PLANT WILD GRUNDTVIG PROJECT

5th meeting report

Good practices for training of medicinal and aromatic plants wild harvesting

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J.Radusiene[1], E. Moré[2], A.M.Barata[3], V.Lopes[3], F.Rocha[3], N.Sekeroglu[4].

[1]Nature Research Center, Institute of Botany, Laboratory of Economic Botany, Žaliųjų Ežerų g. 49, LT-08406 Vilnius (Lithuania).
[2]Forest Sciences Center of Catalonia, Medicinal and Aromatic Plants Group, Ctra. Sant Llorenç de Morunys, km.2. – 25280 Solsona (Spain). E-mail: eva.more@ctfc.es
[2]Instituto Nacional de Recursos Biológicos, Banco Português de Germoplasma Vegetal, Quinta de S. José, S. Pedro de Merelim, 4700-859 Braga (Portugal)
[4]Kilis 7 Aralik University, Faculty of Arts and Sciences, Department of Biology, Mehmet Sanlı Mah. Doğan Güreş Paşa Bul. No:134, Kilis (Turkey).

Good practices for training of medicinal and aromatic plants wild harvesting

Objective

The rising public interest in collecting and use of Medicinal and Aromatic Plants (MAPs) leads to the need to develop the best training model that provides diverse knowledge on sustainable wild harvesting and usage of MAPs. There is a lot of information about usage of medicinal and aromatic plants in variable books and websites, however, for proper identification of plant species the advice of a specialist and the contact with living plants are essential.

During the 5th meeting of Grundtvig Project "Plant Wild" that was held in Solsona (Spain), the Project partners summarized their experience for wild harvesting training and the state of the art advanced from the 2nd meeting in Braga (Portugal), 3rd meeting in Vilnius (Lithuania), and 4th meeting in Kilis (Turkey). Partners presented the vision of Good practices for training in wild harvesting of MAPs and discussed the basic training modules indicating the main subjects, training methodology, tools and measures to create and develop the best models for MAPs wild harvesting training. Partners from Portugal presented the training model for wild harvesting of *Sambucus* raw material. Lithuanian partners' introduced the training practice for wild harvesting used in farm "Jadvygos žolės". Partners from Spain and Turkey summarized their practical experience with theoretical knowledge presenting Good Practices for training in wild harvesting of MAPs.

The **aim** of Good Practices for wild harvesting training on MAPs is to provide learners with knowledge and practical skills and to qualify them so that they will be able to perform sustainable wild harvesting of MAPs.

Target learners

Several target learner groups for wild harvesting of MAPs were identified. These groups involved both individual and stakeholders and employed collectors that require training for wild harvesting of MAPs. **Target learners** for Good Practices for wild harvesting training on MAPs are the following:

- People harvesting raw material for their personal use.
- Local population employed by a farm.
- Groups of harvesters which work is commissioned by a buyer.
- Professional harvesters.
- Enterprises supplying raw material for end products.
- Forest owners.
- Promoters of MAPs projects.
- Policy makers.

There are many people harvesting medicinal and aromatic plants for their personal use. The most popular plants used are easy recognizable and mostly used for such ailment like cough, fever or diarrhoea. Narrow assortment of plants harvested from wild is mainly limited because of lack of people's knowledge in plant species. On the other hand, this group of learners is motivated for their self-education on MAPs knowledge, sometimes traditional knowledge transmitted among generations and neighbours.

Due to the current crisis, more people are searching new businesses or labour opportunities in rural areas and one of these is harvesting of wild MAPs. Population which are employed by farm owners or buyers are interested in regular training of wild plant harvesting in order to assure the sustainability of such professional activity.

Professional harvesters continually update and improve their knowledge in MAPs wild harvesting as market and environmental requirements are changing with new regulations and legislations.

Often the companies themselves harvest and supply raw material for processing herbal products. The direct training in MAPs wild harvesting for owners of enterprises gives more chances to collect desirable plant material for processing. The requirements of the herbal pharmaceutical industry for quality control of raw material promotes the training in MAPs wild harvesting to get higher incomes for the high quality of plant material. On the other hand, there is great potential use for waste resources of common MAPs species, mainly for the production of extracts and essential oils. So, training is needed in the current demand and the raw material's industrial processing of these new products.

Land and forest owners are highly potential harvesters for sustainable use, maintenance and restoration of MAPs wild resources. They are interested in training of MAPs because they may have a direct profit from wild harvesting. They are concerned for sustainable use of resources to avoid the potential negative impacts on private/public forest. On the other hand, forest owners do not have enough information on potential use of forest products and additional incomes from timber products.

Wild harvesting training in MAPs is also fundamental for promoters of MAPs projects participating in Rural Development Programs supported by EC, which aim is to improve and promote rural development.

Policy makers are important actors and must be aware of the main principles and measures of sustainable wild harvesting since they can legislate and implement regulations providing a better control of wild harvesting potential negative impacts.

The training modules of Good Practices for wild harvesting

Knowledge of plant biology, ecology, botanical identification, bioactive compounds and their accumulation patterns, theoretical and practical skills on plant harvesting and post-harvesting technologies, of market and business framework, as well as knowledge of legal acts and legislative measures regulating wild plant harvesting is essential for professional harvesting and sustainable usage of MAPs resources. Each step from plant identification to post-harvesting processing and packing has an impact on the quality of the final product.

Training of Good Practices in wild harvesting provides safe and high quality herbal products and the sustainable use of plant resources.

The training of Good Practices in wild harvesting based in Good Agricultural Collection Practices (GACP) includes the corresponding subjects and training methodologies, tools and measures to achieve the main purposes: safety, quality, sustainability, and regular income

Six **training modules** were defined as follows::

1. Basic plant science with emphasis on MAPs.
2. Knowledge of MAPs species.
3. Harvesting of raw materials and uses.
4. Sustainable wild harvesting: methodology, legislation and control.
5. Post-harvest processing of MAPs.
6. Marketing and business.

Several training **methodological** actions in wild harvesting of MAPs were set to achieve the training objectives.

1. *Regular training*: teaching courses and workshops included in official training courses.
2. *Voluntary training*: courses and workshops not included in official training courses.
3. *Open seminars*: seminars or workshops related to knowledge transfer included in scientific projects.
4. *Media actions* (TV, radio and press releases).
5. *On-line training*, regular or voluntary.
6. *Practical training* in MAPs collections, botanical gardens and field trips.
7. *Practical work* in raw material processing techniques.

And specific **tools and measures**:

1. Handbooks and professional books.
2. Plant catalogues and descriptors.
3. Promotional documents: leaflets, posters, videos.
4. Technical documents: documents with technical or scientific information.
5. Training brochures and booklets for sustainable wild harvesting methods.
6. Websites.

Module 1. Basic plant science with emphasis on MAPs

Numerous factors influence the quality and production of plant material. The knowledge of main ecological and biological characteristics of target species is essential for harvesting the best plant material from the right species. An understanding of the active compounds accumulation related to the phenological development, localization in the plant organs, climatic conditions, season, variability in different populations chemotypes, as well as stability and their degradation is very important for the desirable quality of plant production.

The training main subjects of the module are recommended as following:

1. Plant ecology and habitats of MAPs;
2. Plant phenology;
3. Plant bioactive compounds, their localization and accumulation patterns;
4. Plant use in: pharmacy, cosmetology, culinary.

The principal methodology for training such subjects is teaching courses and workshops using books, divulgation documents and website information.

Table 1. The main subjects, methodology actions and measures for the training module of basic plant science with emphasis on MAPs

Training subjects	Methodology	Tools and measures	Learners
Plant ecology and habitats of MAPs	Teaching courses and workshops of several hours	Books Website Promotional and educational documents: leaflets, posters, videos	Ordinary population Locals employed by farm Harvesters commissioned by buyers Enterprises Forest owners Promoters of projects
Plant phenology			
Plant bioactive compounds, their localization and accumulation patterns			
Plant use in: pharmacy, cosmetology, culinary			

Module 2. Knowledge of MAPs species

Medicinal plants used in folk or traditional medicines represent a relevant part of the natural biodiversity. However the assortment of plants harvested in wild is very limited by lack of people's knowledge of plant species. Knowledge about plant species and their use is mainly maintained by elderly population, especially women. Recent migration to urban areas has decreased knowledge of MAPs species. It is necessary to recover traditional knowledge, improve it with scientific research and to transfer to younger generation.

Wild plant harvesters are trained to recognise common species and species of highest demand for raw material. On the other hand, it is important to know the rare and endangered species which are protected and whose harvesting is prohibited or regulated by legislation. Knowledge of plant use and recommendation is low. The most popular plants used are easy

recognizable and used as ailment for primary health care. . Lack of professional knowledge of plants and their use constitute a health risk due to mistakenly use of raw material. Sometimes self-educated people teach other people, who are going to become wild plant harvesters and also transfer uncompleted information to consumers.

The training subjects of the module are recommended as following:

1. Botanical identification;
2. Species of highest demand for raw material;
3. Endangered and protected MAPs species;
4. Species with different and special indications for use.

The principal methodology is teaching courses and workshops using handbooks and professional books, as well as plant descriptors which are useful for the species botanical identification and field recognition. Legal acts give information about endangered and protected species which harvesting is prohibited or restricted.

Practical training on MAPs knowledge of specialized plant collections and during field trips are the most important activities to achieve good training results.

Table 2. The main subjects, methodology actions and measures for the training module of knowledge of MAPs species

Training subjects	Methodology	Tools and measures	Learners
Botanical identification	Teaching courses and of several hours Workshops	Handbooks and professional books Plant catalogues and descriptors Websites Legal acts MAPs collections, botanical trails Field trips	Ordinary population Locals employed by farm Harvesters commissioned by buyers Enterprises Forest owners Promoters of projects Policy makers
Species of highest demand for raw material	Teaching courses Workshops Practical training in MAPs collections and botanical gardens		
Endangered and protected MAPs species	Practical training during field trips		
Species with different and special recommendations for use	Teaching courses Workshops		

Module 3. Harvesting of raw materials and use

Sites of synthesis and storage of active compounds are different according to species, plant parts and season. To collect a high-quality herbal material, the appropriate part of the medicinal plant must be harvested at the optimum phase of development. MAPs have their own optimum harvesting time. Harvest calendar of raw material highly depends on seasonal variations of bioactive compound contents in different plant organs.

For example, early spring is time for gathering bark from oak, willows, buckthorn and alder. Springtime is the best for picking birch and pine buds, as well as flowers of several plants, as coltsfoot and lungwort etc. Most of MAPs are harvested during the flowering period when herb, flowers or leaves put in the highest contents of active compounds. Plants that store useful compounds in fruits, roots and rhizomes, as hawthorn, valerian, burdock or common dandelion are harvested in autumn.

The training provides information on quality requirements for raw materials, harvesting techniques and guidelines for handling plant materials during and after collection. Harvesters that produced organically certified products often lack of training for sustainable wild harvesting techniques as this training is not always provided by the certifying entities.

The training subjects of this module are recommended as following:

1. Harvesting calendar of raw materials;
2. Species and raw material harvested in spring;
3. Species raw material harvested in summer;
4. Species raw material harvested in autumn;
5. Good Harvesting Practices.

The methodological actions for harvesting periods of species and raw materials include class teaching courses and practical workshops in nature for plant harvesting in different seasons. The main tools and measures should be books and plant catalogues together with websites information. Field trips provide practical knowledge and skills on plant species and harvesting of different raw materials during seasonal development of plants.

The training of Good Harvesting Practices should be based on guidelines of Good Agricultural Collection Practices (GACP).

Table 3. The main subjects, methodology actions and measures for the training module of harvesting of raw materials and use

Training subjects	Methodology	Tools and measures	Learners
Harvesting calendar of raw materials	Teaching course of several hours	Books Plant catalogues Websites Field trips	Ordinary population Locals employed by farm Harvesters commissioned by buyers Enterprises Forest owners Promoters of the projects
Species raw material harvested in spring	Workshop in nature for practical knowledge of plants harvesting		
Species raw material harvested in summer	Workshop in nature of practical knowledge of plants harvesting		
Species raw material harvested in autumn	Workshop in nature of practical knowledge of plants harvesting		
Good Harvesting Practices	Workshop for Good Collecting Practices	Guidelines for GACP	

Module 4. Sustainable wild harvesting: methodology, legislation and control

The aim of sustainable wild harvesting of MAPs is to protect and restore wild resources by ensuring their rational use. Those principles are the background for all activity related to wild harvesting of MAPs. The aim of training in sustainable wild harvesting of MAPs is to introduce learners to the sustainable harvesting methodology and to present international and national legal framework regarding sustainable use of MAPs resources. Sustainable harvesting methodology of MAPs includes technical issues such as harvesting rate and the return period that are based on research and practical experience on the most important species.

Legal framework and procedures for sustainable wild harvesting of MAPs are not well known to the stakeholders of this activity and it is an important subject for training.

The main international document establishing the sustainable use of resources is the Convention on Biological Diversity (CBD) 2010. One of the goals of the Biodiversity Convention Strategy Action Plan is to protect or restore non-timber forest products by ensuring rational use, by preparing and implementing a programme for resources restoration.

The aim of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) is to ensure that international trade does not threaten the survival of species in the wild. CITES declared a list of threatened species which included commercial important MAPs that should not be traded or which trade is regulated or constrained by different prohibitions.

The FairWild Foundation promotes the sustainable use of wild-collected plants and provides guidance on best harvesting practice and trading of wild-harvested plant resources.

National legal framework regarding wild harvesting includes description of regulations, guidelines and certification rules that are applied in wild harvesting activities affecting species. On the other hand, existing legislations are applied mainly to conservation issues of the most endangered species, which not always have a commercial interest. Wild harvesting

of not-protected common plant resources sometimes fall into illegality since it is got round within the legal framework, which is weak and not clear.

Control implementation system for sustainable harvesting based on corresponding laws and regulations is organized by local national environmental institutions. In order to assure the sustainability of commercial activity, wild harvesting should be managed by local communities, who are the most interested in conserving their own habitats and species in the long term.

Local or regional authorities should be responsible for the MAPs wild harvesting activity control of which is to prevent overexploitation of wild resources. On the other hand, they often lack of training on these issues.

The training subjects of this module are recommended as following:

1. Sustainable wild harvesting methodology;
2. Framework of European and national legal for sustainable wild harvesting;
3. Control system for wild harvesting.

The methodology actions on training for sustainable wild harvesting includes short teaching courses and seminars for analyse European and national legal acts and Regulations on use of wild flora resources. The tools measures used in training process could be legal acts and other documents for regulations of wild resources, leaflets and websites information.

Table 4. The main subjects, methodology actions and measures for the training module of sustainable wild harvesting: methodology, legislation and control

Training subjects	Methodology	Tools and measures	Learners
Sustainable wild harvesting methodology	Short teaching courses Seminars	European and national legal acts Regulations on use of wild flora resources Lists of endangered and protected species Websites Leaflets	Ordinary population Locals employed by farm Harvesters commissioned by buyers Enterprises Forest owners Promoters of the projects Policy makers
Framework of European and National Legal for sustainable wild harvesting			
Control system for wild harvesting			

Module 5. Post-harvest processing of MAPs

The post-harvest processing highly affects the quality of final herbal products. Processing technologies of plant material vary depending on what material will be used: for food market as fresh herb and condiment or food supplements, for distillation of essential oil or for dry herb material which will continue to be processed.

Freshly harvested MAPs occupy large volumes and to maintain the high quality of plant material it is essential to ensure effective ventilation, cooling and protection from sunlight. Primary processing of raw material include cleaning, washing, crushing or chopping plants before drying.

The drying of MAPs is necessary for preservation purposes when water content from raw material is removed through thermal treatment. The methods available for drying of MAPs can be grouped into natural and mechanical drying on the basis of heat source or energy utilization. In both processes, water present in plant must move to the surface by internal diffusion. Control the moisture content in plant material to an acceptable level, which permits quality of the herbs and ensures long-time storage with little deterioration is essential in drying process. A control of drying temperature for different plants and their organs could increase the quality of drug materials. The main aim of storage is to prevent the deterioration of herb material quality. Suitable packing of herbs or other products affects the quality and safety of products and adds market value. Depending on the consumer market, the trade conditions and the prices of the product, the packing should be selected to be both practical and attractive.

To prepare a high-quality product, the appropriate part of the plant must be harvested at the optimum phase of growth, dried and stored at temperatures and conditions that do not decrease the phytochemical concentrations. All processing protocols must be designed such that they do not result in a decrease of bioactive compounds in herb material. Commercial pharmaceutical operations produce medicines under strict regulations concerning processing what is very important to know to suppliers of raw material. The materials must satisfy the qualitative and quantitative requirements.

The training subjects of the module are recommended as following:

1. Post-harvest technologies;
2. Processing of raw material;
3. Quality Management;
4. Good Processing Practice.

Learners for practical skills of post-harvest technologies and processing facilities (dryers, distillers, storages etc.) should be taught in farms and enterprises.

The main tools and measures are technical guidelines of post-harvest technologies, Guidelines for GAP, didactic videos, informative leaflets and brochure together with websites information.

Table 5. The main subjects, methodology actions and measures for the training module of Post-harvest processing of MAPs

Training subjects	Methodology	Tools and measures	Learners
Post-harvest technologies **Processing of raw material** **Quality Management** **Good Processing Practice**	Seminars Practical workshops in farms and enterprises	Technical Guidelines of Post-harvest technologies Guidelines for GAP Videos teaching material Brochures and leaflets Websites	Locals employed by farm Harvesters commissioned by buyers Enterprises Forest owners Promoters of the projects

Module 6. Marketing and business

Wild plants are used in different sectors of cosmetic, pharmaceuticals and food industries. Because of the demand for raw plant material by industry and final natural products by consumers, wild plant market is rapidly increasing; manufacturers and wholesalers are required for large quantities of raw material. However, prices for raw material of MAPs are often not satisfactory for harvesters and suppliers. Low prices promote the import of herb material and products which competes with the local market. On the other hand, MAPs trade often escapes large-scale commercialisation; consequently it remains with insufficient trade statistics. Statistical register of annual volumes of marketed MAPs regarding annual volumes are inconsistent, irregular and even do not exists for some years

To effectively assess the demand and market potential of MAPs, two sectors need to be recognized – unprocessed or crude herbal medicines and processed herbal medicines. Numerous opportunities for MAPs market growth undergo adding value by processing and packaging.

Based on the WHO Good Manufacturing Practices (GMP) for herbal medicines, the guidelines should be used when setting up manufacturing facility and process for commercialised herb products. Trainees should be aware that the control of the starting materials, storage and processing procedures are particularly important because of the complex and variable nature of herbal material, and small quantities of active ingredients present in them.

The training subjects of the module are recommended as following**:**

1. Market demand and changes;
2. Products elaboration and distribution;
3. Good manufacturing practices.

The methodology actions on training for commercialisation and business should include short teaching courses and seminars and workshops. The main tools and measures in training process recommended are technical documents for products elaboration**,** statistical surveys of market, websites information and Guidelines for GMP.

The training in commercialisation and business subjects is important for all levels of produces of MAPs together with policy makers.

Table 6. The main subjects, methodology actions and measures for the training module of Marketing and Business

Training subjects	Methodology	Tools and measures	Learners
Market demand and changes	Teaching courses Seminars Workshops	Guidelines for GMP Technical documents Statistical surveys of market Websites	Harvesters commissioned by buyers Enterprises Forest owners Promoters of the projects Policy makers
Products elaboration and distribution			
Good Manufacturing Practices			