

## ***SHORT TERM SCIENTIFIC MISSION***

### ***- REPORT -***

***COST ACTION:*** *FP1203*

***TITLE:*** *European non-wood forest products (NWFPs) network*

***TIME:*** *09 May 2015 – 23 May 2015*

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### 1. Purpose of the STSM and methodologies

The primary **objective** of STSM mission was to conduct research into companies engaged in purchasing, processing and marketing of non-wood forest products (NWFPs) in a field of business activity related to the commercialization of these products. The **purpose** of the research was **clustering** of the analyzed companies and identifying their **typology** based on a number of relevant variables. On this way, efforts were made to establish the typological characteristics of the analyzed companies. The survey included companies with relatively equitable representation of those engaged in purchasing, processing and sale of: **mushrooms, wild berries, herbs and honey**, as the most important NWFPs in Serbia (Keča et al., 2013).

The aim of this study was to make a typology of enterprises in sector of NWFPs in Serbia (n=111). The basic method used in the study is a Two-Step Cluster analysis (Pezdevšek-Malovrh et al., 2015). For this purpose, mixtures of continuous and categorical variables were identified. Quantitative variables with different scale units and nominal scaled variables may be simultaneously analyzed and user must decide to handle ordinal variables either as continuous or as categorical if they are present (Bacher et al., 2004). The procedure first assigns cases into small sub-clusters, then scans the data and the SPSS software algorithm determines, based on a distance measure, if the current case should be merged with a previously formed precluster or starts a new precluster. When preclustering is completed, all cases in the same preclusters are treated as a single entity. In the second step, the preclusters are clustered by using a hierarchical clustering algorithm.

Two-Step Clustering considers categorical and continuous variables in order to create natural grouping of cases. It is based on a likelihood distance measure assuming variables independence. Also each categorical variable is assumed to have a multinomial distribution and each continuous to have normal (Gaussian) distribution (Čabaravdić et al., 2010). Two-step uses mixture data (both continuous and categorical variables) and it also finds the optimal number of

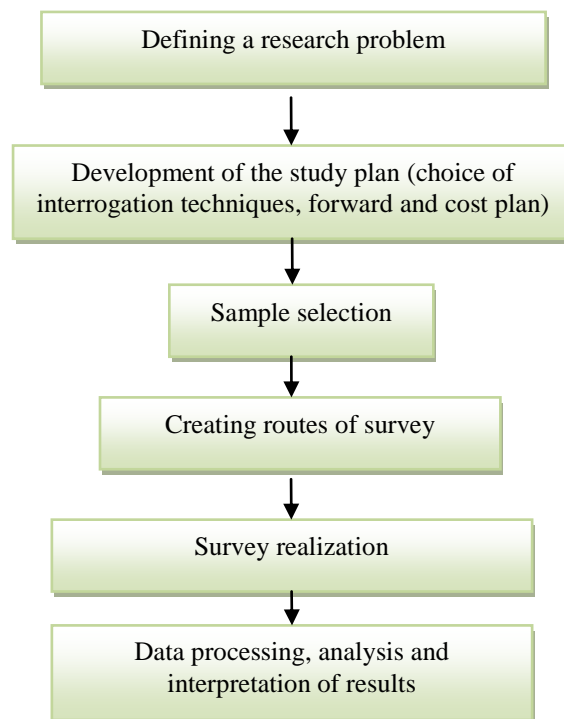
clusters (Schiopu, 2010). Statistically Cluster analysis is used to classify data in to clusters using neural network algorithms. It is a general approach to multivariate problems whose aim is to determine whether the individuals fall into groups or clusters (Chaudhary et al., 2013). The quality of the performed grouping was determined on the basis of *Silhouette* coefficient. (Omnia et al., 2011).

The subject of research are: companies engaged in purchasing, processing and sale of NWFPs, their supply chain, distribution channels, and promotional activities of enterprises conducted with the aim of improving business. In addition, the subject of research covered was bought and sold quantity of NWFPs, the types of final products, as well as the prices for which are realized both in the domestic and foreign market. The basic technique applied to the study of surveys in conjunction with the interview. The answers obtained by the survey were used as the basis for the typology.

## 2. Description of the work carried out during the STSM

The whole survey included a few key steps:

### Scheme 1 Phases of research



The first step was identified research problems and defining the research agenda. In a further step is determined the route of research and then access its further implementation, followed by representative sample of companies and a survey which was conducted on a delegated sample.

In the next step was conducted the survey and collected data relevant for the commercialization of NWFP. The survey covered: micro, small and medium enterprises, whose activity is primarily based on NWFPs (Marčeta et al., 2014) such as **mushrooms**, **wild berries**, **honey** and **medicinal plants**.

The **survey** was made for the purpose of research. It is consisted of 32 questions open and closed character, roughly divided into two parts. The first part covers the basic information about the respondent companies, such as where the company is located, the type of ownership of basic products in the range, the total processing capacity, and the degree of their use. The second part of the survey was consists of questions related to:

- **Product:** the quantity and location of purchase of raw materials, structure and quantity of finished products placed on the domestic and foreign markets, etc.;
- **Price:** the price at which products are realized both in the domestic and foreign markets;
- **Promotion:** the manner of conducting promotional activities and instruments;
- **Distribution:** channels that perform distribution of products.

In addition, the survey included a series of questions that represent the attitudes of respondents about business conditions and problems in businesses.

**Table 1** Variables used as a basis of the typology

Variable	Categories
Degree of utilization of installed capacity (%)	Continuous variable
Total amount of raw materials purchased annually (t) a) mushrooms; b) medical and aromatic plants; c) honey; d) berries	Continuous variable
Quantities of products in a raw state purchased for the period 2007-2014 (average in t) a) mushrooms; b) medical and aromatic plants; c) honey; d) berries	Continuous variable
Final products sold on the domestic market for the period 2007-2014 (average in ) a) mushrooms; b) medical and aromatic plants; c) honey; d) berries	Continuous variable
Final products sold on the foreign markets for the period 2007-2014 (average) a) mushrooms; b) medical and aromatic plants; c) honey; d) berries	Continuous variable
Extension of product range	1 – Yes; 2 – No
Price competitiveness on the domestic market	1 – Yes; 2 – No
Price competitiveness on the foreign markets	1 – Yes; 2 – No
Acceptance of standards related to NWFPs	1 – Yes; 2 – No

The basic variables used for the Two-Step Cluster analysis are primarily quantitative. Namely, these are the quantities of purchase of raw NWFPs in the period 2007-2014 year; quantities of NWFPs placed on the domestic and foreign markets. Other variables are dichotomous and refer attitudes of the respondents whether they have the intention to expand in the future approach variety of products; their attitude in terms of competitiveness on the domestic and international market and implementation of applicable standards. The collected data are analyzed and prepared for further processing. All statistical analyzes were carried out using SPSS 20 software (Corp. 2011).

During his stay in Slovenia, was performed systematization of collected data, statistical analysis and interpretation of the results based on the experience and knowledge of the host institution STSM missions. It also made the terms of reference which will be published on the basis of the results obtained.

**Table 2** Daily work plan for STSM

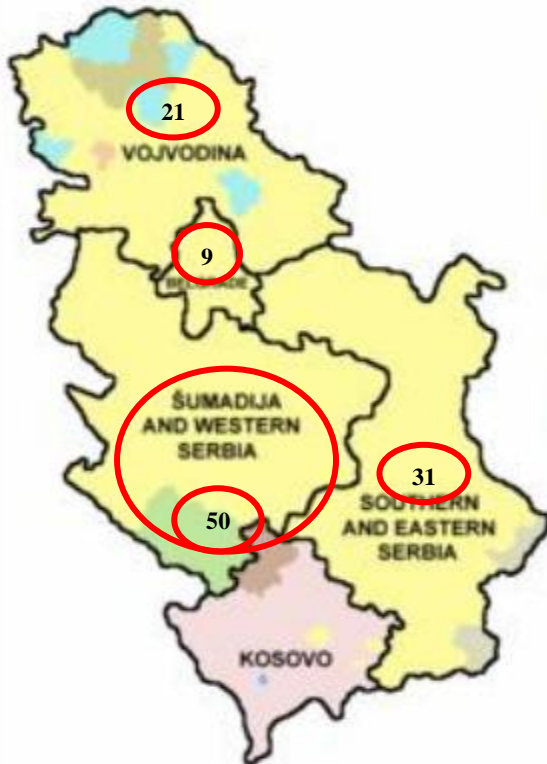
Task	4 days	4 days	3 days	3 days
Database preparation	X			
Literature review	X			
Variables coding		X		
Statistical analysis		X	X	
Draft version of the paper				X

Parallel has studied literature that dealt with issues of clustering companies, in order to better access the interpretation of the obtained results. By completing the research and data processing, they are analyzed and interpreted roughly. In the future results of the research will be systematized and published in journal, according to the topic where the research was customized.

### 3. Description of the main results obtained

The survey was conducted within the four regions in Serbia (Vojvodina, Belgrade, Southern and Eastern Serbia, Šumadija and Western Serbia). The total number of analyzed companies is 111. The largest part of the analyzed company is located in the region of Šumadija and Western Serbia (50).

**Figure 1** Regions in Serbia with number of surveyed companies



Based on the conducted Two-Step Cluster analysis is identified **three clusters**. Silhouette measure of cohesion and separation shows fair cluster quality.

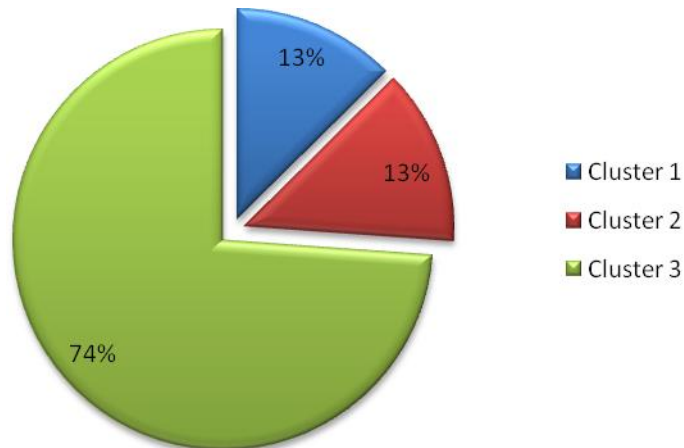
**Table 3** Cluster sizes

Size of Smallest Cluster	14 (12.6%)
Size of Largest Cluster	82 (73.9%)
Ratio of Sizes Largest Cluster to Smallest Cluster	<b>5.86</b>

The first cluster is oriented on the export of **medicinal herbs (cluster 1)**. It is consisted of **14 companies** (13%). The second cluster is oriented, mainly, on the export of **wild berries** and has **15 companies** (13%) (**cluster 2**). Companies engaged in the export of mushrooms dominate in the third cluster. This is the largest cluster and it is consisted of **82 companies** (74%) (**cluster 3**).

The aim of the clusters was to point out how many homogeneous groups of companies are identified on the basis of the analyzed variables.

**Diagram 1** Share of the total number of enterprises in individual clusters



Three groups of enterprises were identified in Serbia based on a preselected criteria algorithm (Schwarz Bayesian Criterion). These were identified and named according to their main distinguishing characteristics.

According to the degree of **capacity utilization** in the cluster 1 is the highest capacity utilization in **medicinal herbs**, while the capacity utilization of other product categories is significantly lower.

The cluster 2 capacity utilization for **wild berries** and **mushrooms** is at the same level, while the use of honey and herbs drastically reduced. The situation in the cluster 3 indicates that the utilization capacity is relatively uniform for **mushrooms**, **honey** and **wild berries**.

Regarding the placement of NWFPs on the domestic market can be noted that in the first cluster is dominant placement of **medical herbs**. In the second cluster is largely represented the placement of honey, while in cluster 3 to these are wild berries.

In the case of the **price competitiveness on the domestic market**, it was found (based on the attitudes of respondents in the analyzed companies) that is in the cluster 1 over 70% of companies are competitive by price on the domestic market, while in cluster 2 over 80% of companies expressed the view that they are not competitive by prices on the domestic market.

In contrast in the cluster 3 are approximately the same level the existence and absence of price competition in the domestic market.

By **price competitiveness on the international market** in the cluster 1 (over 70%) there is a view that the companies are competitive on the international market. The cluster 2 is approximately the same attitude about companies and uncompetitive on the international market. Almost 90% of companies in the cluster 3 considered that they are uncompetitive competitive on the international market.

#### **4. Future collaboration with host institution**

The two-week stay in Slovenia, in the period 09 May - 23 May enabled the establishment of good research platform for the study of the typology of enterprises in the sphere of NWFPs. This line of research is innovative both in Serbia and in Slovenia, taking into account companies engaged in NWFPs. During the stay at the Biotechnical Faculty in Ljubljana, close cooperation was established primarily with the host of STSM Assist.Prof. Špela Pezdevšek Malovrh, and other researchers from host institution, which can contribute to further research in this area. This cooperation will be continued through further study activities related to the implementation of COST Action FP1203. In a further step, the research endeavor is to be done, compare the results between Serbia and Slovenia.

#### **5. Foreseen publications/articles resulting or to result from the STSM**

All results obtained during his stay in Slovenia, and all the next, which will be the result of further research in this field, will be published in some national or international journals.

#### **6. Confirmation by the host institution of the successful execution of the STSM**

As attachments to this report, I submit the Confirmation of the successful execution of STSM, signed by prof. Janez Krč, PhD, vice dean of Forestry and Assist.Prof. Špela Pezdevšek Malovrh.

#### **7. Other comments**

I want to thank the host STSM mission Assist.Prof. Špela Pezdevšek-Malovrh on the dedicated time and unselfish help in realization the goals of the STSM mission. I would like to use this opportunity to express my sincere gratitude to the Chair of the Action dr Luis Fontes and STSM coordinator dr Tine Grebenc for making the STSM possible.

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