field of food industry, natural cosmetics and dietary supplements (teas). The

interviewed cultivators sell their products on the open markets and via eshop. Regarding the support services, they also mention that it is important for them to be a part of an associations, such as the Pelero CZ (the Association of growers and processors of medicinal, aromatic and spice plants), the Union of flax and hemp growers and the Hemp Association of the Czech Republic.

Among the clients of the interviewed **producers** there are mainly the retail services (pharmacies, shops) and direct consumers. In the case of hemp producers, the natural cosmetics companies, diet supplements companies, drugs pharmaceutical companies and producers of health food are also important.

Some of the producers do not prefer to be a member of a supporting association. But there are also producers who really appreciate being a part of the association (e.g. the Association of Organic Farmers), which expresses their identity and bio/"eco" oriented approach.

The cooperation with universities and R&D centers is considered as very beneficial for them. Despite the fact that some of the producers have their own laboratories and R&D activities, they also cooperate with the Palacky University Olomouc, the Academy of Sciences of the Czech Republic, the Charles University, the Masaryk University, the Mendel University in Brno, Veterinary Research Institute, microbiologists and doctors from hospitals, dental hygienists, etc.

Regarding other partnerships which are critical for the interviewed producers, the business and suppliers partnerships are mentioned that lead to initiate the policy direction/change in the future (e.g. to push their ideas forward and implement them into e.g. Action Plans of Agriculture Policy).

5. Quality and Labour Force

Unlike other industries, the **quality** of the plant material is the most important for the phytopharma companies (not price). To obtain more and better quality of the plant-based input, the interviewed producers participate in on-site training, provide educational support for the local collectors and cultivators and support the meeting of cultivators and knowledge exchange. Their suppliers perform the quality measurement and the producers have also a quality management system at their company.

To improve the quality and the price of the plant material, some of them are willing to deploy staff and/or technology for QM into the countries of the plant material origin.

Human resources are very big problem in the industry, especially among the cultivation part of the phytopharma value chain. Due to the influence of communism, the concept of small agriculture enterprises (family farms) was destroyed in the Czech Republic. The collective agriculture was preferred that did not focus on herbs growing. Nowadays, there are individuals who are interested in the cultivation of (medical) herbs but they have

to face some obstacles, especially the high price of human workforce.

6. Competition

According to the interviewed **cultivators**, there is no strong competition in their industry on the regional level. In terms of small-scale growers in the region, there is a need to cooperate rather than compete. Although there is a large assortment of customers, the cultivators are not able to increase the volume of their production. On the other hand, the price of the herbs has not changed significantly since the last century, so they are not under pressure to increase production. However, in general, they mention the competition on regional, national and international level.

The **producers** of the phytopharmaceuticals feel the competition mainly on national and international levels. Some of them have unique products on the market and nobody in the world produces the same, thus they do not have the competitors. But in general, the producers have to compete, of course, with international oil-chemistry-based pharmaceutical companies.

Among the leaders and the most sophisticated clients mentioned, there are North Europe, West Europe, Australia, North America, Austria, Switzerland, Czech Republic, Holland, Poland.

7. Future perspectives

In the developed countries, there is the interest in growing, expanding and using natural products generally. The cultivators try to follow the trends and changing patterns in the global and regional/national value chains (e.g. to build a solar dryer for better drying and processing and thus saving the energy). But the trends in the purchase of herbs are almost not changing and it could cause a big problem in the future (the thread of unwillingness to work in the physically demanding and non-growing industry).

In addition, according to the cultivators, the large companies should cooperate more closely with small businesses, provide them support, not financial, but through training, granting the certificates, offering new ways of growing and getting acquainted with new trends.

The producers currently do not have any big problem with the supply of plant material. But they experience a strong pharmaceutical lobby which makes the situation of natural resource materials worse, as in the case of some herbs with excellent healing effects that have been redefined as medical herbs and not suitable for eating (food industry). Nevertheless, they see the big potential in the bio-based pharmacy and identify the most promising markets, such as developed countries where people are aware of the dangers of the world's pollution with chemicals. They mention such countries as Northern Europe, Western Europe, Australia, North America, Switzerland, Austria, Italy (hemp).

8. Regional value chain narrative

Regarding the regional value chain of the phytopharmaceutical industry, the entire value chain is covered in the Czech Republic.

The first part of the value chain is represented by cultivators. They include mainly smaller garden centres, nurseries and family farms where the cultivation of herbs has a long tradition. The cultivation of herbs is often a part of a wider agricultural production of the farms. There are also companies specialised on one specific species of plant (hemp) or seeds production. Generally, caraway and *Silybum marianum* are the most grown herbs in the Czech Republic, then chamomile, mint, poppy, fennel, coriander (seed), balm, thyme and hemp.

The commercial collecting of wild herbs is not significant in the Czech Republic (wild collecting is too expensive). But there can be identified some collectors of wild herbs and companies specialized on buying the herbs.

The end part of the value chain is represented by producers who buy the resource material from domestic and foreign cultivators. There are also companies which can cover all the value chain of their production by themselves (cultivation of resource material and all processing activities). Some of them even use bioplastic biodegradable packaging (biodegradable pyramids for tea and cellophane based packages for paper boxes (made from corn) - suppliers from UK, Japan).

• Visual Map



• List of main actors/stakeholders

There are 9 companies that participated in the survey. There is a larger quantity of companies which focus on bio-based pharmacy, natural cosmetics and dietary supplements in the Czech Republic.

• Main gaps

In general, the cultivation of medicinal plants for industrial processing is declining and the area of domestic fields with medicinal herbs is reducing in the Czech Republic. It is so thanks to low purchase prices and increasing imports of cheaper medicinal plants from abroad, especially from Southern and South-Eastern Europe (higher quality and higher content of active substances).¹ So the low purchase prices can be considered as one of the main gaps for cultivators to grow more resource material.

According to the producers, a lack of specific resource material could be a gap for them, but, in general, it is not a big issue at the moment. They are international-oriented companies and import the resource material from abroad.

• Missing links

There are no missing links identified within the survey.

• Policy related obstacles

Regarding the policy related obstacles, the producers mention mainly the lagging legislation and regulatory environment. They feel a need for tackling regulatory, harmonizing legislation in the EU and creation of standards of production. The policy-makers should support the replacement of less safe active chemicals by safer substances that do not burden organisms or the environment and do not produce residues. In addition, the regulation on the legal production of the cannabis/hemp, its extracts and products as well as its import problems should be resolved.

• List of suggested cross-regional cooperation areas within DanuBioValNer regions/partners

Regarding the possibility for cooperation within the Danube Region, the respondents see the

1) Lidovky.cz. *Pěstování léčivek je v Česku kvůli nízkým cenám v útlumu* [online]. (Lidovky.cz. *Cultivation of medicinal herbs in the Czech Republic is in decline due to low prices*). © 2017 MAFRA, a.s., ISSN 1213-1385, [cit: 11-12.2017]. Available here: https://relax.lidovky.cz/pestovani-lecivek-je-v-cesku-kvuli-nizkym-cenam-v-utlum-pix-/zdravi.aspx?c=A150715_114334_In-zdravi_ape

potential in the areas of:

- Business cooperation;
- Business - sale of their products (e.g. medical hemp);
- They look for the partners who will distribute their products (e.g. smart fungus). They do not

need R&D cooperation, only to find the distributors of their natural cosmetics, food supplements, etc. They would like to find a distributor in Romania, Serbia, Slovenia, Austria, etc.

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SERBIA

1. The objective and short summary of the Regional Report

The objective of the Regional Report is to provide overview from the interviews conducted with representatives of the phyto-pharmaceutical industry (Phytopharma) in Serbia. The report should serve to highlight the tendencies and patterns that emerge from the aggregate information collected through the interviews. The summary statements relating to the topics listed below are based on the total number of cases interviewed. All the respondents are anonymous.

To reach the particular respondents, the contacts of the network HERBAL PHARMANET Cluster, Obrenovac were used and five important companies dealing with Phytopharma were interviewed. Three of them are suppliers of raw material, an association of wild herbal collectors and two herbal cultivators and small processors companies, selling their products through long-term contracts or to wholesalers, mainly exporting (90-100%). Two of them are herbal processing companies, one herbal extracts producer, exporting through contracts to natural cosmetics and diet supplements companies; the other is end market producer serving home and regional market mainly.

The seeds for herbal material suppliers are from their own production or purchased from the Institutes. Herbal processing companies use semi products from domestic suppliers. The main obstacle to obtain more material is the lack of certified laboratories. The prognosis for the future regarding plant material is that there will be less wild harvesting and more plantations.

Regarding the related industries, the companies mentioned the variety of industries that they are cooperating with in developing the product for the end-market. In relation to supporting activities helping the companies, all mentioned the importance of the associations that are helpful for the

influence on regulation and lobbying for incentives. All five companies, raw material and herbal processing producers, stressed that there is a need for herbal harvesters and cultivators capacity-building. All companies have quality management measures taken at the company and also rely on quality management certification, usually provided by foreign certification body.

In relation to the competition topics, the companies stated that they are rather small and have many competitors on regional and international level. As the most sophisticated clients, taking the lead in promoting the use of phytopharma products, France was pointed out.

Regarding the future perspectives of the phytopharma market, all companies estimated that the market is growing, but there is a need for the public promotion of use of phyto-pharmaceutical medicines and natural cosmetics.

All the companies are interested to cooperate with the Danube Region and with the consortium of DanuBioValNet. Some areas of special interests were addressed such as:

herbal collectors and harvesters capacity building; know-how for the cultivators organizing; cooperation in standardization of the active components; cooperation in product development; launching new products with Danube partners.

2. General Information

Three companies interviewed are the suppliers of raw material, one an association of wild herbal collectors and two companies are herbal cultivators and small processors. Their activities are: collecting or cultivation, production of seeds of natural/medical plants, assembling of species-rich seed mixtures, drying of medical herbs, processing of herbs for teas, production of floral and herbal extracts, etc.

Wild medicinal herbs where respondent

association is harvesting is on the area of about 50 ha in Southeast Serbia; the species are, in order of importance in terms of quantities and value: marshmallow root, calendula, nettle leaf, valerian root, St. John's worth, and wormwood, other in smaller quantities. Cultivated area is 560 ha in South Banat; the species are, in order of importance in terms of quantities and value: parsley, mint, chamomile, immortelle, melissa, thyme, yarrow, marshmallow, mallow, lavender.

All three companies follow conventional production standards, and one (cultivator) has also the organic division. They use almost all production technologies (manual harvesting, mechanical harvesting, drying, storing, packing and processing) and the percentage of the herbal waste in the processing phase is different, amounting to about 20% in average. The products are mainly exported (90-100%) to wholesalers or, the companies/ association have long-term contracts with herbal extract producers. Among the clients of the producers there are also the retail services (pharmacies, shops) and direct consumers. Export countries are EU (90%), CEFTA, US. There are several other producers in Serbia: several associations of wild herbal collectors in South and North Serbia and approx 10 bigger plantations for herbal cultivation in Vojvodina and many households dealing with the medical herbs cultivation as additional activity.

The following part of the phytopharma value chain is represented by two companies, one producing herbal extracts and the other producing herbal drugs/medicines and dietary supplements. The first company covers processing such as analyzing, testing, extraction, purification; active mainly on foreign markets (EU), selling in bulk to the producers of natural cosmetics, diet supplements, drugs, health foods. The latter produce herbal drugs and dietary supplements, sell on home and regional market under its own brands to the clients, pharmacies and shops. The producers spend about 20 % of their operational budget on R&D activities and it takes 10 months in average to enter the market with the new products.

3. Suppliers of the source material

The interviewed cultivators grow the resource material by themselves – having their own production of seeds (multiplication and cutting) or buy the seeds from the Institutes that have certified seed production. In particular cases, some seeds are imported from Netherlands or Germany. The companies in herbal processing industry use semi products from domestic suppliers (to name the few: Herba, JELIGOR, Geen life, Ivan Lalic, Fructus, Macval) or import it from Bulgaria, Poland, France. The company that produces herbal extracts grows their own resource material by themselves too, e.g. plants from organic farming.

Main criteria when purchasing raw material for all

five companies are reliability, quality and certificates. The relationship with the suppliers is based on long term contacts.

In case of herbal collectors and cultivators, the obstacles to obtain more material are: hand labor, the aging of people involved in collecting and younger generation disinterest, specific mechanization; administrative procedures for wild harvesting; lack of certified laboratories: outdated methods of physical and chemical analysis (the reference values are not updated, required parameters are not in accordance with EU standards). The prognosis for the future regarding source material is that there will be less wild harvesting and more plantations.

4. Related industries and support services

As the answer to the question what other industries/know-how are necessary to develop product-oriented activity that the company is engaged in the agriculture; chemical extracting; engineering; packaging, distribution are mentioned. Four companies said that they don't use the services of existing R&D centers; some of the producers have their own laboratories and R&D activities. Only one company mentioned the cooperation with the Faculty and the Institute of Agriculture. The suppliers of plant material cooperate with Institute for certified seed production.

Concerning the role of supporting associations, the answer is that they are important in the activities for the improvement of the regulatory environment. The partnerships that companies regard as the most important for their operations are those with the suppliers, customers and distributors.

5. Quality and Labor Force

The suppliers perform the quality measurement and the producers have also a quality management system at their company. Also, they rely on independent quality management certification, usually provided by foreign certification body.

All five companies, raw material and herbal processing producers, stressed that there is a need for herbal harvesters and cultivators capacity-building. But, herbal harvesters and cultivators do not receive technical assistance from its customers - domestic or foreign. Processing companies said that they are willing to deploy staff and/or technology for QM to the plant material producers (but they didn't so far).

6. Competition

The companies that are producing herbal extracts said that they do not have the competitors at the same technology level on the national market, but competing on EU market (SLO, D). The other companies are facing the competition on national and regional level. For the questions about the "best in class" in the product area: Naturex, Innothera (F), Stada (D), Krka (SLO) were mentioned.

As the most sophisticated clients, taking the lead in promoting the use of phytopharma products, France was pointed out.

7. Future perspectives

The companies, the suppliers of herbal material, stated that their main challenge is how to keep up with high demands from pharmaceutical industry: to grow more variety of species, since wild collecting decreases; to apply EU standards for physical chemical analyzes to all required parameters; to engage themselves more in organic production. According to them, the large companies should cooperate more closely with small businesses, provide them support training, granting the certificates, offering new ways of growing and getting acquainted with new trends. All the producers experience a strong chemical pharmacy lobby and stressed that the use of

phyto-pharmaceutical medicines and natural cosmetics needs massive public promotion.

All companies are interested to cooperate with the Danube Region and with the consortium of DanuBioValNet. Special interests were addressed: in herbal collectors and harvesters capacity building to meet the demands of end-market producers; in cooperation in standardization of the active components, cooperation in product development; one company stated that the launching new products with Danube partners the prospects would be more promising.

8. Regional value chain narrative

– Visual Map illustrating the way the product flows from raw material to end markets and shows the type and number of regional actors involved in all value-added activities in Serbia



• List of main actors/stakeholders, their position and activities in the VC

The five companies that participated in this survey cover the VC starting from cultivation to end product. Three companies are the suppliers of raw material, one association of wild herbal collectors and two companies are herbal cultivators and small processors. Two companies in herbal processing industry are also interviewed, one producer of herbal extracts (semi product for natural cosmetics, diet supplements, drugs or health foods) and the other herbal drugs/medicines and dietary supplements producer. There are more companies and associations in herbal material supply production and larger quantity of companies which focus on bio-based pharmacy, natural cosmetics and dietary supplements in Serbia.

• Main gaps e.g. in technology, standards, IPR, workforce, access to market, suppliers, regulation

Gaps in existing regulations (reference values are not updated, required parameters are not in accordance with EU standards) are identified. There

is a need for the regulation that is not changed frequently on the EU level regarding e.g. pesticide pollution, contamination of the plant material by false treatment, standardization of the active plant component. But, the main gaps seems to be the difficulties in access to the market.

• Missing links and/or key stakeholders

In Serbia, there is a lack of laboratories that can provide physical and chemical analysis in compliance with EU regulations. Missing links and key stakeholders are partners in the end market producers origin countries dealing with better training in terms of quality improvement and cooperation in product development.

• Policy related obstacles from a cross-regional cooperation point of view

Harmonization of the legislation, frequent changes in legislations and creation of standards of production are identified as needed for industry to move forward.

• List of suggested cross-regional cooperation areas within DanuBioValNer regions/partners

Regarding the possibility for cooperation within the Danube Region, the respondents see the potential in the areas of:

- Herbal harvesters and cultivators capacity-building in terms of quality management and GACP rules implementation;
- Know-how for the cultivators organizing;
- Business cooperation;
- Promotion of use of phyto-pharmaceutical medicines and natural cosmetics in public;
- Cooperation in development and launching new products with Danube partners.

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SLOVAKIA

1. General Information

The companies interviewed within DanuBioValNet project produce phytopharmaceutical products (herbal essences and extracts for pharmacy, cosmetics and food industry; wide range of hemp products for bio-food shops, pet-shops, restaurants, whereby partially the raw materials are sold too). Although there are rich natural resources in Slovakia (in relation to the phyto-pharma), there is no cluster or association directly related to the phytopharmaceuticals - the only exception in given area is the Hemp Cluster. However, there are many small processors and growers focused on plants typical for their region.

Most of firms are selling their own brands. The company dealing with the processing of hemp sells products in the open market. The main reason is that through given market channel, it has direct contact and relationships with customers and thus have information about their needs and feedback. On the other hand, there is a need of more intensive work associated with the distribution of products and therefore, the organization also considers the option of contracting key firms. On the contrary, the respondents dealing with the herbal essences and extracts are only in the testing phase and still developing and improving their products. However, they plan to sell the products through contracts with key firms, as they consider it as more stable market channel.

All interviewed companies use following production technologies: both manual and mechanical harvesting, storing, processing/distillation, whereby one company also uses the drying and packaging technologies. The operating procedures for cultivation in Slovakia are implemented both the organic and conventional one. Although the activities of asked companies are oriented both on the domestic and foreign markets, the domestic customers form the major group. Furthermore, the main export market for hemp is Czech Republic,

whereby any of the companies export through the intermediaries. As was mentioned above, the respondents dealing with the herbal essences and extracts are only in the testing phase and are not focused on foreign markets at the moment, but their aim is to export all the products abroad, mainly to Germany, France, the USA and Switzerland.

2. Suppliers of the source material

For all companies, the main source of material is the cultivation, only one company states the wild collections (juniper) as a side source of material. In case of hemp, only *Cannabis sativa* is cultivated and processed. However, hemp is still an issue within Slovak legislation and companies may not finalized their products in the country, thus only semi-finished products are allowed to be made by Slovak producers. The herbal cultivators are small growers and processors that usually focus on plants typical for their region. However, this area has big potential in Slovakia and thus it is slowly being coordinated.

The companies buy hemp seeds from certified seeds cultivators in France and Poland. The herbal cultivators get seeds from the retail within Slovakia and also from neighboring countries, mainly from Hungary and Czech Republic. The majority of companies have long-term contracts with their suppliers. Although the quality, volumes and reliability are considered as the most important criteria, producers also partially take into account the level of prices.

All interviewed companies expect that prices of seeds/plant material will increase in the future, since there are many opportunities in this field and the number of competitors in Slovakia is growing too.

3. Related industries and support services

Phyto-pharmaceutical products offer wide variety of value chains, since they may be used at least in three industries - pharmacy (dietary supplements,

drugs), cosmetics (natural cosmetics, perfumes) and food industry (seeds, oils, herbal essences and extracts, etc.).

There are several R&D centers, such as the National Agricultural and Food Center or AgroBioTech Centre, which provide services relevant for interviewed companies. However, the majority of the respondents use the services of foreign R&D centers, for example from Czech Republic and Hungary.

One herbal processor cooperates with the Slovak Technical University, for the specification of the quality and exploitation of herbs for essences and extracts.

The interviewed companies do not receive any kind of technical assistance. As was mentioned above, there is no association or cluster in Slovakia related to the phyto-pharmaceuticals and the herbal growers and processors are usually local people that focus on given activities in smaller extent. The only cluster relevant for given area is the Hemp Cluster that is formed by 36 growers from 1-7 ha and 9 growers from 14-50 ha.

4. Quality and Labor Force

The quality of the seeds/plant material is considered very important and the majority of producers buy seeds only from certified seeds cultivators. The respondents states that their suppliers have regular product quality measures.

The interviewed companies do not provide any kind of external trainings for their staff - employees are trained within the companies. However, there is a problem with the human resources – herbal cultivators face some limits within the production, since there is often a lack of people for the manual harvesting.

5. Competition

The main competitors for the respondents dealing with the herbal essences and extracts are producers in three following areas: food industry, pharmacy and cosmetics (since there is a wide range of possible products). Although there are

many small herbal processors in the country, the biggest competition is considered on the international level (e.g. the company Dottera, Bayer, Novartis). Since the synthetic essences are the substitutes for natural essences, respondents face a tough competition in both domestic and foreign markets. Furthermore, they even expect the increase in the market share of synthetic essences. On the other hand, hemp processors do not state any substitutes for their products. Although there are many producers dealing with the processing of hemp, respondents do not consider it as a challenge, since they see a big and still unexploited potential in it.

The most frequently mentioned countries considered as the “best in class” were as follows: France, Italy, Slovenia, Netherlands, Lithuania, Germany, US and Switzerland.

6. Future Perspectives

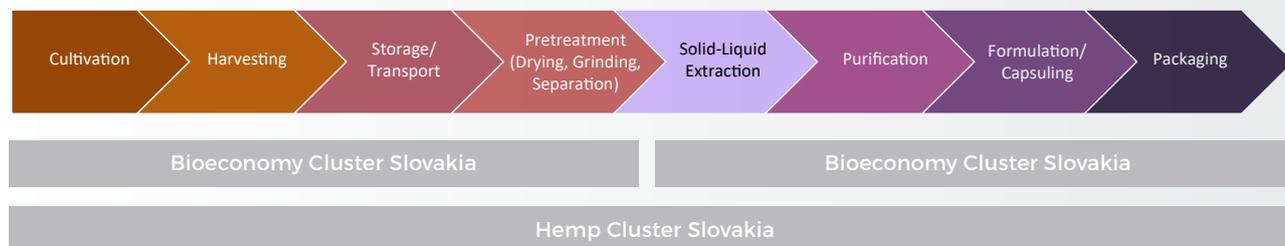
Regarding the future perspectives, all respondents see a huge potential within phyto-pharmaceuticals. The demand for natural products increases from year to year and due to the wide variety of possible products, actual trends and changing pattern of needs, companies are willing to expand their production operations. However, some of them currently face some limitations in relation to the technological and human resources, but they are ready to pay more to obtain sufficient and needed amounts.

In terms of policy, the respondents dealing with processing of hemp would prefer improvements in terms of legislation and bureaucracy burden.

The most promising markets in the area of phyto-pharmaceuticals are considered Germany, France, US and Switzerland.

7. Regional Value Chain Narrative

Visual map that illustrates the way the product flows from raw material to end markets and shows the type and number of regional actors involved in all value-added activities in the region:



- **List of main actors/stakeholders, their position and activities in the VC**

- Hemp Cluster – several hemp processors
- Bioeconomy Cluster -> Distillery Jelšovce – herbal processor

In general, interviewed Slovak organizations are included in the value chain from cultivation to purification.

- **Main gaps e.g. in technology, standards, IPR, workforce, access to market, suppliers, regulation**

- Lack of human resources
- Lack of sufficient technologies
- Uncoordinated wild collection – using mainly unemployed people (no training provided), partially organized by intermediaries

- **Missing links and/or key stakeholders**

- No cluster or association in the area of phyto-pharmaceuticals

- **Policy related obstacles from a cross-regional cooperation point of view**

- Legislation – prohibition of CBD in Slovakia

- **List of suggested cross-regional cooperation areas within DanuBioValNer regions/partners**

- All companies showed interest in further contacts to DanuBioValNet project and relevant partners (if Prounion as a project partner will act as an intermediary)

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SLOVENIA

1. The objective of the Regional Report

The purpose of interviews conducted was to get the empirical information from public and private companies involved in phytopharma value chains in Slovenia. Those 5 interviews have been made with Phytopharma value chain participants at almost all levels of the chain with the objective to identify the primary actors in the value chain, their roles, and interrelationships, to identify market channels and trends within the value chain.

The Regional Report is outlining the topics and issues coming out from interviews conducted with the representatives of the local phytopharma suppliers, including farmers and wild harvest collectors associations, R&D institutes and companies involved in production of plant based products for health, nutrition and cosmetics. The respondents are anonymous and the information's are aggregated. There were 5 representative interviews carried out.

2. General Information

According to the last statistical data², in 2015, 75 tons of spices, aromatic plants and medicinal plants were produced in the Republic of Slovenia – for own housekeeping and majority for sales on the market. The data fluctuates significantly over the years, the overall trend production is rising, but

the overall production volume is still extremely low in comparison to other neighbouring countries. The number of farmers that produced herbs for sale increased in last year by something less than 80% (262 farms in year 2016).

The largest area of production of herbs for sale was in Pomurje region (from 32% in year 2013 to 45% in 2016), in the Podravska region there were 18% of cultivated areas, which were processed by 19% of all of agricultural holdings that have grown herbs for sale. In the Savinjska region, 13% of cultivated land treated by 13% of all agricultural holdings that produced herbs for sale. Among the remaining regions, the largest number of production areas was in the Central Slovenia region. The production of herbs in Slovenia is increasing, but the area remains according to the statistical data extremely low (75 ha for herbs in 2015). All statistical data are only on aggregated level. The biggest issue regarding data is that there is still no systematic identification and evaluation of current species and sites of medicinal and aromatic plants in Slovenia.

Interviews conducted for this report have been made with representatives of cooperative/producer (hemp), regional herb growers associations and one food-supplements company. The cultivators (farmers) cultivate mostly the

2) Source: Statistical Office RS;

http://pxweb.stat.si/pxweb/Dialog/varval.asp?ma=15P6004S&ti=&path=../Database/Okolje/15_kmetijstvo_ribistvo/04_rastlinska_pridelava/02_15P60_popis_vrtnarstva_2010/&lang=2

following species: hemp, rye pink, valerian, mint, melissa, chamomile, echinacea, wormwood, etc. and honey.

The product focus for companies is use in nutrition, health and cosmetics (in some case other industrial sectors - for example construction (hemp)).

The final consumers of herbs cultivated can be divided into three key groups: industry (pharmaceutical and food-processing, up to 60%), retail sales (up to 30%) and catering sector (10%).

The percentage of incomes from the herbs cultivation related to farmers other income-generating activities it's very different - from 10% to 80% of their income (herbs cultivation is mostly registered as complementary activity on the farm).

Imports and exports to the Slovenia from third countries and EU Member States of plants or parts of plants (including seeds and fruits) of the species used primarily in perfumery, pharmacy, or for insecticidal, fungicidal or similar, fresh or dried, cut or not cut, crushed or powdered (No. of Combined Nomenclature CN 1211 90 86) in year 2015 amounted to EUR 4.9 million on the import side and EUR 1.2 million on the export side. Germany, both in terms of imports and exports, is the largest market for Slovenian herbal cultivators and companies (producers) in phytopharma sector.

In Slovenia there is no analysis of the herbal market in terms of production/market demand for the purposes of nutrition, pharmaceutical and cosmetic industries and galenic laboratories. The producers are still not aware of importance of R&D investment and cooperation with R&D institutions for development of new herbal products or semi-products. The producers/farmers/herbalists are still not organized for purposes of joint production and marketing of herbs. But in Slovenia there are some international-oriented and recognized companies in nutrition and cosmetics.

3. Suppliers of the resource material

For all companies the main source of the plant raw materials is cultivation (also organic agriculture), only one company states also wild collection.

Interweaved cultivators buy plant material from Germany (partly Austria) and one on a global scale. Other are buying plant material in Slovenia (from Slovenian seed trading companies, seed bank or trough co-operatives). Purchasing criteria for plant material are for all quality and price, following by reliability and standards/certificates. The preferration for seeds and seedlings of herbs is eco-certificate.

Throughout the interviews, information was recorded on the production order of one pharmaceutical company for a purple American straw (*Echinacea purpurea* Moench.) Other business relationships are based on cooperation or contracts.

All interweaving representatives have been very

optimistic about the future perspectives regarding the availability of plant material – the awareness in EU is on a very high level. And that the competition on this market is also growing.

One cooperative reported of joint research and development of new products (from hemp):

- hemp plastic bio granulate, which can be used also in 3D printing,
- antifungal characteristics of hemp hydrolytes research is undertaken (value in plant protection),
- fibreboard from hemp for use in construction.

4. Related industries and support services

The cooperation with universities and R&D institutions is considered as very important for some of interweaves. Some of them cooperate with Pulp and Paper Institute, Institute for Ecological Research ERICo, Institute of Hop Research and Brewing in Žalec - Centre for the production, processing and application of medicinal and aromatic plants, Agricultural Institute of Slovenia, Biotechnical Faculty at University of Ljubljana, National Institute of Chemistry, Faculty of Polymer Technology and many others.

They see as related industries agriculture, construction, packaging, logistic and others.

5. Quality and Labour Force

The quality is the most important criteria for cultivators (raw material, seeds, plants, drying and extraction) and producers. Most of them already have quality management systems or have implemented other quality measures. For implementation of QM one interweave has already deployed an expert from institute.

In Slovenia there is available a national vocational educational programme "herbalist". In last 10 years more than 100 certificates have been obtained. There is also great interest in the cultivation of herbs among young people. But the area of cultivation of herbs (farmers) is still lacking the specialized advisory service for herbs cultivation. Very often the farmers are using seasonal workforce for picking herbs.

6. Competition

In Slovenia only small-scale growers (farmers) exist and they are not competing between them selfs. The main challenge on this level is cooperation. But all of them have mentioned the competition on cross-border (neighbouring) level.

The producing company is aware of the national and international (EU) competition in pharmaceutical and health industry.

As the most sophisticated clients they mentioned companies from Germany (Wellea), France (Yves Rocher), Switzerland, Austria (Sonnentor) and Baltic region (*Natura Sibirica*).

7. Future perspectives

Most of cultivators and producers see the perspective in organic production and broader cooperation not only in pharmaceutical industry but also with other sectors. They see the opportunities in the development of new business models (sharing

economy) and in new technologies (weather forecasting, virtual technologies, analytics, logistic). All of them also see huge potentials in bio based (herbal) pharmacy.

• Visual Map



Some companies in Slovenia can cover almost all the value chain by themselves.

Organic production, cultivation is growing, specialization

International orientation of producers and cultivators, unique and new products

• List of main actors/stakeholders

There are 2 companies, 2 associations of regional herbalist and one farmer/cultivator that participated in the survey. There is a larger quantity of companies which focus on bio-based pharmacy, natural cosmetics and dietary supplements in Slovenia, but there is no umbrella organisation.

• Main gaps

It was reported that the main gaps in cultivation of medicinal herbs are:

- non-transparent legislation, jurisdiction,
- delimitation between medicinal products and medicinal herbs,
- lack of managed networking and cooperation between the cultivators and producers,
- there is no verified laboratory that certifies the quality of herbal drugs by European Pharmacopoeia,
- dependence on imported herbs.

• Missing links

There was a missing link between agriculture and industry jurisdiction (ministry, policy level) evidenced.

• Policy related obstacles

Transparency in legislation for herbal medicinal products, wide legislative area - need for umbrella institution.

• List of suggested cross-regional cooperation areas within DanuBioValNer regions/partners

Regarding the possibility for cooperation within the Danube Region, the respondents see the potential in the areas of:

- Strengthening the cooperation of different industry sectors (with agriculture) in Danube region;
- R&D cooperation (project partners for hemp, new materials in H2020);
- Business cooperation;
- Raw plant material.

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